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BP's Deepwater Oil Spill - Cementing the Well - and Open Thread

Posted by Heading Out on August 5, 2010 - 10:25am
Topic: Environment/Sustainability
Tags: deepwater horizon, oil spill [list all tags]

The Deepwater well has now reached a point where the mud inside the well is applying enough weight to the fluid in the formation that the flow of fluid, when such exists, is now from the well back into the rock. The well is sufficiently secure that, just before 7 pm CST Wednesday, Admiral Allen issued the following press release:

> Based on the successful completion of the static kill procedure and a positive evaluation of the test results, I have authorized BP to cement its damaged well. I made it clear that implementation of this procedure shall in no way delay the completion of the relief well.

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The crew is now running the drill pipe within the relief well, but must first run a test of the Blow-out Preventer (BOP). There is a regulation, which the other drilling rig did not follow earlier in the process, that is, no doubt, now being practiced.

> The Transocean Development Driller II (DD II) working for BP, received one INC (Incidence of Non-Compliance) because it had not alternated between control stations for BOP testing. MMS regulations require that the regular 14-day BOP tests alternate between the BOP station on the rig floor and the remote station located at another site on the rig. On the DD II they conducted the BOP pressure testing only from the driller's control station for the last two tests. They did perform function testing on the remote station, but the pressure testing was only performed using the driller's station. MMS has ordered the rig to alternate control stations in the future. . . . . in addition, as a condition of its drilling permit, the rig will be required to conduct increased testing of the BOP stack and Remote Operated Vehicle (ROV) intervention both on the rig and on the seabed.

I presume that it is this scheduled BOP test that is currently being planned. After it is over then the excess cement that is still in the casing will be drilled out. This will allow instruments to then move over the full length of the injected cement to ensure that the cement was placed properly

(using a cement bond log – something that was controversially not done by Schlumberger before the well failure of the Deepwater Horizon). In addition there will be a leakoff test, to test the strength of the surrounding rock.

Simplistically, the pressure in the bottom of the well is slowly increased until the fluid in the well starts to penetrate the rock, shown when the pressure no longer steadily increases as fluid is added. This is then used to determine the weight of the mud that will then be used to drill the last section of the well (to ensure that the well pressure isn't high enough to reach that pressure that will fracture the rock, and lose fluid to the formation).

With that in hand the well will start the short advances, then be surveyed, then advance again, to ensure that the relief well remains on target to hit the original well, first along the annulus, and then to penetrate through the production casing to allow a cement seal of the whole bottom section of the well.

The static kill was carried out with a flow rate of 5 bpm, and Kent Wells noted the success that was achieved.

> We were able to watch the pressure continuously and (see it) gradually decline. We were able to watch as the – if you remember, I mentioned the word we injected for the injectivity test, base oil. We were able to watch as the base oil and then the mud actually hit the reservoir. We were able to see (the well) pressure up, and then we were able to see that pressure come back down.
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> And these were all very encouraging signs. And then what we kept doing is we kept injecting it as five barrels a minute, injecting more of the oil that was in the casing and actually mud, and continued to inject it into the reservoir for a period of time to try to get – make sure we'd cleaned out all of the oil that we could out of the casing.
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> And so we pumped for a number of hours. And then as we got confident that we'd actually got the well into a static condition, we actually increased the rate up to 10 barrels a minute, and then ultimately 15 barrels a minute, and we did that to give ourselves confidence that, if we chose to go ahead with the cementing procedure, that we could actually pump at higher rates, because that will give us a more effective cement job. And so that went well, as well.
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> So we spent some extra time yesterday pumping more fluid in, just to give ourselves more information and confidence. So by the end of the whole process, we had injected about 2,300 barrels of mud, and a lot of that was actually designed at just cleaning out the casing and making sure that we could move forward with the cement job with confidence, if we choose to do so.

In earlier posts I had worried that injecting cement after the static kill could cause problems, because the mud might require higher pressures before it would flow into the formation, and this could cause the well to fracture (see the leakoff test comment above). However BP had designed the mud so that it would flow into the rock, as they have demonstrated, and thus would be displaced by any cement that was injected into the well to seal it, as the Admiral has now authorized.

The cap itself can't be removed, since the pressure balance is achieved at sea level, not at the sea bed, and the system is being maintained, with small injections of more mud (75 barrels at 5 bpm every 6 hours) to keep the fluids mobile and stop any settling.

Again the injection of cement is likely to be an ongoing event as I write this post – so we will see what the morning brings. If they do run the cement, it is likely, as Kent Wells noted, that after the injection they will run a positive pressure test to see if the seal holds against higher pressures (without letting mud flow into the well), and then perhaps they will run a negative pressure test to see if, as they drop pressure above the cement, any fluid from below the cement makes its way through the cement and up the well.