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Worldwide Court Reporters, Inc.

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BP-HZN-2179MDL01589602

TREX 005363.0001

Junk Shot Review

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Context

- Final assurance checks being made for Junk Shot operations
- Don't make situation worse
- Focus is on well system integrity
- Range of flow

Leak Scenarios

- Upper Stack Pressure = 2650 psi
- Lower Stack Pressure = 3850 psi
- Possible Flow Restrictions
 - BOP Stack
 - 9 5/8" Casing Hanger Seal Assembly
- Assumed flow area – 3/8" to 2"

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Issues

- Integrity of Casing System
 - Currently 7000 psi upper limit with 20% Safety Factor
 - 8750 psi is Upper Limit with no Safety Factor
 - Weak Point is 16" system
- If 100% seal from Junk Shot what is the maximum anticipated Shut-in Pressure?
- What is the maximum system pressure during kill operation? Can we get ahead of the flow?
- What is the maximum injection rate past the 9 5/8" casing hanger packoff?

Optionality

- Establish flow regimes
 - 3/8" restriction
 - 2" restriction
 - Dynamic Kill Model for both
- Diagnostics - Establish injectivity pressures and rates
- Evaluate effectiveness of Junk Shot and Kill Procedures

Findings

- Assuming best cases for wellbore geometry, well flow output, downhole choking, and pumping at a 5 BPM initial injection rate with 16.4 ppg WBM the initial pump in pressure is XXXX psi and will climb to XXXX psi as kill weight mud overcomes the exiting wellbore fluid

Findings

- Assuming best cases for wellbore geometry, well flow output, downhole choking, and pumping at a 5 BPM initial injection rate with 16.4 ppg Brine the initial pump in pressure is XXXX psi and will climb to XXXX psi as kill weight brineovercomes the exiting wellbore fluid

Momentum Kill Rates – Drill Pipe in Stack 5000 BPM – Best Case

- 8000 psi (WHP) @ 40 BPM = 286* psi / min
- 3800 psi (WHP) @ 25 BPM = 179* psi / min
- Successful Kill Dependent on Build up Rate and downhole choke assumption
 - Can we stay ahead of well recovery
 - If restriction across casing hanger then kill not possible

* Estimates

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Next Steps

- More work to be done on Kill Rate estimates – Mark M. & Bob G / Ole
- More work to be done on Build-up – Mike M. and Group
- Safe Working Margin has not changed
- Risk and Probability of Success – Bill and Charlie

Build Up

- Shut-in Pressure at Mudline – 8400 to 8900 psi – 3 Different Models
- Assuming choke is deep and flowrate is 5000BOPD build up time is 20 minutes
- Assuming choke is deep and flowrate is 25000 BOPD then build up time is 5 minutes
- Depletion is unknown

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At Max Shut in of 8900 psi Static

- Burst Disk will not fail
- 16" seal assembly will exceed rating but not laboratory tested pressure
- 16" will yield but not rupture

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Kill Models – Worst Case, Deep Choke

- Olga model estimates Shut-in Pressure at Wellhead at 9000 psi for 5 bpm @ 5000 BOPD
- Olga model estimates 8500 psi for 5 bpm at 25000 BOPD

Kill Rates - Best Case, Deep Choke

- GSM model predicts Shut-in Wellhead Pressure of 7000 psi

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Work Going Forward

- Technical Report and Recommendation
- 100 psi / min recovery / 12 min @ 5000 BPD
- 400 psi / min recovery / 7 min @ 5000 BOPD

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