

**From:** Birnbaum, Liz  
**Sent:** Friday, April 30, 2010 5:29 PM  
**To:** Good, Keith  
**Subject:** Fw: Deepwater Horizon Incident - Reply from Apache Corporation to Secretary Salazar's request

**Importance:** High  
**Sensitivity:** Confidential

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**From:** O'Brien, Obie <Obie.O'Brien@usa.apachecorp.com>  
**To:** Birnbaum, Liz  
**Cc:** Hayes, David; Rivera, Ray; Brander, Graham <Graham.Brande@apachecorp.com>; Brown, Naomi <Naomi.Brown@usa.apachecorp.com>  
**Sent:** Fri Apr 30 15:26:59 2010  
**Subject:** FW: Deepwater Horizon Incident - Reply from Apache Corporation to Secretary Salazar's request

Director,

In response to Secretary Salazar's request for support and suggestions relating to the Deepwater Horizon incident we have compiled the following items as a response from Apache Corporation. There are three sections covering the following topics

1. Immediate recovery options.
2. Recommendations with regard to testing, and
3. Other items relevant to the Deepwater Horizon incident.

1. Immediate recovery options:

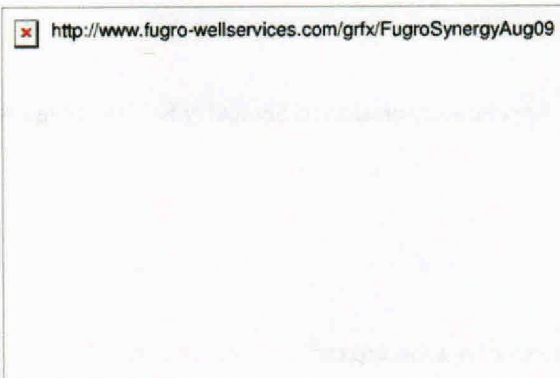
We believe the following list of three items are worth consideration for recovery operations. They are off the wall, fairly non conventional and require further engineering but we believe they have merit and are worth consideration by the teams at BP.

- a) In order to help recover hydrocarbons from the leaks on the riser and drillpipe, considerations could be given to using a riserless drilling subsea pump system. This has been used in other parts of the world to recover oil based drilling muds, while drilling exploration wells. The pump would be lowered to just above the leak and used to recover crude from the source of the discharge, pumped to a test separator on a DP vessel prior to being pumped onto a tanker. (A conical capture device would need to be fabricated. All of these technologies are currently used in other parts of the world. AGR have the subsea pumps. Fugro have a DP vessel capable of running the pump and a flexible riser for recovering the fluids. We understand that they successfully used the pump in 5000ft WD last year. Contact at AGR is John H. Cohen, AGR Subsea, Inc. P: 281-616-0407 Cell: 832-202-3241.
- b) Alternatively, a vacuum type system could be used to recover crude from the leaks. Similar to the above suggestion crude would be pumped to a DP work vessel similar to below and then pumped to a tanker alongside. The vacuum system would use a 9 5/8" casing run as a riser with a fluid injection point run at some depth to create a venturi thereby sucking crude into the casing and up to the DP vessel. Fugro have a couple of vessels capable of this operation. (One of them on contract with BP at Mad Dog). A contact for this idea would be Steve Jeffrey, Technical Director, Fugro Well Services. (Cell +44 78 7022 4602). The vessel in the GOM is called the Fugro Explorer). Both Fugro vessels could be deployed with very short mobilization times.

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- c) In order to address sealing the well at the BOP. If the LMRP can be removed from the BOP, conventional wisdom would suggest that another subsea BOP could be placed on top of the Horizon's BOP in order to close the well in. (Assuming that the BOP can be stabbed on with a riser in place and with hydrocarbons entering the riser – this has significant associated risks). Alternatively, a subsea disconnect device could be used to stab onto the top of the BOP (18 3/4" connection) and used to close the well in. The subsea disconnect device has been used by Shell for the last couple of years for Surface BOP operations in Brazil. The tool consists of two shear rams and has a mini mux control system with a (broadband) acoustic control from Nautronix. This device could be run on wire with shear rams open. Stabbed onto the 18 3/4" profile on top of the BOP and activated to shut the well in on the two 13 5/8" shear rams. There are two systems in the world. Shell is using their subsea disconnect system in Brazil. Stena Drilling has the other, which we believe is available. (This device can be transported by air - Antonov transport planes). Removing the LMRP could be achieved by the 2<sup>nd</sup> drillship that is being mobilized to the Horizon location. Contact for Stena Drilling is John Banks +44 1224 401180 or alternatively Kyle Ramsay Lewis +1 (713) 530-7744 or [john.banks@sdlabz.com](mailto:john.banks@sdlabz.com). Alternatively Brian Tarr at Shell could provide technical information relating to the equipment. Brian Tarr contact info: +1 (281) 544-5275, [brian.tarr@shell.com](mailto:brian.tarr@shell.com)

## 2. Recommendations with regard to testing:

- a) We believe that the testing of the hot stab functions with the ROV pump, on surface, is a positive step to prove the integrity of the ROV controlled part of the subsea control system and that this could be carried out as a single test prior to the subsea BOP's being run. This would provide reassurance that the ROV pump had the necessary specifications for opening and closing rams on the Subsea BOP. Some equipment would be required to connect the ROV pump to the control functions on surface.
- b) Consideration could be given to periodic testing of the disconnect function prior to the first BOP pressure test on a new well. We do not support the disconnect function being tested on a regular testing schedule as there is the potential for significant equipment damage while attempting to reconnect. Disconnecting at times of high environmental loading would also be impractical. (I.e., at times of significant loop current activity). A witnessed disconnect function test once a year, or similar, may help reassure system integrity.
- c) Consideration should be given to checks that confirm the ratings and shearing capabilities of BOP shear rams. All shear rams are designed to cut a certain type and size of pipe if backed up by the appropriate bonnet type. (With or without boosters). Shear rams can be interchanged between BOP's and rigs. Confirming the type and capacity of a shear ram to cut pipe could be checked as a part of the first BOP pressure testing documentation and checked against the proposed work program for each well.

## 3. Other items

- a) Significant statistical information relating to the reliability of surface and subsea BOP's has been captured by the Norwegian organization, Sintef. Data relating to equipment failures and Subsea BOP reliability statistics, breaking down component reliability data is held by this organization. (Some of this data is publically available information and some is stored for sponsoring companies).

- b) There is no information relating to the type of seal assembly used in this well for the 9 7/8" production casing. This is a possible source of failure which would have allowed hydrocarbons to flow into the wellhead and BOP's. This leak path would have significantly reduced the amount of time that a crew would have had to respond to flow from the wellbore. Fluid migration behind the production casing would not have been detected by conventional means until either the casing failed shallow or the seal assembly failed in the wellhead.
- c) There is no information relating to the type and specification of the cement used for this production casing. Events appear to have happened very quickly on the rig which would suggest that a leak path into the well occurred shallow. For this to happen there must have been some type of channeling event to enable hydrocarbons to migrate up the back side of the production casing. This would suggest some type of cement operations failure.

The suggestions listed in section 1 have been forwarded to Scott Sigurdson, VP of Drilling at BP. If we can provide any further information or be of further assistance please contact Obie O'Brien or Graham Brander at the following contact no's 713 906 4167 or 281 844 0559 respectively.

Regards

Obie O'Brien / Graham Brander

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Long term recommendations with regard to testing:

- d) Disconnect testing after the BOP's are landed. Prior to pressure testing.

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- e) Shear ram capabilities. (Test the shearing capability of the ram).

Other items

- d) Disconnect testing after the BOP's are landed. Prior to pressure testing.
- e) Surface testing of the ROV and hot stab functions.
- f) Sintef Subsea BOP reliability statistics. (publically available information and independent studies)
- g)