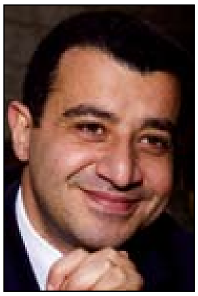
Looking into the future with Sami Iskander, Schlumberger

By Jerry Greenberg, contributing editor

SAMI ISKANDER IS president of drilling and measurements for **Schlumberger**.

DC: The low-hanging fruit of hydrocarbons has been plucked. Industry leaders anticipate that future developments will lie in ultra-deepwater, be characterized by extreme HPHT, or be markedly underpressured. What technical advances must the industry achieve in the next 5-10 years to continue to exploit these reserves effectively?



Sami Iskander

ISKANDER: Increased use of RSS and improvements in automation and geosteering technology are unquestionably where the advances need to be made that will have maximum impact. This includes the use of wellbore seismic to look ahead of the bit. The development of better software applications that enable the integration and interpretation of measurements in real time by experienced geoscience experts at remote onshore collaboration centers will also be key.

As far as underpressured zones, casing directional drilling with RSS is one example of an emerging technology under development to drill directionally through such intervals where conventional methods cannot be used.

DC: What are some of the challenges and issues and what are the service companies doing to meet them in the future?

ISKANDER: One issue we are addressing is reducing drilling risk, and that is done by proper well placement, well planning, drilling engineering, and both BHA and well design. Clients want to find more reserves, and once they find them, they need to produce those reserves and increase recovery factors. An example of technology that will increase ROP is rotary steerable technology. We have the only system on the market that is fully rotational, which leads to better hole-cleaning and better hydraulics. More accurate well placement will help clients to find and maximize reserves, and our Periscope technology does this.

We need to reduce the risk in the entire process. To increase opeators' reserves and production, we need to develop new technology and new tools. When you examine the total footage drilled with rotary steerables by Schlumberger and every other service company, you will find that this number is somewhere in the 10% area. So the vast majority of actual wells are still being drilled with motors. There is a huge opportunity for rotary steerable penetration.

I believe there will be a revolution over the short term in 2007, with a huge increase in the uptake of rotary steerable technology. Looking further, the industry needs a next-generation rotary steerable tool that ca drill faster in one respect or be capable of higher or consistent dog legs. That is an area we are heading towards in the ROP arena.

ISKANDER: That is an interesting question. When the industry thought of rotary steerables, we generally thought of it as an offshore application driven by rig rates. With rig rates in the $400,000 area, or spud rates being $1 million or more per day, it obviously sells itself. On the other hand, over the last 2 years, we introduced rotary steerable to the US and China land drilling markets, and it had a fantastic uptake. This is really not driven by the rig rate because the rigs rates are in $20,000 to $30,000 per day range. Those markets have generally been driven by customers who want to drill more wells in a finite time period. For example, if you can drill one well with traditional technologies every 20 days, shaving 3 to 4 days off that schedule would probably allow you to drill an extra well in a 4- to 5-month period. In the US and China land markets and in Russia to a certain extent, we have had a very good uptake of rotary steerable technology not driven by the rig rate but driven by the desire to punch more holes into the ground.

> **Q:** *How does the future of rotary steerables look?*
>
> **A:** *There will be a revolution over the short term in 2007, with a huge increase in the uptake.*

With rig rates being what they are today and clients' desire to produce wells faster, it goes directly into the benefits of rotary steerable technology. Operators want to drill faster to reduce rig costs or to put wells on production earlier. That is why I think the uptake of rotary steerables will be very, very high.

DC: To what level could the percentage of wells using rotary steerables increase?

ISKANDER: In 3 to 4 years, I believe this number will be somewhere in the 40% to 50% range.

DC: Would rotary steerables at that time still be used primarily offshore in higher-cost environments?

DC: How does automation fit into rigs and wells of the future?

ISKANDER: That area is becoming very important in the drilling world, and we are starting to see some automation. When I say automation, people always think about reduction of people onboard a rig. That is one by-product. There is another aspect of automation that directly impacts drilling. When you look at performance, the directional performance or rate of penetration that we have on automated rigs, the performance is lot better for similar technologies. That is because we fundamentally took the inconsistent human aspect out of the equation. When you want to apply weight on bit, it is applied in a consistent manner. You never take the bottomhole assembly and ram it to the bottom very abruptly, causing stickslip or stalling effect. My idea of automation is how we integrate BHA state with rig state. We know what the rigs are doing, whether it is weight on bit, torque or rpm, and we deduce what is happening downhole. We are developing a lot of measurements to tell us exactly what is happening downhole. The key to automation would be an integration of the BHA state with the rig state. That, I believe, will achieve a quantum leap in drilling performance.

Q: ***What is your idea of automation?***

A: ***It's how we integrate BHA state with rig state.***

DC: How would that affect the drilling operations?

Iskander: On the reservoir side, the client's need for increasing production is about keeping wells in the right layer for the entire horizontal section. There, Schlumberger has a unique technology, our Periscope 15 directional, deep imaging-while-drilling service. It essentially looks at the reservoir in a 15-ft radius and allows us to monitor and correctly place all the reservoir boundaries or the fluid boundaries within those 15 ft.

Usually what happens in the geosteering market today is you would be able to steer but generally steer when you have already seen the event. If you have already exited the reservoir, you have lost production, and it will take you between 100-200 ft to get back to the reservoir. Periscope prevents this from happening.

DC: How does the BHA, or downhole state, and the rig state combine with automation to increase efficiency and performance?

Iskander: Today if you look at the average land rig worldwide, generally they are mechanical rigs; they are basic technology. I'm not going to say that all of them are 30 years old, but the vast majority probably is 30-plus years old. They rely very much on what the driller does. So you have a driller with his hand on the brake to mechanically put weight on bit. You add rpm and flow, and away you go.

On more modern rigs, this process is rather automated. There is still a driller. If you think that at the end of your BHA, you have a rotating motor and you slam that motor on the ground, it will stop. What tends to happen on an automated rig is that process is very gradual. The process prevents our equipment from stalling, so we see a huge increase in our performance on those rigs.

Now we are drilling fairly blind. What you do on surface and what is happening downhole at the bit level are different. We know what the rig state is, and we know what weight, flow and rpm we are applying on surface. How that translates downhole with all the friction losses, stickslip, vibration and so on is different. We have sensors downhole that measure the same we are measuring on surface. Whatever energy is put on surface, we would like to see similar energy at the bit, but that is not happening today. This is where automation would come in. If we have the right sensors within our BHA measuring a variety of physical state, we would be able to integrate what we are seeing at the BHA level with what we are putting in at surface and come up with the right process to pass all the energy we are putting on surface to the bit. That has to be done through automation with downhole sensors and a lot of software.

DC: Are the particular downhole sensors and software you are talking about available today?

Iskander: Some of it is, and some of it isn't. Downhole weight on bit has probably existed for 10 years, and they are fairly basic applications. The close loop automation is what I am talking about. We know the weight put on the bit and what is required from the rig. The command goes to the rig to set the weight, say 10,000 lbs. Then we see in real time that the 10,000 lbs translated to 4,000 or 5,000 lbs, and therefore know there is one of several issues. It is really more of the intelligence that goes around it. I see this coming to our industry in the next 1 ½ to 2 years.

DC: Does the automation also apply to the reservoir?

Iskander: We are expanding our Periscope technology to be able to look deeper into the reservoir, or looking ahead of the BHA itself in a predictive way. I think that is a little bit of the Holy Grail. So extending Periscope technology is something that is coming shortly to the market, perhaps in 6-12 months.

DC: In the next 6-12 months, are you referring to the industry being able to look at a radius of 100 ft from the well?

Iskander: That is correct.

DC: What technologies would be applied to unconventional reserves?

Iskander: Different clients define unconventional in different ways. It could be heavy oil, coalbed methane, shale gas, or it could be the high pressure/high temperature. High pressures and high temperatures certainly are something that we are seeing more of. But it is more in the high temperature issue rather than high pressure. To put that in perspective, more than 90% of the reservoirs around the world will be drilled with 150°C tools. That technology is standard. Once you head into higher temperatures, you go into different specifications that are not that abundant in tools, so the next step would be 175°C, and that will probably take you another 6% or 7% of the marketplace.

Now we have started seeing a lot of our customers plan wells that are in the 200°C and higher range, and they are planning such high temperature wells that are going to happen by the end of 2007 and 2008. That is an area where we are working hard with our subcontractors and in-house engineering to develop specific electronic technology that would survive that temperature on the measurement side and on the rotary steerable tools. We are quite advanced in the 200°C applications, and I think that will be coming to the market within the 2007 time frame with a BHA offering. For higher temperatures than that, I don't think the industry will see BHAs in the coming 2 to 3 years.

Generally, we are going to ceramic components, or mcm type components, which would probably fill the area between 150°C to 200°C with insulation. Above 200°C, we rely on technology called active cooling, which is like having a downhole refrigerator, where your reservoir may be 230°C to 250°C and your electronics are probably only 200°C or less.

DC: Certainly reliability is of primary concern in any technology we discussed.

Iskander: Obviously that is important in all environments, but for deepwater and rigs on wells that cost $1 million or more per day. Tool reliability there is really key. We have focused very much on that with our newer technology, including the commercialization of the Scope technology in 2005. We try to develop hardware that is 3 to 4 times more reliable than standard technology on the market. I am not going to tell you that reliability was the only focus for Scope because there were many others, but certainly reliability was a big factor. The cost of deepwater nonproductive time could be billions of dollars, so the development of more reliable tools is key.

Sami Iskander holds a bachelor's degree in mechanical engineering — industrial and electronics from American University, Cairo. He assumed his current position with Schlumberger in 2006.