

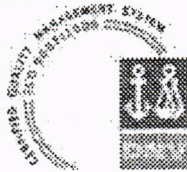
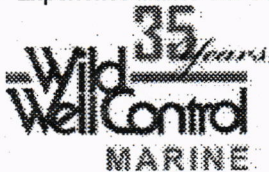
From: Christopher J. Murphy
Sent: Sunday, May 30, 2010 12:29 AM
To: Fred Ng
Cc: David Barnett; David W Moody; Dicky J. Robichaux; Michael W. Allen; Freddy L. Gebhardt; Kerry L. Girlinghouse; Michael Drieu; Mike Cargol; William Burch; Pat Campbell
Subject: RE: Burst disc calculations

Fred

You have captured precisely what we all think. Well said.

Regards

Chris Murphy
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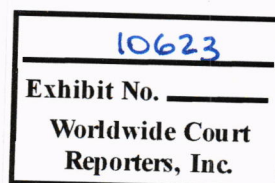
From: Fred Ng
Sent: Saturday, May 29, 2010 23:53
To: Christopher J. Murphy
Cc: David Barnett; David W Moody; Dicky J. Robichaux; Michael W. Allen; Freddy L. Gebhardt; Kerry L. Girlinghouse; Michael Drieu; Mike Cargol; William Burch; Pat Campbell
Subject: RE: Burst disc calculations

I only have a side line seat in this project, so I may be totally off base, but here's my two peso's worth:

Modeling is not the answer to all the world's problems. There seems to be quite a bit of effort at BP in this project to make reality or interpretation of data fit modeling results, which does not seem logical. Validity of modeling in this case is dependent on a number of critical assumptions, being hole geometry, partial bridges and other restrictions, reservoir and fluid properties, fluid content in the hole (mud or hydrocarbon), production rate, leak path geometry and resistance, just to name a few, all of which are unknown, as Bob Grace so aptly put in his e-mail. I would have little confidence in using this kind of model match to come to a specific conclusion that the BD's are gone.

May be these guys need to take a look at the video data besides the pressure data. It is quite apparent from the video that most if not all the mud pumped in these operations went out the DWH riser and now down the hole. In spite of increasing pump rate, junk shot, cubes and balls etc., there was little change in the mud plume exiting the riser. The pressure data simply shows that the surface leaks are too large to be sealed by the materials introduced, and therefore there was no back stop to build up enough injection pressure for the top kill. May be I am missing something, but I fail to see how that can be any indication of the integrity of the 16" before or after the top kill.

Confidential



WW-MDL-00026911

Steve and Phil may be BP's resident experts on rock mechanics and casing design respectively, but I don't know how many kill jobs have pumped. I do know that our pressure data interpretation for the top kill is made by some pretty competent folks that have been designing and conducting pumping of all kinds of fluids under all kinds of unusual situations for over past two decades (I am not one of them).

If this was my well and / or my company, and this is the kind of recommendation I get from my staff, I would really drill down and ask for specific technical justifications to be reviewed by the project team, like BP has done ad infinitum with all the procedures that we have been involved in, for all their job. We spent a day and a half last weekend with over a dozen folks discussing and re-discussing leakage rate. We spent over half a day with just as many folks on Tuesday discussing lube and bleed. So now comes a multi-million dollar decision, and it's down to a couple of guys talking to the execs and Secretary of Energy?

Some one needs to bring reality back into vogue.

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From: Christopher J. Murphy
Sent: Saturday, May 29, 2010 11:07 PM
To: Fred Ng; Pat Campbell
Cc: David Barnett; David W Moody; Dicky J. Robichaux; Michael W. Allen; Freddy L. Gebhardt; Kerry L. Girlinghouse; Michael Drieu; Mike Cargol; William Burch
Subject: RE: Burst disc calculations

Fred

I do not think the top kill operation was blamed for the possible failure of burst disk(s). Rather, BP analysis of the top kill data, in an attempt to pressure match geometries, might suggest that the 16" is no longer a pressure vessel. This is entirely different.

The possibility of the 16" liner top seal or rupture disk failure was discussed with BP during the first few days of the Macondo project.

Regards

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From: Fred Ng

Sent: Saturday, May 29, 2010 22:56

To: Pat Campbell

Cc: David Barnett; David W Moody; Dicky J. Robichaux; Michael W. Allen; Freddy L. Gebhardt; Christopher J. Murphy; Kerry L. Girlinghouse; Michael Drieu; Mike Cargol; William Burch

Subject: Burst disc calculations

Summary

It would be best to re-consider any forward plan decision that is based on the premise that the burst discs have been compromised during the top kill operation. Based on the maximum pressure recorded at the BOP during the past three days of top kill operation, the analysis below indicates that the maximum burst loads experienced by the upper and lower burst discs in the 16" casing would have been substantially less than the 10000 psi rating of the discs.

Assumptions

Maximum BOP pressure (MBOPP) during all top kill was 6100 psi (at 1000 bbl pumped in Kill #1 with 60 bpm)

Reservoir pressure is 12.6 ppg EMW at 18083', or 11848 psi.

Reservoir pressure is balanced by max BOP pressure plus a column of kill mud on top (Lm) and a column of oil at the bottom (Lo).

This is assuming that a significant column of mud actually entered the wellbore, which is a conservative assumption.

Burst load assumes that top kill pressure acts on the 9-7/8"x16" annulus.

Kill mud is 16.4 ppg., or 0.85 psi/ft gradient.

Produced oil is 6.0 ppg., or 0.312 psi/ft gradient. This is also a conservative assumption, as the 3000 GOR oil from the M56 sand should be a lighter oil.

Water depth is 5067'.

Sea water density is 8.6 ppg, or 0.447 psi/ft gradient.

Sea water hydrostatic at mud line is 2266 psi.

Burst discs BD1 and BD2 are located at 6047'/980' MD/BML and 8304'/3237' MD/BML, respectively.

Burst discs are rated for 10000 psi.

Back up gradient for 16" casing below mud line is 8.9 ppg.

Back up pressure (BUP) at the discs are;

BD1 2266 psi + 980' x 0.447 psi/ft = 2704 psi (BUPD1)

BD2 2266 psi + 3237' x 0.447 psi/ft = 3713 psi (BUPD2)

All depths are MD = TVD

Analysis

The above is described by the following simultaneous equations:

$11848 \text{ psi} - 0.312 \text{ psi/ft} \times L_o - 0.85 \text{ psi/ft} \times L_m = 6100 \text{ psi}$

$L_o + L_m = 18083' - 5067' = 13016'$

Solving the above equation gives $L_m = 3135'$, $L_o = 9881'$

BD1:

Internal pressure IPBD1 = 6100 psi (MBOPP) + 980' x 0.85 psi/ft (mud column) = 6933 psi

Burst load = IPBD1 - BUPD1 = 6933 psi - 2704 psi = 4229 psi

BD2:

Internal pressure IPBD2 = 6100 psi (MBOPP) + 3135' x 0.85 psi/ft (mud column) + (3237' - 3135') x 0.312 psi/ft (oil column to BD2) = 8796 psi
Burst load = IPBD2 - BUPD2 = 8796 psi - 3713 psi = 5083 psi

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From: William Burch
Sent: Saturday, May 29, 2010 7:42 PM
To: Fred Ng
Cc: Pat Campbell; David Barnett; David W Moody; Dicky J. Robichaux; Michael W. Allen; Freddy L. Gebhardt; Christopher J. Murphy; Kerry L. Girlinghouse; Michael Drieu; Mike Cargol
Subject: Re: CBS news

Fred,

Mike Cargol heard from his containment group that the latest is that the burst disks are gone. According to his sources, the only option forward is containment until the relief well gets done. Capping is out of the question. Capping with Flowback might still be viable but is very unclear.

I've talked with Kurt Mix to confirm the story. He was in communication with Jon Sprauge earlier and is chasing down with Phil Pattillo. If I'm gathering my information correctly, the analysis was made from the data from pumping yesterday with Dr. Steve Wilson and Phil early this afternoon (I just so happened to stumble in to their conversation while I was talking with Thomas.) Kurt agrees with me that this data could be very misleading and limiting options on uncertain data is not prudent. He will let me know after he talks with Phil. But Jon has confirmed that all efforts are to be focused only on the relief well by Kurt's team - this has been directed by Pat O'Bryan.

Chris is also chasing down Harry for the real story. He is also working with Wayne Sutton to help draft up a third possible option between containment and capping which Wayne brought to us - its got merit and certainly a good play-it-forward for WWCI with Wayne in the future.

Ultimately, it also proves how far out of the loop we are being kept.

I can't wait to see what tomorrow brings.

Sent from my iPhone

On May 29, 2010, at 5:44 PM, "Fred Ng" <fng@wildwell.com> wrote:

CBS news at 17:30 CDT Doug Suttles with BP announced that top kill did not work, and preparations are underway for capping stack option.