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VIDEO: Geologist: Depletion of Oil Reservoir "Unlikely"

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Theme: Environment
In-depth Report: THE BP OIL SLICK

There are 4 alternative explanations for the unexpectedly low oil pressure in the BP well: (1) A leak in the pipe in the well bore; (2) flow under the well between sand layers; (3) a blockage in the well; or (4) depletion of the oil reservoir.

This essay focuses on the fourth possibility: depletion of the oil reservoir. Specifically, BP claims that the oil well pressure is perhaps 1,200 pounds per square inch less than expected because the oil reservoir has been depleted.

The size of the reservoir is crucial in testing BP's theory. While there are other factors which determine oil pressure, the size of the reservoir is probably the most important.

BP claims that there are only 50 million barrels worth of oil in the reservoir underneath the leaking spill site. Assuming a worst-case scenario of 100,000barrels leaking a day, and given that the spill started 89 days ago, that would amount to around 8,900,000 barrels which have leaked to date.

Under this scenario – where 17.8% percent of the oil has leaked – the pressure of the well could, in fact, be declining.

But the Guardian noted on June 18th:

But the 50m figure cited by Hayward took some industry insiders by surprise. There have been reports the reservoir held up to 500m barrels – the figure quoted by Hayward's questioner, Joe Barton, a Republican from Texas.

"I would assume that 500m barrels would be a more likely estimate," said Tadeusz Patzek, the chairman of the department of petroleum and geosystems engineering at the University of Texas at Austin. "I don't think you would be going after a 50mbarrel reservoir so quickly. This is just simply not enough oil to go after."

I spoke with the top geologist at a major oil company today. He agreed that BP wouldn't have spent the amounts needed to drill such a deep well unless BP thought that the reservoir was a lot bigger than 50 million barrels of oil.

He also said that it was unlikely that the well pressures have decreased because of depletion of the oil in the reservoir unless BP's estimates were way too high (in other words, if the well was as big as BP must have thought to invest so much in the well, it couldn't have been substantially depleted by now).

Indeed the Guardian article notes that even BP is not sure of the 50 million barrel estimate:

"We haven't made an assessment of the reserves as far as I know," said Toby Odone, a BP spokesman. "You start evaluating the reservoir once you complete the well. Obviously we didn't get to that point."

Wolf Blitzer noted on June 16th:

One — one expert said to me — and I don't know if this is overblown or not — that they're still really concerned about the structural base of this whole operation, if the rocks get moved, this thing could really explode and they're sitting, what, on — on a billion potential barrels of oil at the bottom of the Gulf of Mexico.

Similarly, Bloomberg reported on June 19th:

The ruptured well may hold as much as 1 billion barrels, the Times reported, citing Rick Mueller, an analyst at Energy Security Analysis in Massachusetts.

And Rob Kall claims that a source inside BP tells him:

Size of reservoir – estimated by BP and its partner, Andarko to be between2.5B and 10B bbl. (that's 100,000,000,000 gallons and 400,000,000,000 gallons).Yes – all of those numbers are BILLIONS.

Given that BP's nearby Tiber and Kaskida wells each contain at least 3 billionbarrels of oil (see this, this, this and this), estimates of more than a billion barrels for the leaking Macondo reservoir are not beyond the realm of possibility.

Recoverable Versus Total Oil Reserves

There's also the issue of whether 50 million is an estimate of recoverable oil or total oil in place. As the Guardian wrote:

BP spokesmen said that Barton [with the 500 million barrel estimate] was referring to recoverable oil rather than the total size of the reservoir.

The Guardian clearly got this backward: the total size of the reservoir is – by definition – larger than the amount of recoverable oil. So what BP spokesmen must have said (and the Guardian got backwards), is that 50 million was an estimate of recoverable oil, while 500 million is one possible estimate for total oil in the reservoir.

Early Estimates Are Usually Low

It is well known that:

In general, most early estimates of the reserves of an oil field are conservative and tend to grow with time. This phenomenon is called reserves growth.

Therefore, 50 million barrels might have been BP's early – and, hence, understated – estimate of the amount of recoverable oil in the reservoir.

Seismic Tests are Imprecise

Is it possible that BP drastically overestimated the size of the oil reservoir, and that it really is only 50 million barrels or so?

Perhaps.

The geologist I spoke with today told me that seismic readings so deep under the ocean and so deep under the seabed can only pick up impressions of things around the size of an olympic pool.

Similarly, oil industry expert Bob Cavner said seismic tests are generally used to find bigger scale things like geologic structures:

http://today.msnbc.msn.com/id/26184891/26411480#38322100

Cavner explained more about seismic testing yesterday.

While BP talks confidently about seismic tests for leaks beneath the seafloor, I am not so sure that a leak could be detected using seismic given the low-resolution of seismic tests.

BP Stonewalls

The biggest problem is that BP is keeping the information it has about the size of the reservoir to itself, and refusing to disclose to the public or even Congress what it knows.

Congressman Markey – chair of the Select Committee on Energy Independence and Global Warming – wrote to BP on June 23rd demanding more information:

Please provide all documents related to the geologic formation in which the Macondo well is located. Are there significant deposits of oil and gas in formations above the target reservoir? Please provide an estimate of the total amount of oil and gas that is contained in i) the Macondo well target formation and ii) each formation above the target formation that could leak hydrocarbons into the annulus as a result of poor cementing, damage caused by the initial explosion(s), or the failed Top Kill effort.

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a. In order to understand the geological complexity of the well, please provide all geological logs, including the mud log, and all geophysical logs, including resistivity and porosity logs.

b. A May 23, 2010 article entitled "Documents show BP chose a less- expensive, less–reliable method for completing well in Gulf oil spill" in the Orlando Sentinel stated that well records indicate that in late February, there was a loss in drilling mud pressure. According to the article, this could mean that the mud fractured layers of sand or shale in the formation and vanished. The article goes on to state that in early March, the pressure of the oil and gas encountered overwhelmed the pressure of the drilling mud. In mid-April, a loss of drilling mud was reportedly again experienced. Do any or all of these events indicate that oil and gas could be flowing from somewhere other than the target reservoir? If so, please explain fully, and if not, why not?

On July 15th, Congressman Markey told CNN that there has been no response from BP:

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