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The Relief Wells Are Ahead of Schedule … But Will They Work?

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In-depth Report: THE BP OIL SLICK

By all reports, BP is ahead of schedule in drilling the relief wells. In fact, BP will likely complete the first relief well this month.

The team leader for BP's relief wells – Boots and Coots – is 40 for 40 in successfully stopping oil spills using relief wells (around 6:10 into video).

Many oil drilling experts are hopeful that BP's relief wells will succeed on the first try. I hope and pray that they do.

But the relief wells are not a slam dunk, especially at such extreme depths.

Indeed:

> "If it was shallow water, it wouldn't be anything serious," said Don Van Nieuwenhuise, director of Petroleum Geoscience Programs at the University of Houston.

CBS News states:

> "It's not a solid dunk," said Eric Smith, a deepwater drilling expert. "It's going to take some work."
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> Smith said two things could go wrong. The cut could miss the broken wellbore, and BP would just try again, or engineers could drill into hidden gas pockets.
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> "When you are drilling into that you have to be careful of a kick, a blowout in the relief well," Smith said.

Similarly:

> George Hirasaki, a Rice University professor in chemical and biomolecular engineering who was involved in the Bay Marchand oil containment effort for Shell, said engineers have to be very careful when drilling into any formation that has hydrocarbons, which poses the risk of the same type of explosion that destroyed the rig.

Recently-retired Shell Oil President John Hofmeister said that the well casing below the sea floor may have been compromised, which could render success from the relief wells less

certain:

> [Question] What are the chances that the well casing below the sea floor has been compromised, and that gas and oil are coming up the outside of the well casing, eroding the surrounding soft rock. Could this lead to a catastrophic geological failure, unstoppable even by the relief wells?
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> John Hofmeister**:** This is what some people fear has occurred. It is also why the "top kill" process was halted. If the casing is compromised the well is that much more difficult to shut down, including the risk that the relief wells may not be enough. If the relief wells do not result in stopping the flow, the next and drastic step is to implode the well on top of itself, which carries other risks as well.

Hofmeister subsequently told MSNBC:

> The question is whether there is enough mechanical structure left at the base of the reservoir to hold the cement when they start pouring cement in [from the relief well].
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> The more oil we some coming out, the more it tells you that the **whole casing system is deteriorating**. The **fact that more oil would be coming out rather than less oil**, would suggest that the **construction within the pipe is offering no resistance whatsoever**, and **we're just getting a gusher**.

Indeed, Hofmeister told Chris Matthews today that he hopes the relief well has a 50-50% chance of being successful:

Yesterday, the Guardian quoted the government official in charge of oil spill response as warning:

> "There is a chance – a slight chance – they could nick the wellbore," Thad Allen, the coast guard commander, said. …
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> A nick risks starting a new small leak or possibly even a collapse of a section of the pipe given that it was damaged in the explosion in ways still not fully understood.
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> The intercept could be complicated if it turns out that the oil is flowing around the pipe, between the pipe and the cement of the well bore.

And Spiegel previously reported that there are many dangers with completing the relief wells:

> Independent experts warn that relief wells, like any well, are not without risk. "More oil could leak than before, because the field is being drilled into again," says Fred Aminzadeh, a geophysicist at the University of Southern California.

> Ira Leifer, a geochemist at the University of California in Santa Barbara, voices similar concerns: "In the worst case, we would suddenly be dealing with two spills, and we'd have twice the problem."
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> As straightforward as it sounds, this approach [i.e. killing a spill by drilling relief wells] has not always been easy to implement in the past. The disaster in the Timor Sea, for example, ended in a debacle. It took engineer five tries to even find the borehole under the sea floor. Shortly before the end, the West Atlas oilrig went up in flames, after all.
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> [David Rensink, incoming president of the American Association of Petroleum Geologists] is particularly concerned that BP, in drilling the relief wells, will penetrate into precisely those rock formations in which extreme pressure and temperature conditions facilitated the April blowout in the first place. Gas bubbles and gushing oil from the depths are real possibilities. "Any relief or kill well needs to be drilled with more caution than the first well," Donald Van Nieuwenhuise, a geologist at the University of Houston, told the New Orleans daily Times-Picayune. "You don't want a repeat performance.

As CBS notes, even BP is no longer expressing full confidence:

> BP leaders have showed supreme confidence in their relief wells.
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> "I fully expect that the well itself will be shut off in August," said Bob Dudley, BP's point man on the spill.
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> But recently? More caution.
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> "The drilling of relief wells, there's nothing guaranteed," Dudley said.

Indeed, the veteran engineer in charge of the Ixtoc Gulf oil well disaster in the 1970's states that – given the pressures involved – a single relief well might not be enough:

> Carlos Osornio, a Mexican engineer in charge of Pemex's deepwater drilling operations during the Ixtoc crisis, said BP may ultimately find that both relief wells are needed to contain the gusher.
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> "One relief well may not be enough to contain the high volume (of oil flow), but two will work for sure," he said.

Similarly, former Secretary of Labor Robert Reich previously noted:

> A petroleum engineer who's worked in the oil industry tells me [that] a recent blow-out off the coast of Australia required five pressure relief wells to successfully shut it down.

In addition, as I've previously pointed out, BP's oil gusher is producing a lot of gas.

Bloomberg has an article today adding some details:

> The cap will help BP contend with the particularly strong upward force created by the vast natural gas reservoir that feeds the Macondo well, [David Pursell, a managing director with Tudor, Pickering, Holt & Co. in Houston] said. The new seal may be able to restrict the amount of leaking mud, creating back-pressure that will more successfully contain the gas, he said.
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> The Macondo well produces about 100 million cubic feet of natural gas a day. [I had estimated 290 million cubic feet a day, based on the U.S. Geological Survey's flow rate group's estimates of the oil flow – and see this – and the flow rate group's calculation that 2,900 cubic feet of natural gas are escaping for every barrel of oil.] "That's a big well, anywhere in the world," Pursell said. Natural gas in a well can provide the same effect that gas in a bottle of soda does, forcing liquid — in this case oil — out of the top at a higher speed.
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> The strength of the gas could push the mud up and out of the well, he said.
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> To prevent the mud from rushing out of the well, BP will try to find a mud that is heavy enough to outweigh the pressure of gas coming out of the well, said Les Ply, a Houston-based geologist who has participated in kill operations in the past.
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> An appropriate balance must be struck — if the mud is too heavy, the rocks around the reservoir can be cracked or overburdened, he said. "Mud will take the path of least resistance. You want the path to be up the well bore," he said.
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> Finding the right pressure and mud weight can be challenging for killing a well at this depth, because there's an additional pressure dynamic created by the 5,000 feet of water bearing down on it, said Van Nieuwenhuise.
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> "It's water, so it won't patch itself," he said. The goal will be to slow the mud flow enough to plug the well adequately so that cement can be poured in and set, Van Nieuwenhuise said.

Hopefully, the relief wells will work. But if not, I wouldn't recommend nuking the leaking well.

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