In re: Oil Spill by the Oil Rig "Deepwater Horizon" in the Gulf of Mexico, on April 20, 2010

United States District Court
Eastern District of Louisiana
MDL No. 2179, Section J
Judge Barbier; Magistrate Judge Shushan

Expert Report of Curtis Hays Whitson, PhD

May 1, 2013

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Summary of Opinions and Analysis

PERA was retained by BP to provide a Pressure, Volume and Temperature ("PVT") model to describe the physical and thermodynamic properties of Macondo reservoir fluids captured in pre-incident fluid samples. The reservoir fluid is a mixture of both oil and gas which will experience a wide range of pressure, volume, and temperature conditions as it travels from the reservoir to the sea surface.

PVT modeling is important in the context of the *Deepwater Horizon* (DWH) Incident for two primary reasons. First, it is critical in determining how much of the released reservoir mixture becomes "stock tank barrels" of oil at surface conditions. As a general matter, a reservoir mixture at high-pressure conditions transforms into a "shrinking" oil volume and an expanding gas volume as it approaches low-pressure surface conditions. The more accurate the PVT model, the more accurate the estimate of oil shrinkage and the calculation of stock tank barrels oil released during the DWH Incident.

Second, flow rate models used to calculate the oil released during the DWH Incident require *PVT* properties of the flowing mixture. The key *PVT* properties include density, viscosity, and volume of each oil or gas phase of the mixture.

PVT Modeling and Equation of State

PERA built a reliable PVT model that is uniquely for the Macondo reservoir fluids. PERA used all available measured laboratory PVT data – some 1000 PVT data – on four independent samples collected prior to the DWH Incident. PERA used the most sophisticated industry-standard PVT model available – a cubic equation of state ("EOS"). This EOS provides a high level of detail to describe the individual components comprising the Macondo hydrocarbon mixture with a total of 40 species (*e.g.* methane, ethane, carbon dioxide).

Nature of the the Macondo Fluids

The Macondo reservoir mixture is one of the most unusual reservoir fluids that PERA has modeled. We at PERA have conducted PVT modeling studies on thousands of reservoir mixtures, from hundreds of producing fields around the world – fields representing more than half of the earth's known reserves of oil and gas (Appendix I).

The Macondo reservoir mixture is referred to in the petroleum industry as "near-critical". A near-critical fluid means that it cannot be labeled as either a "gas" reservoir or an "oil" reservoir. Once the reservoir fluid forms two phases (that is, an oil phase and a gas phase) as a result of changing pressure and temperature, the two phases are so similar that it is difficult to determine which phase is "lighter" and which phase is "heavier". Nonetheless, a near-critical fluid develops distinguishable "gas" and "oil" properties when pressure and temperature depart far enough from a near-critical condition. The Macondo system is particularly unique in our experience because it exhibits near-critical behavior over a wide range of temperatures (40°F to 240°F), while "normal" systems are near-critical only for a narrow range of temperature (*e.g.* ±5°F).

Another characteristic of near-critical systems is that phase densities, viscosities, and volumes change radically with pressure – not linearly, as with most fluids. That characteristic makes PVT modeling more difficult, namely describing highly non-linear phase behavior near critical conditions that exist over the entire range of temperatures experienced by Macondo fluids.

The EOS model developed by PERA satisfies the requirement of predicting all complex phase behavior exhibited by all Macondo fluids, including near-critical behavior over a wide range of temperatures. This model also predicts the shrinkage of reservoir barrels to stock-tank barrels accurately, within only a few percent deviation from measured laboratory data for all four fluid samples.

Other PVT Models and Black Oil Tables

PERA also developed a simplified PVT description from its EOS model for use in engineering calculations. These data includes tables of density, viscosity, and phase amounts for the entire range of pressures and temperatures experienced from reservoir to surface conditions.

Other forms of PVT tables were also created from the EOS model – so-called black-oil tables. The black-oil quantities not only define the density, viscosity, and phase amount at any pressure and temperature, but they also quantify total shrinkage to stock-tank oil volume. The shrinkage to stock-tank oil volume depends on the definition of a pressure-temperature "path", from initial reservoir to stock-tank (surface) conditions – the so-called "surface process".

Surface Processes and Shrinkage

PERA's study considered several paths or surface processes transforming produced reservoir mixtures to final stock-tank oil volumes. One surface process emulates the actual physical process of Macondo reservoir fluid traveling from the seabed of the Gulf of Mexico to surface conditions, through a 5,000-ft column of seawater. This "oceanic process" entails pressure dropping from approximately 2250 psia at the seabed to 1 atmosphere (14.7 psia) at the surface, and a non-linear temperature variation from seabed to surface. The temperature of the water column was taken from published oceanic property tables, and a series of seabed "exit point" temperatures were modeled. Furthermore, the oceanic process incorporates 130 depths or stages of separation, whereby evolved gases were separated from the changing oil at each depth. The final oil at 1 atmosphere was brought to 60°F for defining stock-tank oil volume.

Several black-oil tables for the oceanic process were generated. Each table represented an assumed temperature at the seabed exit point where mixtures first start separating into diverging gas and oil phases. For example, using an average of the four reservoir samples and an exit temperature of the fluid of 210°F, 100 barrels of fluid (either oil or gas) at reservoir conditions equates to 46.7 barrels of oil at surface or stock-tank conditions.

PERA also analyzed a single-stage flash laboratory separation process[1] as well as a 4-stage separation process to convert reservoir volumes to surface stock-tank oil volumes. Black-oil tables were created for a single-stage process as well as for several oceanic processes (dependent on the assumed seabed exit temperature).

In addition to oil shrinkage associated with pressure and temperature changes, PERA calculated additional oil shrinkage due to the solubility of hydrocarbons (methane, ethane, benzene, etc.) from the oil phase during its ascent in the water column towards the surface. When oil (or gas) comes into contact with seawater, some hydrocarbon components dissolve (solubilize) into the seawater. Eventually, the hydrocarbons with greatest water affinity will be removed from the oil, causing additional shrinkage of the final stock-tank oil.

Based on PERA's calculations, seawater solubility effects on the oil phase during its ascent through a 5,000-ft column of seawater results in an additional oil volume reduction of between 7% and 13%; or approximately 10% (±3%). This additional stock-tank oil volume reduction was quantified, but it was not included in the oceanic process black-oil tables. If seawater solubility effects are included, the total stock-tank oil volume from any oceanic process (independent of exit temperature) is, coincidentally, approximately the same as from a single-stage process.

[1] For all EOS calculations of black-oil PVT tables and shrinkage to stock tank oil conditions, the "single-stage" separator test represents a flash of fluids to 1 atmosphere (or 14.7 psia) and 60°F.

Qualifications

Dr. Curtis Hays Whitson is professor of petroleum engineering at the Norwegian University of Science and Technology (NTNU), Department of Petroleum Engineering & Applied Geophysics (CV found in Appenix G). He founded the international consulting company PERA in 1988 (see Appendix I), as well as Petrostreamz (a petroleum software company dealing with optimized Integrated Asset Modeling) in 2006.

Dr. Whitson was born in Oklahoma City (1956). He received his B.Sc. degree in petroleum engineering from Stanford University in 1978 and a PhD degree from the Norwegian Institute of Technology (now NTNU) in 1984. He is an honorary member of the Society of Petroleum Engineers (SPE), and he twice received the SPE Cedric K. Fergusson award (as co-author with Øivind Fevang, 1997 and Lars Høier, 2001), as well as SPE's highest technical award, the Anthony F. Lucas Gold Medal (2011). He received the 2010 Excellence in Research Award from Statoil for his contributions to gas-based EOR and fluid characterization. Whitson was elected into the Norwegian Academy of Science (NTVA) in 2012.

Dr. Whitson researches and teaches both university and industry courses on petroleum phase behavior (PVT), gas-based EOR, gas condensate reservoirs, integrated-model optimization, petroleum-streams management, liquid-loading gas well performance, and liquids-rich shale well optimization. He has co-authored two books [**Well Performance** (Golan and Whitson) and the SPE monograph **Phase Behavior** (Whitson and Brulé)], co-authored some 100 papers, and has written three chapters of edited books.

Background

Petroleum reservoir fluids are naturally occurring mixtures of natural gas and crude oil that exist in the reservoir at elevated temperatures and pressures. Reservoir-fluid compositions typically include hundreds or thousands of hydrocarbon components and a few non-hydrocarbons, such as nitrogen, CO_2, and hydrogen sulfide. The physical properties of these mixtures depend on composition, temperature and pressure conditions.

To determine the fluid properties for a particular reservoir, samples are collected from the reservoir during appraisal and analyzed in a laboratory. The analysis usually includes (1) measurements of composition, (2) experiments at reservoir conditions to measure properties such as density, phase volumes and viscosity, and (3) measurements at lower temperatures and pressures to understand the behavior of the fluids during a surface separation process.

Calculations of fluid properties in reservoir and production engineering are often made with a thermodynamic equation of state (EOS), a cubic equation (in volume) describing the phase and volumetric properties of a petroleum mixture as a function of pressure, temperature, and composition. An EOS represents the reservoir fluid as a multi-component mixture, usually with between 10 and 50 components.

An EOS is not usually able to give accurate predictions of fluid properties based on composition alone. It is almost always necessary to adjust various parameters in the EOS model so that it gives a satisfactory match to measured data on reservoir fluid samples, a process known as "tuning" or "regression".

A simpler way of calculating fluid properties is through a "Black oil" model, which represents a petroleum mixture in terms of two "pseudo" components. The two pseudo-components represent final processed "products" of surface gas and surface (stock-tank) oil after the mixture is passed through a multi-stage separator process that stage-wise partitions, preferentially, light components into a surface gas product and heavier components into a surface (stock tank) oil product. Tables of Black-oil model properties can be and usually are calculated from an EOS model that has been tuned to match measured data.

Petroleum reservoir fluids can be divided into five general categories: *dry gas*, *wet gas*, *gas condensate*, *volatile oil*, and *black oil*. The phase behavior of gas condensates and volatile oils are considerably more complex than those of black oils. Transition fluids between gas condensates and volatile oils are called *near-critical* fluids.

Reservoir fluid usually forms a single hydrocarbon phase at initial reservoir pressure and temperature. As pressure declines, a point will be reached where a second ("incipient") phase is formed - the saturation pressure. For a volatile oil or black oil, the second phase has a lower density than the original phase, so that the original phase can be considered as a liquid and the incipient phase a gas; the saturation pressure is a bubblepoint. For a gas condensate, the incipient phase has a higher density than the original phase, so that the original phase can be considered as a gas and the incipient phase a liquid; the saturation pressure is a dewpoint.

The fluid samples from the Macondo well are "near-critical" fluids, which lie close to the boundary between volatile oil and gas condensate behavior. A near-critical mixture is one of the most unusual, complex fluid types found in petroleum reservoirs, though not entirely uncommon in Gulf of Mexico deep-water fields. The main characteristics of near-critical fluids are that (a) the system may be either "oil" or "gas" at reservoir conditions, i.e. exhibiting bubble-point (oil) or dew-point (gas) saturation pressure, and (b) the system splits dramatically from a single-phase mixture at the saturation pressure to a two-phase mixture with nearly-equal phase properties of gas and oil, at pressures only slightly below the saturation pressure.

Four fluid samples were taken from the Macondo well and PVT measurements were carried out on all four samples. All of the samples have saturation pressures at reservoir temperature (242 or 243 ^{o}F) between 6200 psia and 6550 psia, which is much lower than the initial reservoir pressure of about 11850 psia. The samples have very similar compositions, but two behave as volatile oils and two as gas condensates at reservoir temperature (each sample with unaltered saturation type down to 100^{o}F).

Away from the near-critical region (pressures between about 6000 psi and 6550 psi), properties of the oil and gas-condensate samples are very similar. In the near-critical region, the liquid and gas phases have very similar composition, density and viscosity and the interfacial tension is very low.

Results and Discussion[2]

This report summarizes a comprehensive fluid characterization (PVT[3]) study conducted on four reservoir samples collected from the Macondo well. The purpose of this study was to (1) quality check measured laboratory PVT data collected on samples, (2) develop PVT models – both equation of state (EOS) and black-oil, and (3) estimate the total shrinkage of produced mixture from initial reservoir conditions and at the "exit point" (seabed conditions) to ultimate surface oil volume at ambient "standard conditions"[4], following a highly-unusual and complex "oceanic" separation process from seabed to surface.

Fluid samples

Four open-hole formation (MDT) fluid samples were collected from Macondo at a depth interval 18,086-18,142 ft MD (measured depth) covering 56 feet of vertical section within the reservoir. These MDT samples were sent to three PVT laboratories for analysis. Three of these resulted in PVT studies that were included in this study, two from Core Laboratories (Pencor) and one analyzed at Schlumberger's PVT laboratory. A fourth sample from Intertek was not used in developing the PVT model but was used as a control to check the final EOS model.

All samples showed a slight contamination from oil based mud used during drilling, but without the contamination level (<0.5 wt % in reservoir fluid) being large enough to impact the EOS model development or estimate of in situ reservoir fluid composition.

PVT data

The measured PVT data for the four samples used in this study included (1) constant composition expansion (CCE) at reservoir temperature, and lower temperatures of 170°F (CL samples) and 100°F (CL and SLB samples); (2) differential liberation tests for the two CL samples; (3) multi-stage and single-stage separator tests and (4) viscosity measurements for CL and Intertek samples.

The laboratory PVT data were, for the most part, consistent from sample to sample. All samples showed similar composition, as well as the same complex "near-critical" phase behavior at reservoir temperature (242 or 243 °F) and down to the lowest measured saturation pressure at 100 °F. Two samples indicated that the reservoir fluid was a near-critical gas condensate, while the other two samples indicated the reservoir fluid was a near-critical oil.

The behavior of the different types of fluid is shown in **Figure 1** and **Figure 2**. These are data from constant composition expansion experiments at reservoir temperature, and show the volume of the

[2] The section sub-headers found in *Results and Discussion* (Fluid Samples, PVT Data, etc.) each have a separate appendix with more-detailed discussions of the topic.
[3] PVT (pressure-volume-temperature) refers to the description of physical and thermodynamic properties of petroleum fluids, including both measurement and modeling.
[4] Standard conditions used in this study are those defined by the Society of Petroleum Engineers : 14.7 psia and 60 °F. Actual ambient conditions vary with time and geographical location, which is the reason for an industrial "standard" set of ambient conditions.

liquid phase relative to the total (single phase) volume at saturation pressure. **Figure 1** shows that this fluid is as a near-critical gas condensate, and **Figure 2** shows a fluid that is a near-critical volatile oil.

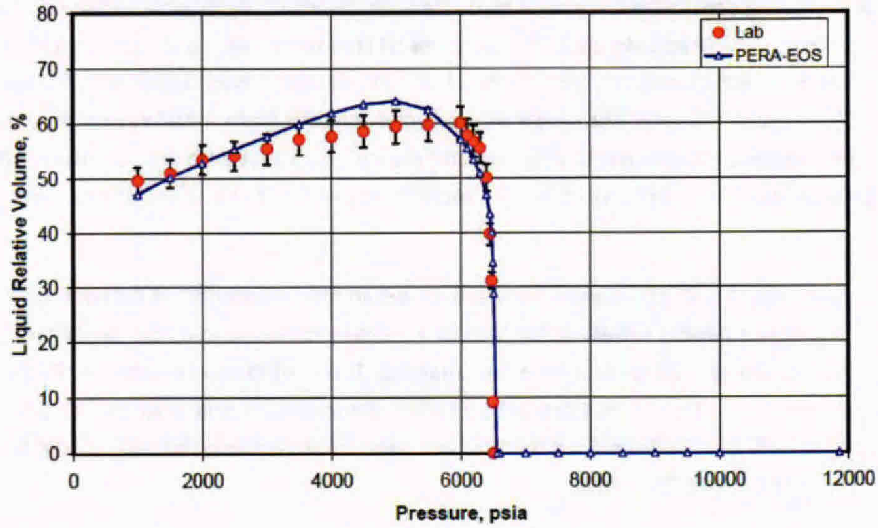

Figure 1. Experimental data and EOS results for CL 68379, relative liquid volume in CCE at 243 F.

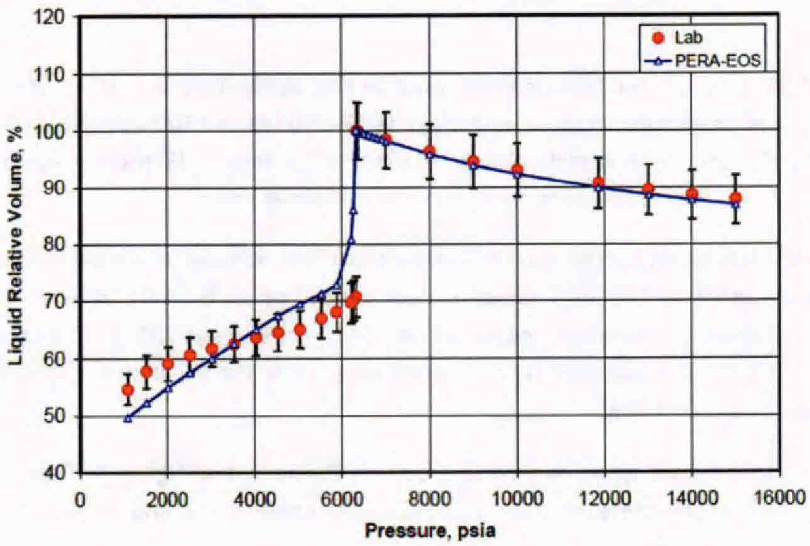

Figure 2. Experimental data and EOS results for SLB-1.18, relative liquid volume in CCE at 243 F.

EOS model development

A 40-component Peng-Robinson (PR) EOS model was successfully developed to describe accurately the phase and volumetric behavior of all four samples. The final EOS model contained 40 components, with nine of these representing the lighter fractions N_2, CO_2, methane (C_1) through n-alkane n-C_5, and the remaining 31 components describing heavier single-carbon-number (SCN) fractions C_6, C_7, C_8, ..., C_{35} and a lumped C_{36+} residue.

Linear temperature-dependent binary interaction parameters (BIPs), as well as temperature-independent volume shift factors, were used. A compositional viscosity model was also successfully developed to describe the gas and oil viscosities.

To achieve a consistent EOS model describing all four samples, an industry-accepted practice was used to make minor compositional adjustments to each sample. The compositional adjustments are small and justified because of differences in laboratory methods and a variety of known error sources in measuring compositions.

The EOS model developed by PERA satisfies the requirement of predicting all complex phase behavior exhibited by all Macondo fluids, including near-critical behavior over a wide range of temperatures. This model also predicts the shrinkage of reservoir barrels to stock-tank barrels accurately, within only a few-percent deviation from measured laboratory data for all four fluid samples.

As all of the samples are contaminated with small amounts of oil-based drilling mud, an additional adjustment of composition was made to estimate the original "reservoir in situ" compositions with no mud. These compositions were then assumed to describe the range of compositions occupying the reservoir rock within the limited depth interval from which these samples were collected.

Surface Process and Shrinkage

The conversion of volume from reservoir to surface conditions is an important part of this study, but the determination of "stock tank oil" will depend on the path which the reservoir fluid takes to the surface. The PVT reports from the three laboratories provide experimental data for two pathways: a single-stage flash (where the fluid is flashed directly to atmospheric pressure) and a laboratory 4-stage separator.

The pathway from reservoir to surface in the *Deepwater Horizon* incident will be different from these cases. The fluids will first expand to exit-point conditions with little or no change in overall composition, and then be transported to surface conditions through a 5,000-ft column of seawater. This entails pressure dropping from approximately 2250 psia at seabed to 1 atmosphere (14.7 psia), and a non-linear temperature variation from seabed to surface. The temperature of the water column was taken from published oceanic property tables, and is shown in **Figure 3**.

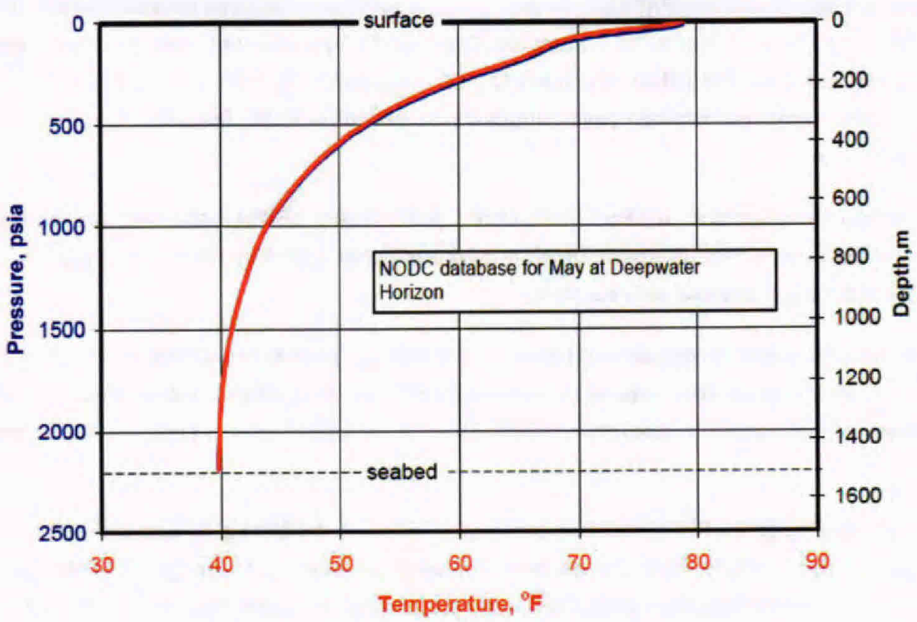

Figure 3. Temperature and pressure versus depth profile used for oceanic separation calculation.

PERA developed a detailed process to model the evolution of gas and shrinkage of oil during the pathway from seabed to surface. Because this complex 130-stage separation process cannot be used in most software, a less complex five-stage process was developed that provides almost identical results. This is called the "oceanic-proxy" separator.

To illustrate the influence of surface process "path" on ultimate stock-tank oil volume, one can consider an example using an initial volume of 100 barrels of reservoir fluid at the initial reservoir conditions (11850 psia and 243 °F). The stock tank oil volumes in this example are EOS calculated values *for an average for the four fluids*. The resulting **stock-tank barrels of oil** associated with each process is as follows:

1. Single Stage Flash: **43.3 barrels**
2. Oceanic Separator (T_{exit}=210°): **46.7 barrels**
3. Oceanic Separator (T_{exit}=130°): **48.0 barrels**
4. 4-Stage Separator: **47.9 barrels**

As seen above with the oceanic process, the volume of stock-tank oil depends on the assumed temperature of the fluid at its exit point on the seabed ("T_{exit}").

Taking into account that most of the light hydrocarbons and some lighter aromatics dissolve in seawater during ascension to the surface through 5,000 ft of seawater, PERA has calculated that the final stock-tank oil volume will be approximately 10% less than the laboratory 4-stage separator, reaching a final stock tank oil volume close to that of the single-stage process, which is approximately 43 stock tank barrels.

Black Oil Tables

PERA also developed a simplified PVT description from its EOS model for use in engineering calculations. These data include tables of density, viscosity, and phase amounts for the entire range of pressures and temperatures experienced from reservoir to surface conditions.

Other forms of PVT tables were also created from the EOS model – so-called "black-oil" tables. The black-oil quantities not only define the density, viscosity, and phase amount at any pressure and temperature, but they also quantify total shrinkage to stock-tank oil volume. Calculation of a black-oil table requires the definition of the path which the reservoir fluid takes from initial reservoir to stock-tank (surface) conditions – the so-called "surface process".

Based on the final EOS model and final estimated reservoir in situ compositions, black-oil tables were generated both for the five-stage "oceanic proxy" separation process and for a single-stage flash to standard conditions.

Black-oil PVT tables based on the oceanic-proxy separation process were generated for each of the four samples, and a range of exit-point temperatures from 35 to 210 °F. These tables are made available in Eclipse 100 (ECL100) and Prosper format.

Zick EOS Model

The Expert Report from Dr. Aaron Zick[5] presents an alternative EOS model of the Macondo reservoir fluids. The main differences between the models are as follows:

- The Zick EOS uses 11 components, with six being lumped pseudocomponents. The PERA model uses 40 components with one being a lumped pseudocomponent (C_{36+}).
- Some methane-C_{7+} binary interaction parameters (BIPs) in the PERA model are temperature-dependent. In the Zick model, all BIPs are constant.
- Most hydrocarbon-hydrocarbon BIPs were assigned non-zero values in the PERA model, while only methane-hydrocarbon BIPs were assigned non-zero values in the Zick model.
- In the PERA model, slight adjustments were made to the four laboratory-reported compositions to develop a consistent, single EOS model, including the complex near-critical phase and volumetric behavior of all four samples. In the Zick model, only the composition of the SLB-1.18 fluid was adjusted, with the changes being considerably larger for methane and C30+, compared with changes required for the PERA model.

[5] "Equation-of-State Fluid Characterization and Analysis of the Macondo Reservoit Fluids'. Expert Report prepared on behalf of the United States. Aaron A. Zick, March 22, 2013.

PERA has assessed the accuracy of the Zick EOS model and compared its predictions with those of the PERA EOS. The Zick model gives fairly accurate predictions for much of the PVT data, except for the following:

- Erroneous type of phase boundary (bubblepoint instead of dewpoint) for both Core Lab / Pencor samples. **Figure 4** and **Figure 5** show how the Zick EOS predicts a bubblepoint instead of a dewpoint for these fluids.
- Erroneous near-critical liquid volumes of both Pencor samples (**Figure 4 and Figure 5**).
- 1-2% overestimation of single phase densities for all samples.
- 3-5% overestimation of the stock-tank oil volume (*i.e.* too little shrinkage) for all samples using the laboratory 4-stage separation process (Table 1).

The PERA EOS model is more accurate with single-phase density predictions and stock-tank oil volume predictions (±2%) for the laboratory 4-stage separation process (Table 1).

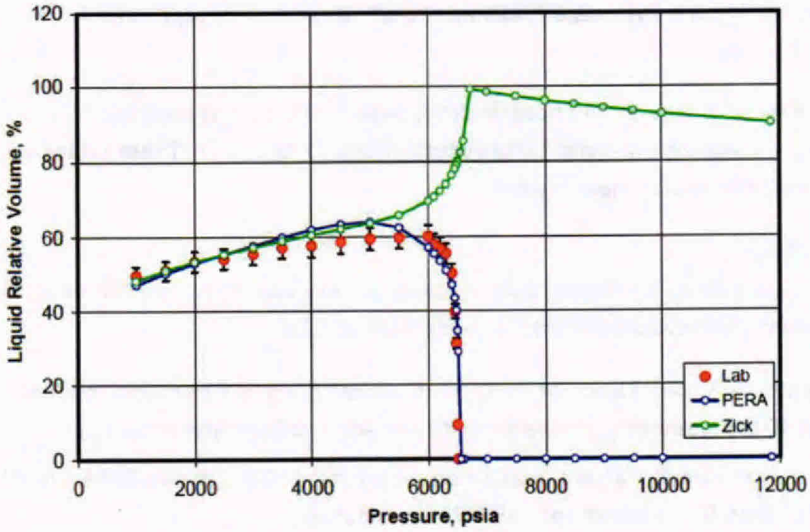

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Figure 4. Experimental data, PERA and Zick EOS results for CL 68379 (Pencor 53), liquid relative volume in CCE at 243°F.

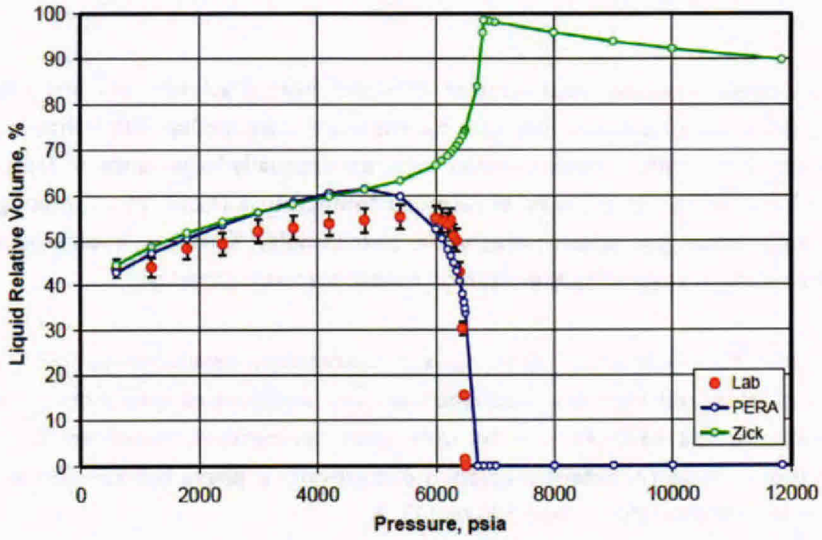

Figure 5. Experimental data, PERA EOS and Zick EOS results for CL 68508 (Pencor 19), liquid relative volume in CCE at 242°F.

Table 1. PERA and Zick EOS calculations for stock tank oil volumes from 4-stage separation on 100 bbl of reservoir fluid at initial conditions.

Sample	Stock Tank Oil Volume,STB		
	Measured	PERA EOS	Zick EOS
CL68508	47.5	46.6	49.0
CL68379	46.9	47.6	49.5
INTERTEK	46.1	48.3	50.1
SLB-1.18	48.7	49.3	50.0
Average error		+1.3	+4.9

Conclusions

1. All four pre-incident reservoir fluid samples collected from Macondo well and analyzed by PVT laboratories show similar composition and, for the most part, similar PVT behavior. The fluids all exhibit complex, near-critical phase behavior over an unusually-large range of temperatures. Two samples exhibit a dew-point pressure at reservoir temperature (~240 °F), suggesting the reservoir contains a near-critical gas condensate, while two samples exhibit a bubble-point pressure at reservoir temperature, suggesting the reservoir contains a near-critical oil.

2. A 40-component Peng-Robinson EOS model was successfully developed by PERA to describe all reservoir fluids produced from the Macondo well, at conditions ranging from initial reservoir to surface conditions. The PERA EOS model uses some temperature-dependent binary interaction parameters that allowed consistent prediction of near-critical phase behavior for all samples over the entire range of temperatures from 100 to 243 °F.

3. Total shrinkage from initial reservoir *and* exit-point conditions to total stock-tank oil volume is calculated using the PERA EOS model, and the model proves accurate when compared with measured shrinkage factors. Total shrinkage factors are found to be similar for all reservoir samples collected from the Macondo well regardless of whether the sample is a dew-point gas or bubble-point oil.

4. A five-stage oceanic proxy separator process was found to accurately emulate a more-complex oceanic separation process that describes the assumed pressure-temperature-composition path from seabed exit-point conditions to final surface conditions.

   - The oceanic process with with seabed exit temperature of 210°F – *assuming no water solubility of hydrocarbons in seawater* – gives a stock oil volume that is **46.7%** of the volume at initial reservoir conditions.
   - A surface separation process (e.g. laboratory 4-stage separation or an oceanic process) – *assuming water solubility of hydrocarbons in seawater* – gives approximately the same stock-tank oil shrinkage as a single-stage separation process, with a stock tank oil volume that is **43.3%** of the volume at initial reservoir conditions.

5. Black-oil PVT tables were generated using the PERA EOS model for two surface processes: single-stage separation, and oceanic process with a range of seabed exit temperatures from 40 to 243°F.

6. PERA has compared the PERA EOS model with an alternative EOS model presented in the Expert Report by Dr. Aaron Zick. The Zick 11-component pseudoized EOS model gives fairly accurate predictions for much of the PVT data, except:

   - Erroneous type of phase boundary (bubblepoint instead of dewpoint) for both Pencor samples.
   - Erroneous near-critical liquid volumes of both Pencor samples.
   - 1-2% overestimation of single phase densities for all samples.
   - 3-5% overestimation of the stock tank oil volume (*i.e.* too little shrinkage) for *all* samples using the laboratory 4-stage separation process.

   The PERA EOS model does not experience any of the shortcomings listed above and, with more accurate single-phase density predictions, and unbiased stock tank oil volume predictions (±2%) for the laboratory 4-stage separation process.

7. The stock-tank oil volume from a single-stage process is 10% smaller than the stock-tank oil volume from the laboratory 4-stage process. This difference is the same for the PERA EOS and the Zick EOS models. For example, using an average sample with 100 barrels of fluid at initial reservoir conditions, the PERA EOS model yields 43.3 stock-tank barrels for a single-stage process and 47.9 stock-tank barrels for the laboratory 4-stage process. Using an average sample with 100 barrels of oil and gas bbl at initial reservoir conditions, the Zick EOS yields 44.7 stock-tank barrels for a single-stage process and 49.6 stock-tank barrels for the laboratory 4-stage process.

My compensation for the preparation of this report is $650 per hour, and $1,000 per hour for testimony as an expert witness at trial or deposition.

Curtis H. Whitson

Curtis Hays Whitson

May 1, 2013

Date

Appendix A - Fluid Samples

Four open-hole formation (MDT) fluid samples were collected from Macondo at a depth interval 18,086-18,142 ft MD (measured depth) covering 56 feet of vertical section within the reservoir. These MDT samples were sent to three PVT laboratories for analysis. Three of these resulted in PVT studies that were included in this study, two from Core Laboratories (Pencor) and one analyzed at Schlumberger's PVT laboratory. A fourth sample from Intertek was not used in developing the PVT model but was used as a control to check the final EOS model. The naming convention used in this study for the four samples is:

CL68379[6]. Core Laboraties (CL) measured saturation pressure is a dewpoint at reservoir temperature of 243 °F, indicating a near-critical gas condensate reservoir fluid; also dewpoints measured at 170 and 100 °F.

This sample is recommended as an "average" representative of the four samples, if such an average is needed. All of our calculations were made using each sample individually because of the sensitivity to composition for near-critical PVT calculations, and the need to quantify differences in PVT behavior for each sample individually.

CL68508[7]. Core Laboratories measured saturation pressure is a dewpoint at reservoir temperature of 242 °F, indicating a near-critical gas condensate reservoir fluid; also dewpoints measured at 170 and 100 °F.

SLB-1.18[8]. Schlumberger measured saturation pressure is a bubblepoint at reservoir temperature of 243 °F, indicating a near-critical oil reservoir fluid; also bubblepoint measured at 100 °F.

Intertek[9]. Intertek measured saturation pressure is a bubblepoint at reservoir temperature of 243 °F, indicating a near-critical oil reservoir fluid; also bubblepoint measured at 100 °F.

All samples showed a slight contamination from oil based mud used during drilling, but without the contamination level (<0.5 wt % in reservoir fluid) being large enough to impact the EOS model development or estimate of in situ reservoir fluid composition.

Molar and mass compositions of the four samples were very similar, and differences can readily be explained by errors expected in connection with sample collection, contamination, handling procedures, laboratory analysis methods – these errors being somewhat different for each sample and each laboratory. Still, any compositional differences may lead to significantly different phase behavior of this near-critical fluid system. At near-critical conditions, phase behavior becomes highly non-linear with respect to composition. These differences do not, however, impact substantially the oil shrinkage.

[6] Core Labs report 36126-53-5010068379 (June 2010). The sample used for PVT analysis is PENCOR 36126-53.
[7] Core Labs report 36126-19-5010068508 (June 2010). The sample used for PVT analysis is PENCOR 36126-19.
[8] Schlumberger report 201000053 (June 2010). The sample used for PVT analysis is 1.18.
[9] Intertek report WTC-10-001812-BP (June 2010).

Appendix B - PVT Data

The measured PVT data for the four samples used in this study included (1) constant composition expansion (CCE) at reservoir temperature, and lower temperatures of 170 (CL samples) and 100 °F (CL and SLB samples); (2) differential liberation tests for the two CL samples; (3) multi-stage and single-stage separator tests and (4) viscosity measurements for CL and Intertek samples.

The multi-stage separator used a 4-stage process with the following conditions.[10]

Stage 1	1250 psia	130 °F
Stage 2	450 psia	120 °F
Stage 3	150 psia	120 °F
Stage 4	15 psia	60 °F

The CCE tests were conducted in windowed PVT cells, reporting single-phase densities and two-phase volumes. All samples showed extreme, near-critical two-phase volumetric changes. The two Core Laboratory samples exhibited dewpoints while the Schlumberger and Intertek samples showed bubblepoints. A dewpoint defines the reservoir fluid as a "gas", while a bubblepoint defines the reservoir fluid as an "oil" (liquid).

Figure 8 plots the CCE liquid volumes (liquid volume / volume at saturation pressure) for the four fluids at reservoir temperature. This figure shows the near-critical behavior for all fluids, with very rapid changes in liquid saturation as pressure drops below saturation pressure. Similar near-critical behavior is seen at 100 and 170°F.

Table 2 summarizes some key PVT properties for the four fluids. In this table the most 'gas-like' value for each property is shown by orange shading. There are a number of inconsistencies between the measured data for the different samples:

1. The SLB 1.18 fluid has the highest C_1 mole fraction and the lowest C7+ mole fraction, but behaves as an oil.
2. The GOR measurements from single-stage flash and four-stage test separator are not consistent.
3. The fluid with the highest 4-stage separator GOR (Intertek) is an oil rather than a gas condensate.

Although two of the fluids are classified as oil and two as gas condensate, this does not have a large effect on properties below the critical region (i.e. less than about 6000 psia). In the single phase region above saturation pressure, the density of the CL gas condensates is approximately 1.5% less than the density of the SLB and Intertek oils. The total oil shrinkage from reservoir (or exit point condition) to

[10] The separator pressures in the Intertek report are given as 1235, 435, 135 and 15 psia. It is not clear whether this is an error in reporting or whether different pressures were actually used. We have used the lower pressures in calculations for the Intertek sample.

surface conditions varies only slightly between the four samples, with only a few percent variation between oil and gas samples.

Appendix C - EOS Model Development

The development of a single equation of state (EOS) model[11] to describe all four samples was a challenging task because of the near-critical nature of these fluids, and the extreme composition dependence of phase behavior (saturation pressure and two-phase volumes). PERA was successful in describing the phase and volumetric behavior for the two Core Laboratories gas condensate mixtures and the Schlumberger and Intertek oil mixtures, with particular emphasis given to the data which affect total oil shrinkage and phase definition.

The final EOS model contained 40 components, with nine of these representing the lighter fractions N_2, CO_2, methane (C_1) through n-alkane n-C_5, and the remaining 31 components describing heavier single-carbon-number (SCN) fractions C_6, C_7, C_8, ..., C_{35} and a lumped C_{36+} residue. Aromatic and other isomer non-alkane fractions are grouped in each SCN fraction – e.g. benzene C_6H_6 being lumped with similar boiling-point compounds such as n-heptane in the C_7 fraction.[12] The Peng-Robinson (1978) equation of state was used with volume shift parameters to improve liquid density predictions.

The default PhazeComp C_{7+} characterization parameters were modified to match the PR EOS model to laboratory PVT data for the three samples. This included minor modifications to (a) the parameters determining the relation between specific gravity and molecular weight of C_{7+} SCN fractions, (b) critical pressures and temperatures of the C_{7+} fractions, (c) BIPs between methane and all hydrocarbons C_{2+}, (d) BIPs amongst C_{7+} fractions and (e) volume shift parameters for the C_{7+} fractions. These EOS parameter modifications apply to all samples, as the EOS model is common to all reservoir fluids at all conditions of pressure, temperature, and composition.

The BIPs between methane and fractions from C_7 to C_{22} are linear functions of temperature. The measured data show only a small change in saturation pressure with temperature (less than 150 psi between 100 F and 243°F), whereas the default EOS predicts a much larger change. Temperature dependent BIPs allow the EOS to match the observed variation in saturation pressure with temperature. The temperature dependent BIPs are shown in **Figure 6 and Figure 7.**

The EOS model parameters are listed in Table 3, and the BIPs in Table 4 to Table 7.

Table 4 shows the BIPs with N_2, CO_2 and methane at reservoir temperature (243 °F), and Table 5 lists the parameters for the temperature dependent BIPs between methane and C_7 to C_{22}. All other BIPs are independent of temperature. Table 6 and Table 7 show the BIPs amongst C_{7+} fractions. The matrix of BIPs is symmetric and the tables only show the lower half of the matrix. BIPs are zero for all other component pairs.

[11] All EOS model tuning was conducted using the PhazeComp software (Zick Technologies). Final EOS model comparisons were made with PVTsim (Calsep),"PR78 Peneloux (T)" model and MultiFlash (InfoChem), showing that the same properties are calculated by all three programs.

[12] For the study of aromatic compound partitioning into seawater, PERA created more-detailed versions of the SCN-based EOS model, tuning BIPs to match measured hydrocarbon-water solubility data.

Because of the inconsistencies between measured compositions and PVT properties (as indicated in Table 2), some adjustments were made to the measured compositions in order to develop a consistent, single EOS model that could match the data for all four samples. Controlled modifications were made to the compositions of each sample by altering the (a) molar distribution of C_{7+}, representing uncertainty in average C_{7+} molecular weight and gas chromatographic analysis, (b) molar recombination ratio representing the uncertainty in the laboratory flash process required to determine composition of pressurized bottomhole samples, and (c) molar amount of the heaviest C_{36+} fraction which is not measured directly but by inference using an internal standard.

After finalizing the EOS model, a rigorous consistency check was made to verify that the model modifications did not introduce any non-physical behavior. The first consistency test is that equilibrium K-values of all C_{7+} fractions decrease monotonically with increasing molecular weight, for all relevant conditions of pressure and temperature; also, hydrocarbon K-values should not cross as a function of pressure. Another test is that the EOS predicts only two-phase gas-oil phase equilibria for all conditions tested as two-phase gas-oil in the laboratory. And finally, individual C_{7+} specific gravities should be well-behaved and monotonically increasing with molecular weight. The final EOS met all these criteria.

Comparison with measured data

Figure 9 to **Figure 22** show a selection of the charts that were used to compare the EOS model results with experimental data. **Figure 9** and **Figure 10** show results for the relative total volume and single-phase fluid (gas) density during a CCE experiments on the CL68379 fluid at 243 F. A similar high-quality match was obtained for all four fluids at all temperatures.

Figure 11 to **Figure 16** show results for the relative liquid volume (liquid volume / volume at saturation pressure) for all fluids at 100 °F and 242 or 243 °F. This is a very sensitive test of the EOS model, as very small changes in EOS parameters or fluid composition can cause a large change in the liquid volumes. The EOS model results are of high quality, particularly given the complex nature of these near-critical fluids. The EOS model overestimates liquid volume of the Intertek fluid at 100 °F, but the measured data for this fluid show similar liquid volumes at 100 °F and 243 °F, whereas for all other fluids the liquid volume is much higher at 243 °F.

Figure 17 to **Figure 19** show the results for the 4-stage laboratory separator test for the CL68379 gas condensate. The liquid volume and density results are well predicted, and the results for CL68508 are of similar quality. The EOS model GOR is somewhat too high. **Figure 20 to Figure 22** show the separator test results for the SLB-1.18 oil, with good agreement for all data.

Initial "oil" FVF (B_i) means the ratio of 1 barrel of reservoir fluid (be it gas or oil) at initial reservoir condition, divided by the resulting barrels of stock-tank oil when passed through a surface separation process. In terms of black-oil PVT properties, this initial "oil" FVF is defined as B_{oi} for a fluid that has a bubblepoint at reservoir temperature, while it is defined as B_{gi}/r_{si} for a fluid that has a dewpoint at reservoir temperature. The initial "oil" FVF is the *inverse* of total shrinkage experienced from initial reservoir conditions to final stock-tank oil.

B_i from the four-stage separator test is predicted to within 2% for three of the four fluids. The exception is the Intertek fluid where the EOS result is low by 4.6%; this is likely due to the Intertek measured B_i is much larger than would be expected, as shown in Table 2. (The Intertek fluid has the lowest C_1 fraction and one would expect B_i to be lower than for the two gas condensate fluids.)

The PVT lab reports also provide data for a single stage flash separation that is used to provide atmospheric vapor and liquid samples for determining composition. The lab reports suggest that the two CL fluids were flashed at 80°F and the SLB fluid at 74.6°F. The flash conditions are not specified for the Intertek fluid. The EOS underestimates B_i for the two CL fluids by approximately 4% if one assumes a single stage flash at 80°F, although the results agree to within 1% if one assumes a single stage flash at standard conditions (60°F). The EOS predicts the single stage flash B_o to within 1% for the SLB and Intertek samples.

The important data that affect shrinkage calculations are (1) the initial and saturated oil formation volume factor in the separator test and (2) the total relative volume and oil relative volume at exit conditions (2250 psi). These data were given additional weight when adjusting the EOS model parameters to match experimental data.

The total shrinkage factor (TSF) is defined as the ratio of the oil volume at surface to the total (oil + gas) volume at exit point conditions, and can be expressed as

$$TSF = 1/[B_s(p_s,T_R)\ V_{rt}(p,T)]$$

where B_s is the "oil" FVF (=B_{ob} for oils and B_{gd}/r_{si} for gas condensates) at saturation pressure and reservoir temperature, and $V_{rt}(P,T)$ is the ratio between the total volume at (p,T) to the volume at p_s, and T_R (saturation pressure and reservoir temperature). B_s and V_{rt} are measured in the (four-stage) separator test and CCE experiments, respectively, so TSF can be estimated from experimental data and compared with EOS calculations to give an extra check of the validity of the EOS model. The results of this comparison are shown in **Figure 23.**

Viscosity Model

Laboratory gas and oil viscosities were matched using the LBC (Lohrenz-Bray-Clark) compositional model, adjusting the default C_{7+} critical volumes. Densities used by the LBC model are calculated from the EOS.

The available laboratory viscosity data included only Core Laboratories and Intertek samples, with viscosities reported at 40, 100, 170, and 243°F. Oil viscosities were measured at pressures below saturation pressure, and single phase (either gas or oil) viscosities at pressures above saturation pressure. **Figure 24** and **Figure 25** compare EOS/LBC model predictions with measured data for CL68379. The data are for oil viscosities below dew-point pressure, and single phase gas viscosities above dew-point pressure. The obvious inconsistencies in reported viscosity data at 100 °F were removed (weighted to zero) when conducting the viscosity model tuning.

In Situ Reservoir Fluid Compositions

The modified compositions resulting from the EOS model tuning were corrected for small amounts of contamination by oil-based mud (OBM) used during drilling. The OBM compositions were measured and were found to consist mainly of C_{16} and C_{18} hydrocarbons. The presence of OBM can be seen by plotting the molar amounts of single-carbon-number fractions in the measured wellstream compositions on a semilog plot, as shown in **Figure 26.** The OBM contamination is shown by peaks at C16 and C18 on this plot. The mud-free reservoir fluid composition can be estimated by assuming an exponential distribution (corresponding to a straight line on the semilog plot) in the C_{15} to C_{19} range. The measured and decontaminated compositions for the CL68379 sample are shown in **Figure 26.**

The OBM contamination levels for the four samples were found to be between 0.2 and 0.5 wt-% of the reservoir fluid (or 0.3 to 0.75 wt-% of the stock tank oil), which is hardly detectible by visual inspection. Calculated phase and volumetric behavior for the decontaminated samples, thought to represent in-situ reservoir fluids, is essentially the same as for measured, contaminated samples. For example, **Figure 27** shows the EOS calculations of liquid relative volume for the SLB-1.18 sample, which is the sample with the highest OBM contamination. The results for the contaminated and decontaminated compositions are almost identical, apart from some small differences in the near-critical region.

Figure 28 shows the calculated phase envelopes (the boundary between the single-phase and two-phase regions) for the four decontaminated fluid samples. For the SLB-1.18 and Intertek samples the phase envelope shows a critical point and the phase boundary is a bubblepoint at temperatures below about 300 °F. For the two CL fluids, a critical point is not found and the phase boundary is a dewpoint.

EOS model calculations in PVTsim and Multiflash

The EOS models and sample compositions were input to the PVTsim and Multiflash programs and a selection of calculations were made to check that the three PVT programs gave identical results. The conversion process from PhazeComp was not insubstantial due to different input conventions for volume shift parameters, temperature-dependent BIPs, and LBC viscosity correlation parameters in PVTsim and Multiflash. The resultant input files for PVTsim and Multiflash also contain a text file with details of the conversion issues from PhazeComp.

Table 8 to Table 11 list the compositions for the four samples. For each sample there are three compositions:

1. The reported composition from the PVT lab report.
2. The adjusted composition after modifications during EOS model development.
3. The adjusted composition with estimated OBM contamination removed. This composition was used to generate the black-oil tables and shrinkage factors.

Appendix D - Surface Processes and Shrinkage

The conversion of volume from reservoir to stock-tank conditions is an important part of this study, but the determination of "stock tank oil" will depend on the path by which the reservoir fluid takes to the surface. The PVT reports provide experimental data for two pathways; a single-stage flash (where the fluid is flashed directly to atmospheric pressure) and a 4-stage separator, defined previously.

Oceanic Separation Process

The pressure-temperature path from seabed to surface was estimated using recognized pressure- and temperature-depth profiles in the Gulf of Mexico near Macondo well [13]. The temperature and pressure versus depth profiles are shown in **Figure 3.** A sensitivity study was then made to see how many stages were needed in the oceanic separation process in order to converge on the correct value of total shrinkage. **Figure 29** shows the results of the sensitivity study, which suggests that at least 100 stages are needed.

A set of 130 separation stages was used from seabed to surface. The first-stage separator was always assumed to equal seabed pressure of 2,250 psia. First-stage separator temperature represents the conditions at the exit point into ocean. For the other stages regional p-depth and T-depth correlations are assumed, ending at standard conditions of 14.7 psia and 60 °F.

Because this complex 130-stage separation process cannot be used in most software, PERA identified near-equivalent process with only five stages, where the first stage was exit-point conditions (2250 psia and T_{exit}) and the final stage was at stock-tank conditions. This five stage process is called the "oceanic-proxy" separator. By regression, PERA identified the three intermediate stage conditions (p,T) so that oil shrinkage, gas-oil ratio, and surface product properties were almost identical for the 5-stage oceanic-proxy separator and the full 130-stage process. The conditions in the "oceanic-proxy" separator were:

Stage 1	2250 psia	T_{exit}
Stage 2	1500 psia	130 F
Stage 3	250 psia	35 F
Stage 4	30 psia	35 F
Stage 5	14.7 psia	60 F

PERA's 130-stage separation process only addresses gas-oil separation path with specified pressure-temperature conditions based on background oceanic conditions. The resulting black oil tables do not reflect decreases in *oil* volumes associated with (1) the evolving gas phase dissolving partially or completely into the ocean seawater, (2) highly soluble light components found in the surfacing oil phase (*e.g.* methane-pentane) dissolving into the seawater, and (3) highly soluble lighter aromatics compounds (*e.g.* benzene and toluene) dissolving into the seawater.

[13] National Oceanographic Data Center database. http://www.nodc.noaa.gov/OC5/GOMclimatology/

PERA conducted an EOS-based quantitative assessment of (2) and (3) above,[14] calculating that the final stock tank surface oil volume decreases by 10% (±3%) from the surface oil volumes calculated in this study and represented in the oceanic-process black-oil tables. The most significant surface oil volume reduction is caused by the oil phase light components C_1-C_5 dissolving into seawater.

Example Showing Effect of Surface Process on Stock Tank Oil Volume

To illustrate the influence of surface process "path" on ultimate stock-tank oil volumes, consider the the example of an initial volume of 100 barrels of reservoir fluid near the initial reservoir conditions (11850 psia and 243°F). The stock-tank oil volumes in this example are EOS calculated values for an average for the four fluids.

The resulting stock-tank barrels of oil associated with each process is as follows:

1. Single Stage Flash: **43.3 barrels**
2. Oceanic Separator (T_{exit}=210°): **46.7 barrels**
3. Oceanic Separator (T_{exit}=130°): **48.0 barrels**
4. 4-Stage Separator: **47.9 barrels**

The pathway from reservoir to surface emulated by the oceanic separator process will be different from the single stage flash and the 4-stage separator processes. The fluids will first expand to exit-point conditions with little or no change in overall composition, and then be transported to surface conditions through a 5,000-ft column of seawater.

The PERA oceanic separator analysis assumed an exit-point pressure equal to the seabed pressure of 2,250 psia, and a range of exit temperatures are then examined. At exit conditions, the 100 barrels of reservoir fluid at initial conditions will now be a 2-phase mixture. The volumes of the two phases will depend somewhat on the exit temperature. For example, whereas an exit temperature of 210°F will result in 63 barrels of oil phase and 122 barrels of gas phase, an exit temperature of 130 °F will result in 65 barrels of oil phase and 92 barrels of gas phase.

The oil and gas exiting at the seabed moves through a path to the surface, and PERA simulated this oceanic process whereby evolving gases are separated immediately from the changing oil at each depth. This results in 46.7 stock-tank barrels for an exit temperature of 210 °F and 48.0 stock-tank barrels of oil for an exit temperature of 130 °F.

Taking into account that most of the light hydrocarbons and some lighter aromatics dissolve in seawater during ascension to the surface through 5,000 of seawater, PERA calculates that the final stock-tank oil

[14] Ryerson et al.: "Chemical data quantify Deepwater Horizon hydrocarbon flow rate and environmental distribution".

volume will be approximately 10% less than the laboratory 4-stage separator, reaching a final stock tank oil volume of 43 stock-tank barrels, which is essentially the same stock-tank oil volume as for a single-stage process.

Oil Shrinkage Definitions

The calculation of oil shrinkage is an important part of this study. However, the industry does not operate with a common definition of "shrinkage" as it is to be used in the Deepwater Horizon Incident. PERA therefore introduces the following nomenclature and definitions to avoid any misunderstanding of the calculations provided in this study and how they should be used. This is also supported by a simple example.

Keeping in line with industrial practice of "naming" different types of barrels (e.g. STB, STBW, and RB), some case-specific barrel definitions for this project are made as follows:

1 barrel = 42 U.S. gallons = 5.6146 ft^3

STB = total surface ("stock-tank") oil barrel at standard conditions.
SBO = surface oil barrel at standard conditions, resulting from shrinkage of exit-point oil.
SBC = surface oil (*condensate*) barrel at standard conditions, resulting from condensation of exit-point gas.
EB = Seabed exit-point total gas+oil barrel at exit-point temperature and exit-point pressure of 2250 psia.
EBO = Seabed exit-point total oil barrel at exit-point temperature and exit-point pressure of 2250 psia.
EBG = Seabed exit-point total gas barrel at exit-point temperature and exit-point pressure of 2250 psia.
RB = reservoir barrel at reservoir temperature and some pressure (may be gas, oil, or gas+oil).
RBO = reservoir barrel oil at reservoir temperature and some pressure.
RBG = reservoir barrel gas at reservoir temperature and some pressure.

Seabed "total shrinkage factor" (TSF) is defined as the fraction of total (gas+oil) volumetric rate at seabed exit-point conditions that ends up as stock-tank oil after some oceanic separation process. Consider these definitions:

$V_{texit} = V_{oexit} + V_{gexit}$ = total gas+oil volume at seabed exit conditions [EB].

V_{oexit} = oil volume at seabed exit conditions [EBO].

V_{gexit} = oil volume at seabed exit conditions [EBG].

V_{oo} = surface oil volume resulting only from shrinkage of seabed exit-condition oil [SBO].

V_{og} = surface oil volume resulting only from condensation of seabed exit-condition gas [SBC].

$V_{ot} = V_{oo} + V_{og}$ = total surface oil volume at standard conditions [STB].

Also consider terms expressing ratios of the volumes idenitified above:

OF = "oil fraction" = V_{oexit} / V_{texit} = oil phase fraction of total gas+oil volume at seabed conditions [EBO/EB].

GF = "gas fraction" = 1 – OF = V_{gexit} / V_{text} = gas phase fraction of total gas+oil volume at seabed conditions [EBG/EB].

OS = V_{oo} / V_{oexit} = "oil shrinkage" = surface oil volume resulting from shrinkage of the oil at seabed exit conditions, expressed as a fraction of oil volume at seabed conditions [SBO/EBO].

OSF = OF x OS = V_{oo} / V_{texit} = "oil shrinkage factor" = surface oil volume resulting from the shrinkage of oil at seabed exit conditions, expressed as a fraction of gas+oil volume at seabed conditions [SBO/EB].

CSF = V_{og} / V_{texit} = "condensate shrinkage factor" = surface oil volume condensing from exit-point gas, expressed as a fraction of gas+oil volume at seabed exit conditions [SBC/EB].

TSF = OSF + CSF = V_{ot} / V_{texit} = "total shrinkage factor" = total surface oil, expressed as a fraction of gas+oil volume at seabed exit conditions **[STB/EB]**.

Example. Consider a simple example using the CL68379 sample and T_{exit}=210 °F, where OF≈0.33, OS≈0.75, and CSF≈0.003. Measured exit-point total gas+oil volume V_{texit}=100 EB.

OF represents the fraction of total gas+oil volume at exit conditions on the seabed that is an oil phase. OF=0.33 means that one third of the total 100 barrels volume leaving the well at seabed exit conditions is an oil phase, 33 EBO, and two thirds of the total volume is a gas phase, 67 EBG.

OS represents the shrinkage of seabed exit-condition oil volume subject to an oceanic separation process, expressed as an oil volume at standard conditions. OS=0.75 means that seabed exit-condition oil shrinks by 1-OS or 25% due to the oceanic separation process, resulting in a surface oil volume 75% of the seabed exit-condition oil volume, 0.75(33 EBO)=25 SBO.

The product of OF and OS has been used previously to approximate shrinkage of total gas+oil volume at seabed exit conditions to final surface oil. However, this does not take into account the surface oil (condensate) that forms from condensation of the gas phase at seabed exit point – e.g. CSF=0.003 in our example. The total surface oil resulting from oceanic separation of 100 barrel of total gas+oil mixture at seabed exit point is TSF=OSF+CSF=0.253 STB/EB times 100 EB, or (0.253)(100)=25.3 STB surface-oil barrels. The impact of condensation of surface oil from the exit-point gas is ≈1.2% difference for the assumed T_{exit}=210 °F in this example; the condensate impact decreases to 0.1% difference for lower exit-point temperatures.

As discussed earlier, the reported total shrinkage factors from this study do *not* include additional shrinkage due to the solubility of hydrocarbons in the oil. PERA did quantify, based on research studies about hydrocarbon solubilities in seawater, that the surface oil volume decreases by approximately 10% due to (a) partial or complete solubility all C_1-C_5 components and (b) the solubility of lighter aromatic compounds. For this example calculation, using a decrease in surface oil volume of 10% due to the solubility of both light components and lighter aromatic compounds, the final total shrinkage would then be: 0.25(1-0.1)(1-0.02)+0.003 = 0.2235 versus 0.253 for no stripping – a net reduction from 25.3 STB to 22.35 STB for 100 EB.

Appendix E - Black-Oil Tables

The procedure for creating black-oil tables requires specification of the following for each table: (a) sample composition, (b) mixture temperature, (c) depletion process to be simulated at mixture temperature, (d) series of depletion pressures at and below the saturation pressure, (e) series of pressures above the saturation pressure, and (f) multi-stage separator conditions.

PERA generated black-oil tables for all four samples, using the decontaminated (mud-free) compositions. The series of mixture exit temperatures was 35, 60, 100, 130, 170, 210, and 243°F. The depletion pressures ranged from saturation pressure and down to 100 psia, and undersaturated pressures up to 12,000 psia. The oceanic proxy five-stage separator process was used.

Complete saturated and undersaturated black-oil tables were created by PVTsim in ECL100 format (for reservoir simulation). Each file is named with the following syntax:

Sample-ID-Texit=xxxF-T=yyyF.ecl (e.g. CL68379-DECON-Texit=100F-T=100F.ecl)

The resulting black-oil PVT properties were checked to be consistent with those generated by PhazeComp.

Some of the black-oil PVT properties are plotted in **Figure 30** to **Figure 40**.

Figure 30 to **Figure 33** show the effect of different sample compositions by plotting properties for different samples at a mixture (reservoir) temperature of 243 °F and an exit temperature of 210 °F.

Figure 34 to **Figure 37** show the effect of mixture temperature by plotting properties for CL68379 (decontaminated) at exit temperature 210 °F and various mixture temperatures.

Figure 38 to **Figure 40** show the effect of exit temperature by plotting properties for CL68379 (decontaminated) at a mixture temperature of 243 °F and various exit temperatures. The exit temperature has no effect on calculated oil or gas viscosities.

The same set of tables was also created by PVTsim in Prosper format (for pipeflow calculations). Each file is named with the following syntax:

Sample-ID-Texit=xxxF-Prosper.pvt (e.g. CL68379-DECON-Texit=100F-Prosper.pvt)

The Prosper black-oil PVT tables generated by PVTsim do not contain a complete set of properties needed for pipe flow calculations using Prosper. The generated Prosper files contain only a partial set of the saturated properties, and no undersaturated properties. The files contain different incomplete saturated properties, according to whether the sample saturation pressure (at a particular mixture temperature) is a dewpoint or a bubblepoint. Any Prosper applications using black-oil PVT tables for the DWH Incident will, as a result, be uncertain when the fluid at issue is near-critcal, and should be validated using an EOS-based compositional version of Prosper.

All .ecl files were also converted into Excel summary files with the following syntax:

Sample-ID-Texit=xxxF-ALL.xls (e.g. CL68379-Texit=100F-ALL.xls)

where "ALL" indicates that all temperatures are found in the same xls file, each temperature with a separate worksheet containing the appropriate black-oil table.

Black-oil tables were also generated for a single-stage surface process (to 14.7 psia and 60°F). These files were labeled with the following syntax:

Sample-ID- T=xxxF-SSF.ecl (CL68379-DECON-T=243F-SSF.ecl)

T=xxxF-SSF-ALL.xls (e.g. T=243F-SSF-ALL.xls)

Black-Oil PVT - Applications

This section defines black-oil PVT quantities and how they are used to calculate oil and gas volume fractions as a function of pressure, temperature, and composition (total mixture gas-oil ratio R_{mix}) at any point in the system – reservoir, production tubing, seabed equipment, and oceanic conditions from seabed to surface. With a given pressure, temperature, and mixture gas-oil ratio, the black-oil tables calculate accurately the percent of total (gas+oil) volume that is oil and the percentage that is gas.

The volumetric calculations of oil and gas from black-oil PVT tables are as accurate as using the equation of state for all points in the system up to and including the seabed exit point as well as at surface conditions. This accuracy is due to the mixture gas-oil ratio equaling the initial reservoir fluid gas-oil ratio. The reservoir does not drop below its saturation pressure and, therefore, the fluid flowing within the reservoir is not only single phase but it is same as the total flow mixture everywhere in the production system up to the seabed exit point, where gas and oil phases separate and travel by independent paths within the ocean.

Volumetric calculations of oil and gas volume within the ocean – *i.e.* between the seabed exit point and just below the surface – are accurate but not as precise because the oceanic separation process is approximated to describe mainly the final surface gas and surface oil products at stock-tank conditions. Within the ocean, between seabed exit and surface conditions, the black-oil PVT properties can be used to obtain a reliable estimate of local gas and oil volumes for any mixture with known gas-oil ratio R_{mix}. The "local" gas-oil mixtures within the ocean can have a dramatic spatial variation, from gas-only to oil-only, or a gas+oil mixture. After leaving the seabed exit point, the local mixture will likely never again be the same as the original reservoir mixture that flowed homogeneously from the reservoir to the seabed exit point.

After a section defining black-oil properties, several examples are given that illustrate how black-oil tables are used to calculate gas and oil volumes as a function of pressure, temperature, and mixture gas-oil ratio – example calculations that traverse from the reservoir, up the production tubing to seabed exit, within the ocean, and finally at stock-tank conditions.

Black-Oil PVT – Definitions

Four black-oil PVT properties are used to calculate gas and oil phase volumes and densities at a specified pressure and temperature and total mixture gas-oil ratio R_{mix}. The formation volume factors (FVFs) B_o and B_g define a ratio of phase volume at (p,T) per surface phase volume. The solution gas-oil ratio R_s and solution oil-gas ratio r_s reflect the "composition" of the oil phase and gas phase, respectively. By definition, total gas-oil ratio must lie between R_s and $1/r_s$. Knowing R_{mix}, black-oil properties B_o, B_g, R_s, and r_s allow one to calculate the phase volume fractions of oil and gas.

The four black-oil properties are:

$B_o = V_o / V_{\bar{o}o}$
$R_s = V_{\bar{g}o} / V_{\bar{o}o}$
$B_g = V_g / V_{\bar{g}g}$
$R_s = V_{\bar{o}g} / V_{\bar{g}g}$

where

V_o = oil phase volume at (p,T)
V_g = gas phase volume at (p,T)

$V_{\bar{o}o}$ = surface oil volume from oil phase at (p,T)
$V_{\bar{g}o}$ = surface gas volume from oil phase at (p,T)
$V_{\bar{o}g}$ = surface oil volume from gas phase at (p,T)
$V_{\bar{g}g}$ = surface gas volume from gas phase at (p,T)

$V_{\bar{o}}$ = total surface oil volume = $V_{\bar{o}o} + V_{\bar{o}g}$
$V_{\bar{g}}$ = total surface gas volume = $V_{\bar{g}o} + V_{\bar{g}g}$

For the mixture defined by its gas-oil ratio R_{mix},

$F_{\bar{o}o}$ = fraction of surface oil volume from oil phase at (p,T)
$1-F_{\bar{o}o}$ = fraction of surface oil volume from gas phase at (p,T)
F_o ("OF") = fraction of mixture existing as an oil phase at (p,T)
$1-F_o$ ("GF") = fraction of mixture existing as a gas phase at (p,T)

The Society of Petroleum Engineers monograph volume 20 "Phase Behavior" (Whitson and Brule) dedicate chapter 7 to the details of black-oil properties in phase and volumetric behavior calculations. From that chapter, two important equations (Eqs. 7.38 and 7.39) are used in connection with this study to define oil phase volumetric fraction "OF" (F_o):

$$F_{\bar{o}o} = (1-R_{mix}r_s) / (1-R_s r_s)$$

$$F_o = [1 + (R_{mix} - R_s\, F_{\bar{o}o})B_g/(F_{\bar{o}o}\, B_o)]^{-1}$$

where B_o and B_g are given at a specified pressure and temperature (p,T).

One can show that if $R_{mix} \le R_s$ then a single-phase oil exists with $F_{\bar{o}o}=F_o=1$; if $R_{mix} \ge 1/r_s$ then a single-phase gas exists with $F_{\bar{o}o}=F_o=0$. For all other mixtures with $R_s<R_{mix}<1/r_s$, the values of $F_{\bar{o}o}$ and F_o lie between 0 and 1, a two-phase gas-oil mixture exists at (p,T), and the system pressure equals the oil-phase bubblepoint (at T) and gas-phase dewpoint (at T) – i.e. the system consists of two saturated phases.

The important terms needed to estimate local and surface oil volumes from a mixture with specified R_{mix}, p, and T are:

$OF = F_o = [1 + (R_{mix} - R_s F_{\bar{o}o})B_g/(F_{\bar{o}o}B_o)]^{-1}$

$OS = 1/B_o$

$OSF = OF \times OS$

$GF = 1 - OF$

$CSF = GF(r_s/B_g)$

$TSF = OSF + CSF$

$B_t = 1/TSF$

Each of these terms, when multiplied by the total mixture gas+oil volume V_{mix} (in barrels) – defined by R_{mix} at a specific pressure and temperature (p,T) – yields barrels according to these relations:

$V_o(p,T) = V_{mix}(p,T) \times OF$

$V_g(p,T) = V_{mix}(p,T) \times GF$

$V_{\bar{o}o} = V_{mix}(p,T) \times OSF$

$V_{\bar{o}g} = V_{mix}(p,T) \times CSF$

$V_{\bar{o}} = V_{\bar{o}o} + V_{\bar{o}g} = V_{mix}(p,T) \times (OSF + CSF)$

Figure 41 shows the different shrinkage factors (OS, OF and TSF) as a function of temperature for the four samples. **Figure 42** shows TSF values, by sample, with an exponential best-fit trend with temperature. Data in these figures represent decontaminated samples using the oceanic-proxy separation and an exit pressure of 2250 psia.

In previous sections discussing stock tank oil shrinkage, two "oil" FVF factors were introduced – the initial "oil" FVF (B_i) and the saturated "oil" FVF (B_s). These unconventional terms represent the ratio of one barrel of single-phase reservoir fluid (be it oil *or* gas) divided by the stock tank oil volume that results after being subjected to a surface process. If the single-phase fluid is an oil, then $B_i=B_{oi}$ and $B_s=B_{ob}$. But if the single-phase fluid is a gas condensate (e.g. both Pencor samples), then $B_i=B_{gi}/r_{smix}$ and $B_s=B_{gd}/r_{smix}$ where solution r_{smix}= the flowing-mixture oil-gas ratio.

Appendix F - Zick EOS Model

The Expert Report of Dr. Aaron Zick[15] presents an alternative EOS model of the Macondo reservoir fluids. This model also uses the Peng-Robinson (1978) equation with volume shift parameters to improve liquid density predictions. The main differences between the PERA and Zick models are:

- The Zick EOS uses 11 components, with six being lumped pseudocomponents. The PERA model uses 40 components with one being a lumped pseudocomponent (C_{36+}).
- Some methane-C_{7+} binary interaction parameters (BIPs) in the PERA model are temperature-dependent. In the Zick model, all BIPs are constant.
- All hydrocarbon-hydrocarbon BIPs were assigned non-zero values in the PERA model, while only methane-hydrocarbon BIPs were assigned non-zero values in the Zick model. (Non-hydrocarbon BIPs were similar non-zero values in both EOS models.)
- In the PERA model, slight adjustments were made to the four laboratory-reported compositions to develop a consistent, single EOS model, including the complex near-critical phase and volumetric behavior of all four samples. In the Zick model, only the composition of the SLB-1.18 fluid was adjusted, with the changes being considerably larger for methane and C_{30+}, compared with changes required for the PERA model. **Figure 43** shows the changes in the PERA model for the CL 68379, CL68508 and Intertek fluids; Dr. Zick did not adjust these compositions. **Figure 44** shows the changes in the compositions of the SLB-1.18 sample, which was adjusted in both the PERA and Zick models.

Zick EOS Model Pseudocomponents

Zick's EOS model uses N_2, CO_2, methane (C_1), ethane (C_2) and propane (C_3) as pure components. The remaining six components are *pseudocomponents*, each of which represents a number of "lumped" components: C_4-C_5, C_6-C_7, C_8-C_9, C_{10}-C_{12}, C_{13}-C_{19}, and C_{20+}. This compares with the 40 components in the PERA model, with single carbon number fractions up to C_{35}, and C_{36+} as the heaviest (and only) pseudocomponent.

In reservoir engineering, it is common to develop EOS models with approximately 10 to 15 components for use in compositional reservoir simulation, where large computing requirements may prohibit the use of a more detailed EOS model. However, it is standard practice to first develop a detailed EOS model, tune its parameters to match measured data, and then use the detailed model to calculate pseudocomponent properties in the model with fewer components. This approach allows the choice of pseudocomponents to be optimized, and gives a quantitative indication of any loss of accuracy in using fewer components. Dr. Zick does not discuss his selection of pseudocomponents, whether his lumping scheme is optimal, and why the heaviest fraction (C_{20+}) was so light.

[15] "Equation-of-State Fluid Characterization and Analysis of the Macondo Reservoir Fluids'. Expert Report prepared on behalf of the United States. Aaron A. Zick, March 22, 2013.

The method described by Dr. Zick for developing his 11-component EOS ("Zick-EOS11") is appreciably different than any known approaches. Dr. Zick starts with a standard, detailed single-carbon-number (SCN) EOS with a total of 35 components, with the heaviest component being C_{30+} ("Zick-EOS35"). The model tuning (regression) is conducted on the 35-component EOS parameters and compositions; the 11-component EOS is derived directly from the regressed Zick-EOS35 model – by averaging of properties using the SLB-1.18 sample (which itself is a "composition" regression variable). The Zick-EOS11 model is used to simulate all experiments, calculating some 1000 PVT data that make up a root mean square best-fit value that is minimized to obtain his final EOS models (Zick-EOS35 and Zick-EOS11).

Given that the Zick-EOS11 model is derived directly from the "parent" Zick-EOS35 model, it would be expected that the Zick-EOS35 model also predicts PVT properties of the Macondo fluids accurately. The more-detailed Zick-EOS35 model should be more accurate than its "pseudoized" derivative model (Zick-EOS11). No such verification or comparison of the 35- and 11-component EOS models was provided.

Some of Dr. Zick's unreported PhazeComp calculations (file *predictions.phz*) do in fact use the Zick-EOS35 model for calculations, although these calculations are only of stock-tank oil properties. Those calculations using the Zick-EOS35 model give inaccurate predictions of the Macondo STO fluids. The parent Zick-EOS35 model predicts liquid-liquid behavior, resulting in a calculated single-stage flash GOR≈2000 scf/STB of STO mixtures, with the heaviest liquid being more-or-less C_{35+} only; these calculated GORs of STO mixtures in *predictions.out* by Dr. Zick are misleading because the upper liquid phase is expressed as a gaseous surface volume.

The use of C_{20+} as the heaviest component is an unusual choice in Zick's pseudoized 11-component EOS model. Dr Zick states in his report that the "normal" choice of heaviest EOS component is usually C_{30+} or heavier. Dr. Zick uses C_{30+} in his detailed 35-component model, with C_{30+} properties being modified as part of the tuning process. In Dr. Zick's renowned paper[16] about modeling PVT properties of Prudoe Bay fluids and the near-critical mixtures that develop during a miscible process, C_{30+} component is used as the heaviest pseudocomponent.

It appears that the BIPs involving C_{30+} component in the Zick-EOS35 model inadvertently cause liquid-liquid behavior – nonphysical behavior that was not observed experimentally. Had the C_{30+} component been kept in his 11-component model, as would normally be done, this would likely lead to unphysical liquid-liquid behavior in the pseudoized EOS model also. By lumping the C_{20} and heavier components into a single C_{20+} pseudocomponent, this apparently eliminated the non-physical liquid-liquid behavior (by averaging away the problematic C_{30+} BIPs).

The decision to use such a light (C_{20+}) heaviest component in his final 11-component EOS model may partially explain the reason that Dr. Zick was not able to predict near-critical dewpoint behavior for either of the Pencor samples. Furthermore, by lumping C_4 and C_5 components as a single pseudocomponent, the Zick-EOS11 model may have adversely impacted the accuracy of surface

[16] Zick, A.A.: "A Combined Condensing/Vaporizing Mechanism in theDisplacement of Oil by Enriched Gases," paper SPE 15493 presentedat the 1986 SPE Annual Technical Conference and Exhibition, New Orleans, 5–8 October.

separator calculations.

PERA vs Zick EOS Models

A comparison was performed of the PERA and Zick EOS model calculations for some of the important PVT data. **Figure 45** to **Figure 50** show results for the relative liquid volume (liquid volume / volume at saturation pressure) for all four fluids at 100°F and 242 or 243 °F.

As discussed earlier, two of the fluids (CL 68379 and CL68508) show a measured dewpoint at both 100°F and 243°F, while the SLB and Intertek fluids show a measured bubblepoint. The PERA model matches the correct phase boundary for all four fluids, whereas the Zick model predicts bubblepoints in all cases, thereby miscalculating the near-critical phase and volumetric behavior of Pencor samples. This is seen clearly by the large differences between the Zick EOS and measured data in **Figure 45** to **Figure 47**.

When developing the PERA model, PERA also had initial difficulty in matching the correct phase boundaries for all four fluids. The use of temperature-dependent BIPs and slight composition adjustments were necessary to give the correct near-critical phase and volumetric behavior measured on all four samples.

Figure 51 to **Figure 54** show single phase fluid density at reservoir temperature. Both EOS models predict the densities to within 2%. For the SLB fluid both models give similar results, while for the other three fluids the PERA model gives a better match to the measured data. The Zick EOS model's overprediction of single-phase densities is one of the reasons for the overprediction of stock tank oil volumes (from a given reservoir fluid volume) in the 4-stage separator.

An important part of the EOS model development is to check that the EOS gives accurate results for the relationship between volumes at reservoir conditions and stock-tank conditions. **Table 13** compares the accuracy of the PERA and Zick EOS model calculations of 4-stage and single-stage separator process results, including calculation of "oil" formation volume factor (FVF) at initial reservoir conditions (11850 psi) for the four fluid samples.

For the 4-stage separator, the PERA EOS model "oil" FVF (B_i) is within ±2% for three of the four samples, with -4.6% for the Intertek sample. The Zick EOS model "oil" FVF (B_i) is, on average, biased low by -5%, with -8% for the Intertek sample. (It is noted above that the Intertek result appears to be inconsistent with the data for the other samples.)

For the single-stage flash process, the results in **Table 13** uses a flash at 80 °F for the two CL samples. The PERA EOS model overestimates B_i for the two CL samples by about 4%, whereas the Zick EOS is more accurate.

There appears to be an inconsistency between the 4-stage and single-stage B_i measurements for the two CL fluids. One would expect errors in EOS predictions to be similar for both 4-stage and single-stage processes. Neither EOS is able to match the CL B_i measurements for both separation processes. Changing the single-stage flash temperature from 80 °F to 60 °F gives more consistent data and the separator K-values are more in line with industry standard correlations.[17] With this assumption the PERA EOS calculations of single-stage B_i are within 1.2% of the measured data for all four samples.

Because the "oil" FVF (B_i) is critical to the calculation of initial oil in place and, consequently, estimated reserves of oil for a new discovery, accurate prediction of the "oil" FVF (using a separation process similar to that used in the field) is one of the most important PVT properties to accurately predict in any EOS modeling study.

Figure 23 shows PERA EOS results for the total *seabed* shrinkage factor (TSF) at exit conditions (2250 psia). TSF is defined as the ratio of the oil volume at surface to the total (oil + gas) volume at exit point conditions, and can be determined from experimental data. The 4-stage laboratory separator test was used to separate stock-tank oil and gas.

Figure 55 to **Figure 58** show the PERA and Zick EOS model calculations for total seabed shrinkage factor, in comparison with the values determined from experimental data. The Zick EOS overestimates the value of TSF by an average of 5%, while the PERA model gives a reasonable match to the experimental data for all four fluids. The Zick EOS's overestimation of TSF (and hence of stock-tank oil volumes) is consistent with its low bias for the 4-stage FVF in Table 13.

Zick Black-Oil Lookup Tables

The so-called "black-oil lookup" tables presented by Dr. Zick in his Table 10 (Appendix G) are not industry-standard black-oil tables. Those tables represent only basic tables of phase density, viscosity, and amount versus pressure and temperature. No commercial or in-house program based on industry-defined black-oil tables could use such tables.

By definition (see Whitson and Brule, Ch. 7 "Black-Oil PVT Formulations"), a black-oil table contains the following properties values:

- Solution gas-oil ratio (oil phase): $R_s(p,T)$
- Oil formation volume factor (oil phase): $B_o(p,T)$
- Oil (phase) viscosity: $\mu_o(p,T)$
- Solution oil-gas ratio (gas phase): $r_s(p,T)$ or $R_v(p,T)$
- Gas formation volume factor (gas phase): $B_g(p,T)$ or $B_{gd}(p,T)$
- Gas (phase) viscosity: $\mu_g(p,T)$
- Surface gas density (single value): $\rho_{\bar{g}}$
- Surface oil density (single value): $\rho_{\bar{o}}$

The properties R_s, B_o, r_s, and B_g are dependent on the surface process of bringing the oil and gas phases at (p,T) conditions to final standard (stock-tank) conditions. Viscosities are not dependent on the surface process. Surface densities $\rho_{\bar{g}}$ and $\rho_{\bar{o}}$ are also dependent on surface process.

The surface process is fundamental to defining black-oil property tables. There is no surface process

[17] SPE Phase Behavior Monograph, p 43.

defined in the Zick "black-oil lookup" tables. His tables do not contain the fundamental black-oil properties: R_s, B_o, r_s, and B_g.

PhazeComp, the program used by Dr. Zick as well as PERA, does not generate directly industry-standard black-oil tables. One can, however, define within PhazeComp a surface process to generate table with quantities that can be manipulated manually into traditional black-oil quantities and tables. The PhazeComp output file name extension is .bot. PERA has a program that reads the .bot file and creates traditional black-oil tables in a number of formats (e.g. Schlumberger ECL100).

One could, theoretically, generate traditional black-oil PVT tables from the Zick EOS model using a third-party PVT program like PVTsim. Such use of the Zick EOS is susceptible to error because of data input incompatibilities and the need to ensure that the 3rd-party program has correctly interpreted the EOS parameters and compositions. It appears that several experts who were calculating stock-tank oil rate estimates could not (or did not) use the Zick PVT results because it lacked traditional black-oil PVT tables; instead they used alternative correlations for estimating black-oil PVT properties dependence on pressure and temperature using correlations which are not intended for use with near-critical fluids.

Zick's Critique of BP EOS

On page 13 of the Zick report, he critiques the BP EOS:

"Although the general accuracy of BP's EOS did not seem unreasonable, I found it to have certain shortcomings. In particular, the laboratory PVT experiments showed the Macondo fluid samples to be very near-critical (simply put, they exhibited phase behavior that was difficult to distinguish between oil-like and gas-like), but BP's EOS did not reflect that very well and did not predict the liquid-liquid critical point that was suggested by the data. In addition, some of the component properties that defined BP's fluid characterization were physically not very realistic."

"In my opinion, these inaccuracies and omissions raised questions about the BP fluid model's predictions for the two-phase, near-critical conditions just below the saturation pressures, and for fluid compositions that were not considered during BP's EOS-tuning process."

From **Figure 45** to **Figure 48** showing the near-critical phase behavior predictions of the Zick EOS, the PERA EOS, and measured PVT data for Pencor samples, it is clear that the critique of BP's original EOS can equally be applied to the Zick EOS. It should be recognized that the Zick EOS does have more near-critical behavior than the original BP EOS, but the Zick EOS miscalculates *the two-phase, near-critical conditions just below the saturation pressures* of both Pencor samples.

Zick's critique of BP's original EOS (*"some of the component properties that defined BP's fluid characterization were physically not very realistic"*) can equally be applied to the Zick 35-component EOS model that has severe physically inconsistent behavior. Given that the Zick 35-component EOS is the only input to the Zick 11-component EOS model (together with SLB-1.18 composition), it is reasonable to apply the same criticism to the Zick EOS model as he gives the BP EOS model.

TABLES

Table 2. Properties of different samples.

The most 'gas-like' values are shown in the shaded boxes.

Laboratory		CL/Pencor	CL/Pencor	SLB	Intertek
Sample		68379	68508	1.18	
Fluid Type		Gas	Gas	Oil	Oil
C1 mol-%		65.4	65.8	66.5	64.8
C7+ mol-%		15.7	15.4	15.1	15.7
C7+ MW		211	213	218	214
Density at 7000 psig, 243 F, g/cc		0.536	0.534	0.544	0.542
Single stage flash GOR, scf/STB		2819	2906	2945	2830
4-stage separator GOR, scf/STB		2554	2485	2442	2747
4-stage separator B_i, RB/STB[18]		2.13	2.11	2.05	2.17
Liquid relative volume at 2250 psia, %	100 F	67	64	75	60
	170 F	63	56		
	243 F	54	49	60	62

[18] Bi defined as (volume at initial reservoir conditions)/(stock tank oil volume).

Table 3. PERA EOS model parameters.

	MW	P_c, psia	T_c, R	Acentric factor	Volume shift	Z_c	Parachor
N2	28.014	227.16	492.84	0.03700	-0.16758	0.29178	41.0
CO2	44.010	547.42	1069.51	0.22500	0.00191	0.27433	78.0
C1	16.043	343.01	667.03	0.01100	-0.14996	0.28620	77.3
C2	30.070	549.58	706.62	0.09900	-0.06280	0.27924	108.9
C3	44.097	665.69	616.12	0.15200	-0.06381	0.27630	151.9
i-C4	58.123	734.13	527.94	0.18600	-0.06197	0.28199	181.5
n-C4	58.123	765.22	550.56	0.20000	-0.05393	0.27385	191.7
i-C5	72.150	828.70	490.37	0.22900	-0.05646	0.27231	225.0
n-C5	72.150	845.46	488.78	0.25200	-0.02927	0.26837	233.9
C6	83.282	922.39	480.00	0.24969	-0.00554	0.26895	271.0
C7	98.471	995.73	440.38	0.28313	0.06868	0.30797	289.7
C8	109.871	1043.29	414.35	0.31047	0.07534	0.30367	316.4
C9	123.394	1095.51	384.77	0.34698	0.08893	0.29870	348.0
C10	136.625	1141.53	359.49	0.38361	0.10107	0.29424	379.0
C11	149.763	1183.17	337.50	0.42051	0.11208	0.29011	409.7
C12	162.811	1221.14	318.26	0.45752	0.12203	0.28621	440.3
C13	175.766	1255.99	301.35	0.49116	0.13096	0.28249	470.6
C14	188.627	1288.14	286.42	0.52632	0.13892	0.27890	500.7
C15	201.390	1317.93	273.16	0.56109	0.14596	0.27542	530.6
C16	214.052	1345.65	261.34	0.59542	0.15213	0.27203	560.2
C17	226.610	1371.55	250.77	0.62930	0.15747	0.26873	589.6
C18	239.063	1395.81	241.27	0.66270	0.16207	0.26551	618.7
C19	251.410	1418.61	232.70	0.69560	0.16596	0.26237	647.6
C20	263.650	1440.10	224.94	0.72799	0.16920	0.25931	676.2
C21	275.783	1460.41	217.90	0.75988	0.17185	0.25632	704.6
C22	287.809	1479.65	211.49	0.79124	0.17396	0.25342	732.8
C23	299.729	1497.91	205.63	0.82208	0.17557	0.25059	760.7
C24	311.544	1515.27	200.27	0.85239	0.17672	0.24783	788.3
C25	323.256	1531.83	195.34	0.88218	0.17746	0.24516	815.7
C26	334.866	1547.63	190.80	0.91144	0.17783	0.24256	842.9
C27	346.376	1562.75	186.61	0.94018	0.17785	0.24003	869.8
C28	357.787	1577.23	182.72	0.96841	0.17756	0.23758	896.5
C29	369.102	1591.11	179.12	0.99612	0.17699	0.23519	923.0
C30	380.322	1604.46	175.77	1.02332	0.17616	0.23288	949.3
C31	391.450	1617.29	172.65	1.05003	0.17510	0.23063	975.3
C32	402.489	1629.65	169.74	1.07623	0.17382	0.22845	1001.1
C33	413.439	1641.57	167.01	1.10194	0.17236	0.22633	1026.7
C34	424.304	1653.08	164.45	1.12718	0.17072	0.22427	1052.2
C35	435.085	1664.20	162.05	1.15193	0.16892	0.22227	1077.4
C36+	579.660	1827.35	152.94	1.22050	0.06623	0.19914	1415.7

Table 4. PERA EOS Binary Interaction Parameters with N_2, CO_2 and C_1 at 243°F.

	N2	CO2	C1
N2		0.00000	0.10000
CO2	0.00000		0.10500
C1	0.10000	0.10500	
C2	0.10000	0.13000	-0.00126
C3	0.10000	0.12500	-0.00414
i-C4	0.10000	0.11500	-0.00791
n-C4	0.10000	0.11500	-0.00745
i-C5	0.10000	0.11500	-0.01067
n-C5	0.10000	0.11500	-0.01083
C6	0.10000	0.11500	-0.03000
C7	0.10000	0.11500	-0.00674
C8	0.10000	0.11500	-0.00770
C9	0.10000	0.11500	-0.00888
C10	0.10000	0.11500	-0.01000
C11	0.10000	0.11500	-0.01107
C12	0.10000	0.11500	-0.01209
C13	0.10000	0.11500	-0.01307
C14	0.10000	0.11500	-0.01399
C15	0.10000	0.11500	-0.01487
C16	0.10000	0.11500	-0.01570
C17	0.10000	0.11500	-0.01648
C18	0.10000	0.11500	-0.01722
C19	0.10000	0.11500	-0.00170
C20	0.10000	0.11500	0.01370
C21	0.10000	0.11500	0.02920
C22	0.10000	0.11500	0.04470
C23	0.10000	0.11500	0.06015
C24	0.10000	0.11500	0.06170
C25	0.10000	0.11500	0.06317
C26	0.10000	0.11500	0.06456
C27	0.10000	0.11500	0.06587
C28	0.10000	0.11500	0.06712
C29	0.10000	0.11500	0.06830
C30	0.10000	0.11500	0.06943
C31	0.10000	0.11500	0.07049
C32	0.10000	0.11500	0.07151
C33	0.10000	0.11500	0.07248
C34	0.10000	0.11500	0.07340
C35	0.10000	0.11500	0.07427
C36+	0.10000	0.11500	0.08336

Table 5. PERA EOS Temperature-dependent BIPs for C_1 with C_7 to C_{22}.

	a	b
C7	0.00346	-4.196E-05
C8	0.01271	-8.399E-05
C9	0.02172	-1.259E-04
C10	0.03080	-1.679E-04
C11	0.03993	-2.099E-04
C12	0.04910	-2.518E-04
C13	0.05833	-2.938E-04
C14	0.06761	-3.358E-04
C15	0.07693	-3.778E-04
C16	0.08631	-4.198E-04
C17	0.09572	-4.617E-04
C18	0.10518	-5.037E-04
C19	0.09618	-4.028E-04
C20	0.08711	-3.021E-04
C21	0.07814	-2.014E-04
C22	0.06917	-1.007E-04

Temperature dependent BIPs are calculated from a+bT, where T is the temperature in degrees F. All other BIPs are independent of temperature.

Table 6. PERA EOS Binary Interaction Parameters for C_{7+} with C_7 to C_{21}.

	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21
C7															
C8	0.00014														
C9	0.00063	0.00018													
C10	0.00138	0.00065	0.00015												
C11	0.00232	0.00133	0.00053	0.00012											
C12	0.00338	0.00216	0.00109	0.00044	0.00010										
C13	0.00453	0.00310	0.00179	0.00091	0.00037	0.00009									
C14	0.00573	0.00411	0.00257	0.00150	0.00077	0.00031	0.00007								
C15	0.00697	0.00517	0.00342	0.00216	0.00126	0.00065	0.00027	0.00006							
C16	0.00821	0.00625	0.00431	0.00288	0.00183	0.00107	0.00055	0.00023	0.00005						
C17	0.00945	0.00734	0.00523	0.00364	0.00244	0.00155	0.00091	0.00047	0.00019	0.00004					
C18	0.01068	0.00843	0.00616	0.00442	0.00309	0.00208	0.00132	0.00078	0.00040	0.00017	0.00004				
C19	0.01188	0.00950	0.00708	0.00521	0.00376	0.00263	0.00177	0.00113	0.00067	0.00035	0.00014	0.00003			
C20	0.01305	0.01056	0.00800	0.00601	0.00443	0.00320	0.00225	0.00152	0.00097	0.00057	0.00030	0.00012	0.00003		
C21	0.01419	0.01159	0.00890	0.00680	0.00512	0.00379	0.00274	0.00193	0.00130	0.00084	0.00049	0.00026	0.00011	0.00002	
C22	0.01530	0.01259	0.00979	0.00757	0.00580	0.00438	0.00325	0.00235	0.00166	0.00112	0.00072	0.00043	0.00022	0.00009	0.00002
C23	0.01637	0.01357	0.01065	0.00834	0.00647	0.00496	0.00376	0.00279	0.00203	0.00143	0.00097	0.00063	0.00037	0.00019	0.00008
C24	0.01740	0.01451	0.01149	0.00909	0.00713	0.00555	0.00427	0.00324	0.00241	0.00175	0.00124	0.00084	0.00054	0.00032	0.00017
C25	0.01839	0.01542	0.01231	0.00982	0.00778	0.00612	0.00477	0.00368	0.00280	0.00209	0.00152	0.00108	0.00073	0.00047	0.00028
C26	0.01934	0.01630	0.01310	0.01052	0.00842	0.00669	0.00527	0.00412	0.00318	0.00242	0.00181	0.00132	0.00094	0.00064	0.00041
C27	0.02026	0.01715	0.01386	0.01121	0.00903	0.00724	0.00577	0.00456	0.00357	0.00276	0.00211	0.00158	0.00116	0.00082	0.00056
C28	0.02114	0.01796	0.01460	0.01188	0.00963	0.00778	0.00625	0.00499	0.00395	0.00310	0.00241	0.00184	0.00138	0.00101	0.00072
C29	0.02199	0.01875	0.01531	0.01252	0.01022	0.00831	0.00673	0.00542	0.00433	0.00344	0.00270	0.00210	0.00161	0.00121	0.00089
C30	0.02281	0.01950	0.01600	0.01315	0.01078	0.00882	0.00719	0.00583	0.00471	0.00377	0.00300	0.00236	0.00184	0.00141	0.00106
C31	0.02359	0.02023	0.01666	0.01375	0.01133	0.00932	0.00764	0.00624	0.00507	0.00410	0.00330	0.00263	0.00207	0.00162	0.00124
C32	0.02434	0.02093	0.01730	0.01433	0.01186	0.00980	0.00808	0.00664	0.00543	0.00443	0.00359	0.00289	0.00231	0.00182	0.00142
C33	0.02506	0.02160	0.01791	0.01489	0.01237	0.01027	0.00850	0.00703	0.00579	0.00475	0.00388	0.00315	0.00254	0.00203	0.00161
C34	0.02575	0.02224	0.01850	0.01543	0.01287	0.01072	0.00892	0.00740	0.00613	0.00506	0.00416	0.00340	0.00277	0.00224	0.00179
C35	0.02642	0.02287	0.01907	0.01596	0.01335	0.01116	0.00932	0.00777	0.00647	0.00536	0.00444	0.00366	0.00300	0.00244	0.00198
C36+	0.03359	0.02960	0.02530	0.02171	0.01867	0.01608	0.01387	0.01197	0.01035	0.00895	0.00774	0.00670	0.00580	0.00502	0.00435

Table 7. PERA EOS Binary Interaction Parameters for C_{7+} with C_{22} to C_{35}.

	C22	C23	C24	C25	C26	C27	C28	C29	C30	C31	C32	C33	C34	C35	C36+
C22															
C23	0.00002														
C24	0.00007	0.00002													
C25	0.00015	0.00006	0.00001												
C26	0.00025	0.00013	0.00005	0.00001											
C27	0.00036	0.00022	0.00011	0.00005	0.00001										
C28	0.00049	0.00032	0.00019	0.00010	0.00004	0.00001									
C29	0.00063	0.00043	0.00028	0.00017	0.00009	0.00004	0.00001								
C30	0.00078	0.00056	0.00038	0.00025	0.00015	0.00008	0.00003	0.00001							
C31	0.00094	0.00069	0.00049	0.00034	0.00022	0.00013	0.00007	0.00003	0.00001						
C32	0.00110	0.00083	0.00061	0.00044	0.00030	0.00020	0.00012	0.00006	0.00003	0.00001					
C33	0.00126	0.00097	0.00073	0.00054	0.00039	0.00027	0.00018	0.00011	0.00006	0.00002	0.00001				
C34	0.00142	0.00112	0.00086	0.00065	0.00048	0.00035	0.00024	0.00016	0.00010	0.00005	0.00002	0.00001			
C35	0.00159	0.00126	0.00099	0.00077	0.00058	0.00043	0.00031	0.00022	0.00014	0.00009	0.00005	0.00002	0.00000		
C36+	0.00376	0.00325	0.00281	0.00242	0.00208	0.00179	0.00153	0.00131	0.00112	0.00095	0.00080	0.00067	0.00056	0.00046	

Table 8. CL68379 compositions (mol-%).

	Measured	Adjusted	Adjusted and decontaminated
N2	0.444	0.447	0.447
CO2	0.919	0.924	0.924
C1	65.467	65.803	65.858
C2	6.418	6.450	6.455
C3	4.572	4.591	4.595
i-C4	0.951	0.953	0.954
n-C4	2.177	2.180	2.182
i-C5	0.890	0.887	0.888
n-C5	1.081	1.076	1.077
C6	1.409	1.440	1.441
C7	2.010	1.864	1.865
C8	2.157	2.050	2.052
C9	1.529	1.448	1.449
C10	1.282	1.227	1.228
C11	0.944	0.903	0.904
C12	0.789	0.759	0.760
C13	0.753	0.730	0.730
C14	0.674	0.661	0.661
C15	0.564	0.562	0.562
C16	0.547	0.553	0.500
C17	0.436	0.444	0.445
C18	0.425	0.435	0.404
C19	0.360	0.367	0.367
C20	0.311	0.316	0.316
C21	0.253	0.260	0.260
C22	0.225	0.232	0.232
C23	0.203	0.210	0.210
C24	0.182	0.188	0.188
C25	0.149	0.154	0.154
C26	0.135	0.141	0.141
C27	0.141	0.148	0.149
C28	0.125	0.132	0.132
C29	0.111	0.118	0.118
C30	0.102	0.108	0.108
C31	0.096	0.103	0.103
C32	0.086	0.092	0.092
C33	0.074	0.080	0.080
C34	0.073	0.079	0.079
C35	0.060	0.065	0.065
C36+	0.878	0.821	0.822

Table 9. CL68508 compositions (mol-%).

	Measured	Adjusted	Adjusted and decontaminated
N2	0.448	0.452	0.453
CO2	0.906	0.914	0.915
C1	65.676	66.260	66.302
C2	6.416	6.470	6.474
C3	4.549	4.583	4.586
i-C4	0.952	0.957	0.957
n-C4	2.189	2.197	2.198
i-C5	0.895	0.892	0.893
n-C5	1.082	1.075	1.076
C6	1.397	1.418	1.418
C7	1.997	1.831	1.832
C8	2.107	1.979	1.980
C9	1.521	1.420	1.421
C10	1.268	1.194	1.194
C11	0.942	0.886	0.887
C12	0.787	0.746	0.747
C13	0.748	0.714	0.714
C14	0.670	0.646	0.647
C15	0.551	0.540	0.540
C16	0.505	0.502	0.478
C17	0.422	0.423	0.423
C18	0.405	0.407	0.381
C19	0.355	0.356	0.343
C20	0.309	0.309	0.309
C21	0.235	0.237	0.237
C22	0.232	0.235	0.235
C23	0.201	0.205	0.205
C24	0.168	0.171	0.172
C25	0.181	0.185	0.185
C26	0.133	0.137	0.137
C27	0.136	0.141	0.141
C28	0.122	0.126	0.126
C29	0.111	0.116	0.116
C30	0.100	0.105	0.105
C31	0.095	0.100	0.100
C32	0.080	0.084	0.084
C33	0.074	0.079	0.079
C34	0.069	0.073	0.073
C35	0.063	0.067	0.067
C36+	0.902	0.768	0.768

Table 10. SLB-1.18 compositions (mol-%).

	Measured	Adjusted	Adjusted and decontaminated
N2	0.308	0.304	0.305
CO2	0.902	0.888	0.889
C1	66.485	65.515	65.591
C2	6.465	6.376	6.383
C3	4.584	4.531	4.536
i-C4	0.938	0.932	0.933
n-C4	2.121	2.114	2.117
i-C5	0.832	0.842	0.843
n-C5	1.005	1.024	1.025
C6	1.300	1.374	1.376
C7	1.847	1.835	1.837
C8	2.012	2.057	2.059
C9	1.436	1.494	1.496
C10	1.238	1.336	1.337
C11	0.924	0.999	1.000
C12	0.772	0.840	0.841
C13	0.709	0.778	0.779
C14	0.608	0.674	0.675
C15	0.585	0.659	0.598
C16	0.479	0.547	0.530
C17	0.404	0.466	0.470
C18	0.382	0.442	0.416
C19	0.333	0.384	0.369
C20	0.284	0.327	0.327
C21	0.255	0.296	0.297
C22	0.222	0.259	0.260
C23	0.197	0.230	0.230
C24	0.178	0.208	0.208
C25	0.158	0.186	0.186
C26	0.148	0.174	0.174
C27	0.134	0.159	0.160
C28	0.124	0.148	0.148
C29	0.118	0.141	0.142
C30	0.109	0.131	0.131
C31	0.100	0.121	0.121
C32	0.090	0.110	0.110
C33	0.084	0.103	0.103
C34	0.078	0.096	0.096
C35	0.079	0.097	0.098
C36+	0.973	0.803	0.804

Table 11. Intertek compositions (mol-%).

	Measured	Adjusted	Adjusted and decontaminated
N2	0.493	0.494	0.494
CO2	0.918	0.918	0.918
C1	64.847	64.851	64.876
C2	6.394	6.391	6.394
C3	4.595	4.593	4.595
i-C4	0.939	0.939	0.939
n-C4	2.150	2.149	2.150
i-C5	0.882	0.881	0.881
n-C5	1.101	1.100	1.101
C6	1.952	2.019	2.019
C7	1.725	1.707	1.708
C8	2.685	2.622	2.623
C9	1.421	1.476	1.476
C10	1.186	1.234	1.234
C11	0.932	0.914	0.914
C12	0.762	0.752	0.752
C13	0.754	0.750	0.751
C14	0.655	0.659	0.659
C15	0.556	0.568	0.576
C16	0.478	0.495	0.504
C17	0.418	0.436	0.441
C18	0.390	0.409	0.385
C19	0.355	0.371	0.337
C20	0.282	0.294	0.294
C21	0.257	0.271	0.271
C22	0.223	0.236	0.236
C23	0.203	0.215	0.215
C24	0.182	0.193	0.193
C25	0.168	0.179	0.179
C26	0.148	0.158	0.158
C27	0.140	0.152	0.152
C28	0.133	0.144	0.144
C29	0.114	0.124	0.124
C30	0.107	0.117	0.117
C31	0.095	0.105	0.105
C32	0.087	0.095	0.095
C33	0.077	0.086	0.086
C34	0.075	0.084	0.084
C35	0.065	0.072	0.072
C36+	1.052	0.746	0.747

Table 12. Shrinkage factors for decontaminated samples using oceanic proxy separation and an exit pressure of 2250 psia.

Sample	Texit=T(BO)	OF	OS	OSF	CSF	TSF
	F	bbl/bbl	STB/bbl	STB/bbl	STB/bbl	STB/bbl
CL68379	210	0.321	0.745	0.239	0.0034	0.243
CL68508	210	0.311	0.743	0.231	0.0035	0.235
SLB-1.18	210	0.337	0.750	0.253	0.0033	0.256
Intertek	210	0.338	0.738	0.250	0.0035	0.253
CL68379	170	0.360	0.741	0.267	0.0018	0.269
CL68508	170	0.350	0.739	0.259	0.0019	0.260
SLB-1.18	170	0.376	0.747	0.281	0.0017	0.282
Intertek	170	0.379	0.734	0.279	0.0018	0.280
CL68379	130	0.408	0.733	0.299	0.0009	0.300
CL68508	130	0.397	0.730	0.290	0.0009	0.291
SLB-1.18	130	0.422	0.740	0.313	0.0009	0.314
Intertek	130	0.428	0.727	0.311	0.0009	0.312
CL68379	100	0.450	0.725	0.326	0.0006	0.326
CL68508	100	0.439	0.721	0.316	0.0006	0.317
SLB-1.18	100	0.464	0.733	0.340	0.0005	0.341
Intertek	100	0.472	0.718	0.339	0.0005	0.340
CL68379	60	0.517	0.710	0.367	0.0004	0.367
CL68508	60	0.505	0.707	0.357	0.0004	0.357
SLB-1.18	60	0.531	0.720	0.382	0.0004	0.382
Intertek	60	0.542	0.704	0.381	0.0003	0.382
CL68379	35	0.564	0.701	0.396	0.0004	0.396
CL68508	35	0.553	0.697	0.386	0.0004	0.386
SLB-1.18	35	0.578	0.711	0.411	0.0004	0.411
Intertek	35	0.592	0.694	0.411	0.0003	0.411

Table 13. PERA and Zick EOS calculations for Formation Volume Factor and GOR in 4-stage and single-stage separation.

FVF is defined as (volume at initial reservoir conditions) / (stock tank oil volume)

4-Stage Separation						
Sample	FVF (B_o or B_g/r_s), RB/STB			GOR (R_s or $1/r_s$), Mscf/STB		
	Measured	PERA EOS	Zick EOS	Measured	PERA EOS	Zick EOS
CL68508	2.11	2.15	2.04	2.49	2.73	2.47
CL68379	2.13	2.10	2.02	2.55	2.62	2.42
INTERTEK	2.17	2.07	2.00	2.75	2.53	2.34
SLB-1.18	2.05	2.03	2.00	2.44	2.46	2.37
Average error		-1.3	-4.7		1.4	-5.9

Single-Stage Separation						
Sample	FVF (B_o or B_g/r_s), RB/STB			GOR (R_s or $1/r_s$), Mscf/STB		
	Measured	PERA EOS	Zick EOS	Measured	PERA EOS	Zick EOS
CL68508	2.49	2.73	2.47	2.36	2.47	2.34
CL68379	2.55	2.62	2.42	2.31	2.40	2.32
INTERTEK	2.75	2.53	2.34	2.28	2.30	2.21
SLB-1.18	2.44	2.46	2.37	2.30	2.28	2.27
Average error		2.0	-1.1		7.5	0.5

FIGURES

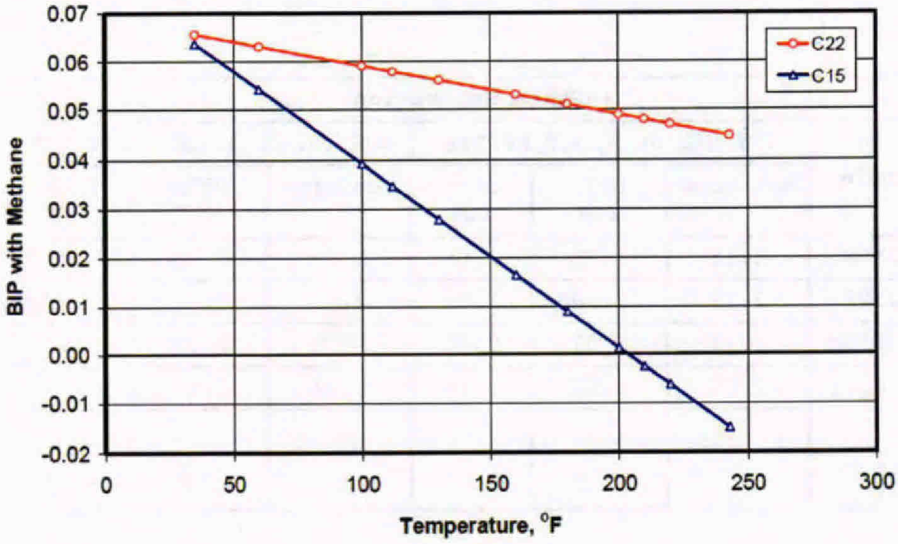

Figure 6. Temperature dependent BIPs for C1 with C_{15} and C_{22}.

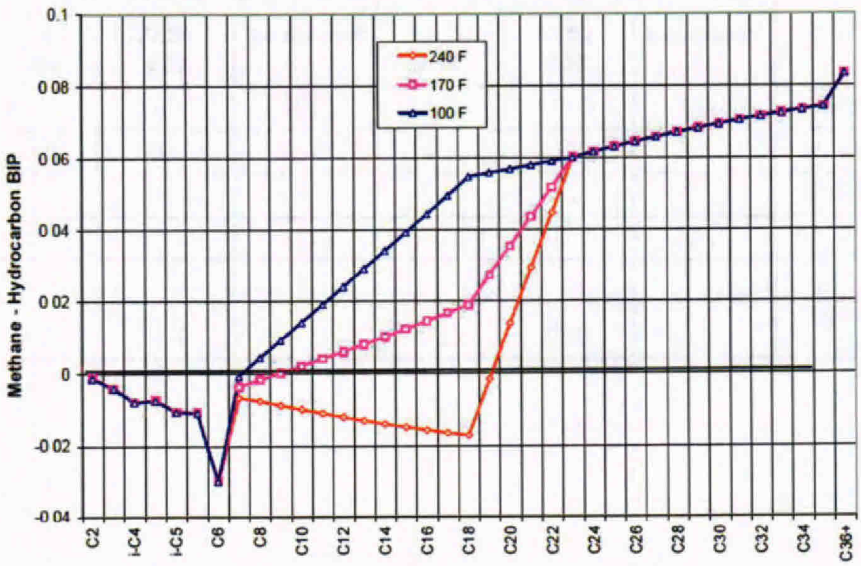

Figure 7. BIPs for C_1 with all other hydrocarbon components at 100°F, 170 °F and 240 °F.

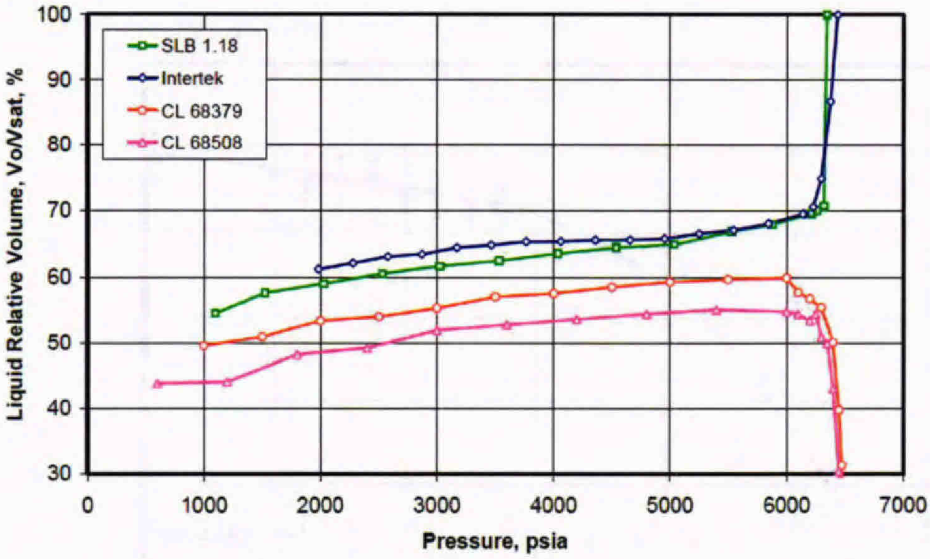

Figure 8. CCE liquid relative volumes (liquid volume / volume at saturation pressure) for different samples at reservoir temperature (242 or 243 °F).

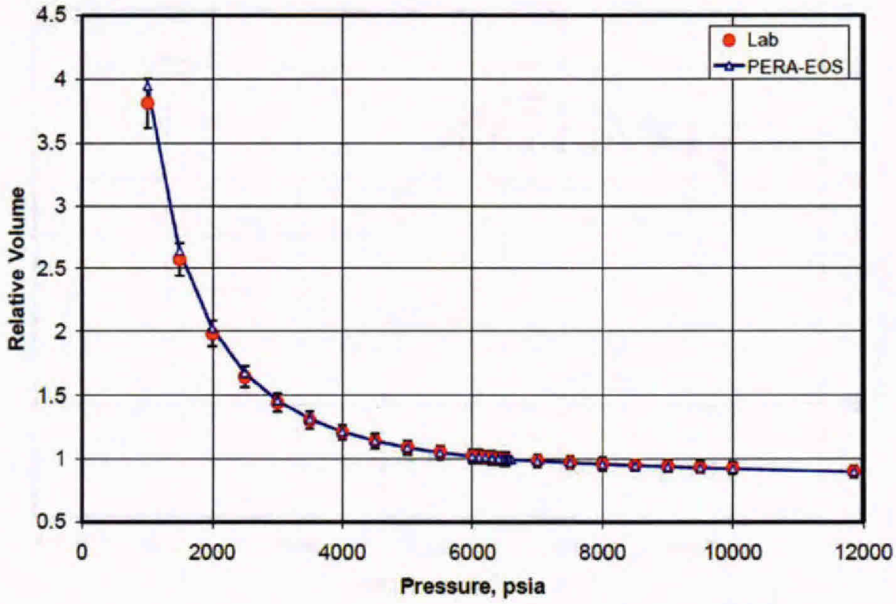

Figure 9. Experimental data and PERA EOS results for CL 68379 fluid, relative total volume in CCE at 243 °F.

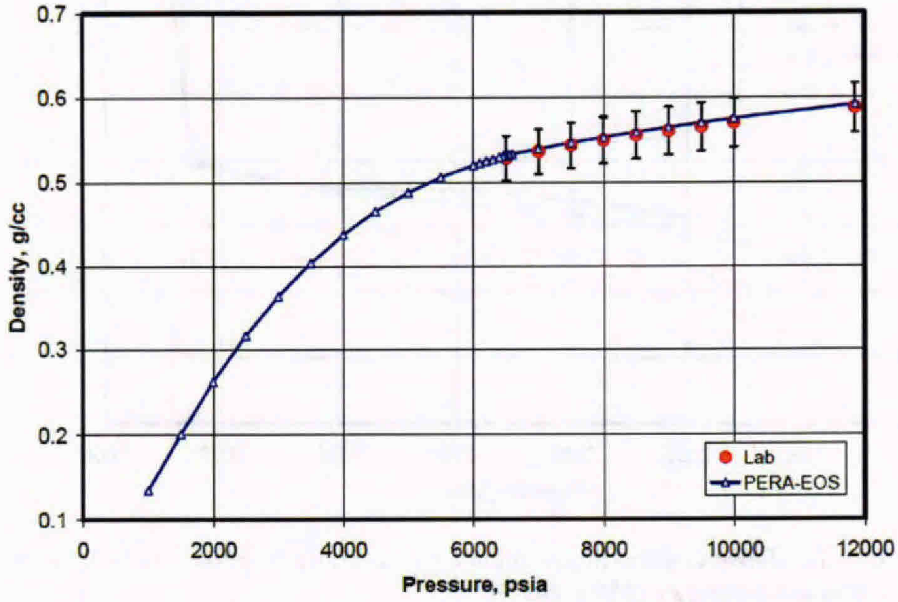

Figure 10. Experimental data and PERA EOS results for CL 68379, CCE single phase density at 243 °F.

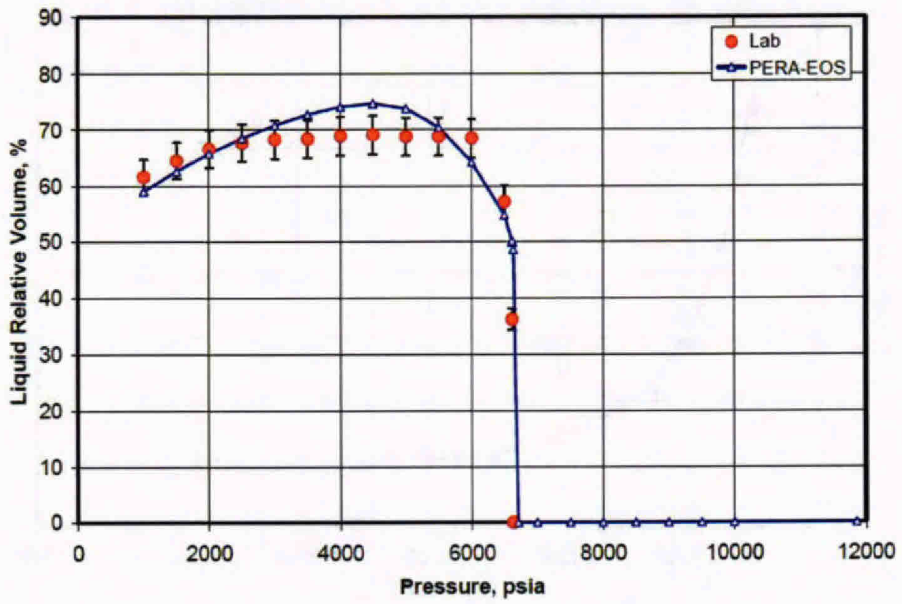

Figure 11. Experimental data and PERA EOS results for CL 68379, CCE relative liquid volume at 100 °F.

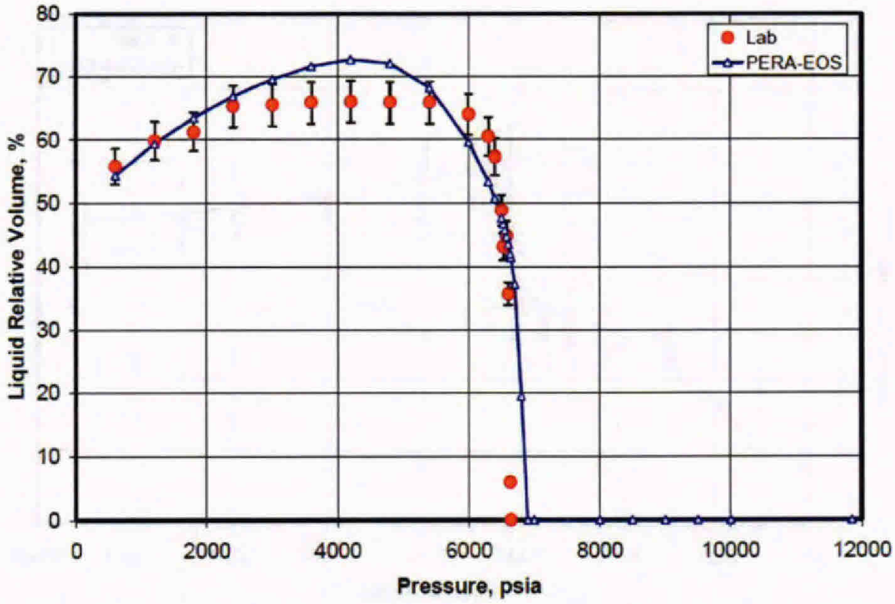

Figure 12. Experimental data and PERA EOS results for CL 68508, CCE relative liquid volume at 100 °F.

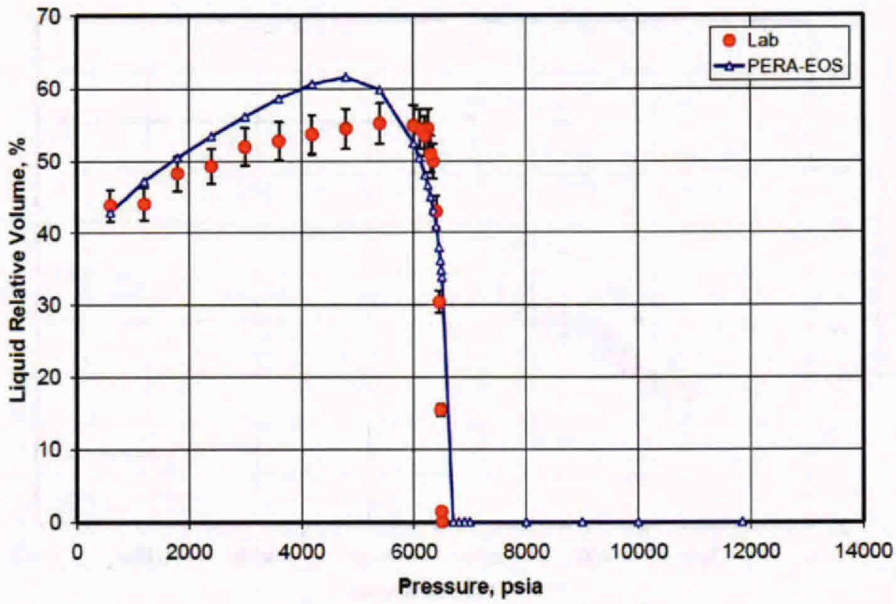

Figure 13. Experimental data and PERA EOS results for CL 68508, CCE relative liquid CCE at 243 °F.

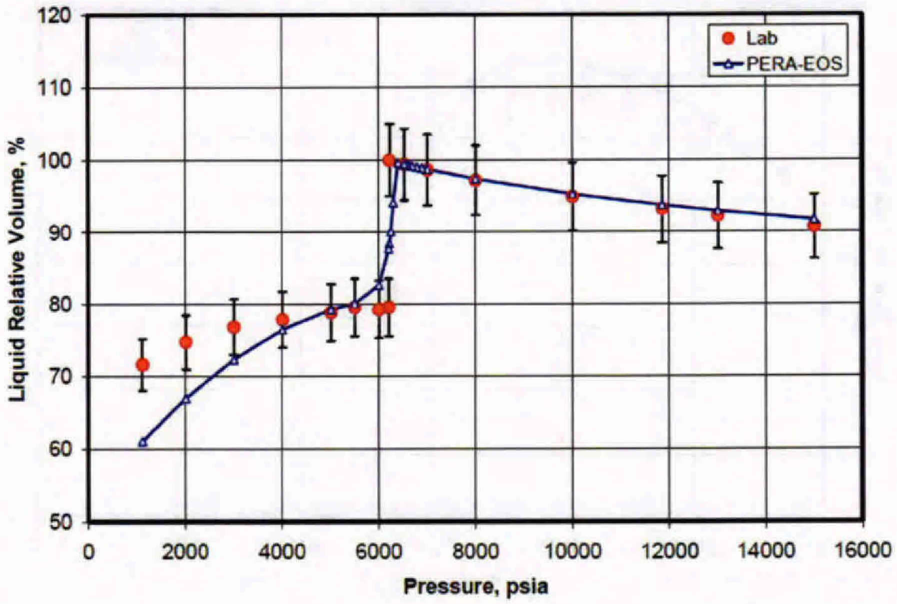

Figure 14. Experimental data and PERA EOS results for SLB-1.18, CCE relative liquid volume at 100 °F.

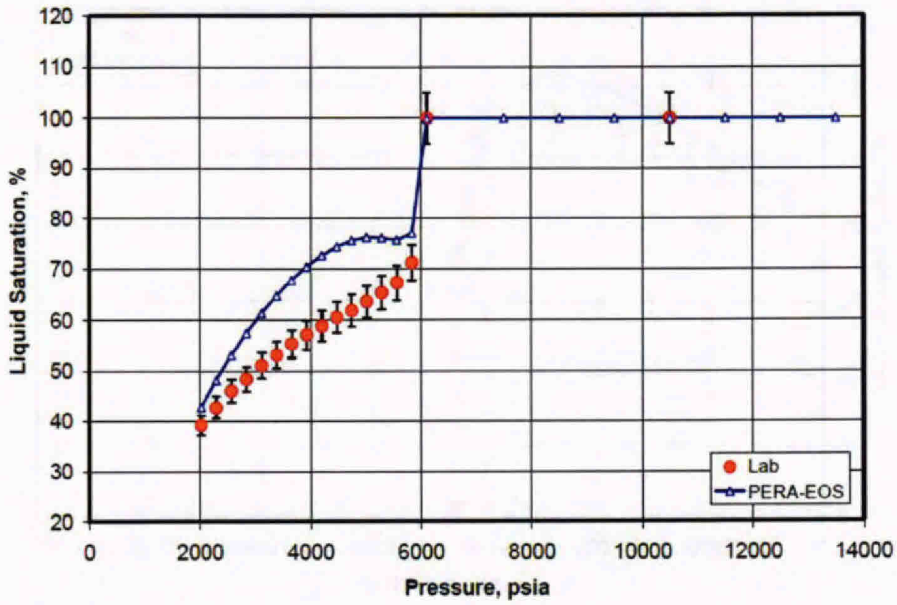

Figure 15. Experimental data and PERA EOS results for Intertek, CCE relative liquid volume in 100 °F.

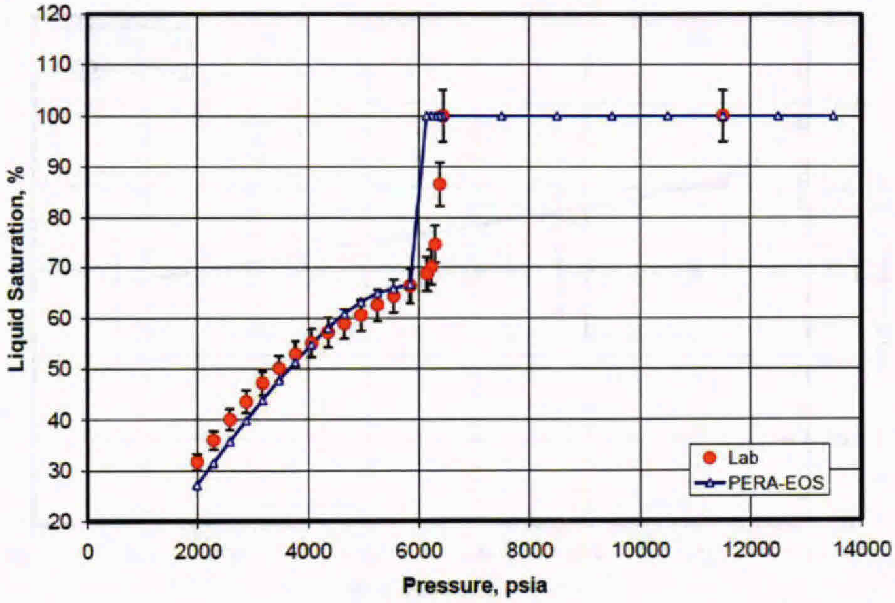

Figure 16. Experimental data and PERA EOS results for Intertek, CCE relative liquid at 243 °F.

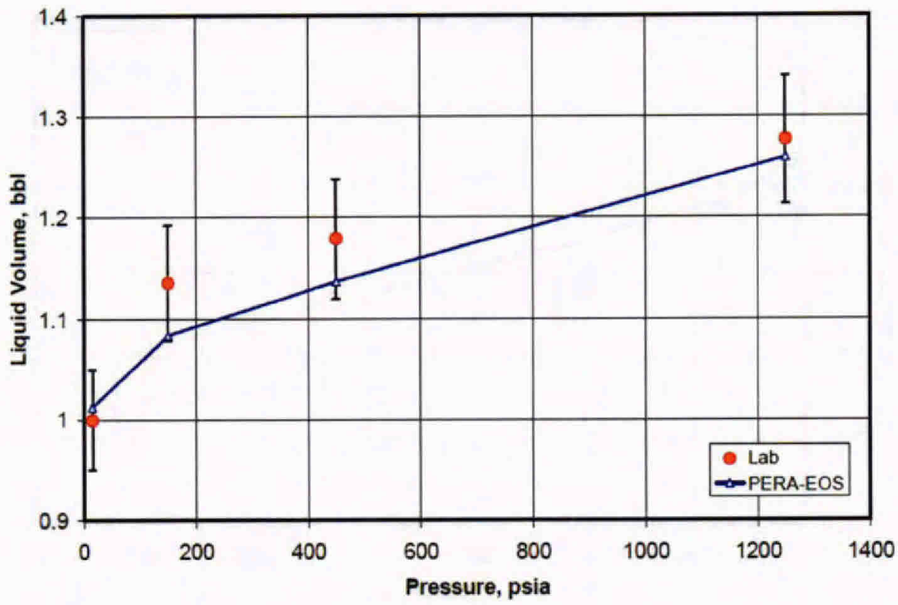

Figure 17. Experimental data and PERA EOS results for oil volume in 4-stage separator for CL68379.

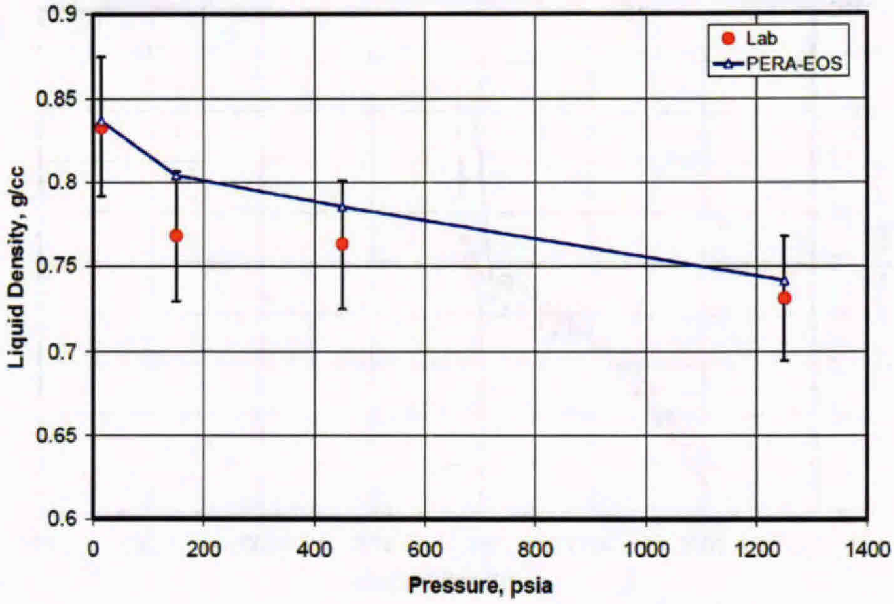

Figure 18. Experimental data and PERA EOS results for oil density in 4-stage separator for CL68379.

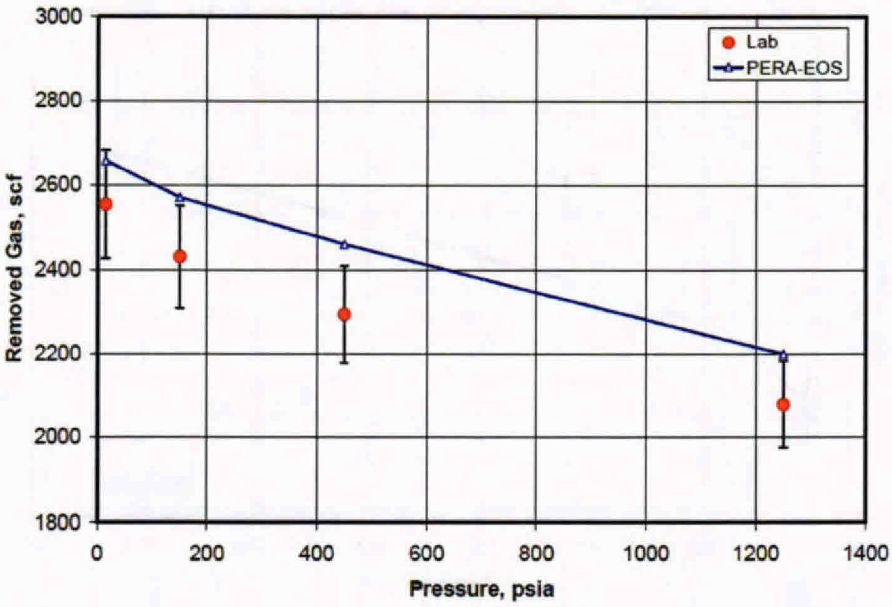

Figure 19. Experimental data and PERA EOS results for gas removed in 4-stage separator for CL68379.

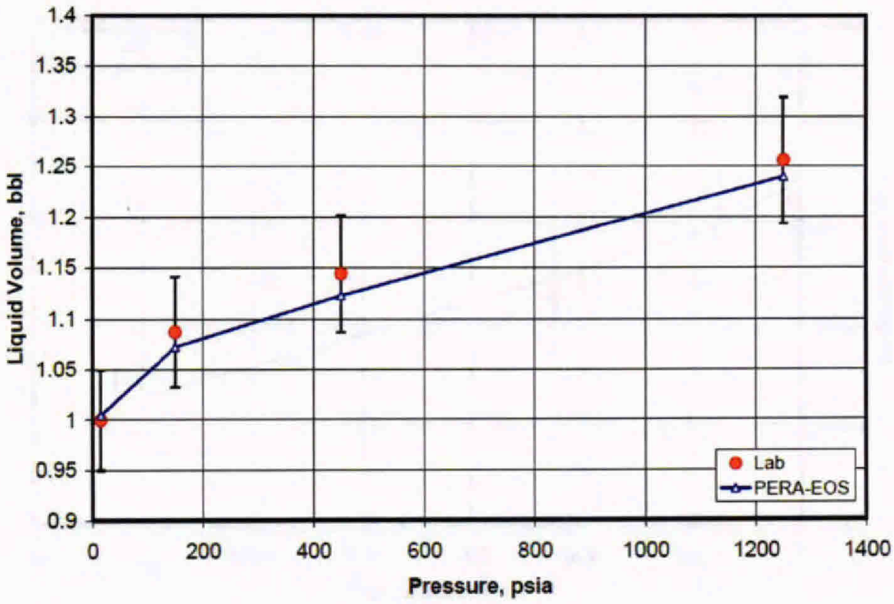

Figure 20. Experimental data and PERA EOS results for oil volume in 4-stage separator for SLB-1.18.

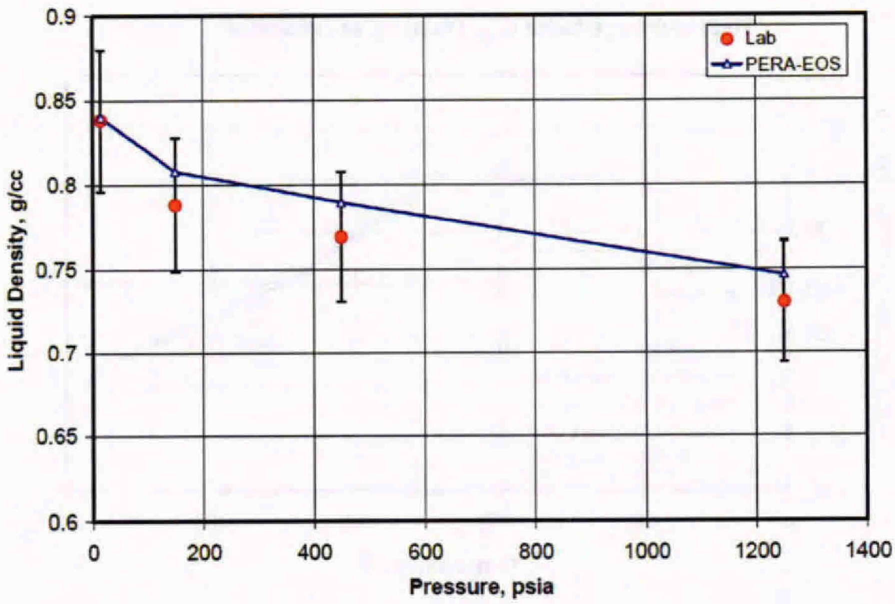

Figure 21. Experimental data and PERA EOS results for oil density in 4-stage separator for SLB-1.18.

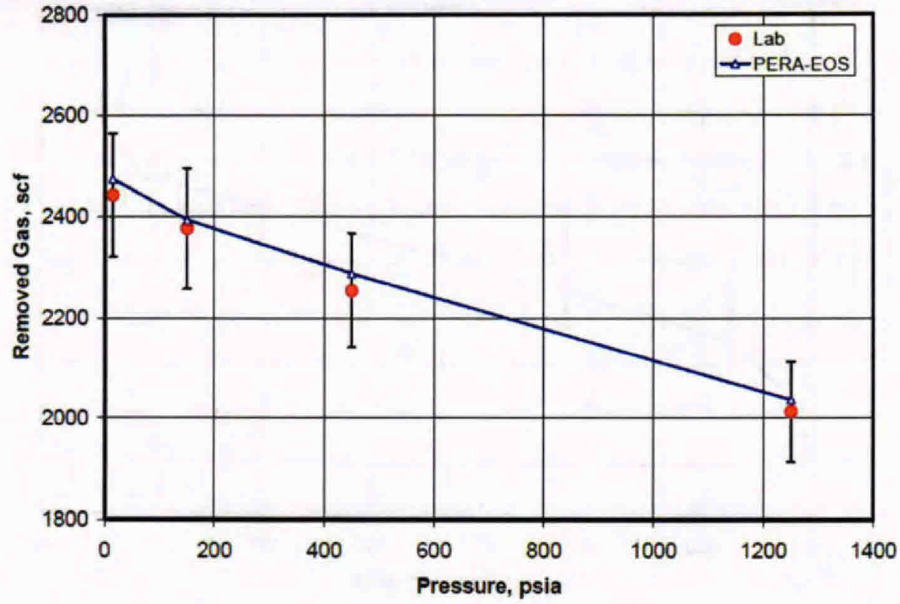

Figure 22. Experimental data and PERA EOS results for gas removed in 4-stage separator for SLB-1.18.

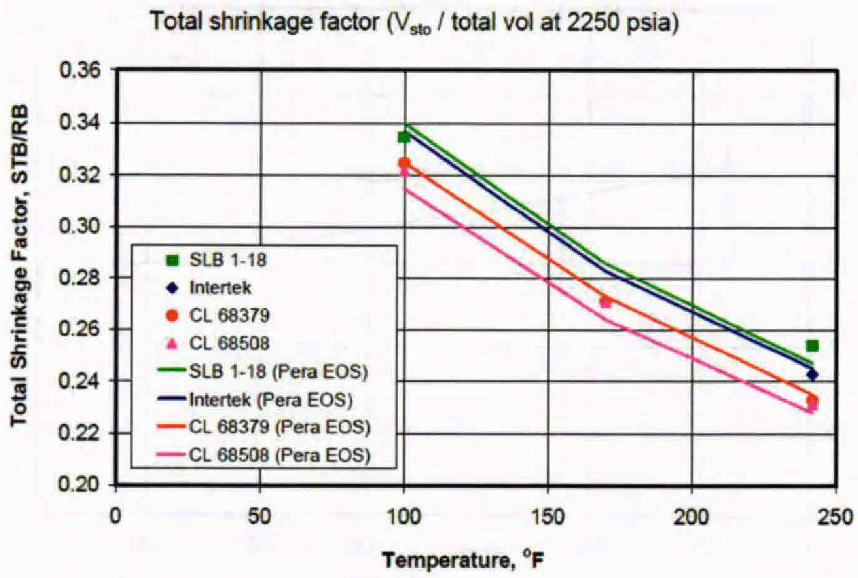

Figure 23. Total shrinkage factors for exit pressure of 2250 psia using 4-stage separation process.

Solid symbols are calculated from measured data in PVT reports. Lines show PERA EOS calculations.

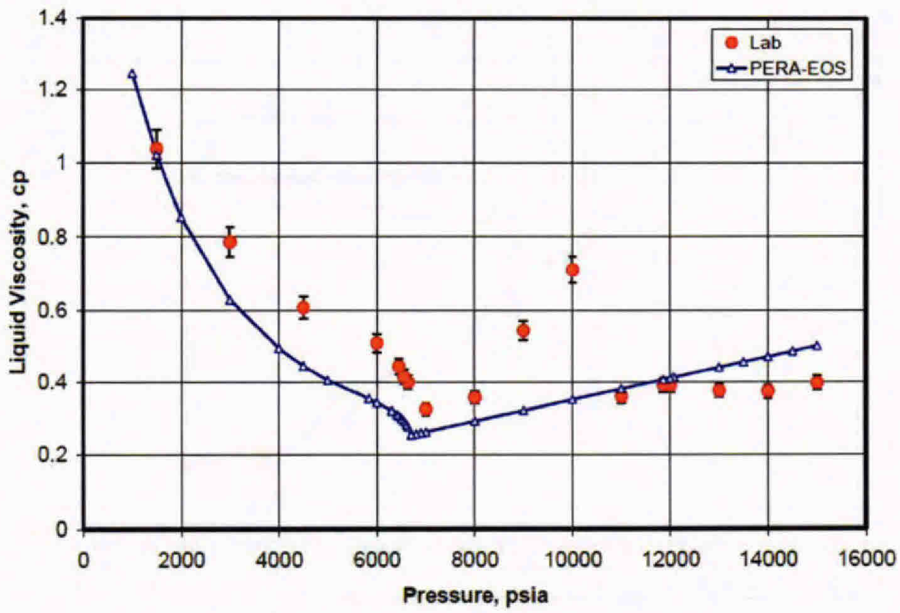

Figure 24. Experimental data and PERA EOS/LBC results for liquid viscosity for CL68379 at 100°F.

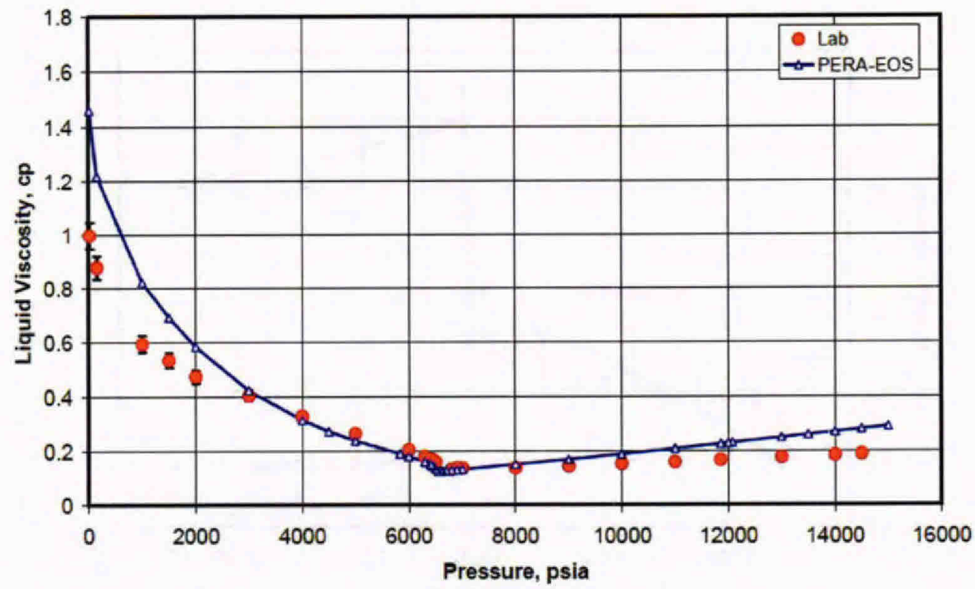

Figure 25. Experimental data and PERA EOS/LBC results for liquid viscosity for CL68379 at 242 °F.

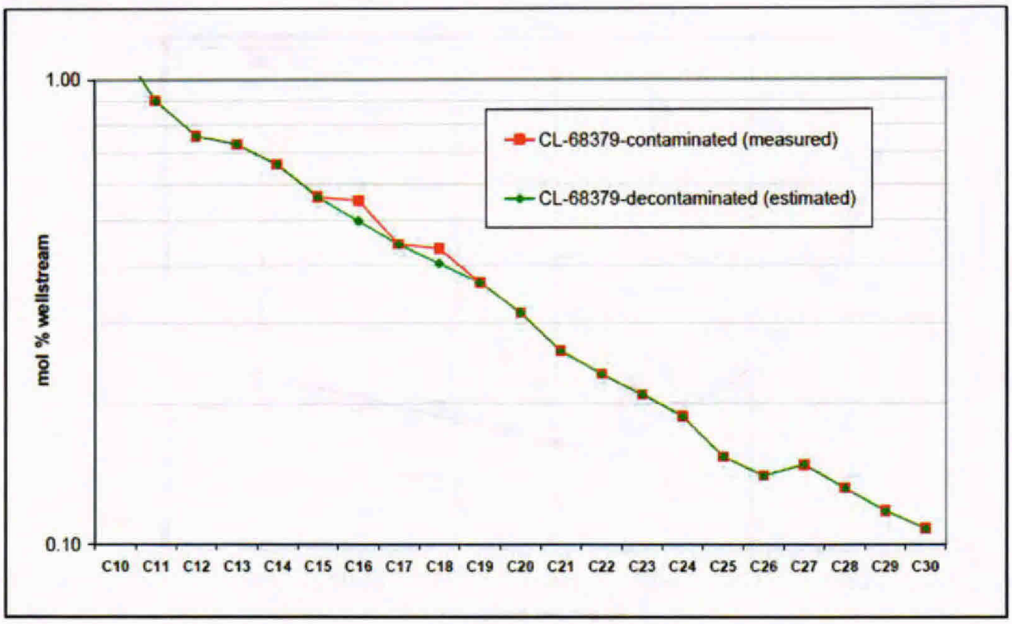

Figure 26. Reservoir fluid compositions for CL68379 sample, showing measured (contaminated) composition and estimated composition after removal of oil-based mud.

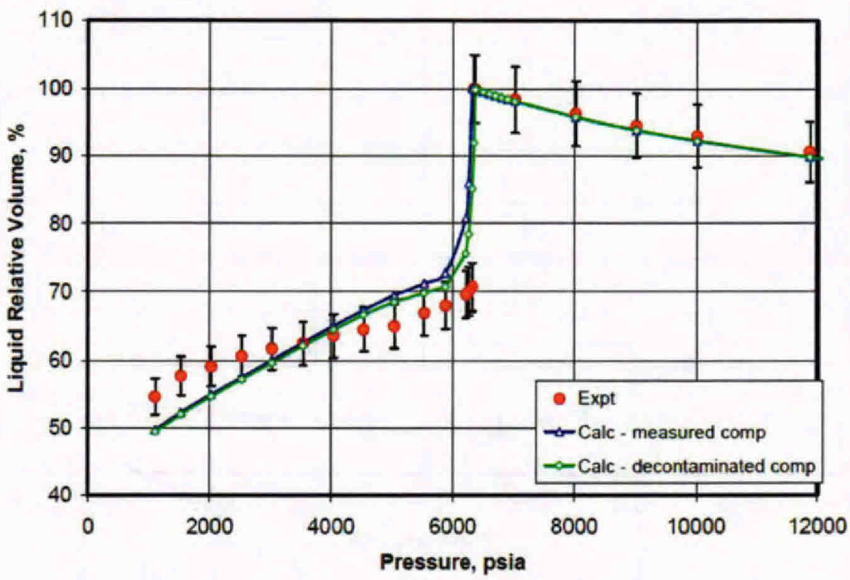

Figure 27. Liquid relative volumes for SLB-1.18. Experimental data and PERA EOS model calculations for measured and decontaminated samples.

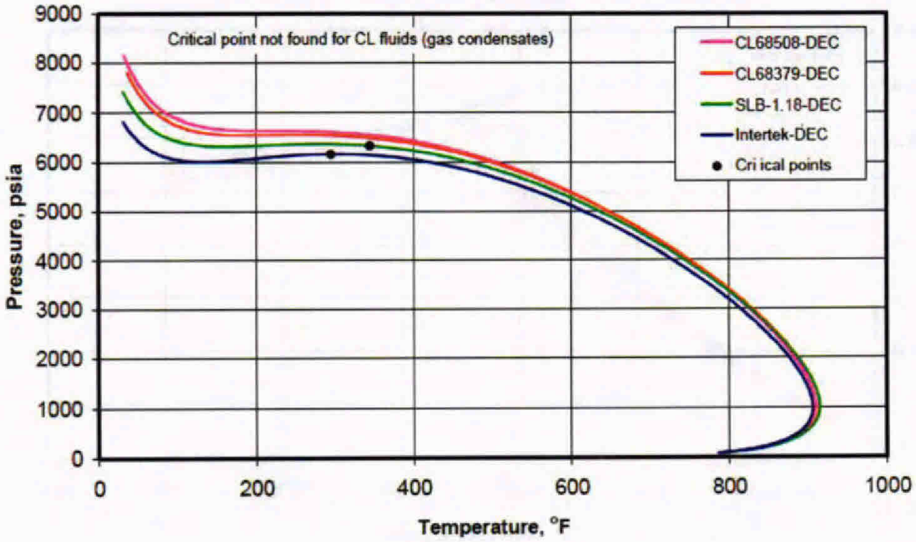

Figure 28. PERA EOS calculations of phase envelope for decontaminated fluid samples.

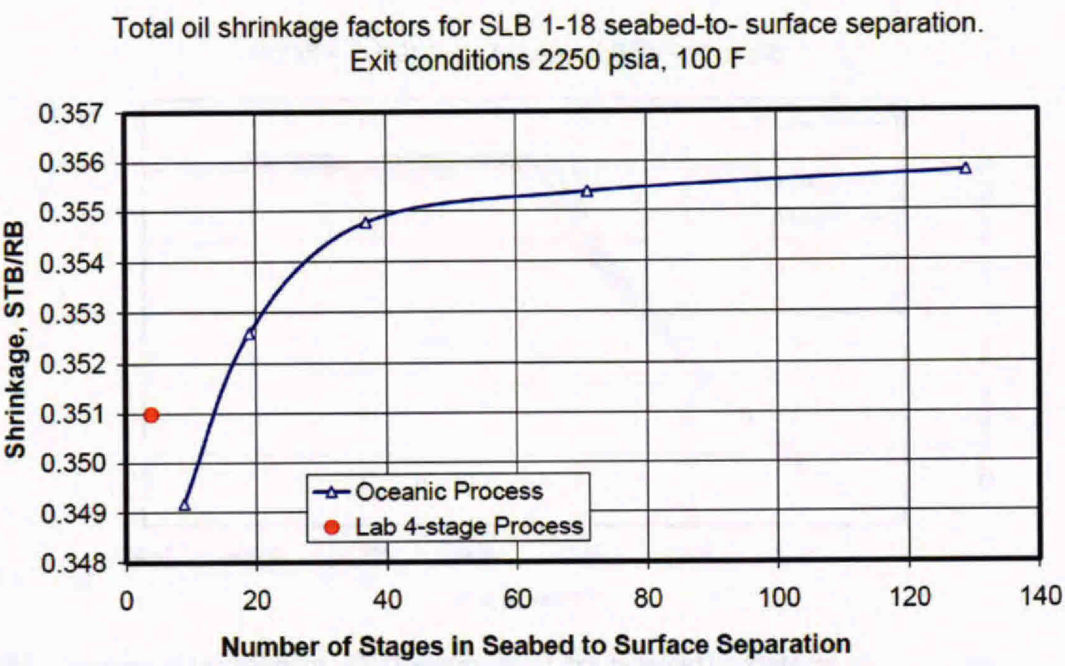

Figure 29. Number of stages needed in oceanic separation calculation for converged solution.

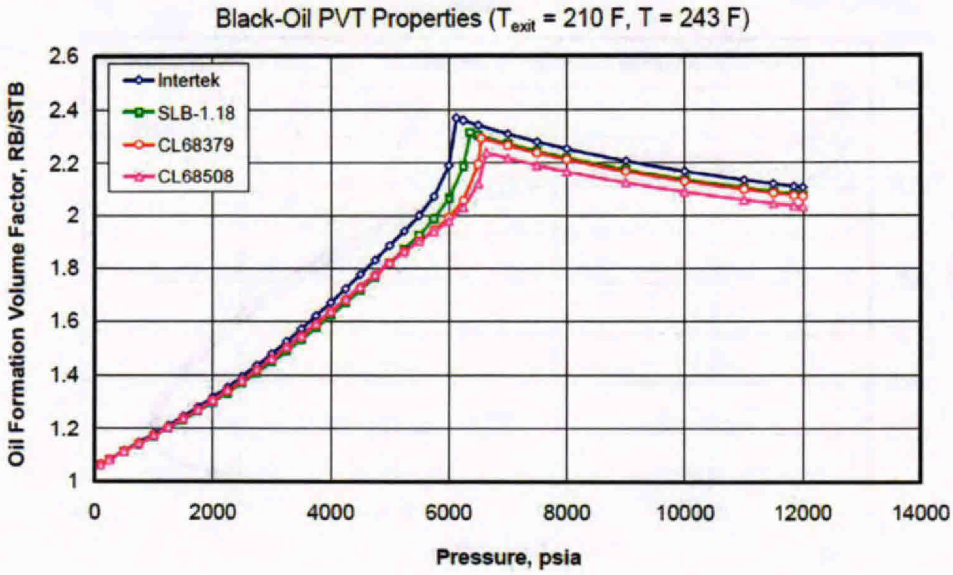

Figure 30. Oil formation volume factor from black oil tables at exit temperature 210°F and mixture temperature 243°F for different decontaminated samples, oceanic proxy separation process.

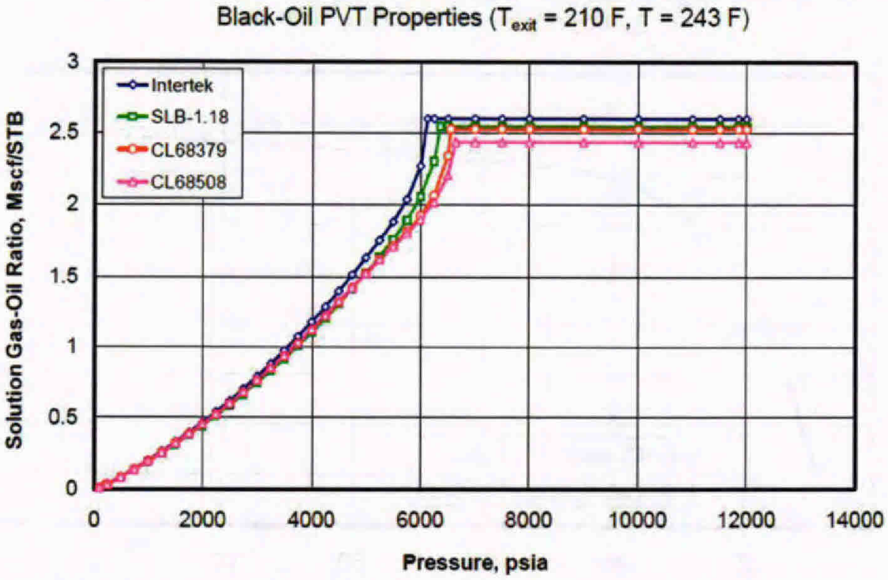

Figure 31. Gas-oil ratio from black oil tables at exit temperature 210°F and mixture temperature 243°F for different decontaminated samples, oceanic proxy separation process.

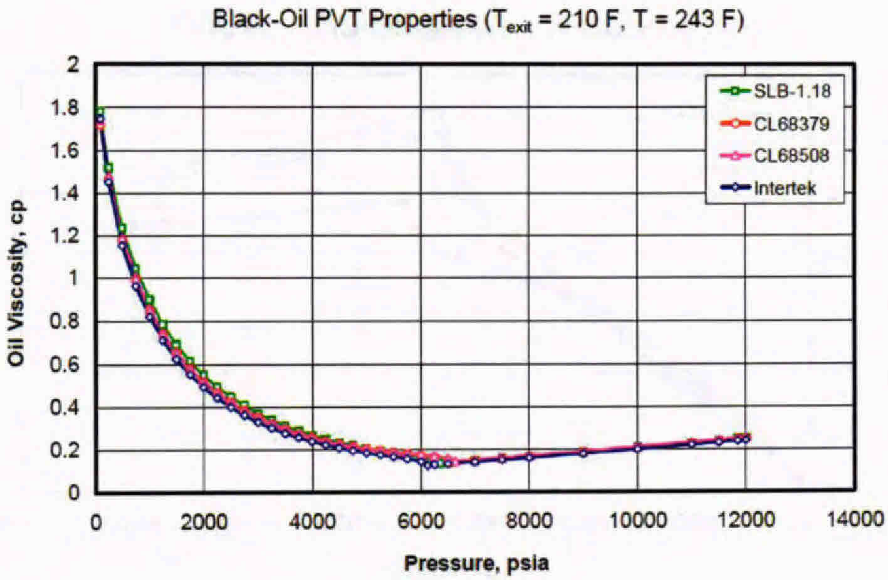

Figure 32. Oil viscosity from black oil tables at exit temperature 210°F and mixture temperature 243°F for different decontaminated samples.

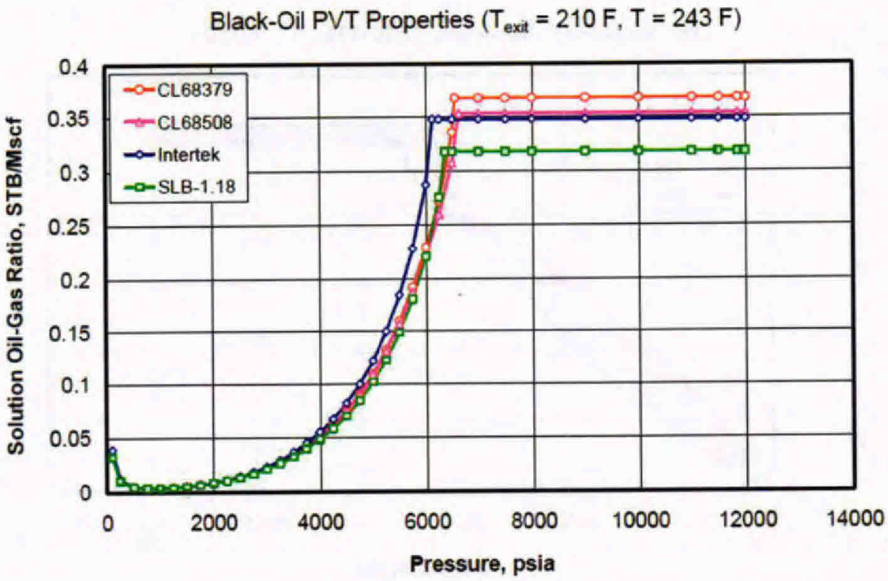

Figure 33. Oil-gas ratio from black oil tables at exit temperature 210°F and mixture temperature 243°F for different decontaminated samples, oceanic proxy separation process.

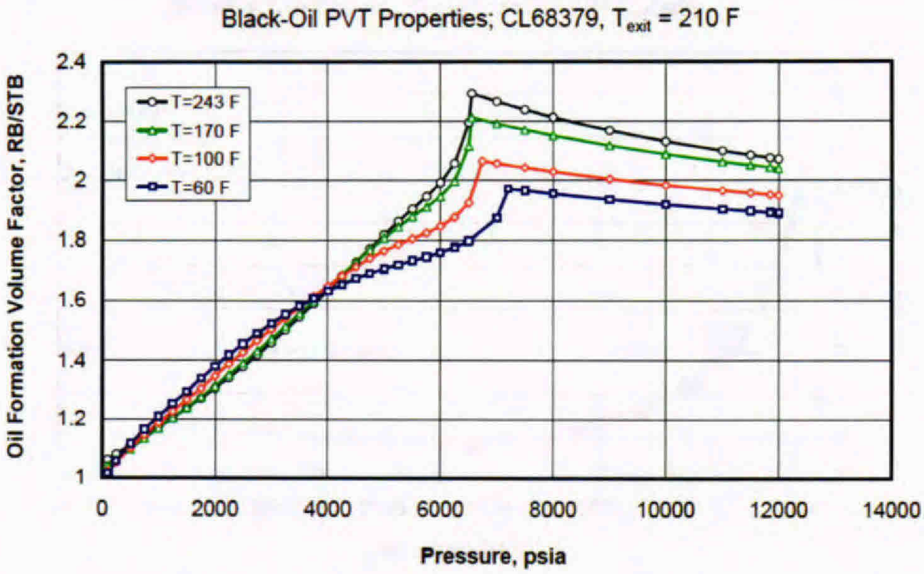

Figure 34. Oil formation volume factor from black oil tables for CL68379 (decontaminated) at exit temperature 210°F and various mixture temperatures, oceanic proxy separation process.

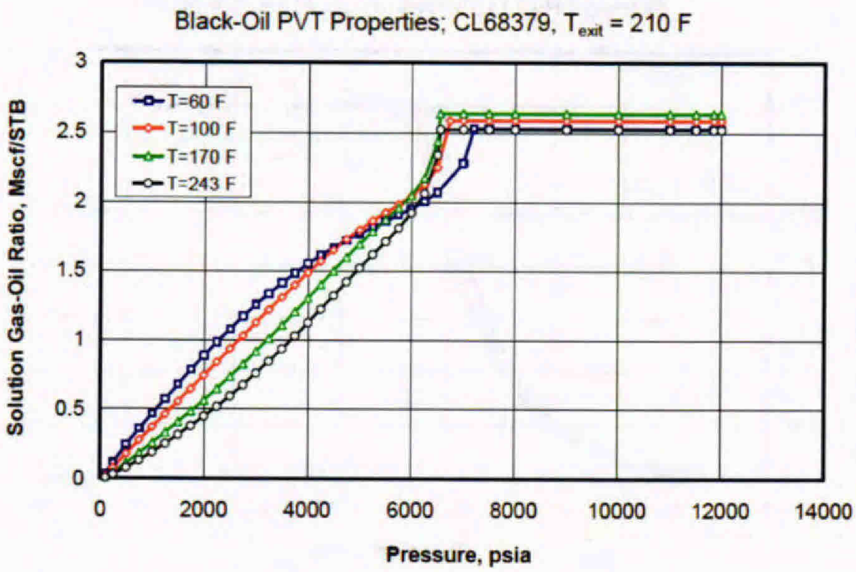

Figure 35. Gas-oil ratio from black oil tables for CL68379 (decontaminated) at exit temperature 210°F and various mixture temperatures, oceanic proxy separation process.

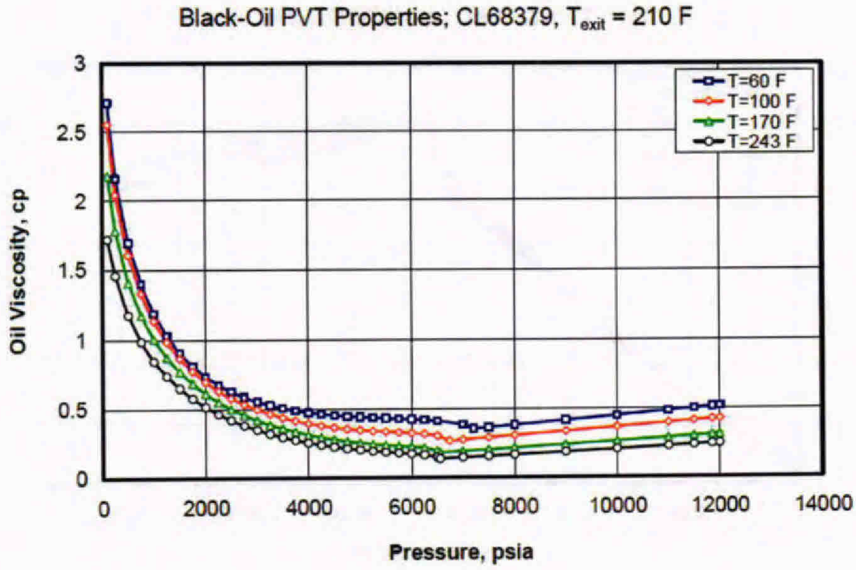

Figure 36. Oil viscosity from black oil tables for CL68379 (decontaminated) at exit temperature 210°F and various mixture temperatures.

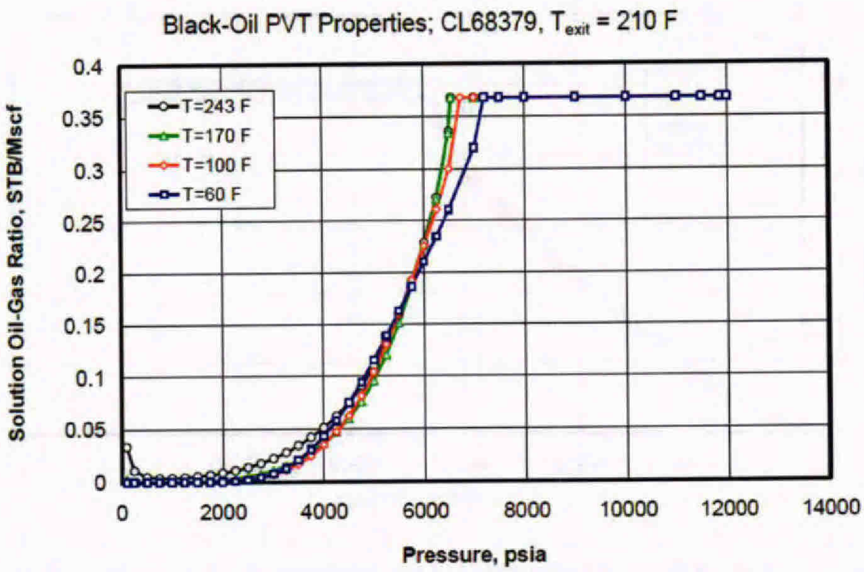

Figure 37. Oil-gas ratio from black oil tables for CL68379 (decontaminated) at exit temperature 210°F and various mixture temperatures, oceanic proxy separation process.

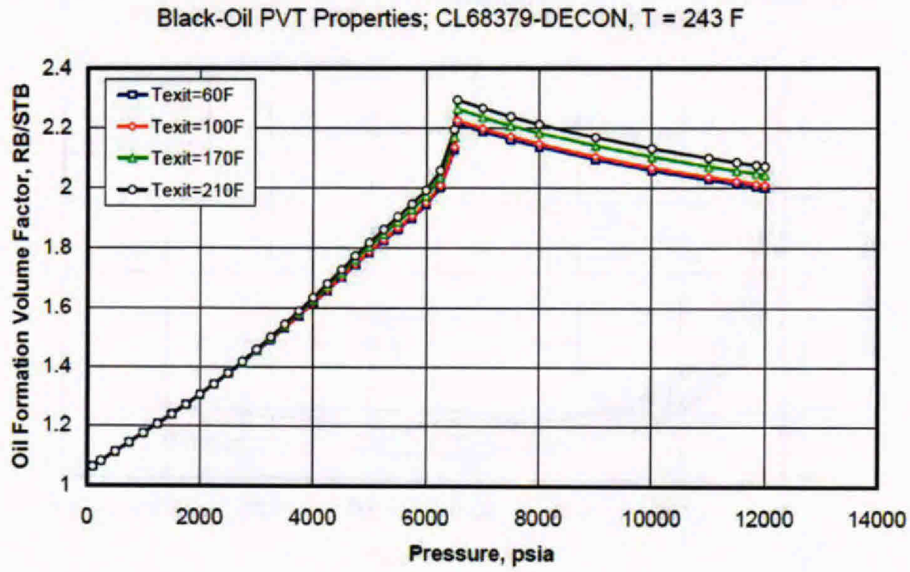

Figure 38. Oil formation volume factor from black oil tables for CL68379 (decontaminated) at mixture temperature 243°F and various exit temperatures, oceanic proxy separation process.

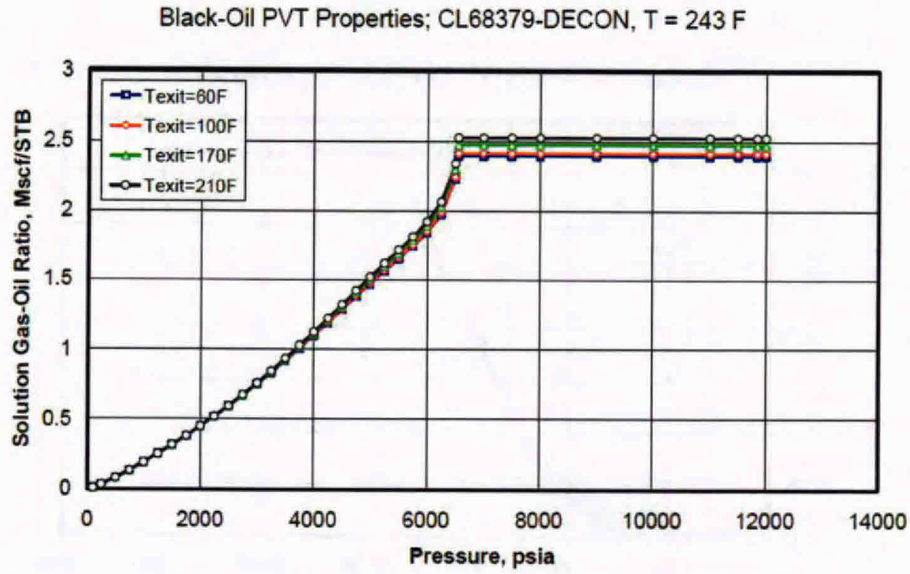

Figure 39. Gas-oil ratio from black oil tables for CL68379 (decontaminated) at mixture temperature 243°F and various exit temperatures, oceanic proxy separation process.

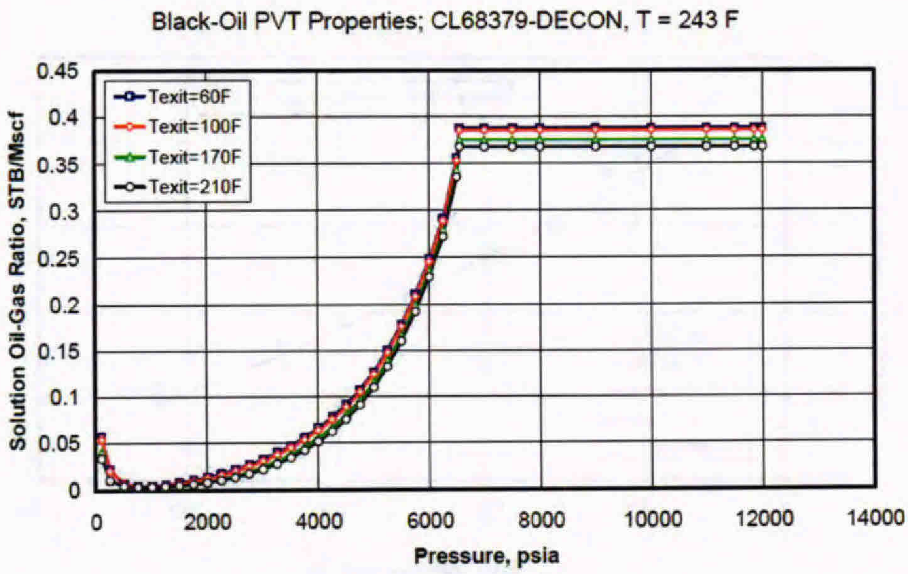

Figure 40. Oil-gas ratio from black oil tables for CL68379 (decontaminated) at mixture temperature 243°F and various exit temperatures, oceanic proxy separation process.

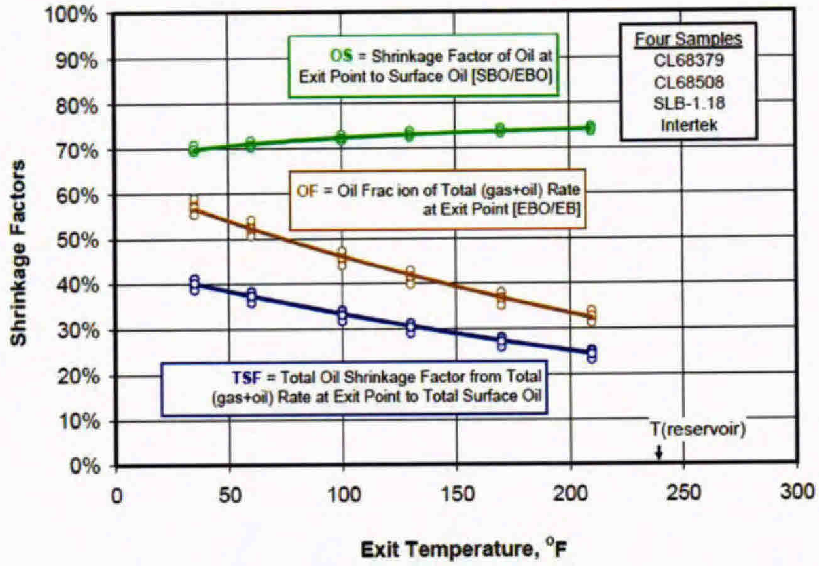

Figure 41. Shrinkage factors for exit pressure 2250 psia and exit temperature, oceanic proxy separation process.

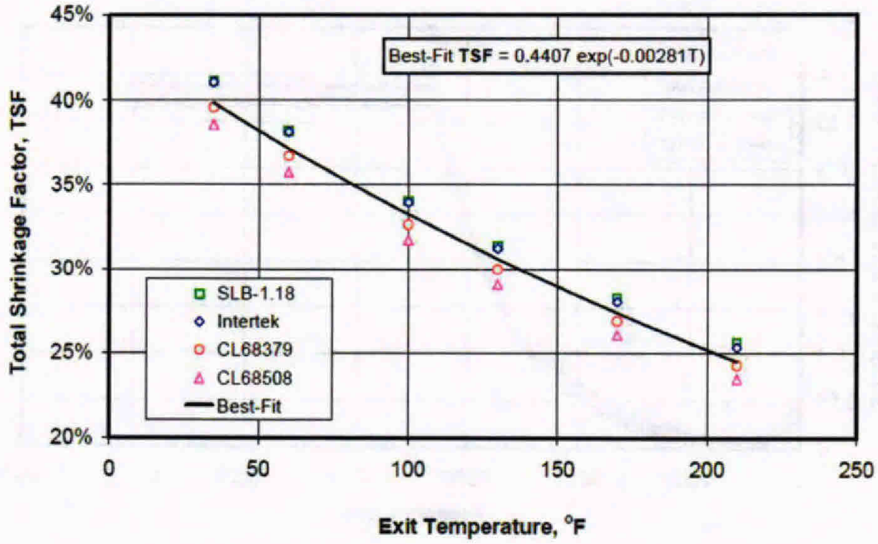

Figure 42. Total shrinkage factors of mixture volume at exit pressure 2250 psia and exit temperature, oceanic proxy separation process.

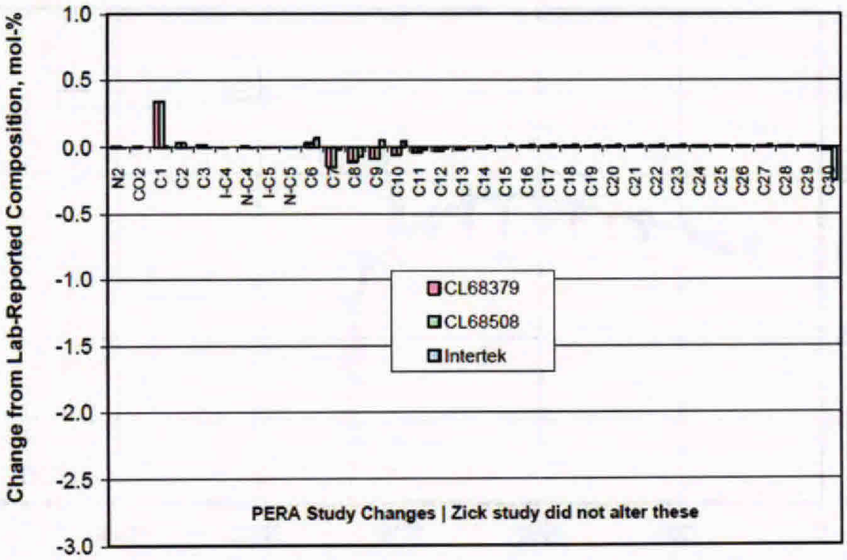

Figure 43. Adjustments to laboratory-reported compositions for CoreLabs and Intertek fluids in PERA EOS model.

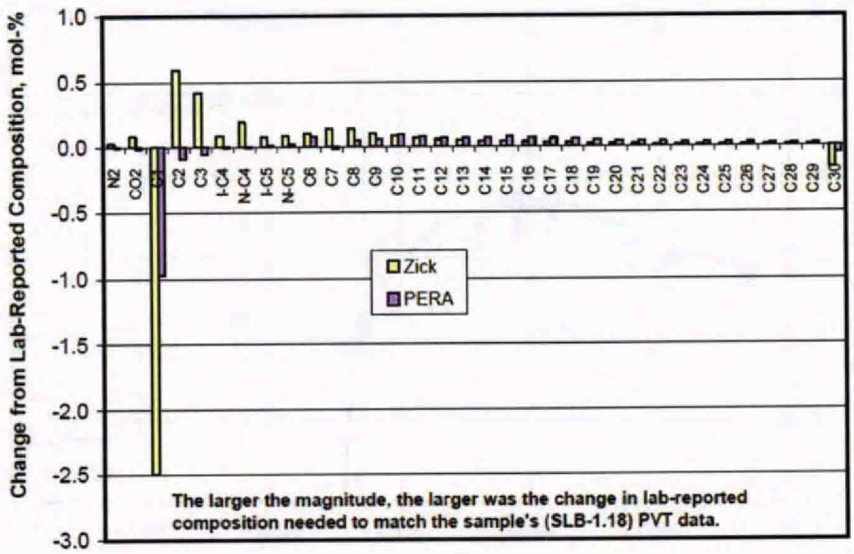

Figure 44. Adjustments to laboratory-reported compositions for SLB-1.18 fluid in PERA EOS and Zick EOS models.

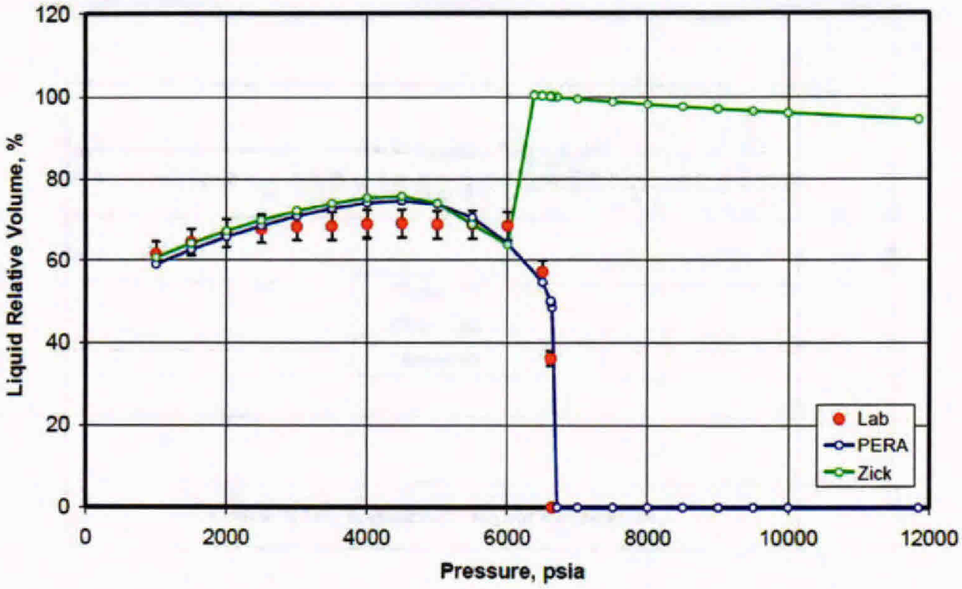

Figure 45. Experimental data, PERA and Zick EOS results for CL 68379 (Pencor 53), liquid relative volume in CCE at 100°F.

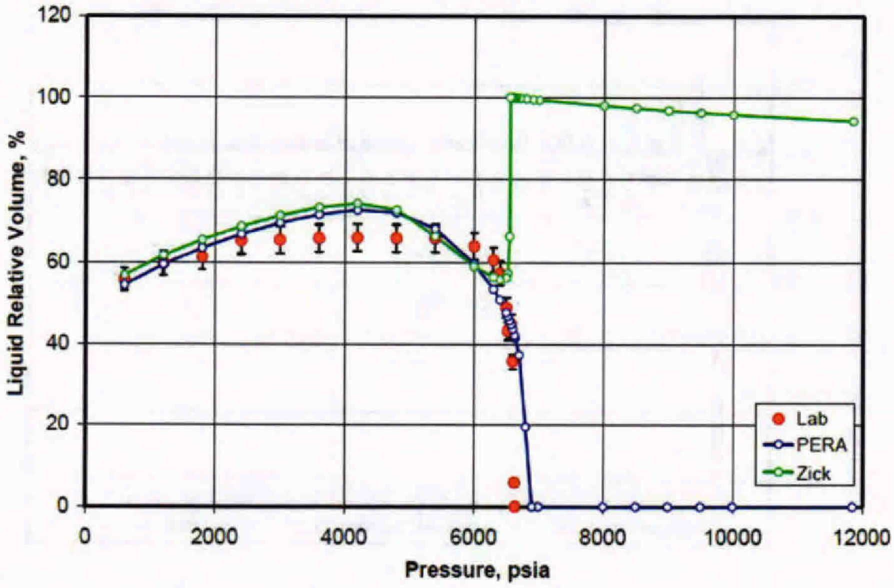

Figure 46. Experimental data, PERA EOS and Zick EOS results for CL 68508 (Pencor 19), liquid relative volume in CCE at 100°F.

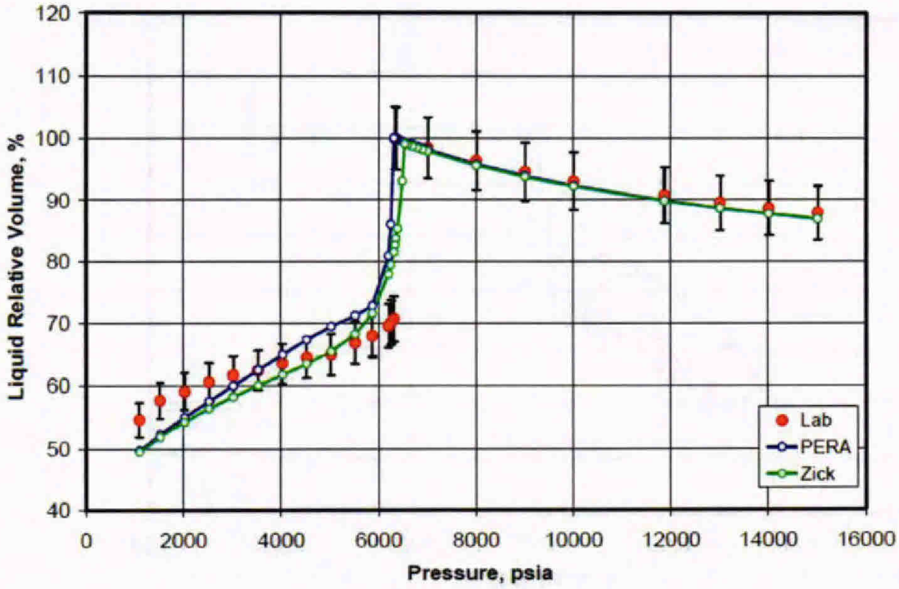

Figure 47. Experimental data, PERA and Zick EOS results for SLB-1.18, liquid relative volume in CCE at 243°F.

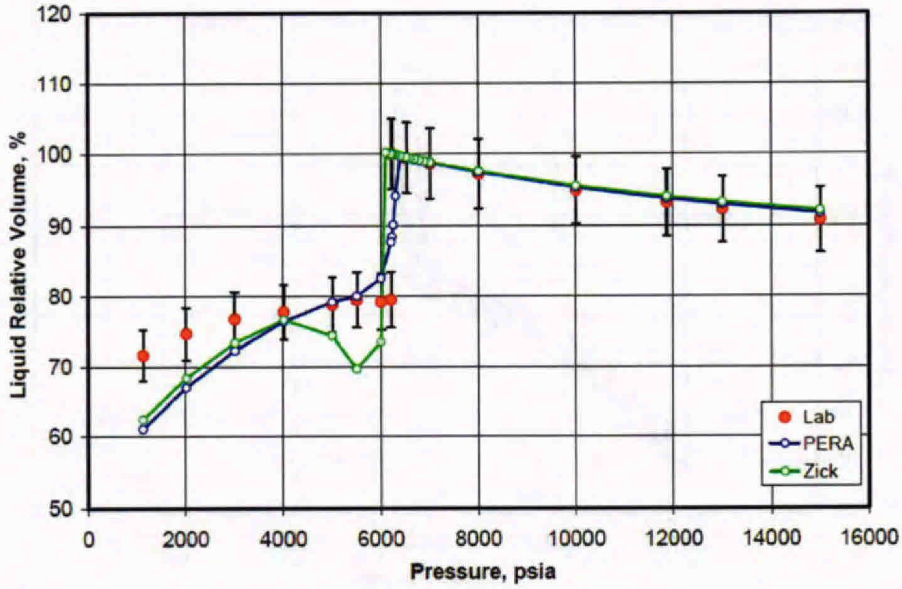

Figure 48. Experimental data, PERA EOS and Zick EOS results for SLB-1.18, liquid relative volume in CCE at 100°F.

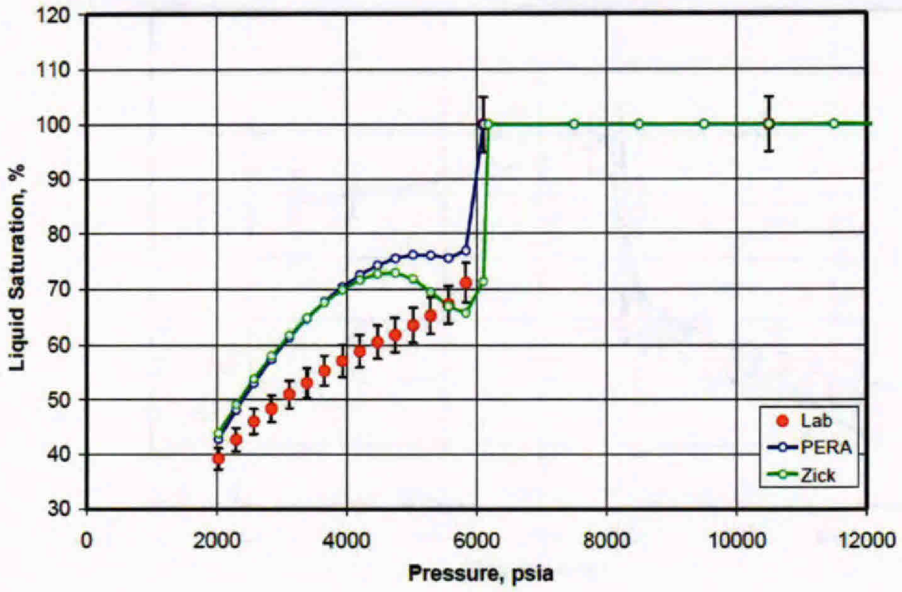

Figure 49. Experimental data, PERA EOS and Zick EOS results for Intertek, liquid relative volume in CCE at 100°F.

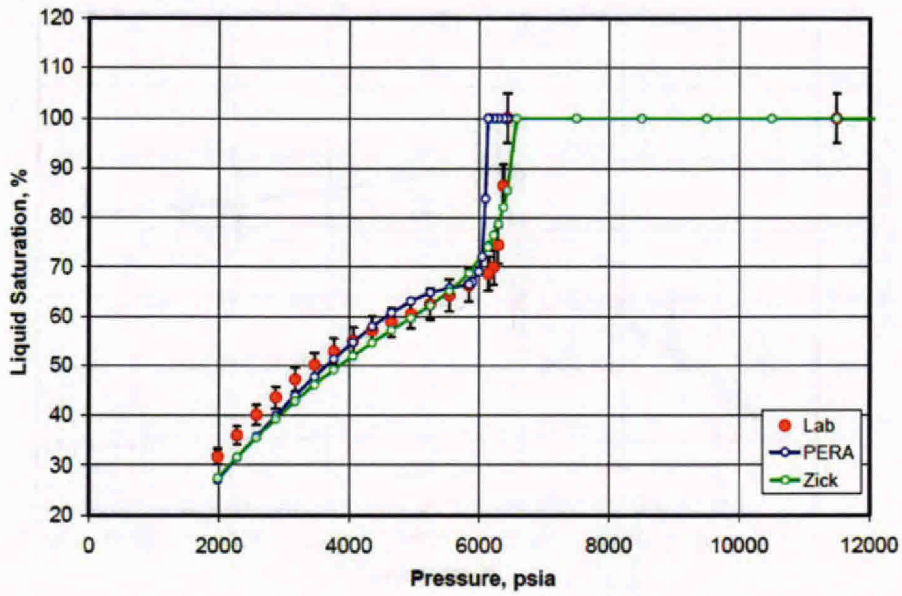

Figure 50. Experimental data, PERA EOS and Zick EOS results for Intertek, liquid relative volume in CCE at 243°F.

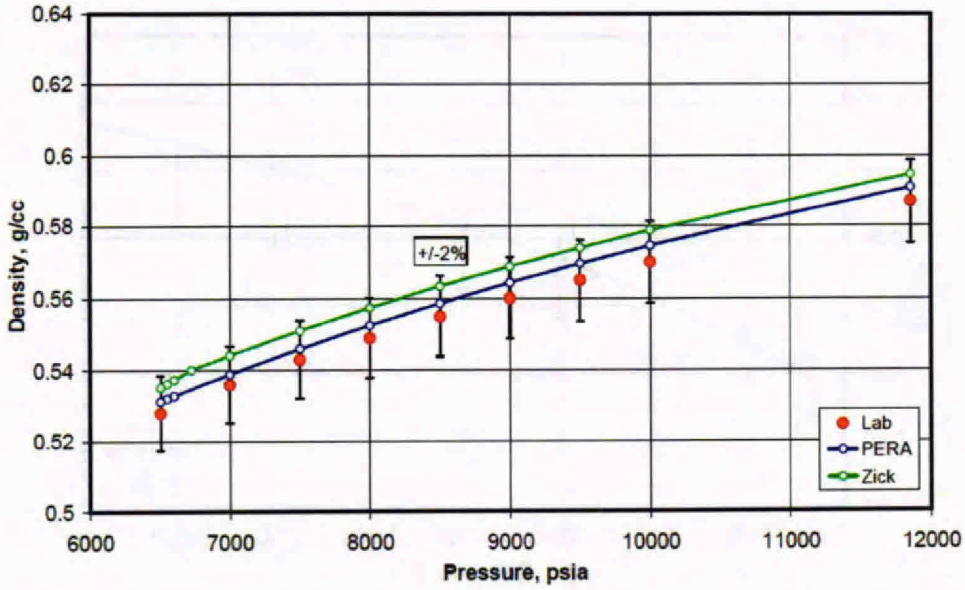

Figure 51. Experimental data, PERA EOS and Zick EOS results for CL 68379 (Pencor 53), single phase fluid density in CCE at 243°F.

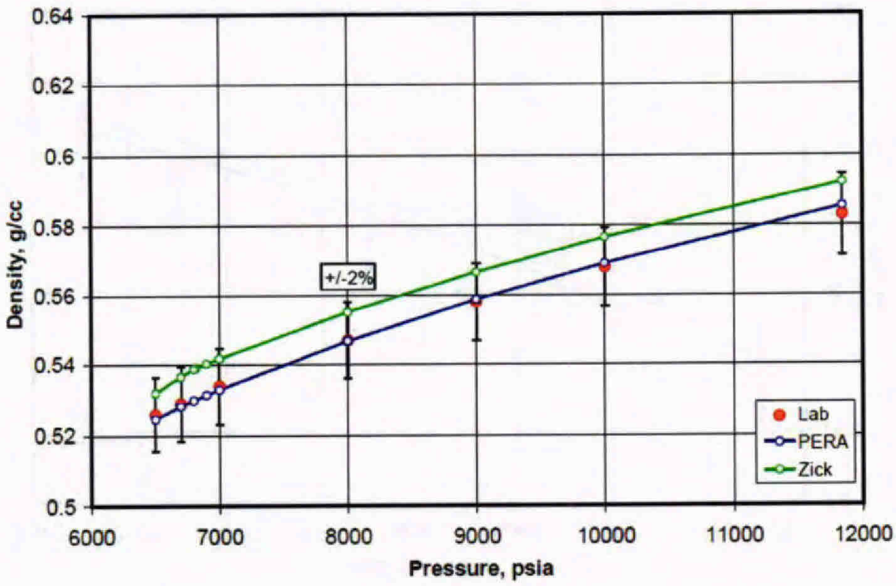

Figure 52. Experimental data, PERA EOS and Zick EOS results for CL 68508 (Pencor 19), single phase fluid density in CCE at 242°F.

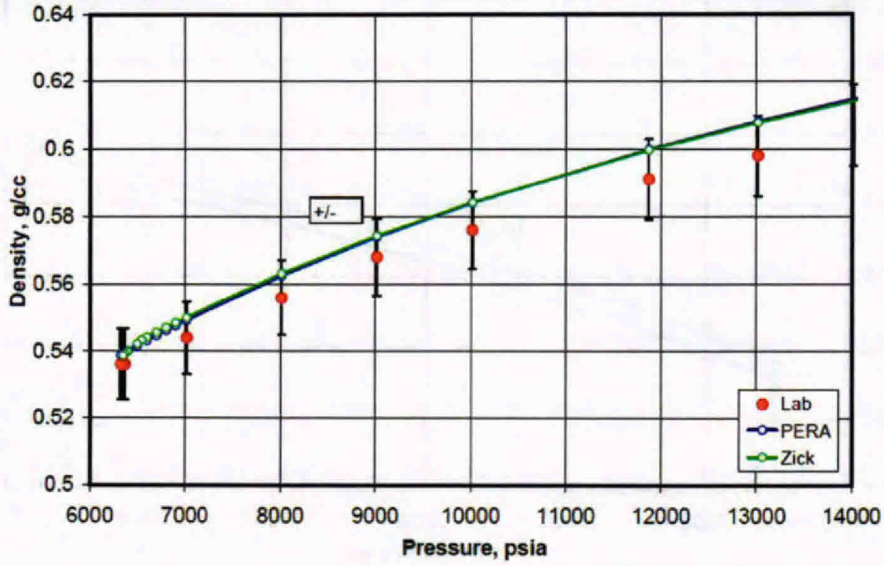

Figure 53. Experimental data, PERA EOS and Zick EOS results for SLB-1.18, single phase fluid density in CCE at 243°F.

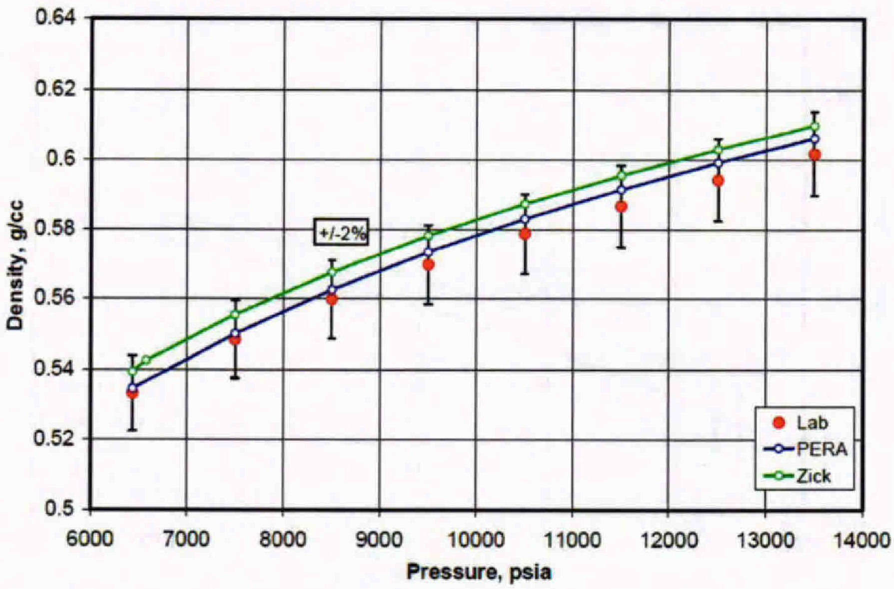

Figure 54. Experimental data, PERA and Zick EOS results for Intertek, single phase fluid density in CCE at 243 F.

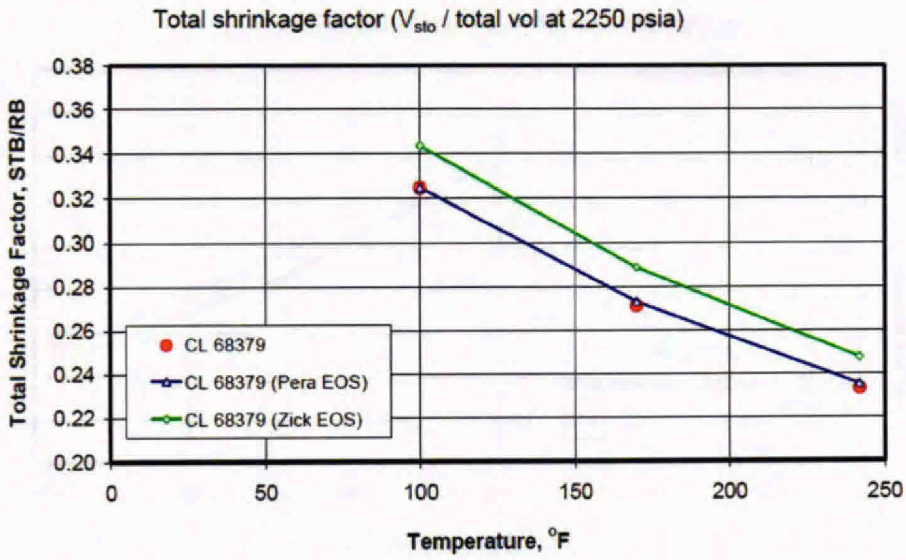

Figure 55. Total shrinkage factors for exit pressure of 2250 psia using 4-stage separation process for CL68379.

Solid symbols are calculated from measured data in PVT reports. Lines show EOS calculations.

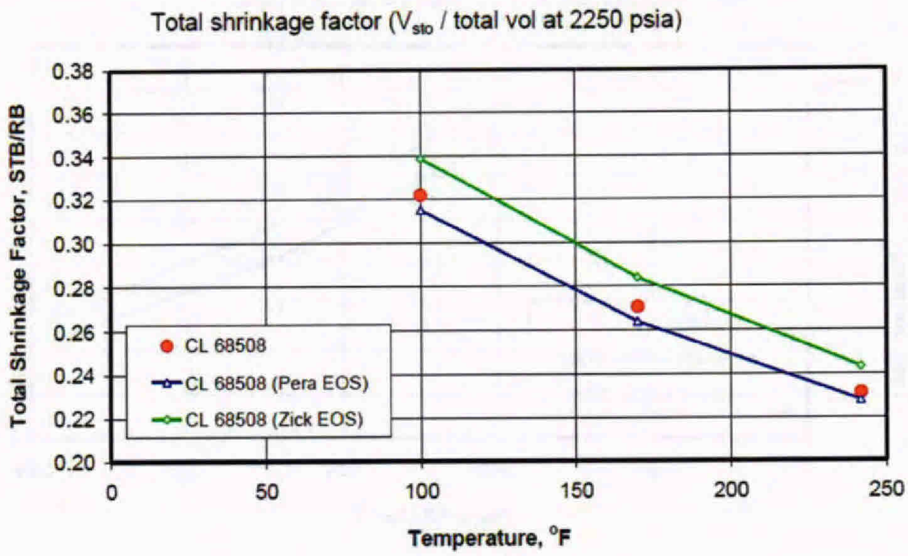

Figure 56. Total shrinkage factors for exit pressure of 2250 psia using 4-stage separation process for CL68508.

Solid symbols are calculated from measured data in PVT reports. Lines show EOS calculations.

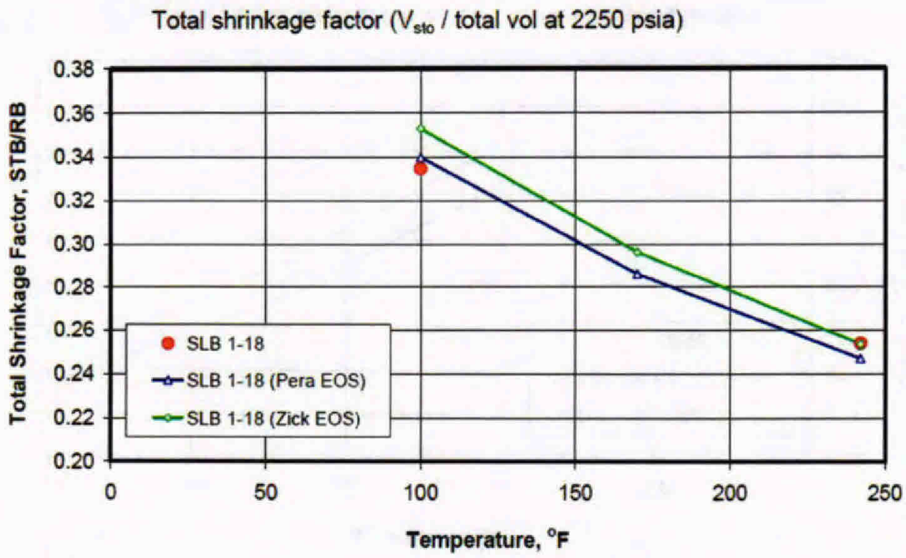

Figure 57. Total shrinkage factors for exit pressure of 2250 psia using 4-stage separation process for SLB-1.18.

Solid symbols are calculated from measured data in PVT reports. Lines show EOS calculations.

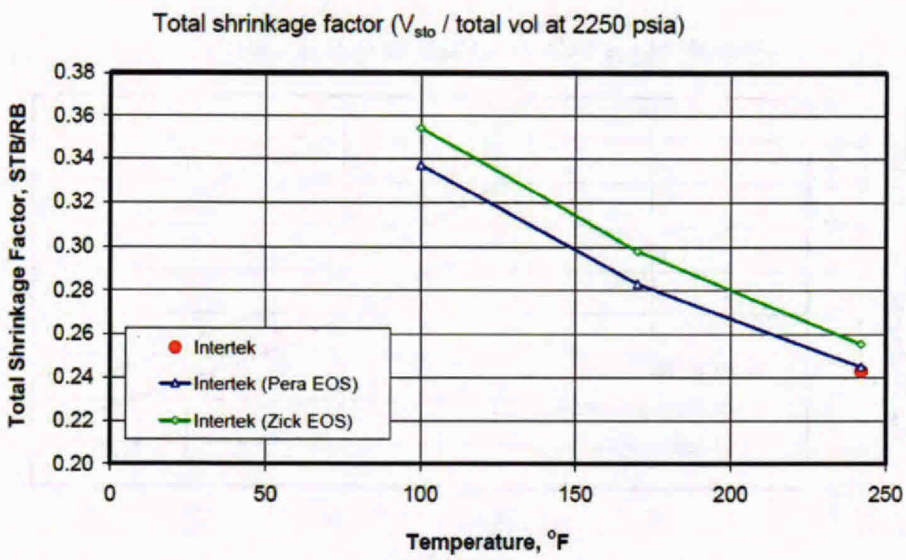

Figure 58. Total shrinkage factors for exit pressure of 2250 psia using 4-stage separation process for Intertek.

Solid symbols are calculated from measured data in PVT reports. Lines show EOS calculations.

Appendix G – Diverse PVT Tables Provided Expert Team.

Density Lookup Tables

Notes
File Name: Single-phase-density-20130306.xls.
This file conatins calculations of single phase fluid densities for Macondo 'decontaminated' fluid samples.

Calculations using PhazeComp and final PERA EOS (20120322).

Clean fluid sample compositions are estimated by removing the small amounts of OBM from the measured

Where entries are missing from the tables, this is because the pressure is below the saturation pressure.

Enter temperature and pressure in the yellow cells and the corresponding density will be displayed in the green cell. The value is calculated by linear interpolation (with constant value extrapolation outside the table
This look up requires a user function so Macros must be enabled for this to work.
If the yellow square shows ##### or #VALUE!, this is because the pressure is below the saturation pressure.

The sheets are protected (but without a password) to prevent inadvertent changes to formulas. The 2D table is obtained from the output in PhzGui.

Fluid CL68379-Decon **Single phase densities (g/cc)**

Temperature 243 F
Pressure 11856 psia
density 0.5901 g/cc

Temperature (F)	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	243
Pressure (psia)																						
12000	0.6574	0.6543	0.6511	0.6479	0.6447	0.6415	0.6383	0.6351	0.6318	0.6285	0.6253	0.6220	0.6187	0.6154	0.6121	0.6088	0.6055	0.6022	0.5988	0.5955	0.5922	0.5912
11900	0.6570	0.6538	0.6506	0.6474	0.6442	0.6410	0.6378	0.6345	0.6312	0.6280	0.6247	0.6214	0.6181	0.6148	0.6114	0.6081	0.6048	0.6014	0.5981	0.5947	0.5914	0.5904
11800	0.6565	0.6534	0.6502	0.6469	0.6437	0.6405	0.6372	0.6339	0.6307	0.6274	0.6241	0.6207	0.6174	0.6141	0.6107	0.6074	0.6040	0.6007	0.5973	0.5940	0.5906	0.5896
11700	0.6561	0.6529	0.6497	0.6465	0.6432	0.6399	0.6367	0.6334	0.6301	0.6268	0.6234	0.6201	0.6168	0.6134	0.6101	0.6067	0.6033	0.6000	0.5966	0.5932	0.5898	0.5888
11600	0.6556	0.6524	0.6492	0.6460	0.6427	0.6394	0.6361	0.6328	0.6295	0.6262	0.6228	0.6195	0.6161	0.6127	0.6094	0.6060	0.6026	0.5992	0.5958	0.5924	0.5890	0.5880
11500	0.6552	0.6520	0.6487	0.6454	0.6422	0.6389	0.6356	0.6322	0.6289	0.6256	0.6222	0.6188	0.6154	0.6121	0.6087	0.6053	0.6019	0.5985	0.5950	0.5916	0.5882	0.5872
11400	0.6547	0.6515	0.6482	0.6449	0.6416	0.6383	0.6350	0.6317	0.6283	0.6249	0.6216	0.6182	0.6148	0.6114	0.6080	0.6045	0.6011	0.5977	0.5943	0.5908	0.5874	0.5864
11300	0.6543	0.6510	0.6477	0.6444	0.6411	0.6378	0.6344	0.6311	0.6277	0.6243	0.6209	0.6175	0.6141	0.6107	0.6072	0.6038	0.6004	0.5969	0.5935	0.5900	0.5866	0.5855
11200	0.6538	0.6505	0.6472	0.6439	0.6406	0.6372	0.6339	0.6305	0.6271	0.6237	0.6203	0.6169	0.6134	0.6100	0.6065	0.6031	0.5996	0.5961	0.5927	0.5892	0.5857	0.5847
11100	0.6533	0.6500	0.6467	0.6434	0.6400	0.6367	0.6333	0.6299	0.6265	0.6231	0.6196	0.6162	0.6127	0.6093	0.6058	0.6023	0.5988	0.5954	0.5919	0.5884	0.5849	0.5838
11000	0.6528	0.6495	0.6462	0.6429	0.6395	0.6361	0.6327	0.6293	0.6259	0.6224	0.6190	0.6155	0.6120	0.6086	0.6051	0.6016	0.5981	0.5946	0.5910	0.5875	0.5840	0.5830
10900	0.6524	0.6490	0.6457	0.6423	0.6389	0.6355	0.6321	0.6287	0.6252	0.6218	0.6183	0.6148	0.6113	0.6078	0.6043	0.6008	0.5973	0.5938	0.5902	0.5867	0.5832	0.5821
10800	0.6519	0.6485	0.6452	0.6418	0.6384	0.6350	0.6315	0.6281	0.6246	0.6211	0.6176	0.6141	0.6106	0.6071	0.6036	0.6000	0.5965	0.5929	0.5894	0.5858	0.5823	0.5812
10700	0.6514	0.6480	0.6446	0.6412	0.6378	0.6344	0.6309	0.6275	0.6240	0.6205	0.6170	0.6134	0.6099	0.6064	0.6028	0.5993	0.5957	0.5921	0.5885	0.5850	0.5814	0.5803
10600	0.6509	0.6475	0.6441	0.6407	0.6373	0.6338	0.6303	0.6268	0.6233	0.6198	0.6163	0.6127	0.6092	0.6056	0.6020	0.5985	0.5949	0.5913	0.5877	0.5841	0.5805	0.5794
10500	0.6504	0.6470	0.6436	0.6401	0.6367	0.6332	0.6297	0.6262	0.6227	0.6191	0.6156	0.6120	0.6084	0.6049	0.6013	0.5977	0.5941	0.5904	0.5868	0.5832	0.5796	0.5785
10400	0.6499	0.6465	0.6430	0.6396	0.6361	0.6326	0.6291	0.6256	0.6220	0.6185	0.6149	0.6113	0.6077	0.6041	0.6005	0.5969	0.5932	0.5896	0.5860	0.5823	0.5787	0.5776
10300	0.6494	0.6460	0.6425	0.6390	0.6355	0.6320	0.6285	0.6249	0.6214	0.6178	0.6142	0.6106	0.6070	0.6033	0.5997	0.5960	0.5924	0.5887	0.5851	0.5814	0.5778	0.5767
10200	0.6489	0.6454	0.6420	0.6385	0.6349	0.6314	0.6278	0.6243	0.6207	0.6171	0.6135	0.6098	0.6062	0.6026	0.5989	0.5952	0.5916	0.5879	0.5842	0.5805	0.5768	0.5757
10100	0.6484	0.6449	0.6414	0.6379	0.6343	0.6308	0.6272	0.6236	0.6200	0.6164	0.6127	0.6091	0.6054	0.6018	0.5981	0.5944	0.5907	0.5870	0.5833	0.5796	0.5759	0.5748
10000	0.6478	0.6444	0.6408	0.6373	0.6337	0.6302	0.6266	0.6230	0.6193	0.6157	0.6120	0.6083	0.6047	0.6010	0.5973	0.5935	0.5898	0.5861	0.5824	0.5786	0.5749	0.5738
9900	0.6473	0.6438	0.6403	0.6367	0.6331	0.6295	0.6259	0.6223	0.6186	0.6150	0.6113	0.6076	0.6039	0.6002	0.5964	0.5927	0.5890	0.5852	0.5815	0.5777	0.5739	0.5728
9800	0.6468	0.6433	0.6397	0.6361	0.6325	0.6289	0.6253	0.6216	0.6179	0.6142	0.6105	0.6068	0.6031	0.5994	0.5956	0.5918	0.5881	0.5843	0.5805	0.5767	0.5730	0.5718
9700	0.6463	0.6427	0.6391	0.6355	0.6319	0.6283	0.6246	0.6209	0.6172	0.6135	0.6098	0.6060	0.6023	0.5985	0.5947	0.5910	0.5872	0.5834	0.5796	0.5758	0.5720	0.5708
9600	0.6457	0.6421	0.6385	0.6349	0.6313	0.6276	0.6239	0.6202	0.6165	0.6128	0.6090	0.6053	0.6015	0.5977	0.5939	0.5901	0.5863	0.5824	0.5786	0.5748	0.5710	0.5698
9500	0.6452	0.6416	0.6379	0.6343	0.6306	0.6270	0.6232	0.6195	0.6158	0.6120	0.6082	0.6045	0.6007	0.5969	0.5930	0.5892	0.5853	0.5815	0.5777	0.5738	0.5699	0.5688
9400	0.6446	0.6410	0.6374	0.6337	0.6300	0.6263	0.6226	0.6188	0.6150	0.6113	0.6075	0.6037	0.5998	0.5960	0.5921	0.5883	0.5844	0.5805	0.5767	0.5728	0.5689	0.5677
9300	0.6441	0.6404	0.6368	0.6331	0.6294	0.6256	0.6219	0.6181	0.6143	0.6105	0.6067	0.6028	0.5990	0.5951	0.5913	0.5874	0.5835	0.5796	0.5757	0.5718	0.5679	0.5667
9200	0.6435	0.6398	0.6361	0.6324	0.6287	0.6249	0.6212	0.6174	0.6136	0.6097	0.6059	0.6020	0.5981	0.5943	0.5904	0.5864	0.5825	0.5786	0.5747	0.5707	0.5668	0.5656
9100	0.6429	0.6392	0.6355	0.6318	0.6280	0.6243	0.6205	0.6166	0.6128	0.6089	0.6051	0.6012	0.5973	0.5934	0.5894	0.5855	0.5816	0.5776	0.5737	0.5697	0.5657	0.5646
9000	0.6423	0.6386	0.6349	0.6312	0.6274	0.6236	0.6197	0.6159	0.6120	0.6082	0.6043	0.6003	0.5964	0.5925	0.5885	0.5846	0.5806	0.5766	0.5726	0.5686	0.5647	0.5635
8900	0.6418	0.6380	0.6343	0.6305	0.6267	0.6229	0.6190	0.6152	0.6113	0.6074	0.6034	0.5995	0.5955	0.5916	0.5876	0.5836	0.5796	0.5756	0.5716	0.5676	0.5636	0.5624
8800	0.6412	0.6374	0.6336	0.6298	0.6260	0.6222	0.6183	0.6144	0.6105	0.6065	0.6026	0.5986	0.5946	0.5907	0.5866	0.5826	0.5786	0.5746	0.5705	0.5665	0.5624	0.5612
8700	0.6406	0.6368	0.6330	0.6292	0.6253	0.6215	0.6176	0.6136	0.6097	0.6057	0.6018	0.5978	0.5937	0.5897	0.5857	0.5816	0.5776	0.5735	0.5695	0.5654	0.5613	0.5601
8600	0.6400	0.6362	0.6324	0.6285	0.6246	0.6207	0.6168	0.6129	0.6089	0.6049	0.6009	0.5969	0.5928	0.5888	0.5847	0.5806	0.5766	0.5725	0.5684	0.5643	0.5602	0.5589
8500	0.6394	0.6356	0.6317	0.6278	0.6239	0.6200	0.6160	0.6121	0.6081	0.6041	0.6000	0.5960	0.5919	0.5878	0.5837	0.5796	0.5755	0.5714	0.5673	0.5631	0.5590	0.5578
8400	0.6388	0.6349	0.6310	0.6271	0.6232	0.6193	0.6153	0.6113	0.6073	0.6032	0.5991	0.5951	0.5910	0.5869	0.5827	0.5786	0.5745	0.5703	0.5662	0.5620	0.5578	0.5566
8300	0.6381	0.6343	0.6304	0.6264	0.6225	0.6185	0.6145	0.6105	0.6064	0.6024	0.5983	0.5942	0.5900	0.5859	0.5817	0.5776	0.5734	0.5692	0.5650	0.5608	0.5566	0.5554
8200	0.6375	0.6336	0.6297	0.6257	0.6218	0.6178	0.6137	0.6097	0.6056	0.6015	0.5974	0.5932	0.5891	0.5849	0.5807	0.5765	0.5723	0.5681	0.5639	0.5597	0.5554	0.5542
8100	0.6369	0.6330	0.6290	0.6250	0.6210	0.6170	0.6129	0.6088	0.6047	0.6006	0.5964	0.5923	0.5881	0.5839	0.5797	0.5755	0.5712	0.5670	0.5627	0.5585	0.5542	0.5529
8000	0.6362	0.6323	0.6283	0.6243	0.6203	0.6162	0.6121	0.6080	0.6039	0.5997	0.5955	0.5913	0.5871	0.5829	0.5786	0.5744	0.5701	0.5658	0.5615	0.5573	0.5530	0.5517
7900	0.6356	0.6316	0.6276	0.6236	0.6195	0.6154	0.6113	0.6072	0.6030	0.5988	0.5946	0.5904	0.5861	0.5819	0.5776	0.5733	0.5690	0.5647	0.5603	0.5560	0.5517	0.5504
7800	0.6349	0.6309	0.6269	0.6228	0.6187	0.6146	0.6105	0.6063	0.6021	0.5979	0.5936	0.5894	0.5851	0.5808	0.5765	0.5722	0.5678	0.5635	0.5591	0.5548	0.5504	0.5491
7700	0.6343	0.6302	0.6262	0.6221	0.6180	0.6138	0.6096	0.6054	0.6012	0.5970	0.5927	0.5884	0.5841	0.5797	0.5754	0.5710	0.5667	0.5623	0.5579	0.5535	0.5491	0.5478
7600		0.6295	0.6255	0.6213	0.6172	0.6130	0.6088	0.6046	0.6003	0.5960	0.5917	0.5874	0.5830	0.5787	0.5743	0.5699	0.5655	0.5611	0.5567	0.5522	0.5478	0.5465
7500		0.6288	0.6247	0.6206	0.6164	0.6122	0.6079	0.6037	0.5994	0.5951	0.5907	0.5864	0.5820	0.5776	0.5732	0.5687	0.5643	0.5598	0.5554	0.5509	0.5465	0.5451
7400			0.6240	0.6198	0.6156	0.6113	0.6071	0.6028	0.5984	0.5941	0.5897	0.5853	0.5809	0.5765	0.5720	0.5676	0.5631	0.5586	0.5541	0.5496	0.5451	0.5437
7300			0.6232	0.6190	0.6148	0.6105	0.6062	0.6019	0.5975	0.5931	0.5887	0.5843	0.5798	0.5754	0.5709	0.5664	0.5618	0.5573	0.5528	0.5482	0.5437	0.5423
7200				0.6182	0.6139	0.6096	0.6053	0.6009	0.5965	0.5921	0.5877	0.5832	0.5787	0.5742	0.5697	0.5651	0.5606	0.5560	0.5515	0.5469	0.5423	0.5409
7100				0.6174	0.6131	0.6088	0.6044	0.6000	0.5956	0.5911	0.5866	0.5821	0.5776	0.5731	0.5685	0.5639	0.5593	0.5547	0.5501	0.5455	0.5409	0.5395
7000					0.6123	0.6079	0.6035	0.5990	0.5946	0.5901	0.5856	0.5810	0.5765	0.5719	0.5673	0.5627	0.5580	0.5534	0.5487	0.5441	0.5394	0.5380
6900						0.6070	0.6026	0.5981	0.5936	0.5891	0.5845	0.5799	0.5753	0.5707	0.5660	0.5614	0.5567	0.5520	0.5473	0.5426	0.5379	0.5365
6800							0.6016	0.5971	0.5926	0.5880	0.5834	0.5788	0.5741	0.5695	0.5648	0.5601	0.5554	0.5507	0.5459	0.5412	0.5364	0.5350
6700								0.5981	0.5915	0.5869	0.5823	0.5776	0.5730	0.5683	0.5635	0.5588	0.5540	0.5493	0.5445	0.5397	0.5349	0.5335
6600											0.5812	0.5765	0.5717	0.5670	0.5622	0.5575	0.5527	0.5478	0.5430	0.5382	0.5334	0.5319
6500																						
6400																						
6300																						
6200																						
6100																						
6000																						

Fluid CL68508-Decon **Single phase densities (g/cc)**

Temperature	**243**	**F**
Pressure	**11856**	**psia**
density	**0.5845**	**g/cc**

Temperature (F) / Pressure (psia)	40	50	60	70	80	90	100	110	120	130	140	150
12000	0.6525	0.6493	0.6461	0.6429	0.6397	0.6364	0.6332	0.6299	0.6266	0.6233	0.6200	0.6167
11900	0.6520	0.6488	0.6456	0.6424	0.6391	0.6359	0.6326	0.6293	0.6260	0.6227	0.6194	0.6161
11800	0.6516	0.6484	0.6451	0.6419	0.6386	0.6354	0.6321	0.6288	0.6255	0.6221	0.6188	0.6154
11700	0.6511	0.6479	0.6447	0.6414	0.6381	0.6348	0.6315	0.6282	0.6249	0.6215	0.6182	0.6148
11600	0.6507	0.6474	0.6442	0.6409	0.6376	0.6343	0.6310	0.6276	0.6243	0.6209	0.6175	0.6142
11500	0.6502	0.6469	0.6437	0.6404	0.6371	0.6337	0.6304	0.6270	0.6237	0.6203	0.6169	0.6135
11400	0.6497	0.6465	0.6432	0.6399	0.6365	0.6332	0.6298	0.6265	0.6231	0.6197	0.6163	0.6129
11300	0.6493	0.6460	0.6427	0.6393	0.6360	0.6326	0.6293	0.6259	0.6225	0.6190	0.6156	0.6122
11200	0.6488	0.6455	0.6422	0.6388	0.6355	0.6321	0.6287	0.6253	0.6218	0.6184	0.6150	0.6115
11100	0.6483	0.6450	0.6416	0.6383	0.6349	0.6315	0.6281	0.6247	0.6212	0.6178	0.6143	0.6108
11000	0.6478	0.6445	0.6411	0.6377	0.6344	0.6309	0.6275	0.6241	0.6206	0.6171	0.6136	0.6101
10900	0.6474	0.6440	0.6406	0.6372	0.6338	0.6304	0.6269	0.6234	0.6200	0.6165	0.6130	0.6095
10800	0.6469	0.6435	0.6401	0.6367	0.6332	0.6298	0.6263	0.6228	0.6193	0.6158	0.6123	0.6088
10700	0.6464	0.6430	0.6396	0.6361	0.6327	0.6292	0.6257	0.6222	0.6187	0.6151	0.6116	0.6080
10600	0.6459	0.6425	0.6390	0.6356	0.6321	0.6286	0.6251	0.6216	0.6180	0.6145	0.6109	0.6073
10500	0.6454	0.6419	0.6385	0.6350	0.6315	0.6280	0.6245	0.6209	0.6174	0.6138	0.6102	0.6066
10400	0.6449	0.6414	0.6379	0.6344	0.6309	0.6274	0.6238	0.6203	0.6167	0.6131	0.6095	0.6059
10300	0.6443	0.6409	0.6374	0.6339	0.6303	0.6268	0.6232	0.6196	0.6160	0.6124	0.6088	0.6051
10200	0.6438	0.6403	0.6368	0.6333	0.6297	0.6262	0.6226	0.6190	0.6153	0.6117	0.6081	0.6044
10100	0.6433	0.6398	0.6363	0.6327	0.6291	0.6255	0.6219	0.6183	0.6147	0.6110	0.6073	0.6036
10000	0.6428	0.6392	0.6357	0.6321	0.6285	0.6249	0.6213	0.6176	0.6140	0.6103	0.6066	0.6029
9900	0.6422	0.6387	0.6351	0.6315	0.6279	0.6243	0.6206	0.6169	0.6133	0.6096	0.6058	0.6021
9800	0.6417	0.6381	0.6345	0.6309	0.6273	0.6236	0.6199	0.6163	0.6125	0.6088	0.6051	0.6013
9700	0.6411	0.6376	0.6339	0.6303	0.6266	0.6230	0.6193	0.6156	0.6118	0.6081	0.6043	0.6005
9600	0.6406	0.6370	0.6334	0.6297	0.6260	0.6223	0.6186	0.6149	0.6111	0.6073	0.6035	0.5997
9500	0.6400	0.6364	0.6328	0.6291	0.6254	0.6216	0.6179	0.6141	0.6104	0.6066	0.6028	0.5989
9400	0.6395	0.6358	0.6321	0.6284	0.6247	0.6210	0.6172	0.6134	0.6096	0.6058	0.6020	0.5981
9300	0.6389	0.6352	0.6315	0.6278	0.6241	0.6203	0.6165	0.6127	0.6089	0.6050	0.6012	0.5973
9200	0.6383	0.6346	0.6309	0.6272	0.6234	0.6196	0.6158	0.6120	0.6081	0.6042	0.6004	0.5965
9100	0.6378	0.6340	0.6303	0.6265	0.6227	0.6189	0.6151	0.6112	0.6073	0.6035	0.5995	0.5956
9000	0.6372	0.6334	0.6297	0.6259	0.6221	0.6182	0.6144	0.6105	0.6066	0.6026	0.5987	0.5948
8900	0.6366	0.6328	0.6290	0.6252	0.6214	0.6175	0.6136	0.6097	0.6058	0.6018	0.5979	0.5939
8800	0.6360	0.6322	0.6284	0.6245	0.6207	0.6168	0.6129	0.6089	0.6050	0.6010	0.5970	0.5930
8700	0.6354	0.6316	0.6277	0.6239	0.6200	0.6161	0.6121	0.6082	0.6042	0.6002	0.5962	0.5921
8600	0.6348	0.6309	0.6271	0.6232	0.6193	0.6153	0.6114	0.6074	0.6034	0.5993	0.5953	0.5912
8500	0.6342	0.6303	0.6264	0.6225	0.6185	0.6146	0.6106	0.6066	0.6025	0.5985	0.5944	0.5903
8400	0.6335	0.6297	0.6257	0.6218	0.6178	0.6138	0.6098	0.6058	0.6017	0.5976	0.5935	0.5894
8300	0.6329	0.6290	0.6251	0.6211	0.6171	0.6131	0.6090	0.6050	0.6009	0.5968	0.5926	0.5885
8200	0.6323	0.6283	0.6244	0.6204	0.6163	0.6123	0.6082	0.6041	0.6000	0.5959	0.5917	0.5875
8100	0.6316	0.6277	0.6237	0.6196	0.6156	0.6115	0.6074	0.6033	0.5991	0.5950	0.5908	0.5866
8000	0.6310	0.6270	0.6230	0.6189	0.6148	0.6107	0.6066	0.6024	0.5983	0.5941	0.5898	0.5856
7900	0.6303	0.6263	0.6223	0.6182	0.6141	0.6099	0.6058	0.6016	0.5974	0.5931	0.5889	0.5846
7800		0.6256	0.6215	0.6174	0.6133	0.6091	0.6049	0.6007	0.5965	0.5922	0.5879	0.5836
7700		0.6249	0.6208	0.6167	0.6125	0.6083	0.6041	0.5998	0.5956	0.5913	0.5869	0.5826
7600		0.6242	0.6201	0.6159	0.6117	0.6075	0.6032	0.5989	0.5946	0.5903	0.5860	0.5816
7500			0.6193	0.6151	0.6109	0.6066	0.6024	0.5980	0.5937	0.5893	0.5850	0.5806
7400			0.6186	0.6143	0.6101	0.6058	0.6015	0.5971	0.5928	0.5884	0.5839	0.5795
7300				0.6135	0.6092	0.6049	0.6006	0.5962	0.5918	0.5874	0.5829	0.5784
7200				0.6127	0.6084	0.6041	0.5997	0.5953	0.5908	0.5863	0.5819	0.5773
7100					0.6076	0.6032	0.5987	0.5943	0.5898	0.5853	0.5808	0.5762
7000						0.6023	0.5978	0.5933	0.5888	0.5843	0.5797	0.5751
6900							0.5969	0.5924	0.5878	0.5832	0.5786	0.5740
6800									0.5868	0.5822	0.5775	0.5728
6700											0.5764	0.5717
6600												
6500												
6400												
6300												
6200												
6100												
6000												

Temperature (F) / Pressure (psia)	160	170	180	190	200	210	220	230	240	243
12000	0.6134	0.6101	0.6067	0.6034	0.6001	0.5967	0.5934	0.5900	0.5867	0.5857
11900	0.6127	0.6094	0.6061	0.6027	0.5993	0.5960	0.5926	0.5893	0.5859	0.5849
11800	0.6121	0.6087	0.6054	0.6020	0.5986	0.5952	0.5919	0.5885	0.5851	0.5841
11700	0.6114	0.6081	0.6047	0.6013	0.5979	0.5945	0.5911	0.5877	0.5843	0.5833
11600	0.6108	0.6074	0.6040	0.6006	0.5972	0.5937	0.5903	0.5869	0.5835	0.5824
11500	0.6101	0.6067	0.6033	0.5998	0.5964	0.5930	0.5895	0.5861	0.5827	0.5816
11400	0.6094	0.6060	0.6025	0.5991	0.5957	0.5922	0.5887	0.5853	0.5818	0.5808
11300	0.6087	0.6053	0.6018	0.5984	0.5949	0.5914	0.5879	0.5845	0.5810	0.5799
11200	0.6080	0.6046	0.6011	0.5976	0.5941	0.5906	0.5871	0.5836	0.5801	0.5791
11100	0.6073	0.6039	0.6004	0.5969	0.5933	0.5898	0.5863	0.5828	0.5793	0.5782
11000	0.6066	0.6031	0.5996	0.5961	0.5926	0.5890	0.5855	0.5819	0.5784	0.5773
10900	0.6059	0.6024	0.5989	0.5953	0.5918	0.5882	0.5847	0.5811	0.5775	0.5765
10800	0.6052	0.6017	0.5981	0.5945	0.5910	0.5874	0.5838	0.5802	0.5766	0.5756
10700	0.6045	0.6009	0.5973	0.5937	0.5901	0.5866	0.5830	0.5794	0.5758	0.5747
10600	0.6037	0.6002	0.5966	0.5929	0.5893	0.5857	0.5821	0.5785	0.5748	0.5738
10500	0.6030	0.5994	0.5958	0.5921	0.5885	0.5849	0.5812	0.5776	0.5739	0.5728
10400	0.6023	0.5986	0.5950	0.5913	0.5877	0.5840	0.5803	0.5767	0.5730	0.5719
10300	0.6015	0.5978	0.5942	0.5905	0.5868	0.5831	0.5794	0.5758	0.5721	0.5710
10200	0.6007	0.5971	0.5934	0.5897	0.5860	0.5822	0.5785	0.5748	0.5711	0.5700
10100	0.5999	0.5963	0.5925	0.5888	0.5851	0.5814	0.5776	0.5739	0.5702	0.5690
10000	0.5992	0.5954	0.5917	0.5880	0.5842	0.5805	0.5767	0.5729	0.5692	0.5681
9900	0.5984	0.5946	0.5909	0.5871	0.5833	0.5795	0.5758	0.5720	0.5682	0.5671
9800	0.5976	0.5938	0.5900	0.5862	0.5824	0.5786	0.5748	0.5710	0.5672	0.5661
9700	0.5968	0.5930	0.5892	0.5853	0.5815	0.5777	0.5739	0.5700	0.5662	0.5651
9600	0.5959	0.5921	0.5883	0.5844	0.5806	0.5767	0.5729	0.5690	0.5652	0.5640
9500	0.5951	0.5913	0.5874	0.5835	0.5797	0.5758	0.5719	0.5680	0.5641	0.5630
9400	0.5943	0.5904	0.5865	0.5826	0.5787	0.5748	0.5709	0.5670	0.5631	0.5619
9300	0.5934	0.5895	0.5856	0.5817	0.5778	0.5738	0.5699	0.5660	0.5620	0.5609
9200	0.5926	0.5886	0.5847	0.5808	0.5768	0.5729	0.5689	0.5649	0.5610	0.5598
9100	0.5917	0.5877	0.5838	0.5798	0.5758	0.5718	0.5679	0.5639	0.5599	0.5587
9000	0.5908	0.5868	0.5828	0.5788	0.5748	0.5708	0.5668	0.5628	0.5588	0.5576
8900	0.5899	0.5859	0.5819	0.5779	0.5738	0.5698	0.5658	0.5617	0.5577	0.5565
8800	0.5890	0.5850	0.5809	0.5769	0.5728	0.5688	0.5647	0.5606	0.5565	0.5553
8700	0.5881	0.5840	0.5800	0.5759	0.5718	0.5677	0.5636	0.5595	0.5554	0.5542
8600	0.5872	0.5831	0.5790	0.5749	0.5707	0.5666	0.5625	0.5584	0.5542	0.5530
8500	0.5862	0.5821	0.5780	0.5738	0.5697	0.5655	0.5614	0.5572	0.5531	0.5518
8400	0.5853	0.5811	0.5770	0.5728	0.5686	0.5644	0.5603	0.5561	0.5519	0.5506
8300	0.5843	0.5801	0.5759	0.5717	0.5675	0.5633	0.5591	0.5549	0.5507	0.5494
8200	0.5833	0.5791	0.5749	0.5707	0.5664	0.5622	0.5579	0.5537	0.5494	0.5482
8100	0.5823	0.5781	0.5739	0.5696	0.5653	0.5610	0.5568	0.5525	0.5482	0.5469
8000	0.5813	0.5771	0.5728	0.5685	0.5642	0.5599	0.5556	0.5512	0.5469	0.5456
7900	0.5803	0.5760	0.5717	0.5674	0.5630	0.5587	0.5544	0.5500	0.5456	0.5443
7800	0.5793	0.5750	0.5706	0.5663	0.5619	0.5575	0.5531	0.5487	0.5443	0.5430
7700	0.5783	0.5739	0.5695	0.5651	0.5607	0.5563	0.5519	0.5474	0.5430	0.5417
7600	0.5772	0.5728	0.5684	0.5639	0.5595	0.5551	0.5506	0.5461	0.5417	0.5403
7500	0.5761	0.5717	0.5672	0.5628	0.5583	0.5538	0.5493	0.5448	0.5403	0.5390
7400	0.5750	0.5706	0.5661	0.5616	0.5571	0.5525	0.5480	0.5435	0.5389	0.5376
7300	0.5739	0.5694	0.5649	0.5604	0.5558	0.5512	0.5467	0.5421	0.5375	0.5362
7200	0.5728	0.5683	0.5637	0.5591	0.5545	0.5499	0.5453	0.5407	0.5361	0.5347
7100	0.5717	0.5671	0.5625	0.5579	0.5532	0.5486	0.5440	0.5393	0.5347	0.5333
7000	0.5706	0.5659	0.5613	0.5566	0.5519	0.5472	0.5426	0.5379	0.5332	0.5318
6900	0.5694	0.5647	0.5600	0.5553	0.5506	0.5459	0.5411	0.5364	0.5317	0.5303
6800	0.5682	0.5635	0.5587	0.5540	0.5492	0.5445	0.5397	0.5349	0.5302	0.5287
6700	0.5670	0.5622	0.5574	0.5527	0.5479	0.5431	0.5382	0.5334	0.5286	0.5272
6600										
6500										
6400										
6300										
6200										
6100										
6000										

SLB-1.18 – Density Lookup Tables using PERA EOS Model.

Fluid SLB-1.18-Decon   Single phase densities (g/cc)

Temperature 243 F
Pressure 11856 psia   density 0.5987 g/cc

Temperature (F) / Pressure (psia)	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	243
12000	0.6651	0.6620	0.6589	0.6557	0.6526	0.6494	0.6462	0.6431	0.6399	0.6367	0.6334	0.6302	0.6270	0.6237	0.6205	0.6172	0.6139	0.6107	0.6074	0.6041	0.6008	0.5998
11900	0.6646	0.6615	0.6584	0.6552	0.6521	0.6489	0.6457	0.6425	0.6393	0.6361	0.6328	0.6296	0.6263	0.6231	0.6198	0.6165	0.6132	0.6099	0.6066	0.6034	0.6001	0.5991
11800	0.6642	0.6611	0.6579	0.6548	0.6516	0.6484	0.6452	0.6420	0.6387	0.6355	0.6322	0.6290	0.6257	0.6224	0.6191	0.6158	0.6125	0.6092	0.6059	0.6026	0.5993	0.5983
11700	0.6638	0.6606	0.6575	0.6543	0.6511	0.6479	0.6447	0.6414	0.6382	0.6349	0.6316	0.6284	0.6251	0.6218	0.6185	0.6152	0.6118	0.6085	0.6052	0.6018	0.5985	0.5975
11600	0.6633	0.6602	0.6570	0.6538	0.6506	0.6474	0.6441	0.6409	0.6376	0.6343	0.6310	0.6277	0.6244	0.6211	0.6178	0.6145	0.6111	0.6078	0.6044	0.6011	0.5977	0.5967
11500	0.6629	0.6597	0.6565	0.6533	0.6501	0.6468	0.6436	0.6403	0.6370	0.6337	0.6304	0.6271	0.6238	0.6205	0.6171	0.6138	0.6104	0.6070	0.6037	0.6003	0.5969	0.5959
11400	0.6624	0.6592	0.6560	0.6528	0.6496	0.6463	0.6430	0.6398	0.6365	0.6331	0.6298	0.6265	0.6231	0.6198	0.6164	0.6130	0.6097	0.6063	0.6029	0.5995	0.5961	0.5951
11300	0.6620	0.6588	0.6555	0.6523	0.6490	0.6458	0.6425	0.6392	0.6359	0.6325	0.6292	0.6258	0.6225	0.6191	0.6157	0.6123	0.6089	0.6055	0.6021	0.5987	0.5953	0.5943
11200	0.6615	0.6583	0.6551	0.6518	0.6485	0.6452	0.6419	0.6386	0.6353	0.6319	0.6286	0.6252	0.6218	0.6184	0.6150	0.6116	0.6082	0.6048	0.6013	0.5979	0.5945	0.5935
11100	0.6611	0.6578	0.6546	0.6513	0.6480	0.6447	0.6414	0.6380	0.6347	0.6313	0.6279	0.6245	0.6211	0.6177	0.6143	0.6109	0.6074	0.6040	0.6006	0.5971	0.5937	0.5926
11000	0.6606	0.6573	0.6541	0.6508	0.6475	0.6441	0.6408	0.6374	0.6341	0.6307	0.6273	0.6239	0.6205	0.6170	0.6136	0.6101	0.6067	0.6032	0.5998	0.5963	0.5928	0.5918
10900	0.6601	0.6569	0.6536	0.6503	0.6469	0.6436	0.6402	0.6368	0.6335	0.6301	0.6266	0.6232	0.6198	0.6163	0.6129	0.6094	0.6059	0.6024	0.5990	0.5955	0.5920	0.5909
10800	0.6596	0.6564	0.6531	0.6497	0.6464	0.6430	0.6396	0.6362	0.6328	0.6294	0.6260	0.6225	0.6191	0.6156	0.6121	0.6086	0.6051	0.6016	0.5981	0.5946	0.5911	0.5901
10700	0.6592	0.6559	0.6525	0.6492	0.6458	0.6425	0.6391	0.6356	0.6322	0.6288	0.6253	0.6218	0.6184	0.6149	0.6114	0.6079	0.6044	0.6008	0.5973	0.5938	0.5903	0.5892
10600	0.6587	0.6554	0.6520	0.6487	0.6453	0.6419	0.6385	0.6350	0.6316	0.6281	0.6246	0.6212	0.6177	0.6142	0.6106	0.6071	0.6036	0.6000	0.5965	0.5929	0.5894	0.5883
10500	0.6582	0.6549	0.6515	0.6481	0.6447	0.6413	0.6379	0.6344	0.6310	0.6275	0.6240	0.6205	0.6169	0.6134	0.6099	0.6063	0.6028	0.5992	0.5956	0.5921	0.5885	0.5874
10400	0.6577	0.6544	0.6510	0.6476	0.6442	0.6407	0.6373	0.6338	0.6303	0.6268	0.6233	0.6198	0.6162	0.6127	0.6091	0.6055	0.6020	0.5984	0.5948	0.5912	0.5876	0.5865
10300	0.6572	0.6538	0.6504	0.6470	0.6436	0.6401	0.6367	0.6332	0.6297	0.6261	0.6226	0.6191	0.6155	0.6119	0.6083	0.6047	0.6011	0.5975	0.5939	0.5903	0.5867	0.5856
10200	0.6567	0.6533	0.6499	0.6465	0.6430	0.6395	0.6360	0.6325	0.6290	0.6255	0.6219	0.6183	0.6147	0.6112	0.6075	0.6039	0.6003	0.5967	0.5931	0.5894	0.5858	0.5847
10100	0.6562	0.6528	0.6494	0.6459	0.6424	0.6389	0.6354	0.6319	0.6283	0.6248	0.6212	0.6176	0.6140	0.6104	0.6068	0.6031	0.5995	0.5958	0.5922	0.5885	0.5849	0.5838
10000	0.6557	0.6523	0.6488	0.6453	0.6419	0.6383	0.6348	0.6312	0.6277	0.6241	0.6205	0.6169	0.6132	0.6096	0.6060	0.6023	0.5986	0.5950	0.5913	0.5876	0.5839	0.5828
9900	0.6552	0.6517	0.6483	0.6448	0.6413	0.6377	0.6342	0.6306	0.6270	0.6234	0.6198	0.6161	0.6125	0.6088	0.6051	0.6015	0.5978	0.5941	0.5904	0.5867	0.5830	0.5819
9800	0.6547	0.6512	0.6477	0.6442	0.6407	0.6371	0.6335	0.6299	0.6263	0.6227	0.6190	0.6154	0.6117	0.6080	0.6043	0.6006	0.5969	0.5932	0.5895	0.5857	0.5820	0.5809
9700	0.6542	0.6507	0.6471	0.6436	0.6401	0.6365	0.6329	0.6293	0.6256	0.6220	0.6183	0.6146	0.6109	0.6072	0.6035	0.5998	0.5960	0.5923	0.5885	0.5848	0.5810	0.5799
9600	0.6536	0.6501	0.6466	0.6430	0.6394	0.6358	0.6322	0.6286	0.6249	0.6213	0.6176	0.6139	0.6101	0.6064	0.6027	0.5989	0.5952	0.5914	0.5876	0.5838	0.5801	0.5789
9500	0.6531	0.6496	0.6460	0.6424	0.6388	0.6352	0.6316	0.6279	0.6242	0.6205	0.6168	0.6131	0.6093	0.6056	0.6018	0.5980	0.5943	0.5905	0.5867	0.5829	0.5791	0.5779
9400	0.6526	0.6490	0.6454	0.6418	0.6382	0.6346	0.6309	0.6272	0.6235	0.6198	0.6160	0.6123	0.6085	0.6048	0.6010	0.5972	0.5934	0.5895	0.5857	0.5819	0.5781	0.5769
9300	0.6520	0.6484	0.6448	0.6412	0.6376	0.6339	0.6302	0.6265	0.6228	0.6190	0.6153	0.6115	0.6077	0.6039	0.6001	0.5963	0.5924	0.5886	0.5847	0.5809	0.5770	0.5759
9200	0.6515	0.6479	0.6442	0.6406	0.6369	0.6332	0.6295	0.6258	0.6221	0.6183	0.6145	0.6107	0.6069	0.6031	0.5992	0.5954	0.5915	0.5876	0.5838	0.5799	0.5760	0.5748
9100	0.6509	0.6473	0.6436	0.6400	0.6363	0.6326	0.6288	0.6251	0.6213	0.6175	0.6137	0.6099	0.6060	0.6022	0.5983	0.5945	0.5906	0.5867	0.5828	0.5789	0.5750	0.5738
9000	0.6503	0.6467	0.6430	0.6394	0.6356	0.6319	0.6282	0.6244	0.6206	0.6168	0.6129	0.6091	0.6052	0.6013	0.5974	0.5935	0.5896	0.5857	0.5818	0.5778	0.5739	0.5727
8900	0.6498	0.6461	0.6424	0.6387	0.6350	0.6312	0.6274	0.6236	0.6198	0.6160	0.6121	0.6082	0.6043	0.6004	0.5965	0.5926	0.5887	0.5847	0.5807	0.5768	0.5728	0.5716
8800	0.6492	0.6455	0.6418	0.6381	0.6343	0.6305	0.6267	0.6229	0.6191	0.6152	0.6113	0.6074	0.6035	0.5996	0.5956	0.5916	0.5877	0.5837	0.5797	0.5757	0.5717	0.5705
8700	0.6486	0.6449	0.6412	0.6374	0.6336	0.6298	0.6260	0.6222	0.6183	0.6144	0.6105	0.6065	0.6026	0.5986	0.5947	0.5907	0.5867	0.5827	0.5787	0.5747	0.5706	0.5694
8600	0.6480	0.6443	0.6406	0.6368	0.6330	0.6291	0.6253	0.6214	0.6175	0.6136	0.6096	0.6057	0.6017	0.5977	0.5937	0.5897	0.5857	0.5817	0.5776	0.5736	0.5695	0.5683
8500	0.6474	0.6437	0.6399	0.6361	0.6323	0.6284	0.6245	0.6206	0.6167	0.6128	0.6088	0.6048	0.6008	0.5968	0.5928	0.5887	0.5847	0.5806	0.5765	0.5725	0.5684	0.5672
8400	0.6468	0.6431	0.6393	0.6354	0.6316	0.6277	0.6238	0.6199	0.6159	0.6119	0.6079	0.6039	0.5999	0.5959	0.5918	0.5877	0.5836	0.5796	0.5755	0.5713	0.5672	0.5660
8300	0.6462	0.6424	0.6386	0.6348	0.6309	0.6270	0.6230	0.6191	0.6151	0.6111	0.6071	0.6030	0.5990	0.5949	0.5908	0.5867	0.5826	0.5785	0.5743	0.5702	0.5661	0.5648
8200	0.6456	0.6418	0.6380	0.6341	0.6302	0.6262	0.6223	0.6183	0.6143	0.6103	0.6062	0.6021	0.5980	0.5939	0.5898	0.5857	0.5815	0.5774	0.5732	0.5691	0.5649	0.5636
8100	0.6450	0.6412	0.6373	0.6334	0.6295	0.6255	0.6215	0.6175	0.6135	0.6094	0.6053	0.6012	0.5971	0.5930	0.5888	0.5846	0.5805	0.5763	0.5721	0.5679	0.5637	0.5624
8000	0.6444	0.6405	0.6366	0.6327	0.6287	0.6247	0.6207	0.6167	0.6126	0.6085	0.6044	0.6003	0.5961	0.5920	0.5878	0.5836	0.5794	0.5752	0.5710	0.5667	0.5625	0.5612
7900	0.6438	0.6399	0.6359	0.6320	0.6280	0.6240	0.6199	0.6159	0.6118	0.6076	0.6035	0.5993	0.5952	0.5910	0.5868	0.5825	0.5783	0.5740	0.5698	0.5655	0.5613	0.5600
7800	0.6431	0.6392	0.6352	0.6313	0.6272	0.6232	0.6191	0.6150	0.6109	0.6067	0.6026	0.5984	0.5942	0.5900	0.5857	0.5814	0.5772	0.5729	0.5686	0.5643	0.5600	0.5587
7700	0.6425	0.6385	0.6345	0.6305	0.6265	0.6224	0.6183	0.6142	0.6100	0.6058	0.6016	0.5974	0.5932	0.5889	0.5846	0.5803	0.5760	0.5717	0.5674	0.5631	0.5587	0.5574
7600	0.6418	0.6378	0.6338	0.6298	0.6257	0.6216	0.6175	0.6133	0.6091	0.6049	0.6007	0.5964	0.5922	0.5879	0.5836	0.5792	0.5749	0.5705	0.5662	0.5618	0.5575	0.5561
7500	0.6412	0.6372	0.6331	0.6291	0.6250	0.6208	0.6167	0.6125	0.6082	0.6040	0.5997	0.5954	0.5911	0.5868	0.5825	0.5781	0.5737	0.5693	0.5650	0.5606	0.5561	0.5548
7400	0.6405	0.6365	0.6324	0.6283	0.6242	0.6200	0.6158	0.6116	0.6073	0.6031	0.5988	0.5944	0.5901	0.5857	0.5814	0.5770	0.5726	0.5681	0.5637	0.5593	0.5548	0.5535
7300	0.6398	0.6358	0.6317	0.6275	0.6234	0.6192	0.6150	0.6107	0.6064	0.6021	0.5978	0.5934	0.5890	0.5847	0.5802	0.5758	0.5714	0.5669	0.5624	0.5580	0.5535	0.5521
7200	0.6108	0.6350	0.6309	0.6268	0.6226	0.6183	0.6141	0.6098	0.6055	0.6011	0.5968	0.5924	0.5880	0.5835	0.5791	0.5746	0.5701	0.5656	0.5611	0.5566	0.5521	0.5507
7100		0.6343	0.6302	0.6260	0.6218	0.6175	0.6132	0.6089	0.6045	0.6002	0.5958	0.5913	0.5869	0.5824	0.5779	0.5734	0.5689	0.5644	0.5598	0.5553	0.5507	0.5493
7000		0.6069	0.6294	0.6252	0.6209	0.6166	0.6123	0.6080	0.6036	0.5992	0.5947	0.5903	0.5858	0.5813	0.5767	0.5722	0.5676	0.5631	0.5585	0.5539	0.5493	0.5479
6900			0.6286	0.6244	0.6201	0.6158	0.6114	0.6070	0.6026	0.5982	0.5937	0.5892	0.5847	0.5801	0.5756	0.5710	0.5664	0.5618	0.5571	0.5525	0.5479	0.5465
6800			0.5948	0.6236	0.6193	0.6149	0.6105	0.6061	0.6016	0.5971	0.5926	0.5881	0.5835	0.5790	0.5743	0.5697	0.5651	0.5604	0.5558	0.5511	0.5464	0.5450
6700				0.5926	0.6184	0.6140	0.6096	0.6051	0.6006	0.5961	0.5916	0.5870	0.5824	0.5778	0.5731	0.5684	0.5638	0.5591	0.5544	0.5496	0.5449	0.5435
6600					0.5853	0.6131	0.6086	0.6041	0.5996	0.5951	0.5905	0.5858	0.5812	0.5765	0.5718	0.5671	0.5624	0.5577	0.5529	0.5482	0.5434	0.5420
6500						0.5735	0.5803	0.6032	0.5986	0.5940	0.5894	0.5847	0.5800	0.5753	0.5706	0.5658	0.5611	0.5563	0.5515	0.5467	0.5419	0.5404
6400								0.5592	0.5591	0.5589	0.5588	0.5835	0.5788	0.5741	0.5693	0.5645	0.5597	0.5548	0.5500	0.5452	0.5403	0.5388
6300																						
6200																						
6100																						
6000																						

Intertek – Density Lookup Tables using PERA EOS Model.

Fluid Intertek-Decon **Single phase densities (g/cc)**

Temperature	243 F	density	0.5939 g/cc
Pressure	11856 psia		

Temperature (F) / Pressure (psia)	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	243
12000	0.6608	0.6577	0.6546	0.6514	0.6482	0.6451	0.6419	0.6386	0.6354	0.6322	0.6289	0.6257	0.6224	0.6191	0.6158	0.6126	0.6093	0.6060	0.6027	0.5994	0.5961	0.5951
11900	0.6604	0.6573	0.6541	0.6509	0.6477	0.6445	0.6413	0.6381	0.6349	0.6316	0.6283	0.6251	0.6218	0.6185	0.6152	0.6119	0.6086	0.6053	0.6019	0.5986	0.5953	0.5943
11800	0.6600	0.6568	0.6536	0.6504	0.6472	0.6440	0.6408	0.6375	0.6343	0.6310	0.6277	0.6244	0.6211	0.6178	0.6145	0.6112	0.6079	0.6045	0.6012	0.5979	0.5945	0.5935
11700	0.6595	0.6563	0.6532	0.6500	0.6467	0.6435	0.6403	0.6370	0.6337	0.6304	0.6271	0.6238	0.6205	0.6172	0.6138	0.6105	0.6072	0.6038	0.6004	0.5971	0.5937	0.5927
11600	0.6591	0.6559	0.6527	0.6495	0.6462	0.6430	0.6397	0.6364	0.6331	0.6298	0.6265	0.6232	0.6199	0.6165	0.6132	0.6098	0.6064	0.6031	0.5997	0.5963	0.5929	0.5919
11500	0.6586	0.6554	0.6522	0.6490	0.6457	0.6424	0.6392	0.6359	0.6326	0.6292	0.6259	0.6226	0.6192	0.6158	0.6125	0.6091	0.6057	0.6023	0.5989	0.5955	0.5921	0.5911
11400	0.6582	0.6550	0.6517	0.6485	0.6452	0.6419	0.6386	0.6353	0.6320	0.6286	0.6253	0.6219	0.6185	0.6152	0.6118	0.6084	0.6050	0.6016	0.5981	0.5947	0.5913	0.5903
11300	0.6577	0.6545	0.6512	0.6480	0.6447	0.6414	0.6381	0.6347	0.6314	0.6280	0.6246	0.6213	0.6179	0.6145	0.6111	0.6076	0.6042	0.6008	0.5974	0.5939	0.5905	0.5895
11200	0.6573	0.6540	0.6507	0.6475	0.6441	0.6408	0.6375	0.6341	0.6308	0.6274	0.6240	0.6206	0.6172	0.6138	0.6104	0.6069	0.6035	0.6000	0.5966	0.5931	0.5897	0.5886
11100	0.6568	0.6535	0.6502	0.6469	0.6436	0.6403	0.6369	0.6336	0.6302	0.6268	0.6234	0.6199	0.6165	0.6131	0.6096	0.6062	0.6027	0.5993	0.5958	0.5923	0.5888	0.5878
11000	0.6563	0.6530	0.6497	0.6464	0.6431	0.6397	0.6363	0.6330	0.6296	0.6261	0.6227	0.6193	0.6158	0.6124	0.6089	0.6054	0.6020	0.5985	0.5950	0.5915	0.5880	0.5869
10900	0.6558	0.6525	0.6492	0.6459	0.6425	0.6392	0.6358	0.6324	0.6289	0.6255	0.6221	0.6186	0.6151	0.6117	0.6082	0.6047	0.6012	0.5977	0.5942	0.5907	0.5871	0.5861
10800	0.6554	0.6521	0.6487	0.6454	0.6420	0.6386	0.6352	0.6318	0.6283	0.6249	0.6214	0.6179	0.6144	0.6109	0.6074	0.6039	0.6004	0.5969	0.5933	0.5898	0.5863	0.5852
10700	0.6549	0.6516	0.6482	0.6448	0.6414	0.6380	0.6346	0.6312	0.6277	0.6242	0.6207	0.6172	0.6137	0.6102	0.6067	0.6031	0.5996	0.5961	0.5925	0.5890	0.5854	0.5843
10600	0.6544	0.6511	0.6477	0.6443	0.6409	0.6374	0.6340	0.6305	0.6271	0.6236	0.6201	0.6165	0.6130	0.6095	0.6059	0.6024	0.5988	0.5952	0.5917	0.5881	0.5845	0.5834
10500	0.6539	0.6505	0.6472	0.6437	0.6403	0.6369	0.6334	0.6299	0.6264	0.6229	0.6194	0.6158	0.6123	0.6087	0.6052	0.6016	0.5980	0.5944	0.5908	0.5872	0.5836	0.5825
10400	0.6534	0.6500	0.6466	0.6432	0.6397	0.6363	0.6328	0.6293	0.6258	0.6222	0.6187	0.6151	0.6116	0.6080	0.6044	0.6008	0.5972	0.5936	0.5900	0.5863	0.5827	0.5816
10300	0.6529	0.6495	0.6461	0.6426	0.6392	0.6357	0.6322	0.6286	0.6251	0.6216	0.6180	0.6144	0.6108	0.6072	0.6036	0.6000	0.5964	0.5927	0.5891	0.5854	0.5818	0.5807
10200	0.6524	0.6490	0.6455	0.6421	0.6386	0.6351	0.6316	0.6280	0.6244	0.6209	0.6173	0.6137	0.6101	0.6065	0.6028	0.5992	0.5955	0.5919	0.5882	0.5845	0.5809	0.5798
10100	0.6519	0.6485	0.6450	0.6415	0.6380	0.6345	0.6309	0.6274	0.6238	0.6202	0.6166	0.6129	0.6093	0.6057	0.6020	0.5983	0.5947	0.5910	0.5873	0.5836	0.5799	0.5788
10000	0.6514	0.6479	0.6444	0.6409	0.6374	0.6339	0.6303	0.6267	0.6231	0.6195	0.6159	0.6122	0.6086	0.6049	0.6012	0.5975	0.5938	0.5901	0.5864	0.5827	0.5790	0.5779
9900	0.6509	0.6474	0.6439	0.6404	0.6368	0.6332	0.6296	0.6260	0.6224	0.6188	0.6151	0.6115	0.6078	0.6041	0.6004	0.5967	0.5930	0.5892	0.5855	0.5818	0.5780	0.5769
9800	0.6503	0.6468	0.6433	0.6398	0.6362	0.6326	0.6290	0.6254	0.6217	0.6181	0.6144	0.6107	0.6070	0.6033	0.5996	0.5958	0.5921	0.5883	0.5846	0.5808	0.5771	0.5759
9700	0.6498	0.6463	0.6427	0.6392	0.6356	0.6320	0.6283	0.6247	0.6210	0.6173	0.6136	0.6099	0.6062	0.6025	0.5987	0.5950	0.5912	0.5874	0.5837	0.5799	0.5761	0.5750
9600	0.6493	0.6457	0.6422	0.6386	0.6350	0.6313	0.6277	0.6240	0.6203	0.6166	0.6129	0.6092	0.6054	0.6017	0.5979	0.5941	0.5903	0.5865	0.5827	0.5789	0.5751	0.5739
9500	0.6487	0.6452	0.6416	0.6380	0.6344	0.6307	0.6270	0.6233	0.6196	0.6159	0.6121	0.6084	0.6046	0.6008	0.5970	0.5932	0.5894	0.5856	0.5818	0.5779	0.5741	0.5729
9400	0.6482	0.6446	0.6410	0.6374	0.6337	0.6300	0.6263	0.6226	0.6189	0.6151	0.6114	0.6076	0.6038	0.6000	0.5962	0.5923	0.5885	0.5846	0.5808	0.5769	0.5731	0.5719
9300	0.6476	0.6440	0.6404	0.6368	0.6331	0.6294	0.6257	0.6219	0.6182	0.6144	0.6106	0.6068	0.6030	0.5991	0.5953	0.5914	0.5876	0.5837	0.5798	0.5759	0.5720	0.5709
9200	0.6471	0.6435	0.6398	0.6361	0.6324	0.6287	0.6250	0.6212	0.6174	0.6136	0.6098	0.6060	0.6021	0.5983	0.5944	0.5905	0.5866	0.5827	0.5788	0.5749	0.5710	0.5698
9100	0.6465	0.6429	0.6392	0.6355	0.6318	0.6280	0.6243	0.6205	0.6167	0.6129	0.6090	0.6051	0.6013	0.5974	0.5935	0.5896	0.5857	0.5817	0.5778	0.5739	0.5699	0.5688
9000	0.6460	0.6423	0.6386	0.6349	0.6311	0.6274	0.6236	0.6198	0.6159	0.6121	0.6082	0.6043	0.6004	0.5965	0.5926	0.5886	0.5847	0.5808	0.5768	0.5728	0.5689	0.5677
8900	0.6454	0.6417	0.6380	0.6342	0.6305	0.6267	0.6229	0.6190	0.6152	0.6113	0.6074	0.6035	0.5996	0.5956	0.5917	0.5877	0.5837	0.5797	0.5758	0.5718	0.5678	0.5666
8800	0.6448	0.6411	0.6374	0.6336	0.6298	0.6260	0.6221	0.6183	0.6144	0.6105	0.6066	0.6026	0.5987	0.5947	0.5907	0.5867	0.5827	0.5787	0.5747	0.5707	0.5667	0.5655
8700	0.6442	0.6405	0.6367	0.6329	0.6291	0.6253	0.6214	0.6175	0.6136	0.6097	0.6057	0.6018	0.5978	0.5938	0.5898	0.5858	0.5817	0.5777	0.5737	0.5696	0.5656	0.5644
8600	0.6436	0.6399	0.6361	0.6323	0.6284	0.6246	0.6207	0.6168	0.6128	0.6089	0.6049	0.6009	0.5969	0.5929	0.5888	0.5848	0.5807	0.5767	0.5726	0.5685	0.5644	0.5632
8500	0.6430	0.6393	0.6354	0.6316	0.6277	0.6238	0.6199	0.6160	0.6120	0.6080	0.6040	0.6000	0.5960	0.5919	0.5879	0.5838	0.5797	0.5756	0.5715	0.5674	0.5633	0.5621
8400	0.6424	0.6386	0.6348	0.6309	0.6270	0.6231	0.6192	0.6152	0.6112	0.6072	0.6032	0.5991	0.5951	0.5910	0.5869	0.5828	0.5787	0.5745	0.5704	0.5663	0.5621	0.5609
8300	0.6418	0.6380	0.6341	0.6302	0.6263	0.6224	0.6184	0.6144	0.6104	0.6064	0.6023	0.5982	0.5941	0.5900	0.5859	0.5818	0.5776	0.5735	0.5693	0.5651	0.5610	0.5597
8200	0.6412	0.6373	0.6335	0.6295	0.6256	0.6216	0.6176	0.6136	0.6096	0.6055	0.6014	0.5973	0.5932	0.5890	0.5849	0.5807	0.5765	0.5724	0.5682	0.5640	0.5598	0.5585
8100	0.6406	0.6367	0.6328	0.6288	0.6249	0.6209	0.6168	0.6128	0.6087	0.6046	0.6005	0.5964	0.5922	0.5881	0.5839	0.5797	0.5755	0.5712	0.5670	0.5628	0.5586	0.5573
8000	0.6400	0.6360	0.6321	0.6281	0.6241	0.6201	0.6161	0.6120	0.6079	0.6037	0.5996	0.5954	0.5912	0.5871	0.5828	0.5786	0.5744	0.5701	0.5659	0.5616	0.5573	0.5560
7900	0.6393	0.6354	0.6314	0.6274	0.6234	0.6193	0.6153	0.6111	0.6070	0.6029	0.5987	0.5945	0.5903	0.5860	0.5818	0.5775	0.5732	0.5690	0.5647	0.5604	0.5561	0.5548
7800	0.6387	0.6347	0.6307	0.6267	0.6226	0.6186	0.6144	0.6103	0.6061	0.6020	0.5977	0.5935	0.5893	0.5850	0.5807	0.5764	0.5721	0.5678	0.5635	0.5592	0.5548	0.5535
7700	0.6380	0.6340	0.6300	0.6260	0.6219	0.6178	0.6136	0.6094	0.6053	0.6010	0.5968	0.5925	0.5883	0.5840	0.5796	0.5753	0.5710	0.5666	0.5623	0.5579	0.5535	0.5522
7600	0.6374	0.6333	0.6293	0.6252	0.6211	0.6170	0.6128	0.6086	0.6044	0.6001	0.5958	0.5915	0.5872	0.5829	0.5786	0.5742	0.5698	0.5654	0.5610	0.5566	0.5522	0.5509
7500	0.6367	0.6326	0.6286	0.6245	0.6203	0.6161	0.6119	0.6077	0.6035	0.5992	0.5949	0.5905	0.5862	0.5818	0.5774	0.5730	0.5686	0.5642	0.5598	0.5554	0.5509	0.5496
7400	0.6360	0.6319	0.6278	0.6237	0.6195	0.6153	0.6111	0.6068	0.6025	0.5982	0.5939	0.5895	0.5851	0.5807	0.5763	0.5719	0.5674	0.5630	0.5585	0.5540	0.5496	0.5482
7300	0.6353	0.6312	0.6271	0.6229	0.6187	0.6145	0.6102	0.6059	0.6016	0.5973	0.5929	0.5885	0.5841	0.5796	0.5752	0.5707	0.5662	0.5617	0.5572	0.5527	0.5482	0.5468
7200	0.6346	0.6305	0.6263	0.6221	0.6179	0.6136	0.6093	0.6050	0.6007	0.5963	0.5919	0.5874	0.5830	0.5785	0.5740	0.5695	0.5650	0.5605	0.5559	0.5514	0.5468	0.5455
7100	0.6339	0.6298	0.6256	0.6214	0.6171	0.6128	0.6085	0.6041	0.5997	0.5953	0.5908	0.5864	0.5819	0.5774	0.5728	0.5683	0.5637	0.5592	0.5546	0.5500	0.5454	0.5440
7000	0.6332	0.6290	0.6248	0.6206	0.6163	0.6119	0.6076	0.6032	0.5987	0.5943	0.5898	0.5853	0.5808	0.5762	0.5717	0.5671	0.5625	0.5579	0.5532	0.5486	0.5440	0.5426
6900	0.6325	0.6283	0.6240	0.6197	0.6154	0.6110	0.6066	0.6022	0.5978	0.5933	0.5887	0.5842	0.5796	0.5751	0.5704	0.5658	0.5612	0.5565	0.5519	0.5472	0.5425	0.5411
6800	0.6318	0.6275	0.6232	0.6189	0.6146	0.6102	0.6057	0.6013	0.5968	0.5922	0.5877	0.5831	0.5785	0.5739	0.5692	0.5645	0.5599	0.5552	0.5505	0.5458	0.5410	0.5396
6700	0.6311	0.6268	0.6224	0.6181	0.6137	0.6093	0.6048	0.6003	0.5957	0.5912	0.5866	0.5820	0.5773	0.5727	0.5680	0.5633	0.5585	0.5538	0.5491	0.5443	0.5395	0.5381
6600		0.6260	0.6216	0.6172	0.6128	0.6083	0.6038	0.5993	0.5947	0.5901	0.5855	0.5808	0.5761	0.5714	0.5667	0.5619	0.5572	0.5524	0.5476	0.5428	0.5380	0.5366
6500		0.6252	0.6208	0.6164	0.6119	0.6074	0.6029	0.5983	0.5937	0.5890	0.5844	0.5797	0.5749	0.5702	0.5654	0.5606	0.5558	0.5510	0.5461	0.5413	0.5365	0.5350
6400			0.6200	0.6155	0.6110	0.6065	0.6019	0.5973	0.5926	0.5879	0.5832	0.5785	0.5737	0.5689	0.5641	0.5593	0.5544	0.5495	0.5447	0.5398	0.5349	0.5334
6300				0.6146	0.6101	0.6055	0.6009	0.5962	0.5915	0.5868	0.5821	0.5773	0.5725	0.5676	0.5628	0.5579	0.5530	0.5481	0.5431	0.5382	0.5333	0.5318
6200					0.6092	0.6045	0.5999	0.5952	0.5904	0.5857	0.5809	0.5760	0.5712	0.5663	0.5614	0.5565	0.5515	0.5466	0.5416	0.5366	0.5316	0.5301
6100						0.5900	0.5989	0.5941	0.5893	0.5845	0.5797	0.5748	0.5699	0.5650	0.5600	0.5550	0.5500	0.5253				
6000																						

MultiFlash Files

These files are for the conversion of EOS40 to Multiflash.
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The folder 'Multiflash-files' contains Multiflash fluid definition files.
There are separate Multiflash fluid definition files for the 8 fluids (4 bottomhole samples, 4 decontaminated fluids)
The EOS parameters are identical in all 8 files. Only the compositions are different.

Some notes on conversion of EOS models to Multiflash
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1. Volume shift parameters are input into Mul iflash with units (m3/mol).

2. BIPs are input in the format A+B*T+C*T*T. (C is zero for this model).

3. The LBC Zc/Vc values cannot be imported into Multiflash. Need to define a reference viscosity for each component - at Tb, 14.7 psi. Multiflash than adjusts Zc for each component to fit the reference viscosity.

4. Library component properties (CO2, N2, C1 to C5) were changed to be consistent with original PVT software.

MultiFlash – CL68379-DEC-EOS20120322.mfl

```
# Multiflash version: 4.1.09   March 2012 #
# Date: 04 April 2012   Time: 11:44 #
remove all;
units temperature K pressure Pa enthalpy J/mol entropy J/mol/K volume m3/mol
amounts mol viscosity Pas thcond W/m/K surten N/m diffusion m2/s;
title "CL68379 decontaminated fluid sample with EOS 20120322.  About 0.4 wt% "
"OBM in reservoir fluid has been removed. T-dependent BIPs Library component "
"properties changed to same as PhazeComp. T-dep BIPs altered from previous "
"version to get correct BIP at 243F n" ;
datum enthalpy compound entropy compound; set fractions;
properties PFC6PLUSMW   200.99 ;
puredata INFODATA ;
components overwrite 1 NITROGEN data TCRIT   126.20 PCRIT  3.39801E+06
ACENTRICFACTOR  3.70000E-02 VSRKS1 -4.02589E-06 ;
2 "CARBON DIOXIDE" data TCRIT   304.12 PCRIT  7.37401E+06 ACENTRICFACTOR
 0.22500 VSPR1  5.09546E-08 ;
3 METHANE data TCRIT   190.56 PCRIT  4.59901E+06 VCRIT  9.85975E-05
ACENTRICFACTOR  1.10000E-02 VSPR1 -4.01930E-06 ;
4 ETHANE data TCRIT   305.32 PCRIT  4.87197E+06 VCRIT  1.45498E-04
ACENTRICFACTOR  9.90000E-02 VSPR1 -2.54577E-06 ;
5 PROPANE data MW   44.097 TCRIT   369.83 PCRIT  4.24800E+06 VSPR1
-3.59343E-06 ;
6 I-BUTANE data MW   58.123 PCRIT  3.64002E+06 ACENTRICFACTOR  0.18600 VSPR1
-4.49142E-06 ;
7 N-BUTANE data TCRIT   425.12 PCRIT  3.79598E+06 ACENTRICFACTOR  0.20000
VSPR1 -3.90684E-06 ;
8 I-PENTANE data TCRIT   460.39 PCRIT  3.38098E+06 ACENTRICFACTOR  0.22900
VSPR1 -4.97311E-06 ;
9 PENTANE data PCRIT  3.37002E+06 ACENTRICFACTOR  0.25200 VSPR1 -2.63886E-06 ;
;
chardata INFOCHAR TBSOEREIDE ;
petrofracs overwrite 10 C6 normal data MW   83.282 TCRIT   512.44 PCRIT
 3.30948E+06 VCRIT  3.46244E-04 ACENTRICFACTOR  0.24969 TBOIL   337.85 SG
 0.69568 CNUMBER   5.9292 REFVISLB  2.26070E-04 VSPR1 -5.54877E-07 ;
11 C7 normal data MW   98.471 TCRIT   553.18 PCRIT  3.03631E+06 VCRIT
 4.66510E-04 ACENTRICFACTOR  0.28313 TBOIL   370.98 SG  0.76726 CNUMBER
  7.1997 REFVISLB  1.34400E-03 VSPR1  8.09391E-06 ;
12 C8 normal data MW   109.87 TCRIT   579.61 PCRIT  2.85684E+06 VCRIT
 5.12238E-04 ACENTRICFACTOR  0.31047 TBOIL   393.58 SG  0.78591 CNUMBER
  7.9958 REFVISLB  1.18160E-03 VSPR1  9.88729E-06 ;
13 C9 normal data MW   123.39 TCRIT   608.62 PCRIT  2.65290E+06 VCRIT
 5.69747E-04 ACENTRICFACTOR  0.34698 TBOIL   419.67 SG  0.80319 CNUMBER
  8.9300 REFVISLB  1.06690E-03 VSPR1  1.31971E-05 ;
14 C10 normal data MW   136.62 TCRIT   634.18 PCRIT  2.47860E+06 VCRIT
 6.25922E-04 ACENTRICFACTOR  0.38361 TBOIL   443.50 SG  0.81695 CNUMBER
  9.7773 REFVISLB  9.69100E-04 VSPR1  1.67277E-05 ;
15 C11 normal data MW   149.76 TCRIT   657.32 PCRIT  2.32698E+06 VCRIT
 6.81347E-04 ACENTRICFACTOR  0.42051 TBOIL   465.72 SG  0.82855 CNUMBER
  10.705 REFVISLB  8.82700E-04 VSPR1  2.04793E-05 ;
16 C12 normal data MW   162.81 TCRIT   678.41 PCRIT  2.19433E+06 VCRIT
 7.35698E-04 ACENTRICFACTOR  0.45752 TBOIL   486.53 SG  0.83860 CNUMBER
  11.611 REFVISLB  8.04100E-04 VSPR1  2.44042E-05 ;
17 C13 normal data MW   175.77 TCRIT   697.77 PCRIT  2.07774E+06 VCRIT
 7.88808E-04 ACENTRICFACTOR  0.49116 TBOIL   506.06 SG  0.84747 CNUMBER
  12.526 REFVISLB  7.32000E-04 VSPR1  2.84490E-05 ;
18 C14 normal data MW   188.63 TCRIT   715.63 PCRIT  1.97480E+06 VCRIT
 8.40335E-04 ACENTRICFACTOR  0.52632 TBOIL   524.44 SG  0.85541 CNUMBER
  13.400 REFVISLB  6.65200E-04 VSPR1  3.25640E-05 ;
19 C15 normal data MW   201.39 TCRIT   732.18 PCRIT  1.88337E+06 VCRIT
 8.90240E-04 ACENTRICFACTOR  0.56109 TBOIL   541.77 SG  0.86261 CNUMBER
  14.189 REFVISLB  6.03600E-04 VSPR1  3.67048E-05 ;
20 C16 normal data MW   214.05 TCRIT   747.58 PCRIT  1.80188E+06 VCRIT
 9.38404E-04 ACENTRICFACTOR  0.59542 TBOIL   558.16 SG  0.86919 CNUMBER
  14.935 REFVISLB  5.46800E-04 VSPR1  4.08277E-05 ;
21 C17 normal data MW   226.61 TCRIT   761.97 PCRIT  1.72900E+06 VCRIT
 9.84662E-04 ACENTRICFACTOR  0.62930 TBOIL   573.66 SG  0.87525 CNUMBER
  15.768 REFVISLB  4.95100E-04 VSPR1  4.48898E-05 ;
22 C18 normal data MW   239.06 TCRIT   775.45 PCRIT  1.66350E+06 VCRIT
 1.02906E-03 ACENTRICFACTOR  0.66270 TBOIL   588.36 SG  0.88086 CNUMBER
  16.527 REFVISLB  4.48200E-04 VSPR1  4.88697E-05 ;
23 C19 normal data MW   251.41 TCRIT   788.12 PCRIT  1.60441E+06 VCRIT
 1.07156E-03 ACENTRICFACTOR  0.69560 TBOIL   602.33 SG  0.88609 CNUMBER
  17.333 REFVISLB  4.05900E-04 VSPR1  5.27332E-05 ;
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24 C20 normal data MW   263.65 TCRIT   800.06 PCRIT  1.55091E+06 VCRIT
 1.11221E-03 ACENTRICFACTOR  0.72799 TBOIL   615.61 SG  0.89098 CNUMBER
  18.287 REFVISLB  3.68000E-04 VSPR1  5.64599E-05 ;
25 C21 normal data MW   275.78 TCRIT   811.34 PCRIT  1.50237E+06 VCRIT
 1.15091E-03 ACENTRICFACTOR  0.75988 TBOIL   628.25 SG  0.89558 CNUMBER
  19.198 REFVISLB  3.34200E-04 VSPR1  6.00317E-05 ;
26 C22 normal data MW   287.81 TCRIT   822.03 PCRIT  1.45817E+06 VCRIT
 1.18783E-03 ACENTRICFACTOR  0.79124 TBOIL   640.31 SG  0.89991 CNUMBER
  19.999 REFVISLB  3.04300E-04 VSPR1  6.34355E-05 ;
27 C23 normal data MW   299.73 TCRIT   832.17 PCRIT  1.41777E+06 VCRIT
 1.22294E-03 ACENTRICFACTOR  0.82208 TBOIL   651.83 SG  0.90401 CNUMBER
  20.791 REFVISLB  2.77800E-04 VSPR1  6.66597E-05 ;
28 C24 normal data MW   311.54 TCRIT   841.82 PCRIT  1.38081E+06 VCRIT
 1.25621E-03 ACENTRICFACTOR  0.85239 TBOIL   662.83 SG  0.90790 CNUMBER
  21.576 REFVISLB  2.54300E-04 VSPR1  6.96905E-05 ;
29 C25 normal data MW   323.26 TCRIT   851.02 PCRIT  1.34682E+06 VCRIT
 1.28799E-03 ACENTRICFACTOR  0.88218 TBOIL   673.37 SG  0.91159 CNUMBER
  22.353 REFVISLB  2.33600E-04 VSPR1  7.25327E-05 ;
30 C26 normal data MW   334.87 TCRIT   859.79 PCRIT  1.31552E+06 VCRIT
 1.31813E-03 ACENTRICFACTOR  0.91144 TBOIL   683.47 SG  0.91511 CNUMBER
  23.122 REFVISLB  2.15300E-04 VSPR1  7.51809E-05 ;
31 C27 normal data MW   346.38 TCRIT   868.19 PCRIT  1.28663E+06 VCRIT
 1.34668E-03 ACENTRICFACTOR  0.94018 TBOIL   693.15 SG  0.91848 CNUMBER
  23.884 REFVISLB  1.99100E-04 VSPR1  7.76287E-05 ;
32 C28 normal data MW   357.79 TCRIT   876.24 PCRIT  1.25981E+06 VCRIT
 1.37395E-03 ACENTRICFACTOR  0.96841 TBOIL   702.46 SG  0.92169 CNUMBER
  24.639 REFVISLB  1.84800E-04 VSPR1  7.98855E-05 ;
33 C29 normal data MW   369.10 TCRIT   883.95 PCRIT  1.23499E+06 VCRIT
 1.39964E-03 ACENTRICFACTOR  0.99612 TBOIL   711.40 SG  0.92478 CNUMBER
  25.388 REFVISLB  1.72200E-04 VSPR1  8.19443E-05 ;
34 C30 normal data MW   380.32 TCRIT   891.37 PCRIT  1.21189E+06 VCRIT
 1.42415E-03 ACENTRICFACTOR   1.0233 TBOIL   720.00 SG  0.92774 CNUMBER
  26.129 REFVISLB  1.61000E-04 VSPR1  8.38118E-05 ;
35 C31 normal data MW   391.45 TCRIT   898.49 PCRIT  1.19038E+06 VCRIT
 1.44735E-03 ACENTRICFACTOR   1.0500 TBOIL   728.29 SG  0.93058 CNUMBER
  26.864 REFVISLB  1.51000E-04 VSPR1  8.54912E-05 ;
36 C32 normal data MW   402.49 TCRIT   905.36 PCRIT  1.17032E+06 VCRIT
 1.46942E-03 ACENTRICFACTOR   1.0762 TBOIL   736.29 SG  0.93333 CNUMBER
  27.591 REFVISLB  1.42100E-04 VSPR1  8.69809E-05 ;
37 C33 normal data MW   413.44 TCRIT   911.98 PCRIT  1.15149E+06 VCRIT
 1.49041E-03 ACENTRICFACTOR   1.1019 TBOIL   744.00 SG  0.93597 CNUMBER
  28.338 REFVISLB  1.34200E-04 VSPR1  8.83013E-05 ;
38 C34 normal data MW   424.30 TCRIT   918.38 PCRIT  1.13384E+06 VCRIT
 1.51034E-03 ACENTRICFACTOR   1.1272 TBOIL   751.45 SG  0.93852 CNUMBER
  29.094 REFVISLB  1.27100E-04 VSPR1  8.94454E-05 ;
39 C35 normal data MW   435.08 TCRIT   924.56 PCRIT  1.11730E+06 VCRIT
 1.52923E-03 ACENTRICFACTOR   1.1519 TBOIL   758.65 SG  0.94099 CNUMBER
  29.757 REFVISLB  1.20800E-04 VSPR1  9.04173E-05 ;
40 C36 normal data MW   579.66 TCRIT   1015.2 PCRIT  1.05448E+06 VCRIT
 1.59405E-03 ACENTRICFACTOR   1.2205 TBOIL   840.35 SG  0.96914 CNUMBER
  39.929 REFVISLB  7.03900E-05 VSPR1  4.12448E-05 ; ;
bipset PR78ABIP 1 linear eos none  1  2 0.1 0  1  3 0.1 0  1  4 0.1 0  1  5
0.1 0  1  6 0.1 0  1  7 0.1 0  1  8 0.1 0  1  9 0.1 0  1 10 0.1 0  1 11 0.1 0
 1 12 0.1 0  1 13 0.1 0  1 14 0.1 0  1 15 0.1 0  1 16 0.1 0  1 17 0.1 0  1 18
0.1 0  1 19 0.1 0  1 20 0.1 0  1 21 0.1 0  1 22 0.1 0  1 23 0.1 0  1 24 0.1 0
 1 25 0.1 0  1 26 0.1 0  1 27 0.1 0  1 28 0.1 0  1 29 0.1 0  1 30 0.1 0  1 31
0.1 0  1 32 0.1 0  1 33 0.1 0  1 34 0.1 0  1 35 0.1 0  1 36 0.1 0  1 37 0.1 0
 1 38 0.1 0  1 39 0.1 0  1 40 0.1 0  2  3 0.105 0  2  4 0.13 0  2  5 0.125 0
 2  6 0.115 0  2  7 0.115 0  2  8 0.115 0  2  9 0.115 0  2 10 0.115 0  2 11
0.115 0  2 12 0.115 0  2 13 0.115 0  2 14 0.115 0  2 15 0.115 0  2 16 0.115 0
 2 17 0.115 0  2 18 0.115 0  2 19 0.115 0  2 20 0.115 0  2 21 0.115 0  2 22
0.115 0  2 23 0.115 0  2 24 0.115 0  2 25 0.115 0  2 26 0.115 0  2 27 0.115 0
 2 28 0.115 0  2 29 0.115 0  2 30 0.115 0  2 31 0.115 0  2 32 0.115 0  2 33
0.115 0  2 34 0.115 0  2 35 0.115 0  2 36 0.115 0  2 37 0.115 0  2 38 0.115 0
 2 39 0.115 0  2 40 0.115 0  3  4 -0.00126 0  3  5 -0.00414 0  3  6 -0.00791 0
 3  7 -0.00745 0  3  8 -0.01067 0  3  9 -0.01083 0  3 10 -0.03 0  3 11
0.02274266 -7.55245E-5  3 12 0.05131445 -.000151175  3 13 0.07961711
-.000226699  3 14 0.1079798 -.000302224  3 15 0.1363924 -.000377748  3 16
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-.000831147  3 22 0.3367193 -.000906671  3 23 0.2813335 -.000725035  3 24
0.2259751 -.000543776  3 25 0.1707167 -.000362517  3 26 0.1154584 -.000181259
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 3 32 0.06712 0  3 33 0.0683 0  3 34 0.06943 0  3 35 0.07049 0  3 36 0.07151 0
 3 37 0.07248 0  3 38 0.0734 0  3 39 0.07427 0  3 40 0.08336 0  4  6 1.E-20 0
 4  7 1.E-20 0  4  8 1.E-20 0  4  9 1.E-20 0  4 10 1.E-20 0  4 11 1.E-20 0  4
12 1.E-20 0  4 13 1.E-20 0  4 14 1.E-20 0  4 15 1.E-20 0  4 16 1.E-20 0  4 17
1.E-20 0  4 18 1.E-20 0  4 19 1.E-20 0  4 20 1.E-20 0  4 21 1.E-20 0  4 22
1.E-20 0  4 23 1.E-20 0  4 24 1.E-20 0  4 25 1.E-20 0  4 26 1.E-20 0  4 27
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1.E-20 0  4 28 1.E-20 0  4 29 1.E-20 0  4 30 1.E-20 0  4 31 1.E-20 0  4 32
1.E-20 0  4 33 1.E-20 0  4 34 1.E-20 0  4 35 1.E-20 0  4 36 1.E-20 0  4 37
1.E-20 0  4 38 1.E-20 0  4 39 1.E-20 0  4 40 1.E-20 0  5  8 1.E-20 0  5  9
1.E-20 0  5 10 1.E-20 0  5 11 1.E-20 0  5 12 1.E-20 0  5 13 1.E-20 0  5 14
1.E-20 0  5 15 1.E-20 0  5 16 1.E-20 0  5 17 1.E-20 0  5 18 1.E-20 0  5 19
1.E-20 0  5 20 1.E-20 0  5 21 1.E-20 0  5 22 1.E-20 0  5 23 1.E-20 0  5 24
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1.E-20 0  5 35 1.E-20 0  5 36 1.E-20 0  5 37 1.E-20 0  5 38 1.E-20 0  5 39
1.E-20 0  5 40 1.E-20 0  6 10 1.E-20 0  6 11 1.E-20 0  6 12 1.E-20 0  6 13
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1.E-20 0  6 39 1.E-20 0  6 40 1.E-20 0  7 10 1.E-20 0  7 11 1.E-20 0  7 12
1.E-20 0  7 13 1.E-20 0  7 14 1.E-20 0  7 15 1.E-20 0  7 16 1.E-20 0  7 17
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1.E-20 0  7 23 1.E-20 0  7 24 1.E-20 0  7 25 1.E-20 0  7 26 1.E-20 0  7 27
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1.E-20 0  8 38 1.E-20 0  8 39 1.E-20 0  8 40 1.E-20 0  9 11 1.E-20 0  9 12
1.E-20 0  9 13 1.E-20 0  9 14 1.E-20 0  9 15 1.E-20 0  9 16 1.E-20 0  9 17
1.E-20 0  9 18 1.E-20 0  9 19 1.E-20 0  9 20 1.E-20 0  9 21 1.E-20 0  9 22
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1.E-20 0  9 38 1.E-20 0  9 39 1.E-20 0  9 40 1.E-20 0 11 12 0.00014 0 11 13
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23 0.00014 0 21 24 0.0003 0 21 25 0.00049 0 21 26 0.00072 0 21 27 0.00097 0 21
28 0.00124 0 21 29 0.00152 0 21 30 0.00181 0 21 31 0.00211 0 21 32 0.00241 0
21 33 0.0027 0 21 34 0.003 0 21 35 0.0033 0 21 36 0.00359 0 21 37 0.00388 0 21
38 0.00416 0 21 39 0.00444 0 21 40 0.00774 0 22 23 3.E-5 0 22 24 0.00012 0 22
25 0.00026 0 22 26 0.00043 0 22 27 0.00063 0 22 28 0.00084 0 22 29 0.00108 0
22 30 0.00132 0 22 31 0.00158 0 22 32 0.00184 0 22 33 0.0021 0 22 34 0.00236 0
22 35 0.00263 0 22 36 0.00289 0 22 37 0.00315 0 22 38 0.0034 0 22 39 0.00366 0
22 40 0.0067 0 23 24 3.E-5 0 23 25 0.00011 0 23 26 0.00022 0 23 27 0.00037 0
23 28 0.00054 0 23 29 0.00073 0 23 30 0.00094 0 23 31 0.00116 0 23 32 0.00138
0 23 33 0.00161 0 23 34 0.00184 0 23 35 0.00207 0 23 36 0.00231 0 23 37
0.00254 0 23 38 0.00277 0 23 39 0.003 0 23 40 0.0058 0 24 25 2.E-5 0 24 26
9.E-5 0 24 27 0.00019 0 24 28 0.00032 0 24 29 0.00047 0 24 30 0.00064 0 24 31
0.00082 0 24 32 0.00101 0 24 33 0.00121 0 24 34 0.00141 0 24 35 0.00162 0 24
36 0.00182 0 24 37 0.00203 0 24 38 0.00224 0 24 39 0.00244 0 24 40 0.00502 0
25 26 2.E-5 0 25 27 8.E-5 0 25 28 0.00017 0 25 29 0.00028 0 25 30 0.00041 0 25
31 0.00056 0 25 32 0.00072 0 25 33 0.00089 0 25 34 0.00106 0 25 35 0.00124 0
25 36 0.00142 0 25 37 0.00161 0 25 38 0.00179 0 25 39 0.00198 0 25 40 0.00435
0 26 27 2.E-5 0 26 28 7.E-5 0 26 29 0.00015 0 26 30 0.00025 0 26 31 0.00036 0
26 32 0.00049 0 26 33 0.00063 0 26 34 0.00078 0 26 35 0.00094 0 26 36 0.0011 0
26 37 0.00126 0 26 38 0.00142 0 26 39 0.00159 0 26 40 0.00376 0 27 28 2.E-5 0
27 29 6.E-5 0 27 30 0.00013 0 27 31 0.00022 0 27 32 0.00032 0 27 33 0.00043 0
27 34 0.00056 0 27 35 0.00069 0 27 36 0.00083 0 27 37 0.00097 0 27 38 0.00112
0 27 39 0.00126 0 27 40 0.00325 0 28 29 1.E-5 0 28 30 5.E-5 0 28 31 0.00011 0
28 32 0.00019 0 28 33 0.00028 0 28 34 0.00038 0 28 35 0.00049 0 28 36 0.00061
0 28 37 0.00073 0 28 38 0.00086 0 28 39 0.00099 0 28 40 0.00281 0 29 30 1.E-5
0 29 31 5.E-5 0 29 32 1.E-4 0 29 33 0.00017 0 29 34 0.00025 0 29 35 0.00034 0
29 36 0.00044 0 29 37 0.00054 0 29 38 0.00065 0 29 39 0.00077 0 29 40 0.00242
0 30 31 1.E-5 0 30 32 4.E-5 0 30 33 9.E-5 0 30 34 0.00015 0 30 35 0.00022 0 30
36 0.0003 0 30 37 0.00039 0 30 38 0.00048 0 30 39 0.00058 0 30 40 0.00208 0 31
32 1.E-5 0 31 33 4.E-5 0 31 34 8.E-5 0 31 35 0.00013 0 31 36 0.0002 0 31 37
0.00027 0 31 38 0.00035 0 31 39 0.00043 0 31 40 0.00179 0 32 33 1.E-5 0 32 34
3.E-5 0 32 35 7.E-5 0 32 36 0.00012 0 32 37 0.00018 0 32 38 0.00024 0 32 39
0.00031 0 32 40 0.00153 0 33 34 1.E-5 0 33 35 3.E-5 0 33 36 6.E-5 0 33 37
0.00011 0 33 38 0.00016 0 33 39 0.00022 0 33 40 0.00131 0 34 35 1.E-5 0 34 36
3.E-5 0 34 37 6.E-5 0 34 38 1.E-4 0 34 39 0.00014 0 34 40 0.00112 0 35 36
1.E-5 0 35 37 2.E-5 0 35 38 5.E-5 0 35 39 9.E-5 0 35 40 0.00095 0 36 37 1.E-5
0 36 38 2.E-5 0 36 39 5.E-5 0 36 40 0.0008 0 37 38 1.E-5 0 37 39 2.E-5 0 37 40
0.00067 0 38 40 0.00056 0 39 40 0.00046 0 ;
bipset LGSTBIP 1 constant eos none ;
bipdata erase ;
model MPR78A PRA PSAT78 LDEN VDW PR78ABIP;
model MLBCMPR78A LBC LFIT MPR78A;
model MSTRAPP SPTHCOND;
bipdata erase ;
model MLGSTMPR78A LGST MPR78A LGSTBIP;
bipdata erase ;
pd GAS gas MPR78A MPR78A MPR78A MLBCMPR78A MSTRAPP MLGSTMPR78A;
pd LIQUID1 liquid MPR78A MPR78A MPR78A MLBCMPR78A MSTRAPP MLGSTMPR78A;
key LIQUID1 not 007732-18-5;
pd LIQUID2 liquid MPR78A MPR78A MPR78A MLBCMPR78A MSTRAPP MLGSTMPR78A;
key LIQUID2 not 007732-18-5;
temperature 390.37222222;
pressure 41368543.759;
amounts 2.027902624101 4.193359402367 298.7272549384 29.28042530284
20.84331556095 4.328189734349 9.897544724322 4.028566572792 4.882945903446
6.537681713487 8.460716503198 9.30556222942 6.573999947368 5.571624766192
4.09847876478 3.447479820209 3.312195442264 2.998953169797 2.550426972978
2.267833936952 2.016553289411 1.832462372455 1.665177052806 1.433196307017
1.180332622106 1.053674210261 .9515297444607 .8543793306541 .7004822433986
.6378338796237 .6736976139501 .6001539614478 .5365975057482 .4916542129514
.4666853137601 .4194722447439 .3645413015521 .3568238809689 .2959912474511
3.726674088607;
inputunits temperature degF pressure psi enthalpy BTU/lbmol entropy BTU/lbmol/F
volume kg/m3 amounts lbmol viscosity cP thcond BTU/hr/ft/F surten dyne/cm
diffusion cm2/s;
outputunits temperature degF pressure psi enthalpy BTU/lbmol entropy
BTU/lbmol/F volume lbmol/ft3 amounts lbmol viscosity cP thcond BTU/hr/ft/F
surten dyne/cm diffusion cm2/s;
set physprops lVCS;
```

MultiFlash – CL68379-EOS20120322.mfl

```
# Multiflash version: 4.1.09   March 2012 #
# Date: 04 April 2012   Time: 11:24 #
remove all;
units temperature K pressure Pa enthalpy J/mol entropy J/mol/K volume m3/mol
amounts mol viscosity Pas thcond W/m/K surten N/m diffusion m2/s;
title "CL68379 bottomhole fluid sample with EOS 20120322.   Contains about "
"0.4 wt% OBM in reservoir fluid. T-dependent BIPs Library component "
"properties changed to same as PhazeComp. T-dep BIPs altered from previous "
"version to get correct BIP at 243F not 240F. Re" ;
datum enthalpy compound entropy compound; set fractions;
properties PFC6PLUSMW   201.12 ;
puredata INFODATA ;
components overwrite 1 NITROGEN data TCRIT   126.20 PCRIT  3.39801E+06
ACENTRICFACTOR  3.70000E-02 VSRKS1 -4.02589E-06 ;
2 "CARBON DIOXIDE" data TCRIT   304.12 PCRIT  7.37401E+06 ACENTRICFACTOR
 0.22500 VSPR1  5.09546E-08 ;
3 METHANE data TCRIT   190.56 PCRIT  4.59901E+06 VCRIT  9.85975E-05
ACENTRICFACTOR  1.10000E-02 VSPR1 -4.01930E-06 ;
4 ETHANE data TCRIT   305.32 PCRIT  4.87197E+06 VCRIT  1.45498E-04
ACENTRICFACTOR  9.90000E-02 VSPR1 -2.54577E-06 ;
5 PROPANE data MW   44.097 TCRIT   369.83 PCRIT  4.24800E+06 VSPR1
-3.59343E-06 ;
6 I-BUTANE data MW   58.123 PCRIT  3.64002E+06 ACENTRICFACTOR  0.18600 VSPR1
-4.49142E-06 ;
7 N-BUTANE data TCRIT   425.12 PCRIT  3.79598E+06 ACENTRICFACTOR  0.20000
VSPR1 -3.90684E-06 ;
8 I-PENTANE data TCRIT   460.39 PCRIT  3.38098E+06 ACENTRICFACTOR  0.22900
VSPR1 -4.97311E-06 ;
9 PENTANE data PCRIT  3.37002E+06 ACENTRICFACTOR  0.25200 VSPR1 -2.63886E-06 ;
;
chardata INFOCHAR TBSOEREIDE ;
petrofracs overwrite 10 C6 normal data MW   83.282 TCRIT   512.44 PCRIT
 3.30948E+06 VCRIT  3.46244E-04 ACENTRICFACTOR  0.24969 TBOIL   337.85 SG
 0.69568 CNUMBER   5.9292 REFVISLB  2.26070E-04 VSPR1 -5.54877E-07 ;
11 C7 normal data MW   98.471 TCRIT   553.18 PCRIT  3.03631E+06 VCRIT
 4.66510E-04 ACENTRICFACTOR  0.28313 TBOIL   370.98 SG  0.76726 CNUMBER
  7.1997 REFVISLB  1.34400E-03 VSPR1  8.09391E-06 ;
12 C8 normal data MW   109.87 TCRIT   579.61 PCRIT  2.85684E+06 VCRIT
 5.12238E-04 ACENTRICFACTOR  0.31047 TBOIL   393.58 SG  0.78591 CNUMBER
  7.9958 REFVISLB  1.18160E-03 VSPR1  9.88729E-06 ;
13 C9 normal data MW   123.39 TCRIT   608.62 PCRIT  2.65290E+06 VCRIT
 5.69747E-04 ACENTRICFACTOR  0.34698 TBOIL   419.67 SG  0.80319 CNUMBER
  8.9300 REFVISLB  1.06690E-03 VSPR1  1.31971E-05 ;
14 C10 normal data MW   136.62 TCRIT   634.18 PCRIT  2.47860E+06 VCRIT
 6.25922E-04 ACENTRICFACTOR  0.38361 TBOIL   443.50 SG  0.81695 CNUMBER
  9.7773 REFVISLB  9.69100E-04 VSPR1  1.67277E-05 ;
15 C11 normal data MW   149.76 TCRIT   657.32 PCRIT  2.32698E+06 VCRIT
 6.81347E-04 ACENTRICFACTOR  0.42051 TBOIL   465.72 SG  0.82855 CNUMBER
  10.705 REFVISLB  8.82700E-04 VSPR1  2.04793E-05 ;
16 C12 normal data MW   162.81 TCRIT   678.41 PCRIT  2.19433E+06 VCRIT
 7.35698E-04 ACENTRICFACTOR  0.45752 TBOIL   486.53 SG  0.83860 CNUMBER
  11.611 REFVISLB  8.04100E-04 VSPR1  2.44042E-05 ;
17 C13 normal data MW   175.77 TCRIT   697.77 PCRIT  2.07774E+06 VCRIT
 7.88808E-04 ACENTRICFACTOR  0.49116 TBOIL   506.06 SG  0.84747 CNUMBER
  12.526 REFVISLB  7.32000E-04 VSPR1  2.84490E-05 ;
18 C14 normal data MW   188.63 TCRIT   715.63 PCRIT  1.97480E+06 VCRIT
 8.40335E-04 ACENTRICFACTOR  0.52632 TBOIL   524.44 SG  0.85541 CNUMBER
  13.400 REFVISLB  6.65200E-04 VSPR1  3.25640E-05 ;
19 C15 normal data MW   201.39 TCRIT   732.18 PCRIT  1.88337E+06 VCRIT
 8.90240E-04 ACENTRICFACTOR  0.56109 TBOIL   541.77 SG  0.86261 CNUMBER
  14.189 REFVISLB  6.03600E-04 VSPR1  3.67048E-05 ;
20 C16 normal data MW   214.05 TCRIT   747.58 PCRIT  1.80188E+06 VCRIT
 9.38404E-04 ACENTRICFACTOR  0.59542 TBOIL   558.16 SG  0.86919 CNUMBER
  14.935 REFVISLB  5.46800E-04 VSPR1  4.08277E-05 ;
21 C17 normal data MW   226.61 TCRIT   761.97 PCRIT  1.72900E+06 VCRIT
 9.84662E-04 ACENTRICFACTOR  0.62930 TBOIL   573.66 SG  0.87525 CNUMBER
  15.768 REFVISLB  4.95100E-04 VSPR1  4.48898E-05 ;
22 C18 normal data MW   239.06 TCRIT   775.45 PCRIT  1.66350E+06 VCRIT
 1.02906E-03 ACENTRICFACTOR  0.66270 TBOIL   588.36 SG  0.88086 CNUMBER
  16.527 REFVISLB  4.48200E-04 VSPR1  4.88697E-05 ;
23 C19 normal data MW   251.41 TCRIT   788.12 PCRIT  1.60441E+06 VCRIT
 1.07156E-03 ACENTRICFACTOR  0.69560 TBOIL   602.33 SG  0.88609 CNUMBER
  17.333 REFVISLB  4.05900E-04 VSPR1  5.27332E-05 ;
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24 C20 normal data MW    263.65 TCRIT   800.06 PCRIT  1.55091E+06 VCRIT
 1.11221E-03 ACENTRICFACTOR  0.72799 TBOIL   615.61 SG  0.89098 CNUMBER
  18.287 REFVISLB  3.68000E-04 VSPR1  5.64599E-05 ;
25 C21 normal data MW    275.78 TCRIT   811.34 PCRIT  1.50237E+06 VCRIT
 1.15091E-03 ACENTRICFACTOR  0.75988 TBOIL   628.25 SG  0.89558 CNUMBER
  19.198 REFVISLB  3.34200E-04 VSPR1  6.00317E-05 ;
26 C22 normal data MW    287.81 TCRIT   822.03 PCRIT  1.45817E+06 VCRIT
 1.18783E-03 ACENTRICFACTOR  0.79124 TBOIL   640.31 SG  0.89991 CNUMBER
  19.999 REFVISLB  3.04300E-04 VSPR1  6.34355E-05 ;
27 C23 normal data MW    299.73 TCRIT   832.17 PCRIT  1.41777E+06 VCRIT
 1.22294E-03 ACENTRICFACTOR  0.82208 TBOIL   651.83 SG  0.90401 CNUMBER
  20.791 REFVISLB  2.77800E-04 VSPR1  6.66597E-05 ;
28 C24 normal data MW    311.54 TCRIT   841.82 PCRIT  1.38081E+06 VCRIT
 1.25621E-03 ACENTRICFACTOR  0.85239 TBOIL   662.83 SG  0.90790 CNUMBER
  21.576 REFVISLB  2.54300E-04 VSPR1  6.96905E-05 ;
29 C25 normal data MW    323.26 TCRIT   851.02 PCRIT  1.34682E+06 VCRIT
 1.28799E-03 ACENTRICFACTOR  0.88218 TBOIL   673.37 SG  0.91159 CNUMBER
  22.353 REFVISLB  2.33600E-04 VSPR1  7.25327E-05 ;
30 C26 normal data MW    334.87 TCRIT   859.79 PCRIT  1.31552E+06 VCRIT
 1.31813E-03 ACENTRICFACTOR  0.91144 TBOIL   683.47 SG  0.91511 CNUMBER
  23.122 REFVISLB  2.15300E-04 VSPR1  7.51809E-05 ;
31 C27 normal data MW    346.38 TCRIT   868.19 PCRIT  1.28663E+06 VCRIT
 1.34668E-03 ACENTRICFACTOR  0.94018 TBOIL   693.15 SG  0.91848 CNUMBER
  23.884 REFVISLB  1.99100E-04 VSPR1  7.76287E-05 ;
32 C28 normal data MW    357.79 TCRIT   876.24 PCRIT  1.25981E+06 VCRIT
 1.37395E-03 ACENTRICFACTOR  0.96841 TBOIL   702.46 SG  0.92169 CNUMBER
  24.639 REFVISLB  1.84800E-04 VSPR1  7.98855E-05 ;
33 C29 normal data MW    369.10 TCRIT   883.95 PCRIT  1.23499E+06 VCRIT
 1.39964E-03 ACENTRICFACTOR  0.99612 TBOIL   711.40 SG  0.92478 CNUMBER
  25.388 REFVISLB  1.72200E-04 VSPR1  8.19443E-05 ;
34 C30 normal data MW    380.32 TCRIT   891.37 PCRIT  1.21189E+06 VCRIT
 1.42415E-03 ACENTRICFACTOR    1.0233 TBOIL   720.00 SG  0.92774 CNUMBER
  26.129 REFVISLB  1.61000E-04 VSPR1  8.38118E-05 ;
35 C31 normal data MW    391.45 TCRIT   898.49 PCRIT  1.19038E+06 VCRIT
 1.44735E-03 ACENTRICFACTOR    1.0500 TBOIL   728.29 SG  0.93058 CNUMBER
  26.864 REFVISLB  1.51000E-04 VSPR1  8.54912E-05 ;
36 C32 normal data MW    402.49 TCRIT   905.36 PCRIT  1.17032E+06 VCRIT
 1.46942E-03 ACENTRICFACTOR    1.0762 TBOIL   736.29 SG  0.93333 CNUMBER
  27.591 REFVISLB  1.42100E-04 VSPR1  8.69809E-05 ;
37 C33 normal data MW    413.44 TCRIT   911.98 PCRIT  1.15149E+06 VCRIT
 1.49041E-03 ACENTRICFACTOR    1.1019 TBOIL   744.00 SG  0.93597 CNUMBER
  28.338 REFVISLB  1.34200E-04 VSPR1  8.83013E-05 ;
38 C34 normal data MW    424.30 TCRIT   918.38 PCRIT  1.13384E+06 VCRIT
 1.51034E-03 ACENTRICFACTOR    1.1272 TBOIL   751.45 SG  0.93852 CNUMBER
  29.094 REFVISLB  1.27100E-04 VSPR1  8.94454E-05 ;
39 C35 normal data MW    435.08 TCRIT   924.56 PCRIT  1.11730E+06 VCRIT
 1.52923E-03 ACENTRICFACTOR    1.1519 TBOIL   758.65 SG  0.94099 CNUMBER
  29.757 REFVISLB  1.20800E-04 VSPR1  9.04173E-05 ;
40 C36 normal data MW    579.66 TCRIT    1015.2 PCRIT  1.05448E+06 VCRIT
 1.59405E-03 ACENTRICFACTOR    1.2205 TBOIL   840.35 SG  0.96914 CNUMBER
  39.929 REFVISLB  7.03900E-05 VSPR1  4.12448E-05 ; ;
bipset PR78ABIP 1 linear eos none  1  2 0.1 0  1  3 0.1 0  1  4 0.1 0  1  5
0.1 0  1  6 0.1 0  1  7 0.1 0  1  8 0.1 0  1  9 0.1 0  1 10 0.1 0  1 11 0.1 0
 1 12 0.1 0  1 13 0.1 0  1 14 0.1 0  1 15 0.1 0  1 16 0.1 0  1 17 0.1 0  1 18
0.1 0  1 19 0.1 0  1 20 0.1 0  1 21 0.1 0  1 22 0.1 0  1 23 0.1 0  1 24 0.1 0
 1 25 0.1 0  1 26 0.1 0  1 27 0.1 0  1 28 0.1 0  1 29 0.1 0  1 30 0.1 0  1 31
0.1 0  1 32 0.1 0  1 33 0.1 0  1 34 0.1 0  1 35 0.1 0  1 36 0.1 0  1 37 0.1 0
 1 38 0.1 0  1 39 0.1 0  1 40 0.1 0  2  3 0.105 0  2  4 0.13 0  2  5 0.125 0
 2  6 0.115 0  2  7 0.115 0  2  8 0.115 0  2  9 0.115 0  2 10 0.115 0  2 11
0.115 0  2 12 0.115 0  2 13 0.115 0  2 14 0.115 0  2 15 0.115 0  2 16 0.115 0
 2 17 0.115 0  2 18 0.115 0  2 19 0.115 0  2 20 0.115 0  2 21 0.115 0  2 22
0.115 0  2 23 0.115 0  2 24 0.115 0  2 25 0.115 0  2 26 0.115 0  2 27 0.115 0
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0.115 0  2 34 0.115 0  2 35 0.115 0  2 36 0.115 0  2 37 0.115 0  2 38 0.115 0
 2 39 0.115 0  2 40 0.115 0  3  4 -0.00126 0  3  5 -0.00414 0  3  6 -0.00791 0
 3  7 -0.00745 0  3  8 -0.01067 0  3  9 -0.01083 0  3 10 -0.03 0  3 11
0.02274266 -7.55245E-5  3 12 0.05131445 -.000151175  3 13 0.07961711
-.000226699  3 14 0.1079798 -.000302224  3 15 0.1363924 -.000377748  3 16
0.1648551 -.000453273  3 17 0.1934069 -.000528923  3 18 0.2219695 -.000604448
 3 19 0.2505722 -.000679972  3 20 0.279274 -.000755622  3 21 0.3079766
-.000831147  3 22 0.3367193 -.000906671  3 23 0.2813335 -.000725035  3 24
0.2259751 -.000543776  3 25 0.1707167 -.000362517  3 26 0.1154584 -.000181259
 3 27 0.06015 0  3 28 0.0617 0  3 29 0.06317 0  3 30 0.06456 0  3 31 0.06587 0
 3 32 0.06712 0  3 33 0.0683 0  3 34 0.06943 0  3 35 0.07049 0  3 36 0.07151 0
 3 37 0.07248 0  3 38 0.0734 0  3 39 0.07427 0  3 40 0.08336 0  4  6 1.E-20 0
 4  7 1.E-20 0  4  8 1.E-20 0  4  9 1.E-20 0  4 10 1.E-20 0  4 11 1.E-20 0  4
12 1.E-20 0  4 13 1.E-20 0  4 14 1.E-20 0  4 15 1.E-20 0  4 16 1.E-20 0  4 17
1.E-20 0  4 18 1.E-20 0  4 19 1.E-20 0  4 20 1.E-20 0  4 21 1.E-20 0  4 22
1.E-20 0  4 23 1.E-20 0  4 24 1.E-20 0  4 25 1.E-20 0  4 26 1.E-20 0  4 27
```

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1.E-20 0  4 28 1.E-20 0  4 29 1.E-20 0  4 30 1.E-20 0  4 31 1.E-20 0  4 32
1.E-20 0  4 33 1.E-20 0  4 34 1.E-20 0  4 35 1.E-20 0  4 36 1.E-20 0  4 37
1.E-20 0  4 38 1.E-20 0  4 39 1.E-20 0  4 40 1.E-20 0  5  8 1.E-20 0  5  9
1.E-20 0  5 10 1.E-20 0  5 11 1.E-20 0  5 12 1.E-20 0  5 13 1.E-20 0  5 14
1.E-20 0  5 15 1.E-20 0  5 16 1.E-20 0  5 17 1.E-20 0  5 18 1.E-20 0  5 19
1.E-20 0  5 20 1.E-20 0  5 21 1.E-20 0  5 22 1.E-20 0  5 23 1.E-20 0  5 24
1.E-20 0  5 25 1.E-20 0  5 26 1.E-20 0  5 27 1.E-20 0  5 28 1.E-20 0  5 29
1.E-20 0  5 30 1.E-20 0  5 31 1.E-20 0  5 32 1.E-20 0  5 33 1.E-20 0  5 34
1.E-20 0  5 35 1.E-20 0  5 36 1.E-20 0  5 37 1.E-20 0  5 38 1.E-20 0  5 39
1.E-20 0  5 40 1.E-20 0  6 10 1.E-20 0  6 11 1.E-20 0  6 12 1.E-20 0  6 13
1.E-20 0  6 14 1.E-20 0  6 15 1.E-20 0  6 16 1.E-20 0  6 17 1.E-20 0  6 18
1.E-20 0  6 19 1.E-20 0  6 20 1.E-20 0  6 21 1.E-20 0  6 22 1.E-20 0  6 23
1.E-20 0  6 24 1.E-20 0  6 25 1.E-20 0  6 26 1.E-20 0  6 27 1.E-20 0  6 28
1.E-20 0  6 29 1.E-20 0  6 30 1.E-20 0  6 31 1.E-20 0  6 32 1.E-20 0  6 33
1.E-20 0  6 34 1.E-20 0  6 35 1.E-20 0  6 36 1.E-20 0  6 37 1.E-20 0  6 38
1.E-20 0  6 39 1.E-20 0  6 40 1.E-20 0  7 10 1.E-20 0  7 11 1.E-20 0  7 12
1.E-20 0  7 13 1.E-20 0  7 14 1.E-20 0  7 15 1.E-20 0  7 16 1.E-20 0  7 17
1.E-20 0  7 18 1.E-20 0  7 19 1.E-20 0  7 20 1.E-20 0  7 21 1.E-20 0  7 22
1.E-20 0  7 23 1.E-20 0  7 24 1.E-20 0  7 25 1.E-20 0  7 26 1.E-20 0  7 27
1.E-20 0  7 28 1.E-20 0  7 29 1.E-20 0  7 30 1.E-20 0  7 31 1.E-20 0  7 32
1.E-20 0  7 33 1.E-20 0  7 34 1.E-20 0  7 35 1.E-20 0  7 36 1.E-20 0  7 37
1.E-20 0  7 38 1.E-20 0  7 39 1.E-20 0  7 40 1.E-20 0  8 11 1.E-20 0  8 12
1.E-20 0  8 13 1.E-20 0  8 14 1.E-20 0  8 15 1.E-20 0  8 16 1.E-20 0  8 17
1.E-20 0  8 18 1.E-20 0  8 19 1.E-20 0  8 20 1.E-20 0  8 21 1.E-20 0  8 22
1.E-20 0  8 23 1.E-20 0  8 24 1.E-20 0  8 25 1.E-20 0  8 26 1.E-20 0  8 27
1.E-20 0  8 28 1.E-20 0  8 29 1.E-20 0  8 30 1.E-20 0  8 31 1.E-20 0  8 32
1.E-20 0  8 33 1.E-20 0  8 34 1.E-20 0  8 35 1.E-20 0  8 36 1.E-20 0  8 37
1.E-20 0  8 38 1.E-20 0  8 39 1.E-20 0  8 40 1.E-20 0  9 11 1.E-20 0  9 12
1.E-20 0  9 13 1.E-20 0  9 14 1.E-20 0  9 15 1.E-20 0  9 16 1.E-20 0  9 17
1.E-20 0  9 18 1.E-20 0  9 19 1.E-20 0  9 20 1.E-20 0  9 21 1.E-20 0  9 22
1.E-20 0  9 23 1.E-20 0  9 24 1.E-20 0  9 25 1.E-20 0  9 26 1.E-20 0  9 27
1.E-20 0  9 28 1.E-20 0  9 29 1.E-20 0  9 30 1.E-20 0  9 31 1.E-20 0  9 32
1.E-20 0  9 33 1.E-20 0  9 34 1.E-20 0  9 35 1.E-20 0  9 36 1.E-20 0  9 37
1.E-20 0  9 38 1.E-20 0  9 39 1.E-20 0  9 40 1.E-20 0 11 12 0.00014 0 11 13
0.00063 0 11 14 0.00138 0 11 15 0.00232 0 11 16 0.00338 0 11 17 0.00453 0 11
18 0.00573 0 11 19 0.00697 0 11 20 0.00821 0 11 21 0.00945 0 11 22 0.01068 0
11 23 0.01188 0 11 24 0.01305 0 11 25 0.01419 0 11 26 0.0153 0 11 27 0.01637 0
11 28 0.0174 0 11 29 0.01839 0 11 30 0.01934 0 11 31 0.02026 0 11 32 0.02114 0
11 33 0.02199 0 11 34 0.02281 0 11 35 0.02359 0 11 36 0.02434 0 11 37 0.02506
0 11 38 0.02575 0 11 39 0.02642 0 11 40 0.03359 0 12 13 0.00018 0 12 14
0.00065 0 12 15 0.00133 0 12 16 0.00216 0 12 17 0.0031 0 12 18 0.00411 0 12 19
0.00517 0 12 20 0.00625 0 12 21 0.00734 0 12 22 0.00843 0 12 23 0.0095 0 12 24
0.01056 0 12 25 0.01159 0 12 26 0.01259 0 12 27 0.01357 0 12 28 0.01451 0 12
29 0.01542 0 12 30 0.0163 0 12 31 0.01715 0 12 32 0.01796 0 12 33 0.01875 0 12
34 0.0195 0 12 35 0.02023 0 12 36 0.02093 0 12 37 0.0216 0 12 38 0.02224 0 12
39 0.02287 0 12 40 0.0296 0 13 14 0.00015 0 13 15 0.00053 0 13 16 0.00109 0 13
17 0.00179 0 13 18 0.00257 0 13 19 0.00342 0 13 20 0.00431 0 13 21 0.00523 0
13 22 0.00616 0 13 23 0.00708 0 13 24 0.008 0 13 25 0.0089 0 13 26 0.00979 0
13 27 0.01065 0 13 28 0.01149 0 13 29 0.01231 0 13 30 0.0131 0 13 31 0.01386 0
13 32 0.0146 0 13 33 0.01531 0 13 34 0.016 0 13 35 0.01666 0 13 36 0.0173 0 13
37 0.01791 0 13 38 0.0185 0 13 39 0.01907 0 13 40 0.0253 0 14 15 0.00012 0 14
16 0.00044 0 14 17 0.00091 0 14 18 0.0015 0 14 19 0.00216 0 14 20 0.00288 0 14
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0 14 36 0.01433 0 14 37 0.01489 0 14 38 0.01543 0 14 39 0.01596 0 14 40
0.02171 0 15 16 1.E-4 0 15 17 0.00037 0 15 18 0.00077 0 15 19 0.00126 0 15 20
0.00183 0 15 21 0.00244 0 15 22 0.00309 0 15 23 0.00376 0 15 24 0.00443 0 15
25 0.00512 0 15 26 0.0058 0 15 27 0.00647 0 15 28 0.00713 0 15 29 0.00778 0 15
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0 15 40 0.01867 0 16 17 9.E-5 0 16 18 0.00031 0 16 19 0.00065 0 16 20 0.00107
0 16 21 0.00155 0 16 22 0.00208 0 16 23 0.00263 0 16 24 0.0032 0 16 25 0.00379
0 16 26 0.00438 0 16 27 0.00496 0 16 28 0.00555 0 16 29 0.00612 0 16 30
0.00669 0 16 31 0.00724 0 16 32 0.00778 0 16 33 0.00831 0 16 34 0.00882 0 16
35 0.00932 0 16 36 0.0098 0 16 37 0.01027 0 16 38 0.01072 0 16 39 0.01116 0 16
40 0.01608 0 17 18 7.E-5 0 17 19 0.00027 0 17 20 0.00055 0 17 21 0.00091 0 17
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0 17 32 0.00625 0 17 33 0.00673 0 17 34 0.00719 0 17 35 0.00764 0 17 36
0.00808 0 17 37 0.0085 0 17 38 0.00892 0 17 39 0.00932 0 17 40 0.01387 0 18 19
6.E-5 0 18 20 0.00023 0 18 21 0.00047 0 18 22 0.00078 0 18 23 0.00113 0 18 24
0.00152 0 18 25 0.00193 0 18 26 0.00235 0 18 27 0.00279 0 18 28 0.00324 0 18
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18 39 0.00777 0 18 40 0.01197 0 19 20 5.E-5 0 19 21 0.00019 0 19 22 0.0004 0
19 23 0.00067 0 19 24 0.00097 0 19 25 0.0013 0 19 26 0.00166 0 19 27 0.00203 0
19 28 0.00241 0 19 29 0.0028 0 19 30 0.00318 0 19 31 0.00357 0 19 32 0.00395 0
19 33 0.00433 0 19 34 0.00471 0 19 35 0.00507 0 19 36 0.00543 0 19 37 0.00579
```

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0 19 38 0.00613 0 19 39 0.00647 0 19 40 0.01035 0 20 21 4.E-5 0 20 22 0.00017
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0.00143 0 20 28 0.00175 0 20 29 0.00209 0 20 30 0.00242 0 20 31 0.00276 0 20
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37 0.00475 0 20 38 0.00506 0 20 39 0.00536 0 20 40 0.00895 0 21 22 4.E-5 0 21
23 0.00014 0 21 24 0.0003 0 21 25 0.00049 0 21 26 0.00072 0 21 27 0.00097 0 21
28 0.00124 0 21 29 0.00152 0 21 30 0.00181 0 21 31 0.00211 0 21 32 0.00241 0
21 33 0.0027 0 21 34 0.003 0 21 35 0.0033 0 21 36 0.00359 0 21 37 0.00388 0 21
38 0.00416 0 21 39 0.00444 0 21 40 0.00774 0 22 23 3.E-5 0 22 24 0.00012 0 22
25 0.00026 0 22 26 0.00043 0 22 27 0.00063 0 22 28 0.00084 0 22 29 0.00108 0
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22 40 0.0067 0 23 24 3.E-5 0 23 25 0.00011 0 23 26 0.00022 0 23 27 0.00037 0
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0 23 33 0.00161 0 23 34 0.00184 0 23 35 0.00207 0 23 36 0.00231 0 23 37
0.00254 0 23 38 0.00277 0 23 39 0.003 0 23 40 0.0058 0 24 25 2.E-5 0 24 26
9.E-5 0 24 27 0.00019 0 24 28 0.00032 0 24 29 0.00047 0 24 30 0.00064 0 24 31
0.00082 0 24 32 0.00101 0 24 33 0.00121 0 24 34 0.00141 0 24 35 0.00162 0 24
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31 0.00056 0 25 32 0.00072 0 25 33 0.00089 0 25 34 0.00106 0 25 35 0.00124 0
25 36 0.00142 0 25 37 0.00161 0 25 38 0.00179 0 25 39 0.00198 0 25 40 0.00435
0 26 27 2.E-5 0 26 28 7.E-5 0 26 29 0.00015 0 26 30 0.00025 0 26 31 0.00036 0
26 32 0.00049 0 26 33 0.00063 0 26 34 0.00078 0 26 35 0.00094 0 26 36 0.0011 0
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0 27 39 0.00126 0 27 40 0.00325 0 28 29 1.E-5 0 28 30 5.E-5 0 28 31 0.00011 0
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0 28 37 0.00073 0 28 38 0.00086 0 28 39 0.00099 0 28 40 0.00281 0 29 30 1.E-5
0 29 31 5.E-5 0 29 32 1.E-4 0 29 33 0.00017 0 29 34 0.00025 0 29 35 0.00034 0
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3.E-5 0 32 35 7.E-5 0 32 36 0.00012 0 32 37 0.00018 0 32 38 0.00024 0 32 39
0.00031 0 32 40 0.00153 0 33 34 1.E-5 0 33 35 3.E-5 0 33 36 6.E-5 0 33 37
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3.E-5 0 34 37 6.E-5 0 34 38 1.E-4 0 34 39 0.00014 0 34 40 0.00112 0 35 36
1.E-5 0 35 37 2.E-5 0 35 38 5.E-5 0 35 39 9.E-5 0 35 40 0.00095 0 36 37 1.E-5
0 36 38 2.E-5 0 36 39 5.E-5 0 36 40 0.0008 0 37 38 1.E-5 0 37 39 2.E-5 0 37 40
0.00067 0 38 40 0.00056 0 39 40 0.00046 0 ;
bipset LGSTBIP 1 constant eos none ;
bipdata erase ;
model MPR78A PRA PSAT78 LDEN VDW PR78ABIP;
model MLBCMPR78A LBC LFIT MPR78A;
model MSTRAPP SPTHCOND;
bipdata erase ;
model MLGSTMPR78A LGST MPR78A LGSTBIP;
bipdata erase ;
pd GAS gas MPR78A MPR78A MPR78A MLBCMPR78A MSTRAPP MLGSTMPR78A;
pd LIQUID1 liquid MPR78A MPR78A MPR78A MLBCMPR78A MSTRAPP MLGSTMPR78A;
key LIQUID1 not 007732-18-5;
pd LIQUID2 liquid MPR78A MPR78A MPR78A MLBCMPR78A MSTRAPP MLGSTMPR78A;
key LIQUID2 not 007732-18-5;
temperature 390.37222222;
pressure 41368543.759;
amounts 2.02619711679 4.18983272169 298.476026454 29.25580068026 20.82578648381
4.32454965558 9.88922085074 4.02517869138 4.87883953172 6.53218372037
8.45360099969 9.29773640026 6.56847110997 5.56693915701 4.09503191636
3.44458045778 3.30940993152 2.99643119622 2.54828193466 2.50609784425
2.01485730754 1.97131244002 1.66377681316 1.43199111209 1.179340162
1.05278789077 .95072960752 .85366084034 .69989302691 .63729727985 .67313107708
.59964911314 .53614618134 .49124053671 .46629295636 .41911934988 .36423467311
.35652360282 .29574222524 3.72353976533;
inputunits temperature degF pressure psi enthalpy BTU/lbmol entropy BTU/lbmol/F
volume kg/m3 amounts lbmol viscosity cP thcond BTU/hr/ft/F surten dyne/cm
diffusion cm2/s;
outputunits temperature degF pressure psi enthalpy BTU/lbmol entropy
BTU/lbmol/F volume lbmol/ft3 amounts lbmol viscosity cP thcond BTU/hr/ft/F
surten dyne/cm diffusion cm2/s;
set physprops lVCS;
```

MultiFlash – CL68508-DEC-EOS20120322.mfl

```
# Multiflash version: 4.1.09   March 2012 #
# Date: 04 April 2012   Time: 11:42 #
remove all;
units temperature K pressure Pa enthalpy J/mol entropy J/mol/K volume m3/mol
amounts mol viscosity Pas thcond W/m/K surten N/m diffusion m2/s;

title "CL68508 decontaminated fluid sample with EOS 20120322.   About 0.3 wt% "

"OBM has been removed.  T-dependent BIPs Library component properties changed "
"to same as PhazeComp. T-dep BIPs altered from previous version to get "
"correct BIP at 243F not 240F. R" ;
datum enthalpy compound entropy compound; set fractions;
properties PFC6PLUSMW   200.04 ;
puredata INFODATA ;
components overwrite 1 NITROGEN data TCRIT   126.20 PCRIT  3.39801E+06
ACENTRICFACTOR  3.70000E-02 VSRKS1 -4.02589E-06 ;
2 "CARBON DIOXIDE" data TCRIT   304.12 PCRIT  7.37401E+06 ACENTRICFACTOR
 0.22500 VSPR1  5.09546E-08 ;
3 METHANE data TCRIT   190.56 PCRIT  4.59901E+06 VCRIT  9.85975E-05
ACENTRICFACTOR  1.10000E-02 VSPR1 -4.01930E-06 ;
4 ETHANE data TCRIT   305.32 PCRIT  4.87197E+06 VCRIT  1.45498E-04
ACENTRICFACTOR  9.90000E-02 VSPR1 -2.54577E-06 ;
5 PROPANE data MW   44.097 TCRIT   369.83 PCRIT  4.24800E+06 VSPR1
-3.59343E-06 ;
6 I-BUTANE data MW   58.123 PCRIT  3.64002E+06 ACENTRICFACTOR  0.18600 VSPR1
-4.49142E-06 ;
7 N-BUTANE data TCRIT   425.12 PCRIT  3.79598E+06 ACENTRICFACTOR  0.20000
VSPR1 -3.90684E-06 ;
8 I-PENTANE data TCRIT   460.39 PCRIT  3.38098E+06 ACENTRICFACTOR  0.22900
VSPR1 -4.97311E-06 ;
9 PENTANE data PCRIT  3.37002E+06 ACENTRICFACTOR  0.25200 VSPR1 -2.63886E-06 ;
;
chardata INFOCHAR TBSOEREIDE ;
petrofracs overwrite 10 C6 normal data MW   83.282 TCRIT   512.44 PCRIT
 3.30948E+06 VCRIT  3.46244E-04 ACENTRICFACTOR  0.24969 TBOIL   337.85 SG
 0.69568 CNUMBER   5.9292 REFVISLB  2.26070E-04 VSPR1 -5.54877E-07 ;
11 C7 normal data MW   98.471 TCRIT   553.18 PCRIT  3.03631E+06 VCRIT
 4.66510E-04 ACENTRICFACTOR  0.28313 TBOIL   370.98 SG  0.76726 CNUMBER
  7.1997 REFVISLB  1.34400E-03 VSPR1  8.09391E-06 ;
12 C8 normal data MW   109.87 TCRIT   579.61 PCRIT  2.85684E+06 VCRIT
 5.12238E-04 ACENTRICFACTOR  0.31047 TBOIL   393.58 SG  0.78591 CNUMBER
  7.9958 REFVISLB  1.18160E-03 VSPR1  9.88729E-06 ;
13 C9 normal data MW   123.39 TCRIT   608.62 PCRIT  2.65290E+06 VCRIT
 5.69747E-04 ACENTRICFACTOR  0.34698 TBOIL   419.67 SG  0.80319 CNUMBER
  8.9300 REFVISLB  1.06690E-03 VSPR1  1.31971E-05 ;
14 C10 normal data MW   136.62 TCRIT   634.18 PCRIT  2.47860E+06 VCRIT
 6.25922E-04 ACENTRICFACTOR  0.38361 TBOIL   443.50 SG  0.81695 CNUMBER
  9.7773 REFVISLB  9.69100E-04 VSPR1  1.67277E-05 ;
15 C11 normal data MW   149.76 TCRIT   657.32 PCRIT  2.32698E+06 VCRIT
 6.81347E-04 ACENTRICFACTOR  0.42051 TBOIL   465.72 SG  0.82855 CNUMBER
  10.705 REFVISLB  8.82700E-04 VSPR1  2.04793E-05 ;
16 C12 normal data MW   162.81 TCRIT   678.41 PCRIT  2.19433E+06 VCRIT
 7.35698E-04 ACENTRICFACTOR  0.45752 TBOIL   486.53 SG  0.83860 CNUMBER
  11.611 REFVISLB  8.04100E-04 VSPR1  2.44042E-05 ;
17 C13 normal data MW   175.77 TCRIT   697.77 PCRIT  2.07774E+06 VCRIT
 7.88808E-04 ACENTRICFACTOR  0.49116 TBOIL   506.06 SG  0.84747 CNUMBER
  12.526 REFVISLB  7.32000E-04 VSPR1  2.84490E-05 ;
18 C14 normal data MW   188.63 TCRIT   715.63 PCRIT  1.97480E+06 VCRIT
 8.40335E-04 ACENTRICFACTOR  0.52632 TBOIL   524.44 SG  0.85541 CNUMBER
  13.400 REFVISLB  6.65200E-04 VSPR1  3.25640E-05 ;
19 C15 normal data MW   201.39 TCRIT   732.18 PCRIT  1.88337E+06 VCRIT
 8.90240E-04 ACENTRICFACTOR  0.56109 TBOIL   541.77 SG  0.86261 CNUMBER
  14.189 REFVISLB  6.03600E-04 VSPR1  3.67048E-05 ;
20 C16 normal data MW   214.05 TCRIT   747.58 PCRIT  1.80188E+06 VCRIT
 9.38404E-04 ACENTRICFACTOR  0.59542 TBOIL   558.16 SG  0.86919 CNUMBER
  14.935 REFVISLB  5.46800E-04 VSPR1  4.08277E-05 ;
21 C17 normal data MW   226.61 TCRIT   761.97 PCRIT  1.72900E+06 VCRIT
 9.84662E-04 ACENTRICFACTOR  0.62930 TBOIL   573.66 SG  0.87525 CNUMBER
  15.768 REFVISLB  4.95100E-04 VSPR1  4.48898E-05 ;
22 C18 normal data MW   239.06 TCRIT   775.45 PCRIT  1.66350E+06 VCRIT
 1.02906E-03 ACENTRICFACTOR  0.66270 TBOIL   588.36 SG  0.88086 CNUMBER
  16.527 REFVISLB  4.48200E-04 VSPR1  4.88697E-05 ;
23 C19 normal data MW   251.41 TCRIT   788.12 PCRIT  1.60441E+06 VCRIT
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 1.07156E-03 ACENTRICFACTOR  0.69560 TBOIL   602.33 SG  0.88609 CNUMBER
  17.333 REFVISLB  4.05900E-04 VSPR1  5.27332E-05 ;
24 C20 normal data MW   263.65 TCRIT   800.06 PCRIT  1.55091E+06 VCRIT
 1.11221E-03 ACENTRICFACTOR  0.72799 TBOIL   615.61 SG  0.89098 CNUMBER
  18.287 REFVISLB  3.68000E-04 VSPR1  5.64599E-05 ;
25 C21 normal data MW   275.78 TCRIT   811.34 PCRIT  1.50237E+06 VCRIT
 1.15091E-03 ACENTRICFACTOR  0.75988 TBOIL   628.25 SG  0.89558 CNUMBER
  19.198 REFVISLB  3.34200E-04 VSPR1  6.00317E-05 ;
26 C22 normal data MW   287.81 TCRIT   822.03 PCRIT  1.45817E+06 VCRIT
 1.18783E-03 ACENTRICFACTOR  0.79124 TBOIL   640.31 SG  0.89991 CNUMBER
  19.999 REFVISLB  3.04300E-04 VSPR1  6.34355E-05 ;
27 C23 normal data MW   299.73 TCRIT   832.17 PCRIT  1.41777E+06 VCRIT
 1.22294E-03 ACENTRICFACTOR  0.82208 TBOIL   651.83 SG  0.90401 CNUMBER
  20.791 REFVISLB  2.77800E-04 VSPR1  6.66597E-05 ;
28 C24 normal data MW   311.54 TCRIT   841.82 PCRIT  1.38081E+06 VCRIT
 1.25621E-03 ACENTRICFACTOR  0.85239 TBOIL   662.83 SG  0.90790 CNUMBER
  21.576 REFVISLB  2.54300E-04 VSPR1  6.96905E-05 ;
29 C25 normal data MW   323.26 TCRIT   851.02 PCRIT  1.34682E+06 VCRIT
 1.28799E-03 ACENTRICFACTOR  0.88218 TBOIL   673.37 SG  0.91159 CNUMBER
  22.353 REFVISLB  2.33600E-04 VSPR1  7.25327E-05 ;
30 C26 normal data MW   334.87 TCRIT   859.79 PCRIT  1.31552E+06 VCRIT
 1.31813E-03 ACENTRICFACTOR  0.91144 TBOIL   683.47 SG  0.91511 CNUMBER
  23.122 REFVISLB  2.15300E-04 VSPR1  7.51809E-05 ;
31 C27 normal data MW   346.38 TCRIT   868.19 PCRIT  1.28663E+06 VCRIT
 1.34668E-03 ACENTRICFACTOR  0.94018 TBOIL   693.15 SG  0.91848 CNUMBER
  23.884 REFVISLB  1.99100E-04 VSPR1  7.76287E-05 ;
32 C28 normal data MW   357.79 TCRIT   876.24 PCRIT  1.25981E+06 VCRIT
 1.37395E-03 ACENTRICFACTOR  0.96841 TBOIL   702.46 SG  0.92169 CNUMBER
  24.639 REFVISLB  1.84800E-04 VSPR1  7.98855E-05 ;
33 C29 normal data MW   369.10 TCRIT   883.95 PCRIT  1.23499E+06 VCRIT
 1.39964E-03 ACENTRICFACTOR  0.99612 TBOIL   711.40 SG  0.92478 CNUMBER
  25.388 REFVISLB  1.72200E-04 VSPR1  8.19443E-05 ;
34 C30 normal data MW   380.32 TCRIT   891.37 PCRIT  1.21189E+06 VCRIT
 1.42415E-03 ACENTRICFACTOR   1.0233 TBOIL   720.00 SG  0.92774 CNUMBER
  26.129 REFVISLB  1.61000E-04 VSPR1  8.38118E-05 ;
35 C31 normal data MW   391.45 TCRIT   898.49 PCRIT  1.19038E+06 VCRIT
 1.44735E-03 ACENTRICFACTOR   1.0500 TBOIL   728.29 SG  0.93058 CNUMBER
  26.864 REFVISLB  1.51000E-04 VSPR1  8.54912E-05 ;
36 C32 normal data MW   402.49 TCRIT   905.36 PCRIT  1.17032E+06 VCRIT
 1.46942E-03 ACENTRICFACTOR   1.0762 TBOIL   736.29 SG  0.93333 CNUMBER
  27.591 REFVISLB  1.42100E-04 VSPR1  8.69809E-05 ;
37 C33 normal data MW   413.44 TCRIT   911.98 PCRIT  1.15149E+06 VCRIT
 1.49041E-03 ACENTRICFACTOR   1.1019 TBOIL   744.00 SG  0.93597 CNUMBER
  28.338 REFVISLB  1.34200E-04 VSPR1  8.83013E-05 ;
38 C34 normal data MW   424.30 TCRIT   918.38 PCRIT  1.13384E+06 VCRIT
 1.51034E-03 ACENTRICFACTOR   1.1272 TBOIL   751.45 SG  0.93852 CNUMBER
  29.094 REFVISLB  1.27100E-04 VSPR1  8.94454E-05 ;
39 C35 normal data MW   435.08 TCRIT   924.56 PCRIT  1.11730E+06 VCRIT
 1.52923E-03 ACENTRICFACTOR   1.1519 TBOIL   758.65 SG  0.94099 CNUMBER
  29.757 REFVISLB  1.20800E-04 VSPR1  9.04173E-05 ;
40 C36 normal data MW   579.66 TCRIT   1015.2 PCRIT  1.05448E+06 VCRIT
 1.59405E-03 ACENTRICFACTOR   1.2205 TBOIL   840.35 SG  0.96914 CNUMBER
  39.929 REFVISLB  7.03900E-05 VSPR1  4.12448E-05 ; ;
bipset PR78ABIP 1 linear eos none  1  2 0.1 0  1  3 0.1 0  1  4 0.1 0  1  5
0.1 0  1  6 0.1 0  1  7 0.1 0  1  8 0.1 0  1  9 0.1 0  1 10 0.1 0  1 11 0.1 0
 1 12 0.1 0  1 13 0.1 0  1 14 0.1 0  1 15 0.1 0  1 16 0.1 0  1 17 0.1 0  1 18
0.1 0  1 19 0.1 0  1 20 0.1 0  1 21 0.1 0  1 22 0.1 0  1 23 0.1 0  1 24 0.1 0
 1 25 0.1 0  1 26 0.1 0  1 27 0.1 0  1 28 0.1 0  1 29 0.1 0  1 30 0.1 0  1 31
0.1 0  1 32 0.1 0  1 33 0.1 0  1 34 0.1 0  1 35 0.1 0  1 36 0.1 0  1 37 0.1 0
 1 38 0.1 0  1 39 0.1 0  1 40 0.1 0  2  3 0.105 0  2  4 0.13 0  2  5 0.125 0
 2  6 0.115 0  2  7 0.115 0  2  8 0.115 0  2  9 0.115 0  2 10 0.115 0  2 11
0.115 0  2 12 0.115 0  2 13 0.115 0  2 14 0.115 0  2 15 0.115 0  2 16 0.115 0
 2 17 0.115 0  2 18 0.115 0  2 19 0.115 0  2 20 0.115 0  2 21 0.115 0  2 22
0.115 0  2 23 0.115 0  2 24 0.115 0  2 25 0.115 0  2 26 0.115 0  2 27 0.115 0
 2 28 0.115 0  2 29 0.115 0  2 30 0.115 0  2 31 0.115 0  2 32 0.115 0  2 33
0.115 0  2 34 0.115 0  2 35 0.115 0  2 36 0.115 0  2 37 0.115 0  2 38 0.115 0
 2 39 0.115 0  2 40 0.115 0  3  4 -0.00126 0  3  5 -0.00414 0  3  6 -0.00791 0
 3  7 -0.00745 0  3  8 -0.01067 0  3  9 -0.01083 0  3 10 -0.03 0  3 11
0.02274266 -7.55245E-5  3 12 0.05131445 -.000151175  3 13 0.07961711
-.000226699  3 14 0.1079798 -.000302224  3 15 0.1363924 -.000377748  3 16
0.1648551 -.000453273  3 17 0.1934069 -.000528923  3 18 0.2219695 -.000604448
 3 19 0.2505722 -.000679972  3 20 0.279274 -.000755622  3 21 0.3079766
-.000831147  3 22 0.3367193 -.000906671  3 23 0.2813335 -.000725035  3 24
0.2259751 -.000543776  3 25 0.1707167 -.000362517  3 26 0.1154584 -.000181259
 3 27 0.06015 0  3 28 0.0617 0  3 29 0.06317 0  3 30 0.06456 0  3 31 0.06587 0
 3 32 0.06712 0  3 33 0.0683 0  3 34 0.06943 0  3 35 0.07049 0  3 36 0.07151 0
 3 37 0.07248 0  3 38 0.0734 0  3 39 0.07427 0  3 40 0.08336 0  4  6 1.E-20 0
 4  7 1.E-20 0  4  8 1.E-20 0  4  9 1.E-20 0  4 10 1.E-20 0  4 11 1.E-20 0  4
12 1.E-20 0  4 13 1.E-20 0  4 14 1.E-20 0  4 15 1.E-20 0  4 16 1.E-20 0  4 17
```

```
1.E-20 0  4 18 1.E-20 0  4 19 1.E-20 0  4 20 1.E-20 0  4 21 1.E-20 0  4 22
1.E-20 0  4 23 1.E-20 0  4 24 1.E-20 0  4 25 1.E-20 0  4 26 1.E-20 0  4 27
1.E-20 0  4 28 1.E-20 0  4 29 1.E-20 0  4 30 1.E-20 0  4 31 1.E-20 0  4 32
1.E-20 0  4 33 1.E-20 0  4 34 1.E-20 0  4 35 1.E-20 0  4 36 1.E-20 0  4 37
1.E-20 0  4 38 1.E-20 0  4 39 1.E-20 0  4 40 1.E-20 0  5  8 1.E-20 0  5  9
1.E-20 0  5 10 1.E-20 0  5 11 1.E-20 0  5 12 1.E-20 0  5 13 1.E-20 0  5 14
1.E-20 0  5 15 1.E-20 0  5 16 1.E-20 0  5 17 1.E-20 0  5 18 1.E-20 0  5 19
1.E-20 0  5 20 1.E-20 0  5 21 1.E-20 0  5 22 1.E-20 0  5 23 1.E-20 0  5 24
1.E-20 0  5 25 1.E-20 0  5 26 1.E-20 0  5 27 1.E-20 0  5 28 1.E-20 0  5 29
1.E-20 0  5 30 1.E-20 0  5 31 1.E-20 0  5 32 1.E-20 0  5 33 1.E-20 0  5 34
1.E-20 0  5 35 1.E-20 0  5 36 1.E-20 0  5 37 1.E-20 0  5 38 1.E-20 0  5 39
1.E-20 0  5 40 1.E-20 0  6 10 1.E-20 0  6 11 1.E-20 0  6 12 1.E-20 0  6 13
1.E-20 0  6 14 1.E-20 0  6 15 1.E-20 0  6 16 1.E-20 0  6 17 1.E-20 0  6 18
1.E-20 0  6 19 1.E-20 0  6 20 1.E-20 0  6 21 1.E-20 0  6 22 1.E-20 0  6 23
1.E-20 0  6 24 1.E-20 0  6 25 1.E-20 0  6 26 1.E-20 0  6 27 1.E-20 0  6 28
1.E-20 0  6 29 1.E-20 0  6 30 1.E-20 0  6 31 1.E-20 0  6 32 1.E-20 0  6 33
1.E-20 0  6 34 1.E-20 0  6 35 1.E-20 0  6 36 1.E-20 0  6 37 1.E-20 0  6 38
1.E-20 0  6 39 1.E-20 0  6 40 1.E-20 0  7 10 1.E-20 0  7 11 1.E-20 0  7 12
1.E-20 0  7 13 1.E-20 0  7 14 1.E-20 0  7 15 1.E-20 0  7 16 1.E-20 0  7 17
1.E-20 0  7 18 1.E-20 0  7 19 1.E-20 0  7 20 1.E-20 0  7 21 1.E-20 0  7 22
1.E-20 0  7 23 1.E-20 0  7 24 1.E-20 0  7 25 1.E-20 0  7 26 1.E-20 0  7 27
1.E-20 0  7 28 1.E-20 0  7 29 1.E-20 0  7 30 1.E-20 0  7 31 1.E-20 0  7 32
1.E-20 0  7 33 1.E-20 0  7 34 1.E-20 0  7 35 1.E-20 0  7 36 1.E-20 0  7 37
1.E-20 0  7 38 1.E-20 0  7 39 1.E-20 0  7 40 1.E-20 0  8 11 1.E-20 0  8 12
1.E-20 0  8 13 1.E-20 0  8 14 1.E-20 0  8 15 1.E-20 0  8 16 1.E-20 0  8 17
1.E-20 0  8 18 1.E-20 0  8 19 1.E-20 0  8 20 1.E-20 0  8 21 1.E-20 0  8 22
1.E-20 0  8 23 1.E-20 0  8 24 1.E-20 0  8 25 1.E-20 0  8 26 1.E-20 0  8 27
1.E-20 0  8 28 1.E-20 0  8 29 1.E-20 0  8 30 1.E-20 0  8 31 1.E-20 0  8 32
1.E-20 0  8 33 1.E-20 0  8 34 1.E-20 0  8 35 1.E-20 0  8 36 1.E-20 0  8 37
1.E-20 0  8 38 1.E-20 0  8 39 1.E-20 0  8 40 1.E-20 0  9 11 1.E-20 0  9 12
1.E-20 0  9 13 1.E-20 0  9 14 1.E-20 0  9 15 1.E-20 0  9 16 1.E-20 0  9 17
1.E-20 0  9 18 1.E-20 0  9 19 1.E-20 0  9 20 1.E-20 0  9 21 1.E-20 0  9 22
1.E-20 0  9 23 1.E-20 0  9 24 1.E-20 0  9 25 1.E-20 0  9 26 1.E-20 0  9 27
1.E-20 0  9 28 1.E-20 0  9 29 1.E-20 0  9 30 1.E-20 0  9 31 1.E-20 0  9 32
1.E-20 0  9 33 1.E-20 0  9 34 1.E-20 0  9 35 1.E-20 0  9 36 1.E-20 0  9 37
1.E-20 0  9 38 1.E-20 0  9 39 1.E-20 0  9 40 1.E-20 0 11 12 0.00014 0 11 13
0.00063 0 11 14 0.00138 0 11 15 0.00232 0 11 16 0.00338 0 11 17 0.00453 0 11
18 0.00573 0 11 19 0.00697 0 11 20 0.00821 0 11 21 0.00945 0 11 22 0.01068 0
11 23 0.01188 0 11 24 0.01305 0 11 25 0.01419 0 11 26 0.0153 0 11 27 0.01637 0
11 28 0.0174 0 11 29 0.01839 0 11 30 0.01934 0 11 31 0.02026 0 11 32 0.02114 0
11 33 0.02199 0 11 34 0.02281 0 11 35 0.02359 0 11 36 0.02434 0 11 37 0.02506
0 11 38 0.02575 0 11 39 0.02642 0 11 40 0.03359 0 12 13 0.00018 0 12 14
0.00065 0 12 15 0.00133 0 12 16 0.00216 0 12 17 0.0031 0 12 18 0.00411 0 12 19
0.00517 0 12 20 0.00625 0 12 21 0.00734 0 12 22 0.00843 0 12 23 0.0095 0 12 24
0.01056 0 12 25 0.01159 0 12 26 0.01259 0 12 27 0.01357 0 12 28 0.01451 0 12
29 0.01542 0 12 30 0.0163 0 12 31 0.01715 0 12 32 0.01796 0 12 33 0.01875 0 12
34 0.0195 0 12 35 0.02023 0 12 36 0.02093 0 12 37 0.0216 0 12 38 0.02224 0 12
39 0.02287 0 12 40 0.0296 0 13 14 0.00015 0 13 15 0.00053 0 13 16 0.00109 0 13
17 0.00179 0 13 18 0.00257 0 13 19 0.00342 0 13 20 0.00431 0 13 21 0.00523 0
13 22 0.00616 0 13 23 0.00708 0 13 24 0.008 0 13 25 0.0089 0 13 26 0.00979 0
13 27 0.01065 0 13 28 0.01149 0 13 29 0.01231 0 13 30 0.0131 0 13 31 0.01386 0
13 32 0.0146 0 13 33 0.01531 0 13 34 0.016 0 13 35 0.01666 0 13 36 0.0173 0 13
37 0.01791 0 13 38 0.0185 0 13 39 0.01907 0 13 40 0.0253 0 14 15 0.00012 0 14
16 0.00044 0 14 17 0.00091 0 14 18 0.0015 0 14 19 0.00216 0 14 20 0.00288 0 14
21 0.00364 0 14 22 0.00442 0 14 23 0.00521 0 14 24 0.00601 0 14 25 0.0068 0 14
26 0.00757 0 14 27 0.00834 0 14 28 0.00909 0 14 29 0.00982 0 14 30 0.01052 0
14 31 0.01121 0 14 32 0.01188 0 14 33 0.01252 0 14 34 0.01315 0 14 35 0.01375
0 14 36 0.01433 0 14 37 0.01489 0 14 38 0.01543 0 14 39 0.01596 0 14 40
0.02171 0 15 16 1.E-4 0 15 17 0.00037 0 15 18 0.00077 0 15 19 0.00126 0 15 20
0.00183 0 15 21 0.00244 0 15 22 0.00309 0 15 23 0.00376 0 15 24 0.00443 0 15
25 0.00512 0 15 26 0.0058 0 15 27 0.00647 0 15 28 0.00713 0 15 29 0.00778 0 15
30 0.00842 0 15 31 0.00903 0 15 32 0.00963 0 15 33 0.01022 0 15 34 0.01078 0
15 35 0.01133 0 15 36 0.01186 0 15 37 0.01237 0 15 38 0.01287 0 15 39 0.01335
0 15 40 0.01867 0 16 17 9.E-5 0 16 18 0.00031 0 16 19 0.00065 0 16 20 0.00107
0 16 21 0.00155 0 16 22 0.00208 0 16 23 0.00263 0 16 24 0.0032 0 16 25 0.00379
0 16 26 0.00438 0 16 27 0.00496 0 16 28 0.00555 0 16 29 0.00612 0 16 30
0.00669 0 16 31 0.00724 0 16 32 0.00778 0 16 33 0.00831 0 16 34 0.00882 0 16
35 0.00932 0 16 36 0.0098 0 16 37 0.01027 0 16 38 0.01072 0 16 39 0.01116 0 16
40 0.01608 0 17 18 7.E-5 0 17 19 0.00027 0 17 20 0.00055 0 17 21 0.00091 0 17
22 0.00132 0 17 23 0.00177 0 17 24 0.00225 0 17 25 0.00274 0 17 26 0.00325 0
17 27 0.00376 0 17 28 0.00427 0 17 29 0.00477 0 17 30 0.00527 0 17 31 0.00577
0 17 32 0.00625 0 17 33 0.00673 0 17 34 0.00719 0 17 35 0.00764 0 17 36
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18 34 0.00583 0 18 35 0.00624 0 18 36 0.00664 0 18 37 0.00703 0 18 38 0.0074 0
18 39 0.00777 0 18 40 0.01197 0 19 20 5.E-5 0 19 21 0.00019 0 19 22 0.0004 0
19 23 0.00067 0 19 24 0.00097 0 19 25 0.0013 0 19 26 0.00166 0 19 27 0.00203 0
```

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0 19 38 0.00613 0 19 39 0.00647 0 19 40 0.01035 0 20 21 4.E-5 0 20 22 0.00017
0 20 23 0.00035 0 20 24 0.00057 0 20 25 0.00084 0 20 26 0.00112 0 20 27
0.00143 0 20 28 0.00175 0 20 29 0.00209 0 20 30 0.00242 0 20 31 0.00276 0 20
32 0.0031 0 20 33 0.00344 0 20 34 0.00377 0 20 35 0.0041 0 20 36 0.00443 0 20
37 0.00475 0 20 38 0.00506 0 20 39 0.00536 0 20 40 0.00895 0 21 22 4.E-5 0 21
23 0.00014 0 21 24 0.0003 0 21 25 0.00049 0 21 26 0.00072 0 21 27 0.00097 0 21
28 0.00124 0 21 29 0.00152 0 21 30 0.00181 0 21 31 0.00211 0 21 32 0.00241 0
21 33 0.0027 0 21 34 0.003 0 21 35 0.0033 0 21 36 0.00359 0 21 37 0.00388 0 21
38 0.00416 0 21 39 0.00444 0 21 40 0.00774 0 22 23 3.E-5 0 22 24 0.00012 0 22
25 0.00026 0 22 26 0.00043 0 22 27 0.00063 0 22 28 0.00084 0 22 29 0.00108 0
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22 35 0.00263 0 22 36 0.00289 0 22 37 0.00315 0 22 38 0.0034 0 22 39 0.00366 0
22 40 0.0067 0 23 24 3.E-5 0 23 25 0.00011 0 23 26 0.00022 0 23 27 0.00037 0
23 28 0.00054 0 23 29 0.00073 0 23 30 0.00094 0 23 31 0.00116 0 23 32 0.00138
0 23 33 0.00161 0 23 34 0.00184 0 23 35 0.00207 0 23 36 0.00231 0 23 37
0.00254 0 23 38 0.00277 0 23 39 0.003 0 23 40 0.0058 0 24 25 2.E-5 0 24 26
9.E-5 0 24 27 0.00019 0 24 28 0.00032 0 24 29 0.00047 0 24 30 0.00064 0 24 31
0.00082 0 24 32 0.00101 0 24 33 0.00121 0 24 34 0.00141 0 24 35 0.00162 0 24
36 0.00182 0 24 37 0.00203 0 24 38 0.00224 0 24 39 0.00244 0 24 40 0.00502 0
25 26 2.E-5 0 25 27 8.E-5 0 25 28 0.00017 0 25 29 0.00028 0 25 30 0.00041 0 25
31 0.00056 0 25 32 0.00072 0 25 33 0.00089 0 25 34 0.00106 0 25 35 0.00124 0
25 36 0.00142 0 25 37 0.00161 0 25 38 0.00179 0 25 39 0.00198 0 25 40 0.00435
0 26 27 2.E-5 0 26 28 7.E-5 0 26 29 0.00015 0 26 30 0.00025 0 26 31 0.00036 0
26 32 0.00049 0 26 33 0.00063 0 26 34 0.00078 0 26 35 0.00094 0 26 36 0.0011 0
26 37 0.00126 0 26 38 0.00142 0 26 39 0.00159 0 26 40 0.00376 0 27 28 2.E-5 0
27 29 6.E-5 0 27 30 0.00013 0 27 31 0.00022 0 27 32 0.00032 0 27 33 0.00043 0
27 34 0.00056 0 27 35 0.00069 0 27 36 0.00083 0 27 37 0.00097 0 27 38 0.00112
0 27 39 0.00126 0 27 40 0.00325 0 28 29 1.E-5 0 28 30 5.E-5 0 28 31 0.00011 0
28 32 0.00019 0 28 33 0.00028 0 28 34 0.00038 0 28 35 0.00049 0 28 36 0.00061
0 28 37 0.00073 0 28 38 0.00086 0 28 39 0.00099 0 28 40 0.00281 0 29 30 1.E-5
0 29 31 5.E-5 0 29 32 1.E-4 0 29 33 0.00017 0 29 34 0.00025 0 29 35 0.00034 0
29 36 0.00044 0 29 37 0.00054 0 29 38 0.00065 0 29 39 0.00077 0 29 40 0.00242
0 30 31 1.E-5 0 30 32 4.E-5 0 30 33 9.E-5 0 30 34 0.00015 0 30 35 0.00022 0 30
36 0.0003 0 30 37 0.00039 0 30 38 0.00048 0 30 39 0.00058 0 30 40 0.00208 0 31
32 1.E-5 0 31 33 4.E-5 0 31 34 8.E-5 0 31 35 0.00013 0 31 36 0.0002 0 31 37
0.00027 0 31 38 0.00035 0 31 39 0.00043 0 31 40 0.00179 0 32 33 1.E-5 0 32 34
3.E-5 0 32 35 7.E-5 0 32 36 0.00012 0 32 37 0.00018 0 32 38 0.00024 0 32 39
0.00031 0 32 40 0.00153 0 33 34 1.E-5 0 33 35 3.E-5 0 33 36 6.E-5 0 33 37
0.00011 0 33 38 0.00016 0 33 39 0.00022 0 33 40 0.00131 0 34 35 1.E-5 0 34 36
3.E-5 0 34 37 6.E-5 0 34 38 1.E-4 0 34 39 0.00014 0 34 40 0.00112 0 35 36
1.E-5 0 35 37 2.E-5 0 35 38 5.E-5 0 35 39 9.E-5 0 35 40 0.00095 0 36 37 1.E-5
0 36 38 2.E-5 0 36 39 5.E-5 0 36 40 0.0008 0 37 38 1.E-5 0 37 39 2.E-5 0 37 40
0.00067 0 38 40 0.00056 0 39 40 0.00046 0 ;
bipset LGSTBIP 1 constant eos none ;
bipdata erase ;
model MPR78A PRA PSAT78 LDEN VDW PR78ABIP;
model MLBCMPR78A LBC LFIT MPR78A;
model MSTRAPP SPTHCOND;
bipdata erase ;
model MLGSTMPR78A LGST MPR78A LGSTBIP;
bipdata erase ;
pd GAS gas MPR78A MPR78A MPR78A MLBCMPR78A MSTRAPP MLGSTMPR78A;
pd LIQUID1 liquid MPR78A MPR78A MPR78A MLBCMPR78A MSTRAPP MLGSTMPR78A;
key LIQUID1 not 007732-18-5;
pd LIQUID2 liquid MPR78A MPR78A MPR78A MLBCMPR78A MSTRAPP MLGSTMPR78A;
key LIQUID2 not 007732-18-5;
temperature 390.37222222;
pressure 41368543.759;
amounts 2.053350516835 4.148912339623 300.7414427436 29.36645544611
20.80084207861 4.34226470559 9.970370340102 4.049058515291 4.88056590428
6.433741475494 8.308717700011 8.982728746289 6.444180450297 5.417505418675
4.022279782543 3.386394535741 3.238884029055 2.933423133696 2.450495130758
2.169295530493 1.920364037837 1.728813340763 1.556369315091 1.401125965681
1.07705598975 1.067070607317 .9295450294715 .7779494699015 .8392229952029
.6204531271901 .639969846094 .573703629576 .5242307633725 .4774812657584
.4547871323026 .3821665402732 .3572030841903 .3331477200321 .3054608953596
3.485340268148;
inputunits temperature degF pressure psi enthalpy BTU/lbmol entropy BTU/lbmol/F
volume kg/m3 amounts lbmol viscosity cP thcond BTU/hr/ft/F surten dyne/cm
diffusion cm2/s;
outputunits temperature degF pressure psi enthalpy BTU/lbmol entropy
BTU/lbmol/F volume lbmol/ft3 amounts lbmol viscosity cP thcond BTU/hr/ft/F
surten dyne/cm diffusion cm2/s;
set physprops lVCS;
```

MultiFlash – CL68508-EOS20120322.mfl

```
# Multiflash version: 4.1.09   March 2012 #
# Date: 04 April 2012   Time: 11:27 #
remove all;
units temperature K pressure Pa enthalpy J/mol entropy J/mol/K volume m3/mol
amounts mol viscosity Pas thcond W/m/K surten N/m diffusion m2/s;
title "CL68508 bottomhole fluid sample with EOS 20120322.   Contains about "
"0.3 wt% OBM in reservoir fluid.  T-dependent BIPs Library component "
"properties changed to same as PhazeComp. T-dep BIPs altered from previous "
"version to get correct BIP at 243F not 240F. R" ;
datum enthalpy compound entropy compound; set fractions;
properties PFC6PLUSMW   200.18 ;
puredata INFODATA ;
components overwrite 1 NITROGEN data TCRIT   126.20 PCRIT  3.39801E+06
ACENTRICFACTOR  3.70000E-02 VSRKS1 -4.02589E-06 ;
2 "CARBON DIOXIDE" data TCRIT   304.12 PCRIT  7.37401E+06 ACENTRICFACTOR
 0.22500 VSPR1  5.09546E-08 ;
3 METHANE data TCRIT   190.56 PCRIT  4.59901E+06 VCRIT  9.85975E-05
ACENTRICFACTOR  1.10000E-02 VSPR1 -4.01930E-06 ;
4 ETHANE data TCRIT   305.32 PCRIT  4.87197E+06 VCRIT  1.45498E-04
ACENTRICFACTOR  9.90000E-02 VSPR1 -2.54577E-06 ;
5 PROPANE data MW   44.097 TCRIT   369.83 PCRIT  4.24800E+06 VSPR1
-3.59343E-06 ;
6 I-BUTANE data MW   58.123 PCRIT  3.64002E+06 ACENTRICFACTOR  0.18600 VSPR1
-4.49142E-06 ;
7 N-BUTANE data TCRIT   425.12 PCRIT  3.79598E+06 ACENTRICFACTOR  0.20000
VSPR1 -3.90684E-06 ;
8 I-PENTANE data TCRIT   460.39 PCRIT  3.38098E+06 ACENTRICFACTOR  0.22900
VSPR1 -4.97311E-06 ;
9 PENTANE data PCRIT  3.37002E+06 ACENTRICFACTOR  0.25200 VSPR1 -2.63886E-06 ;
;
chardata INFOCHAR TBSOEREIDE ;
petrofracs overwrite 10 C6 normal data MW   83.282 TCRIT   512.44 PCRIT
 3.30948E+06 VCRIT  3.46244E-04 ACENTRICFACTOR  0.24969 TBOIL   337.85 SG
 0.69568 CNUMBER   5.9292 REFVISLB  2.26070E-04 VSPR1 -5.54877E-07 ;
11 C7 normal data MW   98.471 TCRIT   553.18 PCRIT  3.03631E+06 VCRIT
 4.66510E-04 ACENTRICFACTOR  0.28313 TBOIL   370.98 SG  0.76726 CNUMBER
  7.1997 REFVISLB  1.34400E-03 VSPR1  8.09391E-06 ;
12 C8 normal data MW   109.87 TCRIT   579.61 PCRIT  2.85684E+06 VCRIT
 5.12238E-04 ACENTRICFACTOR  0.31047 TBOIL   393.58 SG  0.78591 CNUMBER
  7.9958 REFVISLB  1.18160E-03 VSPR1  9.88729E-06 ;
13 C9 normal data MW   123.39 TCRIT   608.62 PCRIT  2.65290E+06 VCRIT
 5.69747E-04 ACENTRICFACTOR  0.34698 TBOIL   419.67 SG  0.80319 CNUMBER
  8.9300 REFVISLB  1.06690E-03 VSPR1  1.31971E-05 ;
14 C10 normal data MW   136.62 TCRIT   634.18 PCRIT  2.47860E+06 VCRIT
 6.25922E-04 ACENTRICFACTOR  0.38361 TBOIL   443.50 SG  0.81695 CNUMBER
  9.7773 REFVISLB  9.69100E-04 VSPR1  1.67277E-05 ;
15 C11 normal data MW   149.76 TCRIT   657.32 PCRIT  2.32698E+06 VCRIT
 6.81347E-04 ACENTRICFACTOR  0.42051 TBOIL   465.72 SG  0.82855 CNUMBER
  10.705 REFVISLB  8.82700E-04 VSPR1  2.04793E-05 ;
16 C12 normal data MW   162.81 TCRIT   678.41 PCRIT  2.19433E+06 VCRIT
 7.35698E-04 ACENTRICFACTOR  0.45752 TBOIL   486.53 SG  0.83860 CNUMBER
  11.611 REFVISLB  8.04100E-04 VSPR1  2.44042E-05 ;
17 C13 normal data MW   175.77 TCRIT   697.77 PCRIT  2.07774E+06 VCRIT
 7.88808E-04 ACENTRICFACTOR  0.49116 TBOIL   506.06 SG  0.84747 CNUMBER
  12.526 REFVISLB  7.32000E-04 VSPR1  2.84490E-05 ;
18 C14 normal data MW   188.63 TCRIT   715.63 PCRIT  1.97480E+06 VCRIT
 8.40335E-04 ACENTRICFACTOR  0.52632 TBOIL   524.44 SG  0.85541 CNUMBER
  13.400 REFVISLB  6.65200E-04 VSPR1  3.25640E-05 ;
19 C15 normal data MW   201.39 TCRIT   732.18 PCRIT  1.88337E+06 VCRIT
 8.90240E-04 ACENTRICFACTOR  0.56109 TBOIL   541.77 SG  0.86261 CNUMBER
  14.189 REFVISLB  6.03600E-04 VSPR1  3.67048E-05 ;
20 C16 normal data MW   214.05 TCRIT   747.58 PCRIT  1.80188E+06 VCRIT
 9.38404E-04 ACENTRICFACTOR  0.59542 TBOIL   558.16 SG  0.86919 CNUMBER
  14.935 REFVISLB  5.46800E-04 VSPR1  4.08277E-05 ;
21 C17 normal data MW   226.61 TCRIT   761.97 PCRIT  1.72900E+06 VCRIT
 9.84662E-04 ACENTRICFACTOR  0.62930 TBOIL   573.66 SG  0.87525 CNUMBER
  15.768 REFVISLB  4.95100E-04 VSPR1  4.48898E-05 ;
22 C18 normal data MW   239.06 TCRIT   775.45 PCRIT  1.66350E+06 VCRIT
 1.02906E-03 ACENTRICFACTOR  0.66270 TBOIL   588.36 SG  0.88086 CNUMBER
  16.527 REFVISLB  4.48200E-04 VSPR1  4.88697E-05 ;
23 C19 normal data MW   251.41 TCRIT   788.12 PCRIT  1.60441E+06 VCRIT
 1.07156E-03 ACENTRICFACTOR  0.69560 TBOIL   602.33 SG  0.88609 CNUMBER
  17.333 REFVISLB  4.05900E-04 VSPR1  5.27332E-05 ;
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24 C20 normal data MW   263.65 TCRIT   800.06 PCRIT  1.55091E+06 VCRIT
 1.11221E-03 ACENTRICFACTOR  0.72799 TBOIL   615.61 SG  0.89098 CNUMBER
  18.287 REFVISLB  3.68000E-04 VSPR1  5.64599E-05 ;
25 C21 normal data MW   275.78 TCRIT   811.34 PCRIT  1.50237E+06 VCRIT
 1.15091E-03 ACENTRICFACTOR  0.75988 TBOIL   628.25 SG  0.89558 CNUMBER
  19.198 REFVISLB  3.34200E-04 VSPR1  6.00317E-05 ;
26 C22 normal data MW   287.81 TCRIT   822.03 PCRIT  1.45817E+06 VCRIT
 1.18783E-03 ACENTRICFACTOR  0.79124 TBOIL   640.31 SG  0.89991 CNUMBER
  19.999 REFVISLB  3.04300E-04 VSPR1  6.34355E-05 ;
27 C23 normal data MW   299.73 TCRIT   832.17 PCRIT  1.41777E+06 VCRIT
 1.22294E-03 ACENTRICFACTOR  0.82208 TBOIL   651.83 SG  0.90401 CNUMBER
  20.791 REFVISLB  2.77800E-04 VSPR1  6.66597E-05 ;
28 C24 normal data MW   311.54 TCRIT   841.82 PCRIT  1.38081E+06 VCRIT
 1.25621E-03 ACENTRICFACTOR  0.85239 TBOIL   662.83 SG  0.90790 CNUMBER
  21.576 REFVISLB  2.54300E-04 VSPR1  6.96905E-05 ;
29 C25 normal data MW   323.26 TCRIT   851.02 PCRIT  1.34682E+06 VCRIT
 1.28799E-03 ACENTRICFACTOR  0.88218 TBOIL   673.37 SG  0.91159 CNUMBER
  22.353 REFVISLB  2.33600E-04 VSPR1  7.25327E-05 ;
30 C26 normal data MW   334.87 TCRIT   859.79 PCRIT  1.31552E+06 VCRIT
 1.31813E-03 ACENTRICFACTOR  0.91144 TBOIL   683.47 SG  0.91511 CNUMBER
  23.122 REFVISLB  2.15300E-04 VSPR1  7.51809E-05 ;
31 C27 normal data MW   346.38 TCRIT   868.19 PCRIT  1.28663E+06 VCRIT
 1.34668E-03 ACENTRICFACTOR  0.94018 TBOIL   693.15 SG  0.91848 CNUMBER
  23.884 REFVISLB  1.99100E-04 VSPR1  7.76287E-05 ;
32 C28 normal data MW   357.79 TCRIT   876.24 PCRIT  1.25981E+06 VCRIT
 1.37395E-03 ACENTRICFACTOR  0.96841 TBOIL   702.46 SG  0.92169 CNUMBER
  24.639 REFVISLB  1.84800E-04 VSPR1  7.98855E-05 ;
33 C29 normal data MW   369.10 TCRIT   883.95 PCRIT  1.23499E+06 VCRIT
 1.39964E-03 ACENTRICFACTOR  0.99612 TBOIL   711.40 SG  0.92478 CNUMBER
  25.388 REFVISLB  1.72200E-04 VSPR1  8.19443E-05 ;
34 C30 normal data MW   380.32 TCRIT   891.37 PCRIT  1.21189E+06 VCRIT
 1.42415E-03 ACENTRICFACTOR   1.0233 TBOIL   720.00 SG  0.92774 CNUMBER
  26.129 REFVISLB  1.61000E-04 VSPR1  8.38118E-05 ;
35 C31 normal data MW   391.45 TCRIT   898.49 PCRIT  1.19038E+06 VCRIT
 1.44735E-03 ACENTRICFACTOR   1.0500 TBOIL   728.29 SG  0.93058 CNUMBER
  26.864 REFVISLB  1.51000E-04 VSPR1  8.54912E-05 ;
36 C32 normal data MW   402.49 TCRIT   905.36 PCRIT  1.17032E+06 VCRIT
 1.46942E-03 ACENTRICFACTOR   1.0762 TBOIL   736.29 SG  0.93333 CNUMBER
  27.591 REFVISLB  1.42100E-04 VSPR1  8.69809E-05 ;
37 C33 normal data MW   413.44 TCRIT   911.98 PCRIT  1.15149E+06 VCRIT
 1.49041E-03 ACENTRICFACTOR   1.1019 TBOIL   744.00 SG  0.93597 CNUMBER
  28.338 REFVISLB  1.34200E-04 VSPR1  8.83013E-05 ;
38 C34 normal data MW   424.30 TCRIT   918.38 PCRIT  1.13384E+06 VCRIT
 1.51034E-03 ACENTRICFACTOR   1.1272 TBOIL   751.45 SG  0.93852 CNUMBER
  29.094 REFVISLB  1.27100E-04 VSPR1  8.94454E-05 ;
39 C35 normal data MW   435.08 TCRIT   924.56 PCRIT  1.11730E+06 VCRIT
 1.52923E-03 ACENTRICFACTOR   1.1519 TBOIL   758.65 SG  0.94099 CNUMBER
  29.757 REFVISLB  1.20800E-04 VSPR1  9.04173E-05 ;
40 C36 normal data MW   579.66 TCRIT   1015.2 PCRIT  1.05448E+06 VCRIT
 1.59405E-03 ACENTRICFACTOR   1.2205 TBOIL   840.35 SG  0.96914 CNUMBER
  39.929 REFVISLB  7.03900E-05 VSPR1  4.12448E-05 ; ;
bipset PR78ABIP 1 linear eos none  1  2 0.1 0  1  3 0.1 0  1  4 0.1 0  1  5
0.1 0  1  6 0.1 0  1  7 0.1 0  1  8 0.1 0  1  9 0.1 0  1 10 0.1 0  1 11 0.1 0
 1 12 0.1 0  1 13 0.1 0  1 14 0.1 0  1 15 0.1 0  1 16 0.1 0  1 17 0.1 0  1 18
0.1 0  1 19 0.1 0  1 20 0.1 0  1 21 0.1 0  1 22 0.1 0  1 23 0.1 0  1 24 0.1 0
 1 25 0.1 0  1 26 0.1 0  1 27 0.1 0  1 28 0.1 0  1 29 0.1 0  1 30 0.1 0  1 31
0.1 0  1 32 0.1 0  1 33 0.1 0  1 34 0.1 0  1 35 0.1 0  1 36 0.1 0  1 37 0.1 0
 1 38 0.1 0  1 39 0.1 0  1 40 0.1 0  2  3 0.105 0  2  4 0.13 0  2  5 0.125 0
 2  6 0.115 0  2  7 0.115 0  2  8 0.115 0  2  9 0.115 0  2 10 0.115 0  2 11
0.115 0  2 12 0.115 0  2 13 0.115 0  2 14 0.115 0  2 15 0.115 0  2 16 0.115 0
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0.115 0  2 23 0.115 0  2 24 0.115 0  2 25 0.115 0  2 26 0.115 0  2 27 0.115 0
 2 28 0.115 0  2 29 0.115 0  2 30 0.115 0  2 31 0.115 0  2 32 0.115 0  2 33
0.115 0  2 34 0.115 0  2 35 0.115 0  2 36 0.115 0  2 37 0.115 0  2 38 0.115 0
 2 39 0.115 0  2 40 0.115 0  3  4 -0.00126 0  3  5 -0.00414 0  3  6 -0.00791 0
 3  7 -0.00745 0  3  8 -0.01067 0  3  9 -0.01083 0  3 10 -0.03 0  3 11
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-.000226699  3 14 0.1079798 -.000302224  3 15 0.1363924 -.000377748  3 16
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-.000831147  3 22 0.3367193 -.000906671  3 23 0.2813335 -.000725035  3 24
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 4  7 1.E-20 0  4  8 1.E-20 0  4  9 1.E-20 0  4 10 1.E-20 0  4 11 1.E-20 0  4
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1.E-20 0  4 23 1.E-20 0  4 24 1.E-20 0  4 25 1.E-20 0  4 26 1.E-20 0  4 27
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0 28 37 0.00073 0 28 38 0.00086 0 28 39 0.00099 0 28 40 0.00281 0 29 30 1.E-5
0 29 31 5.E-5 0 29 32 1.E-4 0 29 33 0.00017 0 29 34 0.00025 0 29 35 0.00034 0
29 36 0.00044 0 29 37 0.00054 0 29 38 0.00065 0 29 39 0.00077 0 29 40 0.00242
0 30 31 1.E-5 0 30 32 4.E-5 0 30 33 9.E-5 0 30 34 0.00015 0 30 35 0.00022 0 30
36 0.0003 0 30 37 0.00039 0 30 38 0.00048 0 30 39 0.00058 0 30 40 0.00208 0 31
32 1.E-5 0 31 33 4.E-5 0 31 34 8.E-5 0 31 35 0.00013 0 31 36 0.0002 0 31 37
0.00027 0 31 38 0.00035 0 31 39 0.00043 0 31 40 0.00179 0 32 33 1.E-5 0 32 34
3.E-5 0 32 35 7.E-5 0 32 36 0.00012 0 32 37 0.00018 0 32 38 0.00024 0 32 39
0.00031 0 32 40 0.00153 0 33 34 1.E-5 0 33 35 3.E-5 0 33 36 6.E-5 0 33 37
0.00011 0 33 38 0.00016 0 33 39 0.00022 0 33 40 0.00131 0 34 35 1.E-5 0 34 36
3.E-5 0 34 37 6.E-5 0 34 38 1.E-4 0 34 39 0.00014 0 34 40 0.00112 0 35 36
1.E-5 0 35 37 2.E-5 0 35 38 5.E-5 0 35 39 9.E-5 0 35 40 0.00095 0 36 37 1.E-5
0 36 38 2.E-5 0 36 39 5.E-5 0 36 40 0.0008 0 37 38 1.E-5 0 37 39 2.E-5 0 37 40
0.00067 0 38 40 0.00056 0 39 40 0.00046 0 ;
bipset LGSTBIP 1 constant eos none ;
bipdata erase ;
model MPR78A PRA PSAT78 LDEN VDW PR78ABIP;
model MLBCMPR78A LBC LFIT MPR78A;
model MSTRAPP SPTHCOND;
bipdata erase ;
model MLGSTMPR78A LGST MPR78A LGSTBIP;
bipdata erase ;
pd GAS gas MPR78A MPR78A MPR78A MLBCMPR78A MSTRAPP MLGSTMPR78A;
pd LIQUID1 liquid MPR78A MPR78A MPR78A MLBCMPR78A MSTRAPP MLGSTMPR78A;
key LIQUID1 not 007732-18-5;
pd LIQUID2 liquid MPR78A MPR78A MPR78A MLBCMPR78A MSTRAPP MLGSTMPR78A;
key LIQUID2 not 007732-18-5;
temperature 390.37222222;
pressure 41368543.759;
amounts 2.05205188188 4.14628785417 300.5512115467 29.34787993137
20.78768472473 4.33951820379 9.96406359179 4.04649753277 4.87747875461
6.42967184475 8.30346192522 8.97704659467 6.44010446926 5.41407852832
4.01973558294 3.38425267257 3.23683515232 2.93156748731 2.44894520563
2.27748728977 1.91914931747 1.84702813064 1.61342806009 1.40023964619
1.07637469401 1.06639566187 .92895717376 .77745732218 .83869229213 .62006076979
.6395652417 .57334075568 .52389918735 .47717917324 .45449955474 .38192477554
.35697719519 .33293679958 .30526766501 3.48313580923;
inputunits temperature degF pressure psi enthalpy BTU/lbmol entropy BTU/lbmol/F
volume kg/m3 amounts lbmol viscosity cP thcond BTU/hr/ft/F surten dyne/cm
diffusion cm2/s;
outputunits temperature degF pressure psi enthalpy BTU/lbmol entropy
BTU/lbmol/F volume lbmol/ft3 amounts lbmol viscosity cP thcond BTU/hr/ft/F
surten dyne/cm diffusion cm2/s;
set physprops 1VCS;
```

MultiFlash – INTERTEK-DEC-EOS20120322.mfl

```
# Multiflash version: 4.1.09   March 2012 #
# Date: 04 April 2012   Time: 11:39 #
remove all;
units temperature K pressure Pa enthalpy J/mol entropy J/mol/K volume m3/mol
amounts mol viscosity Pas thcond W/m/K surten N/m diffusion m2/s;
title "Intertek decontaminated fluid sample with EOS 20120322.   About 0.2 "
"wt% OBM has been removed. T-dependent BIPs Library component properties "
"changed to same as PhazeComp. T-dep BIPs altered from previous version to "
"get correct BIP at 243F not 240F. Re" ;
datum enthalpy compound entropy compound; set fractions;
properties PFC6PLUSMW   197.54 ;
puredata INFODATA ;
components overwrite 1 NITROGEN data TCRIT   126.20 PCRIT  3.39801E+06
ACENTRICFACTOR  3.70000E-02 VSRKS1 -4.02589E-06 ;
2 "CARBON DIOXIDE" data TCRIT   304.12 PCRIT  7.37401E+06 ACENTRICFACTOR
 0.22500 VSPR1  5.09546E-08 ;
3 METHANE data TCRIT   190.56 PCRIT  4.59901E+06 VCRIT  9.85975E-05
ACENTRICFACTOR  1.10000E-02 VSPR1 -4.01930E-06 ;
4 ETHANE data TCRIT   305.32 PCRIT  4.87197E+06 VCRIT  1.45498E-04
ACENTRICFACTOR  9.90000E-02 VSPR1 -2.54577E-06 ;
5 PROPANE data MW   44.097 TCRIT   369.83 PCRIT  4.24800E+06 VSPR1
-3.59343E-06 ;
6 I-BUTANE data MW   58.123 PCRIT  3.64002E+06 ACENTRICFACTOR  0.18600 VSPR1
-4.49142E-06 ;
7 N-BUTANE data TCRIT   425.12 PCRIT  3.79598E+06 ACENTRICFACTOR  0.20000
VSPR1 -3.90684E-06 ;
8 I-PENTANE data TCRIT   460.39 PCRIT  3.38098E+06 ACENTRICFACTOR  0.22900
VSPR1 -4.97311E-06 ;
9 PENTANE data PCRIT  3.37002E+06 ACENTRICFACTOR  0.25200 VSPR1 -2.63886E-06 ;
;
chardata INFOCHAR TBSOEREIDE ;
petrofracs overwrite 10 C6 normal data MW   83.282 TCRIT   512.44 PCRIT
 3.30948E+06 VCRIT  3.46244E-04 ACENTRICFACTOR  0.24969 TBOIL   337.85 SG
 0.69568 CNUMBER   5.9292 REFVISLB  2.26070E-04 VSPR1 -5.54877E-07 ;
11 C7 normal data MW   98.471 TCRIT   553.18 PCRIT  3.03631E+06 VCRIT
 4.66510E-04 ACENTRICFACTOR  0.28313 TBOIL   370.98 SG  0.76726 CNUMBER
  7.1997 REFVISLB  1.34400E-03 VSPR1  8.09391E-06 ;
12 C8 normal data MW   109.87 TCRIT   579.61 PCRIT  2.85684E+06 VCRIT
 5.12238E-04 ACENTRICFACTOR  0.31047 TBOIL   393.58 SG  0.78591 CNUMBER
  7.9958 REFVISLB  1.18160E-03 VSPR1  9.88729E-06 ;
13 C9 normal data MW   123.39 TCRIT   608.62 PCRIT  2.65290E+06 VCRIT
 5.69747E-04 ACENTRICFACTOR  0.34698 TBOIL   419.67 SG  0.80319 CNUMBER
  8.9300 REFVISLB  1.06690E-03 VSPR1  1.31971E-05 ;
14 C10 normal data MW   136.62 TCRIT   634.18 PCRIT  2.47860E+06 VCRIT
 6.25922E-04 ACENTRICFACTOR  0.38361 TBOIL   443.50 SG  0.81695 CNUMBER
  9.7773 REFVISLB  9.69100E-04 VSPR1  1.67277E-05 ;
15 C11 normal data MW   149.76 TCRIT   657.32 PCRIT  2.32698E+06 VCRIT
 6.81347E-04 ACENTRICFACTOR  0.42051 TBOIL   465.72 SG  0.82855 CNUMBER
  10.705 REFVISLB  8.82700E-04 VSPR1  2.04793E-05 ;
16 C12 normal data MW   162.81 TCRIT   678.41 PCRIT  2.19433E+06 VCRIT
 7.35698E-04 ACENTRICFACTOR  0.45752 TBOIL   486.53 SG  0.83860 CNUMBER
  11.611 REFVISLB  8.04100E-04 VSPR1  2.44042E-05 ;
17 C13 normal data MW   175.77 TCRIT   697.77 PCRIT  2.07774E+06 VCRIT
 7.88808E-04 ACENTRICFACTOR  0.49116 TBOIL   506.06 SG  0.84747 CNUMBER
  12.526 REFVISLB  7.32000E-04 VSPR1  2.84490E-05 ;
18 C14 normal data MW   188.63 TCRIT   715.63 PCRIT  1.97480E+06 VCRIT
 8.40335E-04 ACENTRICFACTOR  0.52632 TBOIL   524.44 SG  0.85541 CNUMBER
  13.400 REFVISLB  6.65200E-04 VSPR1  3.25640E-05 ;
19 C15 normal data MW   201.39 TCRIT   732.18 PCRIT  1.88337E+06 VCRIT
 8.90240E-04 ACENTRICFACTOR  0.56109 TBOIL   541.77 SG  0.86261 CNUMBER
  14.189 REFVISLB  6.03600E-04 VSPR1  3.67048E-05 ;
20 C16 normal data MW   214.05 TCRIT   747.58 PCRIT  1.80188E+06 VCRIT
 9.38404E-04 ACENTRICFACTOR  0.59542 TBOIL   558.16 SG  0.86919 CNUMBER
  14.935 REFVISLB  5.46800E-04 VSPR1  4.08277E-05 ;
21 C17 normal data MW   226.61 TCRIT   761.97 PCRIT  1.72900E+06 VCRIT
 9.84662E-04 ACENTRICFACTOR  0.62930 TBOIL   573.66 SG  0.87525 CNUMBER
  15.768 REFVISLB  4.95100E-04 VSPR1  4.48898E-05 ;
22 C18 normal data MW   239.06 TCRIT   775.45 PCRIT  1.66350E+06 VCRIT
 1.02906E-03 ACENTRICFACTOR  0.66270 TBOIL   588.36 SG  0.88086 CNUMBER
  16.527 REFVISLB  4.48200E-04 VSPR1  4.88697E-05 ;
23 C19 normal data MW   251.41 TCRIT   788.12 PCRIT  1.60441E+06 VCRIT
 1.07156E-03 ACENTRICFACTOR  0.69560 TBOIL   602.33 SG  0.88609 CNUMBER
  17.333 REFVISLB  4.05900E-04 VSPR1  5.27332E-05 ;
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24 C20 normal data MW   263.65 TCRIT   800.06 PCRIT  1.55091E+06 VCRIT
 1.11221E-03 ACENTRICFACTOR  0.72799 TBOIL   615.61 SG  0.89098 CNUMBER
  18.287 REFVISLB  3.68000E-04 VSPR1  5.64599E-05 ;
25 C21 normal data MW   275.78 TCRIT   811.34 PCRIT  1.50237E+06 VCRIT
 1.15091E-03 ACENTRICFACTOR  0.75988 TBOIL   628.25 SG  0.89558 CNUMBER
  19.198 REFVISLB  3.34200E-04 VSPR1  6.00317E-05 ;
26 C22 normal data MW   287.81 TCRIT   822.03 PCRIT  1.45817E+06 VCRIT
 1.18783E-03 ACENTRICFACTOR  0.79124 TBOIL   640.31 SG  0.89991 CNUMBER
  19.999 REFVISLB  3.04300E-04 VSPR1  6.34355E-05 ;
27 C23 normal data MW   299.73 TCRIT   832.17 PCRIT  1.41777E+06 VCRIT
 1.22294E-03 ACENTRICFACTOR  0.82208 TBOIL   651.83 SG  0.90401 CNUMBER
  20.791 REFVISLB  2.77800E-04 VSPR1  6.66597E-05 ;
28 C24 normal data MW   311.54 TCRIT   841.82 PCRIT  1.38081E+06 VCRIT
 1.25621E-03 ACENTRICFACTOR  0.85239 TBOIL   662.83 SG  0.90790 CNUMBER
  21.576 REFVISLB  2.54300E-04 VSPR1  6.96905E-05 ;
29 C25 normal data MW   323.26 TCRIT   851.02 PCRIT  1.34682E+06 VCRIT
 1.28799E-03 ACENTRICFACTOR  0.88218 TBOIL   673.37 SG  0.91159 CNUMBER
  22.353 REFVISLB  2.33600E-04 VSPR1  7.25327E-05 ;
30 C26 normal data MW   334.87 TCRIT   859.79 PCRIT  1.31552E+06 VCRIT
 1.31813E-03 ACENTRICFACTOR  0.91144 TBOIL   683.47 SG  0.91511 CNUMBER
  23.122 REFVISLB  2.15300E-04 VSPR1  7.51809E-05 ;
31 C27 normal data MW   346.38 TCRIT   868.19 PCRIT  1.28663E+06 VCRIT
 1.34668E-03 ACENTRICFACTOR  0.94018 TBOIL   693.15 SG  0.91848 CNUMBER
  23.884 REFVISLB  1.99100E-04 VSPR1  7.76287E-05 ;
32 C28 normal data MW   357.79 TCRIT   876.24 PCRIT  1.25981E+06 VCRIT
 1.37395E-03 ACENTRICFACTOR  0.96841 TBOIL   702.46 SG  0.92169 CNUMBER
  24.639 REFVISLB  1.84800E-04 VSPR1  7.98855E-05 ;
33 C29 normal data MW   369.10 TCRIT   883.95 PCRIT  1.23499E+06 VCRIT
 1.39964E-03 ACENTRICFACTOR  0.99612 TBOIL   711.40 SG  0.92478 CNUMBER
  25.388 REFVISLB  1.72200E-04 VSPR1  8.19443E-05 ;
34 C30 normal data MW   380.32 TCRIT   891.37 PCRIT  1.21189E+06 VCRIT
 1.42415E-03 ACENTRICFACTOR   1.0233 TBOIL   720.00 SG  0.92774 CNUMBER
  26.129 REFVISLB  1.61000E-04 VSPR1  8.38118E-05 ;
35 C31 normal data MW   391.45 TCRIT   898.49 PCRIT  1.19038E+06 VCRIT
 1.44735E-03 ACENTRICFACTOR   1.0500 TBOIL   728.29 SG  0.93058 CNUMBER
  26.864 REFVISLB  1.51000E-04 VSPR1  8.54912E-05 ;
36 C32 normal data MW   402.49 TCRIT   905.36 PCRIT  1.17032E+06 VCRIT
 1.46942E-03 ACENTRICFACTOR   1.0762 TBOIL   736.29 SG  0.93333 CNUMBER
  27.591 REFVISLB  1.42100E-04 VSPR1  8.69809E-05 ;
37 C33 normal data MW   413.44 TCRIT   911.98 PCRIT  1.15149E+06 VCRIT
 1.49041E-03 ACENTRICFACTOR   1.1019 TBOIL   744.00 SG  0.93597 CNUMBER
  28.338 REFVISLB  1.34200E-04 VSPR1  8.83013E-05 ;
38 C34 normal data MW   424.30 TCRIT   918.38 PCRIT  1.13384E+06 VCRIT
 1.51034E-03 ACENTRICFACTOR   1.1272 TBOIL   751.45 SG  0.93852 CNUMBER
  29.094 REFVISLB  1.27100E-04 VSPR1  8.94454E-05 ;
39 C35 normal data MW   435.08 TCRIT   924.56 PCRIT  1.11730E+06 VCRIT
 1.52923E-03 ACENTRICFACTOR   1.1519 TBOIL   758.65 SG  0.94099 CNUMBER
  29.757 REFVISLB  1.20800E-04 VSPR1  9.04173E-05 ;
40 C36 normal data MW   579.66 TCRIT   1015.2 PCRIT  1.05448E+06 VCRIT
 1.59405E-03 ACENTRICFACTOR   1.2205 TBOIL   840.35 SG  0.96914 CNUMBER
  39.929 REFVISLB  7.03900E-05 VSPR1  4.12448E-05 ; ;
bipset PR78ABIP 1 linear eos none  1  2 0.1 0  1  3 0.1 0  1  4 0.1 0  1  5
0.1 0  1  6 0.1 0  1  7 0.1 0  1  8 0.1 0  1  9 0.1 0  1 10 0.1 0  1 11 0.1 0
 1 12 0.1 0  1 13 0.1 0  1 14 0.1 0  1 15 0.1 0  1 16 0.1 0  1 17 0.1 0  1 18
0.1 0  1 19 0.1 0  1 20 0.1 0  1 21 0.1 0  1 22 0.1 0  1 23 0.1 0  1 24 0.1 0
 1 25 0.1 0  1 26 0.1 0  1 27 0.1 0  1 28 0.1 0  1 29 0.1 0  1 30 0.1 0  1 31
0.1 0  1 32 0.1 0  1 33 0.1 0  1 34 0.1 0  1 35 0.1 0  1 36 0.1 0  1 37 0.1 0
 1 38 0.1 0  1 39 0.1 0  1 40 0.1 0  2  3 0.105 0  2  4 0.13 0  2  5 0.125 0
 2  6 0.115 0  2  7 0.115 0  2  8 0.115 0  2  9 0.115 0  2 10 0.115 0  2 11
0.115 0  2 12 0.115 0  2 13 0.115 0  2 14 0.115 0  2 15 0.115 0  2 16 0.115 0
 2 17 0.115 0  2 18 0.115 0  2 19 0.115 0  2 20 0.115 0  2 21 0.115 0  2 22
0.115 0  2 23 0.115 0  2 24 0.115 0  2 25 0.115 0  2 26 0.115 0  2 27 0.115 0
 2 28 0.115 0  2 29 0.115 0  2 30 0.115 0  2 31 0.115 0  2 32 0.115 0  2 33
0.115 0  2 34 0.115 0  2 35 0.115 0  2 36 0.115 0  2 37 0.115 0  2 38 0.115 0
 2 39 0.115 0  2 40 0.115 0  3  4 -0.00126 0  3  5 -0.00414 0  3  6 -0.00791 0
 3  7 -0.00745 0  3  8 -0.01067 0  3  9 -0.01083 0  3 10 -0.03 0  3 11
0.02274266 -7.55245E-5  3 12 0.05131445 -.000151175  3 13 0.07961711
-.000226699  3 14 0.1079798 -.000302224  3 15 0.1363924 -.000377748  3 16
0.1648551 -.000453273  3 17 0.1934069 -.000528923  3 18 0.2219695 -.000604448
 3 19 0.2505722 -.000679972  3 20 0.279274 -.000755622  3 21 0.3079766
-.000831147  3 22 0.3367193 -.000906671  3 23 0.2813335 -.000725035  3 24
0.2259751 -.000543776  3 25 0.1707167 -.000362517  3 26 0.1154584 -.000181259
 3 27 0.06015 0  3 28 0.0617 0  3 29 0.06317 0  3 30 0.06456 0  3 31 0.06587 0
 3 32 0.06712 0  3 33 0.0683 0  3 34 0.06943 0  3 35 0.07049 0  3 36 0.07151 0
 3 37 0.07248 0  3 38 0.0734 0  3 39 0.07427 0  3 40 0.08336 0  4  6 1.E-20 0
 4  7 1.E-20 0  4  8 1.E-20 0  4  9 1.E-20 0  4 10 1.E-20 0  4 11 1.E-20 0  4
12 1.E-20 0  4 13 1.E-20 0  4 14 1.E-20 0  4 15 1.E-20 0  4 16 1.E-20 0  4 17
1.E-20 0  4 18 1.E-20 0  4 19 1.E-20 0  4 20 1.E-20 0  4 21 1.E-20 0  4 22
1.E-20 0  4 23 1.E-20 0  4 24 1.E-20 0  4 25 1.E-20 0  4 26 1.E-20 0  4 27
```

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1.E-20 0  4 28 1.E-20 0  4 29 1.E-20 0  4 30 1.E-20 0  4 31 1.E-20 0  4 32
1.E-20 0  4 33 1.E-20 0  4 34 1.E-20 0  4 35 1.E-20 0  4 36 1.E-20 0  4 37
1.E-20 0  4 38 1.E-20 0  4 39 1.E-20 0  4 40 1.E-20 0  5  8 1.E-20 0  5  9
1.E-20 0  5 10 1.E-20 0  5 11 1.E-20 0  5 12 1.E-20 0  5 13 1.E-20 0  5 14
1.E-20 0  5 15 1.E-20 0  5 16 1.E-20 0  5 17 1.E-20 0  5 18 1.E-20 0  5 19
1.E-20 0  5 20 1.E-20 0  5 21 1.E-20 0  5 22 1.E-20 0  5 23 1.E-20 0  5 24
1.E-20 0  5 25 1.E-20 0  5 26 1.E-20 0  5 27 1.E-20 0  5 28 1.E-20 0  5 29
1.E-20 0  5 30 1.E-20 0  5 31 1.E-20 0  5 32 1.E-20 0  5 33 1.E-20 0  5 34
1.E-20 0  5 35 1.E-20 0  5 36 1.E-20 0  5 37 1.E-20 0  5 38 1.E-20 0  5 39
1.E-20 0  5 40 1.E-20 0  6 10 1.E-20 0  6 11 1.E-20 0  6 12 1.E-20 0  6 13
1.E-20 0  6 14 1.E-20 0  6 15 1.E-20 0  6 16 1.E-20 0  6 17 1.E-20 0  6 18
1.E-20 0  6 19 1.E-20 0  6 20 1.E-20 0  6 21 1.E-20 0  6 22 1.E-20 0  6 23
1.E-20 0  6 24 1.E-20 0  6 25 1.E-20 0  6 26 1.E-20 0  6 27 1.E-20 0  6 28
1.E-20 0  6 29 1.E-20 0  6 30 1.E-20 0  6 31 1.E-20 0  6 32 1.E-20 0  6 33
1.E-20 0  6 34 1.E-20 0  6 35 1.E-20 0  6 36 1.E-20 0  6 37 1.E-20 0  6 38
1.E-20 0  6 39 1.E-20 0  6 40 1.E-20 0  7 10 1.E-20 0  7 11 1.E-20 0  7 12
1.E-20 0  7 13 1.E-20 0  7 14 1.E-20 0  7 15 1.E-20 0  7 16 1.E-20 0  7 17
1.E-20 0  7 18 1.E-20 0  7 19 1.E-20 0  7 20 1.E-20 0  7 21 1.E-20 0  7 22
1.E-20 0  7 23 1.E-20 0  7 24 1.E-20 0  7 25 1.E-20 0  7 26 1.E-20 0  7 27
1.E-20 0  7 28 1.E-20 0  7 29 1.E-20 0  7 30 1.E-20 0  7 31 1.E-20 0  7 32
1.E-20 0  7 33 1.E-20 0  7 34 1.E-20 0  7 35 1.E-20 0  7 36 1.E-20 0  7 37
1.E-20 0  7 38 1.E-20 0  7 39 1.E-20 0  7 40 1.E-20 0  8 11 1.E-20 0  8 12
1.E-20 0  8 13 1.E-20 0  8 14 1.E-20 0  8 15 1.E-20 0  8 16 1.E-20 0  8 17
1.E-20 0  8 18 1.E-20 0  8 19 1.E-20 0  8 20 1.E-20 0  8 21 1.E-20 0  8 22
1.E-20 0  8 23 1.E-20 0  8 24 1.E-20 0  8 25 1.E-20 0  8 26 1.E-20 0  8 27
1.E-20 0  8 28 1.E-20 0  8 29 1.E-20 0  8 30 1.E-20 0  8 31 1.E-20 0  8 32
1.E-20 0  8 33 1.E-20 0  8 34 1.E-20 0  8 35 1.E-20 0  8 36 1.E-20 0  8 37
1.E-20 0  8 38 1.E-20 0  8 39 1.E-20 0  8 40 1.E-20 0  9 11 1.E-20 0  9 12
1.E-20 0  9 13 1.E-20 0  9 14 1.E-20 0  9 15 1.E-20 0  9 16 1.E-20 0  9 17
1.E-20 0  9 18 1.E-20 0  9 19 1.E-20 0  9 20 1.E-20 0  9 21 1.E-20 0  9 22
1.E-20 0  9 23 1.E-20 0  9 24 1.E-20 0  9 25 1.E-20 0  9 26 1.E-20 0  9 27
1.E-20 0  9 28 1.E-20 0  9 29 1.E-20 0  9 30 1.E-20 0  9 31 1.E-20 0  9 32
1.E-20 0  9 33 1.E-20 0  9 34 1.E-20 0  9 35 1.E-20 0  9 36 1.E-20 0  9 37
1.E-20 0  9 38 1.E-20 0  9 39 1.E-20 0  9 40 1.E-20 0 11 12 0.00014 0 11 13
0.00063 0 11 14 0.00138 0 11 15 0.00232 0 11 16 0.00338 0 11 17 0.00453 0 11
18 0.00573 0 11 19 0.00697 0 11 20 0.00821 0 11 21 0.00945 0 11 22 0.01068 0
11 23 0.01188 0 11 24 0.01305 0 11 25 0.01419 0 11 26 0.0153 0 11 27 0.01637 0
11 28 0.0174 0 11 29 0.01839 0 11 30 0.01934 0 11 31 0.02026 0 11 32 0.02114 0
11 33 0.02199 0 11 34 0.02281 0 11 35 0.02359 0 11 36 0.02434 0 11 37 0.02506
0 11 38 0.02575 0 11 39 0.02642 0 11 40 0.03359 0 12 13 0.00018 0 12 14
0.00065 0 12 15 0.00133 0 12 16 0.00216 0 12 17 0.0031 0 12 18 0.00411 0 12 19
0.00517 0 12 20 0.00625 0 12 21 0.00734 0 12 22 0.00843 0 12 23 0.0095 0 12 24
0.01056 0 12 25 0.01159 0 12 26 0.01259 0 12 27 0.01357 0 12 28 0.01451 0 12
29 0.01542 0 12 30 0.0163 0 12 31 0.01715 0 12 32 0.01796 0 12 33 0.01875 0 12
34 0.0195 0 12 35 0.02023 0 12 36 0.02093 0 12 37 0.0216 0 12 38 0.02224 0 12
39 0.02287 0 12 40 0.0296 0 13 14 0.00015 0 13 15 0.00053 0 13 16 0.00109 0 13
17 0.00179 0 13 18 0.00257 0 13 19 0.00342 0 13 20 0.00431 0 13 21 0.00523 0
13 22 0.00616 0 13 23 0.00708 0 13 24 0.008 0 13 25 0.0089 0 13 26 0.00979 0
13 27 0.01065 0 13 28 0.01149 0 13 29 0.01231 0 13 30 0.0131 0 13 31 0.01386 0
13 32 0.0146 0 13 33 0.01531 0 13 34 0.016 0 13 35 0.01666 0 13 36 0.0173 0 13
37 0.01791 0 13 38 0.0185 0 13 39 0.01907 0 13 40 0.0253 0 14 15 0.00012 0 14
16 0.00044 0 14 17 0.00091 0 14 18 0.0015 0 14 19 0.00216 0 14 20 0.00288 0 14
21 0.00364 0 14 22 0.00442 0 14 23 0.00521 0 14 24 0.00601 0 14 25 0.0068 0 14
26 0.00757 0 14 27 0.00834 0 14 28 0.00909 0 14 29 0.00982 0 14 30 0.01052 0
14 31 0.01121 0 14 32 0.01188 0 14 33 0.01252 0 14 34 0.01315 0 14 35 0.01375
0 14 36 0.01433 0 14 37 0.01489 0 14 38 0.01543 0 14 39 0.01596 0 14 40
0.02171 0 15 16 1.E-4 0 15 17 0.00037 0 15 18 0.00077 0 15 19 0.00126 0 15 20
0.00183 0 15 21 0.00244 0 15 22 0.00309 0 15 23 0.00376 0 15 24 0.00443 0 15
25 0.00512 0 15 26 0.0058 0 15 27 0.00647 0 15 28 0.00713 0 15 29 0.00778 0 15
30 0.00842 0 15 31 0.00903 0 15 32 0.00963 0 15 33 0.01022 0 15 34 0.01078 0
15 35 0.01133 0 15 36 0.01186 0 15 37 0.01237 0 15 38 0.01287 0 15 39 0.01335
0 15 40 0.01867 0 16 17 9.E-5 0 16 18 0.00031 0 16 19 0.00065 0 16 20 0.00107
0 16 21 0.00155 0 16 22 0.00208 0 16 23 0.00263 0 16 24 0.0032 0 16 25 0.00379
0 16 26 0.00438 0 16 27 0.00496 0 16 28 0.00555 0 16 29 0.00612 0 16 30
0.00669 0 16 31 0.00724 0 16 32 0.00778 0 16 33 0.00831 0 16 34 0.00882 0 16
35 0.00932 0 16 36 0.0098 0 16 37 0.01027 0 16 38 0.01072 0 16 39 0.01116 0 16
40 0.01608 0 17 18 7.E-5 0 17 19 0.00027 0 17 20 0.00055 0 17 21 0.00091 0 17
22 0.00132 0 17 23 0.00177 0 17 24 0.00225 0 17 25 0.00274 0 17 26 0.00325 0
17 27 0.00376 0 17 28 0.00427 0 17 29 0.00477 0 17 30 0.00527 0 17 31 0.00577
0 17 32 0.00625 0 17 33 0.00673 0 17 34 0.00719 0 17 35 0.00764 0 17 36
0.00808 0 17 37 0.0085 0 17 38 0.00892 0 17 39 0.00932 0 17 40 0.01387 0 18 19
6.E-5 0 18 20 0.00023 0 18 21 0.00047 0 18 22 0.00078 0 18 23 0.00113 0 18 24
0.00152 0 18 25 0.00193 0 18 26 0.00235 0 18 27 0.00279 0 18 28 0.00324 0 18
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18 39 0.00777 0 18 40 0.01197 0 19 20 5.E-5 0 19 21 0.00019 0 19 22 0.0004 0
19 23 0.00067 0 19 24 0.00097 0 19 25 0.0013 0 19 26 0.00166 0 19 27 0.00203 0
19 28 0.00241 0 19 29 0.0028 0 19 30 0.00318 0 19 31 0.00357 0 19 32 0.00395 0
19 33 0.00433 0 19 34 0.00471 0 19 35 0.00507 0 19 36 0.00543 0 19 37 0.00579
```

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0.00143 0 20 28 0.00175 0 20 29 0.00209 0 20 30 0.00242 0 20 31 0.00276 0 20
32 0.0031 0 20 33 0.00344 0 20 34 0.00377 0 20 35 0.0041 0 20 36 0.00443 0 20
37 0.00475 0 20 38 0.00506 0 20 39 0.00536 0 20 40 0.00895 0 21 22 4.E-5 0 21
23 0.00014 0 21 24 0.0003 0 21 25 0.00049 0 21 26 0.00072 0 21 27 0.00097 0 21
28 0.00124 0 21 29 0.00152 0 21 30 0.00181 0 21 31 0.00211 0 21 32 0.00241 0
21 33 0.0027 0 21 34 0.003 0 21 35 0.0033 0 21 36 0.00359 0 21 37 0.00388 0 21
38 0.00416 0 21 39 0.00444 0 21 40 0.00774 0 22 23 3.E-5 0 22 24 0.00012 0 22
25 0.00026 0 22 26 0.00043 0 22 27 0.00063 0 22 28 0.00084 0 22 29 0.00108 0
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0 23 33 0.00161 0 23 34 0.00184 0 23 35 0.00207 0 23 36 0.00231 0 23 37
0.00254 0 23 38 0.00277 0 23 39 0.003 0 23 40 0.0058 0 24 25 2.E-5 0 24 26
9.E-5 0 24 27 0.00019 0 24 28 0.00032 0 24 29 0.00047 0 24 30 0.00064 0 24 31
0.00082 0 24 32 0.00101 0 24 33 0.00121 0 24 34 0.00141 0 24 35 0.00162 0 24
36 0.00182 0 24 37 0.00203 0 24 38 0.00224 0 24 39 0.00244 0 24 40 0.00502 0
25 26 2.E-5 0 25 27 8.E-5 0 25 28 0.00017 0 25 29 0.00028 0 25 30 0.00041 0 25
31 0.00056 0 25 32 0.00072 0 25 33 0.00089 0 25 34 0.00106 0 25 35 0.00124 0
25 36 0.00142 0 25 37 0.00161 0 25 38 0.00179 0 25 39 0.00198 0 25 40 0.00435
0 26 27 2.E-5 0 26 28 7.E-5 0 26 29 0.00015 0 26 30 0.00025 0 26 31 0.00036 0
26 32 0.00049 0 26 33 0.00063 0 26 34 0.00078 0 26 35 0.00094 0 26 36 0.0011 0
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27 29 6.E-5 0 27 30 0.00013 0 27 31 0.00022 0 27 32 0.00032 0 27 33 0.00043 0
27 34 0.00056 0 27 35 0.00069 0 27 36 0.00083 0 27 37 0.00097 0 27 38 0.00112
0 27 39 0.00126 0 27 40 0.00325 0 28 29 1.E-5 0 28 30 5.E-5 0 28 31 0.00011 0
28 32 0.00019 0 28 33 0.00028 0 28 34 0.00038 0 28 35 0.00049 0 28 36 0.00061
0 28 37 0.00073 0 28 38 0.00086 0 28 39 0.00099 0 28 40 0.00281 0 29 30 1.E-5
0 29 31 5.E-5 0 29 32 1.E-4 0 29 33 0.00017 0 29 34 0.00025 0 29 35 0.00034 0
29 36 0.00044 0 29 37 0.00054 0 29 38 0.00065 0 29 39 0.00077 0 29 40 0.00242
0 30 31 1.E-5 0 30 32 4.E-5 0 30 33 9.E-5 0 30 34 0.00015 0 30 35 0.00022 0 30
36 0.0003 0 30 37 0.00039 0 30 38 0.00048 0 30 39 0.00058 0 30 40 0.00208 0 31
32 1.E-5 0 31 33 4.E-5 0 31 34 8.E-5 0 31 35 0.00013 0 31 36 0.0002 0 31 37
0.00027 0 31 38 0.00035 0 31 39 0.00043 0 31 40 0.00179 0 32 33 1.E-5 0 32 34
3.E-5 0 32 35 7.E-5 0 32 36 0.00012 0 32 37 0.00018 0 32 38 0.00024 0 32 39
0.00031 0 32 40 0.00153 0 33 34 1.E-5 0 33 35 3.E-5 0 33 36 6.E-5 0 33 37
0.00011 0 33 38 0.00016 0 33 39 0.00022 0 33 40 0.00131 0 34 35 1.E-5 0 34 36
3.E-5 0 34 37 6.E-5 0 34 38 1.E-4 0 34 39 0.00014 0 34 40 0.00112 0 35 36
1.E-5 0 35 37 2.E-5 0 35 38 5.E-5 0 35 39 9.E-5 0 35 40 0.00095 0 36 37 1.E-5
0 36 38 2.E-5 0 36 39 5.E-5 0 36 40 0.0008 0 37 38 1.E-5 0 37 39 2.E-5 0 37 40
0.00067 0 38 40 0.00056 0 39 40 0.00046 0 ;
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bipdata erase ;
model MPR78A PRA PSAT78 LDEN VDW PR78ABIP;
model MLBCMPR78A LBC LFIT MPR78A;
model MSTRAPP SPTHCOND;
bipdata erase ;
model MLGSTMPR78A LGST MPR78A LGSTBIP;
bipdata erase ;
pd GAS gas MPR78A MPR78A MPR78A MLBCMPR78A MSTRAPP MLGSTMPR78A;
pd LIQUID1 liquid MPR78A MPR78A MPR78A MLBCMPR78A MSTRAPP MLGSTMPR78A;
key LIQUID1 not 007732-18-5;
pd LIQUID2 liquid MPR78A MPR78A MPR78A MLBCMPR78A MSTRAPP MLGSTMPR78A;
key LIQUID2 not 007732-18-5;
temperature 390.37222222;
pressure 41368543.759;
amounts 2.241593164755 4.164643830199 294.2707979001 29.0018578991
20.84273133398 4.258572830994 9.751837247307 3.99811238107 4.992308838222
9.160129175788 7.745747426686 11.8963249039 6.697099473477 5.599444947021
4.147400969846 3.413210916656 3.404589486479 2.991210801634 2.614877005646
2.285890995609 1.998295742927 1.746883553599 1.527102628193 1.334973147255
1.227884978215 1.072243828296 .9769535967992 .8748567581977 .8099685552998
.7183079699473 .6874518953856 .6547809977517 .5635744583615 .5304499683575
.4741831956362 .4328904142332 .3884215790555 .3798001488789 .328071114227
3.386892580163;
inputunits temperature degF pressure psi enthalpy BTU/lbmol entropy BTU/lbmol/F
volume kg/m3 amounts lbmol viscosity cP thcond BTU/hr/ft/F surten dyne/cm
diffusion cm2/s;
outputunits temperature degF pressure psi enthalpy BTU/lbmol entropy
BTU/lbmol/F volume lbmol/ft3 amounts lbmol viscosity cP thcond BTU/hr/ft/F
surten dyne/cm diffusion cm2/s;
set physprops 1VCS;
```

MultiFlash – INTERTEK-EOS20120322.mfl

```
# Multiflash version: 4.1.09   March 2012 #
# Date: 04 April 2012   Time: 11:32 #
remove all;
units temperature K pressure Pa enthalpy J/mol entropy J/mol/K volume m3/mol
amounts mol viscosity Pas thcond W/m/K surten N/m diffusion m2/s;
title "Intertek bottomhole fluid sample with EOS 20120322.   Contains about "
"0.2 wt% OBM in reservoir fluid.  T-dependent BIPs Library component "
"properties changed to same as PhazeComp. T-dep BIPs altered from previous "
"version to get correct BIP at 243F not 240F." ;
datum enthalpy compound entropy compound; set fractions;
properties PFC6PLUSMW   197.70 ;
puredata INFODATA ;
components overwrite 1 NITROGEN data TCRIT   126.20 PCRIT  3.39801E+06
ACENTRICFACTOR  3.70000E-02 VSRKS1 -4.02589E-06 ;
2 "CARBON DIOXIDE" data TCRIT   304.12 PCRIT  7.37401E+06 ACENTRICFACTOR
 0.22500 VSPR1  5.09546E-08 ;
3 METHANE data TCRIT   190.56 PCRIT  4.59901E+06 VCRIT  9.85975E-05
ACENTRICFACTOR  1.10000E-02 VSPR1 -4.01930E-06 ;
4 ETHANE data TCRIT   305.32 PCRIT  4.87197E+06 VCRIT  1.45498E-04
ACENTRICFACTOR  9.90000E-02 VSPR1 -2.54577E-06 ;
5 PROPANE data MW   44.097 TCRIT   369.83 PCRIT  4.24800E+06 VSPR1
-3.59343E-06 ;
6 I-BUTANE data MW   58.123 PCRIT  3.64002E+06 ACENTRICFACTOR  0.18600 VSPR1
-4.49142E-06 ;
7 N-BUTANE data TCRIT   425.12 PCRIT  3.79598E+06 ACENTRICFACTOR  0.20000
VSPR1 -3.90684E-06 ;
8 I-PENTANE data TCRIT   460.39 PCRIT  3.38098E+06 ACENTRICFACTOR  0.22900
VSPR1 -4.97311E-06 ;
9 PENTANE data PCRIT  3.37002E+06 ACENTRICFACTOR  0.25200 VSPR1 -2.63886E-06 ;
;
chardata INFOCHAR TBSOEREIDE ;
petrofracs overwrite 10 C6 normal data MW   83.282 TCRIT   512.44 PCRIT
 3.30948E+06 VCRIT  3.46244E-04 ACENTRICFACTOR  0.24969 TBOIL   337.85 SG
 0.69568 CNUMBER   5.9292 REFVISLB  2.26070E-04 VSPR1 -5.54877E-07 ;
11 C7 normal data MW   98.471 TCRIT   553.18 PCRIT  3.03631E+06 VCRIT
 4.66510E-04 ACENTRICFACTOR  0.28313 TBOIL   370.98 SG  0.76726 CNUMBER
  7.1997 REFVISLB  1.34400E-03 VSPR1  8.09391E-06 ;
12 C8 normal data MW   109.87 TCRIT   579.61 PCRIT  2.85684E+06 VCRIT
 5.12238E-04 ACENTRICFACTOR  0.31047 TBOIL   393.58 SG  0.78591 CNUMBER
  7.9958 REFVISLB  1.18160E-03 VSPR1  9.88729E-06 ;
13 C9 normal data MW   123.39 TCRIT   608.62 PCRIT  2.65290E+06 VCRIT
 5.69747E-04 ACENTRICFACTOR  0.34698 TBOIL   419.67 SG  0.80319 CNUMBER
  8.9300 REFVISLB  1.06690E-03 VSPR1  1.31971E-05 ;
14 C10 normal data MW   136.62 TCRIT   634.18 PCRIT  2.47860E+06 VCRIT
 6.25922E-04 ACENTRICFACTOR  0.38361 TBOIL   443.50 SG  0.81695 CNUMBER
  9.7773 REFVISLB  9.69100E-04 VSPR1  1.67277E-05 ;
15 C11 normal data MW   149.76 TCRIT   657.32 PCRIT  2.32698E+06 VCRIT
 6.81347E-04 ACENTRICFACTOR  0.42051 TBOIL   465.72 SG  0.82855 CNUMBER
  10.705 REFVISLB  8.82700E-04 VSPR1  2.04793E-05 ;
16 C12 normal data MW   162.81 TCRIT   678.41 PCRIT  2.19433E+06 VCRIT
 7.35698E-04 ACENTRICFACTOR  0.45752 TBOIL   486.53 SG  0.83860 CNUMBER
  11.611 REFVISLB  8.04100E-04 VSPR1  2.44042E-05 ;
17 C13 normal data MW   175.77 TCRIT   697.77 PCRIT  2.07774E+06 VCRIT
 7.88808E-04 ACENTRICFACTOR  0.49116 TBOIL   506.06 SG  0.84747 CNUMBER
  12.526 REFVISLB  7.32000E-04 VSPR1  2.84490E-05 ;
18 C14 normal data MW   188.63 TCRIT   715.63 PCRIT  1.97480E+06 VCRIT
 8.40335E-04 ACENTRICFACTOR  0.52632 TBOIL   524.44 SG  0.85541 CNUMBER
  13.400 REFVISLB  6.65200E-04 VSPR1  3.25640E-05 ;
19 C15 normal data MW   201.39 TCRIT   732.18 PCRIT  1.88337E+06 VCRIT
 8.90240E-04 ACENTRICFACTOR  0.56109 TBOIL   541.77 SG  0.86261 CNUMBER
  14.189 REFVISLB  6.03600E-04 VSPR1  3.67048E-05 ;
20 C16 normal data MW   214.05 TCRIT   747.58 PCRIT  1.80188E+06 VCRIT
 9.38404E-04 ACENTRICFACTOR  0.59542 TBOIL   558.16 SG  0.86919 CNUMBER
  14.935 REFVISLB  5.46800E-04 VSPR1  4.08277E-05 ;
21 C17 normal data MW   226.61 TCRIT   761.97 PCRIT  1.72900E+06 VCRIT
 9.84662E-04 ACENTRICFACTOR  0.62930 TBOIL   573.66 SG  0.87525 CNUMBER
  15.768 REFVISLB  4.95100E-04 VSPR1  4.48898E-05 ;
22 C18 normal data MW   239.06 TCRIT   775.45 PCRIT  1.66350E+06 VCRIT
 1.02906E-03 ACENTRICFACTOR  0.66270 TBOIL   588.36 SG  0.88086 CNUMBER
  16.527 REFVISLB  4.48200E-04 VSPR1  4.88697E-05 ;
23 C19 normal data MW   251.41 TCRIT   788.12 PCRIT  1.60441E+06 VCRIT
 1.07156E-03 ACENTRICFACTOR  0.69560 TBOIL   602.33 SG  0.88609 CNUMBER
  17.333 REFVISLB  4.05900E-04 VSPR1  5.27332E-05 ;
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24 C20 normal data MW   263.65 TCRIT   800.06 PCRIT  1.55091E+06 VCRIT
 1.11221E-03 ACENTRICFACTOR  0.72799 TBOIL   615.61 SG  0.89098 CNUMBER
  18.287 REFVISLB  3.68000E-04 VSPR1  5.64599E-05 ;
25 C21 normal data MW   275.78 TCRIT   811.34 PCRIT  1.50237E+06 VCRIT
 1.15091E-03 ACENTRICFACTOR  0.75988 TBOIL   628.25 SG  0.89558 CNUMBER
  19.198 REFVISLB  3.34200E-04 VSPR1  6.00317E-05 ;
26 C22 normal data MW   287.81 TCRIT   822.03 PCRIT  1.45817E+06 VCRIT
 1.18783E-03 ACENTRICFACTOR  0.79124 TBOIL   640.31 SG  0.89991 CNUMBER
  19.999 REFVISLB  3.04300E-04 VSPR1  6.34355E-05 ;
27 C23 normal data MW   299.73 TCRIT   832.17 PCRIT  1.41777E+06 VCRIT
 1.22294E-03 ACENTRICFACTOR  0.82208 TBOIL   651.83 SG  0.90401 CNUMBER
  20.791 REFVISLB  2.77800E-04 VSPR1  6.66597E-05 ;
28 C24 normal data MW   311.54 TCRIT   841.82 PCRIT  1.38081E+06 VCRIT
 1.25621E-03 ACENTRICFACTOR  0.85239 TBOIL   662.83 SG  0.90790 CNUMBER
  21.576 REFVISLB  2.54300E-04 VSPR1  6.96905E-05 ;
29 C25 normal data MW   323.26 TCRIT   851.02 PCRIT  1.34682E+06 VCRIT
 1.28799E-03 ACENTRICFACTOR  0.88218 TBOIL   673.37 SG  0.91159 CNUMBER
  22.353 REFVISLB  2.33600E-04 VSPR1  7.25327E-05 ;
30 C26 normal data MW   334.87 TCRIT   859.79 PCRIT  1.31552E+06 VCRIT
 1.31813E-03 ACENTRICFACTOR  0.91144 TBOIL   683.47 SG  0.91511 CNUMBER
  23.122 REFVISLB  2.15300E-04 VSPR1  7.51809E-05 ;
31 C27 normal data MW   346.38 TCRIT   868.19 PCRIT  1.28663E+06 VCRIT
 1.34668E-03 ACENTRICFACTOR  0.94018 TBOIL   693.15 SG  0.91848 CNUMBER
  23.884 REFVISLB  1.99100E-04 VSPR1  7.76287E-05 ;
32 C28 normal data MW   357.79 TCRIT   876.24 PCRIT  1.25981E+06 VCRIT
 1.37395E-03 ACENTRICFACTOR  0.96841 TBOIL   702.46 SG  0.92169 CNUMBER
  24.639 REFVISLB  1.84800E-04 VSPR1  7.98855E-05 ;
33 C29 normal data MW   369.10 TCRIT   883.95 PCRIT  1.23499E+06 VCRIT
 1.39964E-03 ACENTRICFACTOR  0.99612 TBOIL   711.40 SG  0.92478 CNUMBER
  25.388 REFVISLB  1.72200E-04 VSPR1  8.19443E-05 ;
34 C30 normal data MW   380.32 TCRIT   891.37 PCRIT  1.21189E+06 VCRIT
 1.42415E-03 ACENTRICFACTOR   1.0233 TBOIL   720.00 SG  0.92774 CNUMBER
  26.129 REFVISLB  1.61000E-04 VSPR1  8.38118E-05 ;
35 C31 normal data MW   391.45 TCRIT   898.49 PCRIT  1.19038E+06 VCRIT
 1.44735E-03 ACENTRICFACTOR   1.0500 TBOIL   728.29 SG  0.93058 CNUMBER
  26.864 REFVISLB  1.51000E-04 VSPR1  8.54912E-05 ;
36 C32 normal data MW   402.49 TCRIT   905.36 PCRIT  1.17032E+06 VCRIT
 1.46942E-03 ACENTRICFACTOR   1.0762 TBOIL   736.29 SG  0.93333 CNUMBER
  27.591 REFVISLB  1.42100E-04 VSPR1  8.69809E-05 ;
37 C33 normal data MW   413.44 TCRIT   911.98 PCRIT  1.15149E+06 VCRIT
 1.49041E-03 ACENTRICFACTOR   1.1019 TBOIL   744.00 SG  0.93597 CNUMBER
  28.338 REFVISLB  1.34200E-04 VSPR1  8.83013E-05 ;
38 C34 normal data MW   424.30 TCRIT   918.38 PCRIT  1.13384E+06 VCRIT
 1.51034E-03 ACENTRICFACTOR   1.1272 TBOIL   751.45 SG  0.93852 CNUMBER
  29.094 REFVISLB  1.27100E-04 VSPR1  8.94454E-05 ;
39 C35 normal data MW   435.08 TCRIT   924.56 PCRIT  1.11730E+06 VCRIT
 1.52923E-03 ACENTRICFACTOR   1.1519 TBOIL   758.65 SG  0.94099 CNUMBER
  29.757 REFVISLB  1.20800E-04 VSPR1  9.04173E-05 ;
40 C36 normal data MW   579.66 TCRIT   1015.2 PCRIT  1.05448E+06 VCRIT
 1.59405E-03 ACENTRICFACTOR   1.2205 TBOIL   840.35 SG  0.96914 CNUMBER
  39.929 REFVISLB  7.03900E-05 VSPR1  4.12448E-05 ; ;
bipset PR78ABIP 1 linear eos none  1  2 0.1 0  1  3 0.1 0  1  4 0.1 0  1  5
0.1 0  1  6 0.1 0  1  7 0.1 0  1  8 0.1 0  1  9 0.1 0  1 10 0.1 0  1 11 0.1 0
 1 12 0.1 0  1 13 0.1 0  1 14 0.1 0  1 15 0.1 0  1 16 0.1 0  1 17 0.1 0  1 18
0.1 0  1 19 0.1 0  1 20 0.1 0  1 21 0.1 0  1 22 0.1 0  1 23 0.1 0  1 24 0.1 0
 1 25 0.1 0  1 26 0.1 0  1 27 0.1 0  1 28 0.1 0  1 29 0.1 0  1 30 0.1 0  1 31
0.1 0  1 32 0.1 0  1 33 0.1 0  1 34 0.1 0  1 35 0.1 0  1 36 0.1 0  1 37 0.1 0
 1 38 0.1 0  1 39 0.1 0  1 40 0.1 0  2  3 0.105 0  2  4 0.13 0  2  5 0.125 0
 2  6 0.115 0  2  7 0.115 0  2  8 0.115 0  2  9 0.115 0  2 10 0.115 0  2 11
0.115 0  2 12 0.115 0  2 13 0.115 0  2 14 0.115 0  2 15 0.115 0  2 16 0.115 0
 2 17 0.115 0  2 18 0.115 0  2 19 0.115 0  2 20 0.115 0  2 21 0.115 0  2 22
0.115 0  2 23 0.115 0  2 24 0.115 0  2 25 0.115 0  2 26 0.115 0  2 27 0.115 0
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0.115 0  2 34 0.115 0  2 35 0.115 0  2 36 0.115 0  2 37 0.115 0  2 38 0.115 0
 2 39 0.115 0  2 40 0.115 0  3  4 -0.00126 0  3  5 -0.00414 0  3  6 -0.00791 0
 3  7 -0.00745 0  3  8 -0.01067 0  3  9 -0.01083 0  3 10 -0.03 0  3 11
0.02274266 -7.55245E-5  3 12 0.05131445 -.000151175  3 13 0.07961711
-.000226699  3 14 0.1079798 -.000302224  3 15 0.1363924 -.000377748  3 16
0.1648551 -.000453273  3 17 0.1934069 -.000528923  3 18 0.2219695 -.000604448
 3 19 0.2505722 -.000679972  3 20 0.279274 -.000755622  3 21 0.3079766
-.000831147  3 22 0.3367193 -.000906671  3 23 0.2813335 -.000725035  3 24
0.2259751 -.000543776  3 25 0.1707167 -.000362517  3 26 0.1154584 -.000181259
 3 27 0.06015 0  3 28 0.0617 0  3 29 0.06317 0  3 30 0.06456 0  3 31 0.06587 0
 3 32 0.06712 0  3 33 0.0683 0  3 34 0.06943 0  3 35 0.07049 0  3 36 0.07151 0
 3 37 0.07248 0  3 38 0.0734 0  3 39 0.07427 0  3 40 0.08336 0  4  6 1.E-20 0
 4  7 1.E-20 0  4  8 1.E-20 0  4  9 1.E-20 0  4 10 1.E-20 0  4 11 1.E-20 0  4
12 1.E-20 0  4 13 1.E-20 0  4 14 1.E-20 0  4 15 1.E-20 0  4 16 1.E-20 0  4 17
1.E-20 0  4 18 1.E-20 0  4 19 1.E-20 0  4 20 1.E-20 0  4 21 1.E-20 0  4 22
1.E-20 0  4 23 1.E-20 0  4 24 1.E-20 0  4 25 1.E-20 0  4 26 1.E-20 0  4 27
```

```
1.E-20 0  4 28 1.E-20 0  4 29 1.E-20 0  4 30 1.E-20 0  4 31 1.E-20 0  4 32
1.E-20 0  4 33 1.E-20 0  4 34 1.E-20 0  4 35 1.E-20 0  4 36 1.E-20 0  4 37
1.E-20 0  4 38 1.E-20 0  4 39 1.E-20 0  4 40 1.E-20 0  5  8 1.E-20 0  5  9
1.E-20 0  5 10 1.E-20 0  5 11 1.E-20 0  5 12 1.E-20 0  5 13 1.E-20 0  5 14
1.E-20 0  5 15 1.E-20 0  5 16 1.E-20 0  5 17 1.E-20 0  5 18 1.E-20 0  5 19
1.E-20 0  5 20 1.E-20 0  5 21 1.E-20 0  5 22 1.E-20 0  5 23 1.E-20 0  5 24
1.E-20 0  5 25 1.E-20 0  5 26 1.E-20 0  5 27 1.E-20 0  5 28 1.E-20 0  5 29
1.E-20 0  5 30 1.E-20 0  5 31 1.E-20 0  5 32 1.E-20 0  5 33 1.E-20 0  5 34
1.E-20 0  5 35 1.E-20 0  5 36 1.E-20 0  5 37 1.E-20 0  5 38 1.E-20 0  5 39
1.E-20 0  5 40 1.E-20 0  6 10 1.E-20 0  6 11 1.E-20 0  6 12 1.E-20 0  6 13
1.E-20 0  6 14 1.E-20 0  6 15 1.E-20 0  6 16 1.E-20 0  6 17 1.E-20 0  6 18
1.E-20 0  6 19 1.E-20 0  6 20 1.E-20 0  6 21 1.E-20 0  6 22 1.E-20 0  6 23
1.E-20 0  6 24 1.E-20 0  6 25 1.E-20 0  6 26 1.E-20 0  6 27 1.E-20 0  6 28
1.E-20 0  6 29 1.E-20 0  6 30 1.E-20 0  6 31 1.E-20 0  6 32 1.E-20 0  6 33
1.E-20 0  6 34 1.E-20 0  6 35 1.E-20 0  6 36 1.E-20 0  6 37 1.E-20 0  6 38
1.E-20 0  6 39 1.E-20 0  6 40 1.E-20 0  7 10 1.E-20 0  7 11 1.E-20 0  7 12
1.E-20 0  7 13 1.E-20 0  7 14 1.E-20 0  7 15 1.E-20 0  7 16 1.E-20 0  7 17
1.E-20 0  7 18 1.E-20 0  7 19 1.E-20 0  7 20 1.E-20 0  7 21 1.E-20 0  7 22
1.E-20 0  7 23 1.E-20 0  7 24 1.E-20 0  7 25 1.E-20 0  7 26 1.E-20 0  7 27
1.E-20 0  7 28 1.E-20 0  7 29 1.E-20 0  7 30 1.E-20 0  7 31 1.E-20 0  7 32
1.E-20 0  7 33 1.E-20 0  7 34 1.E-20 0  7 35 1.E-20 0  7 36 1.E-20 0  7 37
1.E-20 0  7 38 1.E-20 0  7 39 1.E-20 0  7 40 1.E-20 0  8 11 1.E-20 0  8 12
1.E-20 0  8 13 1.E-20 0  8 14 1.E-20 0  8 15 1.E-20 0  8 16 1.E-20 0  8 17
1.E-20 0  8 18 1.E-20 0  8 19 1.E-20 0  8 20 1.E-20 0  8 21 1.E-20 0  8 22
1.E-20 0  8 23 1.E-20 0  8 24 1.E-20 0  8 25 1.E-20 0  8 26 1.E-20 0  8 27
1.E-20 0  8 28 1.E-20 0  8 29 1.E-20 0  8 30 1.E-20 0  8 31 1.E-20 0  8 32
1.E-20 0  8 33 1.E-20 0  8 34 1.E-20 0  8 35 1.E-20 0  8 36 1.E-20 0  8 37
1.E-20 0  8 38 1.E-20 0  8 39 1.E-20 0  8 40 1.E-20 0  9 11 1.E-20 0  9 12
1.E-20 0  9 13 1.E-20 0  9 14 1.E-20 0  9 15 1.E-20 0  9 16 1.E-20 0  9 17
1.E-20 0  9 18 1.E-20 0  9 19 1.E-20 0  9 20 1.E-20 0  9 21 1.E-20 0  9 22
1.E-20 0  9 23 1.E-20 0  9 24 1.E-20 0  9 25 1.E-20 0  9 26 1.E-20 0  9 27
1.E-20 0  9 28 1.E-20 0  9 29 1.E-20 0  9 30 1.E-20 0  9 31 1.E-20 0  9 32
1.E-20 0  9 33 1.E-20 0  9 34 1.E-20 0  9 35 1.E-20 0  9 36 1.E-20 0  9 37
1.E-20 0  9 38 1.E-20 0  9 39 1.E-20 0  9 40 1.E-20 0 11 12 0.00014 0 11 13
0.00063 0 11 14 0.00138 0 11 15 0.00232 0 11 16 0.00338 0 11 17 0.00453 0 11
18 0.00573 0 11 19 0.00697 0 11 20 0.00821 0 11 21 0.00945 0 11 22 0.01068 0
11 23 0.01188 0 11 24 0.01305 0 11 25 0.01419 0 11 26 0.0153 0 11 27 0.01637 0
11 28 0.0174 0 11 29 0.01839 0 11 30 0.01934 0 11 31 0.02026 0 11 32 0.02114 0
11 33 0.02199 0 11 34 0.02281 0 11 35 0.02359 0 11 36 0.02434 0 11 37 0.02506
0 11 38 0.02575 0 11 39 0.02642 0 11 40 0.03359 0 12 13 0.00018 0 12 14
0.00065 0 12 15 0.00133 0 12 16 0.00216 0 12 17 0.0031 0 12 18 0.00411 0 12 19
0.00517 0 12 20 0.00625 0 12 21 0.00734 0 12 22 0.00843 0 12 23 0.0095 0 12 24
0.01056 0 12 25 0.01159 0 12 26 0.01259 0 12 27 0.01357 0 12 28 0.01451 0 12
29 0.01542 0 12 30 0.0163 0 12 31 0.01715 0 12 32 0.01796 0 12 33 0.01875 0 12
34 0.0195 0 12 35 0.02023 0 12 36 0.02093 0 12 37 0.0216 0 12 38 0.02224 0 12
39 0.02287 0 12 40 0.0296 0 13 14 0.00015 0 13 15 0.00053 0 13 16 0.00109 0 13
17 0.00179 0 13 18 0.00257 0 13 19 0.00342 0 13 20 0.00431 0 13 21 0.00523 0
13 22 0.00616 0 13 23 0.00708 0 13 24 0.008 0 13 25 0.0089 0 13 26 0.00979 0
13 27 0.01065 0 13 28 0.01149 0 13 29 0.01231 0 13 30 0.0131 0 13 31 0.01386 0
13 32 0.0146 0 13 33 0.01531 0 13 34 0.016 0 13 35 0.01666 0 13 36 0.0173 0 13
37 0.01791 0 13 38 0.0185 0 13 39 0.01907 0 13 40 0.0253 0 14 15 0.00012 0 14
16 0.00044 0 14 17 0.00091 0 14 18 0.0015 0 14 19 0.00216 0 14 20 0.00288 0 14
21 0.00364 0 14 22 0.00442 0 14 23 0.00521 0 14 24 0.00601 0 14 25 0.0068 0 14
26 0.00757 0 14 27 0.00834 0 14 28 0.00909 0 14 29 0.00982 0 14 30 0.01052 0
14 31 0.01121 0 14 32 0.01188 0 14 33 0.01252 0 14 34 0.01315 0 14 35 0.01375
0 14 36 0.01433 0 14 37 0.01489 0 14 38 0.01543 0 14 39 0.01596 0 14 40
0.02171 0 15 16 1.E-4 0 15 17 0.00037 0 15 18 0.00077 0 15 19 0.00126 0 15 20
0.00183 0 15 21 0.00244 0 15 22 0.00309 0 15 23 0.00376 0 15 24 0.00443 0 15
25 0.00512 0 15 26 0.0058 0 15 27 0.00647 0 15 28 0.00713 0 15 29 0.00778 0 15
30 0.00842 0 15 31 0.00903 0 15 32 0.00963 0 15 33 0.01022 0 15 34 0.01078 0
15 35 0.01133 0 15 36 0.01186 0 15 37 0.01237 0 15 38 0.01287 0 15 39 0.01335
0 15 40 0.01867 0 16 17 9.E-5 0 16 18 0.00031 0 16 19 0.00065 0 16 20 0.00107
0 16 21 0.00155 0 16 22 0.00208 0 16 23 0.00263 0 16 24 0.0032 0 16 25 0.00379
0 16 26 0.00438 0 16 27 0.00496 0 16 28 0.00555 0 16 29 0.00612 0 16 30
0.00669 0 16 31 0.00724 0 16 32 0.00778 0 16 33 0.00831 0 16 34 0.00882 0 16
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40 0.01608 0 17 18 7.E-5 0 17 19 0.00027 0 17 20 0.00055 0 17 21 0.00091 0 17
22 0.00132 0 17 23 0.00177 0 17 24 0.00225 0 17 25 0.00274 0 17 26 0.00325 0
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0 17 32 0.00625 0 17 33 0.00673 0 17 34 0.00719 0 17 35 0.00764 0 17 36
0.00808 0 17 37 0.0085 0 17 38 0.00892 0 17 39 0.00932 0 17 40 0.01387 0 18 19
6.E-5 0 18 20 0.00023 0 18 21 0.00047 0 18 22 0.00078 0 18 23 0.00113 0 18 24
0.00152 0 18 25 0.00193 0 18 26 0.00235 0 18 27 0.00279 0 18 28 0.00324 0 18
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18 34 0.00583 0 18 35 0.00624 0 18 36 0.00664 0 18 37 0.00703 0 18 38 0.0074 0
18 39 0.00777 0 18 40 0.01197 0 19 20 5.E-5 0 19 21 0.00019 0 19 22 0.0004 0
19 23 0.00067 0 19 24 0.00097 0 19 25 0.0013 0 19 26 0.00166 0 19 27 0.00203 0
19 28 0.00241 0 19 29 0.0028 0 19 30 0.00318 0 19 31 0.00357 0 19 32 0.00395 0
19 33 0.00433 0 19 34 0.00471 0 19 35 0.00507 0 19 36 0.00543 0 19 37 0.00579
```

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0 19 38 0.00613 0 19 39 0.00647 0 19 40 0.01035 0 20 21 4.E-5 0 20 22 0.00017
0 20 23 0.00035 0 20 24 0.00057 0 20 25 0.00084 0 20 26 0.00112 0 20 27
0.00143 0 20 28 0.00175 0 20 29 0.00209 0 20 30 0.00242 0 20 31 0.00276 0 20
32 0.0031 0 20 33 0.00344 0 20 34 0.00377 0 20 35 0.0041 0 20 36 0.00443 0 20
37 0.00475 0 20 38 0.00506 0 20 39 0.00536 0 20 40 0.00895 0 21 22 4.E-5 0 21
23 0.00014 0 21 24 0.0003 0 21 25 0.00049 0 21 26 0.00072 0 21 27 0.00097 0 21
28 0.00124 0 21 29 0.00152 0 21 30 0.00181 0 21 31 0.00211 0 21 32 0.00241 0
21 33 0.0027 0 21 34 0.003 0 21 35 0.0033 0 21 36 0.00359 0 21 37 0.00388 0 21
38 0.00416 0 21 39 0.00444 0 21 40 0.00774 0 22 23 3.E-5 0 22 24 0.00012 0 22
25 0.00026 0 22 26 0.00043 0 22 27 0.00063 0 22 28 0.00084 0 22 29 0.00108 0
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22 40 0.0067 0 23 24 3.E-5 0 23 25 0.00011 0 23 26 0.00022 0 23 27 0.00037 0
23 28 0.00054 0 23 29 0.00073 0 23 30 0.00094 0 23 31 0.00116 0 23 32 0.00138
0 23 33 0.00161 0 23 34 0.00184 0 23 35 0.00207 0 23 36 0.00231 0 23 37
0.00254 0 23 38 0.00277 0 23 39 0.003 0 23 40 0.0058 0 24 25 2.E-5 0 24 26
9.E-5 0 24 27 0.00019 0 24 28 0.00032 0 24 29 0.00047 0 24 30 0.00064 0 24 31
0.00082 0 24 32 0.00101 0 24 33 0.00121 0 24 34 0.00141 0 24 35 0.00162 0 24
36 0.00182 0 24 37 0.00203 0 24 38 0.00224 0 24 39 0.00244 0 24 40 0.00502 0
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31 0.00056 0 25 32 0.00072 0 25 33 0.00089 0 25 34 0.00106 0 25 35 0.00124 0
25 36 0.00142 0 25 37 0.00161 0 25 38 0.00179 0 25 39 0.00198 0 25 40 0.00435
0 26 27 2.E-5 0 26 28 7.E-5 0 26 29 0.00015 0 26 30 0.00025 0 26 31 0.00036 0
26 32 0.00049 0 26 33 0.00063 0 26 34 0.00078 0 26 35 0.00094 0 26 36 0.0011 0
26 37 0.00126 0 26 38 0.00142 0 26 39 0.00159 0 26 40 0.00376 0 27 28 2.E-5 0
27 29 6.E-5 0 27 30 0.00013 0 27 31 0.00022 0 27 32 0.00032 0 27 33 0.00043 0
27 34 0.00056 0 27 35 0.00069 0 27 36 0.00083 0 27 37 0.00097 0 27 38 0.00112
0 27 39 0.00126 0 27 40 0.00325 0 28 29 1.E-5 0 28 30 5.E-5 0 28 31 0.00011 0
28 32 0.00019 0 28 33 0.00028 0 28 34 0.00038 0 28 35 0.00049 0 28 36 0.00061
0 28 37 0.00073 0 28 38 0.00086 0 28 39 0.00099 0 28 40 0.00281 0 29 30 1.E-5
0 29 31 5.E-5 0 29 32 1.E-4 0 29 33 0.00017 0 29 34 0.00025 0 29 35 0.00034 0
29 36 0.00044 0 29 37 0.00054 0 29 38 0.00065 0 29 39 0.00077 0 29 40 0.00242
0 30 31 1.E-5 0 30 32 4.E-5 0 30 33 9.E-5 0 30 34 0.00015 0 30 35 0.00022 0 30
36 0.0003 0 30 37 0.00039 0 30 38 0.00048 0 30 39 0.00058 0 30 40 0.00208 0 31
32 1.E-5 0 31 33 4.E-5 0 31 34 8.E-5 0 31 35 0.00013 0 31 36 0.0002 0 31 37
0.00027 0 31 38 0.00035 0 31 39 0.00043 0 31 40 0.00179 0 32 33 1.E-5 0 32 34
3.E-5 0 32 35 7.E-5 0 32 36 0.00012 0 32 37 0.00018 0 32 38 0.00024 0 32 39
0.00031 0 32 40 0.00153 0 33 34 1.E-5 0 33 35 3.E-5 0 33 36 6.E-5 0 33 37
0.00011 0 33 38 0.00016 0 33 39 0.00022 0 33 40 0.00131 0 34 35 1.E-5 0 34 36
3.E-5 0 34 37 6.E-5 0 34 38 1.E-4 0 34 39 0.00014 0 34 40 0.00112 0 35 36
1.E-5 0 35 37 2.E-5 0 35 38 5.E-5 0 35 39 9.E-5 0 35 40 0.00095 0 36 37 1.E-5
0 36 38 2.E-5 0 36 39 5.E-5 0 36 40 0.0008 0 37 38 1.E-5 0 37 39 2.E-5 0 37 40
0.00067 0 38 40 0.00056 0 39 40 0.00046 0 ;
bipset LGSTBIP 1 constant eos none ;
bipdata erase ;
model MPR78A PRA PSAT78 LDEN VDW PR78ABIP;
model MLBCMPR78A LBC LFIT MPR78A;
model MSTRAPP SPTHCOND;
bipdata erase ;
model MLGSTMPR78A LGST MPR78A LGSTBIP;
bipdata erase ;
pd GAS gas MPR78A MPR78A MPR78A MLBCMPR78A MSTRAPP MLGSTMPR78A;
pd LIQUID1 liquid MPR78A MPR78A MPR78A MLBCMPR78A MSTRAPP MLGSTMPR78A;
key LIQUID1 not 007732-18-5;
pd LIQUID2 liquid MPR78A MPR78A MPR78A MLBCMPR78A MSTRAPP MLGSTMPR78A;
key LIQUID2 not 007732-18-5;
temperature 390.37222222;
pressure 41368543.759;
amounts 2.2407463078 4.16307077186 294.1596414611 28.99090273618 20.83485833121
4.25696439245 9.74815362367 3.99660237207 4.99042325474 9.15666917319
7.7428217559 11.89183116429 6.69456978883 5.5973298458 4.1458342618
3.41192180714 3.40330355211 2.99008090304 2.57685825397 2.24664300861
1.97811632557 1.85700716278 1.68101332322 1.33446875254 1.22742095322
1.07183877031 .97658437261 .87452608936 .80966238045 .71803672171 .68719244055
.65453378991 .56336172354 .53024948053 .47400402665 .43272712098 .38827506872
.37965681369 .32794728351 3.38561344968;
inputunits temperature degF pressure psi enthalpy BTU/lbmol entropy BTU/lbmol/F
volume kg/m3 amounts lbmol viscosity cP thcond BTU/hr/ft/F surten dyne/cm
diffusion cm2/s;
outputunits temperature degF pressure psi enthalpy BTU/lbmol entropy
BTU/lbmol/F volume lbmol/ft3 amounts lbmol viscosity cP thcond BTU/hr/ft/F
surten dyne/cm diffusion cm2/s;
set physprops 1VCS;
```

MultiFlash – SLB-118-DEC-EOS20120322.mfl

```
# Multiflash version: 4.1.09   March 2012 #
# Date: 04 April 2012   Time: 11:41 #
remove all;
units temperature K pressure Pa enthalpy J/mol entropy J/mol/K volume m3/mol
amounts mol viscosity Pas thcond W/m/K surten N/m diffusion m2/s;

title "SLB-1.18 decontaminated fluid sample with EOS 20120322.  About 0.5 wt% "

"OBM has been removed.  T-dependent BIPs Library component properties changed "
"to same as PhazeComp. T-dep BIPs altered from previous version to get "
"correct BIP at 243F not 240F." ;
datum enthalpy compound entropy compound; set fractions;
properties PFC6PLUSMW   202.91 ;
puredata INFODATA ;
components overwrite 1 NITROGEN data TCRIT   126.20 PCRIT  3.39801E+06
ACENTRICFACTOR  3.70000E-02 VSRKS1 -4.02589E-06 ;
2 "CARBON DIOXIDE" data TCRIT   304.12 PCRIT  7.37401E+06 ACENTRICFACTOR
 0.22500 VSPR1  5.09546E-08 ;
3 METHANE data TCRIT   190.56 PCRIT  4.59901E+06 VCRIT  9.85975E-05
ACENTRICFACTOR  1.10000E-02 VSPR1 -4.01930E-06 ;
4 ETHANE data TCRIT   305.32 PCRIT  4.87197E+06 VCRIT  1.45498E-04
ACENTRICFACTOR  9.90000E-02 VSPR1 -2.54577E-06 ;
5 PROPANE data MW   44.097 TCRIT   369.83 PCRIT  4.24800E+06 VSPR1
-3.59343E-06 ;
6 I-BUTANE data MW   58.123 PCRIT  3.64002E+06 ACENTRICFACTOR  0.18600 VSPR1
-4.49142E-06 ;
7 N-BUTANE data TCRIT   425.12 PCRIT  3.79598E+06 ACENTRICFACTOR  0.20000
VSPR1 -3.90684E-06 ;
8 I-PENTANE data TCRIT   460.39 PCRIT  3.38098E+06 ACENTRICFACTOR  0.22900
VSPR1 -4.97311E-06 ;
9 PENTANE data PCRIT  3.37002E+06 ACENTRICFACTOR  0.25200 VSPR1 -2.63886E-06 ;
;
chardata INFOCHAR TBSOEREIDE ;
petrofracs overwrite 10 C6 normal data MW   83.282 TCRIT   512.44 PCRIT
 3.30948E+06 VCRIT  3.46244E-04 ACENTRICFACTOR  0.24969 TBOIL   337.85 SG
 0.69568 CNUMBER   5.9292 REFVISLB  2.26070E-04 VSPR1 -5.54877E-07 ;
11 C7 normal data MW   98.471 TCRIT   553.18 PCRIT  3.03631E+06 VCRIT
 4.66510E-04 ACENTRICFACTOR  0.28313 TBOIL   370.98 SG  0.76726 CNUMBER
  7.1997 REFVISLB  1.34400E-03 VSPR1  8.09391E-06 ;
12 C8 normal data MW   109.87 TCRIT   579.61 PCRIT  2.85684E+06 VCRIT
 5.12238E-04 ACENTRICFACTOR  0.31047 TBOIL   393.58 SG  0.78591 CNUMBER
  7.9958 REFVISLB  1.18160E-03 VSPR1  9.88729E-06 ;
13 C9 normal data MW   123.39 TCRIT   608.62 PCRIT  2.65290E+06 VCRIT
 5.69747E-04 ACENTRICFACTOR  0.34698 TBOIL   419.67 SG  0.80319 CNUMBER
  8.9300 REFVISLB  1.06690E-03 VSPR1  1.31971E-05 ;
14 C10 normal data MW   136.62 TCRIT   634.18 PCRIT  2.47860E+06 VCRIT
 6.25922E-04 ACENTRICFACTOR  0.38361 TBOIL   443.50 SG  0.81695 CNUMBER
  9.7773 REFVISLB  9.69100E-04 VSPR1  1.67277E-05 ;
15 C11 normal data MW   149.76 TCRIT   657.32 PCRIT  2.32698E+06 VCRIT
 6.81347E-04 ACENTRICFACTOR  0.42051 TBOIL   465.72 SG  0.82855 CNUMBER
  10.705 REFVISLB  8.82700E-04 VSPR1  2.04793E-05 ;
16 C12 normal data MW   162.81 TCRIT   678.41 PCRIT  2.19433E+06 VCRIT
 7.35698E-04 ACENTRICFACTOR  0.45752 TBOIL   486.53 SG  0.83860 CNUMBER
  11.611 REFVISLB  8.04100E-04 VSPR1  2.44042E-05 ;
17 C13 normal data MW   175.77 TCRIT   697.77 PCRIT  2.07774E+06 VCRIT
 7.88808E-04 ACENTRICFACTOR  0.49116 TBOIL   506.06 SG  0.84747 CNUMBER
  12.526 REFVISLB  7.32000E-04 VSPR1  2.84490E-05 ;
18 C14 normal data MW   188.63 TCRIT   715.63 PCRIT  1.97480E+06 VCRIT
 8.40335E-04 ACENTRICFACTOR  0.52632 TBOIL   524.44 SG  0.85541 CNUMBER
  13.400 REFVISLB  6.65200E-04 VSPR1  3.25640E-05 ;
19 C15 normal data MW   201.39 TCRIT   732.18 PCRIT  1.88337E+06 VCRIT
 8.90240E-04 ACENTRICFACTOR  0.56109 TBOIL   541.77 SG  0.86261 CNUMBER
  14.189 REFVISLB  6.03600E-04 VSPR1  3.67048E-05 ;
20 C16 normal data MW   214.05 TCRIT   747.58 PCRIT  1.80188E+06 VCRIT
 9.38404E-04 ACENTRICFACTOR  0.59542 TBOIL   558.16 SG  0.86919 CNUMBER
  14.935 REFVISLB  5.46800E-04 VSPR1  4.08277E-05 ;
21 C17 normal data MW   226.61 TCRIT   761.97 PCRIT  1.72900E+06 VCRIT
 9.84662E-04 ACENTRICFACTOR  0.62930 TBOIL   573.66 SG  0.87525 CNUMBER
  15.768 REFVISLB  4.95100E-04 VSPR1  4.48898E-05 ;
22 C18 normal data MW   239.06 TCRIT   775.45 PCRIT  1.66350E+06 VCRIT
 1.02906E-03 ACENTRICFACTOR  0.66270 TBOIL   588.36 SG  0.88086 CNUMBER
  16.527 REFVISLB  4.48200E-04 VSPR1  4.88697E-05 ;
23 C19 normal data MW   251.41 TCRIT   788.12 PCRIT  1.60441E+06 VCRIT
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 1.07156E-03 ACENTRICFACTOR  0.69560 TBOIL   602.33 SG  0.88609 CNUMBER
  17.333 REFVISLB  4.05900E-04 VSPR1  5.27332E-05 ;
24 C20 normal data MW   263.65 TCRIT   800.06 PCRIT  1.55091E+06 VCRIT
 1.11221E-03 ACENTRICFACTOR  0.72799 TBOIL   615.61 SG  0.89098 CNUMBER
  18.287 REFVISLB  3.68000E-04 VSPR1  5.64599E-05 ;
25 C21 normal data MW   275.78 TCRIT   811.34 PCRIT  1.50237E+06 VCRIT
 1.15091E-03 ACENTRICFACTOR  0.75988 TBOIL   628.25 SG  0.89558 CNUMBER
  19.198 REFVISLB  3.34200E-04 VSPR1  6.00317E-05 ;
26 C22 normal data MW   287.81 TCRIT   822.03 PCRIT  1.45817E+06 VCRIT
 1.18783E-03 ACENTRICFACTOR  0.79124 TBOIL   640.31 SG  0.89991 CNUMBER
  19.999 REFVISLB  3.04300E-04 VSPR1  6.34355E-05 ;
27 C23 normal data MW   299.73 TCRIT   832.17 PCRIT  1.41777E+06 VCRIT
 1.22294E-03 ACENTRICFACTOR  0.82208 TBOIL   651.83 SG  0.90401 CNUMBER
  20.791 REFVISLB  2.77800E-04 VSPR1  6.66597E-05 ;
28 C24 normal data MW   311.54 TCRIT   841.82 PCRIT  1.38081E+06 VCRIT
 1.25621E-03 ACENTRICFACTOR  0.85239 TBOIL   662.83 SG  0.90790 CNUMBER
  21.576 REFVISLB  2.54300E-04 VSPR1  6.96905E-05 ;
29 C25 normal data MW   323.26 TCRIT   851.02 PCRIT  1.34682E+06 VCRIT
 1.28799E-03 ACENTRICFACTOR  0.88218 TBOIL   673.37 SG  0.91159 CNUMBER
  22.353 REFVISLB  2.33600E-04 VSPR1  7.25327E-05 ;
30 C26 normal data MW   334.87 TCRIT   859.79 PCRIT  1.31552E+06 VCRIT
 1.31813E-03 ACENTRICFACTOR  0.91144 TBOIL   683.47 SG  0.91511 CNUMBER
  23.122 REFVISLB  2.15300E-04 VSPR1  7.51809E-05 ;
31 C27 normal data MW   346.38 TCRIT   868.19 PCRIT  1.28663E+06 VCRIT
 1.34668E-03 ACENTRICFACTOR  0.94018 TBOIL   693.15 SG  0.91848 CNUMBER
  23.884 REFVISLB  1.99100E-04 VSPR1  7.76287E-05 ;
32 C28 normal data MW   357.79 TCRIT   876.24 PCRIT  1.25981E+06 VCRIT
 1.37395E-03 ACENTRICFACTOR  0.96841 TBOIL   702.46 SG  0.92169 CNUMBER
  24.639 REFVISLB  1.84800E-04 VSPR1  7.98855E-05 ;
33 C29 normal data MW   369.10 TCRIT   883.95 PCRIT  1.23499E+06 VCRIT
 1.39964E-03 ACENTRICFACTOR  0.99612 TBOIL   711.40 SG  0.92478 CNUMBER
  25.388 REFVISLB  1.72200E-04 VSPR1  8.19443E-05 ;
34 C30 normal data MW   380.32 TCRIT   891.37 PCRIT  1.21189E+06 VCRIT
 1.42415E-03 ACENTRICFACTOR   1.0233 TBOIL   720.00 SG  0.92774 CNUMBER
  26.129 REFVISLB  1.61000E-04 VSPR1  8.38118E-05 ;
35 C31 normal data MW   391.45 TCRIT   898.49 PCRIT  1.19038E+06 VCRIT
 1.44735E-03 ACENTRICFACTOR   1.0500 TBOIL   728.29 SG  0.93058 CNUMBER
  26.864 REFVISLB  1.51000E-04 VSPR1  8.54912E-05 ;
36 C32 normal data MW   402.49 TCRIT   905.36 PCRIT  1.17032E+06 VCRIT
 1.46942E-03 ACENTRICFACTOR   1.0762 TBOIL   736.29 SG  0.93333 CNUMBER
  27.591 REFVISLB  1.42100E-04 VSPR1  8.69809E-05 ;
37 C33 normal data MW   413.44 TCRIT   911.98 PCRIT  1.15149E+06 VCRIT
 1.49041E-03 ACENTRICFACTOR   1.1019 TBOIL   744.00 SG  0.93597 CNUMBER
  28.338 REFVISLB  1.34200E-04 VSPR1  8.83013E-05 ;
38 C34 normal data MW   424.30 TCRIT   918.38 PCRIT  1.13384E+06 VCRIT
 1.51034E-03 ACENTRICFACTOR   1.1272 TBOIL   751.45 SG  0.93852 CNUMBER
  29.094 REFVISLB  1.27100E-04 VSPR1  8.94454E-05 ;
39 C35 normal data MW   435.08 TCRIT   924.56 PCRIT  1.11730E+06 VCRIT
 1.52923E-03 ACENTRICFACTOR   1.1519 TBOIL   758.65 SG  0.94099 CNUMBER
  29.757 REFVISLB  1.20800E-04 VSPR1  9.04173E-05 ;
40 C36 normal data MW   579.66 TCRIT   1015.2 PCRIT  1.05448E+06 VCRIT
 1.59405E-03 ACENTRICFACTOR   1.2205 TBOIL   840.35 SG  0.96914 CNUMBER
  39.929 REFVISLB  7.03900E-05 VSPR1  4.12448E-05 ; ;
bipset PR78ABIP 1 linear eos none  1  2 0.1 0  1  3 0.1 0  1  4 0.1 0  1  5
0.1 0  1  6 0.1 0  1  7 0.1 0  1  8 0.1 0  1  9 0.1 0  1 10 0.1 0  1 11 0.1 0
 1 12 0.1 0  1 13 0.1 0  1 14 0.1 0  1 15 0.1 0  1 16 0.1 0  1 17 0.1 0  1 18
0.1 0  1 19 0.1 0  1 20 0.1 0  1 21 0.1 0  1 22 0.1 0  1 23 0.1 0  1 24 0.1 0
 1 25 0.1 0  1 26 0.1 0  1 27 0.1 0  1 28 0.1 0  1 29 0.1 0  1 30 0.1 0  1 31
0.1 0  1 32 0.1 0  1 33 0.1 0  1 34 0.1 0  1 35 0.1 0  1 36 0.1 0  1 37 0.1 0
 1 38 0.1 0  1 39 0.1 0  1 40 0.1 0  2  3 0.105 0  2  4 0.13 0  2  5 0.125 0
 2  6 0.115 0  2  7 0.115 0  2  8 0.115 0  2  9 0.115 0  2 10 0.115 0  2 11
0.115 0  2 12 0.115 0  2 13 0.115 0  2 14 0.115 0  2 15 0.115 0  2 16 0.115 0
 2 17 0.115 0  2 18 0.115 0  2 19 0.115 0  2 20 0.115 0  2 21 0.115 0  2 22
0.115 0  2 23 0.115 0  2 24 0.115 0  2 25 0.115 0  2 26 0.115 0  2 27 0.115 0
 2 28 0.115 0  2 29 0.115 0  2 30 0.115 0  2 31 0.115 0  2 32 0.115 0  2 33
0.115 0  2 34 0.115 0  2 35 0.115 0  2 36 0.115 0  2 37 0.115 0  2 38 0.115 0
 2 39 0.115 0  2 40 0.115 0  3  4 -0.00126 0  3  5 -0.00414 0  3  6 -0.00791 0
 3  7 -0.00745 0  3  8 -0.01067 0  3  9 -0.01083 0  3 10 -0.03 0  3 11
0.02274266 -7.55245E-5  3 12 0.05131445 -.000151175  3 13 0.07961711
-.000226699  3 14 0.1079798 -.000302224  3 15 0.1363924 -.000377748  3 16
0.1648551 -.000453273  3 17 0.1934069 -.000528923  3 18 0.2219695 -.000604448
 3 19 0.2505722 -.000679972  3 20 0.279274 -.000755622  3 21 0.3079766
-.000831147  3 22 0.3367193 -.000906671  3 23 0.2813335 -.000725035  3 24
0.2259751 -.000543776  3 25 0.1707167 -.000362517  3 26 0.1154584 -.000181259
 3 27 0.06015 0  3 28 0.0617 0  3 29 0.06317 0  3 30 0.06456 0  3 31 0.06587 0
 3 32 0.06712 0  3 33 0.0683 0  3 34 0.06943 0  3 35 0.07049 0  3 36 0.07151 0
 3 37 0.07248 0  3 38 0.0734 0  3 39 0.07427 0  3 40 0.08336 0  4  6 1.E-20 0
 4  7 1.E-20 0  4  8 1.E-20 0  4  9 1.E-20 0  4 10 1.E-20 0  4 11 1.E-20 0  4
12 1.E-20 0  4 13 1.E-20 0  4 14 1.E-20 0  4 15 1.E-20 0  4 16 1.E-20 0  4 17
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1.E-20 0  4 28 1.E-20 0  4 29 1.E-20 0  4 30 1.E-20 0  4 31 1.E-20 0  4 32
1.E-20 0  4 33 1.E-20 0  4 34 1.E-20 0  4 35 1.E-20 0  4 36 1.E-20 0  4 37
1.E-20 0  4 38 1.E-20 0  4 39 1.E-20 0  4 40 1.E-20 0  5  8 1.E-20 0  5  9
1.E-20 0  5 10 1.E-20 0  5 11 1.E-20 0  5 12 1.E-20 0  5 13 1.E-20 0  5 14
1.E-20 0  5 15 1.E-20 0  5 16 1.E-20 0  5 17 1.E-20 0  5 18 1.E-20 0  5 19
1.E-20 0  5 20 1.E-20 0  5 21 1.E-20 0  5 22 1.E-20 0  5 23 1.E-20 0  5 24
1.E-20 0  5 25 1.E-20 0  5 26 1.E-20 0  5 27 1.E-20 0  5 28 1.E-20 0  5 29
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1.E-20 0  6 14 1.E-20 0  6 15 1.E-20 0  6 16 1.E-20 0  6 17 1.E-20 0  6 18
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1.E-20 0  6 24 1.E-20 0  6 25 1.E-20 0  6 26 1.E-20 0  6 27 1.E-20 0  6 28
1.E-20 0  6 29 1.E-20 0  6 30 1.E-20 0  6 31 1.E-20 0  6 32 1.E-20 0  6 33
1.E-20 0  6 34 1.E-20 0  6 35 1.E-20 0  6 36 1.E-20 0  6 37 1.E-20 0  6 38
1.E-20 0  6 39 1.E-20 0  6 40 1.E-20 0  7 10 1.E-20 0  7 11 1.E-20 0  7 12
1.E-20 0  7 13 1.E-20 0  7 14 1.E-20 0  7 15 1.E-20 0  7 16 1.E-20 0  7 17
1.E-20 0  7 18 1.E-20 0  7 19 1.E-20 0  7 20 1.E-20 0  7 21 1.E-20 0  7 22
1.E-20 0  7 23 1.E-20 0  7 24 1.E-20 0  7 25 1.E-20 0  7 26 1.E-20 0  7 27
1.E-20 0  7 28 1.E-20 0  7 29 1.E-20 0  7 30 1.E-20 0  7 31 1.E-20 0  7 32
1.E-20 0  7 33 1.E-20 0  7 34 1.E-20 0  7 35 1.E-20 0  7 36 1.E-20 0  7 37
1.E-20 0  7 38 1.E-20 0  7 39 1.E-20 0  7 40 1.E-20 0  8 11 1.E-20 0  8 12
1.E-20 0  8 13 1.E-20 0  8 14 1.E-20 0  8 15 1.E-20 0  8 16 1.E-20 0  8 17
1.E-20 0  8 18 1.E-20 0  8 19 1.E-20 0  8 20 1.E-20 0  8 21 1.E-20 0  8 22
1.E-20 0  8 23 1.E-20 0  8 24 1.E-20 0  8 25 1.E-20 0  8 26 1.E-20 0  8 27
1.E-20 0  8 28 1.E-20 0  8 29 1.E-20 0  8 30 1.E-20 0  8 31 1.E-20 0  8 32
1.E-20 0  8 33 1.E-20 0  8 34 1.E-20 0  8 35 1.E-20 0  8 36 1.E-20 0  8 37
1.E-20 0  8 38 1.E-20 0  8 39 1.E-20 0  8 40 1.E-20 0  9 11 1.E-20 0  9 12
1.E-20 0  9 13 1.E-20 0  9 14 1.E-20 0  9 15 1.E-20 0  9 16 1.E-20 0  9 17
1.E-20 0  9 18 1.E-20 0  9 19 1.E-20 0  9 20 1.E-20 0  9 21 1.E-20 0  9 22
1.E-20 0  9 23 1.E-20 0  9 24 1.E-20 0  9 25 1.E-20 0  9 26 1.E-20 0  9 27
1.E-20 0  9 28 1.E-20 0  9 29 1.E-20 0  9 30 1.E-20 0  9 31 1.E-20 0  9 32
1.E-20 0  9 33 1.E-20 0  9 34 1.E-20 0  9 35 1.E-20 0  9 36 1.E-20 0  9 37
1.E-20 0  9 38 1.E-20 0  9 39 1.E-20 0  9 40 1.E-20 0 11 12 0.00014 0 11 13
0.00063 0 11 14 0.00138 0 11 15 0.00232 0 11 16 0.00338 0 11 17 0.00453 0 11
18 0.00573 0 11 19 0.00697 0 11 20 0.00821 0 11 21 0.00945 0 11 22 0.01068 0
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11 28 0.0174 0 11 29 0.01839 0 11 30 0.01934 0 11 31 0.02026 0 11 32 0.02114 0
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0 11 38 0.02575 0 11 39 0.02642 0 11 40 0.03359 0 12 13 0.00018 0 12 14
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0 14 36 0.01433 0 14 37 0.01489 0 14 38 0.01543 0 14 39 0.01596 0 14 40
0.02171 0 15 16 1.E-4 0 15 17 0.00037 0 15 18 0.00077 0 15 19 0.00126 0 15 20
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0 19 38 0.00613 0 19 39 0.00647 0 19 40 0.01035 0 20 21 4.E-5 0 20 22 0.00017
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0 23 33 0.00161 0 23 34 0.00184 0 23 35 0.00207 0 23 36 0.00231 0 23 37
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9.E-5 0 24 27 0.00019 0 24 28 0.00032 0 24 29 0.00047 0 24 30 0.00064 0 24 31
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0 26 27 2.E-5 0 26 28 7.E-5 0 26 29 0.00015 0 26 30 0.00025 0 26 31 0.00036 0
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0 27 39 0.00126 0 27 40 0.00325 0 28 29 1.E-5 0 28 30 5.E-5 0 28 31 0.00011 0
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0 29 31 5.E-5 0 29 32 1.E-4 0 29 33 0.00017 0 29 34 0.00025 0 29 35 0.00034 0
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0 30 31 1.E-5 0 30 32 4.E-5 0 30 33 9.E-5 0 30 34 0.00015 0 30 35 0.00022 0 30
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32 1.E-5 0 31 33 4.E-5 0 31 34 8.E-5 0 31 35 0.00013 0 31 36 0.0002 0 31 37
0.00027 0 31 38 0.00035 0 31 39 0.00043 0 31 40 0.00179 0 32 33 1.E-5 0 32 34
3.E-5 0 32 35 7.E-5 0 32 36 0.00012 0 32 37 0.00018 0 32 38 0.00024 0 32 39
0.00031 0 32 40 0.00153 0 33 34 1.E-5 0 33 35 3.E-5 0 33 36 6.E-5 0 33 37
0.00011 0 33 38 0.00016 0 33 39 0.00022 0 33 40 0.00131 0 34 35 1.E-5 0 34 36
3.E-5 0 34 37 6.E-5 0 34 38 1.E-4 0 34 39 0.00014 0 34 40 0.00112 0 35 36
1.E-5 0 35 37 2.E-5 0 35 38 5.E-5 0 35 39 9.E-5 0 35 40 0.00095 0 36 37 1.E-5
0 36 38 2.E-5 0 36 39 5.E-5 0 36 40 0.0008 0 37 38 1.E-5 0 37 39 2.E-5 0 37 40
0.00067 0 38 40 0.00056 0 39 40 0.00046 0 ;
bipset LGSTBIP 1 constant eos none ;
bipdata erase ;
model MPR78A PRA PSAT78 LDEN VDW PR78ABIP;
model MLBCMPR78A LBC LFIT MPR78A;
model MSTRAPP SPTHCOND;
bipdata erase ;
model MLGSTMPR78A LGST MPR78A LGSTBIP;
bipdata erase ;
pd GAS gas MPR78A MPR78A MPR78A MLBCMPR78A MSTRAPP MLGSTMPR78A;
pd LIQUID1 liquid MPR78A MPR78A MPR78A MLBCMPR78A MSTRAPP MLGSTMPR78A;
key LIQUID1 not 007732-18-5;
pd LIQUID2 liquid MPR78A MPR78A MPR78A MLBCMPR78A MSTRAPP MLGSTMPR78A;
key LIQUID2 not 007732-18-5;
temperature 390.37222222;
pressure 41368543.759;
amounts 1.381888659677 4.033952528593 297.5156902137 28.95472375516
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6.240978326015 8.33356549004 9.33898835835 6.784106201114 6.066596100145
4.536209916785 3.815066540933 3.532603232325 3.062588550569 2.713970609166
2.405035649845 2.131267706969 1.88866292069 1.673673745081 1.483157692203
1.345105040024 1.177534410775 1.044477171367 .9432081388407 .8442102433111
.7910777938664 .7238681052187 .6711901553288 .642126224221 .5944436871019
.5481232878699 .499532658826 .4672899523893 .4350472459526 .4423133421276
3.647495911684;
inputunits temperature degF pressure psi enthalpy BTU/lbmol entropy BTU/lbmol/F
volume kg/m3 amounts lbmol viscosity cP thcond BTU/hr/ft/F surten dyne/cm
diffusion cm2/s;
outputunits temperature degF pressure psi enthalpy BTU/lbmol entropy
BTU/lbmol/F volume lbmol/ft3 amounts lbmol viscosity cP thcond BTU/hr/ft/F
surten dyne/cm diffusion cm2/s;
set physprops 1VCS;
```

MultiFlash – SLB-118-EOS20120322.mfl

```
# Multiflash version: 4.1.09   March 2012 #
# Date: 04 April 2012   Time: 11:29 #
remove all;
units temperature K pressure Pa enthalpy J/mol entropy J/mol/K volume m3/mol
amounts mol viscosity Pas thcond W/m/K surten N/m diffusion m2/s;
title "SLB-1.18 bottomhole fluid sample with EOS 20120322.   Contains about "
"0.5 wt% OBM in reservoir fluid.  T-dependent BIPs Library component "
"properties changed to same as PhazeComp. T-dep BIPs altered from previous "
"version to get correct BIP at 243F not 240F." ;
datum enthalpy compound entropy compound; set fractions;
properties PFC6PLUSMW   203.02 ;
puredata INFODATA ;
components overwrite 1 NITROGEN data TCRIT   126.20 PCRIT  3.39801E+06
ACENTRICFACTOR  3.70000E-02 VSRKS1 -4.02589E-06 ;
2 "CARBON DIOXIDE" data TCRIT   304.12 PCRIT  7.37401E+06 ACENTRICFACTOR
 0.22500 VSPR1  5.09546E-08 ;
3 METHANE data TCRIT   190.56 PCRIT  4.59901E+06 VCRIT  9.85975E-05
ACENTRICFACTOR  1.10000E-02 VSPR1 -4.01930E-06 ;
4 ETHANE data TCRIT   305.32 PCRIT  4.87197E+06 VCRIT  1.45498E-04
ACENTRICFACTOR  9.90000E-02 VSPR1 -2.54577E-06 ;
5 PROPANE data MW   44.097 TCRIT   369.83 PCRIT  4.24800E+06 VSPR1
-3.59343E-06 ;
6 I-BUTANE data MW   58.123 PCRIT  3.64002E+06 ACENTRICFACTOR  0.18600 VSPR1
-4.49142E-06 ;
7 N-BUTANE data TCRIT   425.12 PCRIT  3.79598E+06 ACENTRICFACTOR  0.20000
VSPR1 -3.90684E-06 ;
8 I-PENTANE data TCRIT   460.39 PCRIT  3.38098E+06 ACENTRICFACTOR  0.22900
VSPR1 -4.97311E-06 ;
9 PENTANE data PCRIT  3.37002E+06 ACENTRICFACTOR  0.25200 VSPR1 -2.63886E-06 ;
;
chardata INFOCHAR TBSOEREIDE ;
petrofracs overwrite 10 C6 normal data MW   83.282 TCRIT   512.44 PCRIT
 3.30948E+06 VCRIT  3.46244E-04 ACENTRICFACTOR  0.24969 TBOIL   337.85 SG
 0.69568 CNUMBER   5.9292 REFVISLB  2.26070E-04 VSPR1 -5.54877E-07 ;
11 C7 normal data MW   98.471 TCRIT   553.18 PCRIT  3.03631E+06 VCRIT
 4.66510E-04 ACENTRICFACTOR  0.28313 TBOIL   370.98 SG  0.76726 CNUMBER
  7.1997 REFVISLB  1.34400E-03 VSPR1  8.09391E-06 ;
12 C8 normal data MW   109.87 TCRIT   579.61 PCRIT  2.85684E+06 VCRIT
 5.12238E-04 ACENTRICFACTOR  0.31047 TBOIL   393.58 SG  0.78591 CNUMBER
  7.9958 REFVISLB  1.18160E-03 VSPR1  9.88729E-06 ;
13 C9 normal data MW   123.39 TCRIT   608.62 PCRIT  2.65290E+06 VCRIT
 5.69747E-04 ACENTRICFACTOR  0.34698 TBOIL   419.67 SG  0.80319 CNUMBER
  8.9300 REFVISLB  1.06690E-03 VSPR1  1.31971E-05 ;
14 C10 normal data MW   136.62 TCRIT   634.18 PCRIT  2.47860E+06 VCRIT
 6.25922E-04 ACENTRICFACTOR  0.38361 TBOIL   443.50 SG  0.81695 CNUMBER
  9.7773 REFVISLB  9.69100E-04 VSPR1  1.67277E-05 ;
15 C11 normal data MW   149.76 TCRIT   657.32 PCRIT  2.32698E+06 VCRIT
 6.81347E-04 ACENTRICFACTOR  0.42051 TBOIL   465.72 SG  0.82855 CNUMBER
  10.705 REFVISLB  8.82700E-04 VSPR1  2.04793E-05 ;
16 C12 normal data MW   162.81 TCRIT   678.41 PCRIT  2.19433E+06 VCRIT
 7.35698E-04 ACENTRICFACTOR  0.45752 TBOIL   486.53 SG  0.83860 CNUMBER
  11.611 REFVISLB  8.04100E-04 VSPR1  2.44042E-05 ;
17 C13 normal data MW   175.77 TCRIT   697.77 PCRIT  2.07774E+06 VCRIT
 7.88808E-04 ACENTRICFACTOR  0.49116 TBOIL   506.06 SG  0.84747 CNUMBER
  12.526 REFVISLB  7.32000E-04 VSPR1  2.84490E-05 ;
18 C14 normal data MW   188.63 TCRIT   715.63 PCRIT  1.97480E+06 VCRIT
 8.40335E-04 ACENTRICFACTOR  0.52632 TBOIL   524.44 SG  0.85541 CNUMBER
  13.400 REFVISLB  6.65200E-04 VSPR1  3.25640E-05 ;
19 C15 normal data MW   201.39 TCRIT   732.18 PCRIT  1.88337E+06 VCRIT
 8.90240E-04 ACENTRICFACTOR  0.56109 TBOIL   541.77 SG  0.86261 CNUMBER
  14.189 REFVISLB  6.03600E-04 VSPR1  3.67048E-05 ;
20 C16 normal data MW   214.05 TCRIT   747.58 PCRIT  1.80188E+06 VCRIT
 9.38404E-04 ACENTRICFACTOR  0.59542 TBOIL   558.16 SG  0.86919 CNUMBER
  14.935 REFVISLB  5.46800E-04 VSPR1  4.08277E-05 ;
21 C17 normal data MW   226.61 TCRIT   761.97 PCRIT  1.72900E+06 VCRIT
 9.84662E-04 ACENTRICFACTOR  0.62930 TBOIL   573.66 SG  0.87525 CNUMBER
  15.768 REFVISLB  4.95100E-04 VSPR1  4.48898E-05 ;
22 C18 normal data MW   239.06 TCRIT   775.45 PCRIT  1.66350E+06 VCRIT
 1.02906E-03 ACENTRICFACTOR  0.66270 TBOIL   588.36 SG  0.88086 CNUMBER
  16.527 REFVISLB  4.48200E-04 VSPR1  4.88697E-05 ;
23 C19 normal data MW   251.41 TCRIT   788.12 PCRIT  1.60441E+06 VCRIT
 1.07156E-03 ACENTRICFACTOR  0.69560 TBOIL   602.33 SG  0.88609 CNUMBER
  17.333 REFVISLB  4.05900E-04 VSPR1  5.27332E-05 ;
```

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24 C20 normal data MW   263.65 TCRIT   800.06 PCRIT  1.55091E+06 VCRIT
 1.11221E-03 ACENTRICFACTOR  0.72799 TBOIL   615.61 SG  0.89098 CNUMBER
  18.287 REFVISLB  3.68000E-04 VSPR1  5.64599E-05 ;
25 C21 normal data MW   275.78 TCRIT   811.34 PCRIT  1.50237E+06 VCRIT
 1.15091E-03 ACENTRICFACTOR  0.75988 TBOIL   628.25 SG  0.89558 CNUMBER
  19.198 REFVISLB  3.34200E-04 VSPR1  6.00317E-05 ;
26 C22 normal data MW   287.81 TCRIT   822.03 PCRIT  1.45817E+06 VCRIT
 1.18783E-03 ACENTRICFACTOR  0.79124 TBOIL   640.31 SG  0.89991 CNUMBER
  19.999 REFVISLB  3.04300E-04 VSPR1  6.34355E-05 ;
27 C23 normal data MW   299.73 TCRIT   832.17 PCRIT  1.41777E+06 VCRIT
 1.22294E-03 ACENTRICFACTOR  0.82208 TBOIL   651.83 SG  0.90401 CNUMBER
  20.791 REFVISLB  2.77800E-04 VSPR1  6.66597E-05 ;
28 C24 normal data MW   311.54 TCRIT   841.82 PCRIT  1.38081E+06 VCRIT
 1.25621E-03 ACENTRICFACTOR  0.85239 TBOIL   662.83 SG  0.90790 CNUMBER
  21.576 REFVISLB  2.54300E-04 VSPR1  6.96905E-05 ;
29 C25 normal data MW   323.26 TCRIT   851.02 PCRIT  1.34682E+06 VCRIT
 1.28799E-03 ACENTRICFACTOR  0.88218 TBOIL   673.37 SG  0.91159 CNUMBER
  22.353 REFVISLB  2.33600E-04 VSPR1  7.25327E-05 ;
30 C26 normal data MW   334.87 TCRIT   859.79 PCRIT  1.31552E+06 VCRIT
 1.31813E-03 ACENTRICFACTOR  0.91144 TBOIL   683.47 SG  0.91511 CNUMBER
  23.122 REFVISLB  2.15300E-04 VSPR1  7.51809E-05 ;
31 C27 normal data MW   346.38 TCRIT   868.19 PCRIT  1.28663E+06 VCRIT
 1.34668E-03 ACENTRICFACTOR  0.94018 TBOIL   693.15 SG  0.91848 CNUMBER
  23.884 REFVISLB  1.99100E-04 VSPR1  7.76287E-05 ;
32 C28 normal data MW   357.79 TCRIT   876.24 PCRIT  1.25981E+06 VCRIT
 1.37395E-03 ACENTRICFACTOR  0.96841 TBOIL   702.46 SG  0.92169 CNUMBER
  24.639 REFVISLB  1.84800E-04 VSPR1  7.98855E-05 ;
33 C29 normal data MW   369.10 TCRIT   883.95 PCRIT  1.23499E+06 VCRIT
 1.39964E-03 ACENTRICFACTOR  0.99612 TBOIL   711.40 SG  0.92478 CNUMBER
  25.388 REFVISLB  1.72200E-04 VSPR1  8.19443E-05 ;
34 C30 normal data MW   380.32 TCRIT   891.37 PCRIT  1.21189E+06 VCRIT
 1.42415E-03 ACENTRICFACTOR   1.0233 TBOIL   720.00 SG  0.92774 CNUMBER
  26.129 REFVISLB  1.61000E-04 VSPR1  8.38118E-05 ;
35 C31 normal data MW   391.45 TCRIT   898.49 PCRIT  1.19038E+06 VCRIT
 1.44735E-03 ACENTRICFACTOR   1.0500 TBOIL   728.29 SG  0.93058 CNUMBER
  26.864 REFVISLB  1.51000E-04 VSPR1  8.54912E-05 ;
36 C32 normal data MW   402.49 TCRIT   905.36 PCRIT  1.17032E+06 VCRIT
 1.46942E-03 ACENTRICFACTOR   1.0762 TBOIL   736.29 SG  0.93333 CNUMBER
  27.591 REFVISLB  1.42100E-04 VSPR1  8.69809E-05 ;
37 C33 normal data MW   413.44 TCRIT   911.98 PCRIT  1.15149E+06 VCRIT
 1.49041E-03 ACENTRICFACTOR   1.1019 TBOIL   744.00 SG  0.93597 CNUMBER
  28.338 REFVISLB  1.34200E-04 VSPR1  8.83013E-05 ;
38 C34 normal data MW   424.30 TCRIT   918.38 PCRIT  1.13384E+06 VCRIT
 1.51034E-03 ACENTRICFACTOR   1.1272 TBOIL   751.45 SG  0.93852 CNUMBER
  29.094 REFVISLB  1.27100E-04 VSPR1  8.94454E-05 ;
39 C35 normal data MW   435.08 TCRIT   924.56 PCRIT  1.11730E+06 VCRIT
 1.52923E-03 ACENTRICFACTOR   1.1519 TBOIL   758.65 SG  0.94099 CNUMBER
  29.757 REFVISLB  1.20800E-04 VSPR1  9.04173E-05 ;
40 C36 normal data MW   579.66 TCRIT   1015.2 PCRIT  1.05448E+06 VCRIT
 1.59405E-03 ACENTRICFACTOR   1.2205 TBOIL   840.35 SG  0.96914 CNUMBER
  39.929 REFVISLB  7.03900E-05 VSPR1  4.12448E-05 ; ;
bipset PR78ABIP 1 linear eos none  1  2 0.1 0  1  3 0.1 0  1  4 0.1 0  1  5
0.1 0  1  6 0.1 0  1  7 0.1 0  1  8 0.1 0  1  9 0.1 0  1 10 0.1 0  1 11 0.1 0
 1 12 0.1 0  1 13 0.1 0  1 14 0.1 0  1 15 0.1 0  1 16 0.1 0  1 17 0.1 0  1 18
0.1 0  1 19 0.1 0  1 20 0.1 0  1 21 0.1 0  1 22 0.1 0  1 23 0.1 0  1 24 0.1 0
 1 25 0.1 0  1 26 0.1 0  1 27 0.1 0  1 28 0.1 0  1 29 0.1 0  1 30 0.1 0  1 31
0.1 0  1 32 0.1 0  1 33 0.1 0  1 34 0.1 0  1 35 0.1 0  1 36 0.1 0  1 37 0.1 0
 1 38 0.1 0  1 39 0.1 0  1 40 0.1 0  2  3 0.105 0  2  4 0.13 0  2  5 0.125 0
 2  6 0.115 0  2  7 0.115 0  2  8 0.115 0  2  9 0.115 0  2 10 0.115 0  2 11
0.115 0  2 12 0.115 0  2 13 0.115 0  2 14 0.115 0  2 15 0.115 0  2 16 0.115 0
 2 17 0.115 0  2 18 0.115 0  2 19 0.115 0  2 20 0.115 0  2 21 0.115 0  2 22
0.115 0  2 23 0.115 0  2 24 0.115 0  2 25 0.115 0  2 26 0.115 0  2 27 0.115 0
 2 28 0.115 0  2 29 0.115 0  2 30 0.115 0  2 31 0.115 0  2 32 0.115 0  2 33
0.115 0  2 34 0.115 0  2 35 0.115 0  2 36 0.115 0  2 37 0.115 0  2 38 0.115 0
 2 39 0.115 0  2 40 0.115 0  3  4 -0.00126 0  3  5 -0.00414 0  3  6 -0.00791 0
 3  7 -0.00745 0  3  8 -0.01067 0  3  9 -0.01083 0  3 10 -0.03 0  3 11
0.02274266 -7.55245E-5  3 12 0.05131445 -.000151175  3 13 0.07961711
-.000226699  3 14 0.1079798 -.000302224  3 15 0.1363924 -.000377748  3 16
0.1648551 -.000453273  3 17 0.1934069 -.000528923  3 18 0.2219695 -.000604448
 3 19 0.2505722 -.000679972  3 20 0.279274 -.000755622  3 21 0.3079766
-.000831147  3 22 0.3367193 -.000906671  3 23 0.2813335 -.000725035  3 24
0.2259751 -.000543776  3 25 0.1707167 -.000362517  3 26 0.1154584 -.000181259
 3 27 0.06015 0  3 28 0.0617 0  3 29 0.06317 0  3 30 0.06456 0  3 31 0.06587 0
 3 32 0.06712 0  3 33 0.0683 0  3 34 0.06943 0  3 35 0.07049 0  3 36 0.07151 0
 3 37 0.07248 0  3 38 0.0734 0  3 39 0.07427 0  3 40 0.08336 0  4  6 1.E-20 0
 4  7 1.E-20 0  4  8 1.E-20 0  4  9 1.E-20 0  4 10 1.E-20 0  4 11 1.E-20 0  4
12 1.E-20 0  4 13 1.E-20 0  4 14 1.E-20 0  4 15 1.E-20 0  4 16 1.E-20 0  4 17
1.E-20 0  4 18 1.E-20 0  4 19 1.E-20 0  4 20 1.E-20 0  4 21 1.E-20 0  4 22
1.E-20 0  4 23 1.E-20 0  4 24 1.E-20 0  4 25 1.E-20 0  4 26 1.E-20 0  4 27
```

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1.E-20 0  4 28 1.E-20 0  4 29 1.E-20 0  4 30 1.E-20 0  4 31 1.E-20 0  4 32
1.E-20 0  4 33 1.E-20 0  4 34 1.E-20 0  4 35 1.E-20 0  4 36 1.E-20 0  4 37
1.E-20 0  4 38 1.E-20 0  4 39 1.E-20 0  4 40 1.E-20 0  5  8 1.E-20 0  5  9
1.E-20 0  5 10 1.E-20 0  5 11 1.E-20 0  5 12 1.E-20 0  5 13 1.E-20 0  5 14
1.E-20 0  5 15 1.E-20 0  5 16 1.E-20 0  5 17 1.E-20 0  5 18 1.E-20 0  5 19
1.E-20 0  5 20 1.E-20 0  5 21 1.E-20 0  5 22 1.E-20 0  5 23 1.E-20 0  5 24
1.E-20 0  5 25 1.E-20 0  5 26 1.E-20 0  5 27 1.E-20 0  5 28 1.E-20 0  5 29
1.E-20 0  5 30 1.E-20 0  5 31 1.E-20 0  5 32 1.E-20 0  5 33 1.E-20 0  5 34
1.E-20 0  5 35 1.E-20 0  5 36 1.E-20 0  5 37 1.E-20 0  5 38 1.E-20 0  5 39
1.E-20 0  5 40 1.E-20 0  6 10 1.E-20 0  6 11 1.E-20 0  6 12 1.E-20 0  6 13
1.E-20 0  6 14 1.E-20 0  6 15 1.E-20 0  6 16 1.E-20 0  6 17 1.E-20 0  6 18
1.E-20 0  6 19 1.E-20 0  6 20 1.E-20 0  6 21 1.E-20 0  6 22 1.E-20 0  6 23
1.E-20 0  6 24 1.E-20 0  6 25 1.E-20 0  6 26 1.E-20 0  6 27 1.E-20 0  6 28
1.E-20 0  6 29 1.E-20 0  6 30 1.E-20 0  6 31 1.E-20 0  6 32 1.E-20 0  6 33
1.E-20 0  6 34 1.E-20 0  6 35 1.E-20 0  6 36 1.E-20 0  6 37 1.E-20 0  6 38
1.E-20 0  6 39 1.E-20 0  6 40 1.E-20 0  7 10 1.E-20 0  7 11 1.E-20 0  7 12
1.E-20 0  7 13 1.E-20 0  7 14 1.E-20 0  7 15 1.E-20 0  7 16 1.E-20 0  7 17
1.E-20 0  7 18 1.E-20 0  7 19 1.E-20 0  7 20 1.E-20 0  7 21 1.E-20 0  7 22
1.E-20 0  7 23 1.E-20 0  7 24 1.E-20 0  7 25 1.E-20 0  7 26 1.E-20 0  7 27
1.E-20 0  7 28 1.E-20 0  7 29 1.E-20 0  7 30 1.E-20 0  7 31 1.E-20 0  7 32
1.E-20 0  7 33 1.E-20 0  7 34 1.E-20 0  7 35 1.E-20 0  7 36 1.E-20 0  7 37
1.E-20 0  7 38 1.E-20 0  7 39 1.E-20 0  7 40 1.E-20 0  8 11 1.E-20 0  8 12
1.E-20 0  8 13 1.E-20 0  8 14 1.E-20 0  8 15 1.E-20 0  8 16 1.E-20 0  8 17
1.E-20 0  8 18 1.E-20 0  8 19 1.E-20 0  8 20 1.E-20 0  8 21 1.E-20 0  8 22
1.E-20 0  8 23 1.E-20 0  8 24 1.E-20 0  8 25 1.E-20 0  8 26 1.E-20 0  8 27
1.E-20 0  8 28 1.E-20 0  8 29 1.E-20 0  8 30 1.E-20 0  8 31 1.E-20 0  8 32
1.E-20 0  8 33 1.E-20 0  8 34 1.E-20 0  8 35 1.E-20 0  8 36 1.E-20 0  8 37
1.E-20 0  8 38 1.E-20 0  8 39 1.E-20 0  8 40 1.E-20 0  9 11 1.E-20 0  9 12
1.E-20 0  9 13 1.E-20 0  9 14 1.E-20 0  9 15 1.E-20 0  9 16 1.E-20 0  9 17
1.E-20 0  9 18 1.E-20 0  9 19 1.E-20 0  9 20 1.E-20 0  9 21 1.E-20 0  9 22
1.E-20 0  9 23 1.E-20 0  9 24 1.E-20 0  9 25 1.E-20 0  9 26 1.E-20 0  9 27
1.E-20 0  9 28 1.E-20 0  9 29 1.E-20 0  9 30 1.E-20 0  9 31 1.E-20 0  9 32
1.E-20 0  9 33 1.E-20 0  9 34 1.E-20 0  9 35 1.E-20 0  9 36 1.E-20 0  9 37
1.E-20 0  9 38 1.E-20 0  9 39 1.E-20 0  9 40 1.E-20 0 11 12 0.00014 0 11 13
0.00063 0 11 14 0.00138 0 11 15 0.00232 0 11 16 0.00338 0 11 17 0.00453 0 11
18 0.00573 0 11 19 0.00697 0 11 20 0.00821 0 11 21 0.00945 0 11 22 0.01068 0
11 23 0.01188 0 11 24 0.01305 0 11 25 0.01419 0 11 26 0.0153 0 11 27 0.01637 0
11 28 0.0174 0 11 29 0.01839 0 11 30 0.01934 0 11 31 0.02026 0 11 32 0.02114 0
11 33 0.02199 0 11 34 0.02281 0 11 35 0.02359 0 11 36 0.02434 0 11 37 0.02506
0 11 38 0.02575 0 11 39 0.02642 0 11 40 0.03359 0 12 13 0.00018 0 12 14
0.00065 0 12 15 0.00133 0 12 16 0.00216 0 12 17 0.0031 0 12 18 0.00411 0 12 19
0.00517 0 12 20 0.00625 0 12 21 0.00734 0 12 22 0.00843 0 12 23 0.0095 0 12 24
0.01056 0 12 25 0.01159 0 12 26 0.01259 0 12 27 0.01357 0 12 28 0.01451 0 12
29 0.01542 0 12 30 0.0163 0 12 31 0.01715 0 12 32 0.01796 0 12 33 0.01875 0 12
34 0.0195 0 12 35 0.02023 0 12 36 0.02093 0 12 37 0.0216 0 12 38 0.02224 0 12
39 0.02287 0 12 40 0.0296 0 13 14 0.00015 0 13 15 0.00053 0 13 16 0.00109 0 13
17 0.00179 0 13 18 0.00257 0 13 19 0.00342 0 13 20 0.00431 0 13 21 0.00523 0
13 22 0.00616 0 13 23 0.00708 0 13 24 0.008 0 13 25 0.0089 0 13 26 0.00979 0
13 27 0.01065 0 13 28 0.01149 0 13 29 0.01231 0 13 30 0.0131 0 13 31 0.01386 0
13 32 0.0146 0 13 33 0.01531 0 13 34 0.016 0 13 35 0.01666 0 13 36 0.0173 0 13
37 0.01791 0 13 38 0.0185 0 13 39 0.01907 0 13 40 0.0253 0 14 15 0.00012 0 14
16 0.00044 0 14 17 0.00091 0 14 18 0.0015 0 14 19 0.00216 0 14 20 0.00288 0 14
21 0.00364 0 14 22 0.00442 0 14 23 0.00521 0 14 24 0.00601 0 14 25 0.0068 0 14
26 0.00757 0 14 27 0.00834 0 14 28 0.00909 0 14 29 0.00982 0 14 30 0.01052 0
14 31 0.01121 0 14 32 0.01188 0 14 33 0.01252 0 14 34 0.01315 0 14 35 0.01375
0 14 36 0.01433 0 14 37 0.01489 0 14 38 0.01543 0 14 39 0.01596 0 14 40
0.02171 0 15 16 1.E-4 0 15 17 0.00037 0 15 18 0.00077 0 15 19 0.00126 0 15 20
0.00183 0 15 21 0.00244 0 15 22 0.00309 0 15 23 0.00376 0 15 24 0.00443 0 15
25 0.00512 0 15 26 0.0058 0 15 27 0.00647 0 15 28 0.00713 0 15 29 0.00778 0 15
30 0.00842 0 15 31 0.00903 0 15 32 0.00963 0 15 33 0.01022 0 15 34 0.01078 0
15 35 0.01133 0 15 36 0.01186 0 15 37 0.01237 0 15 38 0.01287 0 15 39 0.01335
0 15 40 0.01867 0 16 17 9.E-5 0 16 18 0.00031 0 16 19 0.00065 0 16 20 0.00107
0 16 21 0.00155 0 16 22 0.00208 0 16 23 0.00263 0 16 24 0.0032 0 16 25 0.00379
0 16 26 0.00438 0 16 27 0.00496 0 16 28 0.00555 0 16 29 0.00612 0 16 30
0.00669 0 16 31 0.00724 0 16 32 0.00778 0 16 33 0.00831 0 16 34 0.00882 0 16
35 0.00932 0 16 36 0.0098 0 16 37 0.01027 0 16 38 0.01072 0 16 39 0.01116 0 16
40 0.01608 0 17 18 7.E-5 0 17 19 0.00027 0 17 20 0.00055 0 17 21 0.00091 0 17
22 0.00132 0 17 23 0.00177 0 17 24 0.00225 0 17 25 0.00274 0 17 26 0.00325 0
17 27 0.00376 0 17 28 0.00427 0 17 29 0.00477 0 17 30 0.00527 0 17 31 0.00577
0 17 32 0.00625 0 17 33 0.00673 0 17 34 0.00719 0 17 35 0.00764 0 17 36
0.00808 0 17 37 0.0085 0 17 38 0.00892 0 17 39 0.00932 0 17 40 0.01387 0 18 19
6.E-5 0 18 20 0.00023 0 18 21 0.00047 0 18 22 0.00078 0 18 23 0.00113 0 18 24
0.00152 0 18 25 0.00193 0 18 26 0.00235 0 18 27 0.00279 0 18 28 0.00324 0 18
29 0.00368 0 18 30 0.00412 0 18 31 0.00456 0 18 32 0.00499 0 18 33 0.00542 0
18 34 0.00583 0 18 35 0.00624 0 18 36 0.00664 0 18 37 0.00703 0 18 38 0.0074 0
18 39 0.00777 0 18 40 0.01197 0 19 20 5.E-5 0 19 21 0.00019 0 19 22 0.0004 0
19 23 0.00067 0 19 24 0.00097 0 19 25 0.0013 0 19 26 0.00166 0 19 27 0.00203 0
19 28 0.00241 0 19 29 0.0028 0 19 30 0.00318 0 19 31 0.00357 0 19 32 0.00395 0
19 33 0.00433 0 19 34 0.00471 0 19 35 0.00507 0 19 36 0.00543 0 19 37 0.00579
```

```
0 19 38 0.00613 0 19 39 0.00647 0 19 40 0.01035 0 20 21 4.E-5 0 20 22 0.00017
0 20 23 0.00035 0 20 24 0.00057 0 20 25 0.00084 0 20 26 0.00112 0 20 27
0.00143 0 20 28 0.00175 0 20 29 0.00209 0 20 30 0.00242 0 20 31 0.00276 0 20
32 0.0031 0 20 33 0.00344 0 20 34 0.00377 0 20 35 0.0041 0 20 36 0.00443 0 20
37 0.00475 0 20 38 0.00506 0 20 39 0.00536 0 20 40 0.00895 0 21 22 4.E-5 0 21
23 0.00014 0 21 24 0.0003 0 21 25 0.00049 0 21 26 0.00072 0 21 27 0.00097 0 21
28 0.00124 0 21 29 0.00152 0 21 30 0.00181 0 21 31 0.00211 0 21 32 0.00241 0
21 33 0.0027 0 21 34 0.003 0 21 35 0.0033 0 21 36 0.00359 0 21 37 0.00388 0 21
38 0.00416 0 21 39 0.00444 0 21 40 0.00774 0 22 23 3.E-5 0 22 24 0.00012 0 22
25 0.00026 0 22 26 0.00043 0 22 27 0.00063 0 22 28 0.00084 0 22 29 0.00108 0
22 30 0.00132 0 22 31 0.00158 0 22 32 0.00184 0 22 33 0.0021 0 22 34 0.00236 0
22 35 0.00263 0 22 36 0.00289 0 22 37 0.00315 0 22 38 0.0034 0 22 39 0.00366 0
22 40 0.0067 0 23 24 3.E-5 0 23 25 0.00011 0 23 26 0.00022 0 23 27 0.00037 0
23 28 0.00054 0 23 29 0.00073 0 23 30 0.00094 0 23 31 0.00116 0 23 32 0.00138
0 23 33 0.00161 0 23 34 0.00184 0 23 35 0.00207 0 23 36 0.00231 0 23 37
0.00254 0 23 38 0.00277 0 23 39 0.003 0 23 40 0.0058 0 24 25 2.E-5 0 24 26
9.E-5 0 24 27 0.00019 0 24 28 0.00032 0 24 29 0.00047 0 24 30 0.00064 0 24 31
0.00082 0 24 32 0.00101 0 24 33 0.00121 0 24 34 0.00141 0 24 35 0.00162 0 24
36 0.00182 0 24 37 0.00203 0 24 38 0.00224 0 24 39 0.00244 0 24 40 0.00502 0
25 26 2.E-5 0 25 27 8.E-5 0 25 28 0.00017 0 25 29 0.00028 0 25 30 0.00041 0 25
31 0.00056 0 25 32 0.00072 0 25 33 0.00089 0 25 34 0.00106 0 25 35 0.00124 0
25 36 0.00142 0 25 37 0.00161 0 25 38 0.00179 0 25 39 0.00198 0 25 40 0.00435
0 26 27 2.E-5 0 26 28 7.E-5 0 26 29 0.00015 0 26 30 0.00025 0 26 31 0.00036 0
26 32 0.00049 0 26 33 0.00063 0 26 34 0.00078 0 26 35 0.00094 0 26 36 0.0011 0
26 37 0.00126 0 26 38 0.00142 0 26 39 0.00159 0 26 40 0.00376 0 27 28 2.E-5 0
27 29 6.E-5 0 27 30 0.00013 0 27 31 0.00022 0 27 32 0.00032 0 27 33 0.00043 0
27 34 0.00056 0 27 35 0.00069 0 27 36 0.00083 0 27 37 0.00097 0 27 38 0.00112
0 27 39 0.00126 0 27 40 0.00325 0 28 29 1.E-5 0 28 30 5.E-5 0 28 31 0.00011 0
28 32 0.00019 0 28 33 0.00028 0 28 34 0.00038 0 28 35 0.00049 0 28 36 0.00061
0 28 37 0.00073 0 28 38 0.00086 0 28 39 0.00099 0 28 40 0.00281 0 29 30 1.E-5
0 29 31 5.E-5 0 29 32 1.E-4 0 29 33 0.00017 0 29 34 0.00025 0 29 35 0.00034 0
29 36 0.00044 0 29 37 0.00054 0 29 38 0.00065 0 29 39 0.00077 0 29 40 0.00242
0 30 31 1.E-5 0 30 32 4.E-5 0 30 33 9.E-5 0 30 34 0.00015 0 30 35 0.00022 0 30
36 0.0003 0 30 37 0.00039 0 30 38 0.00048 0 30 39 0.00058 0 30 40 0.00208 0 31
32 1.E-5 0 31 33 4.E-5 0 31 34 8.E-5 0 31 35 0.00013 0 31 36 0.0002 0 31 37
0.00027 0 31 38 0.00035 0 31 39 0.00043 0 31 40 0.00179 0 32 33 1.E-5 0 32 34
3.E-5 0 32 35 7.E-5 0 32 36 0.00012 0 32 37 0.00018 0 32 38 0.00024 0 32 39
0.00031 0 32 40 0.00153 0 33 34 1.E-5 0 33 35 3.E-5 0 33 36 6.E-5 0 33 37
0.00011 0 33 38 0.00016 0 33 39 0.00022 0 33 40 0.00131 0 34 35 1.E-5 0 34 36
3.E-5 0 34 37 6.E-5 0 34 38 1.E-4 0 34 39 0.00014 0 34 40 0.00112 0 35 36
1.E-5 0 35 37 2.E-5 0 35 38 5.E-5 0 35 39 9.E-5 0 35 40 0.00095 0 36 37 1.E-5
0 36 38 2.E-5 0 36 39 5.E-5 0 36 40 0.0008 0 37 38 1.E-5 0 37 39 2.E-5 0 37 40
0.00067 0 38 40 0.00056 0 39 40 0.00046 0 ;
bipset LGSTBIP 1 constant eos none ;
bipdata erase ;
model MPR78A PRA PSAT78 LDEN VDW PR78ABIP;
model MLBCMPR78A LBC LFIT MPR78A;
model MSTRAPP SPTHCOND;
bipdata erase ;
model MLGSTMPR78A LGST MPR78A LGSTBIP;
bipdata erase ;
pd GAS gas MPR78A MPR78A MPR78A MLBCMPR78A MSTRAPP MLGSTMPR78A;
pd LIQUID1 liquid MPR78A MPR78A MPR78A MLBCMPR78A MSTRAPP MLGSTMPR78A;
key LIQUID1 not 007732-18-5;
pd LIQUID2 liquid MPR78A MPR78A MPR78A MLBCMPR78A MSTRAPP MLGSTMPR78A;
key LIQUID2 not 007732-18-5;
temperature 390.37222222;
pressure 41368543.759;
amounts 1.38028158191 4.02926102271 297.1696804284 28.9210495112 20.55317746944
4.22702729603 9.59030347891 3.81743338592 4.6447858688 6.23371994091
8.32387358187 9.32812708905 6.77621641543 6.05954047083 4.53093418393
3.81062950037 3.52849504623 3.05902694328 2.9891737183 2.48160385627
2.11328685183 2.00397109066 1.73998033132 1.48143268042 1.34354059994
1.17616501541 1.043262451 .94211135249 .84322821583 .79015790854 .72302623778
.67040952286 .64137961118 .59375241233 .54748599059 .498951607 .46674654873
.43454149046 .44179896838 3.64325391584;
inputunits temperature degF pressure psi enthalpy BTU/lbmol entropy BTU/lbmol/F
volume kg/m3 amounts lbmol viscosity cP thcond BTU/hr/ft/F surten dyne/cm
diffusion cm2/s;
outputunits temperature degF pressure psi enthalpy BTU/lbmol entropy
BTU/lbmol/F volume lbmol/ft3 amounts lbmol viscosity cP thcond BTU/hr/ft/F
surten dyne/cm diffusion cm2/s;
set physprops lVCS;
```

MultiFlash – CL68379-EOS20120322.out

```
*****************************************************************
 *****************************************************************
 **                                                             **
 **         MULTIFLASH Version 4.1.09   March 2012              **
 **                                                             **
 **              Serial number: 676/1                           **
 **                                                             **
 **                                                             **
 **   Copyright (C) Infochem Computer Services Ltd, 1989-2012   **
 **                                                             **
 *****************************************************************
 *****************************************************************

          Run on: 02 April 2012      at 10:50

Multiflash application files location: C:\Program Files\Infochem\MF41\
------------------------------------------------------------------------------
------------------------------------------------------------------------------
Model set: PR78 (Advanced) with STRAPP/STRAPP/LGST transport properties
------------------------------------------------------------------------------
Load file: C:\!\Multiflash\CL68379-EOS20120223.MFL
# Multiflash version: 4.1.09   March 2012 #
# Date: 02 April 2012   Time: 10:49 #
remove all;
units temperature K pressure Pa enthalpy J/mol entropy J/mol/K volume m3/mol
amounts mol viscosity Pas thcond W/m/K surten N/m diffusion m2/s;
title "CL68379 with EOS 20120322 T-dependent BIPs Library component "
"properties changed to same as PhazeComp. T-dep BIPs altered from previous "
"version to get correct BIP at 243F not 240F" ;
datum enthalpy compound entropy compound; set fractions;
properties PFC6PLUSMW   201.12 ;
puredata INFODATA ;
components overwrite 1 NITROGEN data TCRIT   126.20 PCRIT  3.39801E+06
ACENTRICFACTOR  3.70000E-02 VSRKS1 -4.02589E-06 ;
2 "CARBON DIOXIDE" data TCRIT   304.12 PCRIT  7.37401E+06 ACENTRICFACTOR
 0.22500 VSPR1  5.09546E-08 ;
3 METHANE data TCRIT   190.56 PCRIT  4.59901E+06 VCRIT  9.85975E-05
ACENTRICFACTOR  1.10000E-02 VSPR1 -4.01930E-06 ;
4 ETHANE data TCRIT   305.32 PCRIT  4.87197E+06 VCRIT  1.45498E-04
ACENTRICFACTOR  9.90000E-02 VSPR1 -2.54577E-06 ;
5 PROPANE data MW   44.097 TCRIT   369.83 PCRIT  4.24800E+06 VSPR1
-3.59343E-06 ;
6 I-BUTANE data MW   58.123 PCRIT  3.64002E+06 ACENTRICFACTOR  0.18600 VSPR1
-4.49142E-06 ;
7 N-BUTANE data TCRIT   425.12 PCRIT  3.79598E+06 ACENTRICFACTOR  0.20000
VSPR1 -3.90684E-06 ;
8 I-PENTANE data TCRIT   460.39 PCRIT  3.38098E+06 ACENTRICFACTOR  0.22900
VSPR1 -4.97311E-06 ;
9 PENTANE data PCRIT  3.37002E+06 ACENTRICFACTOR  0.25200 VSPR1 -2.63886E-06 ;
;
chardata INFOCHAR TBSOEREIDE ;
petrofracs overwrite 10 C6 normal data MW   83.282 TCRIT   512.44 PCRIT
 3.30948E+06 VCRIT  3.46244E-04 ACENTRICFACTOR  0.24969 TBOIL   337.85 SG
 0.69568 CNUMBER   5.9292 REFVISLB  2.26070E-04 VSPR1 -5.54877E-07 ;
11 C7 normal data MW   98.471 TCRIT   553.18 PCRIT  3.03631E+06 VCRIT
 4.66510E-04 ACENTRICFACTOR  0.28313 TBOIL   370.98 SG  0.76726 CNUMBER
  7.1997 REFVISLB  1.34400E-03 VSPR1  8.09391E-06 ;
12 C8 normal data MW   109.87 TCRIT   579.61 PCRIT  2.85684E+06 VCRIT
 5.12238E-04 ACENTRICFACTOR  0.31047 TBOIL   393.58 SG  0.78591 CNUMBER
  7.9958 REFVISLB  1.18160E-03 VSPR1  9.88729E-06 ;
13 C9 normal data MW   123.39 TCRIT   608.62 PCRIT  2.65290E+06 VCRIT
 5.69747E-04 ACENTRICFACTOR  0.34698 TBOIL   419.67 SG  0.80319 CNUMBER
  8.9300 REFVISLB  1.06690E-03 VSPR1  1.31971E-05 ;
14 C10 normal data MW   136.62 TCRIT   634.18 PCRIT  2.47860E+06 VCRIT
 6.25922E-04 ACENTRICFACTOR  0.38361 TBOIL   443.50 SG  0.81695 CNUMBER
  9.7773 REFVISLB  9.69100E-04 VSPR1  1.67277E-05 ;
15 C11 normal data MW   149.76 TCRIT   657.32 PCRIT  2.32698E+06 VCRIT
 6.81347E-04 ACENTRICFACTOR  0.42051 TBOIL   465.72 SG  0.82855 CNUMBER
  10.705 REFVISLB  8.82700E-04 VSPR1  2.04793E-05 ;
16 C12 normal data MW   162.81 TCRIT   678.41 PCRIT  2.19433E+06 VCRIT
 7.35698E-04 ACENTRICFACTOR  0.45752 TBOIL   486.53 SG  0.83860 CNUMBER
  11.611 REFVISLB  8.04100E-04 VSPR1  2.44042E-05 ;
17 C13 normal data MW   175.77 TCRIT   697.77 PCRIT  2.07774E+06 VCRIT
```

```
 7.88808E-04 ACENTRICFACTOR  0.49116 TBOIL   506.06 SG  0.84747 CNUMBER
  12.526 REFVISLB  7.32000E-04 VSPR1  2.84490E-05 ;
18 C14 normal data MW   188.63 TCRIT   715.63 PCRIT  1.97480E+06 VCRIT
 8.40335E-04 ACENTRICFACTOR  0.52632 TBOIL   524.44 SG  0.85541 CNUMBER
  13.400 REFVISLB  6.65200E-04 VSPR1  3.25640E-05 ;
19 C15 normal data MW   201.39 TCRIT   732.18 PCRIT  1.88337E+06 VCRIT
 8.90240E-04 ACENTRICFACTOR  0.56109 TBOIL   541.77 SG  0.86261 CNUMBER
  14.189 REFVISLB  6.03600E-04 VSPR1  3.67048E-05 ;
20 C16 normal data MW   214.05 TCRIT   747.58 PCRIT  1.80188E+06 VCRIT
 9.38404E-04 ACENTRICFACTOR  0.59542 TBOIL   558.16 SG  0.86919 CNUMBER
  14.935 REFVISLB  5.46800E-04 VSPR1  4.08277E-05 ;
21 C17 normal data MW   226.61 TCRIT   761.97 PCRIT  1.72900E+06 VCRIT
 9.84662E-04 ACENTRICFACTOR  0.62930 TBOIL   573.66 SG  0.87525 CNUMBER
  15.768 REFVISLB  4.95100E-04 VSPR1  4.48898E-05 ;
22 C18 normal data MW   239.06 TCRIT   775.45 PCRIT  1.66350E+06 VCRIT
 1.02906E-03 ACENTRICFACTOR  0.66270 TBOIL   588.36 SG  0.88086 CNUMBER
  16.527 REFVISLB  4.48200E-04 VSPR1  4.88697E-05 ;
23 C19 normal data MW   251.41 TCRIT   788.12 PCRIT  1.60441E+06 VCRIT
 1.07156E-03 ACENTRICFACTOR  0.69560 TBOIL   602.33 SG  0.88609 CNUMBER
  17.333 REFVISLB  4.05900E-04 VSPR1  5.27332E-05 ;
24 C20 normal data MW   263.65 TCRIT   800.06 PCRIT  1.55091E+06 VCRIT
 1.11221E-03 ACENTRICFACTOR  0.72799 TBOIL   615.61 SG  0.89098 CNUMBER
  18.287 REFVISLB  3.68000E-04 VSPR1  5.64599E-05 ;
25 C21 normal data MW   275.78 TCRIT   811.34 PCRIT  1.50237E+06 VCRIT
 1.15091E-03 ACENTRICFACTOR  0.75988 TBOIL   628.25 SG  0.89558 CNUMBER
  19.198 REFVISLB  3.34200E-04 VSPR1  6.00317E-05 ;
26 C22 normal data MW   287.81 TCRIT   822.03 PCRIT  1.45817E+06 VCRIT
 1.18783E-03 ACENTRICFACTOR  0.79124 TBOIL   640.31 SG  0.89991 CNUMBER
  19.999 REFVISLB  3.04300E-04 VSPR1  6.34355E-05 ;
27 C23 normal data MW   299.73 TCRIT   832.17 PCRIT  1.41777E+06 VCRIT
 1.22294E-03 ACENTRICFACTOR  0.82208 TBOIL   651.83 SG  0.90401 CNUMBER
  20.791 REFVISLB  2.77800E-04 VSPR1  6.66597E-05 ;
28 C24 normal data MW   311.54 TCRIT   841.82 PCRIT  1.38081E+06 VCRIT
 1.25621E-03 ACENTRICFACTOR  0.85239 TBOIL   662.83 SG  0.90790 CNUMBER
  21.576 REFVISLB  2.54300E-04 VSPR1  6.96905E-05 ;
29 C25 normal data MW   323.26 TCRIT   851.02 PCRIT  1.34682E+06 VCRIT
 1.28799E-03 ACENTRICFACTOR  0.88218 TBOIL   673.37 SG  0.91159 CNUMBER
  22.353 REFVISLB  2.33600E-04 VSPR1  7.25327E-05 ;
30 C26 normal data MW   334.87 TCRIT   859.79 PCRIT  1.31552E+06 VCRIT
 1.31813E-03 ACENTRICFACTOR  0.91144 TBOIL   683.47 SG  0.91511 CNUMBER
  23.122 REFVISLB  2.15300E-04 VSPR1  7.51809E-05 ;
31 C27 normal data MW   346.38 TCRIT   868.19 PCRIT  1.28663E+06 VCRIT
 1.34668E-03 ACENTRICFACTOR  0.94018 TBOIL   693.15 SG  0.91848 CNUMBER
  23.884 REFVISLB  1.99100E-04 VSPR1  7.76287E-05 ;
32 C28 normal data MW   357.79 TCRIT   876.24 PCRIT  1.25981E+06 VCRIT
 1.37395E-03 ACENTRICFACTOR  0.96841 TBOIL   702.46 SG  0.92169 CNUMBER
  24.639 REFVISLB  1.84800E-04 VSPR1  7.98855E-05 ;
33 C29 normal data MW   369.10 TCRIT   883.95 PCRIT  1.23499E+06 VCRIT
 1.39964E-03 ACENTRICFACTOR  0.99612 TBOIL   711.40 SG  0.92478 CNUMBER
  25.388 REFVISLB  1.72200E-04 VSPR1  8.19443E-05 ;
34 C30 normal data MW   380.32 TCRIT   891.37 PCRIT  1.21189E+06 VCRIT
 1.42415E-03 ACENTRICFACTOR   1.0233 TBOIL   720.00 SG  0.92774 CNUMBER
  26.129 REFVISLB  1.61000E-04 VSPR1  8.38118E-05 ;
35 C31 normal data MW   391.45 TCRIT   898.49 PCRIT  1.19038E+06 VCRIT
 1.44735E-03 ACENTRICFACTOR   1.0500 TBOIL   728.29 SG  0.93058 CNUMBER
  26.864 REFVISLB  1.51000E-04 VSPR1  8.54912E-05 ;
36 C32 normal data MW   402.49 TCRIT   905.36 PCRIT  1.17032E+06 VCRIT
 1.46942E-03 ACENTRICFACTOR   1.0762 TBOIL   736.29 SG  0.93333 CNUMBER
  27.591 REFVISLB  1.42100E-04 VSPR1  8.69809E-05 ;
37 C33 normal data MW   413.44 TCRIT   911.98 PCRIT  1.15149E+06 VCRIT
 1.49041E-03 ACENTRICFACTOR   1.1019 TBOIL   744.00 SG  0.93597 CNUMBER
  28.338 REFVISLB  1.34200E-04 VSPR1  8.83013E-05 ;
38 C34 normal data MW   424.30 TCRIT   918.38 PCRIT  1.13384E+06 VCRIT
 1.51034E-03 ACENTRICFACTOR   1.1272 TBOIL   751.45 SG  0.93852 CNUMBER
  29.094 REFVISLB  1.27100E-04 VSPR1  8.94454E-05 ;
39 C35 normal data MW   435.08 TCRIT   924.56 PCRIT  1.11730E+06 VCRIT
 1.52923E-03 ACENTRICFACTOR   1.1519 TBOIL   758.65 SG  0.94099 CNUMBER
  29.757 REFVISLB  1.20800E-04 VSPR1  9.04173E-05 ;
40 C36 normal data MW   579.66 TCRIT   1015.2 PCRIT  1.05448E+06 VCRIT
 1.59405E-03 ACENTRICFACTOR   1.2205 TBOIL   840.35 SG  0.96914 CNUMBER
  39.929 REFVISLB  7.03900E-05 VSPR1  4.12448E-05 ; ;
bipset PR78ABIP 1 linear eos none  1  2 0.1 0  1  3 0.1 0  1  4 0.1 0  1  5
0.1 0  1  6 0.1 0  1  7 0.1 0  1  8 0.1 0  1  9 0.1 0  1 10 0.1 0  1 11 0.1 0
 1 12 0.1 0  1 13 0.1 0  1 14 0.1 0  1 15 0.1 0  1 16 0.1 0  1 17 0.1 0  1 18
0.1 0  1 19 0.1 0  1 20 0.1 0  1 21 0.1 0  1 22 0.1 0  1 23 0.1 0  1 24 0.1 0
 1 25 0.1 0  1 26 0.1 0  1 27 0.1 0  1 28 0.1 0  1 29 0.1 0  1 30 0.1 0  1 31
0.1 0  1 32 0.1 0  1 33 0.1 0  1 34 0.1 0  1 35 0.1 0  1 36 0.1 0  1 37 0.1 0
 1 38 0.1 0  1 39 0.1 0  1 40 0.1 0  2  3 0.105 0  2  4 0.13 0  2  5 0.125 0
 2  6 0.115 0  2  7 0.115 0  2  8 0.115 0  2  9 0.115 0  2 10 0.115 0  2 11
```

```
0.115 0  2 12 0.115 0  2 13 0.115 0  2 14 0.115 0  2 15 0.115 0  2 16 0.115 0
 2 17 0.115 0  2 18 0.115 0  2 19 0.115 0  2 20 0.115 0  2 21 0.115 0  2 22
0.115 0  2 23 0.115 0  2 24 0.115 0  2 25 0.115 0  2 26 0.115 0  2 27 0.115 0
 2 28 0.115 0  2 29 0.115 0  2 30 0.115 0  2 31 0.115 0  2 32 0.115 0  2 33
0.115 0  2 34 0.115 0  2 35 0.115 0  2 36 0.115 0  2 37 0.115 0  2 38 0.115 0
 2 39 0.115 0  2 40 0.115 0  3  4 -0.00126 0  3  5 -0.00414 0  3  6 -0.00791 0
 3  7 -0.00745 0  3  8 -0.01067 0  3  9 -0.01083 0  3 10 -0.03 0  3 11
0.02274266 -7.55245E-5  3 12 0.05131445 -.000151175  3 13 0.07961711
-.000226699  3 14 0.1079798 -.000302224  3 15 0.1363924 -.000377748  3 16
0.1648551 -.000453273  3 17 0.1934069 -.000528923  3 18 0.2219695 -.000604448
 3 19 0.2505722 -.000679972  3 20 0.279274 -.000755622  3 21 0.3079766
-.000831147  3 22 0.3367193 -.000906671  3 23 0.2813335 -.000725035  3 24
0.2259751 -.000543776  3 25 0.1707167 -.000362517  3 26 0.1154584 -.000181259
 3 27 0.06015 0  3 28 0.0617 0  3 29 0.06317 0  3 30 0.06456 0  3 31 0.06587 0
 3 32 0.06712 0  3 33 0.0683 0  3 34 0.06943 0  3 35 0.07049 0  3 36 0.07151 0
 3 37 0.07248 0  3 38 0.0734 0  3 39 0.07427 0  3 40 0.08336 0  4  6 1.E-20 0
 4  7 1.E-20 0  4  8 1.E-20 0  4  9 1.E-20 0  4 10 1.E-20 0  4 11 1.E-20 0  4
12 1.E-20 0  4 13 1.E-20 0  4 14 1.E-20 0  4 15 1.E-20 0  4 16 1.E-20 0  4 17
1.E-20 0  4 18 1.E-20 0  4 19 1.E-20 0  4 20 1.E-20 0  4 21 1.E-20 0  4 22
1.E-20 0  4 23 1.E-20 0  4 24 1.E-20 0  4 25 1.E-20 0  4 26 1.E-20 0  4 27
1.E-20 0  4 28 1.E-20 0  4 29 1.E-20 0  4 30 1.E-20 0  4 31 1.E-20 0  4 32
1.E-20 0  4 33 1.E-20 0  4 34 1.E-20 0  4 35 1.E-20 0  4 36 1.E-20 0  4 37
1.E-20 0  4 38 1.E-20 0  4 39 1.E-20 0  4 40 1.E-20 0  5  8 1.E-20 0  5  9
1.E-20 0  5 10 1.E-20 0  5 11 1.E-20 0  5 12 1.E-20 0  5 13 1.E-20 0  5 14
1.E-20 0  5 15 1.E-20 0  5 16 1.E-20 0  5 17 1.E-20 0  5 18 1.E-20 0  5 19
1.E-20 0  5 20 1.E-20 0  5 21 1.E-20 0  5 22 1.E-20 0  5 23 1.E-20 0  5 24
1.E-20 0  5 25 1.E-20 0  5 26 1.E-20 0  5 27 1.E-20 0  5 28 1.E-20 0  5 29
1.E-20 0  5 30 1.E-20 0  5 31 1.E-20 0  5 32 1.E-20 0  5 33 1.E-20 0  5 34
1.E-20 0  5 35 1.E-20 0  5 36 1.E-20 0  5 37 1.E-20 0  5 38 1.E-20 0  5 39
1.E-20 0  5 40 1.E-20 0  6 10 1.E-20 0  6 11 1.E-20 0  6 12 1.E-20 0  6 13
1.E-20 0  6 14 1.E-20 0  6 15 1.E-20 0  6 16 1.E-20 0  6 17 1.E-20 0  6 18
1.E-20 0  6 19 1.E-20 0  6 20 1.E-20 0  6 21 1.E-20 0  6 22 1.E-20 0  6 23
1.E-20 0  6 24 1.E-20 0  6 25 1.E-20 0  6 26 1.E-20 0  6 27 1.E-20 0  6 28
1.E-20 0  6 29 1.E-20 0  6 30 1.E-20 0  6 31 1.E-20 0  6 32 1.E-20 0  6 33
1.E-20 0  6 34 1.E-20 0  6 35 1.E-20 0  6 36 1.E-20 0  6 37 1.E-20 0  6 38
1.E-20 0  6 39 1.E-20 0  6 40 1.E-20 0  7 10 1.E-20 0  7 11 1.E-20 0  7 12
1.E-20 0  7 13 1.E-20 0  7 14 1.E-20 0  7 15 1.E-20 0  7 16 1.E-20 0  7 17
1.E-20 0  7 18 1.E-20 0  7 19 1.E-20 0  7 20 1.E-20 0  7 21 1.E-20 0  7 22
1.E-20 0  7 23 1.E-20 0  7 24 1.E-20 0  7 25 1.E-20 0  7 26 1.E-20 0  7 27
1.E-20 0  7 28 1.E-20 0  7 29 1.E-20 0  7 30 1.E-20 0  7 31 1.E-20 0  7 32
1.E-20 0  7 33 1.E-20 0  7 34 1.E-20 0  7 35 1.E-20 0  7 36 1.E-20 0  7 37
1.E-20 0  7 38 1.E-20 0  7 39 1.E-20 0  7 40 1.E-20 0  8 11 1.E-20 0  8 12
1.E-20 0  8 13 1.E-20 0  8 14 1.E-20 0  8 15 1.E-20 0  8 16 1.E-20 0  8 17
1.E-20 0  8 18 1.E-20 0  8 19 1.E-20 0  8 20 1.E-20 0  8 21 1.E-20 0  8 22
1.E-20 0  8 23 1.E-20 0  8 24 1.E-20 0  8 25 1.E-20 0  8 26 1.E-20 0  8 27
1.E-20 0  8 28 1.E-20 0  8 29 1.E-20 0  8 30 1.E-20 0  8 31 1.E-20 0  8 32
1.E-20 0  8 33 1.E-20 0  8 34 1.E-20 0  8 35 1.E-20 0  8 36 1.E-20 0  8 37
1.E-20 0  8 38 1.E-20 0  8 39 1.E-20 0  8 40 1.E-20 0  9 11 1.E-20 0  9 12
1.E-20 0  9 13 1.E-20 0  9 14 1.E-20 0  9 15 1.E-20 0  9 16 1.E-20 0  9 17
1.E-20 0  9 18 1.E-20 0  9 19 1.E-20 0  9 20 1.E-20 0  9 21 1.E-20 0  9 22
1.E-20 0  9 23 1.E-20 0  9 24 1.E-20 0  9 25 1.E-20 0  9 26 1.E-20 0  9 27
1.E-20 0  9 28 1.E-20 0  9 29 1.E-20 0  9 30 1.E-20 0  9 31 1.E-20 0  9 32
1.E-20 0  9 33 1.E-20 0  9 34 1.E-20 0  9 35 1.E-20 0  9 36 1.E-20 0  9 37
1.E-20 0  9 38 1.E-20 0  9 39 1.E-20 0  9 40 1.E-20 0 11 12 0.00014 0 11 13
0.00063 0 11 14 0.00138 0 11 15 0.00232 0 11 16 0.00338 0 11 17 0.00453 0 11
18 0.00573 0 11 19 0.00697 0 11 20 0.00821 0 11 21 0.00945 0 11 22 0.01068 0
11 23 0.01188 0 11 24 0.01305 0 11 25 0.01419 0 11 26 0.0153 0 11 27 0.01637 0
11 28 0.0174 0 11 29 0.01839 0 11 30 0.01934 0 11 31 0.02026 0 11 32 0.02114 0
11 33 0.02199 0 11 34 0.02281 0 11 35 0.02359 0 11 36 0.02434 0 11 37 0.02506
0 11 38 0.02575 0 11 39 0.02642 0 11 40 0.03359 0 12 13 0.00018 0 12 14
0.00065 0 12 15 0.00133 0 12 16 0.00216 0 12 17 0.0031 0 12 18 0.00411 0 12 19
0.00517 0 12 20 0.00625 0 12 21 0.00734 0 12 22 0.00843 0 12 23 0.0095 0 12 24
0.01056 0 12 25 0.01159 0 12 26 0.01259 0 12 27 0.01357 0 12 28 0.01451 0 12
29 0.01542 0 12 30 0.0163 0 12 31 0.01715 0 12 32 0.01796 0 12 33 0.01875 0 12
34 0.0195 0 12 35 0.02023 0 12 36 0.02093 0 12 37 0.0216 0 12 38 0.02224 0 12
39 0.02287 0 12 40 0.0296 0 13 14 0.00015 0 13 15 0.00053 0 13 16 0.00109 0 13
17 0.00179 0 13 18 0.00257 0 13 19 0.00342 0 13 20 0.00431 0 13 21 0.00523 0
13 22 0.00616 0 13 23 0.00708 0 13 24 0.008 0 13 25 0.0089 0 13 26 0.00979 0
13 27 0.01065 0 13 28 0.01149 0 13 29 0.01231 0 13 30 0.0131 0 13 31 0.01386 0
13 32 0.0146 0 13 33 0.01531 0 13 34 0.016 0 13 35 0.01666 0 13 36 0.0173 0 13
37 0.01791 0 13 38 0.0185 0 13 39 0.01907 0 13 40 0.0253 0 14 15 0.00012 0 14
16 0.00044 0 14 17 0.00091 0 14 18 0.0015 0 14 19 0.00216 0 14 20 0.00288 0 14
21 0.00364 0 14 22 0.00442 0 14 23 0.00521 0 14 24 0.00601 0 14 25 0.0068 0 14
26 0.00757 0 14 27 0.00834 0 14 28 0.00909 0 14 29 0.00982 0 14 30 0.01052 0
14 31 0.01121 0 14 32 0.01188 0 14 33 0.01252 0 14 34 0.01315 0 14 35 0.01375
0 14 36 0.01433 0 14 37 0.01489 0 14 38 0.01543 0 14 39 0.01596 0 14 40
0.02171 0 15 16 1.E-4 0 15 17 0.00037 0 15 18 0.00077 0 15 19 0.00126 0 15 20
0.00183 0 15 21 0.00244 0 15 22 0.00309 0 15 23 0.00376 0 15 24 0.00443 0 15
25 0.00512 0 15 26 0.0058 0 15 27 0.00647 0 15 28 0.00713 0 15 29 0.00778 0 15
```

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30 0.00842 0 15 31 0.00903 0 15 32 0.00963 0 15 33 0.01022 0 15 34 0.01078 0
15 35 0.01133 0 15 36 0.01186 0 15 37 0.01237 0 15 38 0.01287 0 15 39 0.01335
0 15 40 0.01867 0 16 17 9.E-5 0 16 18 0.00031 0 16 19 0.00065 0 16 20 0.00107
0 16 21 0.00155 0 16 22 0.00208 0 16 23 0.00263 0 16 24 0.0032 0 16 25 0.00379
0 16 26 0.00438 0 16 27 0.00496 0 16 28 0.00555 0 16 29 0.00612 0 16 30
0.00669 0 16 31 0.00724 0 16 32 0.00778 0 16 33 0.00831 0 16 34 0.00882 0 16
35 0.00932 0 16 36 0.0098 0 16 37 0.01027 0 16 38 0.01072 0 16 39 0.01116 0 16
40 0.01608 0 17 18 7.E-5 0 17 19 0.00027 0 17 20 0.00055 0 17 21 0.00091 0 17
22 0.00132 0 17 23 0.00177 0 17 24 0.00225 0 17 25 0.00274 0 17 26 0.00325 0
17 27 0.00376 0 17 28 0.00427 0 17 29 0.00477 0 17 30 0.00527 0 17 31 0.00577
0 17 32 0.00625 0 17 33 0.00673 0 17 34 0.00719 0 17 35 0.00764 0 17 36
0.00808 0 17 37 0.0085 0 17 38 0.00892 0 17 39 0.00932 0 17 40 0.01387 0 18 19
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0.00152 0 18 25 0.00193 0 18 26 0.00235 0 18 27 0.00279 0 18 28 0.00324 0 18
29 0.00368 0 18 30 0.00412 0 18 31 0.00456 0 18 32 0.00499 0 18 33 0.00542 0
18 34 0.00583 0 18 35 0.00624 0 18 36 0.00664 0 18 37 0.00703 0 18 38 0.0074 0
18 39 0.00777 0 18 40 0.01197 0 19 20 5.E-5 0 19 21 0.00019 0 19 22 0.0004 0
19 23 0.00067 0 19 24 0.00097 0 19 25 0.0013 0 19 26 0.00166 0 19 27 0.00203 0
19 28 0.00241 0 19 29 0.0028 0 19 30 0.00318 0 19 31 0.00357 0 19 32 0.00395 0
19 33 0.00433 0 19 34 0.00471 0 19 35 0.00507 0 19 36 0.00543 0 19 37 0.00579
0 19 38 0.00613 0 19 39 0.00647 0 19 40 0.01035 0 20 21 4.E-5 0 20 22 0.00017
0 20 23 0.00035 0 20 24 0.00057 0 20 25 0.00084 0 20 26 0.00112 0 20 27
0.00143 0 20 28 0.00175 0 20 29 0.00209 0 20 30 0.00242 0 20 31 0.00276 0 20
32 0.0031 0 20 33 0.00344 0 20 34 0.00377 0 20 35 0.0041 0 20 36 0.00443 0 20
37 0.00475 0 20 38 0.00506 0 20 39 0.00536 0 20 40 0.00895 0 21 22 4.E-5 0 21
23 0.00014 0 21 24 0.0003 0 21 25 0.00049 0 21 26 0.00072 0 21 27 0.00097 0 21
28 0.00124 0 21 29 0.00152 0 21 30 0.00181 0 21 31 0.00211 0 21 32 0.00241 0
21 33 0.0027 0 21 34 0.003 0 21 35 0.0033 0 21 36 0.00359 0 21 37 0.00388 0 21
38 0.00416 0 21 39 0.00444 0 21 40 0.00774 0 22 23 3.E-5 0 22 24 0.00012 0 22
25 0.00026 0 22 26 0.00043 0 22 27 0.00063 0 22 28 0.00084 0 22 29 0.00108 0
22 30 0.00132 0 22 31 0.00158 0 22 32 0.00184 0 22 33 0.0021 0 22 34 0.00236 0
22 35 0.00263 0 22 36 0.00289 0 22 37 0.00315 0 22 38 0.0034 0 22 39 0.00366 0
22 40 0.0067 0 23 24 3.E-5 0 23 25 0.00011 0 23 26 0.00022 0 23 27 0.00037 0
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0 23 33 0.00161 0 23 34 0.00184 0 23 35 0.00207 0 23 36 0.00231 0 23 37
0.00254 0 23 38 0.00277 0 23 39 0.003 0 23 40 0.0058 0 24 25 2.E-5 0 24 26
9.E-5 0 24 27 0.00019 0 24 28 0.00032 0 24 29 0.00047 0 24 30 0.00064 0 24 31
0.00082 0 24 32 0.00101 0 24 33 0.00121 0 24 34 0.00141 0 24 35 0.00162 0 24
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31 0.00056 0 25 32 0.00072 0 25 33 0.00089 0 25 34 0.00106 0 25 35 0.00124 0
25 36 0.00142 0 25 37 0.00161 0 25 38 0.00179 0 25 39 0.00198 0 25 40 0.00435
0 26 27 2.E-5 0 26 28 7.E-5 0 26 29 0.00015 0 26 30 0.00025 0 26 31 0.00036 0
26 32 0.00049 0 26 33 0.00063 0 26 34 0.00078 0 26 35 0.00094 0 26 36 0.0011 0
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0 27 39 0.00126 0 27 40 0.00325 0 28 29 1.E-5 0 28 30 5.E-5 0 28 31 0.00011 0
28 32 0.00019 0 28 33 0.00028 0 28 34 0.00038 0 28 35 0.00049 0 28 36 0.00061
0 28 37 0.00073 0 28 38 0.00086 0 28 39 0.00099 0 28 40 0.00281 0 29 30 1.E-5
0 29 31 5.E-5 0 29 32 1.E-4 0 29 33 0.00017 0 29 34 0.00025 0 29 35 0.00034 0
29 36 0.00044 0 29 37 0.00054 0 29 38 0.00065 0 29 39 0.00077 0 29 40 0.00242
0 30 31 1.E-5 0 30 32 4.E-5 0 30 33 9.E-5 0 30 34 0.00015 0 30 35 0.00022 0 30
36 0.0003 0 30 37 0.00039 0 30 38 0.00048 0 30 39 0.00058 0 30 40 0.00208 0 31
32 1.E-5 0 31 33 4.E-5 0 31 34 8.E-5 0 31 35 0.00013 0 31 36 0.0002 0 31 37
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3.E-5 0 32 35 7.E-5 0 32 36 0.00012 0 32 37 0.00018 0 32 38 0.00024 0 32 39
0.00031 0 32 40 0.00153 0 33 34 1.E-5 0 33 35 3.E-5 0 33 36 6.E-5 0 33 37
0.00011 0 33 38 0.00016 0 33 39 0.00022 0 33 40 0.00131 0 34 35 1.E-5 0 34 36
3.E-5 0 34 37 6.E-5 0 34 38 1.E-4 0 34 39 0.00014 0 34 40 0.00112 0 35 36
1.E-5 0 35 37 2.E-5 0 35 38 5.E-5 0 35 39 9.E-5 0 35 40 0.00095 0 36 37 1.E-5
0 36 38 2.E-5 0 36 39 5.E-5 0 36 40 0.0008 0 37 38 1.E-5 0 37 39 2.E-5 0 37 40
0.00067 0 38 40 0.00056 0 39 40 0.00046 0 ;
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bipdata erase ;
model MPR78A PRA PSAT78 LDEN VDW PR78ABIP;
model MLBCMPR78A LBC LFIT MPR78A;
model MSTRAPP SPTHCOND;
bipdata erase ;
model MLGSTMPR78A LGST MPR78A LGSTBIP;
bipdata erase ;
pd GAS gas MPR78A MPR78A MPR78A MLBCMPR78A MSTRAPP MLGSTMPR78A;
pd LIQUID1 liquid MPR78A MPR78A MPR78A MLBCMPR78A MSTRAPP MLGSTMPR78A;
key LIQUID1 not 007732-18-5;
pd LIQUID2 liquid MPR78A MPR78A MPR78A MLBCMPR78A MSTRAPP MLGSTMPR78A;
key LIQUID2 not 007732-18-5;
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pressure 13789514.586;
amounts 2.02619711679 4.18983272169 298.476026454 29.2558006802б 20.82578648381
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3.44458045778 3.30940993152 2.99643119622 2.54828193466 2.50609784425
2.01485730754 1.97131244002 1.66377681316 1.43199111209 1.179340162
1.05278789077 .95072960752 .85366084034 .69989302691 .63729727985 .67313107708
.59964911314 .53614618134 .49124053671 .46629295636 .41911934988 .36423467311
.35652360282 .29574222524 3.72353976533;
inputunits temperature degF pressure psi enthalpy BTU/lbmol entropy BTU/lbmol/F
volume kg/m3 amounts lbmol viscosity cP thcond BTU/hr/ft/F surten dyne/cm
diffusion cm2/s;
outputunits temperature degF pressure psi enthalpy BTU/lbmol entropy
BTU/lbmol/F volume lbmol/ft3 amounts lbmol viscosity cP thcond BTU/hr/ft/F
surten dyne/cm diffusion cm2/s;
set physprops 1VCS;
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Flash at fixed P and T:

T (degF) = 243.000 P (psi) = 2000.00
NO. PHASES = 2 CONVERGED STABLE

COMPONENT	OVERALL fractions	PHASE1 GAS fractions	PHASE2 LIQUID1 fractions
NITROGEN	4.467009E-03	5.934348E-03	1.304281E-03
CARBON DIOXIDE	9.237018E-03	1.074089E-02	5.995537E-03
METHANE	0.658028	0.817144	0.315068
ETHANE	6.449813E-02	6.831624E-02	5.626851E-02
PROPANE	4.591309E-02	4.121316E-02	5.604342E-02
I-BUTANE	9.534019E-03	7.392565E-03	1.414975E-02
N-BUTANE	2.180204E-02	1.564188E-02	3.507976E-02
I-PENTANE	8.874018E-03	5.249138E-03	1.668715E-02
PENTANE	1.075602E-02	5.963006E-03	2.108697E-02
C6	1.440103E-02	6.065605E-03	3.236735E-02
C7	1.863704E-02	5.828361E-03	4.624508E-02
C8	2.049804E-02	4.833321E-03	5.426205E-02
C9	1.448103E-02	2.382738E-03	4.055790E-02
C10	1.227302E-02	1.407861E-03	3.569199E-02
C11	9.028018E-03	7.199466E-04	2.693538E-02
C12	7.594015E-03	4.209319E-04	2.305500E-02
C13	7.296015E-03	2.814233E-04	2.241539E-02
C14	6.606013E-03	1.776758E-04	2.046176E-02
C15	5.618011E-03	1.056437E-04	1.749946E-02
C16	5.525011E-03	7.284248E-05	1.727671E-02
C17	4.442009E-03	4.116821E-05	1.392766E-02
C18	4.346009E-03	2.839633E-05	1.365227E-02
C19	3.668007E-03	1.617346E-05	1.153923E-02
C20	3.157006E-03	9.381376E-06	9.941452E-03
C21	2.600005E-03	5.196258E-06	8.192902E-03
C22	2.321005E-03	3.113949E-06	7.317027E-03
C23	2.096004E-03	1.885193E-06	6.609705E-03
C24	1.882004E-03	1.189597E-06	5.935943E-03
C25	1.543003E-03	6.868850E-07	4.867338E-03
C26	1.405003E-03	4.415995E-07	4.432419E-03
C27	1.484003E-03	3.299870E-07	4.681938E-03
C28	1.322003E-03	2.084055E-07	4.171021E-03
C29	1.182002E-03	1.324536E-07	3.729425E-03
C30	1.083002E-03	8.644695E-08	3.417138E-03
C31	1.028002E-03	5.860776E-08	3.243649E-03
C32	9.240018E-04	3.770078E-08	2.915530E-03
C33	8.030016E-04	2.351175E-08	2.533755E-03
C34	7.860016E-04	1.654179E-08	2.480127E-03
C35	6.520013E-04	9.898878E-09	2.057315E-03
C36	8.209016E-03	6.309185E-09	2.590286E-02
Total(lbmol)	0.999998	0.683083	0.316915
Z (Fug. Model)	0.812249	0.878576	0.669285
Av.Mol.Wt.	50.1572	22.1869	110.445
Den/V(lbmol/ft)	0.326534	0.301883	0.396284
H (BTU/lbmol)	-1238.63	832.050	-5701.80
S (BTU/lbmol)	-5.16390	-6.22033	-2.88686
U (BTU/lbmol)	-2372.04	-393.921	-6635.72
G (BTU/lbmol)	2389.89	5202.89	-3673.29
Visc.(cP)		1.729471E-02	0.519263
Th.C.(BTU/hr/f)		3.289809E-02	9.185240E-02
STen (dyne/cm)			
GAS		N/A	9.69086
LIQUID1		9.69086	N/A

Flash at fixed P and T:

T (degF) = 243.000 P (psi) = 6000.00
NO. PHASES = 2 CONVERGED STABLE

COMPONENT	OVERALL fractions	PHASE1 LIQUID1 fractions	PHASE2 LIQUID2 fractions
NITROGEN	4.467009E-03	4.061621E-03	4.909542E-03
CARBON DIOXIDE	9.237018E-03	9.017269E-03	9.476903E-03
METHANE	0.658028	0.618456	0.701226
ETHANE	6.449813E-02	6.428106E-02	6.473508E-02
PROPANE	4.591309E-02	4.695814E-02	4.477229E-02
I-BUTANE	9.534019E-03	9.880287E-03	9.156023E-03
N-BUTANE	2.180204E-02	2.285142E-02	2.065651E-02
I-PENTANE	8.874018E-03	9.427592E-03	8.269721E-03
PENTANE	1.075602E-02	1.149530E-02	9.949009E-03
C6	1.440103E-02	1.565245E-02	1.303494E-02
C7	1.863704E-02	2.038613E-02	1.672768E-02
C8	2.049804E-02	2.276081E-02	1.802794E-02
C9	1.448103E-02	1.635605E-02	1.243421E-02
C10	1.227302E-02	1.408010E-02	1.030037E-02
C11	9.028018E-03	1.050994E-02	7.410306E-03
C12	7.594015E-03	8.963321E-03	6.099242E-03
C13	7.296015E-03	8.724981E-03	5.736115E-03
C14	6.606013E-03	7.999105E-03	5.085275E-03
C15	5.618011E-03	6.884492E-03	4.235485E-03
C16	5.525011E-03	6.848790E-03	4.079937E-03
C17	4.442009E-03	5.567848E-03	3.213011E-03
C18	4.346009E-03	5.506445E-03	3.079243E-03
C19	3.668007E-03	4.747063E-03	2.490080E-03
C20	3.157006E-03	4.172915E-03	2.048011E-03
C21	2.600005E-03	3.509819E-03	1.606827E-03
C22	2.321005E-03	3.199204E-03	1.362337E-03
C23	2.096004E-03	2.948882E-03	1.164978E-03
C24	1.882004E-03	2.677930E-03	1.013148E-03
C25	1.543003E-03	2.219762E-03	8.042334E-04
C26	1.405003E-03	2.042783E-03	7.087835E-04
C27	1.484003E-03	2.179900E-03	7.243423E-04
C28	1.322003E-03	1.961312E-03	6.241142E-04
C29	1.182002E-03	1.770500E-03	5.395818E-04
C30	1.083002E-03	1.637312E-03	4.779018E-04
C31	1.028002E-03	1.568107E-03	4.384077E-04
C32	9.240018E-04	1.421692E-03	3.807091E-04
C33	8.030016E-04	1.245829E-03	3.195990E-04
C34	7.860016E-04	1.229283E-03	3.021025E-04
C35	6.520013E-04	1.027594E-03	2.419939E-04
C36	8.209016E-03	1.377079E-02	2.137630E-03
Total(lbmol)	0.999998	0.521903	0.478095
Z (Fug. Model)	1.22977	1.31730	1.13421
Av.Mol.Wt.	50.1572	59.7952	39.6362
Den/V(lbmol/ft)	0.647018	0.604023	0.701529
H (BTU/lbmol)	-1366.87	-1835.19	-855.635
S (BTU/lbmol)	-7.42427	-6.88953	-8.00801
U (BTU/lbmol)	-3082.89	-3673.36	-2438.32
G (BTU/lbmol)	3849.95	3005.88	4771.35
Visc.(cP)		0.168597	7.577873E-02
Th.C.(BTU/hr/f)		8.865779E-02	7.196474E-02
STen (dyne/cm)			
LIQUID1		N/A	0.158755
LIQUID2		0.158755	N/A

Flash at fixed P and T:

T (degF) = 243.000 P (psi) = 10000.0
NO. PHASES = 1 CONVERGED STABLE

COMPONENT	OVERALL fractions	PHASE1 LIQUID1 fractions
NITROGEN	4.467009E-03	4.467009E-03
CARBON DIOXIDE	9.237018E-03	9.237018E-03
METHANE	0.658028	0.658028
ETHANE	6.449813E-02	6.449813E-02
PROPANE	4.591309E-02	4.591309E-02
I-BUTANE	9.534019E-03	9.534019E-03

N-BUTANE	2.180204E-02	2.180204E-02
I-PENTANE	8.874018E-03	8.874018E-03
PENTANE	1.075602E-02	1.075602E-02
C6	1.440103E-02	1.440103E-02
C7	1.863704E-02	1.863704E-02
C8	2.049804E-02	2.049804E-02
C9	1.448103E-02	1.448103E-02
C10	1.227302E-02	1.227302E-02
C11	9.028018E-03	9.028018E-03
C12	7.594015E-03	7.594015E-03
C13	7.296015E-03	7.296015E-03
C14	6.606013E-03	6.606013E-03
C15	5.618011E-03	5.618011E-03
C16	5.525011E-03	5.525011E-03
C17	4.442009E-03	4.442009E-03
C18	4.346009E-03	4.346009E-03
C19	3.668007E-03	3.668007E-03
C20	3.157006E-03	3.157006E-03
C21	2.600005E-03	2.600005E-03
C22	2.321005E-03	2.321005E-03
C23	2.096004E-03	2.096004E-03
C24	1.882004E-03	1.882004E-03
C25	1.543003E-03	1.543003E-03
C26	1.405003E-03	1.405003E-03
C27	1.484003E-03	1.484003E-03
C28	1.322003E-03	1.322003E-03
C29	1.182002E-03	1.182002E-03
C30	1.083002E-03	1.083002E-03
C31	1.028002E-03	1.028002E-03
C32	9.240018E-04	9.240018E-04
C33	8.030016E-04	8.030016E-04
C34	7.860016E-04	7.860016E-04
C35	6.520013E-04	6.520013E-04
C36	8.209016E-03	8.209016E-03
Total(lbmol)	0.999998	0.999998
Z (Fug. Model)	1.85419	1.85419
Av.Mol.Wt.	50.1572	50.1572
Den/V(lbmol/ft)	0.715208	0.715208
H (BTU/lbmol)	-887.788	-887.788
S (BTU/lbmol)	-8.27933	-8.27933
U (BTU/lbmol)	-3475.14	-3475.14
G (BTU/lbmol)	4929.85	4929.85
Visc.(cP)		0.189135
Th.C.(BTU/hr/f)		0.100838
STen (dyne/cm)		
LIQUID1		N/A

Flash at fixed P and T:

T (degF) = 243.000 P (psi) = 7000.00
NO. PHASES = 1 CONVERGED STABLE

COMPONENT	OVERALL fractions	PHASE1 LIQUID1 fractions
NITROGEN	4.467009E-03	4.467009E-03
CARBON DIOXIDE	9.237018E-03	9.237018E-03
METHANE	0.658028	0.658028
ETHANE	6.449813E-02	6.449813E-02
PROPANE	4.591309E-02	4.591309E-02
I-BUTANE	9.534019E-03	9.534019E-03
N-BUTANE	2.180204E-02	2.180204E-02
I-PENTANE	8.874018E-03	8.874018E-03
PENTANE	1.075602E-02	1.075602E-02
C6	1.440103E-02	1.440103E-02
C7	1.863704E-02	1.863704E-02
C8	2.049804E-02	2.049804E-02
C9	1.448103E-02	1.448103E-02
C10	1.227302E-02	1.227302E-02
C11	9.028018E-03	9.028018E-03
C12	7.594015E-03	7.594015E-03
C13	7.296015E-03	7.296015E-03
C14	6.606013E-03	6.606013E-03
C15	5.618011E-03	5.618011E-03
C16	5.525011E-03	5.525011E-03
C17	4.442009E-03	4.442009E-03
C18	4.346009E-03	4.346009E-03

C19	3.668007E-03	3.668007E-03
C20	3.157006E-03	3.157006E-03
C21	2.600005E-03	2.600005E-03
C22	2.321005E-03	2.321005E-03
C23	2.096004E-03	2.096004E-03
C24	1.882004E-03	1.882004E-03
C25	1.543003E-03	1.543003E-03
C26	1.405003E-03	1.405003E-03
C27	1.484003E-03	1.484003E-03
C28	1.322003E-03	1.322003E-03
C29	1.182002E-03	1.182002E-03
C30	1.083002E-03	1.083002E-03
C31	1.028002E-03	1.028002E-03
C32	9.240018E-04	9.240018E-04
C33	8.030016E-04	8.030016E-04
C34	7.860016E-04	7.860016E-04
C35	6.520013E-04	6.520013E-04
C36	8.209016E-03	8.209016E-03
Total(lbmol)	0.999998	0.999998
Z (Fug. Model)	1.38389	1.38389
Av.Mol.Wt.	50.1572	50.1572
Den/V(lbmol/ft)	0.670786	0.670786
H (BTU/lbmol)	-1268.61	-1268.61
S (BTU/lbmol)	-7.68339	-7.68339
U (BTU/lbmol)	-3199.70	-3199.70
G (BTU/lbmol)	4130.27	4130.27
Visc.(cP)		0.133871
Th.C.(BTU/hr/f)		9.126883E-02
STen (dyne/cm)		
LIQUID1		N/A

Flash at fixed P and T:

T (degF) = 243.000 P (psi) = 6550.00

NO. PHASES = 1 CONVERGED STABLE

COMPONENT	OVERALL fractions	PHASE1 LIQUID1 fractions
NITROGEN	4.467009E-03	4.467009E-03
CARBON DIOXIDE	9.237018E-03	9.237018E-03
METHANE	0.658028	0.658028
ETHANE	6.449813E-02	6.449813E-02
PROPANE	4.591309E-02	4.591309E-02
I-BUTANE	9.534019E-03	9.534019E-03
N-BUTANE	2.180204E-02	2.180204E-02
I-PENTANE	8.874018E-03	8.874018E-03
PENTANE	1.075602E-02	1.075602E-02
C6	1.440103E-02	1.440103E-02
C7	1.863704E-02	1.863704E-02
C8	2.049804E-02	2.049804E-02
C9	1.448103E-02	1.448103E-02
C10	1.227302E-02	1.227302E-02
C11	9.028018E-03	9.028018E-03
C12	7.594015E-03	7.594015E-03
C13	7.296015E-03	7.296015E-03
C14	6.606013E-03	6.606013E-03
C15	5.618011E-03	5.618011E-03
C16	5.525011E-03	5.525011E-03
C17	4.442009E-03	4.442009E-03
C18	4.346009E-03	4.346009E-03
C19	3.668007E-03	3.668007E-03
C20	3.157006E-03	3.157006E-03
C21	2.600005E-03	2.600005E-03
C22	2.321005E-03	2.321005E-03
C23	2.096004E-03	2.096004E-03
C24	1.882004E-03	1.882004E-03
C25	1.543003E-03	1.543003E-03
C26	1.405003E-03	1.405003E-03
C27	1.484003E-03	1.484003E-03
C28	1.322003E-03	1.322003E-03
C29	1.182002E-03	1.182002E-03
C30	1.083002E-03	1.083002E-03
C31	1.028002E-03	1.028002E-03
C32	9.240018E-04	9.240018E-04
C33	8.030016E-04	8.030016E-04
C34	7.860016E-04	7.860016E-04

C35	6.520013E-04	6.520013E-04
C36	8.209016E-03	8.209016E-03
Total(lbmol)	0.999998	0.999998
Z (Fug. Model)	1.31169	1.31169
Av.Mol.Wt.	50.1572	50.1572
Den/V(lbmol/ft)	0.662215	0.662215
H (BTU/lbmol)	-1315.71	-1315.71
S (BTU/lbmol)	-7.57262	-7.57262
U (BTU/lbmol)	-3146.05	-3146.05
G (BTU/lbmol)	4005.34	4005.34
Visc.(cP)		0.126090
Th.C.(BTU/hr/f)		8.968998E-02
STen (dyne/cm)		
LIQUID1		N/A

Flash at fixed P and T:

T (degF) = 243.000 P (psi) = 6504.00
NO. PHASES = 2 CONVERGED MARGINALLY STABLE

COMPONENT	OVERALL	PHASE1	PHASE2
		LIQUID1	LIQUID2
	fractions	fractions	fractions
NITROGEN	4.467009E-03	4.386383E-03	4.498996E-03
CARBON DIOXIDE	9.237018E-03	9.193539E-03	9.254268E-03
METHANE	0.658028	0.649718	0.661325
ETHANE	6.449813E-02	6.444848E-02	6.451783E-02
PROPANE	4.591309E-02	4.610941E-02	4.583521E-02
I-BUTANE	9.534019E-03	9.598618E-03	9.508391E-03
N-BUTANE	2.180204E-02	2.200233E-02	2.172258E-02
I-PENTANE	8.874018E-03	8.979198E-03	8.832290E-03
PENTANE	1.075602E-02	1.089719E-02	1.070002E-02
C6	1.440103E-02	1.463965E-02	1.430636E-02
C7	1.863704E-02	1.895125E-02	1.851238E-02
C8	2.049804E-02	2.091046E-02	2.033442E-02
C9	1.448103E-02	1.482719E-02	1.434370E-02
C10	1.227302E-02	1.260997E-02	1.213935E-02
C11	9.028018E-03	9.306640E-03	8.917481E-03
C12	7.594015E-03	7.853345E-03	7.491132E-03
C13	7.296015E-03	7.568438E-03	7.187937E-03
C14	6.606013E-03	6.873250E-03	6.499993E-03
C15	5.618011E-03	5.862392E-03	5.521058E-03
C16	5.525011E-03	5.781911E-03	5.423091E-03
C17	4.442009E-03	4.661730E-03	4.354839E-03
C18	4.346009E-03	4.573748E-03	4.255658E-03
C19	3.668007E-03	3.884288E-03	3.582203E-03
C20	3.157006E-03	3.364867E-03	3.074542E-03
C21	2.600005E-03	2.790030E-03	2.524617E-03
C22	2.321005E-03	2.508270E-03	2.246711E-03
C23	2.096004E-03	2.281731E-03	2.022321E-03
C24	1.882004E-03	2.056982E-03	1.812585E-03
C25	1.543003E-03	1.693223E-03	1.483407E-03
C26	1.405003E-03	1.547956E-03	1.348289E-03
C27	1.484003E-03	1.641528E-03	1.421509E-03
C28	1.322003E-03	1.468170E-03	1.264014E-03
C29	1.182002E-03	1.317915E-03	1.128082E-03
C30	1.083002E-03	1.212330E-03	1.031694E-03
C31	1.028002E-03	1.155318E-03	9.774922E-04
C32	9.240018E-04	1.042546E-03	8.769721E-04
C33	8.030016E-04	9.095867E-04	7.607163E-04
C34	7.860016E-04	8.938283E-04	7.432237E-04
C35	6.520013E-04	7.443351E-04	6.153699E-04
C36	8.209016E-03	9.734368E-03	7.603867E-03
Total(lbmol)	0.999998	0.284040	0.715958
Z (Fug. Model)	1.30439	1.32796	1.29504
Av.Mol.Wt.	50.1572	52.3757	49.2771
Den/V(lbmol/ft)	0.661243	0.649505	0.666018
H (BTU/lbmol)	-1320.32	-1419.97	-1280.78
S (BTU/lbmol)	-7.56087	-7.43889	-7.60926
U (BTU/lbmol)	-3140.47	-3273.01	-3087.88
G (BTU/lbmol)	3992.48	3807.12	4066.01
Visc.(cP)		0.136157	0.121173
Th.C.(BTU/hr/f)		9.406178E-02	8.831332E-02
STen (dyne/cm)			
LIQUID1		N/A	4.894666E-04

LIQUID2	4.894666E-04	N/A

Flash at fixed P and T:

T (degF) = 243.000 P (psi) = 5000.00
NO. PHASES = 2 CONVERGED STABLE

COMPONENT	OVERALL fractions	PHASE1 GAS fractions	PHASE2 LIQUID1 fractions
NITROGEN	4.467009E-03	5.553682E-03	3.541366E-03
CARBON DIOXIDE	9.237018E-03	9.835630E-03	8.727113E-03
METHANE	0.658028	0.755219	0.575240
ETHANE	6.449813E-02	6.481259E-02	6.423026E-02
PROPANE	4.591309E-02	4.263233E-02	4.870769E-02
I-BUTANE	9.534019E-03	8.440346E-03	1.046562E-02
N-BUTANE	2.180204E-02	1.864135E-02	2.449436E-02
I-PENTANE	8.874018E-03	7.198631E-03	1.030113E-02
PENTANE	1.075602E-02	8.543749E-03	1.264046E-02
C6	1.440103E-02	1.067376E-02	1.757597E-02
C7	1.863704E-02	1.307460E-02	2.337520E-02
C8	2.049804E-02	1.348248E-02	2.647399E-02
C9	1.448103E-02	8.811415E-03	1.931048E-02
C10	1.227302E-02	6.924620E-03	1.682887E-02
C11	9.028018E-03	4.727023E-03	1.269166E-02
C12	7.594015E-03	3.692498E-03	1.091738E-02
C13	7.296015E-03	3.296083E-03	1.070321E-02
C14	6.606013E-03	2.773556E-03	9.870552E-03
C15	5.618011E-03	2.192686E-03	8.535749E-03
C16	5.525011E-03	2.004700E-03	8.523660E-03
C17	4.442009E-03	1.498153E-03	6.949625E-03
C18	4.346009E-03	1.362320E-03	6.887555E-03
C19	3.668007E-03	1.015879E-03	5.927126E-03
C20	3.157006E-03	7.678734E-04	5.192102E-03
C21	2.600005E-03	5.516402E-04	4.344830E-03
C22	2.321005E-03	4.268098E-04	3.934505E-03
C23	2.096004E-03	3.320628E-04	3.598553E-03
C24	1.882004E-03	2.702934E-04	3.254880E-03
C25	1.543003E-03	2.007867E-04	2.686321E-03
C26	1.405003E-03	1.655925E-04	2.460749E-03
C27	1.484003E-03	1.583489E-04	2.613213E-03
C28	1.322003E-03	1.276658E-04	2.339355E-03
C29	1.182002E-03	1.032917E-04	2.100863E-03
C30	1.083002E-03	8.561923E-05	1.932586E-03
C31	1.028002E-03	7.352674E-05	1.841037E-03
C32	9.240018E-04	5.977753E-05	1.660160E-03
C33	8.030016E-04	4.699793E-05	1.446976E-03
C34	7.860016E-04	4.161038E-05	1.420084E-03
C35	6.520013E-04	3.123805E-05	1.180776E-03
C36	8.209016E-03	1.500449E-04	1.507376E-02
Total(lbmol)	0.999998	0.459988	0.540010
Z (Fug. Model)	1.09230	0.978719	1.18904
Av.Mol.Wt.	50.1572	30.2801	67.0889
Den/V(lbmol/ft)	0.607040	0.677485	0.557647
H (BTU/lbmol)	-1433.27	-316.712	-2384.37
S (BTU/lbmol)	-7.09968	-8.19614	-6.16571
U (BTU/lbmol)	-2957.47	-1682.42	-4043.57
G (BTU/lbmol)	3555.46	5442.47	1948.09
Visc.(cP)		4.322665E-02	0.199243
Th.C.(BTU/hr/f)		5.429058E-02	9.068614E-02
STen (dyne/cm)			
GAS		N/A	1.22186
LIQUID1		1.22186	N/A

Flash at fixed P and T:

T (degF) = 243.000 P (psi) = 4000.00
NO. PHASES = 2 CONVERGED STABLE

COMPONENT	OVERALL fractions	PHASE1 GAS fractions	PHASE2 LIQUID1 fractions
NITROGEN	4.467009E-03	5.931997E-03	2.844350E-03
CARBON DIOXIDE	9.237018E-03	1.014644E-02	8.229722E-03
METHANE	0.658028	0.789633	0.512260
ETHANE	6.449813E-02	6.507151E-02	6.386304E-02
PROPANE	4.591309E-02	4.095992E-02	5.139936E-02

I-BUTANE	9.534019E-03	7.823680E-03	1.142843E-02
N-BUTANE	2.180204E-02	1.696904E-02	2.715520E-02
I-PENTANE	8.874018E-03	6.276635E-03	1.175095E-02
PENTANE	1.075602E-02	7.344573E-03	1.453463E-02
C6	1.440103E-02	8.652692E-03	2.076804E-02
C7	1.863704E-02	9.916388E-03	2.829625E-02
C8	2.049804E-02	9.659010E-03	3.250363E-02
C9	1.448103E-02	5.873021E-03	2.401548E-02
C10	1.227302E-02	4.292707E-03	2.111223E-02
C11	9.028018E-03	2.722659E-03	1.601200E-02
C12	7.594015E-03	1.974758E-03	1.381805E-02
C13	7.296015E-03	1.636035E-03	1.356515E-02
C14	6.606013E-03	1.277413E-03	1.250811E-02
C15	5.618011E-03	9.370378E-04	1.080278E-02
C16	5.525011E-03	7.949668E-04	1.076413E-02
C17	4.442009E-03	5.513468E-04	8.751406E-03
C18	4.346009E-03	4.654057E-04	8.644265E-03
C19	3.668007E-03	3.182099E-04	7.378329E-03
C20	3.157006E-03	2.204800E-04	6.409579E-03
C21	2.600005E-03	1.451566E-04	5.319059E-03
C22	2.321005E-03	1.029231E-04	4.777809E-03
C23	2.096004E-03	7.340056E-05	4.336292E-03
C24	1.882004E-03	5.541179E-05	3.905184E-03
C25	1.543003E-03	3.819987E-05	3.209762E-03
C26	1.405003E-03	2.925775E-05	2.928813E-03
C27	1.484003E-03	2.599883E-05	3.098926E-03
C28	1.322003E-03	1.949077E-05	2.764698E-03
C29	1.182002E-03	1.467430E-05	2.474965E-03
C30	1.083002E-03	1.132582E-05	2.270019E-03
C31	1.028002E-03	9.062993E-06	2.156605E-03
C32	9.240018E-04	6.869829E-06	1.939841E-03
C33	8.030016E-04	5.039459E-06	1.686845E-03
C34	7.860016E-04	4.164940E-06	1.651984E-03
C35	6.520013E-04	2.921382E-06	1.370939E-03
C36	8.209016E-03	7.583770E-06	1.729313E-02
Total(lbmol)	0.999998	0.525531	0.474467
Z (Fug. Model)	0.973854	0.908464	1.04628
Av.Mol.Wt.	50.1572	25.7004	77.2463
Den/V(lbmol/ft)	0.544696	0.583902	0.506990
H (BTU/lbmol)	-1451.56	82.8219	-3151.08
S (BTU/lbmol)	-6.66964	-7.93577	-5.26725
U (BTU/lbmol)	-2810.48	-1184.85	-4611.07
G (BTU/lbmol)	3235.00	5659.05	550.059
Visc.(cP)		2.999299E-02	0.254318
Th.C.(BTU/hr/f)		4.477142E-02	9.247518E-02
STen (dyne/cm)			
GAS		N/A	3.21752
LIQUID1		3.21752	N/A

Flash at fixed P and T:

T (degF) = 243.000 P (psi) = 3000.00
NO. PHASES = 2 CONVERGED STABLE

COMPONENT	OVERALL	PHASE1	PHASE2
		GAS	LIQUID1
	fractions	fractions	fractions
NITROGEN	4.467009E-03	6.031418E-03	2.070701E-03
CARBON DIOXIDE	9.237018E-03	1.044131E-02	7.392321E-03
METHANE	0.658028	0.809084	0.426646
ETHANE	6.449813E-02	6.610352E-02	6.203905E-02
PROPANE	4.591309E-02	4.033551E-02	5.445664E-02
I-BUTANE	9.534019E-03	7.442646E-03	1.273751E-02
N-BUTANE	2.180204E-02	1.590840E-02	3.082972E-02
I-PENTANE	8.874018E-03	5.611555E-03	1.387135E-02
PENTANE	1.075602E-02	6.470995E-03	1.731968E-02
C6	1.440103E-02	7.119841E-03	2.555410E-02
C7	1.863704E-02	7.532960E-03	3.564588E-02
C8	2.049804E-02	6.832879E-03	4.142987E-02
C9	1.448103E-02	3.788519E-03	3.085945E-02
C10	1.227302E-02	2.521638E-03	2.720986E-02
C11	9.028018E-03	1.454175E-03	2.062937E-02
C12	7.594015E-03	9.584144E-04	1.775820E-02
C13	7.296015E-03	7.215149E-04	1.736661E-02
C14	6.606013E-03	5.121418E-04	1.594040E-02
C15	5.618011E-03	3.417805E-04	1.369996E-02
C16	5.525011E-03	2.640430E-04	1.358358E-02

C17	4.442009E-03	1.669229E-04	1.099044E-02
C18	4.346009E-03	1.285783E-04	1.080612E-02
C19	3.668007E-03	8.051590E-05	9.163204E-03
C20	3.157006E-03	5.119550E-05	7.914381E-03
C21	2.600005E-03	3.099170E-05	6.535132E-03
C22	2.321005E-03	2.024286E-05	5.845233E-03
C23	2.096004E-03	1.332275E-05	5.286184E-03
C24	1.882004E-03	9.257997E-06	4.750612E-03
C25	1.543003E-03	5.880343E-06	3.897515E-03
C26	1.405003E-03	4.153725E-06	3.550775E-03
C27	1.484003E-03	3.406940E-06	3.751929E-03
C28	1.322003E-03	2.359437E-06	3.343387E-03
C29	1.182002E-03	1.642493E-06	2.990037E-03
C30	1.083002E-03	1.173046E-06	2.740111E-03
C31	1.028002E-03	8.693347E-07	2.601329E-03
C32	9.240018E-04	6.107209E-07	2.338421E-03
C33	8.030016E-04	4.155377E-07	2.032375E-03
C34	7.860016E-04	3.187207E-07	1.989484E-03
C35	6.520013E-04	2.076792E-07	1.650396E-03
C36	8.209016E-03	2.794209E-07	2.078288E-02
Total(lbmol)	0.999998	0.605018	0.394980
Z (Fug. Model)	0.877911	0.877593	0.878399
Av.Mol.Wt.	50.1572	23.3549	91.2121
Den/V(lbmol/ft)	0.453167	0.453331	0.452916
H (BTU/lbmol)	-1398.16	441.859	-4216.63
S (BTU/lbmol)	-6.06721	-7.29960	-4.17949
U (BTU/lbmol)	-2623.20	-782.740	-5442.36
G (BTU/lbmol)	2865.09	5571.07	-1279.83
Visc.(cP)		2.222124E-02	0.350477
Th.C.(BTU/hr/f)		3.831014E-02	9.321718E-02
STen (dyne/cm)			
GAS		N/A	6.01715
LIQUID1		6.01715	N/A

Flash at fixed P and T:

T (degF) = 243.000 P (psi) = 1000.00
NO. PHASES = 2 CONVERGED STABLE

COMPONENT	OVERALL	PHASE1 GAS	PHASE2 LIQUID1
	fractions	fractions	fractions
NITROGEN	4.467009E-03	5.676511E-03	5.990595E-04
CARBON DIOXIDE	9.237018E-03	1.097882E-02	3.666777E-03
METHANE	0.658028	0.809893	0.172369
ETHANE	6.449813E-02	7.207241E-02	4.027583E-02
PROPANE	4.591309E-02	4.502068E-02	4.876701E-02
I-BUTANE	9.534019E-03	8.120576E-03	1.405416E-02
N-BUTANE	2.180204E-02	1.727221E-02	3.628830E-02
I-PENTANE	8.874018E-03	5.661744E-03	1.914677E-02
PENTANE	1.075602E-02	6.381453E-03	2.474575E-02
C6	1.440103E-02	6.104077E-03	4.093441E-02
C7	1.863704E-02	5.338172E-03	6.116638E-02
C8	2.049804E-02	4.013794E-03	7.321413E-02
C9	1.448103E-02	1.728837E-03	5.526213E-02
C10	1.227302E-02	8.881763E-04	4.868140E-02
C11	9.028018E-03	3.940345E-04	3.663922E-02
C12	7.594015E-03	1.999117E-04	3.124012E-02
C13	7.296015E-03	1.161267E-04	3.025706E-02
C14	6.606013E-03	6.381356E-05	2.752776E-02
C15	5.618011E-03	3.308606E-05	2.347842E-02
C16	5.525011E-03	1.993022E-05	2.313008E-02
C17	4.442009E-03	9.857799E-06	1.861589E-02
C18	4.346009E-03	5.960960E-06	1.822534E-02
C19	3.668007E-03	3.046255E-06	1.538843E-02
C20	3.157006E-03	1.590888E-06	1.324792E-02
C21	2.600005E-03	7.962702E-07	1.091219E-02
C22	2.321005E-03	4.326629E-07	9.742119E-03
C23	2.096004E-03	2.382803E-07	8.798196E-03
C24	1.882004E-03	1.341298E-07	7.900162E-03
C25	1.543003E-03	6.918266E-08	6.477256E-03
C26	1.405003E-03	3.979001E-08	5.898029E-03
C27	1.484003E-03	2.663406E-08	6.229712E-03
C28	1.322003E-03	1.508680E-08	5.549676E-03
C29	1.182002E-03	8.612770E-09	4.961980E-03
C30	1.083002E-03	5.055581E-09	4.546392E-03
C31	1.028002E-03	3.086898E-09	4.315510E-03

C32	9.240018E-04	1.790660E-09	3.878924E-03
C33	8.030016E-04	1.008319E-09	3.370972E-03
C34	7.860016E-04	6.412179E-10	3.299607E-03
C35	6.520013E-04	3.473632E-10	2.737079E-03
C36	8.209016E-03	9.371092E-11	3.446119E-02
Total(lbmol)	0.999998	0.761788	0.238210
Z (Fug. Model)	0.791085	0.914213	0.397324
Av.Mol.Wt.	50.1572	22.0824	139.940
Den/V(lbmol/ft)	0.167635	0.145058	0.333766
H (BTU/lbmol)	-902.943	1300.83	-7950.53
S (BTU/lbmol)	-3.59064	-4.30327	-1.31165
U (BTU/lbmol)	-2006.83	25.1275	-8504.95
G (BTU/lbmol)	1620.09	4324.61	-7028.87
Visc.(cP)		1.451906E-02	0.852742
Th.C.(BTU/hr/f)		2.768331E-02	8.752042E-02
STen (dyne/cm)			
GAS		N/A	14.4348
LIQUID1		14.4348	N/A

Flash at fixed P and T:

T (degF) = 100.000 P (psi) = 1000.00
NO. PHASES = 2 CONVERGED STABLE

COMPONENT	OVERALL fractions	PHASE1 GAS fractions	PHASE2 LIQUID1 fractions
NITROGEN	4.467009E-03	6.337796E-03	6.754768E-04
CARBON DIOXIDE	9.237018E-03	1.079286E-02	6.083785E-03
METHANE	0.658028	0.871235	0.225922
ETHANE	6.449813E-02	6.333970E-02	6.684592E-02
PROPANE	4.591309E-02	2.974945E-02	7.867201E-02
I-BUTANE	9.534019E-03	4.162622E-03	2.042025E-02
N-BUTANE	2.180204E-02	7.740781E-03	5.030007E-02
I-PENTANE	8.874018E-03	1.866102E-03	2.307699E-02
PENTANE	1.075602E-02	1.881465E-03	2.874212E-02
C6	1.440103E-02	1.312273E-03	4.092807E-02
C7	1.863704E-02	8.318655E-04	5.472286E-02
C8	2.049804E-02	4.881172E-04	6.105224E-02
C9	1.448103E-02	1.594891E-04	4.350656E-02
C10	1.227302E-02	6.380933E-05	3.701749E-02
C11	9.028018E-03	2.234461E-05	2.727986E-02
C12	7.594015E-03	9.019124E-06	2.296656E-02
C13	7.296015E-03	4.185689E-06	2.207440E-02
C14	6.606013E-03	1.841294E-06	1.999072E-02
C15	5.618011E-03	7.648028E-07	1.700251E-02
C16	5.525011E-03	3.690258E-07	1.672183E-02
C17	4.442009E-03	1.461051E-07	1.344435E-02
C18	4.346009E-03	7.066211E-08	1.315394E-02
C19	3.668007E-03	2.994884E-08	1.110191E-02
C20	3.157006E-03	1.300607E-08	9.555298E-03
C21	2.600005E-03	5.425400E-09	7.869436E-03
C22	2.321005E-03	2.462745E-09	7.024990E-03
C23	2.096004E-03	1.135976E-09	6.343983E-03
C24	1.882004E-03	5.220400E-10	5.696268E-03
C25	1.543003E-03	2.199485E-10	4.670214E-03
C26	1.405003E-03	1.034195E-10	4.252528E-03
C27	1.484003E-03	5.663262E-11	4.491638E-03
C28	1.322003E-03	2.626494E-11	4.001311E-03
C29	1.182002E-03	1.228984E-11	3.577572E-03
C30	1.083002E-03	5.918769E-12	3.277927E-03
C31	1.028002E-03	2.968602E-12	3.111458E-03
C32	9.240018E-04	1.415970E-12	2.796680E-03
C33	8.030016E-04	6.565474E-13	2.430448E-03
C34	7.860016E-04	3.440506E-13	2.378994E-03
C35	6.520013E-04	1.539194E-13	1.973415E-03
C36	8.209016E-03	1.050609E-14	2.484627E-02
Total(lbmol)	0.999998	0.669606	0.330392
Z (Fug. Model)	0.699482	0.848489	0.397490
Av.Mol.Wt.	50.1572	19.0877	113.126
Den/V(lbmol/ft)	0.238029	0.196228	0.418872
H (BTU/lbmol)	-5149.25	-448.996	-14675.3
S (BTU/lbmol)	-10.3332	-7.71324	-15.6431
U (BTU/lbmol)	-5926.68	-1392.03	-15117.1
G (BTU/lbmol)	633.935	3867.87	-5920.30

Visc.(cP)		1.292996E-02	1.14545
Th.C.(BTU/hr/f)		2.461917E-02	0.101997
STen (dyne/cm)			
GAS		N/A	17.1022
LIQUID1		17.1022	N/A

Flash at fixed P and T:

T (degF) = 100.000 P (psi) = 2000.00
NO. PHASES = 2 CONVERGED STABLE

COMPONENT	OVERALL	PHASE1 GAS	PHASE2 LIQUID1
	fractions	fractions	fractions
NITROGEN	4.467009E-03	6.735237E-03	1.544549E-03
CARBON DIOXIDE	9.237018E-03	1.005812E-02	8.179078E-03
METHANE	0.658028	0.870171	0.384697
ETHANE	6.449813E-02	5.831198E-02	7.246857E-02
PROPANE	4.591309E-02	2.896030E-02	6.775562E-02
I-BUTANE	9.534019E-03	4.574317E-03	1.592426E-02
N-BUTANE	2.180204E-02	8.889098E-03	3.843951E-02
I-PENTANE	8.874018E-03	2.582873E-03	1.697974E-02
PENTANE	1.075602E-02	2.751245E-03	2.106964E-02
C6	1.440103E-02	2.418935E-03	2.983915E-02
C7	1.863704E-02	1.952929E-03	4.013339E-02
C8	2.049804E-02	1.408033E-03	4.509424E-02
C9	1.448103E-02	5.926842E-04	3.237523E-02
C10	1.227302E-02	3.024937E-04	2.769625E-02
C11	9.028018E-03	1.344115E-04	2.048683E-02
C12	7.594015E-03	6.851290E-05	1.729012E-02
C13	7.296015E-03	3.998288E-05	1.664493E-02
C14	6.606013E-03	2.202885E-05	1.508904E-02
C15	5.618011E-03	1.141667E-05	1.284173E-02
C16	5.525011E-03	6.847385E-06	1.263480E-02
C17	4.442009E-03	3.357622E-06	1.016091E-02
C18	4.346009E-03	2.003735E-06	9.942968E-03
C19	3.668007E-03	1.057760E-06	8.392626E-03
C20	3.157006E-03	5.709721E-07	7.223862E-03
C21	2.600005E-03	2.952481E-07	5.949557E-03
C22	2.321005E-03	1.657401E-07	5.311250E-03
C23	2.096004E-03	9.432527E-08	4.796444E-03
C24	1.882004E-03	5.324913E-08	4.306771E-03
C25	1.543003E-03	2.749899E-08	3.531024E-03
C26	1.405003E-03	1.580960E-08	3.215234E-03
C27	1.484003E-03	1.056268E-08	3.396028E-03
C28	1.322003E-03	5.963975E-09	3.025307E-03
C29	1.182002E-03	3.388944E-09	2.704929E-03
C30	1.083002E-03	1.977643E-09	2.478375E-03
C31	1.028002E-03	1.199047E-09	2.352512E-03
C32	9.240018E-04	6.898246E-10	2.114515E-03
C33	8.030016E-04	3.849243E-10	1.837615E-03
C34	7.860016E-04	2.423036E-10	1.798712E-03
C35	6.520013E-04	1.298582E-10	1.492061E-03
C36	8.209016E-03	3.889537E-11	1.878578E-02
Total(lbmol)	0.999998	0.563019	0.436979
Z (Fug. Model)	0.725339	0.768112	0.670229
Av.Mol.Wt.	50.1572	19.5002	89.6568
Den/V(lbmol/ft)	0.459088	0.433523	0.496837
H (BTU/lbmol)	-5523.41	-1092.58	-11232.2
S (BTU/lbmol)	-11.9692	-9.89243	-14.6451
U (BTU/lbmol)	-6329.57	-1946.28	-11977.1
G (BTU/lbmol)	1175.42	4443.92	-3035.83
Visc.(cP)		1.745217E-02	0.701485
Th.C.(BTU/hr/f)		3.221514E-02	0.107273
STen (dyne/cm)			
GAS		N/A	11.0012
LIQUID1		11.0012	N/A

Flash at fixed P and T:

T (degF) = 100.000 P (psi) = 3000.00
NO. PHASES = 2 CONVERGED STABLE

COMPONENT	OVERALL	PHASE1 GAS	PHASE2 LIQUID1
	fractions	fractions	fractions
NITROGEN	4.467009E-03	6.703211E-03	2.477535E-03

CARBON DIOXIDE	9.237018E-03	9.700665E-03	8.824528E-03
METHANE	0.658028	0.848460	0.488608
ETHANE	6.449813E-02	5.866641E-02	6.968642E-02
PROPANE	4.591309E-02	3.250041E-02	5.784590E-02
I-BUTANE	9.534019E-03	5.749910E-03	1.290061E-02
N-BUTANE	2.180204E-02	1.172351E-02	3.076858E-02
I-PENTANE	8.874018E-03	3.942736E-03	1.326121E-02
PENTANE	1.075602E-02	4.401108E-03	1.640978E-02
C6	1.440103E-02	4.650812E-03	2.307547E-02
C7	1.863704E-02	4.556255E-03	3.116424E-02
C8	2.049804E-02	3.866441E-03	3.529462E-02
C9	1.448103E-02	1.987894E-03	2.559575E-02
C10	1.227302E-02	1.229752E-03	2.209785E-02
C11	9.028018E-03	6.592469E-04	1.647343E-02
C12	7.594015E-03	4.035859E-04	1.399110E-02
C13	7.296015E-03	2.817233E-04	1.353639E-02
C14	6.606013E-03	1.849690E-04	1.231860E-02
C15	5.618011E-03	1.138448E-04	1.051488E-02
C16	5.525011E-03	8.082874E-05	1.036852E-02
C17	4.442009E-03	4.678150E-05	8.352295E-03
C18	4.346009E-03	3.285864E-05	8.183274E-03
C19	3.668007E-03	2.053568E-05	6.913041E-03
C20	3.157006E-03	1.310410E-05	5.954031E-03
C21	2.600005E-03	7.995919E-06	4.906029E-03
C22	2.321005E-03	5.288424E-06	4.381220E-03
C23	2.096004E-03	3.540779E-06	3.957599E-03
C24	1.882004E-03	2.345032E-06	3.554273E-03
C25	1.543003E-03	1.418805E-06	2.914499E-03
C26	1.405003E-03	9.541867E-07	2.654138E-03
C27	1.484003E-03	7.447850E-07	2.803608E-03
C28	1.322003E-03	4.906295E-07	2.497708E-03
C29	1.182002E-03	3.247601E-07	2.233301E-03
C30	1.083002E-03	2.204594E-07	2.046317E-03
C31	1.028002E-03	1.552560E-07	1.942443E-03
C32	9.240018E-04	1.036061E-07	1.745963E-03
C33	8.030016E-04	6.695897E-08	1.517346E-03
C34	7.860016E-04	4.876519E-08	1.485237E-03
C35	6.520013E-04	3.017917E-08	1.232038E-03
C36	8.209016E-03	2.983653E-08	1.551228E-02
Total(lbmol)	0.999998	0.470805	0.529193
Z (Fug. Model)	0.832549	0.763389	0.894078
Av.Mol.Wt.	50.1572	21.0386	76.0631
Den/V(lbmol/ft)	0.599955	0.654308	0.558667
H (BTU/lbmol)	-5666.99	-1705.08	-9191.77
S (BTU/lbmol)	-12.8458	-11.2305	-14.2829
U (BTU/lbmol)	-6592.31	-2553.53	-10185.5
G (BTU/lbmol)	1522.43	4580.30	-1198.05
Visc.(cP)		2.589001E-02	0.500747
Th.C.(BTU/hr/f)		4.156954E-02	0.109157
STen (dyne/cm)			
GAS		N/A	6.33326
LIQUID1		6.33326	N/A

Flash at fixed P and T:

T (degF) = 100.000 P (psi) = 4000.00
NO. PHASES = 2 CONVERGED STABLE

COMPONENT	OVERALL	PHASE1 GAS	PHASE2 LIQUID1
	fractions	fractions	fractions
NITROGEN	4.467009E-03	6.275889E-03	3.286277E-03
CARBON DIOXIDE	9.237018E-03	9.533243E-03	9.043660E-03
METHANE	0.658028	0.813409	0.556605
ETHANE	6.449813E-02	6.050165E-02	6.710680E-02
PROPANE	4.591309E-02	3.679438E-02	5.186526E-02
I-BUTANE	9.534019E-03	7.018441E-03	1.117604E-02
N-BUTANE	2.180204E-02	1.488001E-02	2.632035E-02
I-PENTANE	8.874018E-03	5.484594E-03	1.108644E-02
PENTANE	1.075602E-02	6.328167E-03	1.364627E-02
C6	1.440103E-02	7.524921E-03	1.888935E-02
C7	1.863704E-02	8.437819E-03	2.529450E-02
C8	2.049804E-02	8.005010E-03	2.865277E-02
C9	1.448103E-02	4.724578E-03	2.084947E-02
C10	1.227302E-02	3.345203E-03	1.810059E-02
C11	9.028018E-03	2.049670E-03	1.358308E-02
C12	7.594015E-03	1.431617E-03	1.161647E-02

C13	7.296015E-03	1.138065E-03	1.131557E-02
C14	6.606013E-03	8.493419E-04	1.036363E-02
C15	5.618011E-03	5.930919E-04	8.897987E-03
C16	5.525011E-03	4.769001E-04	8.820125E-03
C17	4.442009E-03	3.121003E-04	7.137774E-03
C18	4.346009E-03	2.474808E-04	7.021290E-03
C19	3.668007E-03	1.744278E-04	5.948414E-03
C20	3.157006E-03	1.253853E-04	5.135873E-03
C21	2.600005E-03	8.610099E-05	4.240936E-03
C22	2.321005E-03	6.402733E-05	3.794229E-03
C23	2.096004E-03	4.815366E-05	3.432722E-03
C24	1.882004E-03	3.579092E-05	3.087104E-03
C25	1.543003E-03	2.428230E-05	2.534336E-03
C26	1.405003E-03	1.829559E-05	2.310165E-03
C27	1.484003E-03	1.598775E-05	2.442238E-03
C28	1.322003E-03	1.178214E-05	2.177239E-03
C29	1.182002E-03	8.716954E-06	1.947855E-03
C30	1.083002E-03	6.609051E-06	1.785609E-03
C31	1.028002E-03	5.193910E-06	1.695632E-03
C32	9.240018E-04	3.865092E-06	1.524614E-03
C33	8.030016E-04	2.783063E-06	1.325338E-03
C34	7.860016E-04	2.257043E-06	1.297585E-03
C35	6.520013E-04	1.553532E-06	1.076576E-03
C36	8.209016E-03	3.766551E-06	1.356493E-02
Total(lbmol)	0.999998	0.394944	0.605054
Z (Fug. Model)	0.986587	0.826123	1.09133
Av.Mol.Wt.	50.1572	24.0230	67.2161
Den/V(lbmol/ft)	0.675043	0.806162	0.610255
H (BTU/lbmol)	-5662.83	-2323.33	-7842.66
S (BTU/lbmol)	-13.3544	-12.1121	-14.1653
U (BTU/lbmol)	-6759.35	-3241.51	-9055.59
G (BTU/lbmol)	1811.22	4455.45	85.2211
Visc.(cP)		3.851577E-02	0.396690
Th.C.(BTU/hr/f)		5.300063E-02	0.109705
STen (dyne/cm)			
GAS		N/A	3.09845
LIQUID1		3.09845	N/A

Flash at fixed P and T:

T (degF) = 100.000 P (psi) = 5000.00
NO. PHASES = 2 CONVERGED STABLE

COMPONENT	OVERALL	PHASE1	PHASE2
		LIQUID1	LIQUID2
	fractions	fractions	fractions
NITROGEN	4.467009E-03	3.857395E-03	5.567586E-03
CARBON DIOXIDE	9.237018E-03	9.129998E-03	9.430230E-03
METHANE	0.658028	0.599884	0.762999
ETHANE	6.449813E-02	6.554037E-02	6.261651E-02
PROPANE	4.591309E-02	4.856355E-02	4.112805E-02
I-BUTANE	9.534019E-03	1.025034E-02	8.240789E-03
N-BUTANE	2.180204E-02	2.386913E-02	1.807020E-02
I-PENTANE	8.874018E-03	9.882151E-03	7.053968E-03
PENTANE	1.075602E-02	1.209466E-02	8.339284E-03
C6	1.440103E-02	1.647513E-02	1.065651E-02
C7	1.863704E-02	2.168408E-02	1.313601E-02
C8	2.049804E-02	2.440188E-02	1.345018E-02
C9	1.448103E-02	1.767231E-02	8.719597E-03
C10	1.227302E-02	1.531680E-02	6.777900E-03
C11	9.028018E-03	1.150127E-02	4.562896E-03
C12	7.594015E-03	9.859568E-03	3.503861E-03
C13	7.296015E-03	9.639980E-03	3.064298E-03
C14	6.606013E-03	8.870715E-03	2.517397E-03
C15	5.618011E-03	7.657486E-03	1.936012E-03
C16	5.525011E-03	7.635202E-03	1.715343E-03
C17	4.442009E-03	6.216943E-03	1.237602E-03
C18	4.346009E-03	6.153772E-03	1.082333E-03
C19	3.668007E-03	5.237632E-03	8.342593E-04
C20	3.157006E-03	4.542614E-03	6.554760E-04
C21	2.600005E-03	3.767668E-03	4.919453E-04
C22	2.321005E-03	3.385210E-03	3.997246E-04
C23	2.096004E-03	3.075124E-03	3.283346E-04
C24	1.882004E-03	2.776671E-03	2.668024E-04
C25	1.543003E-03	2.288110E-03	1.978129E-04
C26	1.405003E-03	2.093068E-03	1.627924E-04
C27	1.484003E-03	2.219967E-03	1.553177E-04

C28	1.322003E-03	1.985076E-03	1.249130E-04
C29	1.182002E-03	1.780885E-03	1.007991E-04
C30	1.083002E-03	1.636730E-03	8.331967E-05
C31	1.028002E-03	1.557899E-03	7.134417E-05
C32	9.240018E-04	1.403781E-03	5.782379E-05
C33	8.030016E-04	1.222686E-03	4.531795E-05
C34	7.860016E-04	1.199220E-03	3.999089E-05
C35	6.520013E-04	9.965729E-04	2.992321E-05
C36	8.209016E-03	1.267389E-02	1.482785E-04
Total(lbmol)	0.999998	0.643539	0.356459
Z (Fug. Model)	1.16417	1.27702	0.960438
Av.Mol.Wt.	50.1572	61.5114	29.6587
Den/V(lbmol/ft)	0.715090	0.651898	0.866778
H (BTU/lbmol)	-5577.16	-6940.87	-3115.18
S (BTU/lbmol)	-13.6758	-14.1813	-12.7631
U (BTU/lbmol)	-6871.06	-8360.18	-4182.64
G (BTU/lbmol)	2076.76	995.992	4027.94
Visc.(cP)		0.343574	6.456119E-02
Th.C.(BTU/hr/f)		0.110255	6.958183E-02
STen (dyne/cm)			
LIQUID1		N/A	1.03280
LIQUID2		1.03280	N/A

Flash at fixed P and T:

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T (degF)     =        100.000    P (psi    )  =      6000.00
NO. PHASES   =    2              CONVERGED         STABLE
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COMPONENT	OVERALL fractions	PHASE1 LIQUID1 fractions	PHASE2 LIQUID2 fractions
NITROGEN	4.467009E-03	4.875608E-03	4.180929E-03
CARBON DIOXIDE	9.237018E-03	9.323761E-03	9.176286E-03
METHANE	0.658028	0.703740	0.626023
ETHANE	6.449813E-02	6.401939E-02	6.483332E-02
PROPANE	4.591309E-02	4.438128E-02	4.698559E-02
I-BUTANE	9.534019E-03	9.131071E-03	9.816142E-03
N-BUTANE	2.180204E-02	2.056407E-02	2.266881E-02
I-PENTANE	8.874018E-03	8.277099E-03	9.291949E-03
PENTANE	1.075602E-02	9.948501E-03	1.132141E-02
C6	1.440103E-02	1.317322E-02	1.526067E-02
C7	1.863704E-02	1.703445E-02	1.975909E-02
C8	2.049804E-02	1.830070E-02	2.203650E-02
C9	1.448103E-02	1.257281E-02	1.581707E-02
C10	1.227302E-02	1.035862E-02	1.361339E-02
C11	9.028018E-03	7.400603E-03	1.016745E-02
C12	7.594015E-03	6.039723E-03	8.682250E-03
C13	7.296015E-03	5.623066E-03	8.467326E-03
C14	6.606013E-03	4.926884E-03	7.781652E-03
C15	5.618011E-03	4.048913E-03	6.716613E-03
C16	5.525011E-03	3.841536E-03	6.703693E-03
C17	4.442009E-03	2.974509E-03	5.469476E-03
C18	4.346009E-03	2.797812E-03	5.429975E-03
C19	3.668007E-03	2.290919E-03	4.632173E-03
C20	3.157006E-03	1.912455E-03	4.028377E-03
C21	2.600005E-03	1.526414E-03	3.351678E-03
C22	2.321005E-03	1.319748E-03	3.022033E-03
C23	2.096004E-03	1.153843E-03	2.755656E-03
C24	1.882004E-03	1.000719E-03	2.499034E-03
C25	1.543003E-03	7.921194E-04	2.068733E-03
C26	1.405003E-03	6.960739E-04	1.901358E-03
C27	1.484003E-03	7.092484E-04	2.026446E-03
C28	1.322003E-03	6.092532E-04	1.821033E-03
C29	1.182002E-03	5.251115E-04	1.641923E-03
C30	1.083002E-03	4.636288E-04	1.516655E-03
C31	1.028002E-03	4.239724E-04	1.450912E-03
C32	9.240018E-04	3.669916E-04	1.313992E-03
C33	8.030016E-04	3.070924E-04	1.150212E-03
C34	7.860016E-04	2.893404E-04	1.133738E-03
C35	6.520013E-04	2.310254E-04	9.467468E-04
C36	8.209016E-03	2.028038E-03	1.253662E-02
Total(lbmol)	0.999998	0.411815	0.588183
Z (Fug. Model)	1.35418	1.20573	1.45811
Av.Mol.Wt.	50.1572	39.2027	57.8271
Den/V(lbmol/ft)	0.737705	0.828532	0.685120

H (BTU/lbmol)	-5451.09	-4210.65	-6319.58
S (BTU/lbmol)	-13.9051	-13.3966	-14.2612
U (BTU/lbmol)	-6956.16	-5550.73	-7940.17
G (BTU/lbmol)	2331.19	3286.99	1661.99
Visc.(cP)		0.137239	0.318510
Th.C.(BTU/hr/f)		8.133978E-02	0.111121
STen (dyne/cm)			
LIQUID1		N/A	0.140716
LIQUID2		0.140716	N/A

Flash at fixed P and T:

T (degF) = 100.000 P (psi) = 6650.00
NO. PHASES = 2 CONVERGED MARGINALLY STABLE

COMPONENT	OVERALL	PHASE1	PHASE2
		LIQUID1	LIQUID2
	fractions	fractions	fractions
NITROGEN	4.467009E-03	4.522691E-03	4.401651E-03
CARBON DIOXIDE	9.237018E-03	9.249274E-03	9.222634E-03
METHANE	0.658028	0.664781	0.650102
ETHANE	6.449813E-02	6.444204E-02	6.456397E-02
PROPANE	4.591309E-02	4.571658E-02	4.614375E-02
I-BUTANE	9.534019E-03	9.483460E-03	9.593364E-03
N-BUTANE	2.180204E-02	2.164179E-02	2.199015E-02
I-PENTANE	8.874018E-03	8.797605E-03	8.963710E-03
PENTANE	1.075602E-02	1.065177E-02	1.087839E-02
C6	1.440103E-02	1.424543E-02	1.458367E-02
C7	1.863704E-02	1.845967E-02	1.884522E-02
C8	2.049804E-02	2.024157E-02	2.079908E-02
C9	1.448103E-02	1.424892E-02	1.475347E-02
C10	1.227302E-02	1.203283E-02	1.255496E-02
C11	9.028018E-03	8.818563E-03	9.273873E-03
C12	7.594015E-03	7.389496E-03	7.834076E-03
C13	7.296015E-03	7.071440E-03	7.559617E-03
C14	6.606013E-03	6.376375E-03	6.875559E-03
C15	5.618011E-03	5.399600E-03	5.874378E-03
C16	5.525011E-03	5.286635E-03	5.804813E-03
C17	4.442009E-03	4.230693E-03	4.690047E-03
C18	4.346009E-03	4.119331E-03	4.612080E-03
C19	3.668007E-03	3.464190E-03	3.907245E-03
C20	3.157006E-03	2.970831E-03	3.375536E-03
C21	2.600005E-03	2.437660E-03	2.790563E-03
C22	2.321005E-03	2.167944E-03	2.500665E-03
C23	2.096004E-03	1.950407E-03	2.266904E-03
C24	1.882004E-03	1.744212E-03	2.043742E-03
C25	1.543003E-03	1.424218E-03	1.682432E-03
C26	1.405003E-03	1.291534E-03	1.538190E-03
C27	1.484003E-03	1.358540E-03	1.631270E-03
C28	1.322003E-03	1.205218E-03	1.459083E-03
C29	1.182002E-03	1.073099E-03	1.309831E-03
C30	1.083002E-03	9.791037E-04	1.204956E-03
C31	1.028002E-03	9.254778E-04	1.148343E-03
C32	9.240018E-04	8.283340E-04	1.036295E-03
C33	8.030016E-04	7.168166E-04	9.041641E-04
C34	7.860016E-04	6.986585E-04	8.885234E-04
C35	6.520013E-04	5.770903E-04	7.399306E-04
C36	8.209016E-03	6.979757E-03	9.651901E-03
Total(lbmol)	0.999998	0.539971	0.460027
Z (Fug. Model)	1.48033	1.45219	1.51336
Av.Mol.Wt.	50.1572	48.3539	52.2740
Den/V(lbmol/ft)	0.747946	0.762438	0.731624
H (BTU/lbmol)	-5359.16	-5161.63	-5591.02
S (BTU/lbmol)	-14.0301	-13.9435	-14.1318
U (BTU/lbmol)	-7004.44	-6775.63	-7273.01
G (BTU/lbmol)	2493.08	2642.11	2318.15
Visc.(cP)		0.234259	0.273517
Th.C.(BTU/hr/f)		9.961734E-02	0.105942
STen (dyne/cm)			
LIQUID1		N/A	1.078613E-03
LIQUID2		1.078613E-03	N/A

Flash at fixed P and T:

T (degF) = 100.000 P (psi) = 7000.00
NO. PHASES = 1 CONVERGED STABLE

COMPONENT	OVERALL	PHASE1 LIQUID1
	fractions	fractions
NITROGEN	4.467009E-03	4.467009E-03
CARBON DIOXIDE	9.237018E-03	9.237018E-03
METHANE	0.658028	0.658028
ETHANE	6.449813E-02	6.449813E-02
PROPANE	4.591309E-02	4.591309E-02
I-BUTANE	9.534019E-03	9.534019E-03
N-BUTANE	2.180204E-02	2.180204E-02
I-PENTANE	8.874018E-03	8.874018E-03
PENTANE	1.075602E-02	1.075602E-02
C6	1.440103E-02	1.440103E-02
C7	1.863704E-02	1.863704E-02
C8	2.049804E-02	2.049804E-02
C9	1.448103E-02	1.448103E-02
C10	1.227302E-02	1.227302E-02
C11	9.028018E-03	9.028018E-03
C12	7.594015E-03	7.594015E-03
C13	7.296015E-03	7.296015E-03
C14	6.606013E-03	6.606013E-03
C15	5.618011E-03	5.618011E-03
C16	5.525011E-03	5.525011E-03
C17	4.442009E-03	4.442009E-03
C18	4.346009E-03	4.346009E-03
C19	3.668007E-03	3.668007E-03
C20	3.157006E-03	3.157006E-03
C21	2.600005E-03	2.600005E-03
C22	2.321005E-03	2.321005E-03
C23	2.096004E-03	2.096004E-03
C24	1.882004E-03	1.882004E-03
C25	1.543003E-03	1.543003E-03
C26	1.405003E-03	1.405003E-03
C27	1.484003E-03	1.484003E-03
C28	1.322003E-03	1.322003E-03
C29	1.182002E-03	1.182002E-03
C30	1.083002E-03	1.083002E-03
C31	1.028002E-03	1.028002E-03
C32	9.240018E-04	9.240018E-04
C33	8.030016E-04	8.030016E-04
C34	7.860016E-04	7.860016E-04
C35	6.520013E-04	6.520013E-04
C36	8.209016E-03	8.209016E-03
Total(lbmol)	0.999998	0.999998
Z (Fug. Model)	1.54959	1.54959
Av.Mol.Wt.	50.1572	50.1572
Den/V(lbmol/ft)	0.752122	0.752122
H (BTU/lbmol)	-5308.64	-5308.64
S (BTU/lbmol)	-14.0941	-14.0941
U (BTU/lbmol)	-7030.90	-7030.90
G (BTU/lbmol)	2579.43	2579.43
Visc.(cP)		0.262123
Th.C.(BTU/hr/f)		0.103552
STen (dyne/cm)		
LIQUID1		N/A

Flash at fixed P and T:

T (degF) = 100.000 P (psi) = 10000.0
NO. PHASES = 1 CONVERGED STABLE

COMPONENT	OVERALL	PHASE1 LIQUID1
	fractions	fractions
NITROGEN	4.467009E-03	4.467009E-03
CARBON DIOXIDE	9.237018E-03	9.237018E-03
METHANE	0.658028	0.658028
ETHANE	6.449813E-02	6.449813E-02
PROPANE	4.591309E-02	4.591309E-02
I-BUTANE	9.534019E-03	9.534019E-03
N-BUTANE	2.180204E-02	2.180204E-02
I-PENTANE	8.874018E-03	8.874018E-03
PENTANE	1.075602E-02	1.075602E-02
C6	1.440103E-02	1.440103E-02
C7	1.863704E-02	1.863704E-02
C8	2.049804E-02	2.049804E-02
C9	1.448103E-02	1.448103E-02

C10	1.227302E-02	1.227302E-02
C11	9.028018E-03	9.028018E-03
C12	7.594015E-03	7.594015E-03
C13	7.296015E-03	7.296015E-03
C14	6.606013E-03	6.606013E-03
C15	5.618011E-03	5.618011E-03
C16	5.525011E-03	5.525011E-03
C17	4.442009E-03	4.442009E-03
C18	4.346009E-03	4.346009E-03
C19	3.668007E-03	3.668007E-03
C20	3.157006E-03	3.157006E-03
C21	2.600005E-03	2.600005E-03
C22	2.321005E-03	2.321005E-03
C23	2.096004E-03	2.096004E-03
C24	1.882004E-03	1.882004E-03
C25	1.543003E-03	1.543003E-03
C26	1.405003E-03	1.405003E-03
C27	1.484003E-03	1.484003E-03
C28	1.322003E-03	1.322003E-03
C29	1.182002E-03	1.182002E-03
C30	1.083002E-03	1.083002E-03
C31	1.028002E-03	1.028002E-03
C32	9.240018E-04	9.240018E-04
C33	8.030016E-04	8.030016E-04
C34	7.860016E-04	7.860016E-04
C35	6.520013E-04	6.520013E-04
C36	8.209016E-03	8.209016E-03
Total(lbmol)	0.999998	0.999998
Z (Fug. Model)	2.13242	2.13242
Av.Mol.Wt.	50.1572	50.1572
Den/V(lbmol/ft)	0.780789	0.780789
H (BTU/lbmol)	-4846.52	-4846.52
S (BTU/lbmol)	-14.5613	-14.5613
U (BTU/lbmol)	-7216.55	-7216.55
G (BTU/lbmol)	3303.02	3303.02
Visc.(cP)		0.350360
Th.C.(BTU/hr/f)		0.111086
STen (dyne/cm)		
LIQUID1		N/A

Surface Tension Calculations

PVTsim Calculations with PVTsim Parachors (manually input)

Gas-Oil Interfacial (Surface) Tension, mN/m

Temperature (F)	Pressure (psia)	CL68379	CL68508	SLB-1.18	Intertek	Average	Std Dev
220	2200	4.52	4.48	4.66	4.36	4.50	0.11
220	2300	4.14	4.10	4.27	3.98	4.12	0.10
220	2400	3.79	3.75	3.91	3.63	3.77	0.10
220	2500	3.45	3.42	3.57	3.30	3.44	0.10
220	2600	3.14	3.11	3.26	2.99	3.13	0.10
220	2625	3.07	3.03	3.18	2.92	3.05	0.09

PhazeComp Calculations with PVTsim Parachors

Gas-Oil Interfacial (Surface) Tension, mN/m

CL68379	CL68508	SLB-1.18	Intertek	Average
4.52	4.48	4.66	4.36	4.50
4.14	4.10	4.27	3.98	4.12
3.78	3.75	3.91	3.63	3.77
3.45	3.42	3.57	3.30	3.43
3.14	3.11	3.26	2.99	3.13
3.07	3.03	3.18	2.92	3.05

Black-Oil Tables

Single-Stage Flash Black-Oil Tables

Single-stage Flash Black-Oil Tables are labeled below as (e.g.) "CL68379-T=243F-SSF" where Sample ID is given first (e.g. "CL68379"), temperature of properties given next (e.g. "T=243F"), and with suffix "SSF" indicating the black-oil tables were generated with a single-stage flash to 1 atmosphere (14.7 psia) and 60°F.

Using the PERA EOS, the stock-tank oil volume (at 14.7 psia and 60°F) per 1 kmol of CL68379 sample at initial reservoir conditions of 11,856 psia and 243°F with molecular weight of 50.012 is, from the single-stage flash, 0.036258 m^3/kmol.

Oceanic Proxy Five-Stage Flash Black-Oil Tables

Oceanic Proxy Five-Stage Flash Black-Oil Tables are labeled below as (e.g.) "CL68379-Texit=130F-T=243F" where Sample ID is given first (e.g. "CL68379"), exit temperature is next (e.g. "Texit=130F"), and temperature of properties is given last (always "T=243F"). Tables are given for Texit=130F and Texit=210F for each of the four samples.

Single-Stage Flash Black-Oil Tables – CL68379-T=243F-SSF

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	µo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	µg(cp)
100	1.0635	0.0093	1.7242	35.8200	0.0303	0.0127
250	1.0854	0.0380	1.4645	13.8490	0.0110	0.0131
500	1.1243	0.0992	1.1804	6.7318	0.0050	0.0135
750	1.1652	0.1677	0.9907	4.3984	0.0038	0.0139
1000	1.2066	0.2397	0.8504	3.2454	0.0039	0.0143
1250	1.2482	0.3140	0.7409	2.5621	0.0044	0.0149
1500	1.2899	0.3903	0.6524	2.1130	0.0054	0.0155
1750	1.3319	0.4687	0.5794	1.7974	0.0067	0.0162
2000	1.3743	0.5492	0.5182	1.5651	0.0085	0.0171
2250	1.4172	0.6321	0.4663	1.3884	0.0107	0.0181
2500	1.4609	0.7176	0.4218	1.2506	0.0135	0.0193
2750	1.5054	0.8060	0.3835	1.1409	0.0168	0.0206
3000	1.5509	0.8975	0.3503	1.0524	0.0208	0.0221
3250	1.5975	0.9922	0.3214	0.9803	0.0255	0.0237
3500	1.6452	1.0900	0.2961	0.9211	0.0311	0.0256
3750	1.6940	1.1910	0.2741	0.8724	0.0377	0.0276
4000	1.7437	1.2960	0.2549	0.8325	0.0455	0.0299
4250	1.7941	1.4020	0.2381	0.8001	0.0548	0.0325
4500	1.8447	1.5110	0.2236	0.7745	0.0659	0.0355
4750	1.8949	1.6210	0.2112	0.7553	0.0793	0.0390
5000	1.9440	1.7300	0.2007	0.7424	0.0957	0.0432
5250	1.9912	1.8370	0.1918	0.7360	0.1156	0.0485
5500	2.0364	1.9420	0.1845	0.7366	0.1396	0.0552
5750	2.0817	2.0490	0.1780	0.7441	0.1679	0.0639
6000	2.1332	2.1670	0.1712	0.7587	0.2008	0.0751
6250	2.2059	2.3250	0.1624	0.7812	0.2397	0.0899
6500	2.3619	2.6360	0.1457	0.8225	0.2969	0.1133
6554.33	2.4744	2.8470	0.1352	0.8467	0.3260	0.1252
7000	2.4447	2.8470	0.1434	0.8359	0.3260	0.1329
7500	2.4145	2.8470	0.1528	0.8250	0.3260	0.1416
8000	2.3873	2.8470	0.1624	0.8152	0.3260	0.1505
9000	2.3397	2.8470	0.1820	0.7982	0.3260	0.1689
10000	2.2995	2.8470	0.2022	0.7838	0.3260	0.1877
11000	2.2649	2.8470	0.2230	0.7715	0.3260	0.2072
11500	2.2493	2.8470	0.2335	0.7659	0.3260	0.2171
11850	2.2390	2.8470	0.2410	0.7623	0.3260	0.2241
12000	2.2347	2.8470	0.2442	0.7607	0.3260	0.2271

Single-Stage Flash Black-Oil Tables – CL68508-T=243F-SSF

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	µo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	µg(cp)
100	1.0636	0.0093	1.7454	35.8110	0.0299	0.0127
250	1.0856	0.0380	1.4785	13.8490	0.0110	0.0131
500	1.1248	0.0996	1.1872	6.7316	0.0050	0.0135
750	1.1661	0.1686	0.9935	4.3979	0.0039	0.0139
1000	1.2081	0.2413	0.8509	3.2448	0.0039	0.0143
1250	1.2501	0.3162	0.7399	2.5614	0.0044	0.0149
1500	1.2924	0.3933	0.6506	2.1122	0.0054	0.0155
1750	1.3348	0.4724	0.5771	1.7967	0.0068	0.0162
2000	1.3777	0.5537	0.5157	1.5645	0.0085	0.0171
2250	1.4211	0.6374	0.4636	1.3878	0.0108	0.0181
2500	1.4652	0.7237	0.4192	1.2500	0.0135	0.0193
2750	1.5102	0.8128	0.3810	1.1404	0.0169	0.0206
3000	1.5561	0.9050	0.3479	1.0520	0.0208	0.0221
3250	1.6031	1.0000	0.3192	0.9799	0.0256	0.0237
3500	1.6510	1.0990	0.2942	0.9208	0.0311	0.0256
3750	1.7000	1.2000	0.2724	0.8721	0.0377	0.0276
4000	1.7497	1.3050	0.2534	0.8323	0.0455	0.0299
4250	1.7998	1.4110	0.2370	0.7999	0.0548	0.0325
4500	1.8499	1.5190	0.2228	0.7743	0.0658	0.0355
4750	1.8993	1.6280	0.2107	0.7551	0.0790	0.0389
5000	1.9470	1.7350	0.2005	0.7420	0.0949	0.0431
5250	1.9922	1.8390	0.1922	0.7353	0.1141	0.0482
5500	2.0344	1.9380	0.1853	0.7349	0.1370	0.0547
5750	2.0753	2.0370	0.1795	0.7411	0.1636	0.0629
6000	2.1195	2.1420	0.1738	0.7533	0.1937	0.0732
6250	2.1776	2.2730	0.1667	0.7718	0.2282	0.0862
6500	2.2776	2.4830	0.1554	0.8008	0.2718	0.1041
6637.41	2.4124	2.7440	0.1418	0.8329	0.3129	0.1214
7000	2.3897	2.7440	0.1487	0.8242	0.3129	0.1274
7500	2.3610	2.7440	0.1584	0.8132	0.3129	0.1357
8000	2.3351	2.7440	0.1682	0.8032	0.3129	0.1442
9000	2.2898	2.7440	0.1884	0.7860	0.3129	0.1618
10000	2.2514	2.7440	0.2091	0.7715	0.3129	0.1799
11000	2.2184	2.7440	0.2303	0.7591	0.3129	0.1985
11500	2.2035	2.7440	0.2411	0.7535	0.3129	0.2080
11850	2.1936	2.7440	0.2487	0.7498	0.3129	0.2147
12000	2.1895	2.7440	0.2520	0.7483	0.3129	0.2176

Single-Stage Flash Black-Oil Tables – SLB-1.18-T=243F-SSF

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	μo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	μg(cp)
100	1.0635	0.0093	1.7850	35.8020	0.0295	0.0127
250	1.0847	0.0377	1.5228	13.8510	0.0107	0.0131
500	1.1223	0.0976	1.2363	6.7377	0.0048	0.0135
750	1.1618	0.1644	1.0427	4.4042	0.0038	0.0139
1000	1.2017	0.2343	0.8981	3.2509	0.0038	0.0143
1250	1.2417	0.3065	0.7842	2.5672	0.0044	0.0148
1500	1.2819	0.3805	0.6916	2.1178	0.0053	0.0155
1750	1.3223	0.4565	0.6147	1.8019	0.0066	0.0162
2000	1.3632	0.5347	0.5499	1.5695	0.0083	0.0170
2250	1.4047	0.6153	0.4947	1.3925	0.0105	0.0180
2500	1.4469	0.6986	0.4473	1.2543	0.0131	0.0191
2750	1.4902	0.7848	0.4062	1.1444	0.0163	0.0204
3000	1.5345	0.8742	0.3705	1.0556	0.0201	0.0219
3250	1.5801	0.9671	0.3393	0.9831	0.0246	0.0234
3500	1.6270	1.0640	0.3119	0.9235	0.0299	0.0252
3750	1.6754	1.1640	0.2879	0.8744	0.0361	0.0272
4000	1.7252	1.2680	0.2667	0.8339	0.0434	0.0294
4250	1.7766	1.3760	0.2480	0.8009	0.0521	0.0318
4500	1.8294	1.4890	0.2315	0.7744	0.0624	0.0346
4750	1.8836	1.6050	0.2169	0.7542	0.0748	0.0379
5000	1.9394	1.7260	0.2041	0.7399	0.0898	0.0418
5250	1.9970	1.8510	0.1926	0.7319	0.1082	0.0467
5500	2.0578	1.9840	0.1822	0.7306	0.1308	0.0529
5750	2.1253	2.1300	0.1721	0.7371	0.1590	0.0613
6000	2.2101	2.3090	0.1611	0.7529	0.1945	0.0730
6250	2.3489	2.5870	0.1457	0.7836	0.2438	0.0910
6363.8	2.4917	2.8580	0.1324	0.8125	0.2821	0.1061
6500	2.4818	2.8580	0.1350	0.8087	0.2821	0.1081
7000	2.4478	2.8580	0.1444	0.7958	0.2821	0.1156
7500	2.4174	2.8580	0.1540	0.7843	0.2821	0.1232
8000	2.3898	2.8580	0.1638	0.7740	0.2821	0.1311
9000	2.3418	2.8580	0.1840	0.7561	0.2821	0.1473
10000	2.3013	2.8580	0.2048	0.7412	0.2821	0.1641
11000	2.2664	2.8580	0.2261	0.7285	0.2821	0.1814
11500	2.2507	2.8580	0.2370	0.7228	0.2821	0.1903
11850	2.2403	2.8580	0.2447	0.7190	0.2821	0.1966
12000	2.2360	2.8580	0.2480	0.7174	0.2821	0.1993

Single-Stage Flash Black-Oil Tables – Intertek-T=243F-SSF

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	μo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	μg(cp)
100	1.0652	0.0095	1.7500	35.9310	0.0341	0.0126
250	1.0882	0.0390	1.4528	13.8520	0.0123	0.0130
500	1.1287	0.1023	1.1526	6.7266	0.0053	0.0135
750	1.1712	0.1731	0.9597	4.3938	0.0040	0.0139
1000	1.2142	0.2475	0.8194	3.2416	0.0040	0.0143
1250	1.2575	0.3243	0.7108	2.5588	0.0046	0.0149
1500	1.3010	0.4034	0.6236	2.1099	0.0056	0.0155
1750	1.3449	0.4848	0.5520	1.7945	0.0070	0.0163
2000	1.3895	0.5688	0.4921	1.5624	0.0089	0.0172
2250	1.4348	0.6556	0.4414	1.3859	0.0112	0.0182
2500	1.4811	0.7455	0.3982	1.2481	0.0141	0.0194
2750	1.5286	0.8388	0.3609	1.1386	0.0177	0.0207
3000	1.5775	0.9358	0.3287	1.0503	0.0219	0.0222
3250	1.6278	1.0370	0.3007	0.9784	0.0270	0.0239
3500	1.6797	1.1420	0.2763	0.9196	0.0330	0.0259
3750	1.7333	1.2510	0.2549	0.8713	0.0402	0.0280
4000	1.7886	1.3650	0.2362	0.8319	0.0487	0.0304
4250	1.8453	1.4830	0.2198	0.8003	0.0590	0.0332
4500	1.9035	1.6060	0.2055	0.7758	0.0715	0.0364
4750	1.9629	1.7320	0.1931	0.7581	0.0868	0.0403
5000	2.0233	1.8610	0.1822	0.7476	0.1059	0.0451
5250	2.0853	1.9950	0.1726	0.7448	0.1299	0.0514
5500	2.1517	2.1390	0.1638	0.7510	0.1602	0.0599
5750	2.2323	2.3090	0.1543	0.7677	0.1986	0.0720
6000	2.3661	2.5750	0.1406	0.8005	0.2516	0.0906
6129.32	2.5712	2.9520	0.1233	0.8424	0.3060	0.1111
6250	2.5614	2.9520	0.1255	0.8389	0.3060	0.1131
6500	2.5420	2.9520	0.1299	0.8320	0.3060	0.1171
7000	2.5064	2.9520	0.1390	0.8195	0.3060	0.1252
7500	2.4745	2.9520	0.1483	0.8084	0.3060	0.1336
8000	2.4457	2.9520	0.1577	0.7983	0.3060	0.1421
9000	2.3956	2.9520	0.1771	0.7808	0.3060	0.1596
10000	2.3533	2.9520	0.1971	0.7662	0.3060	0.1777
11000	2.3170	2.9520	0.2176	0.7536	0.3060	0.1964
11500	2.3007	2.9520	0.2281	0.7480	0.3060	0.2060
11850	2.2898	2.9520	0.2355	0.7443	0.3060	0.2127
12000	2.2854	2.9520	0.2387	0.7427	0.3060	0.2156

Single-Stage Flash Black-Oil Tables – CL68379-T=220F-SSF

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	μo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	μg(cp)
100	1.057077	0.01055	1.87092	34.285	0.01928	0.012462
250	1.079574	0.04281	1.56881	13.302	0.0053159	0.012809
500	1.12107	0.111	1.25663	6.4705	0.0020745	0.013213
750	1.164388	0.1858	1.05221	4.2224	0.0016752	0.013619
1000	1.207744	0.2633	0.90214	3.1102	0.0018482	0.014085
1250	1.25081	0.3424	0.78538	2.451	0.0023329	0.014639
1500	1.293639	0.423	0.69135	2.018	0.0031102	0.015299
1750	1.336429	0.5053	0.6139	1.714	0.0042163	0.016082
2000	1.379398	0.5894	0.54909	1.4906	0.0057052	0.017001
2250	1.422747	0.6757	0.4942	1.321	0.0076383	0.018067
2500	1.466644	0.7643	0.44729	1.1889	0.010082	0.019288
2750	1.511268	0.8555	0.40691	1.0842	0.013106	0.020671
3000	1.556737	0.9496	0.37194	1	0.016792	0.022223
3250	1.603127	1.047	0.34152	0.93163	0.021233	0.023952
3500	1.650493	1.147	0.315	0.87571	0.026548	0.025872
3750	1.698778	1.25	0.29183	0.82993	0.032889	0.028005
4000	1.747872	1.356	0.2716	0.7926	0.040461	0.030391
4250	1.797525	1.465	0.25398	0.76257	0.049538	0.03309
4500	1.84729	1.575	0.23873	0.73911	0.060495	0.036206
4750	1.896541	1.685	0.22566	0.72189	0.073836	0.039901
5000	1.944433	1.795	0.21462	0.71091	0.090213	0.044431
5250	1.990074	1.902	0.20546	0.70651	0.11038	0.050186
5500	2.033166	2.005	0.1979	0.70914	0.13502	0.057703
5750	2.075537	2.108	0.19135	0.71901	0.16436	0.067599
6000	2.123405	2.221	0.18461	0.73592	0.19832	0.080491
6250	2.191891	2.375	0.17557	0.76066	0.23811	0.097423
6500	2.344756	2.689	0.15739	0.80421	0.29638	0.124204
6550.43	2.458895	2.909	0.1456	0.82933	0.32601	0.137748
7000	2.431096	2.909	0.15445	0.81958	0.32601	0.146162
7500	2.403091	2.909	0.16446	0.80978	0.32601	0.15568
8000	2.377687	2.909	0.17463	0.8009	0.32601	0.165361
9000	2.333221	2.909	0.19542	0.78539	0.32601	0.185181
10000	2.29545	2.909	0.21676	0.77224	0.32601	0.20556
11000	2.262839	2.909	0.23859	0.76091	0.32601	0.226436
11500	2.24812	2.909	0.24966	0.75581	0.32601	0.237041
11850	2.238369	2.909	0.25747	0.75243	0.32601	0.244526
12000	2.234317	2.909	0.26083	0.75102	0.32601	0.247748

Single-Stage Flash Black-Oil Tables – CL68508-T=220F-SSF

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	μo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	μg(cp)
100	1.057209	0.01057	1.89377	34.281	0.019119	0.012464
250	1.079856	0.04293	1.58288	13.302	0.0053291	0.012807
500	1.121727	0.1115	1.2626	6.4701	0.0020914	0.01321
750	1.165534	0.187	1.05396	4.2217	0.0016901	0.013616
1000	1.209447	0.2653	0.90151	3.1094	0.0018639	0.014083
1250	1.253085	0.3452	0.78336	2.4502	0.0023516	0.014638
1500	1.296494	0.4267	0.68853	2.0171	0.0031337	0.0153
1750	1.339853	0.5099	0.61066	1.7131	0.0042465	0.016086
2000	1.383371	0.5949	0.54567	1.4898	0.0057441	0.017008
2250	1.427251	0.6821	0.49076	1.3202	0.007688	0.018079
2500	1.471669	0.7716	0.44393	1.1883	0.010144	0.019305
2750	1.516768	0.8637	0.40369	1.0836	0.013182	0.020694
3000	1.562677	0.9586	0.36892	0.99948	0.016882	0.022252
3250	1.609456	1.056	0.33874	0.93115	0.021337	0.023987
3500	1.65713	1.157	0.31248	0.87531	0.026661	0.025913
3750	1.705623	1.261	0.28959	0.82961	0.033005	0.028051
4000	1.754766	1.367	0.26967	0.79236	0.040564	0.030438
4250	1.804266	1.475	0.25238	0.7624	0.049599	0.033135
4500	1.8536	1.585	0.23749	0.73899	0.060462	0.036239
4750	1.902035	1.694	0.22481	0.72174	0.073612	0.039902
5000	1.948593	1.801	0.21422	0.7106	0.089622	0.044361
5250	1.992206	1.905	0.20556	0.7058	0.10912	0.049962
5500	2.032358	2.003	0.19861	0.70759	0.13259	0.057161
5750	2.070302	2.097	0.19282	0.71594	0.16007	0.066447
6000	2.110878	2.198	0.18719	0.7304	0.19122	0.078251
6250	2.164574	2.323	0.18012	0.75097	0.22639	0.09316
6500	2.259149	2.527	0.16834	0.78152	0.27037	0.11345
6638.97	2.395331	2.8	0.1531	0.81562	0.31292	0.133459
7000	2.374393	2.8	0.16044	0.80776	0.31292	0.139929
7500	2.347837	2.8	0.17074	0.79784	0.31292	0.149032
8000	2.32372	2.8	0.1812	0.78886	0.31292	0.158294
9000	2.281438	2.8	0.20256	0.77319	0.31292	0.177269
10000	2.245455	2.8	0.22444	0.75994	0.31292	0.196797
11000	2.214342	2.8	0.24678	0.74854	0.31292	0.216819
11500	2.20029	2.8	0.2581	0.74341	0.31292	0.226997
11850	2.190974	2.8	0.26608	0.74001	0.31292	0.234183
12000	2.1871	2.8	0.26951	0.73859	0.31292	0.237277

Single-Stage Flash Black-Oil Tables – SLB-1.18-T=220F-SSF

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	μo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	μg(cp)
100	1.056896	0.01054	1.93845	34.27	0.01861	0.012468
250	1.078675	0.04232	1.63535	13.307	0.0051323	0.012813
500	1.118723	0.1088	1.32038	6.4768	0.0020568	0.013211
750	1.160374	0.1814	1.11122	4.2281	0.0016796	0.013611
1000	1.201998	0.2565	0.95599	3.1155	0.0018549	0.014071
1250	1.243318	0.3331	0.83418	2.4561	0.0023333	0.014615
1500	1.284421	0.4111	0.73541	2.0227	0.0030948	0.015263
1750	1.325538	0.4907	0.6536	1.7185	0.0041717	0.01603
2000	1.366868	0.5722	0.5848	1.4949	0.0056137	0.016928
2250	1.408637	0.6558	0.52628	1.3251	0.0074774	0.017968
2500	1.451022	0.7419	0.47607	1.1928	0.0098233	0.019157
2750	1.494218	0.8306	0.43267	1.0878	0.012716	0.0205
3000	1.538366	0.9224	0.39494	1.0033	0.016228	0.022004
3250	1.583614	1.017	0.36199	0.93453	0.020443	0.023676
3500	1.630064	1.116	0.33311	0.87822	0.025465	0.025525
3750	1.677789	1.218	0.30772	0.83198	0.031427	0.027573
4000	1.726858	1.323	0.28535	0.79411	0.038501	0.029849
4250	1.777263	1.433	0.26563	0.76341	0.046923	0.032407
4500	1.828966	1.546	0.24823	0.73908	0.057009	0.03533
4750	1.881944	1.663	0.23288	0.72072	0.069191	0.038753
5000	1.936195	1.784	0.21931	0.70823	0.084059	0.042892
5250	1.992016	1.909	0.20724	0.7019	0.1024	0.048092
5500	2.050545	2.041	0.19627	0.70237	0.12522	0.054904
5750	2.115238	2.185	0.1857	0.71066	0.15375	0.064182
6000	2.196112	2.361	0.17414	0.7284	0.18988	0.077317
6250	2.329363	2.637	0.15776	0.76099	0.23976	0.097769
6350.01	2.441806	2.858	0.14591	0.78544	0.27175	0.111801
6500	2.431985	2.858	0.14896	0.78163	0.27175	0.114135
7000	2.401485	2.858	0.15925	0.76988	0.27175	0.12203
7500	2.373999	2.858	0.16972	0.75938	0.27175	0.130094
8000	2.349059	2.858	0.18037	0.74993	0.27175	0.138324
9000	2.30539	2.858	0.20217	0.73354	0.27175	0.155258
10000	2.268276	2.858	0.22456	0.71977	0.27175	0.172785
11000	2.236223	2.858	0.24748	0.70798	0.27175	0.190854
11500	2.221754	2.858	0.25912	0.70269	0.27175	0.200075
11850	2.212164	2.858	0.26733	0.69919	0.27175	0.206599
12000	2.208179	2.858	0.27086	0.69774	0.27175	0.209412

Single-Stage Flash Black-Oil Tables – Intertek-T=220F-SSF

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	μo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	μg(cp)
100	1.058713	0.01077	1.89163	34.351	0.021858	0.012419
250	1.082257	0.0441	1.55228	13.299	0.0058625	0.012788
500	1.125346	0.1145	1.22652	6.4654	0.002167	0.013206
750	1.170185	0.1916	1.02006	4.2186	0.0017099	0.013619
1000	1.215086	0.2715	0.87046	3.1073	0.0018745	0.01409
1250	1.259782	0.3533	0.75483	2.4485	0.0023679	0.014648
1500	1.304399	0.4368	0.66211	2.0156	0.0031695	0.015315
1750	1.349157	0.5222	0.58597	1.7118	0.0043192	0.016106
2000	1.394302	0.61	0.52241	1.4884	0.0058769	0.017037
2250	1.440073	0.7003	0.4687	1.3188	0.0079108	0.01812
2500	1.486677	0.7935	0.42289	1.1869	0.010494	0.019366
2750	1.534317	0.8899	0.38351	1.0822	0.013705	0.020782
3000	1.583145	0.9899	0.34946	0.9981	0.017636	0.022377
3250	1.633325	1.094	0.31987	0.92986	0.022395	0.024163
3500	1.684954	1.201	0.29407	0.87419	0.028122	0.026157
3750	1.738097	1.313	0.27152	0.82876	0.035002	0.028388
4000	1.792762	1.429	0.25178	0.79195	0.043287	0.030904
4250	1.848856	1.549	0.2345	0.76265	0.053329	0.033785
4500	1.906209	1.673	0.2194	0.74025	0.065625	0.037164
4750	1.964577	1.801	0.20625	0.72459	0.080886	0.041266
5000	2.023757	1.931	0.1948	0.71601	0.10011	0.046468
5250	2.084156	2.066	0.18474	0.71537	0.12461	0.053399
5500	2.14848	2.209	0.17544	0.72404	0.15599	0.063065
5750	2.227108	2.379	0.16543	0.74387	0.19624	0.077043
6000	2.36383	2.658	0.15018	0.781	0.25236	0.099245
6102.31	2.518186	2.952	0.13557	0.81452	0.29502	0.117296
6250	2.507442	2.952	0.13843	0.81066	0.29502	0.119771
6500	2.490088	2.952	0.1433	0.80445	0.29502	0.123996
7000	2.458153	2.952	0.15319	0.79306	0.29502	0.132581
7500	2.429404	2.952	0.16326	0.78286	0.29502	0.14134
8000	2.403347	2.952	0.17351	0.77365	0.29502	0.150269
9000	2.357771	2.952	0.19449	0.75763	0.29502	0.168608
10000	2.319084	2.952	0.21606	0.74411	0.29502	0.187543
11000	2.285711	2.952	0.23816	0.73251	0.29502	0.207016
11500	2.270659	2.952	0.24939	0.72729	0.29502	0.216937
11850	2.260683	2.952	0.25731	0.72384	0.29502	0.22395
12000	2.256542	2.952	0.26072	0.72241	0.29502	0.226972

Single-Stage Flash Black-Oil Tables – CL68379-T=210F-SSF

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	µo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	µg(cp)
100	1.0543	0.0112	1.9350	33.6390	0.0151	0.0124
250	1.0772	0.0453	1.6137	13.0740	0.0035	0.0127
500	1.1201	0.1169	1.2894	6.3594	0.0013	0.0131
750	1.1646	0.1947	1.0787	4.1467	0.0011	0.0135
1000	1.2089	0.2748	0.9244	3.0518	0.0013	0.0140
1250	1.2526	0.3562	0.8046	2.4028	0.0017	0.0145
1500	1.2960	0.4388	0.7082	1.9766	0.0024	0.0152
1750	1.3391	0.5228	0.6288	1.6776	0.0034	0.0160
2000	1.3824	0.6086	0.5625	1.4581	0.0047	0.0170
2250	1.4259	0.6963	0.5064	1.2915	0.0065	0.0181
2500	1.4699	0.7863	0.4585	1.1621	0.0088	0.0193
2750	1.5145	0.8788	0.4173	1.0595	0.0117	0.0207
3000	1.5599	0.9740	0.3816	0.9772	0.0153	0.0223
3250	1.6062	1.0720	0.3506	0.9105	0.0196	0.0241
3500	1.6533	1.1730	0.3235	0.8560	0.0248	0.0261
3750	1.7013	1.2770	0.2999	0.8116	0.0311	0.0282
4000	1.7500	1.3840	0.2793	0.7754	0.0386	0.0307
4250	1.7992	1.4930	0.2614	0.7465	0.0476	0.0334
4500	1.8485	1.6030	0.2458	0.7240	0.0585	0.0366
4750	1.8971	1.7140	0.2325	0.7077	0.0719	0.0404
5000	1.9443	1.8230	0.2213	0.6977	0.0883	0.0451
5250	1.9890	1.9290	0.2121	0.6942	0.1086	0.0511
5500	2.0309	2.0310	0.2045	0.6978	0.1336	0.0590
5750	2.0719	2.1320	0.1979	0.7088	0.1634	0.0696
6000	2.1180	2.2430	0.1912	0.7267	0.1978	0.0833
6250	2.1846	2.3950	0.1821	0.7524	0.2379	0.1013
6500	2.3359	2.7090	0.1632	0.7968	0.2965	0.1297
6548.47	2.4492	2.9300	0.1509	0.8220	0.3260	0.1438
7000	2.4223	2.9300	0.1601	0.8127	0.3260	0.1526
7500	2.3953	2.9300	0.1704	0.8033	0.3260	0.1625
8000	2.3707	2.9300	0.1808	0.7948	0.3260	0.1725
9000	2.3277	2.9300	0.2022	0.7800	0.3260	0.1930
10000	2.2911	2.9300	0.2241	0.7673	0.3260	0.2141
11000	2.2594	2.9300	0.2464	0.7564	0.3260	0.2356
11500	2.2451	2.9300	0.2578	0.7515	0.3260	0.2465
11850	2.2356	2.9300	0.2658	0.7482	0.3260	0.2542
12000	2.2316	2.9300	0.2692	0.7469	0.3260	0.2575

Single-Stage Flash Black-Oil Tables – CL68508-T=210F-SSF

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	µo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	µg(cp)
100	1.0544	0.0112	1.9584	33.6370	0.0150	0.0124
250	1.0775	0.0454	1.6277	13.0740	0.0035	0.0127
500	1.1208	0.1175	1.2949	6.3589	0.0013	0.0131
750	1.1659	0.1961	1.0799	4.1459	0.0011	0.0135
1000	1.2107	0.2770	0.9232	3.0509	0.0013	0.0140
1250	1.2551	0.3593	0.8020	2.4020	0.0017	0.0145
1500	1.2990	0.4429	0.7048	1.9758	0.0024	0.0152
1750	1.3428	0.5279	0.6251	1.6768	0.0034	0.0160
2000	1.3866	0.6146	0.5587	1.4573	0.0048	0.0170
2250	1.4307	0.7033	0.5026	1.2908	0.0066	0.0181
2500	1.4752	0.7942	0.4548	1.1613	0.0089	0.0193
2750	1.5203	0.8877	0.4137	1.0589	0.0118	0.0208
3000	1.5662	0.9837	0.3783	0.9766	0.0154	0.0224
3250	1.6129	1.0830	0.3475	0.9100	0.0197	0.0241
3500	1.6603	1.1840	0.3208	0.8556	0.0250	0.0261
3750	1.7085	1.2890	0.2975	0.8112	0.0312	0.0283
4000	1.7573	1.3960	0.2772	0.7752	0.0387	0.0307
4250	1.8064	1.5040	0.2596	0.7463	0.0477	0.0335
4500	1.8552	1.6140	0.2444	0.7239	0.0585	0.0367
4750	1.9030	1.7230	0.2316	0.7076	0.0717	0.0404
5000	1.9489	1.8300	0.2208	0.6974	0.0878	0.0451
5250	1.9916	1.9330	0.2121	0.6935	0.1074	0.0509
5500	2.0305	2.0290	0.2051	0.6963	0.1312	0.0585
5750	2.0671	2.1220	0.1994	0.7057	0.1591	0.0683
6000	2.1059	2.2200	0.1938	0.7211	0.1906	0.0809
6250	2.1577	2.3430	0.1868	0.7425	0.2260	0.0967
6500	2.2497	2.5440	0.1748	0.7736	0.2700	0.1181
6639.53	2.3852	2.8190	0.1588	0.8083	0.3129	0.1393
7000	2.3651	2.8190	0.1664	0.8009	0.3129	0.1460
7500	2.3395	2.8190	0.1770	0.7914	0.3129	0.1555
8000	2.3162	2.8190	0.1878	0.7828	0.3129	0.1651
9000	2.2753	2.8190	0.2097	0.7678	0.3129	0.1847
10000	2.2404	2.8190	0.2321	0.7550	0.3129	0.2049
11000	2.2102	2.8190	0.2550	0.7441	0.3129	0.2256
11500	2.1966	2.8190	0.2666	0.7391	0.3129	0.2360
11850	2.1875	2.8190	0.2748	0.7358	0.3129	0.2434
12000	2.1837	2.8190	0.2783	0.7345	0.3129	0.2466

Single-Stage Flash Black-Oil Tables – SLB-1.18-T=210F-SSF

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	µo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	µg(cp)
100	1.0540	0.0112	2.0058	33.6280	0.0145	0.0124
250	1.0763	0.0447	1.6841	13.0800	0.0034	0.0127
500	1.1176	0.1144	1.3567	6.3657	0.0013	0.0131
750	1.1603	0.1899	1.1408	4.1523	0.0011	0.0135
1000	1.2028	0.2673	0.9810	3.0570	0.0013	0.0140
1250	1.2447	0.3459	0.8558	2.4078	0.0017	0.0145
1500	1.2862	0.4258	0.7544	1.9813	0.0024	0.0152
1750	1.3276	0.5070	0.6705	1.6821	0.0033	0.0160
2000	1.3692	0.5900	0.6000	1.4624	0.0047	0.0169
2250	1.4111	0.6750	0.5401	1.2956	0.0064	0.0180
2500	1.4535	0.7623	0.4887	1.1659	0.0086	0.0192
2750	1.4966	0.8522	0.4444	1.0631	0.0114	0.0206
3000	1.5407	0.9449	0.4058	0.9805	0.0148	0.0221
3250	1.5857	1.0410	0.3722	0.9134	0.0189	0.0238
3500	1.6319	1.1400	0.3427	0.8586	0.0238	0.0257
3750	1.6793	1.2430	0.3168	0.8136	0.0297	0.0278
4000	1.7280	1.3490	0.2940	0.7770	0.0367	0.0301
4250	1.7779	1.4590	0.2738	0.7473	0.0450	0.0327
4500	1.8290	1.5720	0.2561	0.7240	0.0550	0.0357
4750	1.8813	1.6890	0.2404	0.7065	0.0672	0.0392
5000	1.9347	1.8100	0.2266	0.6949	0.0820	0.0435
5250	1.9896	1.9340	0.2143	0.6894	0.1004	0.0489
5500	2.0470	2.0650	0.2031	0.6907	0.1233	0.0560
5750	2.1103	2.2080	0.1923	0.6998	0.1521	0.0657
6000	2.1895	2.3830	0.1805	0.7185	0.1885	0.0796
6250	2.3205	2.6570	0.1636	0.7520	0.2387	0.1013
6343.11	2.4208	2.8580	0.1525	0.7745	0.2679	0.1148
6500	2.4110	2.8580	0.1558	0.7707	0.2679	0.1173
7000	2.3819	2.8580	0.1665	0.7594	0.2679	0.1254
7500	2.3557	2.8580	0.1773	0.7493	0.2679	0.1337
8000	2.3318	2.8580	0.1883	0.7402	0.2679	0.1421
9000	2.2899	2.8580	0.2109	0.7245	0.2679	0.1594
10000	2.2543	2.8580	0.2340	0.7112	0.2679	0.1773
11000	2.2234	2.8580	0.2576	0.6998	0.2679	0.1957
11500	2.2094	2.8580	0.2696	0.6947	0.2679	0.2051
11850	2.2002	2.8580	0.2781	0.6913	0.2679	0.2118
12000	2.1963	2.8580	0.2817	0.6899	0.2679	0.2146

Single-Stage Flash Black-Oil Tables – Intertek-T=210F-SSF

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	μo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	μg(cp)
100	1.0559	0.0114	1.9530	33.6890	0.0171	0.0123
250	1.0799	0.0467	1.5952	13.0680	0.0039	0.0127
500	1.1243	0.1205	1.2586	6.3547	0.0013	0.0131
750	1.1703	0.2007	1.0463	4.1435	0.0011	0.0135
1000	1.2161	0.2832	0.8927	3.0493	0.0013	0.0140
1250	1.2615	0.3672	0.7740	2.4007	0.0017	0.0146
1500	1.3066	0.4528	0.6789	1.9747	0.0024	0.0152
1750	1.3517	0.5401	0.6008	1.6757	0.0034	0.0160
2000	1.3971	0.6296	0.5357	1.4562	0.0048	0.0170
2250	1.4431	0.7215	0.4807	1.2896	0.0067	0.0181
2500	1.4898	0.8162	0.4338	1.1601	0.0092	0.0194
2750	1.5375	0.9140	0.3935	1.0576	0.0122	0.0208
3000	1.5863	1.0150	0.3587	0.9754	0.0160	0.0225
3250	1.6364	1.1200	0.3285	0.9088	0.0207	0.0243
3500	1.6878	1.2290	0.3022	0.8546	0.0263	0.0263
3750	1.7407	1.3420	0.2791	0.8104	0.0331	0.0286
4000	1.7950	1.4580	0.2590	0.7748	0.0413	0.0312
4250	1.8507	1.5790	0.2413	0.7465	0.0512	0.0341
4500	1.9075	1.7040	0.2259	0.7251	0.0635	0.0376
4750	1.9653	1.8320	0.2125	0.7104	0.0788	0.0418
5000	2.0237	1.9620	0.2008	0.7028	0.0981	0.0472
5250	2.0832	2.0960	0.1906	0.7032	0.1230	0.0545
5500	2.1464	2.2390	0.1811	0.7132	0.1549	0.0648
5750	2.2241	2.4090	0.1709	0.7345	0.1961	0.0798
6000	2.3630	2.6950	0.1548	0.7738	0.2538	0.1039
6088.96	2.4959	2.9520	0.1415	0.8034	0.2911	0.1205
6250	2.4848	2.9520	0.1447	0.7993	0.2911	0.1233
6500	2.4682	2.9520	0.1498	0.7934	0.2911	0.1276
7000	2.4378	2.9520	0.1601	0.7825	0.2911	0.1364
7500	2.4103	2.9520	0.1705	0.7727	0.2911	0.1454
8000	2.3854	2.9520	0.1811	0.7638	0.2911	0.1546
9000	2.3417	2.9520	0.2029	0.7484	0.2911	0.1733
10000	2.3045	2.9520	0.2251	0.7354	0.2911	0.1927
11000	2.2724	2.9520	0.2479	0.7242	0.2911	0.2125
11500	2.2579	2.9520	0.2595	0.7192	0.2911	0.2226
11850	2.2482	2.9520	0.2677	0.7158	0.2911	0.2298
12000	2.2442	2.9520	0.2712	0.7144	0.2911	0.2329

Single-Stage Flash Black-Oil Tables – CL68379-T=200F-SSF

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	μo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	μg(cp)
100	1.0514	0.0119	1.9988	33.0100	0.0113	0.0123
250	1.0750	0.0481	1.6581	12.8510	0.0022	0.0126
500	1.1195	0.1234	1.3218	6.2494	0.0007	0.0130
750	1.1653	0.2044	1.1048	4.0713	0.0007	0.0134
1000	1.2105	0.2872	0.9464	2.9934	0.0008	0.0139
1250	1.2549	0.3709	0.8236	2.3546	0.0012	0.0145
1500	1.2987	0.4555	0.7248	1.9352	0.0018	0.0151
1750	1.3423	0.5414	0.6437	1.6412	0.0027	0.0160
2000	1.3858	0.6289	0.5759	1.4255	0.0039	0.0169
2250	1.4295	0.7181	0.5186	1.2620	0.0056	0.0181
2500	1.4736	0.8095	0.4697	1.1351	0.0077	0.0194
2750	1.5182	0.9032	0.4277	1.0348	0.0105	0.0208
3000	1.5635	0.9995	0.3914	0.9544	0.0139	0.0225
3250	1.6096	1.0990	0.3598	0.8893	0.0182	0.0243
3500	1.6565	1.2000	0.3323	0.8364	0.0233	0.0263
3750	1.7041	1.3050	0.3083	0.7933	0.0295	0.0285
4000	1.7524	1.4120	0.2873	0.7584	0.0369	0.0310
4250	1.8010	1.5210	0.2691	0.7306	0.0459	0.0338
4500	1.8496	1.6310	0.2533	0.7091	0.0568	0.0371
4750	1.8975	1.7420	0.2398	0.6938	0.0701	0.0410
5000	1.9438	1.8510	0.2285	0.6848	0.0867	0.0459
5250	1.9874	1.9550	0.2192	0.6823	0.1072	0.0522
5500	2.0281	2.0560	0.2116	0.6870	0.1325	0.0606
5750	2.0674	2.1540	0.2051	0.6990	0.1627	0.0718
6000	2.1119	2.2630	0.1984	0.7179	0.1975	0.0864
6250	2.1765	2.4120	0.1891	0.7444	0.2379	0.1055
6500	2.3255	2.7260	0.1696	0.7896	0.2967	0.1355
6546.93	2.4377	2.9480	0.1568	0.8149	0.3260	0.1503
7000	2.4117	2.9480	0.1663	0.8059	0.3260	0.1595
7500	2.3857	2.9480	0.1769	0.7970	0.3260	0.1697
8000	2.3620	2.9480	0.1876	0.7889	0.3260	0.1801
9000	2.3205	2.9480	0.2096	0.7746	0.3260	0.2013
10000	2.2850	2.9480	0.2321	0.7625	0.3260	0.2231
11000	2.2543	2.9480	0.2550	0.7520	0.3260	0.2453
11500	2.2404	2.9480	0.2666	0.7472	0.3260	0.2565
11850	2.2312	2.9480	0.2748	0.7441	0.3260	0.2645
12000	2.2273	2.9480	0.2783	0.7428	0.3260	0.2679

Single-Stage Flash Black-Oil Tables – CL68508-T=200F-SSF

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	μo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	μg(cp)
100	1.0516	0.0119	2.0228	33.0090	0.0112	0.0123
250	1.0754	0.0482	1.6719	12.8510	0.0022	0.0126
500	1.1203	0.1241	1.3267	6.2487	0.0008	0.0130
750	1.1666	0.2060	1.1054	4.0705	0.0007	0.0134
1000	1.2125	0.2897	0.9447	2.9925	0.0008	0.0139
1250	1.2575	0.3743	0.8204	2.3537	0.0012	0.0145
1500	1.3020	0.4600	0.7210	1.9343	0.0018	0.0151
1750	1.3462	0.5470	0.6395	1.6403	0.0027	0.0160
2000	1.3903	0.6354	0.5716	1.4246	0.0039	0.0169
2250	1.4346	0.7257	0.5144	1.2612	0.0056	0.0181
2500	1.4792	0.8181	0.4656	1.1343	0.0078	0.0194
2750	1.5243	0.9128	0.4238	1.0341	0.0106	0.0208
3000	1.5701	1.0100	0.3877	0.9537	0.0140	0.0225
3250	1.6166	1.1100	0.3565	0.8888	0.0183	0.0243
3500	1.6638	1.2120	0.3293	0.8359	0.0234	0.0263
3750	1.7117	1.3170	0.3056	0.7929	0.0296	0.0286
4000	1.7601	1.4250	0.2850	0.7581	0.0370	0.0311
4250	1.8086	1.5340	0.2671	0.7304	0.0460	0.0339
4500	1.8568	1.6440	0.2518	0.7090	0.0568	0.0372
4750	1.9038	1.7530	0.2387	0.6937	0.0700	0.0410
5000	1.9488	1.8590	0.2278	0.6845	0.0862	0.0458
5250	1.9904	1.9600	0.2191	0.6816	0.1061	0.0520
5500	2.0281	2.0550	0.2121	0.6854	0.1302	0.0600
5750	2.0630	2.1450	0.2065	0.6958	0.1584	0.0705
6000	2.1001	2.2400	0.2010	0.7122	0.1903	0.0838
6250	2.1498	2.3600	0.1940	0.7343	0.2259	0.1006
6500	2.2390	2.5580	0.1818	0.7659	0.2698	0.1231
6640.62	2.3735	2.8340	0.1652	0.8012	0.3129	0.1456
7000	2.3542	2.8340	0.1729	0.7941	0.3129	0.1525
7500	2.3296	2.8340	0.1839	0.7850	0.3129	0.1623
8000	2.3071	2.8340	0.1949	0.7768	0.3129	0.1723
9000	2.2676	2.8340	0.2175	0.7624	0.3129	0.1926
10000	2.2339	2.8340	0.2405	0.7502	0.3129	0.2135
11000	2.2046	2.8340	0.2640	0.7396	0.3129	0.2348
11500	2.1914	2.8340	0.2759	0.7348	0.3129	0.2456
11850	2.1826	2.8340	0.2842	0.7317	0.3129	0.2532
12000	2.1789	2.8340	0.2878	0.7304	0.3129	0.2565

Single-Stage Flash Black-Oil Tables – SLB-1.18-T=200F-SSF

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	μo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	μg(cp)
100	1.0512	0.0118	2.0731	33.0030	0.0108	0.0123
250	1.0740	0.0473	1.7326	12.8580	0.0021	0.0126
500	1.1168	0.1205	1.3928	6.2555	0.0008	0.0130
750	1.1606	0.1990	1.1702	4.0768	0.0007	0.0134
1000	1.2039	0.2789	1.0059	2.9985	0.0009	0.0139
1250	1.2464	0.3597	0.8773	2.3594	0.0012	0.0144
1500	1.2884	0.4414	0.7733	1.9398	0.0018	0.0151
1750	1.3301	0.5244	0.6873	1.6456	0.0027	0.0159
2000	1.3719	0.6089	0.6152	1.4297	0.0038	0.0169
2250	1.4139	0.6952	0.5539	1.2661	0.0055	0.0180
2500	1.4564	0.7838	0.5015	1.1389	0.0075	0.0192
2750	1.4995	0.8748	0.4562	1.0383	0.0102	0.0206
3000	1.5434	0.9685	0.4169	0.9576	0.0135	0.0222
3250	1.5882	1.0650	0.3826	0.8922	0.0175	0.0240
3500	1.6341	1.1650	0.3525	0.8389	0.0223	0.0259
3750	1.6811	1.2680	0.3261	0.7954	0.0281	0.0281
4000	1.7293	1.3750	0.3029	0.7599	0.0350	0.0304
4250	1.7786	1.4850	0.2824	0.7314	0.0433	0.0331
4500	1.8291	1.5980	0.2643	0.7091	0.0533	0.0362
4750	1.8806	1.7150	0.2483	0.6925	0.0654	0.0398
5000	1.9331	1.8350	0.2343	0.6818	0.0802	0.0442
5250	1.9869	1.9590	0.2217	0.6772	0.0987	0.0498
5500	2.0431	2.0890	0.2104	0.6793	0.1218	0.0572
5750	2.1050	2.2310	0.1994	0.6894	0.1508	0.0675
6000	2.1824	2.4040	0.1874	0.7090	0.1875	0.0822
6250	2.3112	2.6770	0.1700	0.7433	0.2379	0.1052
6336.16	2.4002	2.8580	0.1595	0.7640	0.2645	0.1182
6500	2.3905	2.8580	0.1631	0.7602	0.2645	0.1209
7000	2.3627	2.8580	0.1741	0.7494	0.2645	0.1292
7500	2.3377	2.8580	0.1854	0.7398	0.2645	0.1376
8000	2.3148	2.8580	0.1968	0.7311	0.2645	0.1463
9000	2.2747	2.8580	0.2201	0.7159	0.2645	0.1640
10000	2.2404	2.8580	0.2440	0.7031	0.2645	0.1823
11000	2.2107	2.8580	0.2684	0.6921	0.2645	0.2011
11500	2.1973	2.8580	0.2807	0.6872	0.2645	0.2107
11850	2.1883	2.8580	0.2894	0.6839	0.2645	0.2175
12000	2.1846	2.8580	0.2931	0.6826	0.2645	0.2204

Single-Stage Flash Black-Oil Tables – Intertek-T=200F-SSF

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	μo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	μg(cp)
100	1.0530	0.0122	2.0139	33.0440	0.0128	0.0122
250	1.0776	0.0496	1.6378	12.8450	0.0023	0.0126
500	1.1236	0.1272	1.2905	6.2453	0.0008	0.0130
750	1.1709	0.2106	1.0724	4.0686	0.0007	0.0134
1000	1.2175	0.2958	0.9148	2.9914	0.0008	0.0139
1250	1.2636	0.3821	0.7931	2.3529	0.0012	0.0145
1500	1.3092	0.4698	0.6956	1.9336	0.0018	0.0152
1750	1.3547	0.5590	0.6156	1.6396	0.0027	0.0160
2000	1.4004	0.6503	0.5489	1.4238	0.0040	0.0170
2250	1.4466	0.7438	0.4927	1.2603	0.0057	0.0181
2500	1.4934	0.8400	0.4448	1.1334	0.0080	0.0194
2750	1.5411	0.9392	0.4036	1.0330	0.0109	0.0209
3000	1.5899	1.0420	0.3681	0.9526	0.0146	0.0226
3250	1.6398	1.1480	0.3373	0.8877	0.0191	0.0245
3500	1.6910	1.2570	0.3104	0.8349	0.0246	0.0266
3750	1.7436	1.3710	0.2870	0.7921	0.0313	0.0289
4000	1.7975	1.4880	0.2664	0.7577	0.0394	0.0315
4250	1.8526	1.6100	0.2485	0.7306	0.0494	0.0345
4500	1.9088	1.7350	0.2328	0.7102	0.0616	0.0381
4750	1.9658	1.8620	0.2191	0.6966	0.0770	0.0425
5000	2.0234	1.9930	0.2073	0.6900	0.0965	0.0481
5250	2.0818	2.1260	0.1969	0.6915	0.1218	0.0558
5500	2.1438	2.2680	0.1873	0.7028	0.1544	0.0668
5750	2.2205	2.4380	0.1767	0.7257	0.1964	0.0830
6000	2.3622	2.7330	0.1596	0.7673	0.2558	0.1092
6075.07	2.4741	2.9520	0.1478	0.7928	0.2876	0.1242
6250	2.4626	2.9520	0.1515	0.7886	0.2876	0.1273
6500	2.4468	2.9520	0.1568	0.7829	0.2876	0.1317
7000	2.4178	2.9520	0.1674	0.7725	0.2876	0.1408
7500	2.3916	2.9520	0.1783	0.7631	0.2876	0.1500
8000	2.3678	2.9520	0.1893	0.7546	0.2876	0.1594
9000	2.3259	2.9520	0.2117	0.7398	0.2876	0.1786
10000	2.2902	2.9520	0.2348	0.7273	0.2876	0.1984
11000	2.2592	2.9520	0.2583	0.7165	0.2876	0.2187
11500	2.2452	2.9520	0.2702	0.7116	0.2876	0.2290
11850	2.2360	2.9520	0.2786	0.7084	0.2876	0.2363
12000	2.2321	2.9520	0.2822	0.7070	0.2876	0.2394

Single-Stage Flash Black-Oil Tables – CL68379-T=180F-SSF

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	μo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	μg(cp)
100	1.0459	0.0135	2.1245	31.8070	0.0052	0.0120
250	1.0712	0.0546	1.7447	12.4180	0.0006	0.0124
500	1.1193	0.1383	1.3851	6.0311	0.0002	0.0128
750	1.1679	0.2263	1.1561	3.9207	0.0002	0.0132
1000	1.2150	0.3148	0.9896	2.8763	0.0003	0.0137
1250	1.2609	0.4034	0.8608	2.2577	0.0005	0.0143
1500	1.3058	0.4924	0.7575	1.8519	0.0009	0.0150
1750	1.3501	0.5822	0.6728	1.5678	0.0016	0.0159
2000	1.3941	0.6731	0.6023	1.3597	0.0026	0.0169
2250	1.4381	0.7654	0.5428	1.2025	0.0040	0.0181
2500	1.4823	0.8595	0.4922	1.0808	0.0059	0.0195
2750	1.5268	0.9557	0.4488	0.9849	0.0084	0.0210
3000	1.5719	1.0540	0.4113	0.9085	0.0116	0.0228
3250	1.6174	1.1550	0.3788	0.8469	0.0156	0.0247
3500	1.6636	1.2580	0.3505	0.7971	0.0206	0.0268
3750	1.7103	1.3630	0.3259	0.7569	0.0267	0.0292
4000	1.7575	1.4710	0.3044	0.7246	0.0341	0.0318
4250	1.8047	1.5800	0.2857	0.6991	0.0430	0.0348
4500	1.8516	1.6890	0.2696	0.6800	0.0540	0.0383
4750	1.8975	1.7980	0.2559	0.6669	0.0676	0.0425
5000	1.9415	1.9040	0.2444	0.6599	0.0844	0.0479
5250	1.9824	2.0060	0.2351	0.6596	0.1055	0.0549
5500	2.0199	2.1020	0.2276	0.6665	0.1315	0.0644
5750	2.0558	2.1950	0.2213	0.6807	0.1625	0.0771
6000	2.0965	2.2980	0.2146	0.7016	0.1979	0.0937
6250	2.1568	2.4410	0.2052	0.7293	0.2383	0.1152
6500	2.2977	2.7460	0.1847	0.7750	0.2963	0.1482
6547.29	2.4088	2.9720	0.1705	0.8009	0.3260	0.1649
7000	2.3850	2.9720	0.1806	0.7928	0.3260	0.1747
7500	2.3611	2.9720	0.1919	0.7847	0.3260	0.1857
8000	2.3393	2.9720	0.2034	0.7773	0.3260	0.1969
9000	2.3008	2.9720	0.2267	0.7642	0.3260	0.2196
10000	2.2677	2.9720	0.2505	0.7530	0.3260	0.2427
11000	2.2390	2.9720	0.2746	0.7433	0.3260	0.2663
11500	2.2260	2.9720	0.2868	0.7389	0.3260	0.2782
11850	2.2174	2.9720	0.2954	0.7360	0.3260	0.2866
12000	2.2138	2.9720	0.2991	0.7348	0.3260	0.2902

Single-Stage Flash Black-Oil Tables – CL68508-T=180F-SSF

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	μo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	μg(cp)
100	1.0460	0.0136	2.1493	31.8070	0.0052	0.0120
250	1.0715	0.0548	1.7577	12.4180	0.0006	0.0124
500	1.1202	0.1393	1.3887	6.0302	0.0002	0.0128
750	1.1695	0.2283	1.1553	3.9197	0.0002	0.0132
1000	1.2174	0.3179	0.9865	2.8753	0.0003	0.0137
1250	1.2639	0.4077	0.8564	2.2566	0.0006	0.0143
1500	1.3096	0.4978	0.7525	1.8509	0.0010	0.0150
1750	1.3546	0.5888	0.6676	1.5667	0.0016	0.0159
2000	1.3993	0.6808	0.5971	1.3588	0.0026	0.0169
2250	1.4439	0.7743	0.5377	1.2016	0.0040	0.0181
2500	1.4886	0.8695	0.4873	1.0799	0.0059	0.0195
2750	1.5337	0.9667	0.4442	0.9842	0.0085	0.0211
3000	1.5792	1.0660	0.4070	0.9078	0.0117	0.0228
3250	1.6252	1.1680	0.3749	0.8463	0.0158	0.0248
3500	1.6718	1.2710	0.3470	0.7966	0.0208	0.0269
3750	1.7187	1.3770	0.3227	0.7565	0.0269	0.0292
4000	1.7659	1.4850	0.3016	0.7243	0.0342	0.0319
4250	1.8130	1.5940	0.2834	0.6990	0.0432	0.0349
4500	1.8595	1.7030	0.2677	0.6799	0.0541	0.0384
4750	1.9046	1.8100	0.2545	0.6668	0.0675	0.0426
5000	1.9472	1.9140	0.2435	0.6597	0.0840	0.0478
5250	1.9861	2.0120	0.2348	0.6589	0.1044	0.0546
5500	2.0206	2.1020	0.2280	0.6649	0.1291	0.0637
5750	2.0520	2.1870	0.2227	0.6774	0.1581	0.0756
6000	2.0854	2.2750	0.2174	0.6955	0.1904	0.0907
6250	2.1308	2.3880	0.2104	0.7189	0.2260	0.1095
6500	2.2131	2.5760	0.1981	0.7508	0.2691	0.1342
6646.65	2.3449	2.8550	0.1799	0.7872	0.3129	0.1596
7000	2.3276	2.8550	0.1880	0.7809	0.3129	0.1670
7500	2.3049	2.8550	0.1997	0.7726	0.3129	0.1775
8000	2.2842	2.8550	0.2114	0.7651	0.3129	0.1882
9000	2.2477	2.8550	0.2354	0.7519	0.3129	0.2100
10000	2.2163	2.8550	0.2597	0.7407	0.3129	0.2322
11000	2.1890	2.8550	0.2844	0.7309	0.3129	0.2549
11500	2.1766	2.8550	0.2969	0.7265	0.3129	0.2663
11850	2.1684	2.8550	0.3056	0.7235	0.3129	0.2744
12000	2.1649	2.8550	0.3094	0.7223	0.3129	0.2779

Single-Stage Flash Black-Oil Tables – SLB-1.18-T=180F-SSF

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	μo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	μg(cp)
100	1.0455	0.0134	2.2066	31.8080	0.0050	0.0120
250	1.0699	0.0536	1.8278	12.4250	0.0006	0.0124
500	1.1161	0.1347	1.4636	6.0368	0.0002	0.0127
750	1.1625	0.2195	1.2280	3.9258	0.0002	0.0132
1000	1.2075	0.3048	1.0547	2.8811	0.0003	0.0137
1250	1.2513	0.3901	0.9196	2.2622	0.0006	0.0142
1500	1.2942	0.4758	0.8105	1.8563	0.0010	0.0150
1750	1.3366	0.5623	0.7205	1.5720	0.0016	0.0158
2000	1.3788	0.6499	0.6452	1.3638	0.0025	0.0168
2250	1.4210	0.7391	0.5815	1.2064	0.0039	0.0180
2500	1.4635	0.8302	0.5270	1.0845	0.0057	0.0193
2750	1.5064	0.9233	0.4800	0.9885	0.0081	0.0209
3000	1.5500	1.0190	0.4394	0.9117	0.0112	0.0225
3250	1.5943	1.1170	0.4039	0.8498	0.0150	0.0244
3500	1.6395	1.2180	0.3729	0.7997	0.0197	0.0264
3750	1.6855	1.3220	0.3457	0.7589	0.0254	0.0287
4000	1.7325	1.4290	0.3217	0.7261	0.0322	0.0312
4250	1.7804	1.5390	0.3006	0.6999	0.0404	0.0340
4500	1.8292	1.6520	0.2820	0.6798	0.0504	0.0372
4750	1.8788	1.7670	0.2656	0.6653	0.0626	0.0411
5000	1.9291	1.8860	0.2512	0.6565	0.0776	0.0459
5250	1.9805	2.0070	0.2383	0.6538	0.0963	0.0520
5500	2.0338	2.1330	0.2266	0.6579	0.1197	0.0603
5750	2.0924	2.2720	0.2154	0.6699	0.1492	0.0719
6000	2.1660	2.4410	0.2028	0.6913	0.1864	0.0885
6250	2.2897	2.7110	0.1844	0.7272	0.2371	0.1143
6323.91	2.3601	2.8580	0.1750	0.7447	0.2592	0.1263
6500	2.3506	2.8580	0.1792	0.7409	0.2592	0.1293
7000	2.3255	2.8580	0.1911	0.7311	0.2592	0.1382
7500	2.3026	2.8580	0.2032	0.7223	0.2592	0.1471
8000	2.2818	2.8580	0.2154	0.7143	0.2592	0.1563
9000	2.2449	2.8580	0.2404	0.7003	0.2592	0.1750
10000	2.2134	2.8580	0.2658	0.6885	0.2592	0.1943
11000	2.1858	2.8580	0.2916	0.6783	0.2592	0.2140
11500	2.1734	2.8580	0.3047	0.6737	0.2592	0.2240
11850	2.1651	2.8580	0.3139	0.6707	0.2592	0.2311
12000	2.1616	2.8580	0.3178	0.6694	0.2592	0.2342

Single-Stage Flash Black-Oil Tables – Intertek-T=180F-SSF

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	μo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	μg(cp)
100	1.0473	0.0139	2.1333	31.8150	0.0060	0.0120
250	1.0736	0.0563	1.7214	12.4120	0.0006	0.0123
500	1.1232	0.1424	1.3535	6.0284	0.0002	0.0128
750	1.1732	0.2327	1.1242	3.9192	0.0002	0.0132
1000	1.2218	0.3237	0.9586	2.8753	0.0003	0.0137
1250	1.2692	0.4150	0.8308	2.2568	0.0005	0.0143
1500	1.3159	0.5071	0.7286	1.8510	0.0009	0.0150
1750	1.3623	0.6004	0.6449	1.5668	0.0016	0.0159
2000	1.4085	0.6953	0.5753	1.3587	0.0026	0.0169
2250	1.4551	0.7922	0.5166	1.2012	0.0040	0.0181
2500	1.5021	0.8914	0.4668	1.0794	0.0060	0.0195
2750	1.5498	0.9933	0.4241	0.9835	0.0086	0.0211
3000	1.5983	1.0980	0.3873	0.9070	0.0121	0.0229
3250	1.6479	1.2060	0.3554	0.8454	0.0164	0.0249
3500	1.6985	1.3180	0.3277	0.7958	0.0217	0.0271
3750	1.7502	1.4330	0.3034	0.7558	0.0283	0.0295
4000	1.8030	1.5510	0.2823	0.7239	0.0364	0.0323
4250	1.8568	1.6730	0.2638	0.6992	0.0464	0.0355
4500	1.9114	1.7970	0.2477	0.6812	0.0588	0.0393
4750	1.9664	1.9240	0.2336	0.6697	0.0744	0.0441
5000	2.0216	2.0530	0.2215	0.6655	0.0945	0.0504
5250	2.0773	2.1830	0.2109	0.6696	0.1207	0.0591
5500	2.1363	2.3220	0.2011	0.6839	0.1548	0.0718
5750	2.2108	2.4910	0.1900	0.7101	0.1988	0.0908
6000	2.3600	2.8080	0.1703	0.7566	0.2619	0.1222
6047.22	2.4316	2.9520	0.1619	0.7736	0.2826	0.1331
6250	2.4195	2.9520	0.1665	0.7692	0.2826	0.1369
6500	2.4053	2.9520	0.1722	0.7640	0.2826	0.1416
7000	2.3790	2.9520	0.1837	0.7545	0.2826	0.1512
7500	2.3551	2.9520	0.1953	0.7459	0.2826	0.1610
8000	2.3333	2.9520	0.2071	0.7381	0.2826	0.1710
9000	2.2949	2.9520	0.2312	0.7245	0.2826	0.1913
10000	2.2620	2.9520	0.2557	0.7129	0.2826	0.2121
11000	2.2334	2.9520	0.2807	0.7029	0.2826	0.2334
11500	2.2204	2.9520	0.2933	0.6984	0.2826	0.2442
11850	2.2118	2.9520	0.3022	0.6954	0.2826	0.2519
12000	2.2082	2.9520	0.3060	0.6941	0.2826	0.2551

Single-Stage Flash Black-Oil Tables – CL68379-T=160F-SSF

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	µo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	µg(cp)
100	1.0404	0.0157	2.2454	30.6820	0.0016	0.0118
250	1.0683	0.0628	1.8275	11.9960	0.0001	0.0121
500	1.1208	0.1563	1.4459	5.8130	0.0000	0.0125
750	1.1724	0.2520	1.2054	3.7693	0.0000	0.0129
1000	1.2216	0.3467	1.0311	2.7582	0.0001	0.0135
1250	1.2690	0.4406	0.8966	2.1596	0.0002	0.0141
1500	1.3150	0.5342	0.7890	1.7674	0.0005	0.0149
1750	1.3600	0.6281	0.7011	1.4932	0.0009	0.0158
2000	1.4046	0.7226	0.6280	1.2930	0.0016	0.0169
2250	1.4488	0.8181	0.5667	1.1420	0.0028	0.0182
2500	1.4930	0.9149	0.5146	1.0257	0.0044	0.0197
2750	1.5373	1.0130	0.4701	0.9345	0.0067	0.0214
3000	1.5818	1.1130	0.4318	0.8622	0.0098	0.0232
3250	1.6266	1.2150	0.3987	0.8044	0.0137	0.0253
3500	1.6718	1.3190	0.3699	0.7579	0.0186	0.0276
3750	1.7172	1.4240	0.3449	0.7207	0.0246	0.0301
4000	1.7627	1.5310	0.3231	0.6913	0.0320	0.0329
4250	1.8080	1.6390	0.3043	0.6685	0.0411	0.0361
4500	1.8527	1.7460	0.2881	0.6518	0.0523	0.0399
4750	1.8959	1.8520	0.2743	0.6411	0.0662	0.0445
5000	1.9367	1.9540	0.2630	0.6366	0.0836	0.0505
5250	1.9741	2.0500	0.2538	0.6387	0.1053	0.0584
5500	2.0078	2.1400	0.2467	0.6480	0.1321	0.0693
5750	2.0398	2.2260	0.2406	0.6642	0.1635	0.0839
6000	2.0765	2.3220	0.2342	0.6865	0.1989	0.1026
6250	2.1315	2.4570	0.2247	0.7148	0.2386	0.1264
6500	2.2568	2.7370	0.2043	0.7589	0.2936	0.1615
6556.91	2.3726	2.9800	0.1874	0.7873	0.3260	0.1817
7000	2.3514	2.9800	0.1980	0.7802	0.3260	0.1921
7500	2.3296	2.9800	0.2101	0.7728	0.3260	0.2039
8000	2.3096	2.9800	0.2224	0.7660	0.3260	0.2158
9000	2.2743	2.9800	0.2472	0.7541	0.3260	0.2401
10000	2.2438	2.9800	0.2724	0.7438	0.3260	0.2647
11000	2.2172	2.9800	0.2980	0.7348	0.3260	0.2897
11500	2.2052	2.9800	0.3109	0.7308	0.3260	0.3024
11850	2.1971	2.9800	0.3199	0.7280	0.3260	0.3112
12000	2.1938	2.9800	0.3238	0.7269	0.3260	0.3150

Single-Stage Flash Black-Oil Tables – CL68508-T=160F-SSF

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	μo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	μg(cp)
100	1.0406	0.0157	2.2705	30.6830	0.0016	0.0118
250	1.0687	0.0632	1.8392	11.9960	0.0001	0.0121
500	1.1219	0.1577	1.4478	5.8121	0.0000	0.0125
750	1.1743	0.2546	1.2030	3.7683	0.0000	0.0129
1000	1.2244	0.3506	1.0265	2.7571	0.0001	0.0135
1250	1.2726	0.4459	0.8908	2.1585	0.0002	0.0141
1500	1.3193	0.5408	0.7828	1.7663	0.0005	0.0149
1750	1.3652	0.6360	0.6947	1.4922	0.0009	0.0158
2000	1.4104	0.7318	0.6218	1.2919	0.0016	0.0169
2250	1.4553	0.8285	0.5606	1.1411	0.0028	0.0182
2500	1.5001	0.9265	0.5089	1.0248	0.0045	0.0197
2750	1.5449	1.0260	0.4647	0.9337	0.0068	0.0214
3000	1.5900	1.1270	0.4268	0.8615	0.0099	0.0233
3250	1.6352	1.2300	0.3941	0.8037	0.0138	0.0254
3500	1.6807	1.3350	0.3657	0.7574	0.0187	0.0276
3750	1.7264	1.4410	0.3412	0.7204	0.0248	0.0301
4000	1.7719	1.5480	0.3199	0.6910	0.0322	0.0330
4250	1.8171	1.6550	0.3015	0.6683	0.0413	0.0362
4500	1.8612	1.7620	0.2858	0.6518	0.0525	0.0400
4750	1.9035	1.8660	0.2726	0.6411	0.0662	0.0446
5000	1.9429	1.9650	0.2618	0.6364	0.0832	0.0504
5250	1.9782	2.0580	0.2534	0.6380	0.1042	0.0582
5500	2.0089	2.1410	0.2471	0.6462	0.1296	0.0685
5750	2.0365	2.2180	0.2421	0.6607	0.1589	0.0821
6000	2.0659	2.3000	0.2371	0.6801	0.1911	0.0991
6250	2.1067	2.4050	0.2303	0.7041	0.2260	0.1199
6500	2.1799	2.5780	0.2181	0.7354	0.2674	0.1464
6662.62	2.3100	2.8620	0.1979	0.7736	0.3129	0.1759
7000	2.2950	2.8620	0.2062	0.7682	0.3129	0.1835
7500	2.2744	2.8620	0.2186	0.7607	0.3129	0.1948
8000	2.2554	2.8620	0.2312	0.7539	0.3129	0.2063
9000	2.2219	2.8620	0.2566	0.7418	0.3129	0.2295
10000	2.1930	2.8620	0.2824	0.7315	0.3129	0.2532
11000	2.1677	2.8620	0.3085	0.7224	0.3129	0.2773
11500	2.1561	2.8620	0.3216	0.7183	0.3129	0.2894
11850	2.1485	2.8620	0.3308	0.7156	0.3129	0.2980
12000	2.1453	2.8620	0.3348	0.7145	0.3129	0.3016

Single-Stage Flash Black-Oil Tables – SLB-1.18-T=160F-SSF

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	μo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	μg(cp)
100	1.0400	0.0155	2.3364	30.6890	0.0015	0.0118
250	1.0668	0.0614	1.9197	12.0030	0.0001	0.0121
500	1.1170	0.1517	1.5322	5.8183	0.0000	0.0125
750	1.1662	0.2436	1.2840	3.7740	0.0001	0.0129
1000	1.2131	0.3346	1.1020	2.7626	0.0001	0.0134
1250	1.2582	0.4248	0.9604	2.1639	0.0002	0.0141
1500	1.3020	0.5147	0.8465	1.7715	0.0005	0.0148
1750	1.3450	0.6050	0.7528	1.4973	0.0009	0.0157
2000	1.3876	0.6959	0.6747	1.2969	0.0016	0.0168
2250	1.4300	0.7880	0.6087	1.1459	0.0027	0.0181
2500	1.4724	0.8815	0.5525	1.0294	0.0043	0.0195
2750	1.5151	0.9766	0.5042	0.9381	0.0065	0.0212
3000	1.5581	1.0740	0.4625	0.8655	0.0094	0.0230
3250	1.6017	1.1730	0.4262	0.8073	0.0131	0.0250
3500	1.6458	1.2750	0.3945	0.7604	0.0177	0.0271
3750	1.6907	1.3790	0.3667	0.7228	0.0233	0.0295
4000	1.7361	1.4850	0.3423	0.6927	0.0301	0.0322
4250	1.7822	1.5940	0.3208	0.6691	0.0384	0.0352
4500	1.8289	1.7050	0.3019	0.6514	0.0485	0.0387
4750	1.8761	1.8180	0.2853	0.6392	0.0609	0.0429
5000	1.9236	1.9330	0.2706	0.6326	0.0762	0.0481
5250	1.9718	2.0510	0.2576	0.6321	0.0953	0.0550
5500	2.0217	2.1730	0.2457	0.6382	0.1192	0.0643
5750	2.0766	2.3060	0.2342	0.6522	0.1491	0.0774
6000	2.1457	2.4690	0.2212	0.6751	0.1864	0.0962
6250	2.2623	2.7300	0.2018	0.7119	0.2365	0.1249
6317.85	2.3212	2.8580	0.1930	0.7276	0.2560	0.1368
6500	2.3124	2.8580	0.1976	0.7241	0.2560	0.1402
7000	2.2896	2.8580	0.2105	0.7152	0.2560	0.1496
7500	2.2688	2.8580	0.2234	0.7071	0.2560	0.1592
8000	2.2498	2.8580	0.2365	0.6998	0.2560	0.1690
9000	2.2161	2.8580	0.2631	0.6870	0.2560	0.1889
10000	2.1870	2.8580	0.2902	0.6761	0.2560	0.2093
11000	2.1616	2.8580	0.3175	0.6667	0.2560	0.2301
11500	2.1501	2.8580	0.3313	0.6625	0.2560	0.2407
11850	2.1424	2.8580	0.3410	0.6596	0.2560	0.2481
12000	2.1392	2.8580	0.3452	0.6585	0.2560	0.2513

Single-Stage Flash Black-Oil Tables – Intertek-T=160F-SSF

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	μo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	μg(cp)
100	1.0418	0.0161	2.2475	30.6760	0.0018	0.0118
250	1.0706	0.0648	1.8023	11.9920	0.0001	0.0121
500	1.1245	0.1607	1.4152	5.8117	0.0000	0.0125
750	1.1774	0.2587	1.1749	3.7689	0.0000	0.0129
1000	1.2280	0.3558	1.0014	2.7581	0.0001	0.0135
1250	1.2770	0.4525	0.8677	2.1596	0.0002	0.0141
1500	1.3247	0.5493	0.7608	1.7673	0.0004	0.0149
1750	1.3719	0.6469	0.6736	1.4929	0.0009	0.0158
2000	1.4187	0.7457	0.6011	1.2925	0.0016	0.0169
2250	1.4656	0.8460	0.5404	1.1413	0.0028	0.0182
2500	1.5128	0.9483	0.4888	1.0248	0.0045	0.0197
2750	1.5603	1.0530	0.4448	0.9334	0.0069	0.0215
3000	1.6085	1.1600	0.4070	0.8610	0.0101	0.0234
3250	1.6574	1.2700	0.3743	0.8031	0.0142	0.0255
3500	1.7071	1.3820	0.3459	0.7567	0.0195	0.0278
3750	1.7577	1.4980	0.3212	0.7198	0.0261	0.0304
4000	1.8090	1.6160	0.2996	0.6907	0.0342	0.0334
4250	1.8609	1.7370	0.2808	0.6687	0.0444	0.0369
4500	1.9132	1.8600	0.2644	0.6532	0.0571	0.0410
4750	1.9655	1.9840	0.2503	0.6444	0.0733	0.0463
5000	2.0175	2.1090	0.2381	0.6429	0.0943	0.0535
5250	2.0695	2.2350	0.2275	0.6500	0.1218	0.0636
5500	2.1247	2.3680	0.2175	0.6675	0.1575	0.0786
5750	2.1965	2.5360	0.2059	0.6969	0.2031	0.1010
6000	2.3545	2.8780	0.1830	0.7483	0.2697	0.1385
6022.81	2.3905	2.9520	0.1782	0.7571	0.2802	0.1447
6250	2.3783	2.9520	0.1838	0.7526	0.2802	0.1493
6500	2.3654	2.9520	0.1899	0.7480	0.2802	0.1544
7000	2.3416	2.9520	0.2022	0.7394	0.2802	0.1647
7500	2.3200	2.9520	0.2148	0.7316	0.2802	0.1752
8000	2.3001	2.9520	0.2274	0.7245	0.2802	0.1858
9000	2.2650	2.9520	0.2531	0.7120	0.2802	0.2074
10000	2.2347	2.9520	0.2792	0.7013	0.2802	0.2296
11000	2.2083	2.9520	0.3056	0.6921	0.2802	0.2521
11500	2.1963	2.9520	0.3190	0.6879	0.2802	0.2635
11850	2.1883	2.9520	0.3284	0.6851	0.2802	0.2716
12000	2.1850	2.9520	0.3324	0.6839	0.2802	0.2750

Single-Stage Flash Black-Oil Tables – CL68379-T=35F-SSF

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	μo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	μg(cp)
100	1.0263	0.0660	2.7962	24.2240	0.0000	0.0102
250	1.0965	0.2007	2.2325	9.3398	0.0000	0.0104
500	1.1855	0.3845	1.7495	4.4014	0.0000	0.0109
750	1.2576	0.5442	1.4413	2.7667	0.0000	0.0114
1000	1.3214	0.6920	1.2189	1.9581	0.0000	0.0123
1250	1.3794	0.8309	1.0528	1.4822	0.0000	0.0134
1500	1.4321	0.9607	0.9278	1.1755	0.0000	0.0150
1750	1.4793	1.0810	0.8336	0.9681	0.0000	0.0172
2000	1.5213	1.1900	0.7626	0.8246	0.0001	0.0197
2250	1.5584	1.2900	0.7086	0.7241	0.0007	0.0227
2500	1.5913	1.3800	0.6672	0.6534	0.0021	0.0261
2750	1.6204	1.4630	0.6352	0.6037	0.0050	0.0297
3000	1.6461	1.5370	0.6102	0.5690	0.0097	0.0336
3250	1.6687	1.6050	0.5908	0.5454	0.0164	0.0381
3500	1.6885	1.6670	0.5758	0.5303	0.0249	0.0431
3750	1.7059	1.7220	0.5641	0.5216	0.0352	0.0491
4000	1.7213	1.7730	0.5550	0.5181	0.0471	0.0561
4250	1.7349	1.8190	0.5478	0.5185	0.0602	0.0645
4500	1.7473	1.8620	0.5419	0.5221	0.0744	0.0744
4750	1.7587	1.9030	0.5370	0.5280	0.0894	0.0859
5000	1.7696	1.9420	0.5328	0.5356	0.1049	0.0993
5250	1.7803	1.9800	0.5289	0.5446	0.1207	0.1145
5500	1.7910	2.0190	0.5253	0.5546	0.1367	0.1315
5750	1.8022	2.0580	0.5217	0.5653	0.1528	0.1503
6000	1.8141	2.0990	0.5179	0.5766	0.1689	0.1707
6250	1.8273	2.1430	0.5138	0.5883	0.1850	0.1926
6500	1.8424	2.1920	0.5092	0.6005	0.2013	0.2159
7000	1.8814	2.3120	0.4969	0.6269	0.2350	0.2672
7500	1.9455	2.4960	0.4757	0.6596	0.2744	0.3284
7860.63	2.0717	2.8320	0.4322	0.7057	0.3260	0.4007
8000	2.0690	2.8320	0.4373	0.7047	0.3260	0.4055
9000	2.0507	2.8320	0.4738	0.6982	0.3260	0.4405
10000	2.0344	2.8320	0.5100	0.6923	0.3260	0.4752
11000	2.0199	2.8320	0.5458	0.6872	0.3260	0.5096
11500	2.0132	2.8320	0.5636	0.6848	0.3260	0.5267
11850	2.0086	2.8320	0.5760	0.6831	0.3260	0.5387
12000	2.0067	2.8320	0.5813	0.6825	0.3260	0.5438

Single-Stage Flash Black-Oil Tables – CL68508-T=35F-SSF

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	μo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	μg(cp)
100	1.0267	0.0668	2.8054	24.2230	0.0000	0.0102
250	1.0987	0.2043	2.2264	9.3387	0.0000	0.0104
500	1.1899	0.3923	1.7354	4.4002	0.0000	0.0109
750	1.2640	0.5557	1.4247	2.7655	0.0000	0.0114
1000	1.3294	0.7069	1.2017	1.9569	0.0000	0.0123
1250	1.3888	0.8488	1.0359	1.4809	0.0000	0.0134
1500	1.4427	0.9814	0.9116	1.1741	0.0000	0.0151
1750	1.4909	1.1030	0.8185	0.9667	0.0000	0.0172
2000	1.5335	1.2150	0.7486	0.8232	0.0001	0.0198
2250	1.5709	1.3150	0.6958	0.7228	0.0007	0.0228
2500	1.6039	1.4060	0.6556	0.6523	0.0022	0.0262
2750	1.6328	1.4890	0.6248	0.6028	0.0052	0.0298
3000	1.6581	1.5630	0.6010	0.5684	0.0099	0.0338
3250	1.6802	1.6300	0.5828	0.5451	0.0166	0.0382
3500	1.6994	1.6900	0.5688	0.5302	0.0252	0.0433
3750	1.7160	1.7440	0.5582	0.5217	0.0355	0.0493
4000	1.7304	1.7930	0.5500	0.5182	0.0472	0.0563
4250	1.7432	1.8370	0.5437	0.5185	0.0601	0.0645
4500	1.7546	1.8780	0.5386	0.5218	0.0740	0.0742
4750	1.7651	1.9170	0.5344	0.5273	0.0884	0.0855
5000	1.7750	1.9540	0.5309	0.5344	0.1033	0.0983
5250	1.7846	1.9900	0.5278	0.5428	0.1184	0.1129
5500	1.7941	2.0250	0.5248	0.5520	0.1335	0.1290
5750	1.8038	2.0610	0.5220	0.5618	0.1487	0.1467
6000	1.8141	2.0980	0.5191	0.5722	0.1638	0.1658
6250	1.8253	2.1370	0.5159	0.5828	0.1789	0.1862
6500	1.8379	2.1790	0.5124	0.5939	0.1939	0.2078
7000	1.8692	2.2800	0.5032	0.6172	0.2244	0.2545
7500	1.9161	2.4200	0.4888	0.6439	0.2576	0.3074
8000	2.0122	2.6870	0.4570	0.6840	0.3041	0.3776
8055.19	2.0355	2.7490	0.4490	0.6920	0.3129	0.3898
9000	2.0189	2.7490	0.4836	0.6858	0.3129	0.4217
10000	2.0033	2.7490	0.5199	0.6800	0.3129	0.4553
11000	1.9892	2.7490	0.5558	0.6748	0.3129	0.4886
11500	1.9827	2.7490	0.5736	0.6724	0.3129	0.5052
11850	1.9783	2.7490	0.5860	0.6707	0.3129	0.5168
12000	1.9765	2.7490	0.5914	0.6701	0.3129	0.5217

Single-Stage Flash Black-Oil Tables – SLB-1.18-T=35F-SSF

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	μo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	μg(cp)
100	1.0246	0.0630	2.9607	24.2280	0.0000	0.0102
250	1.0906	0.1906	2.3855	9.3428	0.0000	0.0104
500	1.1741	0.3647	1.8829	4.4036	0.0000	0.0109
750	1.2418	0.5159	1.5582	2.7687	0.0000	0.0114
1000	1.3018	0.6559	1.3222	1.9601	0.0000	0.0122
1250	1.3564	0.7874	1.1448	1.4843	0.0000	0.0134
1500	1.4060	0.9104	1.0104	1.1779	0.0000	0.0150
1750	1.4506	1.0240	0.9084	0.9708	0.0000	0.0171
2000	1.4907	1.1290	0.8308	0.8276	0.0001	0.0196
2250	1.5265	1.2250	0.7710	0.7274	0.0006	0.0225
2500	1.5588	1.3140	0.7242	0.6567	0.0020	0.0257
2750	1.5880	1.3960	0.6871	0.6067	0.0047	0.0292
3000	1.6147	1.4720	0.6572	0.5715	0.0089	0.0329
3250	1.6391	1.5440	0.6329	0.5470	0.0148	0.0370
3500	1.6615	1.6110	0.6130	0.5306	0.0223	0.0416
3750	1.6823	1.6730	0.5965	0.5205	0.0313	0.0469
4000	1.7017	1.7330	0.5824	0.5153	0.0418	0.0531
4250	1.7202	1.7910	0.5704	0.5140	0.0534	0.0604
4500	1.7380	1.8470	0.5597	0.5157	0.0662	0.0690
4750	1.7555	1.9020	0.5500	0.5200	0.0798	0.0791
5000	1.7729	1.9570	0.5410	0.5263	0.0943	0.0910
5250	1.7907	2.0120	0.5325	0.5342	0.1094	0.1047
5500	1.8093	2.0700	0.5241	0.5437	0.1252	0.1206
5750	1.8290	2.1300	0.5157	0.5544	0.1416	0.1387
6000	1.8504	2.1960	0.5069	0.5663	0.1587	0.1592
6250	1.8746	2.2670	0.4974	0.5794	0.1765	0.1824
6500	1.9027	2.3490	0.4866	0.5940	0.1955	0.2085
7000	1.9835	2.5760	0.4569	0.6300	0.2398	0.2731
7311.43	2.0894	2.8580	0.4195	0.6668	0.2820	0.3344
7500	2.0854	2.8580	0.4267	0.6654	0.2820	0.3406
8000	2.0752	2.8580	0.4458	0.6616	0.2820	0.3569
9000	2.0566	2.8580	0.4838	0.6549	0.2820	0.3897
10000	2.0401	2.8580	0.5215	0.6489	0.2820	0.4224
11000	2.0253	2.8580	0.5589	0.6436	0.2820	0.4550
11500	2.0185	2.8580	0.5774	0.6411	0.2820	0.4713
11850	2.0139	2.8580	0.5904	0.6395	0.2820	0.4826
12000	2.0120	2.8580	0.5959	0.6388	0.2820	0.4875

Single-Stage Flash Black-Oil Tables – Intertek-T=35F-SSF

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	μo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	μg(cp)
100	1.0266	0.0672	2.7983	24.2260	0.0000	0.0102
250	1.0968	0.2021	2.2327	9.3426	0.0000	0.0104
500	1.1859	0.3868	1.7456	4.4045	0.0000	0.0109
750	1.2590	0.5486	1.4330	2.7700	0.0000	0.0115
1000	1.3244	0.6999	1.2065	1.9616	0.0000	0.0123
1250	1.3847	0.8436	1.0366	1.4858	0.0000	0.0134
1500	1.4404	0.9798	0.9079	1.1791	0.0000	0.0150
1750	1.4913	1.1080	0.8102	0.9714	0.0000	0.0171
2000	1.5376	1.2260	0.7358	0.8272	0.0001	0.0197
2250	1.5794	1.3360	0.6787	0.7258	0.0006	0.0227
2500	1.6171	1.4380	0.6345	0.6542	0.0020	0.0260
2750	1.6511	1.5310	0.6000	0.6037	0.0050	0.0297
3000	1.6816	1.6170	0.5731	0.5685	0.0101	0.0339
3250	1.7088	1.6960	0.5520	0.5450	0.0175	0.0386
3500	1.7329	1.7680	0.5356	0.5306	0.0273	0.0442
3750	1.7543	1.8330	0.5229	0.5234	0.0396	0.0510
4000	1.7733	1.8930	0.5129	0.5222	0.0540	0.0594
4250	1.7905	1.9480	0.5049	0.5256	0.0705	0.0699
4500	1.8066	2.0010	0.4982	0.5328	0.0885	0.0826
4750	1.8222	2.0520	0.4922	0.5429	0.1078	0.0981
5000	1.8379	2.1030	0.4866	0.5552	0.1280	0.1164
5250	1.8544	2.1560	0.4809	0.5693	0.1489	0.1376
5500	1.8727	2.2140	0.4748	0.5848	0.1705	0.1619
5750	1.8938	2.2780	0.4678	0.6015	0.1927	0.1892
6000	1.9199	2.3550	0.4591	0.6198	0.2159	0.2197
6250	1.9543	2.4520	0.4474	0.6403	0.2411	0.2543
6500	2.0067	2.5940	0.4296	0.6655	0.2708	0.2957
6736.29	2.1469	2.9520	0.3827	0.7132	0.3239	0.3652
7000	2.1406	2.9520	0.3925	0.7110	0.3239	0.3747
7500	2.1293	2.9520	0.4110	0.7072	0.3239	0.3928
8000	2.1187	2.9520	0.4295	0.7035	0.3239	0.4107
9000	2.0994	2.9520	0.4664	0.6970	0.3239	0.4466
10000	2.0823	2.9520	0.5031	0.6911	0.3239	0.4823
11000	2.0669	2.9520	0.5395	0.6859	0.3239	0.5177
11500	2.0599	2.9520	0.5575	0.6835	0.3239	0.5353
11850	2.0551	2.9520	0.5701	0.6819	0.3239	0.5476
12000	2.0531	2.9520	0.5755	0.6812	0.3239	0.5529

Oceanic Proxy Five-Stage Flash Black-Oil Tables – CL68379-Texit=130F-T=243F

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	μo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	μg(cp)
100	1.0632	0.0087	1.7220	36.7646	0.0487	0.0128
250	1.0820	0.0328	1.4630	14.0084	0.0167	0.0132
500	1.1130	0.0828	1.1790	6.7656	0.0053	0.0136
750	1.1432	0.1363	0.9900	4.4180	0.0039	0.0140
1000	1.1743	0.1936	0.8500	3.2597	0.0039	0.0144
1250	1.2061	0.2539	0.7400	2.5740	0.0047	0.0149
1500	1.2385	0.3166	0.6520	2.1239	0.0062	0.0156
1750	1.2714	0.3816	0.5790	1.8080	0.0082	0.0163
2000	1.3057	0.4497	0.5180	1.5760	0.0108	0.0172
2250	1.3411	0.5208	0.4660	1.3998	0.0141	0.0182
2500	1.3775	0.5946	0.4220	1.2626	0.0180	0.0194
2750	1.4150	0.6713	0.3830	1.1537	0.0227	0.0207
3000	1.4540	0.7516	0.3500	1.0661	0.0281	0.0222
3250	1.4942	0.8349	0.3210	0.9949	0.0344	0.0238
3500	1.5354	0.9212	0.2960	0.9367	0.0418	0.0256
3750	1.5777	1.0105	0.2740	0.8890	0.0503	0.0277
4000	1.6208	1.1025	0.2550	0.8503	0.0602	0.0300
4250	1.6645	1.1969	0.2380	0.8192	0.0717	0.0326
4500	1.7085	1.2930	0.2240	0.7951	0.0854	0.0356
4750	1.7521	1.3898	0.2110	0.7775	0.1016	0.0391
5000	1.7947	1.4861	0.2010	0.7666	0.1210	0.0433
5250	1.8356	1.5806	0.1920	0.7625	0.1443	0.0486
5500	1.8746	1.6729	0.1840	0.7656	0.1722	0.0553
5750	1.9135	1.7658	0.1780	0.7760	0.2047	0.0640
6000	1.9573	1.8685	0.1710	0.7937	0.2420	0.0753
6250	2.0182	2.0034	0.1620	0.8199	0.2857	0.0900
6500	2.1472	2.2645	0.1460	0.8665	0.3497	0.1135
6553.9	2.2387	2.4372	0.1350	0.8934	0.3821	0.1253
7000	2.2117	2.4372	0.1440	0.8820	0.3821	0.1330
7500	2.1845	2.4372	0.1530	0.8705	0.3821	0.1417
8000	2.1598	2.4372	0.1620	0.8602	0.3821	0.1506
9000	2.1168	2.4372	0.1820	0.8422	0.3821	0.1689
10000	2.0804	2.4372	0.2020	0.8270	0.3821	0.1878
11000	2.0491	2.4372	0.2230	0.8140	0.3821	0.2072
11500	2.0350	2.4372	0.2330	0.8082	0.3821	0.2171
11850	2.0257	2.4372	0.2410	0.8043	0.3821	0.2241
12000	2.0218	2.4372	0.2440	0.8027	0.3821	0.2271

Oceanic Proxy Five-Stage Flash Black-Oil Tables – CL68379-Texit=210F-T=243F

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	μo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	μg(cp)
100	1.0632	0.0087	1.7220	36.1495	0.0337	0.0128
250	1.0820	0.0328	1.4630	13.9168	0.0111	0.0132
500	1.1130	0.0828	1.1790	6.7629	0.0050	0.0136
750	1.1432	0.1363	0.9900	4.4180	0.0039	0.0140
1000	1.1743	0.1936	0.8500	3.2595	0.0039	0.0144
1250	1.2061	0.2539	0.7400	2.5731	0.0044	0.0149
1500	1.2385	0.3166	0.6520	2.1219	0.0054	0.0156
1750	1.2714	0.3816	0.5790	1.8050	0.0068	0.0163
2000	1.3057	0.4497	0.5180	1.5718	0.0085	0.0172
2250	1.3411	0.5208	0.4660	1.3945	0.0108	0.0182
2500	1.3790	0.5964	0.4220	1.2564	0.0138	0.0194
2750	1.4188	0.6762	0.3830	1.1469	0.0176	0.0207
3000	1.4597	0.7590	0.3500	1.0588	0.0221	0.0222
3250	1.5018	0.8451	0.3210	0.9873	0.0277	0.0238
3500	1.5451	0.9344	0.2960	0.9288	0.0342	0.0256
3750	1.5895	1.0269	0.2740	0.8810	0.0420	0.0277
4000	1.6349	1.1224	0.2550	0.8420	0.0512	0.0300
4250	1.6810	1.2204	0.2380	0.8108	0.0622	0.0326
4500	1.7274	1.3204	0.2240	0.7865	0.0752	0.0356
4750	1.7736	1.4213	0.2110	0.7689	0.0909	0.0391
5000	1.8187	1.5219	0.2010	0.7578	0.1098	0.0433
5250	1.8622	1.6207	0.1920	0.7536	0.1326	0.0486
5500	1.9039	1.7175	0.1840	0.7565	0.1600	0.0553
5750	1.9454	1.8151	0.1780	0.7668	0.1921	0.0640
6000	1.9923	1.9231	0.1710	0.7843	0.2290	0.0753
6250	2.0575	2.0654	0.1620	0.8102	0.2724	0.0900
6500	2.1955	2.3420	0.1460	0.8564	0.3358	0.1135
6553.9	2.2935	2.5257	0.1350	0.8831	0.3679	0.1253
7000	2.2659	2.5257	0.1440	0.8719	0.3679	0.1330
7500	2.2379	2.5257	0.1530	0.8605	0.3679	0.1417
8000	2.2127	2.5257	0.1620	0.8503	0.3679	0.1506
9000	2.1686	2.5257	0.1820	0.8325	0.3679	0.1689
10000	2.1313	2.5257	0.2020	0.8175	0.3679	0.1878
11000	2.0993	2.5257	0.2230	0.8046	0.3679	0.2072
11500	2.0848	2.5257	0.2330	0.7989	0.3679	0.2171
11850	2.0753	2.5257	0.2410	0.7950	0.3679	0.2241
12000	2.0713	2.5257	0.2440	0.7935	0.3679	0.2271

Oceanic Proxy Five-Stage Flash Black-Oil Tables – CL68508-Texit=130F-T=243F

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	µo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	µg(cp)
100	1.0633	0.0088	1.7430	36.7452	0.0481	0.0128
250	1.0823	0.0329	1.4770	14.0085	0.0167	0.0132
500	1.1135	0.0831	1.1860	6.7656	0.0054	0.0136
750	1.1440	0.1369	0.9930	4.4175	0.0039	0.0140
1000	1.1754	0.1946	0.8500	3.2591	0.0039	0.0144
1250	1.2074	0.2553	0.7390	2.5734	0.0048	0.0149
1500	1.2401	0.3185	0.6500	2.1232	0.0062	0.0156
1750	1.2734	0.3841	0.5770	1.8074	0.0082	0.0163
2000	1.3080	0.4527	0.5150	1.5754	0.0109	0.0172
2250	1.3438	0.5244	0.4630	1.3992	0.0142	0.0182
2500	1.3805	0.5987	0.4190	1.2620	0.0181	0.0194
2750	1.4183	0.6760	0.3810	1.1532	0.0228	0.0207
3000	1.4576	0.7568	0.3480	1.0657	0.0283	0.0222
3250	1.4980	0.8405	0.3190	0.9946	0.0346	0.0238
3500	1.5395	0.9272	0.2940	0.9364	0.0420	0.0257
3750	1.5818	1.0168	0.2720	0.8889	0.0505	0.0277
4000	1.6249	1.1089	0.2530	0.8502	0.0603	0.0300
4250	1.6685	1.2030	0.2370	0.8192	0.0718	0.0326
4500	1.7120	1.2985	0.2230	0.7950	0.0853	0.0356
4750	1.7549	1.3942	0.2110	0.7774	0.1013	0.0390
5000	1.7963	1.4886	0.2010	0.7662	0.1203	0.0432
5250	1.8356	1.5802	0.1920	0.7616	0.1428	0.0483
5500	1.8722	1.6682	0.1850	0.7637	0.1693	0.0548
5750	1.9074	1.7547	0.1800	0.7725	0.1998	0.0630
6000	1.9452	1.8464	0.1740	0.7876	0.2341	0.0733
6250	1.9941	1.9593	0.1670	0.8093	0.2729	0.0863
6500	2.0772	2.1363	0.1550	0.8423	0.3217	0.1043
6636.9	2.1876	2.3534	0.1420	0.8782	0.3675	0.1215
7000	2.1669	2.3534	0.1490	0.8690	0.3675	0.1274
7500	2.1409	2.3534	0.1580	0.8573	0.3675	0.1358
8000	2.1174	2.3534	0.1680	0.8469	0.3675	0.1443
9000	2.0763	2.3534	0.1880	0.8287	0.3675	0.1618
10000	2.0415	2.3534	0.2090	0.8134	0.3675	0.1799
11000	2.0116	2.3534	0.2300	0.8004	0.3675	0.1985
11500	1.9981	2.3534	0.2410	0.7945	0.3675	0.2080
11850	1.9891	2.3534	0.2490	0.7906	0.3675	0.2147
12000	1.9854	2.3534	0.2520	0.7890	0.3675	0.2176

Oceanic Proxy Five-Stage Flash Black-Oil Tables – CL68508-Texit=210F-T=243F

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	µo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	µg(cp)
100	1.0633	0.0088	1.7430	36.1355	0.0333	0.0128
250	1.0823	0.0329	1.4770	13.9169	0.0111	0.0132
500	1.1135	0.0831	1.1860	6.7627	0.0050	0.0136
750	1.1440	0.1369	0.9930	4.4175	0.0039	0.0140
1000	1.1754	0.1946	0.8500	3.2589	0.0039	0.0144
1250	1.2074	0.2553	0.7390	2.5724	0.0045	0.0149
1500	1.2401	0.3185	0.6500	2.1213	0.0054	0.0156
1750	1.2734	0.3841	0.5770	1.8043	0.0068	0.0163
2000	1.3080	0.4527	0.5150	1.5711	0.0086	0.0172
2250	1.3438	0.5244	0.4630	1.3938	0.0109	0.0182
2500	1.3820	0.6006	0.4190	1.2559	0.0139	0.0194
2750	1.4221	0.6809	0.3810	1.1464	0.0177	0.0207
3000	1.4634	0.7643	0.3480	1.0584	0.0223	0.0222
3250	1.5058	0.8509	0.3190	0.9869	0.0278	0.0238
3500	1.5493	0.9407	0.2940	0.9285	0.0344	0.0257
3750	1.5938	1.0334	0.2720	0.8807	0.0422	0.0277
4000	1.6392	1.1290	0.2530	0.8419	0.0513	0.0300
4250	1.6852	1.2269	0.2370	0.8107	0.0622	0.0326
4500	1.7312	1.3262	0.2230	0.7865	0.0751	0.0356
4750	1.7766	1.4260	0.2110	0.7687	0.0905	0.0390
5000	1.8206	1.5246	0.2010	0.7574	0.1090	0.0432
5250	1.8623	1.6204	0.1920	0.7527	0.1311	0.0483
5500	1.9014	1.7127	0.1850	0.7547	0.1572	0.0548
5750	1.9391	1.8035	0.1800	0.7633	0.1873	0.0630
6000	1.9796	1.9000	0.1740	0.7782	0.2212	0.0733
6250	2.0320	2.0190	0.1670	0.7998	0.2596	0.0863
6500	2.1209	2.2061	0.1550	0.8325	0.3080	0.1043
6636.9	2.2391	2.4366	0.1420	0.8681	0.3534	0.1215
7000	2.2180	2.4366	0.1490	0.8589	0.3534	0.1274
7500	2.1914	2.4366	0.1580	0.8474	0.3534	0.1358
8000	2.1673	2.4366	0.1680	0.8371	0.3534	0.1443
9000	2.1253	2.4366	0.1880	0.8191	0.3534	0.1618
10000	2.0896	2.4366	0.2090	0.8040	0.3534	0.1799
11000	2.0590	2.4366	0.2300	0.7911	0.3534	0.1985
11500	2.0451	2.4366	0.2410	0.7853	0.3534	0.2080
11850	2.0360	2.4366	0.2490	0.7814	0.3534	0.2147
12000	2.0322	2.4366	0.2520	0.7798	0.3534	0.2176

Oceanic Proxy Five-Stage Flash Black-Oil Tables – SLB-1.18-Texit=130F-T=243F

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	μo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	μg(cp)
100	1.0632	0.0088	1.7830	36.6921	0.0467	0.0128
250	1.0814	0.0327	1.5210	13.9976	0.0156	0.0132
500	1.1115	0.0818	1.2350	6.7700	0.0051	0.0136
750	1.1408	0.1342	1.0420	4.4235	0.0038	0.0140
1000	1.1710	0.1903	0.8970	3.2649	0.0039	0.0144
1250	1.2018	0.2492	0.7840	2.5788	0.0046	0.0149
1500	1.2333	0.3105	0.6910	2.1283	0.0060	0.0155
1750	1.2653	0.3741	0.6140	1.8121	0.0079	0.0163
2000	1.2986	0.4407	0.5500	1.5797	0.0103	0.0171
2250	1.3331	0.5103	0.4940	1.4031	0.0134	0.0181
2500	1.3686	0.5825	0.4470	1.2655	0.0171	0.0192
2750	1.4053	0.6578	0.4060	1.1563	0.0215	0.0205
3000	1.4435	0.7367	0.3700	1.0682	0.0266	0.0219
3250	1.4830	0.8188	0.3390	0.9966	0.0326	0.0235
3500	1.5238	0.9043	0.3120	0.9379	0.0395	0.0253
3750	1.5659	0.9932	0.2880	0.8897	0.0474	0.0273
4000	1.6094	1.0856	0.2670	0.8503	0.0566	0.0295
4250	1.6541	1.1816	0.2480	0.8185	0.0674	0.0319
4500	1.7001	1.2810	0.2310	0.7933	0.0799	0.0347
4750	1.7473	1.3839	0.2170	0.7746	0.0948	0.0380
5000	1.7957	1.4902	0.2040	0.7620	0.1126	0.0419
5250	1.8456	1.6004	0.1930	0.7560	0.1341	0.0468
5500	1.8979	1.7164	0.1820	0.7571	0.1603	0.0530
5750	1.9556	1.8435	0.1720	0.7664	0.1926	0.0614
6000	2.0273	1.9973	0.1610	0.7857	0.2328	0.0731
6250	2.1434	2.2332	0.1460	0.8210	0.2883	0.0912
6363.4	2.2612	2.4583	0.1320	0.8535	0.3310	0.1061
6500	2.2521	2.4583	0.1350	0.8495	0.3310	0.1082
7000	2.2213	2.4583	0.1440	0.8359	0.3310	0.1157
7500	2.1937	2.4583	0.1540	0.8238	0.3310	0.1233
8000	2.1687	2.4583	0.1640	0.8130	0.3310	0.1312
9000	2.1251	2.4583	0.1840	0.7943	0.3310	0.1473
10000	2.0883	2.4583	0.2050	0.7786	0.3310	0.1641
11000	2.0566	2.4583	0.2260	0.7652	0.3310	0.1815
11500	2.0424	2.4583	0.2370	0.7592	0.3310	0.1903
11850	2.0330	2.4583	0.2450	0.7552	0.3310	0.1966
12000	2.0290	2.4583	0.2480	0.7536	0.3310	0.1993

Oceanic Proxy Five-Stage Flash Black-Oil Tables – SLB-1.18-Texit=210F-T=243F

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	μo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	μg(cp)
100	1.0632	0.0088	1.7830	36.1140	0.0327	0.0128
250	1.0814	0.0327	1.5210	13.9184	0.0107	0.0132
500	1.1115	0.0818	1.2350	6.7684	0.0049	0.0136
750	1.1408	0.1342	1.0420	4.4235	0.0038	0.0140
1000	1.1710	0.1903	0.8970	3.2648	0.0038	0.0144
1250	1.2018	0.2492	0.7840	2.5781	0.0044	0.0149
1500	1.2333	0.3105	0.6910	2.1267	0.0053	0.0155
1750	1.2653	0.3741	0.6140	1.8095	0.0066	0.0163
2000	1.2986	0.4407	0.5500	1.5760	0.0084	0.0171
2250	1.3331	0.5103	0.4940	1.3984	0.0106	0.0181
2500	1.3700	0.5842	0.4470	1.2601	0.0134	0.0192
2750	1.4088	0.6623	0.4060	1.1502	0.0170	0.0205
3000	1.4488	0.7436	0.3700	1.0617	0.0213	0.0219
3250	1.4901	0.8283	0.3390	0.9897	0.0265	0.0235
3500	1.5328	0.9165	0.3120	0.9307	0.0326	0.0253
3750	1.5769	1.0084	0.2880	0.8823	0.0399	0.0273
4000	1.6225	1.1041	0.2670	0.8427	0.0484	0.0295
4250	1.6695	1.2036	0.2480	0.8107	0.0586	0.0319
4500	1.7179	1.3068	0.2310	0.7854	0.0706	0.0347
4750	1.7677	1.4138	0.2170	0.7665	0.0849	0.0380
5000	1.8188	1.5246	0.2040	0.7539	0.1022	0.0419
5250	1.8716	1.6397	0.1930	0.7477	0.1232	0.0468
5500	1.9270	1.7610	0.1820	0.7487	0.1490	0.0530
5750	1.9884	1.8944	0.1720	0.7578	0.1808	0.0614
6000	2.0647	2.0561	0.1610	0.7768	0.2206	0.0731
6250	2.1885	2.3051	0.1460	0.8118	0.2755	0.0912
6363.4	2.3144	2.5440	0.1320	0.8440	0.3179	0.1061
6500	2.3051	2.5440	0.1350	0.8400	0.3179	0.1082
7000	2.2736	2.5440	0.1440	0.8266	0.3179	0.1157
7500	2.2453	2.5440	0.1540	0.8147	0.3179	0.1233
8000	2.2197	2.5440	0.1640	0.8039	0.3179	0.1312
9000	2.1751	2.5440	0.1840	0.7854	0.3179	0.1473
10000	2.1374	2.5440	0.2050	0.7699	0.3179	0.1641
11000	2.1050	2.5440	0.2260	0.7567	0.3179	0.1815
11500	2.0905	2.5440	0.2370	0.7507	0.3179	0.1903
11850	2.0808	2.5440	0.2450	0.7468	0.3179	0.1966
12000	2.0768	2.5440	0.2480	0.7452	0.3179	0.1993

Oceanic Proxy Five-Stage Flash Black-Oil Tables – Intertek-Texit=130F-T=243F

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	µo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	µg(cp)
100	1.0649	0.0089	1.7480	37.0328	0.0563	0.0128
250	1.0847	0.0337	1.4510	14.0433	0.0199	0.0131
500	1.1169	0.0853	1.1510	6.7646	0.0062	0.0136
750	1.1483	0.1405	0.9590	4.4138	0.0041	0.0140
1000	1.1805	0.1996	0.8190	3.2563	0.0042	0.0144
1250	1.2135	0.2618	0.7100	2.5713	0.0051	0.0150
1500	1.2471	0.3266	0.6230	2.1215	0.0066	0.0156
1750	1.2815	0.3940	0.5520	1.8060	0.0088	0.0164
2000	1.3173	0.4647	0.4920	1.5742	0.0116	0.0172
2250	1.3545	0.5388	0.4410	1.3982	0.0152	0.0183
2500	1.3928	0.6159	0.3980	1.2612	0.0194	0.0195
2750	1.4326	0.6964	0.3610	1.1526	0.0245	0.0208
3000	1.4742	0.7811	0.3290	1.0653	0.0304	0.0223
3250	1.5173	0.8694	0.3010	0.9944	0.0372	0.0240
3500	1.5618	0.9614	0.2760	0.9366	0.0452	0.0259
3750	1.6078	1.0572	0.2550	0.8896	0.0545	0.0281
4000	1.6553	1.1569	0.2360	0.8515	0.0654	0.0305
4250	1.7041	1.2602	0.2200	0.8214	0.0782	0.0333
4500	1.7540	1.3670	0.2060	0.7986	0.0935	0.0365
4750	1.8048	1.4768	0.1930	0.7829	0.1121	0.0404
5000	1.8563	1.5893	0.1820	0.7746	0.1348	0.0452
5250	1.9089	1.7052	0.1730	0.7746	0.1629	0.0515
5500	1.9649	1.8283	0.1640	0.7840	0.1980	0.0600
5750	2.0320	1.9728	0.1540	0.8047	0.2420	0.0721
6000	2.1419	2.1946	0.1410	0.8428	0.3019	0.0908
6128.9	2.3074	2.5021	0.1230	0.8901	0.3629	0.1112
6250	2.2986	2.5021	0.1260	0.8864	0.3629	0.1131
6500	2.2812	2.5021	0.1300	0.8792	0.3629	0.1172
7000	2.2493	2.5021	0.1390	0.8659	0.3629	0.1253
7500	2.2207	2.5021	0.1480	0.8541	0.3629	0.1336
8000	2.1948	2.5021	0.1580	0.8435	0.3629	0.1421
9000	2.1499	2.5021	0.1770	0.8250	0.3629	0.1596
10000	2.1119	2.5021	0.1970	0.8096	0.3629	0.1777
11000	2.0793	2.5021	0.2180	0.7963	0.3629	0.1964
11500	2.0646	2.5021	0.2280	0.7903	0.3629	0.2060
11850	2.0549	2.5021	0.2360	0.7864	0.3629	0.2127
12000	2.0509	2.5021	0.2390	0.7848	0.3629	0.2156

Oceanic Proxy Five-Stage Flash Black-Oil Tables – Intertek-Texit=210F-T=243F

p(psia)	Bo(RB/STB)	Rs(Mscf/STB)	μo(cp)	Bg(RB/Mscf)	rs(STB/Mscf)	μg(cp)
100	1.0649	0.0089	1.7480	36.3289	0.0391	0.0128
250	1.0847	0.0337	1.4510	13.9216	0.0123	0.0131
500	1.1169	0.0853	1.1510	6.7581	0.0054	0.0136
750	1.1483	0.1405	0.9590	4.4136	0.0041	0.0140
1000	1.1805	0.1996	0.8190	3.2558	0.0040	0.0144
1250	1.2135	0.2618	0.7100	2.5698	0.0046	0.0150
1500	1.2471	0.3266	0.6230	2.1190	0.0056	0.0156
1750	1.2815	0.3940	0.5520	1.8022	0.0070	0.0164
2000	1.3173	0.4647	0.4920	1.5691	0.0089	0.0172
2250	1.3545	0.5388	0.4410	1.3920	0.0114	0.0183
2500	1.3945	0.6180	0.3980	1.2541	0.0146	0.0195
2750	1.4369	0.7019	0.3610	1.1449	0.0186	0.0208
3000	1.4807	0.7895	0.3290	1.0570	0.0235	0.0223
3250	1.5260	0.8809	0.3010	0.9858	0.0295	0.0240
3500	1.5729	0.9764	0.2760	0.9278	0.0367	0.0259
3750	1.6214	1.0760	0.2550	0.8805	0.0452	0.0281
4000	1.6716	1.1797	0.2360	0.8423	0.0554	0.0305
4250	1.7232	1.2875	0.2200	0.8121	0.0675	0.0333
4500	1.7761	1.3990	0.2060	0.7891	0.0823	0.0365
4750	1.8302	1.5140	0.1930	0.7733	0.1002	0.0404
5000	1.8851	1.6321	0.1820	0.7650	0.1224	0.0452
5250	1.9413	1.7540	0.1730	0.7648	0.1500	0.0515
5500	2.0012	1.8838	0.1640	0.7740	0.1846	0.0600
5750	2.0733	2.0367	0.1540	0.7945	0.2280	0.0721
6000	2.1914	2.2724	0.1410	0.8323	0.2874	0.0908
6128.9	2.3697	2.6012	0.1230	0.8791	0.3479	0.1112
6250	2.3606	2.6012	0.1260	0.8755	0.3479	0.1131
6500	2.3427	2.6012	0.1300	0.8684	0.3479	0.1172
7000	2.3100	2.6012	0.1390	0.8553	0.3479	0.1253
7500	2.2806	2.6012	0.1480	0.8436	0.3479	0.1336
8000	2.2540	2.6012	0.1580	0.8331	0.3479	0.1421
9000	2.2079	2.6012	0.1770	0.8149	0.3479	0.1596
10000	2.1689	2.6012	0.1970	0.7996	0.3479	0.1777
11000	2.1354	2.6012	0.2180	0.7865	0.3479	0.1964
11500	2.1203	2.6012	0.2280	0.7806	0.3479	0.2060
11850	2.1104	2.6012	0.2360	0.7768	0.3479	0.2127
12000	2.1062	2.6012	0.2390	0.7751	0.3479	0.2156

Appendix H – Author CV

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Curtis Hays Whitson is professor of petroleum engineering at the Norwegian University of Science and Technology (NTNU), Dept. of Petroleum Engineering & Applied Geophysics; he founded the international consulting company PERA in 1988, as well as Petrostreamz in 2006, a petroleum software company dealing with optimized IAM.

Whitson researches and teaches both university and industry courses on petroleum phase behavior (PVT), gas-based EOR, gas condensate reservoirs, integrated-model optimization, petroleum-streams management, liquid-loading gas well performance, and liquids-rich shale well optimization. He has co-authored two books: **Well Performance** (Golan and Whitson) and the SPE monograph **Phase Behavior** (Whitson and Brulé), co-authored some 100 papers, and has written three chapters of edited books.

Whitson consults extensively for the petroleum industry through *PERA*, a specialty consulting company he founded in 1988. *PERA* staff consult on *compositionally-sensitive reservoir processes* for most major oil companies worldwide. Whitson is also CTO at *Petrostreamz* which has developed the new-generation software *Pipe-It* for optimized IAM.

Whitson has a B.Sc. degree in petroleum engineering from Stanford University and a PhD degree from the Norwegian Institute of Technology (now NTNU). He is an honorary member of the Society of Petroleum Engineers (SPE), and he received twice the Cedric K. Fergusson award (as co-author with Øivind Fevang, 1997 and Lars Høier, 2001), and the Anthony F. Lucas Gold Medal (2011) from the SPE. He received the 2010 Excellence in Research Award from Statoil for his contributions to gas-based EOR and fluid characterization. Whitson was elected into the Norwegian Academy of Technological Sciences (NTVA) in 2012.

Profession Experience

Professor	NTH / NTNU	1987-2013
Founder & President	Petroleum Engineering Reservoir Analysts, PERA AS	1988-2013
Founder & CTO	Petrostreamz AS	2006-2013
Consultant	Independent / PERA / Petrostreamz	1980-2013
Invited Keynote Speaker (~10)	PVT / EOR / Gas Condensate worldwide	1988-2013
Industry One-Week Courses (~100)	PVT / EOR / Gas Condensate worldwide	1988-2013
Specialist Training Consultant	Phillips Petroleum Company	1990-1991
Lecturer	NTH / U. Stavanger	1980-1986
Graduate Assistant	NTH / NTNU	1978-1980

Professional Awards

Norwegian Academy of Science	NTVA	2012
Anthony F. Lucas Gold Medal	SPE	2011
Excellence in Research Award	Statoil	2010
Best Paper Award	SPE Reservoir Engineering	1996
Cedric K. Fergusson Award	SPE (jointly with Øivind Fevang)	1997
Cedric K. Fergusson Award	SPE (jointly with Lars Høier)	2001

Books Published

Well Performance	IHRDC / Prentice-Hall (2 ed.)	1986
Phase Behavior	SPE Monograph	2000
Chapters in Edited Books (3)	AAPG / AIChE / SPE	1992-2008

Graduate Students & Research

PhD Students (~20)	NTH / NTNU	1988-2011
MS Students (~125)	NTH / NTNU	1980-2011

PUBLICATIONS

1. Johnsen, S.G. and Whitson, C.H.: "On the Loss of Injectant and Apparent Dispersivity in Single-Well Push-Pull Tests Influenced by Natural Drift", Transport in Porous Media (2011)86:505-508.
2. Juell, A., Whitson, C.H., and Hoda, M.F.: "Model-Based Integration and Optimization – Gas Cycling Benchmark", SPEJ (Sept. 2010), 646-657.
3. Johnsen, S.G. and Whitson, C.H.: "Analytical Treatment of a Push–Pull "Echo" Test," Transport in Porous Media (2009)77:399–415.
4. Whitson, C.H.: "International vs. National Oil Companies – What's the Difference?", SPE Pillars of the Industry series, TWA (2009), Vol. 5, No. 3, 9-10.
5. Coats, K.H., Whitson, C.H., and Thomas, L.K.: "Modeling Conformance as Dispersion", SPEREE (Feb. 2009), 33-47.
6. Singh, K., Fevang, O., and Whitson, C.H.: "Depletion oil recovery for systems with widely varying initial composition," *J. Petroleum Science & Engineering*, Elsevier (2005).
7. Alavian, S. Ahmad and Whitson, C.H.: "CO2 EOR Potential in Naturally-Fractured Haft Kel Field, Iran", SPEREE (Aug. 2010), 720-729.
8. Høier, L. and Whitson, C.H.: "Miscibility Variation in Compositionally Grading Reservoirs", SPEREE (Feb. 2001), 36-41.
9. Chouparavoa, E., Philp, R.P., Nagarajan, N., and Whitson: "n-Alkane Distributions in Wax Deposits vs. Temperature of Deposition", contribution to *Organic Solids in Petroleum Production*, Elsevier (2001), 1-24.
10. Chouparova, E., Vairavamurthy, A., Whitson, C.H., and Philp, R.P.: "Sulfur Speciation in Rod Wax Deposits from an Oil Producing Well, Eastern Anadarko Basin, Oklahoma: A Sulfur K-Edge XANES Spectroscopy Study", *Organic Chemistry* (2001), 1-33.
11. Whitson, C.H. and Brulé, M.R.: **Phase Behavior**, Monograph Series, Society of Petroleum Engineers (2000).
12. Fetkovich, M.J., Reese, D.E., and Whitson, C.H.: "Application of a General Material Balance for High-Pressure Gas Reservoirs," SPE Advances in Technology J. (1998).
13. Fevang, Ø. and Whitson, C.H.: "Modeling Gas Condensate Well Deliverability," *SPERE* (Nov. 1996), 221-230. Selected as best paper in SPERE 1996, and subsequently as the best peer-reviewed paper published by the SPE in 1996 as recognized by the 1997 Cedric K. Fergusson award.
14. Whitson, C.H.: "Petroleum Reservoir Fluids," article in book **Development Geology Reference Manual**, Ed. D. Morton-Thompson and A.M. Woods (1994), AAPG Methods in Exploration Series, No. 10, The American Association of Petroleum Geologists, Tulsa, 504-507.
15. Riazi, M.R., Whitson, C.H., and da Silva, F.: "Modelling of Diffusional Mass Transfer in Naturally Fractured Reservoirs," J. Pet. Science and Engineering (Feb. 1994)10, 239-253.
16. Riazi, M.R. and Whitson, C.H.: "Estimating Diffusion Coefficients of Dense Fluids," Ind. Eng. Chem. Res. (Dec. 1993)32, 3081-3088.
17. Søreide, I. and Whitson, C.H.: "Water- and NaCl Brine-Hydrocarbon Predictions with the Peng-Robinson Equation of State," *Fluid Phase Equilibria*, 77(1992)217-240.
18. Søreide, I. and Whitson, C.H.: "Discussion of a Systematic and Consistent Approach to Determine Binary Interaction Coefficients for the Peng-Robinson Equation of State," *SPERE* (May 1990), 260-261.
19. Whitson, C.H., Anderson, T.F., and Søreide, I.: "Applications of the Gamma Distribution Model to Molecular Weight and Boiling Point Data for Petroleum Fractions," *Chem. Eng. Comm.* (1990)**96**, 259.
20. Whitson, C.H. and Søgnesand, S.: "Application of the van Everdingen-Meyer Method for Analyzing Variable-Rate Well Tests," *SPEFE* (March 1990), 67-75.
21. Whitson, C.H., Anderson, T.F., and Søreide, I.: "C_{7+} Characterization of Related Equilibrium Fluids Using the Gamma Distribution," **C_{7+} Fraction Characterization**, *Advances in Thermodynamics*, Vol. 1 (1989), Mansoori, G.A., ed., Taylor and Francis, NY, 35-56.
22. Whitson, C.H. and Michelsen, M.L.: "The Negative Flash," *Fluid Phase Equilibria*, 53 (1989), 51-71.
23. Bøe, A., Skjæveland, S., and Whitson, C.H.: "Two-Phase Pressure Test Analysis," *SPEFE* (Dec. 1989), 604-610.
24. Whitson, C.H.: "Discussion of An Improved Method for the Determination of the Reservoir-Gas Specific Gravity for Retrograde Gases," *JPT* (Nov. 1989), 1216-1217.
25. Chen, Z. and Whitson, C.H.: "Further Discussions of Modifications of Welge's Method of Shock Front Location in Buckley-Leverett Problem for Nonzero Initial Condition," *SPERE* (May 1987), 260-261.
26. Golan, M. and Whitson, C.H.: **Well Performance**, International Human Resources Development Corporation, 1986; Prentice

Hall Inc., 1989 (2nd ed.); 617 pages.
27. Whitson, C.H.: "Effect of Physical Properties Estimation on Equation-of-State Predictions," *SPEJ* (Dec. 1984), 685-696.
28. Whitson, C.H.: **Topics on Phase Behavior and Flow of Petroleum Reservoir Fluids**, Dissertation for Doctor of Technology degree from the Norwegian Institute of Technology, NTH, Trondheim, Norway (August 1983).
29. Whitson, C.H.: "Characterizing Hydrocarbon Plus Fractions," *SPEJ* (Aug. 1983), 683-694.
30. Whitson, C.H. and Torp, S.B.: "Evaluating Constant Volume Depletion Data," *JPT* (March 1983), 610-620.
31. Glasø, Ø. and Whitson, C.H.: "The Accuracy of PVT Parameters Calculated From Computer Flash Separation at Pressures Less Than 1,000 psia," *JPT* (Aug. 1982), 1811-1813.

SELECTION OF PRESENTED PAPERS

1. Alavian, S. Ahmad and Whitson, C.H.: "CO2 Modeling CO2 Injection Including Diffusion in a Fractured-Chalk Experiment", SPE 135339 ATCE (Sept. 20-22, 2010).
2. Martinsen, S.Ø., Castiblanco, I., Osorio, R., and Whitson, C.H.: "Advanced Fluid Characterization of Pauto Complex, Colombia," SPE 135085 ATCE (Sept. 20-22, 2010).
3. Alavian, S. Ahmad and Whitson, C.H.: "CO2 IOR Potential in Naturally-Fractured Haft Kel Field, Iran", IPTC 10641 (Nov. 21-23, 2005); SPEREE (Aug. 2010).
4. Alavian, S. Ahmad and Whitson, C.H.: "Modeling Scale Dependence of Diffusion in Naturally Fractured Reservoirs for CO2 Injection", SPE 129666 IOR Symposium (Oct. 19-21, 2010).
5. Rahmawati, S.D., Whitson, C.H., Foss, B., and Kuntadi, A.: "Multi-Field Asset Integrated Optimization Benchmark", SPE 130768 Europec (June 14-17, 2010).
6. Alavian, S. Ahmad and Whitson, C.H.: "Modeling CO2 Injection in a Fractured Chalk Experiment", SPE 125362 (Oct. 19-21, 2009).
7. Juell, A., Whitson, C.H., and Hoda, M.F.: "Model-Based Integration and Optimization – Gas Cycling Benchmark", SPE 121252 Europec (June 8-11, 2009); SPEJ (Sept. 2010).
8. Whitson, C.H. and Kuntadi, A.: "Khuff Gas Condensate Development", IPTC 10692 (Nov. 21-23, 2005).
9. Høier, L., Cheng, N., and Whitson, C.H.: "Miscible Gas Injection in Undersaturated Gas-Oil Systems", SPE paper 90379 presented at the 2004 Annual Technical Conference & Exhibition (Sept. 26-29), Houston.
10. Coats, K.H., Whitson, C.H., and Thomas, L.K.: "Modeling Conformance as Dispersion", SPE paper 90390 presented at the 2004 Annual Technical Conference & Exhibition (Sept. 26-29), Houston; SPEREE (Feb. 2009).
11. Høier, L. and Whitson, C.H.: "Compositionally Grading – Theory and Practice", SPE paper 63085 presented at the 2000 Annual Technical Conference & Exhibition (Oct. 1-4), Dallas.
12. Høier, L. and Whitson, C.H.: "Miscibility Variation in Compositionally Grading Reservoirs", SPE paper 63087 presented at the 2000 Annual Technical Conference & Exhibition (Oct. 1-4), Dallas.
13. Fevang, Ø., Singh, K., and Whitson, C.H.: "Guidelines for Choosing Compositional and Black-Oil Models for Volatile Oil and Gas-Condensate Reservoirs", SPE paper 63087 presented at the 2000 Annual Technical Conference & Exhibition (Oct. 1-4), Dallas.
14. Smith, R.W., Bard, W.A., Lugo, C., Yemex, I., Guerini, A., Whitson, C.H., and Fevang, Ø.: "Equation of State of a Complex Fluid Column and Prediction of Contacts in Orocual Field, Venezuela", SPE paper 63088 presented at the 2000 Annual Technical Conference & Exhibition (Oct. 1-4), Dallas.
15. Whitson, C.H., Fevang, Ø., and Saevareid, A.: "Gas Condensate Relative Permeability for Well Calculations", SPE paper 56476 presented at the 1999 Annual Technical Conference & Exhibition (Oct. 3-6), Houston.
16. Saevareid, A., Whitson, C.H., and Fevang, Ø., A.: "An Engineering Approach To Measuring And Modeling Gas Condensate Relative Permeabilities", paper presented at the 1999 Society of Core Analysts Meeting (Aug. 2-4) Goldon, CO.
17. Whitson, C.H., Fevang, Ø., and Yang, T.: "Gas Condensate PVT – What's Really Important and Why?", presented at the IBC Conference "Optimisation of Gas Condensate Fields", London, Jan. 28-29, 1999.
18. Høier, L. and Whitson, C.H.: "Miscibility Variation in Compositionally Grading Reservoirs", paper SPE 49269 presented at the 1998 SPE Annual Technical Conference and Exhibition held in New Orleans, Louisiana (Sept. 27–30).
19. Fevang, Ø. and Whitson, C.H.: "Modeling Gas Condensate Well Deliverability," SPE paper 30714 presented at the 1995 Annual Technical Conference & Exhibition (Oct. 22-25), Dallas (now published).
20. Fevang, O. and Whitson, C.H.: "Accurate Insitu Compositions in Petroleum Reservoirs," paper SPE 28829 to be presented at the SPE EUROPEC Meeting, London, Oct. 1994.
21. Whitson, C.H. and Belery, P.: "Compositional Gradients in Petroleum Reservoirs," paper SPE 28000 to be presented at the U. Tulsa/SPE Centennial Petroleum Engineering Symposium, Tulsa, Aug. 29-31, 1994 (invited paper).
22. Christoffersen, K.R. and Whitson, C.H.: "Gas-Oil Capillary Pressure of Chalk at Elevated Pressures," paper SPE 26673 presented at the 1993 Annual Technical Conference and Exhibition of the Society of Petroleum Engineers, Houston, Oct. 3-6.
23. Fetkovich, M.J., Reese, D.E., and Whitson, C.H.: "Application of a General Material Balance for High-Pressure Gas Reservoirs,"

paper SPE 22921 presented at the 1991 Annual Technical Conference and Exhibition of the Society of Petroleum Engineers, Dallas, Oct. 6-9.

24. Hu, H., Whitson, C.H., and Qi, Y.: "A Study of Recovery Mechanisms in a Nitrogen Diffusion Experiment," paper presented at the European EOR Symposium, Stavanger Norway, 1990. Submitted for publication in the Society of Petroleum Engineers, paper SPE 21893.
25. Whitson, C.H. and Søreide, I.: "Equilibrium Calculations for a Gas-Oil System in a Porous Media Including Capillary Forces," (July 1989); not submitted for publication.
26. Whitson, C.H., da Silva, F., and Søreide, I.: "Simplified Compositional Formulation for Black-Oil Reservoir Simulators," SPE 18315, to be presented at the 1988 SPE Annual Meeting, Houston, TX (Oct. 2-5, 1988).
27. Austad, T., Hvidsten, J., Norvik, H., and Whitson, C.H.: "Practical Aspects of Characterizing Petroleum Fluids," Presented at the North Sea Condensate Reservoirs and Their Development conference in London, May 24-25, 1984.
28. Whitson, C.H.: "Critical Properties Estimation From an Equation of State," Presented at the SPE/DOE Fourth Symposium on Enhanced Oil Recovery held in Tulsa, OK, April 15-18, 1984; accepted for publication in *SPEJ*.
29. Whitson, C.H.: "Reservoir Well Performance and Predicting Deliverability," unsolicited SPE paper 012518 (Dec. 1983). Accepted for publication in *JPT*.
30. Whitson, C.H.: "A Family of Cubic Equations of State" (Jan. 1983); not submitted for publication.

Appendix I – PERA Company Description

PERA (Petroleum Engineering Reservoir Analysts) is a Norwegian company specializing in compositionally-sensitive reservoir processes. Our activities include:

- Solving reservoir engineering problems for compositionally-sensitive processes such as gas injection, gas condensate and volatile oil fluid systems, and reservoir-to-product value-chain optimization.
- Developing EOS and black-oil fluid characterizations for reservoir fluid systems of any complexity. Our characterization approach uses all available PVT data passing rigorous quality controls, often using thousands of measured data in the EOS model tuning.
- Designing PVT sample collection and laboratory programs. Special programs for miscible and immiscible gas injection processes.
- Conducting and supervising compositional EOS reservoir simulation studies.
- Conducting and supervising black-oil reservoir simulation of complex compositional reservoir processes (e.g. gas injection and gas condensate reservoirs).
- Simulating gas condensate well performance including accurate treatment of condensate blockage, turbulent flow, and capillary number (velocity/IFT) dependence on relative permeabilities.
- Performance monitoring of gas condensate wells.
- Special design and interpretation of gas condensate relative permeability tests for quantifying near-well blockage problems.
- Development and application of software for managing petroleum streams – Petrostreamz Pipe-It (Pipe-It).

PERA also conducts worldwide training courses in the area of PVT and Advance Phase Behavior, Gas Condensate Reservoirs, Gas-Based EOR Methods, and Liquid-Rich Shale Reservoir Development. PERA conducts industry-sponsored and in-house R&D, and we actively support graduate research at the Norwegian University of Science and Technology (NTNU).

PERA uses a suite of commercial and proprietary in-house software, including:

- *PhazeComp* – EOS-based PVT modeling.
  www.zicktech.com
- *SENSOR / ECL100, ECL300,* and other reservoir simulators.
  www.coatsengineering.com / www.slb.com
- *Pipe-It* – model integration and optimization, stream engineering and processing.
  www.petrostreamz.com
- *BOPVT* – in-house software for black-oil table generation, QC, and extrapolation.
  www.pera.no

PERA Project Summary

We have worked on a wide variety of reservoir engineering problems for a large number of oil companies around the world. Here are some of the projects, with a short description of each. Study type: **EOS**: PVT Fluid Characterization, **EOR**: Modeling Study, **MOD**: Modeling Study, **IHC**: In-house Course.

ADCO
EOS: Rumaitha, UAE (large oil miscible gas/water injection)
EOS: Bu Hassa, UAE (large oil miscible gas injection)
EOS: 3-year Core Laboratories Subcontract for all ADCO EOS modeling (2012-2014)

ADMA
IHC: PVT/EOR training courses

AGIP/ENI
EOS: Bu Attifel Libya (large oil miscible gas/water injection)
EOS/MOD: Tempa Rosa EOS & modeling study
EOS/MOD: ValDagri EOS & modeling study

Amerada Hess
EOS: Baldpate Gulf Coast (deep-water very-high-pressure near-critical gas condensate/oil)
EOS/MOD: Full-Field Reservoir Simulation Studies
EOS: Baldpate Gulf Coast (deep-water very-high-pressure near-critical gas condensate/oil)

Anadarko
EOS: Algerian Fields (gas condensate reservoirs with complex fluid/fault-block system)

ARC Resources
EOS/MOD: Liquid-Rich Shale PVT and History Matching, Montney Field, Canada

BP-Amoco-Arco
EOS/MOD: Cupiagua Columbia (giant compositional grading gas condensate reservoir)
EOS: Dalma UAE (H2S compositional grading)
EOS: Zakum Thamama UAE (miscibility study of giant oil reservoir)
EOS: Skarv-Area Fields (complete PVT/EOS study)
EOS: Valhall (complete PVT/EOS study)
EOS: North Sea Discovery (gas condensate with possible underlying oil reservoir estimation)
EOS: Gas Condensate Field Cluster Netherlands (condensate allocation issues)
EOS: Gas Condensate Well Performance/Condensate Blockage
EOS: Cupiagua Columbia (giant compositional grading gas condensate reservoir)

BHP
EOS: Algerian Fields (three lean gas condensate/oil reservoirs)
EOS: Gas Condensate Well Performance/Condensate Blockage
EOS: Algerian Fields (three lean gas condensate/oil reservoirs)

Britannia Operating License
EOS: Gas Condensate Well Performance/Condensate Blockage
EOS/MOD: Britannia, UK (large gas condensate, depletion, low-moderate permeabilities)

British Gas
EOS: Tunisia (gas condensate and oil, multiple reservoirs)

Bunduq
EOS: Uwainat UAE (saturated oil reservoir with uncertain gas cap composition estimation)
EOS: EL Bunduq Arab C&D UAE (near-critical oil with strong compositioanl grading and gas injection)

Burlington / LLE
EOS: Gas Condensate Fields North Africa (initial fluid distributions and fluid communication / EOS QC)
MOD: Gas Condensate Well Performance/Condensate Blockage
EOS: Middle-East Field (rich gas condensate reservoir with low-moderate permeability)

CNR (Canadian Natural Resources)
EOS: Baobab (biodegraded oil)

ConocoPhillips
EOS: Amauligak (biodegraded oil with compositional gradient)
EOS: Belenak Indonesia (multiple reservoir gas condensate and oil field with gas injection)
EOS: N Belut/Kerisi Indonesia (multiple reservoir gas condensate and oil field with gas injection)

EOS: Ursa Gulf Coast USA (complex low-API volatile oil / gas condensate reservoir)
EOS: Magnolia Gulf Coast USA (comlex gas condensate / volatile oil reservoirs)
EOS: Bayu USA (near-critical gas condensate)
EOS: Chatom USA (gas condensate gas cycling field)
EOS: Embla Norway (very-high-pressure volatile oil reservoir)
EOS: Eldfisk Norway (large volatile oil reservoir)
EOS: Ekofisk Norway (giant volatile oil reservoir)
EOS: J-Block UK (compositional grading studies)
EOS: Mahogony Gulf-Coast (deep-water saturated gas/oil reservoir)
EOS: NW Tor Norway (very-high-pressure gas condensate reservoir)
EOS: Gas Condensate Well Performance/Condensate Blockage
EOS: Judy UK (rich gas condensate horizontal well history match)
IHC: PVT / Gas / Gas Condensate training courses

Deminex
EOS: Snorre (oil reservoir with miscibility evaluation)

DPC
EOS: Oil Field Dubai (oil reservoir with gas injection/miscibility evaluation)

Ecopetrol
EOS: Cupiagua (gas condensate reservoir with complex compositional variations)
EOS: Foothills area production optimization and allocation.
EOS/MOD: Fracture well numerical test history matching (Pipe-It) module.
IHC: PVT / Gas Condensate training course

Edison
EOS: Gullebi (gas condensate and oil with multipe reservoir fluid systems)
EOS: Q-Fields North Africa
EOS: Abu Qir Egypt
EOS/MOD: Gullebi (black-oil to compositional conversions)

Expro
EOS: North Sea Gas Condensate (PVT model and QC)

JVPC
EOS: Rong Dang, Vietnam (Volatile oil single-porosity fractured basement reservoir)

Mobil/Exxon
EOS: Three West Texas Oil Fields (CO_2 miscible injection in low-temperature reservoirs)
EOS: Smorbukk Norway (large complex rich gas condensate, compositional grading into volatile oil)
EOS: Wax Research (experimental and modeling of wax precipitation)
IHC: PVT and Gas condensate training courses

Norsk Hydro
EOS: Brage Norway (highly undersaturated oil with possible gas injection; CO_2 study)
EOS: Dehluran (heavy oil with significant API variation with depth)
EOS: Delta Norway (saturated oil with estimation of initial gas cap composition)
EOS: Edda Norway (volatile oil reservoir)
EOS: Egyptian Gas Condensate field (rich gas condensate with wax precipitation problems)
EOS: Girassol Angola (highly-undersaturated oil reservoir)
EOS: Gjoa Norway (multiple oil reservoirs)
EOS: Grane Norway (very-high permeability highly undersaturated oil reservoir, CO_2 study)
EOS: J West, Oseberg South (potential gas-oil contact)
EOS: Njord Norway (gas injection in compositionally grading oil reservoir)
EOS: Omega South (multi-reservoir fluid system)
EOS: Ormen Lange Norway (very large lean gas condensate discovery)
EOS: Oseberg Norway (giant oil field with gas cap; gas injection in gas cap; compositional grading)
EOS: Oseberg East Norway (highly-undersaturated oil reservoir with rich gas injection)
EOS: Oseberg South Norway (complex multiple fluid reservoir system from oil to gas condensate)
EOS: Snorre (gas injection studies and black-oil vs EOS modeling)
EOS: Tampen Area Norway (highly undersaturated oil slightly volatile oil reservoirs)

EOS: Vale Norway (high-pressure near-critical gas condensate)
EOS: Visund Norway (multiple near-critical gas condensate and oil reservoirs; compositional grading)
MOD: Borg Norway (very-high permeability highly undersaturated oil reservoir)
MOD: Grane Norway (very-high permeability highly undersaturated oil reservoir)
MOD: Njord Norway (gas injection in compositionally grading oil reservoir)
MOD: Ormen Lange Norway (very large lean gas condensate discovery)
MOD: Oseberg Norway (giant oil field with gas cap; gas cycling in gas cap)
MOD: Oseberg East Norway (highly-undersaturated oil reservoir with rich gas injection; WAG)
MOD: Snorre Norway (undersaturated oil with gas injection; WAG)
MOD: Vale Norway (high-pressure near-critical gas condensate)
IHC: PVT and Gas Condensate training courses

Oxy

EOS: Malampaya Indonesia (deep water gas condensate and oil reservoir)
EOS: West Texas oil (CO2 miscible injection in low-temperature reservoirs)
EOS: Safah Oman (miscible and immiscible gas injection in light low-permeability oil field)
EOS: Ratana Pakistan (fractured gas condensate reservoir)
IHC: PVT and Gas condensate training courses

Pakistan Petroleum Ltd.

EOS: Gas Condensate Well Performance/Condensate Blockage
EOS: Gas condensate reservoir

PDO (Oman)

EOS: Saih Rawl and Barik (huge gas condensate reservoirs, gas cycling)
EOS: Birba (Carbonate compositionally grading oil reservoir with small undersaturated gas cap)
EOS: Gas Condensate Well Performance/Condensate Blockage
EOS: Saih Rawl and Barik (huge gas condensate reservoirs, gas cycling)
IHC: PVT training courses

PDVSA

EOS: Orocual Venezuela (gas condensate reservoir with complex compositional variations)
IHC: PVT / Gas Condensate training course

Petrofina / Fina

EOS: Ekofisk Norway (giant volatile oil reservoir)
EOS: Tempa Rossa Italy (very thick complex heavy oil with strong API grading)
EOS: Tommeliten Norway (small rich gas condensate field)
EOS: Vietnam (lean gas condensate gas caps and saturated oils)
EOS: West Texas oil (CO2 miscible injection in low-temperature reservoirs)

PGS

EOS: Varg South (oil and gas cap)

Qatar Petroleum

EOS: Dukhan Arab D Qatar (oil miscibility; gas cap cycling; fluid initialization and gas cap estimation)
IHC: PVT training course

RasGas

IHC: Gas Condensate training course

ResLab

EOS: Many Synthetic/Real Gas Condensates (laboratory measurements of relative permeability)
EOS: Ekofisk/Valhall/Danish Chalks (gas/water EOR and blowdown core flooding experiments)

Saga Petroleum

EOS: Kristin Norway (very-high-pressure gas condensate reservoir with low-high permeability)
EOS: Lavrans Norway (high-pressure complex gas condensate reservoirs with low-moderate permeability)
EOS: Gas Condensate Well Performance/Condensate Blockage
EOS: Britannia UK (gas condensate reservoir with low-moderate permeability)
EOS: Kristin Norway (very-high-pressure gas condensate reservoir with low-high permeability)
EOS: Lavrans Norway (high-pressure complex gas condensate reservoirs with low-moderate permeability)
MOD: Kristin Norway (very-high-pressure gas condensate reservoir with low-moderate permeability)

MOD: Lavrans Norway (high-pressure gas condensate reservoir with low-moderate permeability)
MOD: Britannia UK (gas condensate reservoir with low-moderate permeability)
IHC: High-pressure gas injection in Kristin gas condensate reservoir

Saudi ARAMCO
EOS: All (>30) Major Oil and Gas Condensate Fields
EOS/MOD: EOS Reservoir Modeling Studies
EOS: Several miscible gas injection studies.
EOS/MOD: Saudi Arabia (multi-million cell full-field application)
EOS: Production (crude blending) optimization
EOS: Scale study
IHC: PVT specialization: three Saudi national training programs

Sintef Petroleum Research
EOS: Seven Middle Eastern Oil Fields (light-to-heavy oils with some significant API variation with depth)

Statoil
EOS: Gullfaks Norway
EOS: Kristin-Lavrans Norway
EOS: Rimfaks
EOS: Smorbukk Norway (gas condensate reservoirs with low-moderate permeability)
EOS: Smorbukk South Norway (very-high-pressure gas condensate reservoir with low-high permeability)
EOS/MOD: Lavrans Norway (high-pressure complex gas condensate reservoirs with low-moderate permeability)
EOS/MOD: Small-Scale Reservoir Simulation Studies
EOS/MOD: Middle Eastern Field (Carbonate and sandstone gas injection in naturally fractured reservoirs; CO2 evaluation)
EOS/MOD: Full-Field Reservoir Simulation Studies
EOS/MOD: Smorbukk South Norway (very-high-pressure gas condensate reservoir with low-high permeability)
EOS/MOD: Haltenbanken Norway (allocation simulations for total multi-field optimization)
EOS/MOD: Heidrun, Norway (CO2 gas injection screening study)
EOS/MOD Troll EOR
EOS/MOD Eagle Ford
EOS/MOD Bakken

Shell
EOS: Giant Gas Condensate field, Middle East
EOS: Gas Condensate Well Performance/Condensate Blockage/Relative Permeabilities
EOS: Implementing pseudopressure options in in-house simulator
EOS: Project peer reviews and training

Total
EOS: Smorbukk Norway (large complex rich gas condensate, compositional grading into volatile oil)
IHC: PVT / Gas Condensate training course

Wintershall
EOS: Oil Field North Africa (large oil, gas injection)
EOS: Gas Condensate North Africa
EOS: Gas Condensate Caspian Sea

Joint Industry Projects
Gas Condensate Well Performance/Condensate Blockage/Relative Permeabilities
{BP / Chevron / INA / Mobil / NFR / NPD / Norsk Hydro / Oxy / Saga}
Black Oil versus EOS Reservoir Modeling
{Conoco / Elf / Mobil / NFR / NPD / Neste (Fortum) / Norsk Hydro / Statoil}
Black Oil PVT Models
{Conoco / Ecopetrol / Norsk AGIP / Phillips / Norsk Hydro / Statoil}
Petrostream Management
Norsk Hydro / NFR
Oil Based Muds in Gas Condensates
Norsk Hydro