Natalie Eades

From: Wayne Miller <miller99@llnl.gov>
Sent: Friday, July 23, 2010 8:14 PM
To: Reidar Barfod Schüller
Cc: Ruben Schulkes; Ståle Selmer-Olsen; Reidar B. Schüller; Reidar Barfod Schüller
Subject: Re: SV: Help with the HYDRO model

Dear Reidar and Staale,

We are moving towards approval to work with you on this. It has taken a few days to discuss this in our management but I'm hopeful we can conclude on our end early next week. At the moment there is a concern that we have some agreement that the information we send you, and your results, remain confidential. Is it possible that we can create a non-disclosure agreement or something similar with Statoil? I am sorry about the need for this. This work is sensitive for political and business reasons.

Meanwhile I hope you have heard that the well is capped for now and not leaking. There is tremendous effort going on to evaluate the stability of this situation, and we all hope that no more oil will be released. Several additional actions are being considered, including some that would use the choke valve again so I do want to get it characterized.

Kind Regards,
Wayne

At 8:39 PM +0200 7/18/10, Reidar Barfod Schüller wrote:
>Dear Wayne
>
>Referring to previous emails I confirm that I can assist you in
>carrying out calculations with the Hydro Choke Model.
>
>I will be travelling between different locations in Norway this week,
>so please use my university
>mailbox:
>
>reidar.schuller@umb.no
>
>Mail to this mailbox is frequently synchronized with my mobile phone.
>
>
>In order to run the model I will require the following:
>
>1.
>Fluid information. We normally obtain this from a PVTSim fluid
>description. If you can send me a PVTSim-file, I can use this to
>generate the required input to the choke model. If you do not have a
>PVTSim-file, we must discuss how I can generate a suitable fluid input
>file.
>
>2.
>Mass fractions of each phase (gas, oil, water) at the choke inlet. (You
>state mass ratio 70/30 oil/methane, but is this at the upstream choke
>position? I expect that a significant amount of gas also flashes from
>the oil phase as a result of the pressure drop.)
>
>3.
>Choke geometry information: CV-curve (I have

>received this) and information about the hole
>sizes in the plug and cage geometry.
>
>4.
>Oil viscosity information.
>
>5.
>Your calculation matrix (upstream pressures,
>upstream temperatures, phase mass fractions at
>choke inlet, valve openings, downstream
>pressures, ...).
>
>
>I look forward to receiving more information.
>
>
>Best regards,
>
>Reidar
>
>
>**********
>Reidar Barfod Schüller, B.Sc., Ph.D.
>Professor
>IKBM
>Norwegian University of Life Sciences
>P.O.Box 5003
>1432 Aas
>Norway
>reidar.schuller@umb.no
>Phone: +47 64 96 58 51
>Mobile: [redacted]
>Private email: reidar@schuller.no
>**********
>_____
>Fra: Wayne Miller [miller99@lini.gov]
>Sendt: 18. juli 2010 02:09
>Til: Ruben Schulkes; Stale.Selmer-Olsen@dnv.com;
>Reidar B. Schuller; Reidar Barfod Schüller
>Kopi: Reidar B. Schuller; Reidar Barfod Schüller
>Emne: RE: Help with the HYDRO model
>
>Dear Ruben & Stale,
>
>Thank you very much for your fast approval for
>this assistance. I am discussing the matter with
>our management team on this project. I will need
>to get approval before I can send you the
>information you need to run HYDRO, as some of it
>may be business proprietary information. I will
>let you know immediately when I get an answer.
>
>This information will help us understand the rate
>that the well is producing (it is currently
>closed by this choke valve), and may be useful in
>future configurations for capturing oil. I
>consider this very valuable information, but it
>is not of an emergency nature so please do not
>give up your weekend (I have given up many
>weekends since this started).
>

>Tusen Takk!
>Wayne
>
>
>At 7:40 PM +0200 7/17/10, Ruben Schulkes wrote:
>>Dear Wayne and Ståle
>>I have spoken to Reidar - he is able to start on
>>the work at once. If the total amount of work
> >does not exceed one week we do not need a
>>contract. If the complexity or amount of the
>>work is such that more time is required, we will
>>have to establish some sort of contract.
>>Based on my conversation with Ståle I understand
>>that the work from our side will consist of the
>>following:
>>- based on input from LLNL perform calculations
>>with the Hydro choke model to compute flow rates
>>in the BP GoM well.
>>
>>Results will be delivered in the form of curves
>>(based on choke model calclations) and
>>explanation of the curves.
>>
>>I hope our contribution will be beneficial.
>>Regards
>>Ruben
>>
>>Sent from my HTC
>>
>>---- Original Message ----
> >From: Stale.Selmer-Olsen@dnv.com <Stale.Selmer-Olsen@dnv.com>
>>Sent: 17. juli 2010 00:19
>>To: miller99@llnl.gov <miller99@llnl.gov>
>>Cc: Ruben Schulkes <rubs@statoil.com>; Reidar B.
>>Schuller <rbsc@statoil.com>;
>>reidar.schuller@umb.no <reidar.schuller@umb.no>
>>Subject: FW: Help with the HYDRO model
>>
>>
>>Dear Wayne Miller,
>>
>>Since we spoke earlier today I have been in
>>contact with Statoil (Dr. Schulkes and Dr.
>>Schüller) regarding running the so-called HYDRO
>>code on the choke flow in the current Gulf oil
>>spill. Statoil is the owner of the HYDRO code
>>after merger with Norsk Hydro.
>>
>>Statoil says yes to assist you and run some
>>cases using the HYDRO code. A contact should be
>>made between you and Dr. Ruben Schulkes in order
>>to move things forward. I expect Dr. Schüller
>>(and possibly myself) will be involved
>>afterwards.
>>
>>Ruben Schulkes
>>e-mail: rubs@statoil.com
>>cell phone: [redacted]
>>
>>Reidar B. Schüller
>>e-mail: rbsc@statoil.com or reidar.schuller@umb.no

>>cell phone: [redacted]
>>
>>To speed up the process some additional info
>>will be needed in addition to what you already
>>provided.
>>We need a PVT-sim file describing the
>>composition of the well stream, alternatively a
>>compositional description including the C6+
>>components.
>>We should also know the oil viscosity.
>>We need to know the mass fraction of each component.
>>We need to know the mass fraction of produced water (if present).
>>And of course a defintion of the cases you want
>>to run (upstream pressure, upstream temperature,
>>% open choke, internal dimensions of the choke.
>>If you know, also sea water temperature.
>>If I understand right, upstream there is a
>>straight well pipe and downstream the choke
>>exhausts into the ocean at 150 bara.
>>
>>The HYDRO code is based on a choke model that I
>>developed partly inside and partly outside a
>>contract I had with Norsk Hydro in 1992. The
>>model was based on some of the results from my
>>Ph.D. in 1991. The model was initially published
>>in 1995 as:
>>1) S.Selmer-Olsen, H.Holm, K.Haugen, P.J.Nilsen
>>and R.Sandberg (1995) "Subsea Chokes as
>>Multiphase Flowmeters. Production Control at
>>Troll Olje", Proc. 7th Int. Conf. on Multiphase
>>Production, BHR Group, Wilson,A. (ed.), Cannes,
>>7-9 June, pp. 441-466.
>>Norsk Hydro later validated the model against a
>>wider set of experimental data. It was recoded
>>from handling two-component flows to
>>multicomponent hydrocarbon systems and called
>>the HYDRO code model. This resulted in two
>>papers (2003 and 2006):
>>2) R.B.Schüller, T.Solbakken and S.Selmer-Olsen
>>(2003) "Evaluation of Multiphase Flow Rate
>>Models for Chokes under Sub-Critical
>>Oil/Gas/Water Flow Conditions", SPE Production &
>>Facilities Journal, August 2003, Paper SPE
>>84961, pp. 170-181.
>>3) R.B.Schüller, S.Munaweera, S.Selmer-Olsen and
>>T.Solbakken (2006) "Critical and Subcritical
>>Oil/Gas/Water Mass Flow Rate Experiments and
>>Predictions for Chokes", SPE Production &
>>Operations Journal, August 2006, Paper SPE
>>88813, pp. 372-380.
>>
>>Best regards
>>
>>Ståle Selmer-Olsen, M.Sc, Dr.
>>Associate Director, Cleaner Energy
>>_____
>>DNV Energy - Natural Gas, Cleaner Energy and Solutions (NCG)
>>Phone: +47 6757 9900 (switchboard)
>>Mobile: [redacted](direct)
>>Fax: +47 6757 9911
>>E-mail: staale.selmer-olsen@dnv.com

>>E-mail: staselme@online.no
>>Address: Det Norske Veritas, DNV Energy, Carbon
>>Capture & Storage (NCGNO693), P.O.Box 300,
>>N-1322 Høvik, Norway
> >Web: http://**www.**dnv.com
>>
>>
>>
>>-----Original Message-----
>>From: Wayne Miller [mailto:miller99@llnl.gov]
>>Sent: 16. juli 2010 18:50
>>To: Selmer-Olsen, Ståle
>>Subject: Help with the HYDRO model
>>
>>Dear Mr. Selmer-Olsen,
>>
>>Thank you for talking with me about running the HYDRO model for
>>two-phase flow through a choke valve. We are assisting the U.S.
>>Government and British Petroleum in understanding and stopping the
>>current Gulf oil spill.
>>
>>The well head is about 1.5 km below the ocean surface. The current
>>configuration at the well head includes a choke valve that can be
>>used as the only exit for oil from the well. This choke valve is
> >used to turn off all oil flow so that the pressure integrity of the
>>sealed well can be measured. The well pressure at the choke valve
>>can vary from ocean ambient (~150 bara) when full open, up to ~600
>>bara when the choke is closed. The choke valve exhausts into the
>>ocean. The well is producing oil and methane at a 70/30 mass ratio.
>>
>>We have modeled the choke valve resistance to the flow using the
>>manufacturers Cv data, and this does not produce physical results as
>>the valve allows too much fluid to pass. I have also tried the
>>Simpson's 2-phase multiplier you described in your paper, but this
>>also allowed too much fluid to pass. I suspect we need a more
>>sophisticated analysis of two-phase flow, perhaps at choked (sonic)
>>conditions at the highest pressures. I am interested to know if your
>>HYDRO model can be applied to this case.
>>
>>The choke valve is a Cameron CC40 plug and cage control choke
>>http://**www.**coopercameron.com/content/products/product_detail.cfm?pid=2862&bunit=FLC
>>
>>I've attached the vendor Cv curve for this valve.
>>
>>Please let me know if you can provide HYDRO or even someone to run
>>some cases for us and what kind of agreement this will require. I'm
>>not sure what will be required to set up any kind of a contract for
>>this help, and I will need to have any payment approved here before I
>>can ask you to proceed with any effort requiring payment.
>>
>>Kind Regards,
>>Wayne Miller
>>--
>>~~~~~~
>>Wayne O. Miller
>>Thermal Fluids Group Leader
>>Associate Program Leader for Renewable Energy
>>Lawrence Livermore National Laboratory
>>7000 East Ave., L-140
>>Livermore, CA 94551
>>[redacted]

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>>
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>~~~~~~
>Wayne O. Miller
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