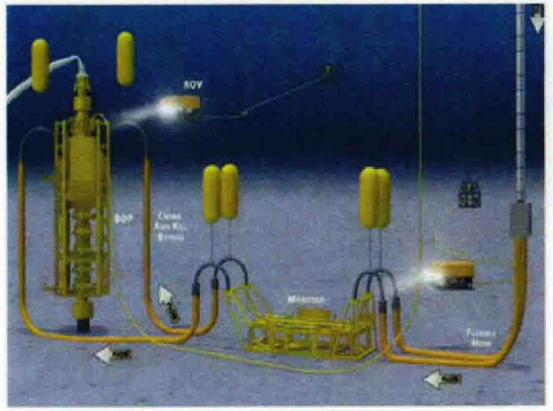
Top Kill Analysis

29th May 2010

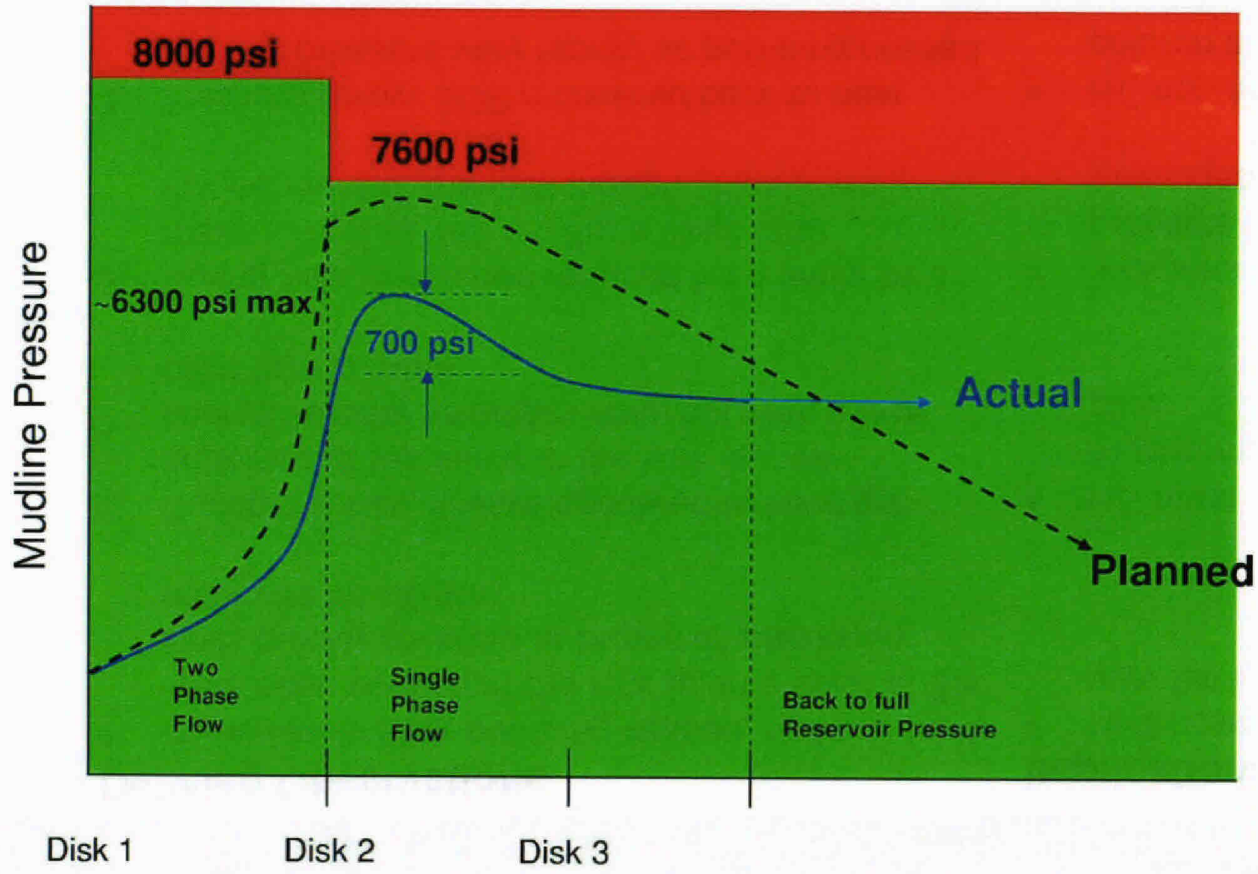
Summary of Operations

- Top Kill Statistics:
  - 3 separate attempts over 3 days.
  - Pumped total 30,000 barrels of heavy mud at rates up to 80 bpm, 1,1000 psi surface pressure, 6,000 psi wellhead.
  - Fired 16 different bridging material shots (varying sized balls, cubes and misc objects).
  - 29 vessels in the area, including 10 ROVs.

- Top Kill #1 May 26th
  - Pumped 13,100 bbls, 16.4 ppg, 53 bpm
- Top Kill #2 May 27th
  - Pumped 6,800 bbls, 16.4 ppg, 25 bpm with 15 shots of bridging materials
- Top Kill #3 May 28th
  - Pumped 9,800 bbls, 16.4 ppg, >70 bpm, with 2 shots of bridging materials



Top Kill Pump Actual Performance



Key Messages

- The operation was limited by available rate, not pressure.
- Back pressure required to kill well not generated.
- Pressures flat lined once a ca. 700 psi pressure drop was reached.

Scenarios to Explain Top Kill Results:

Defining Observations

1. Immediately after pumping ceased, hydrocarbons were seen venting at the kink (plume color at the kinks quickly reverted to brown as previously observed for oil/gas).

2. During the kills, always appeared to have gas entrained at the vents in the kink (similar energy/velocity as oil/gas only, but with a grey color due to mud).

3. During Kills, pressures reduced for a while by a maximum of ca.700 psi (for a fixed rate) independent of the rate though "Flat-Lined".

4. Pressure below BOP recovered back to near starting pressure very rapidly as pumping ceased.

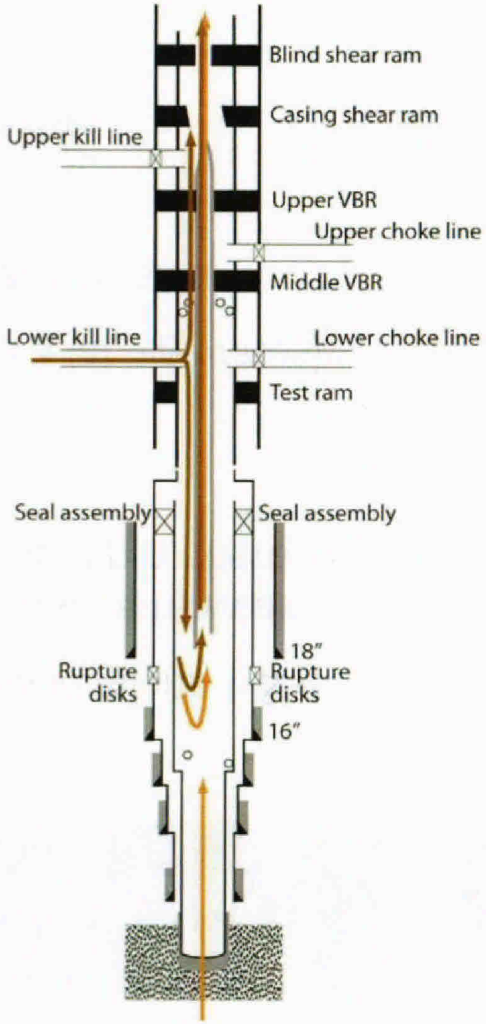
5. Pressure drops across rams in BOP have remained, although they have reduced somewhat.

Implications

- Hydrocarbon (HC) not displaced very far from wellhead
- HC must have alternate path to mud going in, probably via drill pipe.
- Indicates level is controlling the pressure reduction in well. Coincident w/ rupture disc height.
- HC not displaced/limited mud column built in main flow path.
- Drill pipe (including 3.1/2") is still present. Limited flow path by rams causing minor erosion.

Scenario #1:
HC and dominant mud flow up drill pipe and bypass through rams

- Drill Pipe exists through the BOP.*
- HC flow is predominantly through the drill pipe and may also be bypassing the rams.
- Mud flow is predominantly straight back out of the well by going back up the drill pipe, and also by passing the BOP rams.
- At 70bpm and the pressures recorded, only ca. 25 bpm of mud could reasonably be flowing up the drill pipe.



* Pressure readings taken across the BOP stack indicate that both the 5.1/2" / 3.1/2" drill pipe are present.

Scenario #1: Supporting Evidence
HC and dominant mud flow up drill pipe and bypass through rams

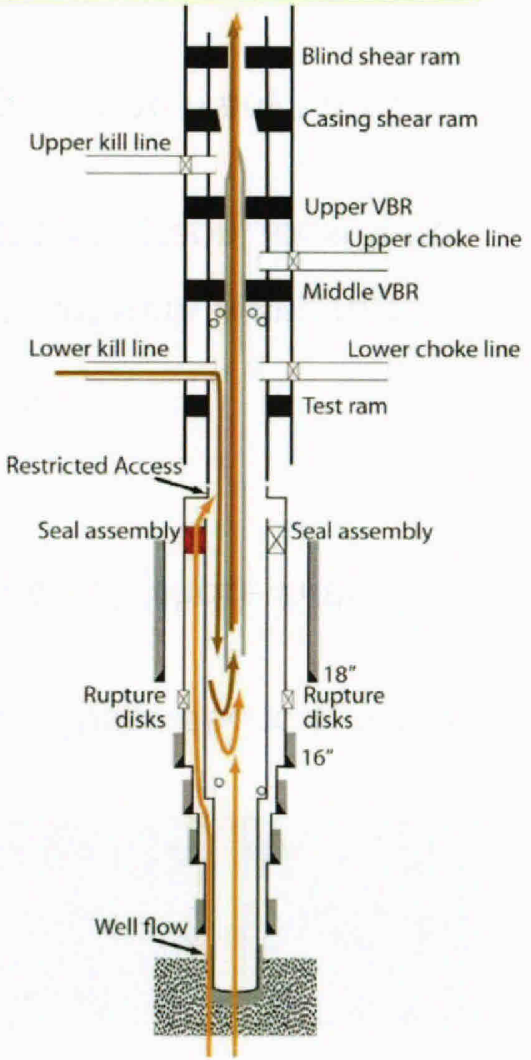
- Supporting evidence consistent with Defining Observations 1 & 4.
- Need 78 bpm to flow up combination of drill pipe and ram bypass. Pressure drop indicates max flow up drill pipe ca. 25 bpm, therefore, ca. 50 bpm bypass at rams.
- Inconsistencies:
  - Not consistent with Defining Observations 2 & 3 (at high rates).
  - Massive flow past rams would expect significant erosion.

Conclusion: Possible but not Plausible

Scenarios #2:
HC flow is up annulus and casing, dominant mud flow into casing

- Drill pipe exists through BOP. Hydrocarbon flow is both through the 9.7/8" casing and also up the 9.7/8" x 16" annulus.

- Mud flow into the well is down into the casing and is prevented from entering the 9.7/8" x 16" annulus due to restrictions. As soon as mud flow ceases, hydrocarbon in the 9.7/8" / 16" annulus flows into the wellbore.



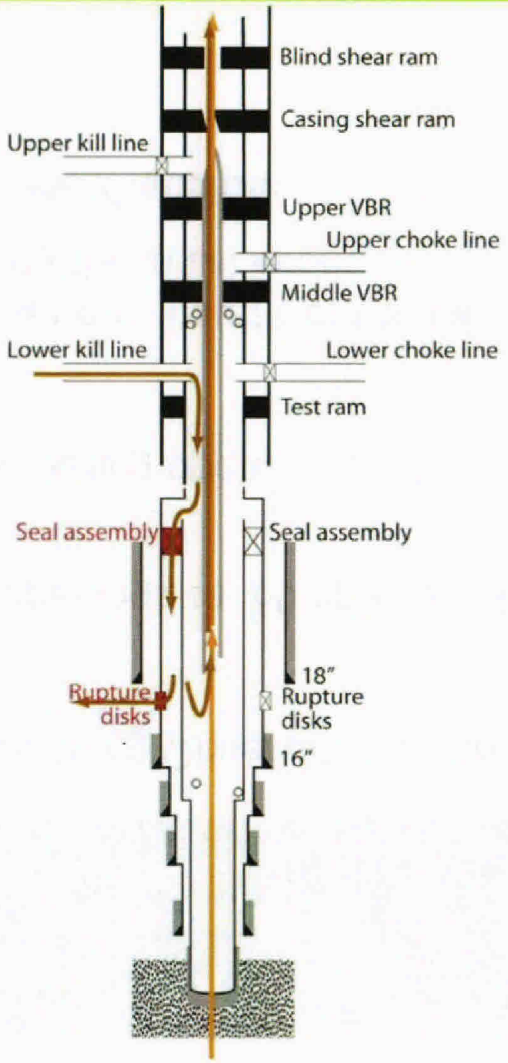
Scenario #2: Supporting Evidence
HC flow is up annulus and casing, dominant mud flow into casing

- Supporting evidence consistent with Defining Observations 1, 4 & 5. 2 is possible.
- Need tight restriction through BOP providing a high choke in the annulus.
- Inconsistencies:
  - Not consistent with Defining Observation 3.
  - Would expect different pressure fall off for different pump rates.
  - No real variation from 1st to 3rd Kill attempts (kill graph doesn't fit model).
  - Volumes pumped would have filled casing volume many times.

Conclusion: Possible but not Plausible

Scenario #3:
HC flow is up 9.7/8" casing (and possibly annulus as well) dominant mud flow though failed 16" rupture discs

- HC are flowing through 9.7/8" casing and possibly also through the 9.7/8" x 16" annulus.
- The casing hanger has lifted off its seat due to temperature and/or pressure and one or more rupture discs in the 16" casing failed during the initial event.
- Mud flow is down the casing and back up the drill pipe, and also down the 9.7/8" x 16" annulus. Because the annular flow path is open to the formation, this limits the maximum pressure that can be applied and prevents a successful kill.



Scenario #3 Supporting Evidence

HC flow is up 9.7/8" casing (and possibly annulus as well) Dominant mud flow though failed 16" rupture discs.

- Supporting evidence consistent with all Defining Observations 1 to 5.
- Max flow rate up drill pipe < 25 bpm.
- Max flow rate through 7/8" rupture disc openings ca. 60 bpm (six discs failed).
- HC flow continues up drill pipe throughout killing operations.
- Inconsistencies:
  - Pressure during remedial activities have been insufficient to fail discs. Disc(s) would need to have failed during the initial event.

Conclusion: Possible and Plausible

Scenario #3 Supporting Evidence (cont.)

HC flow is up 9.7/8" casing (and possibly annulus as well) Dominant mud flow though failed 16" rupture discs.

- Additional Supporting Evidence:
  - Coincident with initial WHFP of ca. 4,400 psi and fracture closure pressure calculated at ca. 4,700 psi.
  - BOP pressure reduction measured during kill is approximately equal to replacing a gas column with 16.4ppg mud down to first rupture disc.
  - "Flatline" profile has same character as a leak off test.
  - Consistent with modeling of HC flow through drill pipe only (small bypass of rams).
  - There are plausible explanations for annulus exposure and disc rupture either inward or outward.

Conclusions & Path Forward

- There is little chance of success repeating the top kill. While options might be available to change the method, these are unlikely to work and carry additional risk.
- If there is a path open to formation then containment is the preferred option.
- Shutting the well in (via BOP on BOP) is likely to lead to broaching.
- Relief wells are most likely solution to kill the well completely.