From: Bodek, Robert
Sent: Tue Mar 16 19:13:30 2010
To: Johnston, Paul J (Houston); Bellow, Jonathan M; Vinson, Graham (Pinky)
Subject: For your review...
Importance: Normal
Attachments: Lessons learned_plan forward Macondo SS NPT.doc
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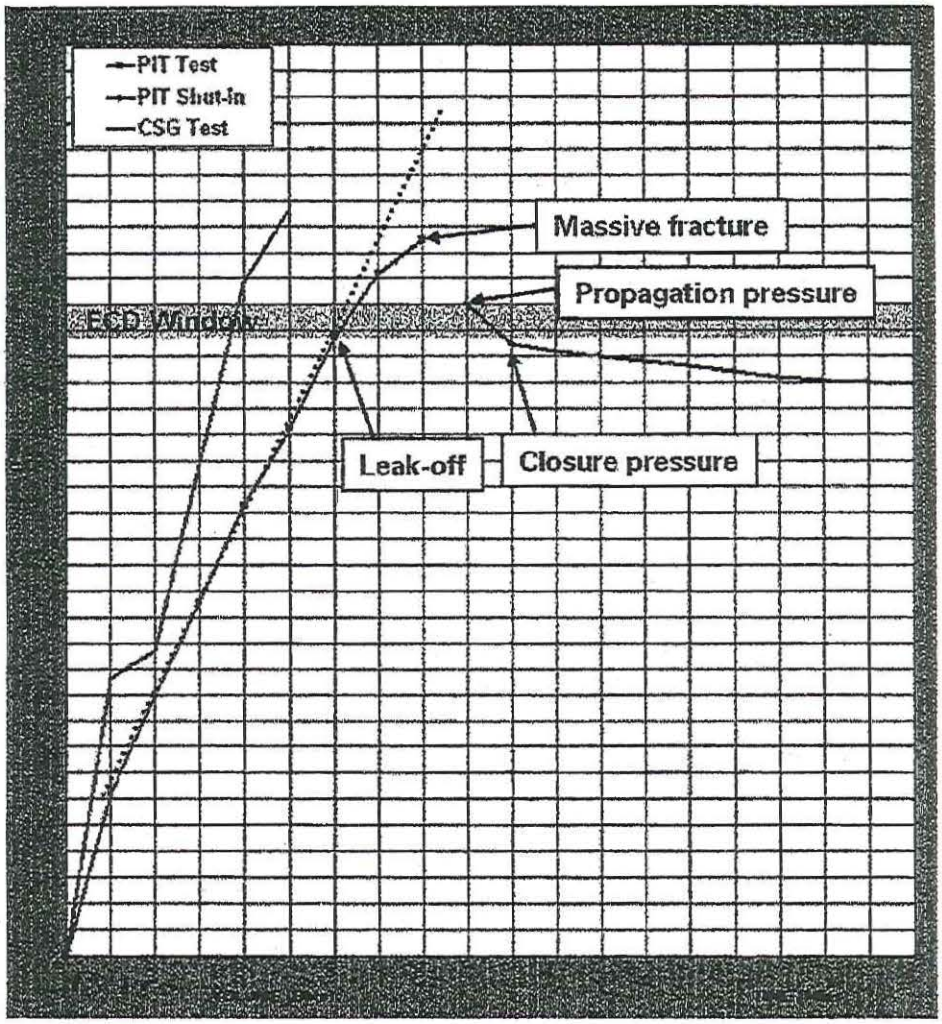
EXHIBIT # 1074
WIT:

Lessons learned and path forward: Macondo subsurface NPT events

1. When interpreting graphical leak-off test results, understanding the significance of the leak-off, facture propagation, and fracture pressures is imperative. The value that is reported to the MMS is the fracture pressure. It is at this point that a large fracture(s) has/have been formed. ECD values should be maintained between the fracture initiation pressure (leak-off), and fracture propagation pressure. Once the ECD values approach the MMS reported fracture pressure, fracture failure and corresponding fluid losses are imminent.

   It should also be noted that weaker lithologies (i.e. – sand or marl) can be present in shallow reaches of the hole-section that may behave more brittle that the lithology exposed at the shoe during the leak-off test. As a good practice, the ECD value should be maintained more towards the leak-off value to mitigate the chances of losses into a weaker lithology.



2. The entire breadth of pore-pressure indicators need to be evaluated under higher scrutiny. A systematic approach of integrating sonic/resistivity modeling, cutting/caving description, d-exponent, background gas, flowback fingerprinting, normalized gas curves, and gas ratio analysis need to be implemented. Thus far on this well, it has been shown that one or more pore-pressure indicators have provided ambiguous or even contradictory data. A more robust analysis of all indicators would allow us to better discern actual pore-pressure deviations from localized anomalies.

3. The application of some traditional exploration drilling practices needs to be considered. In wells with narrow drilling margins, drilling techniques such as drilling at reduced ROP, only having one connection in the hole at a time, simulating connections, performing flow-checks when a sand interval is cut, and circulating to manage ECD should be employed.

4. Better lines of communication between the rig and Houston office need to be established. Preceding each well control event, subtle indicators of pore pressure increase were either not recognized, or not discussed with the greater group.

In retrospect, after compiling the above list of observations from various individuals, it seems that the accelerated rate of penetration and the resulting 'onslaught' of drilling indicators exceeded the ability of all team members to effectively recognize, properly communicate, and decisively act upon available data.

I would like to propose the following:

1. Wellsite subsurface personnel evaluate the entire suite of possible drilling indicators.
    a. Resistivity and sonic are modeled real-time at the wellsite during the evening tour, and by the office PP/FG during the workday hours
    b. Cutting and cavings are monitored as they are lagged-up by the wellsite and operations geologist
    c. Background gas and d-exponent are displayed on the real-time displays on the rig, in the operations room, and in a standard template in INSITE anywhere.
    d. Sperry drilling services provides flowback fingerprints and gas ratio analysis on each lagged connection, and a normalized gas curve
2. Rate of penetration is such that all the aforementioned indicators can be adequately evaluated in 'real-time'. Practices such as having only one connection in the hole at one time, stopping and circulating during times of uncertainty, simulating connections, and performing flow-checks when in a narrow drilling window after cutting a sand will be implemented.
3. All indicators, no matter how subtle, will be discussed cross-discipline. For example, an observation made in the office by a subsurface team member will be communicated to the drilling group. Upon cross-discipline consensus of noteworthiness of a feature, either on the rig or in the office, the rig- and subsurface-based teams will be assembled.