

From: Morten Haug Emilsen  
Sent: Mon Aug 09 17:51:48 2010  
To: 'Wall, Dave'  
Subject: RE: BP Incident Investigation  
Importance: Normal  
Attachments: PressureBumps.pps

Dave,

I'm in Houston and are happy to see that our main conclusions are unchanged. The flow path is through the shoe, the well got underbalanced at 20:50. In addition, the reported gain of 39 bbl between 20:50 and 21:08 matches quite well with the simulations (this information was not available last time I was here).

We had a hard time explaining the pressure bumps after 21:30, and our initial assumption was that rig crew tried to close the annular. At the same time we had a hard time explaining how they could struggle with a leaking annular in nearly 20 minutes before they eventually closed the VBR. This has changed, and I can agree as it makes more sense seen from the guys at the rig floor.

However, I am not convinced that the first pressure build-up (21:30- 21:35) is caused by hydrodynamic conditions in the wellbore (more heavy 14 ppg mud being pushed on the back side of the drillpipe replacing the 8.6 / 14 ppg mud) while the second pressure build-up (21:42 - 21:47) is caused by a partly sealing annular.

The curves are too similar too be caused by two different mechanisms. (If they are, it is incredible!). In detail, the pressure build-ups contain two gradients, the latter slightly steeper than the first one, before they are flattening out. Enclosed is a couple of slides showing how similar they are.

This detail at the very end will not change the main conclusions. Anyway, I am here to review the new simulations and update my report accordingly, and in that respect I am looking for more information to be convinced that this is the case.

The changes made to my original model is that they moved the restriction from the BOP to surface. Ok. In addition, they reduced the net pay from 15 to 13 ft to hold back the gas. Ok. The gas reached surface a little bit too early in the original work. The pressure decline seen while pumping at a steady rate right before they shut down the pumps at 21:30 cannot, for the new simulations, be reproduced without playing with a restriction at surface. Initially this decline was reproduced by gas reaching the backside of the DP and hence cause a lighter column on the back side. According to the new simulations, the first gas reaches surface at 21:47 (no Gas Buster or vent line is modeled that will cause additional delay in gas surfacing), this is little bit too late according to gas alarm and witness statements regarding noise. Also, the gain from the new simulations shows 28 bbl at 21:08, a little bit on the low side.

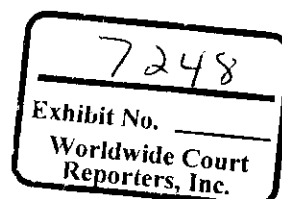
I read the Chapter in the report dealing with the CFD modeling and tried to get a feeling for the timing required from start of the release to the most likely condition for ignition and explosion, that is get inside the LEL - UEL envelope. Plots were presented both for 190 and 240 seconds. Assume the time is related to first gas at surface. My interpretation is that it could be 3-4 minutes of flow before the first explosion occurred, most likely at 21:49.

As you have seen, the modeling results are very sensitive to the amount and location of the hydrocarbons in the wellbore, and smaller changes wrt. choking effects and well productivity will affect the results. Further, we will probably not get any closer by modeling the real incident where variations in inflow due to cement channels, pop-off skin effects, wiper plug movements etc. could have influenced the flow. My main concern is though, that we are now explaining two similar pressure build-ups with two different mechanisms, and I have a hard time supporting that conclusion.

I heard that you are on your way over here, and we might have time for a chat before I travel back home on Thursday.

This was just to give you my comment on the new information just received. Any feedback will be appreciated.

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Ihanks,

Best regards,  
Morten

-----Original Message-----

From: Wall, Dave [mailto:dave.wall@bp.com]

Sent: 6. juli 2010 15:31

To: Morten Haug Emilsen

Subject: RE: BP Incident Investigation

Morten,

Yep I am back in Houston. I have been catching up today and have been briefed on Fridays call, you'll be pleased to know that the sensitivities work is just validating the good work you did. They are going to do a little more detailed modelling of the annulars but the basic building blocks are sound and over the weekend they have basically validated the work you have done.

I'll work with this team to do the detailed work.

Thanks for all your help and have a fantastic holiday.

Dave

David Wall

VP HSE & IM

EPT - HSE, Operations & Engineering

07748180428

-----Original Message-----

From: Morten Haug Emilsen [mailto:Morten.Haug.Emilsen@addenergy.no]

Sent: 06 July 2010 13:08

To: Wall, Dave

Subject: Re: BP Incident Investigation

Dave, good to hear from you. Are you back in Houston?

I'm currently in Cannes and did not bring my computer with me but do not think the 14" Diverter will create any significant back pressure on the system.

Have had a conference call with Kent Corser and the BOP team regarding some issues and a guy from SPT group has been hired to run some sensitivities.

Sent from my iPad

On 6. juli 2010, at 17.33, "Wall, Dave" <dave.wall@bp.com> wrote:

>

> Morten.

>

> I know your on your holidays but I have been asked to do a little more

> work on the Well Inflow modelling. We would like to prove that by

> diverting to the 14" Starboard Diverter line that the release of

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> hydrocarbons would have been to a safe location and therefore the  
> explosion and fire would not have occurred, or if the gas did ignite  
> it would be in a safe location. The key issue to check is, what would  
> the back pressure have been going through this 14" line. If we can  
> prove the pressure didn't exceed any equipment failure point then we  
> can assert all of the gas would have safely vented to a safe location.  
>  
> Could you please let me know if you could run the model and do a  
> pressure plot for us from 21:30 to 22:00 hrs assuming the team closed  
> the diverter and opened to the starboard diverter line at 21:30 hrs  
> All other parameters such as partially closing annulars and scaling  
> VBRs should remain unchanged.  
>  
> If you could call to discuss that would be great, my UK mobile number  
> is shown below.  
>  
> Thanks  
> Dave  
>  
> David Wall  
> VP HSE & IM  
> EPT - HSE, Operations & Engineering  
> 07748180428  
>  
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