Two months have passed since the blowout of the BP exploratory Macondo well in the Gulf of Mexico. Much more is now known about a string of fateful decisions taken in the course of drilling this well.

Individually, none of BP’s decisions would have caused the blowout, but their confluence led almost inevitably to the largest oil-related tragedy in U.S. history. Eleven people have died, a whole coastal region of the Gulf of Mexico has been devastated, and it is uncertain that BP will survive the ordeal.

There is some good news, however: Most of the oil and gas spewing from the failed well is being captured by BP engineers. Here is why.

On June 17, video feeds showed oil and gas to be still escaping from the containment hat attached to the failed blowout preventer (BOP) on top of the well. The brown part of the plume consists of oil droplets, while the white bubbles are gas encapsulated in hydrate ice skins. These ice-gas bubbles eventually dissolve in seawater, thus they never reach the ocean surface.

I have watched the BP video feeds for weeks. The plume currently overflowing the top hat is significantly smaller and less violent than the initial oil and gas plume emanating from the broken riser. That suggests that a large portion of the well flow is being produced in a controlled fashion.

On June 16, BP managed to connect the choke and kill lines below the BOP to a surface collection system onboard the Q4000 vessel. The production lines are capable of collecting about 25,000 barrels of oil and 30 million standard cubic feet of gas daily. Correcting volumes for the pressure difference between the sea bottom and the surface, the total flow of oil and gas through the BOP should be about 35,000 barrels a day, not 60,000 barrels as some claim.

There are two reasons why the oil flow rate from the failed BP well may have increased from the initial 9,000 to 22,000 barrels a day, the amount estimated to have been leaking in May. First, the partially closed rams and rubber rings functioning as flow barriers in the BOP may have been eroded by oil and gas, and perhaps sand. Second, “wormholes,” or meandering flow tubes that connect the reservoir and the well, may have formed.

“Wormholes” are created when sandstone crumbles and washes away because either the oil and gas flow rate is high, or the reservoir oil is highly viscous, like cold...
molasses. The combined effect of rock and well erosion might have increased oil flow from about 20,000 to 30,000 barrels a day.

The physics of that phenomenon, akin to washing soil away by rain, is nicely described on The Oil Drum website. Gas is another 50 percent of the total flow and is often conflated with the oil flow. Gas dissolves in the seawater at depth and doesn't reach the ocean surface.

For the sake of perspective, consider the BP Thunder Horse platform, the world's largest semisubmersible facility. Prior to the disastrous spill it was also the most productive platform in the Gulf of Mexico, located in water that's about 6,050 feet deep. As of March 20, 2009, daily production at this platform was approximately 260,000 barrels of oil and 210.5 million standard cubic feet of natural gas a day from seven wells, an average of 37,000 barrels of oil and 30 million standard cubic feet of gas per well.

The former Minerals Management Service reports that the majority of ultra-deepwater oil wells in the Gulf of Mexico produce about 20,000 barrels a day, with the best well in the entire region producing 41,000 barrels a day.

Unless there has been a complete failure of the central 7-inch production casing — which I don't believe has occurred — then no reason exists to believe the failed Macondo well is producing 60,000 barrels of oil a day.

Based on available data and calculations, it is highly probable that the failed BP well is producing oil at a rate closer to 20,000 or 30,000 barrels of oil a day. If BP is collecting 25,000 barrels a day, then only some 5,000 barrels of oil are being spilled in the Gulf waters.

Based on the evidence presented thus far, it seems quite unlikely that 60,000 to 150,000 barrels of oil a day will ever flow from the Macondo well. By controlling the spill rate, BP has gained the breathing room required to successfully complete the bottom kill using the relief wells. I anxiously await the good news that the Macondo well has ceased flowing.

Patzek is chairman of the petroleum and geosystems engineering department at the University of Texas.
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