



From: Pere, Allen L
Sent: Tue Jun 23 12:27:37 2009
To: Harland, Richard; Daigle, Keith G; Mills, Bill H; Rogers, Bruce A (Houston)
Subject: Macondo PPFG Peer Review Finding
Importance: Normal
Attachments: Macondo_PPFG_Peer_Review_Findings.doc

Attached is the report from the PPFG peer review.

Thanks

Allen

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Date: April 24, 2009

Well Name: MC 252 #1 (Macondo)

Reviewer: Mike Mueller (Appraisal), Bruce Wagner (GOMX) and Ray Wydrinski (GOMX)

Reviewer Final Comment: Calculate centroid pressures at Macondo; resolve the pressure measurements at Arial and Rigel Field

Planning Team Participants:

- Single Point of Accountability (SPA) for the prediction – Martin Albertin
- SPA for delivery of the wellsite pressure detection – Martin Albertin
- Prospect geologist – Charles Bondurant
- Prospect petrophysicist – Donald Charles
- Prospect geophysicist – Binh Van Nguyen, Sharma Tadeipalli
- Prospect drilling engineer – Mark Hafle
- Basin Modeller – Dave Greeley? Pierre-Andre Depret?
- Person who did velocity based PPFG work – Martin Albertin
- Person who did the PRESGRAF analysis – Martin Albertin

Objectives:

The primary objective of the review is to determine if the prediction is appropriate for proceeding with well execution and that the methods used meet the Engineering Technical Practice on Pore Pressure Prediction (GP 10-15). As a minimum the Validation Review Team should answer the following questions:

1. Have the appropriate analogy wells been identified and used?
 - a. MC 252 - Rigel Field
 - b. MC 382-1 – Yumuri
 - c. MC 429-1 – Arial
 - d. MC 562-1 - Isabela
2. Were the analogs properly analyzed to determine or constrain pore and fracture pressures in sands and shale?
 - a. Yes – For the Most Likely Pore Pressure and Fracture Gradient condition.
 - b. For the minimum fracture gradient, the minimum fracture gradient needs to be calculated for potential mud loss problem that may be encountered.
3. Were the appropriate methods used to project offset pressures to the proposed well location?
 - a. Yes – Pressure measurements were appropriately adjusted to the sand projection.
4. Were the analogs properly used to calibrate seismic velocities and/or basin models at the proposed location (consistent with BP approved workflows)?

- a. Yes w/r to seismic velocity; no basin model was constructed (decision based on quality of the seismic and laterally discontinuous nature of the channel sands w/r to the distribution of offset wells)
5. Have deviations from approved workflows been properly defended (compaction trends for sonic and resistivity, fracture relationships, porosity-effective stress and porosity-permeability relationships for basin models)?
 - a. Shale FG seams to match better with a PR of 0.44 rather than the BP Deepwater model.
 - b. Overburden has a better fit with the density data from the Rigel field with a constant of 4200 (compared to the BP recommended 5200).
 - c. sand frac needs final calibration to offset well events (losses & weak shoes) to vet the PR_{sand}: suggest the Rigel well shallow (ca 7500') and Ariel deep (ca 13400).
 - d. evaluate smectite-illite acoustic-to-density compared to the methods already evaluated (Gardner, Wendt, ...)
6. Have uncertainties with pore and fracture pressure prediction been properly described?
 - a. Centroid effects need to be accounted for in the maximum pore pressure prediction.
7. Should any additional work be mandatory before proceeding with execution?
 - a. Calculate the centroid effect from 9000' to 21,000' to be sure it fits with-in the maximum and most likely pore pressure.
 - b. Resolve issues with the MDT (RFT) pressures that are equal to greater than the surface mud weights between 12,000' and 13,000' in the Rigel field and Ariel. Will this have an affect at Macondo?
 - c. Calibrated sand frac needs to be applied to the minimum pressure case (for stress cage evaluation) in addition to the most-likely case forecast.
 - d. Depth of the anticipated L. Miocene to O90 ramp needs to be confirmed for each forecast case, min-ML-max.
8. Any non-mandatory comments?
 - a. May want to bump up the mud weight below the 13 5/8" casing to avoid the kicks that were encountered at Yumuri and Isabela.
 - b. Review if the real time sonic DT from Isabela to determine if the kick could have been identified.
 - c. Add an Isabela *Presgraf* display to the slide pack, similar to Yumuri, Ariel et al plots; describe fit of seismic and sonic to pressure
 - d. Understand the possible locations of the Rigel field depleted sands.
 - e. analyze and explain the stuck pipe event at Rigel
 - f. No basin model was done for this analysis. May consider a 2-D Basin model to understand the depleted sands from the Rigel field.
 - g. On the discordant, "Shale FG seams to match better with a PR of 0.44 rather than the BP Deepwater model," vs. "Overburden has a better fit with the density data from the Rigel field with a constant of 4200 (compared to the BP recommended 5200)," it would be good to know how these moved in opposite directions.... (higher PR means looser sed, lower OB coeff means tighter...)
 - h. evaluate drilling fluids used in offset wells to determine if:

1. shale reactivity occurred/caused problems in any of the offset wells
2. mud compressibility effects, if any

Desired Outcomes:

- Identification of mandatory additional work that needs to be completed before proceeding to execution.
- Assurance that the work performed meets the standards of BP Engineering Technical Practices on Pressure Prediction and is consistent with approved BP pressure prediction workflows.
- Documentation of the review and any major accident risks that need to be expressed to relevant business leaders.