

Subtracting the Formation Fracture Pressure at Depth (Equation 2, above) from the Total Dynamic Mud Pressure at 18" Shoe should show whether the mud had sufficient pressure to fracture the Shoe. If the Dynamic Mud Pressure is in excess of the Formation Fracture Pressure (*i.e.*, a positive number) the formation would be expected to fracture.

**Equation 21: Calculate Excess Mud Pressure above Formation Fracture Pressure during Top Kill**

(Dynamic Mud Pressure	-	Formation Fracture Pressure at Depth)	=	Excess Mud Pressure Above Fracture Pressure
(7,516 psi	-	5,484 psi)	=	2,029 psi

This shows the Top Kill mud, even at the low BOP pressures, had sufficient pressure to possibly fracture the formation outside the 18" Shoe. With a plausible theory that the collapse disks could be open, and mud flow could get to them through a loose Production Casing Hanger, then fracture at the 18" Shoe could explain the low BOP pressures during the Top Kill.

Scenario #3 relies on the collapse disks being open, in contrast to Scenario #2 in which they are assumed to be closed. It also requires more than one collapse disk to be open so that the pressure drop across the collapse disks does not need to be excessive. But, without knowing the flow path geometry precisely, the Top Kill mud pressures were there to potentially fracture at the 18" Shoe.

### **Summary of BP's Conclusions**

The Top Kill results did not allow BP and the Unified Command to select just one of the three scenarios, or to rule any of them definitely out. This left all three scenarios open as possibilities. From the data available at the time it was reasonable to conclude that one or more collapse disks could have ruptured. Therefore, Scenario #3, with the fracture and surface broaching potential, had to be considered a real possibility if the well was shut-in without the ability to control flowrate and BOP pressures.

Following the initial blowout, there were many questions about the integrity of the Macondo well. The hope was that data from Top Kill would answer some of those questions. It did not. Absent those necessary answers, the Unified Command chose to guard against formation fracture and surface broaching, which could have made the incident much worse, by deciding to pursue containment instead of early shut-in.

### **Alternative Views**

It is clear from the documents that there were many opinions about what could have been the situation within the well, and therefore what should be the recommended way forward.<sup>70</sup> It is not clear that some of these individuals have analyzed and ruled out Scenario #3 based on evidence and calculations.

<sup>70</sup> MDL Dep. Ex. 9946 at 2358 (*Summary & Conclusions from Top Kill Efforts 26-28 May 2010*).