From: Tooms, Paul J
Sent: Mon May 17 11:09:41 2010
To: Thierens, Harry H
Subject: FW: Top Preventer Peer Assist Recommendations
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Attachments: Top Preventer Peer Assist Recommendations Final.ppt

In case you don't have this already

From: Turnbull, Jon B
Sent: Saturday, May 15, 2010 12:00 PM
To: Wellings, James S; Patteson, Mark R; Holt, Charles A; Frazelle, Andrew E
Cc: Wulf, Gary T; Tooms, Paul J; O'Bryan, Patrick L; MC252_Email_Retention
Subject: Top Preventer Peer Assist Recommendations

Jim et al,
Attached is the final feedback from the Peer Assist on Top Preventer. This covers both the BOP on BOP and the Ram/Valve on Flex Joint.
Since the review was completed the Stack on Stack option has been accepted as the preferred option with the Ram on Flex Joint as a contingency option in the event the LMRP cannot be recovered in the event it is the choke point in the well. The ball valve alternative should not be progressed further.
There is much to be done for the BOP on BOP to be implemented with confidence and the move to get additional resource into you team to assist is important to maximise the probability of this operation being successful.
The work done by your team in describing the procedures and the risks greatly helped the review team focus on the important issues, so thanks again for that.
<<...>>
regards

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MC 252 Top Preventer Peer Assist Recommendations

May 13/14, 2010

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Purpose and Expectations

The intent of this Peer Assist is to conduct a line item review of both:

- Removing the Horizon LMRP and running the DDII BOP on the Horizon lower stack
- Running the double Ram or Valve preventer/valve on top of Horizon Flex Joint.

Specifically:

1. Assess the feasibility and risks associated with both operations and determine the significance of these risks.
2. Examine the contingencies and confirm that these are sufficient and effective
3. Identify any needed, pre-work, modeling, trials and tests for pressure, interference, compatibility etc.
4. Assess and summarize the relative merits of above options

Context

- Most of the risks associated with these operations were identified by the planning team and the proposed mitigations described in the review discussion
- The Review team has not repeated these risks and so this slide pack should not be considered a complete listing of the risks and mitigations
- Focus of Peer Review was to determine installation risks not examine the wider nor longer term implications – mission is to "stop the flow"

Overall Feedback

BOP on BOP and Ram/Valve on Flex Joint

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- Amazing amount of work been done – great job in short time
- Key risks had all been identified - no significant additional risks identified by review team
- Review team believes that the BOP on BOP has a great probability of successful installation than the ram/valve on Flex joint
- Review team believes that the BOP on BOP operation is feasible and can be managed safely
- The Ram is the recommended option over the ball valve for the Ram/Valve on flex joint (case of being unable to remove the LMRP for BOP on BOP option)
- Schedule pressures need to be given careful thought and stop points/decision points clearly understood
- Key operational risks
  - Removal of LMRP (low probability, high consequence)
  - Dynamics (BOP placement, weather, timing etc.)
  - Subsea visibility and close control
  - Hydrate Management and Inhibition
- Working 3 options (BOP on BOP, Ram on Flex-joint and Valve on flex joint) is stretching limited resource and could compromise the success of the selected option

Comparison of Ram vs Valve on Flex Joint

Ram/valve on Flex Joint

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- Ram's control system more complex than valve but gives more options
- Valve closure a simpler operation (ROV) but re-opening valve may be difficult – need to assess likelihood of being unable to re-open valve and implications.
- Ball valve could hydrate after closure preventing opening
- Approval of ball valve by MMS as pressure containment/BOP system is likely to be a challenge

- The Ram is the recommended choice over the ball valve

BOP on BOP vs Valve on Flex Joint

BOP on BOP and Ram on Flex Joint

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BOP on BOP

- Uses equipment in function for which it was advised
- BOP on riser is stiffer than Valve on Drill-pipe
- Hydrate inhibitor can be circulated to H4 connector

Valve/Ram on Flex joint

- Offers alternative if pressure restriction is in LMRP or LMRP cannot be removed
- Approval of Pressure Control system by MMS will be challenging
- Removal of Flex joint bolts and making up valve assembly is a unique operation sub-sea
- No hydration inhibition circulation system
- Mule shoe means that flange has to be held higher above connector than BOP and so more prone to hydrates
- "O" rings could be pulled out by venturi forces as system is landed

General Recommendations
BOP on BOP

- Focus on Hydrate Risks and Mitigations:
  - Educate operations team on general Hydrate risks and issues (Proximity, timing, chemistry, pressure, temperature effects)
  - Decide on which new ideas we need to pursue and which should be dropped? (e.g. shroud around base of BOP)
  - What lessons from cofferdam would help on ROVs, hydrates, SIMOPS etc.?
  - Quantify and model the glycol flowrate, volumes, duration needed for effective placement and inhibition
- Adjust organizational structure and establish boundaries:
  - Consider separate teams for critical work fronts that need to be progressed, e.g. hydrate inhibition
  - Develop resource plan defining essential personnel on rig etc.
  - Develop a decision flow chart that shows who makes decisions and anticipates what ifs – considering rehearsing these
  - Establish the boundary conditions (e.g. regulatory) and determine if we have best tools, and chemicals for the job.
  - Engage ROV contractor in training, trialling etc.
  - Conduct critical operations during daylight hours

Preparation
BOP on BOP

- Document requested on Status of Horizon BOP
- DP system - need TO analysis and report
- Assess Watch circle tightness
- Wellhead stress weight and bending calculations required
- Loop current study for leaving stack on stack – to be modelled
- BOP Test requirements/certification – to be defined (timing issue)
- Evaluate use of anchor winch 7 to pull off location to avoid clash issues
- To manage Gas around vessels consider Water spraying moonpool area etc.
- Review inhibition system to confirm adequacy and build in additions if needed

Deploy BOP Stack

BOP on BOP

- Manage potential leak path of Riser Fill up valve
- Decide whether Glycol or methanol will be used for Hydrate inhibition
- Confirm whether hot water could be used – ref. Enterprise study
- Identify critical parts that could be hydrated and could cause a problem if hydrates expands or preventing locking/unlocking of connector
- Hydrate inhibition – Assess adequacy/opportunity for backup
- Determine how long can we can operate in the plume area while waiting for hydrates to disassociate
- Evaluate opportunity for gas diverter on base on of BOP – flat plate with funnel guide
- Check Interference with lines

Deploy LMRP Pulling Assembly

BOP on BOP

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- Determine what is likely to be most successful way of pulling LMRP (Winch, Q4000 crane, derrick)?

Navigate to Location

BOP on BOP

- Enterprise interference – confirm stand off distance (multiple SIMOPs)
- Approach path to be evaluated (current issues)

Pull LMRP
BOP on BOP

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- What if LMRP already released? Confirm it's locked when cutting riser
- Develop unlatch plan (lessons from ROV operations during initial response)
  - Capabilities and functionality of Q4000 run yellow pod to activate connector? Line distance/SIMOPS
  - Explore opportunity to access blue pod?
  - Consider lifting LMRP with Q4000?
  - Risk of activating wrong functions from pod.
  - Accumulator back-up
  - Lessons from unlatch incidents
  - Checking hydraulics
- Assess operation of ROV around plume with diamond saw
- Drill pipe falling could cause a problem, seal face damage – consider leaving AX ring to protect seal face
- Evaluate LMRP stability with pod which will upset value?
- ROV ring removal in plume – visibility, lifting forces when lifted, ROV Tooling reference points, model or trial ring placement and ring placement tool (horseshoe)?

Install BOP
BOP on BOP

- Develop decision tree on rigid vs. hydraulic release of ring gasket
- Hydrates in diverter joint - Could glycol be injected into diverter joint? Pump down boost line?
- Risk of riser plugging with hydrates
- Progress design of external grip ring gasket removal tool
- Evaluate feasibility/value of snubbing in the stack with clump weight/compensated crane
- Landing BOP – consider design funnel on base of BOP to help centralize
- Determine how long to wait before latching to give time for warming/dissociation
- Evaluate use of shroud to hold hydrate inhibitor if methanol used?
- Degree of control with stack placement? Less than 1 foot – closer is better for hydrate temp management and need to land BOP quickly – (temperature should help on venturi effect)
- Guidance system such that BOP is positively in place before landing assuming loss of visibility, involving ROV operators and consider how Horizon stack could be utilised?
- Lateral movement is a risk with currents – use marker to rehearse accuracy of placement
- How to manage loss of visibility when landing BOP? Referencing between stacks?
- DDII is the right rig for this work but need rig DPO operators involved in procedures

Shut-in Well
BOP on BOP

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- Hydrate potential if there is a small leak at the connector? Methanol
- Pressure Build up when well shut-in – how to manage bleed of pressure, risks to rig,
- Develop an Exit strategy if things go awry

General Observations
Ram on Flex Joint

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- Operation is different – using much equipment with which crews are unfamiliar
- Hydrates more of a problem than for BOP on BOP – landed higher, less inhibitor
- "O" ring seals could be a problem. Record of such issues not good – venturi forces on rings.
- Stabbing over obstruction once cut off horizontally is a risk
- Risk of drillpipe stub having lateral force that prevents centering of flange
- Bolt loosening and shearing is a risk as is number of tools
- Time frame and resources to carry three options

- Significantly lower probably of success than BOP on BOP
- Looks to be doable but not recommended as first choice
- Involves holding pressure in system not normally used for this (flex-joint and riser connect below ram/valve) – ok as diverter system but more risk as capping system

Remove Riser Bolts
Ram on Flex Joint

- Failure to remove all bolts – what are load implications if not all the bolts are replaced because of stud blocking hole
- Operation of breaking out and making up flange bolts subsea has not been done before – (normally a surface operation). New tools and procedure and only two tools available.

Flex Joint Valve Assembly Pre-work

Ram on Flex Joint

- Status of wear bushing in Flex-joint and latch mechanism needs to be confirmed

Deploy Capping BOP

Ram on Flex Joint

- Capping stack certification/MMS issue
- Emergency disconnect
- Need to understand schematic of control system
- Opportunity to have both full BOP and capping stack in water simultaneously has not been evaluated.

Install Capping Stack Steps

Ram on Flex Joint

- System not set up to provide glycol inhibition – ROV hot stab/choke and kill injection
- Potential for mule shoe to damage sealing face
- Evaluate engineering an external funnel/guide for assisting alignment
- Develop contingency plan for cutting mule shoe without creating a seal area problem
- Level of confidence of ROV probing on potential stick up objects

Shut-In Well

Ram on Flex Joint

- Need to understand closing volumes and control sequencing (normally outside seal first)

Subsequent Operations
Ram on Flex Joint

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- Connector release fluid volumes

Ball Valve

Ball Valve on Flex Joint

- Pressure lock of ball valve as it is partially closed? Torque tests been conducted indicating OK to close under flow
- Hydrate could collect above ball valve in the valve cavity, which will make opening of valve very difficult – water ingress?
- MMS acceptance of ball valve likely to be a challenge

Risks – Individual's risks raised at start of meeting

BOP on BOP and Ram or Valve on Flex Joint

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- Station Keeping
- Making up Flange
- Hydrates on BOP/Seals
- Flex-joint connection
- Stabbing/Pressure integrity
- What's in LMRP
- What happens on LMRP Release
- Connector Damage
- Latching & Bending moments
- Making it work
- Failure to understand downsides
- Reconnecting Stack
- Seal Damage
- Disturbance of something in stack
- What we don't know
- ROV Camera Visibility
- Plume
- Safety of 176 People on Rig
- Equipment
- Unable to Re-connect

Peer Assist Participants

Review Team for BOP on BOP

1. Jon Turnbull – BP
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3. Andy Frazelle - BP
4. Joe Dean Thompson – WWC
5. Larry Talley – ExxonMobil
6. Mario Lugo – ExxonMobil
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Review Team for Ram/Valve on Flexjoint

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