The Oil Drum
DISCUSSIONS ABOUT ENERGY AND OUR FUTURE

New Oil and Gas Technology Open Thread

Posted by Gail the Actuary on October 25, 2008 - 10:50am
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It gets depressing hearing about our financial problems every day. I am sure a lot of people would rather talk about oil and natural gas, and about better prospects for the future. Improved technology is one factor that might make future production better than the bleak future that most of us are foreseeing today. It might even reduce costs, so that more oil and gas can be produced at the lower prices we are seeing today.

What kinds of technology advances are you hearing about? Which ones really have promise? Which ones will not be hurt too badly by the financial crisis, and in fact, may help production in spite of the crisis?

To get people started, below the fold I quote paragraphs about technologies I have read about, mostly from articles in the Next Generation Oil & Gas Journal.

One area ripe for improvement is the poor success rate in drilling new oil wells--generally 25% or less. One newer technology trying to improve success rates is Deep Electromagnetic Imaging.

> Whatever your criterion, deep electromagnetic (EM) imaging, which uses EM energy to find hydrocarbons without drilling wells, has clearly become a major industry in its own right. Its much older sister industry, seismic surveying, has been the cornerstone for exploration decisions since modern-day oil exploration began. However, seismic techniques have limited ability to successfully predict the location of hydrocarbons when used in isolation, which is one reason why offshore exploration drilling hit rates are less than one in four.
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> The traditional exploration workflow relies on indirect evidence to locate hydrocarbons, and seismic methods are mainly sensitive to rock structures and not to the fluids within them. In contrast, EM methods are very sensitive to reservoir fluids and can indicate hydrocarbons directly. Naturally, the first popular use of EM imaging in the oil industry was to test, before drilling, whether the potential reservoir structures (prospects) identified from seismic data actually contained oil. This significantly reduced exploration drilling risks and avoided many costly dry wells.
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> More recently, new applications of EM imaging have extended its use to act like a divining rod to search for direct evidence of hydrocarbons before performing extensive seismic surveys or bidding for new acreage in licensing rounds. This is particularly

> valuable in frontier regions because it enables costly exploration resources to be targeted on the most promising areas, and it accelerates the delivery of higher-grade prospects and, ultimately, more discoveries. Applications beyond exploration are also being pursued. Scientists and engineers are developing methods and technology to use EM imaging for field appraisal, advancing field development plans and even reservoir monitoring on mature assets to help optimise production and recovery.
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> Fewer than 10 years have passed since the idea behind the technology was conceived, and it is only five years since the first commercial survey was performed, and yet the usually conservative exploration community has embraced EM imaging. During the latter half of 2007, interest in EM technology has intensified and has culminated in a frenzy of merger and acquisition activities, as smaller EM companies and the big-three seismic players have scrambled to catch up with the market leader and pioneer of the technique, Electromagnetic Geoservices (EMGS).

TOD reader geolog (Andrey Berg) writes to me that he has recently patented an imaging system which works better at greater depths, which he calls the Binary Seismo-Electromagnetic (BSE) method. This is a link to a write-up about that method.

Another area for innovation is the Digital Oilfield. (The responses to O&G questions are from Ross Philo from Cisco Systems.)

> **O&G. What does the digital oilfield entail and why is it so important nowadays?**
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> RP. The digital oilfield provides the ability to instrument and link all aspects of down-hole and up-hole operations at remote sites with regional offices and headquarters in order to drive efficiency and bring new levels of collaboration to the oilfields. This is especially valuable at a time when the industry is experiencing a growing shortage of expertise as the older and experienced workforce retires. Using the network as a platform will allow experienced staff to provide assistance to less experienced workers at the wellsite from any point in the world.
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> **O&G. What are the critical elements to creating a successful digital oilfield?**
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> RP. The necessary technologies already exist, but realization of the digital oilfield is dependent on a shared consensus and leadership of companies to take the first step towards a shared network. There has also been a concern on the part of operating companies to converge process control networks onto an IP backbone. However, process control technology is shifting to an IP-based approach, and network convergence can be implemented in a highly secure and very effective manner to address these concerns by using a properly architected solution. By taking a lead, Cisco is hoping to demonstrate that the digital oilfield can deliver the long awaited benefits of improved productivity, reduced costs and increased reliability, safety and employee satisfaction.

Another innovation I read about is Through Tubing Rotary Drilling. According to O&G:

> TTRD is a technique where new/stranded pockets of oil are accessed by drilling through an existing well bore. The main benefit of this technique is that the functionality of existing wells remains undisturbed hence dramatically reducing the associated well construction costs in some cases by as much as 50 percent. In many cases, this technique is the only economical way of accessing these stranded reserves.

A number of special tools have been developed to make this process work. The process has only been deployed in Norway to date.

Regarding improvements in technology in Canada's oil sands, O&G reports that gasification of byproducts is now providing significant benefits:

> In recent years, advancements in gasification make it possible to use process byproducts to replace costly natural gas. “Gasification will be used because natural gas is so valuable,” Heusinkveld said. “The gasification process takes coker and hydrocracker residue produced from upgrading and converts it into a syngas that has a variety of potential uses. Syngas can be used as a boiler fuel in place of natural gas to raise the steam required for in-situ production; it can be used to fuel large gas turbine generators to make the operations self-sufficient in power; it can be used to produce the hydrogen needed for the hydrotreating and hydrocracking of the bitumen (replacing the natural gas fueled steam methane reforming process); and it can be used as a feedstock for various fertilizer and primary petrochemical production processes.
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> Residue gasification will dramatically reduce operating costs in these projects. The coke is a waste product, and none of the operating companies has a license to store it indefinitely. Something has to be done with it. So the gasification process solves two problems. It addresses the issue of disposing of the coke, and it alleviates the need for additional natural gas which is becoming increasingly more expensive.”
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> An additional advantage of the gasification process is that it produces a great deal of excess heat, which can be used to produce steam. This provides upgraders with an accessible supply of cheap steam to run steam turbines as equipment drivers or to produce electric power.

On the pipeline end of things, I read about innovations in pigging pipelines (for cleaning the pipelines):

> Being asked to clean pipe work whilst still in operation, i.e. online, completely floors many traditional pigging contractors yet this requirement is becoming more and more common and rightly so. With the immense raft of technology currently available why should operators have to shut down the plant or even take individual portions of a plant offline in order to get their pipelines cleaned? Yes there are CIP, cleaning in place, systems primarily used for pharmaceutical and food industries, but for online cleaning of larger, more industrial pipeline applications pigging contractors and of course pipeline operators need to know where to turn.

> Tube Tech International were asked by a global oil giant in Asia if we could "pig" the blockages inside their furnace tubes which had formed along 2 x 100mm diameter 100m long serpentine, coiled furnace tubes. The client had told us that other pigging contractors had conceded that pigging was not the way to go and could only recommend high pressure jetting companies, who in turn suggested the only solution was to shut down and cut off all the bends. We didn't think so.
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> As one of four high pressure jetting contractors approached we believed it was possible not only to unblock both lines without cutting off bends and re-welding but to up the stakes by "unblocking and pigging" the unit whilst online and operating at 430 degrees centigrade! In order to prove our theory we fabricated the scale size furnace in our yard and demonstrated the new procedure to the client and successfully unblocked the furnace, blocked with concrete as a simulation, at 430 deg C much to the astonishment of the client. Actual site conditions were slightly less at 150 degrees due to other critical site requirements but the point was still proven thanks to innovation and exhaustive trials.

Something else I ran across in Drumbeat that sounds interesting involves producing electricity from the hot water co-produced in an operating oil field:

Geothermal Energy Improves U.S. Oil Recovery

> Ormat Technologies, Inc. announces the successful co-production of geothermal power at a producing oil well. This project marks the first of its kind by providing onsite fuel free power that will increase the productivity and possibly extend the longevity of existing U.S. oil fields. . .
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> The oil fields in the United States could provide an additional 5,000 MW of electricity for the United States through this technology, according to United States Senator Mike Enzi (R - Wyoming).

What have you run across that might be of interest to other readers? Are some especially worthwhile in practice?