



BP's Deepwater Oil Spill - The Two Options - and Open Thread

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So who makes the decision? BP are now faced with a couple of problems that may have arisen because of a false assumption early in the process, about the condition of the well. They have now been led to two different choices, as to how to proceed with the final steps. Let me explain what I mean and how, I believe, these came about.

At the beginning of the disaster, when the plans were being made to bring in a relief well to seal the bottom of the flowing well, it was necessary to make a number of decisions. One of these had to be where the relief well should intersect the well that was flowing.

If you go back to those times there was an increasingly dominant viewpoint that developed in the early weeks that the failure had been in the cement surrounding the production casing, and that, as a result, the oil and gas was flowing up the outside of the production casing, through the gap between it and the liner segments higher in the well, and then through a failed seal in the BOP, down into the main flow channel and up through the center of the BOP.

Accordingly when the relief well was planned, it was assumed that there was a flow channel that had developed down through the cement in the annulus to the reservoir. The path of the relief well was therefore aimed so that it would intersect the annulus at the top of the gap below the last lined segment of the well. Once there it would allow a check that there was flowing oil, and could then be used to force mud and then cement into the annulus to displace the oil. The cement would push the existing fluids down the well, back into the reservoir, and thus create an 800-ft long plug in the annulus. If there were indications that there was still some flow up through the production casing, then the relief well would have re-drilled through the injected cement, and then, using a milling bit, cut an access slot through the casing.

In the same way, as before, the relief well would then have injected mud, firstly to kill any driving pressure in the well, by filling the well with mud, and then killed the flow by driving the oil back into the reservoir, and then injecting cement to kill the well. At this point the bottom of the well would be sealed with a known amount of cement in both the annulus and the bottom of the production casing. For this method to work, however, there had to be a pathway that would allow the mud injected either into the annulus, or the casing, to displace the oil in the well back into the reservoir.

In the initial arrival at the annulus injected mud would push the oil both up along the anticipated existing annulus flow path to the BOP, and then fill the casing as the mud displaced the oil downwards in the production casing. The injected mud would also push down, through the flow

path through the cement around the production casing, pushing that oil more directly into the reservoir.

This scenario should have worked if the leak had been through the annular cement and up through the outside of the production casing. However some snags have now arisen. The first is that the leak was not apparently mainly up the annulus, but rather up through the production casing. That poses the first problem with the trajectory for the relief well. Because if the flow did not go up the annulus, then cement could not be sent down the annulus to stop it. Thus, I suspect, the decision to send the cement down the production casing. At least this way the reservoir and flow path could be sealed off, and should there be a need to temporarily abandon the well due to a hurricane, then there would be no significant chance of a leak. So that was done.

But now it has left BP and the oversight panel with the problems that I have mentioned in my last two posts on the subject ([here](#) and [here](#)). Because with the bottom end of the production casing sealed, and it having been determined that the annular seal under the BOP is still intact, there is no good and easy way to get the oil (if there is any) from the annulus and replace it, first with mud, and then with a cement plug of suitable, and known, size. Injecting additional fluid into what is a sealed space doesn't work well.

One thing that could be done is to sensibly shrug the shoulders, say to heck with the bottom – we know it is currently sealed, and just do a conventional plug and abandon at the top of the well. This would require removing the existing stack, and the original BOP and the 3,000 ft of drill pipe (DP) suspended below it in the well (but now surrounded by drilling mud). Then putting a new BOP in place that would allow a new DP to be run down the well. This could be fitted with the necessary tools to put a cement plug in both the production casing, and in the annulus beyond it. It would also allow any remaining superstructure above the plug to be removed, according to regulation. That operation would, however, come under a different jurisdiction.

This would, I gather, now be a route that BP might prefer to move along. But Admiral Allen has been fairly adamant about having the bottom plugged with the relief well. But his [latest directive to BP](#) is beginning to work to give them wiggle room in changing this option. He sets out four directions:

Provide me a plan for a pressure relief system to prevent excessive pressurization of the Macondo well stack (capping stack, LMRP, and BOP), including any necessary containment option, Contingent upon the approval of the plan, this system will be installed before the intercept of the DDIII relief well.

Because the seal is still in place at the top of the annulus, and the cement is sealing the bottom of it, when the relief well drills into the annulus, any imbalance of pressure could cause flow into the original well. This would increase the pressure in that well, and cause the top seal that is currently intact to likely open. This in turn could increase the contained pressure within the stack assembly.

Because we have seen the very small leaks on some of the joints in the stack, any increase in pressure could possibly cause a greater failure, and a fluid leak into the Gulf of significant size. To ensure that doesn't happen, the Admiral wants to be sure there is another form of pressure relief in place, or a way of capturing fluids, so that they don't get into the water.

The next direction is to be ready to have the DDIII able to continue the completion of the relief well, when directed.

The third directive, however, addresses the change in the stack to a more regular BOP to allow a top plug to be inserted into the well.

Provide me a plan for an ambient pressure test and analysis to assess the stability of the well during the period of time after the removal of the current Macondo well stack and its replacement with a new BOP package.

In other words tell me how you can be sure that the well won't flow after you take the stack and BOP off. The question of the fluid in the production casing has been answered by the pressure tests on the cement plug, and I believe that the negative pressure test, has shown that there would be no flow up through the annulus. It just needs BP to couch the results in the form that the Admiral requests.

And the final direction is

Before the current BOP stack is removed, prove to my satisfaction that the Macondo annulus does not represent a potential pathway for hydrocarbon flow; or, if the potential for flow can't be proven, identify the conditions under which flow could occur and the risks of those events occurring.

This is where the judgment call is required. Can BP provide a logical answer to satisfy the Admiral and the science panel?

There are offsetting risks in the two approaches being considered. Drilling into the annulus will identify whether there is any communication (flow path) from the reservoir up through the annulus to the BOP. But it runs the risk of overpressuring the seals in the BOP and higher elements of the stack that could rupture and dump up to 1,000 bbl of oil into the Gulf. On the other hand accepting that the annulus is currently sealed, so that the BOP can be removed to inject the top plug, runs the risk that, if the seal at the top of the annulus were to fail during the operation, then seawater could flow down the annulus, displacing the lighter oil and causing it to flow up out of the well and again dump it into the waters of the Gulf.

It appears that the Admiral is asking for the arguments on both sides. But these focus on whether or not to allow the relief well to intersect the original well or not. The need for the top plug is still an abandonment requirement.



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