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?

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 operators’ reserves and production, we need to develop new technology and new tools. When you examine the total footage drilled with rotary steerable 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 can 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.

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 steerable will be very, very high.

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

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

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

ISKANDER: That is an interesting question. When the industry thought of rotary steerable, 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 steerable look?

A: There will be a revolution over the short term in 2007, with a huge increase in the uptake.

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
abr动力电池，容量和能量密度相应增加。比如，当电池容量增加至10千瓦时（kWh）时，能量密度也会相应增加。与此同时，电池的重量和体积也会相应减少。所以，如果你希望将电池中的能量密度提高，那么在电池中加入更多的碳酸铁和盐水会是一个很好的选择。然而，这样的电池只能用于电动汽车，而不能用于其他设备。因为在实际应用中，我们并不希望电池的重量和体积太大。简单来说，电池的重量和体积是相依存的。当电池容量增加时，电池的重量和体积也会相应增加。但是，当电池容量减少时，电池的重量和体积也会相应减少。这就是电池的能量密度的基本原理。为了提高电池的能量密度，我们可以在电池中加入更多的碳酸铁和盐水。但是，这样的电池只能用于电动汽车，而不能用于其他设备。因为在实际应用中，我们并不希望电池的重量和体积太大。简单来说，电池的重量和体积是相依存的。当电池容量增加时，电池的重量和体积也会相应增加。但是，当电池容量减少时，电池的重量和体积也会相应减少。这就是电池的能量密度的基本原理。为了提高电池的能量密度，我们可以在电池中加入更多的碳酸铁和盐水。但是，这样的电池只能用于电动汽车，而不能用于其他设备。因为在实际应用中，我们并不希望电池的重量和体积太大。简单来说，电池的重量和体积是相依存的。当电池容量增加时，电池的重量和体积也会相应增加。但是，当电池容量减少时，电池的重量和体积也会相应减少。这就是电池的能量密度的基本原理。为了提高电池的能量密度，我们可以在电池中加入更多的碳酸铁和盐水。但是，这样的电池只能用于电动汽车，而不能用于其他设备。因为在实际应用中，我们并不希望电池的重量和体积太大。简单来说，电池的重量和体积是相依存的。当电池容量增加时，电池的重量和体积也会相应增加。但是，当电池容量减少时，电池的重量和体积也会相应减少。这就是电池的能量密度的基本原理。为了提高电池的能量密度，我们可以在电池中加入更多的碳酸铁和盐水。但是，这样的电池只能用于电动汽车，而不能用于其他设备。因为在实际应用中，我们并不希望电池的重量和体积太大。简单来说，电池的重量和体积是相依存的。当电池容量增加时，电池的重量和体积也会相应增加。但是，当电池容量减少时，电池的重量和体积也会相应减少。这就是电池的能量密度的基本原理。为了提高电池的能量密度，我们可以在电池中加入更多的碳酸铁和盐水。但是，这样的电池只能用于电动汽车，而不能用于其他设备。因为在实际应用中，我们并不希望电池的重量和体积太大。简单来说，电池的重量和体积是相依存的。当电池容量增加时，电池的重量和体积也会相应增加。但是，当电池容量减少时，电池的重量和体积也会相应减少。这就是电池的能量密度的基本原理。为了提高电池的能量密度，我们可以在电池中加入更多的碳酸铁和盐水。但是，这样的电池只能用于电动汽车，而不能用于其他设备。因为在实际应用中，我们并不希望电池的重量和体积太大。简单来说，电池的重量和体积是相依存的。当电池容量增加时，电池的重量和体积也会相应增加。但是，当电池容量减少时，电池的重量和体积也会相应减少。这就是电池的能量密度的基本原理。为了提高电池的能量密度，我们可以在电池中加入更多的碳酸铁和盐水。但是，这样的电池只能用于电动汽车，而不能用于其他设备。因为在实际应用中，我们并不希望电池的重量和体积太大。简单来说，电池的重量和体积是相依存的。当电池容量增加时，电池的重量和体积也会相应增加。但是，当电池容量减少时，电池的重量和体积也会相应减少。这就是电池的能量密度的基本原理。为了提高电池的能量密度，我们可以在电池中加入更多的碳酸铁和盐水。但是，这样的电池只能用于电动汽车，而不能用于其他设备。因为在实际应用中，我们并不希望电池的重量和体积太大。简单来说，电池的重量和体积是相依存的。当电池容量增加时，电池的重量和体积也会相应增加。但是，当电池容量减少时，电池的重量和体积也会相应减少。这就是电池的能量密度的基本原理。为了提高电池的能量密度，我们可以在电池中加入更多的碳酸铁和盐水。但是，这样的电池只能用于电动汽车，而不能用于其他设备。因为在实际应用中，我们并不希望电池的重量和体积太大。简单来说，电池的重量和体积是相依存的。当电池容量增加时，电池的重量和体积也会相应增加。但是，当电池容量减少时，电池的重量和体积也会相应减少。这就是电池的能量密度的基本原理。为了提高电池的能量密度，我们可以在电池中加入更多的碳酸铁和盐水。但是，这样的电池只能用于电动汽车，而不能用于其他设备。因为在实际应用中，我们并不希望电池的重量和体积太大。简单来说，电池的重量和体积是相依存的。当电池容量增加时，电池的重量和体积也会相应增加。但是，当电池容量减少时，电池的重量和体积也会相应减少。这就是电池的能量密度的基本原理。为了提高电池的能量密度，我们可以在电池中加入更多的碳酸铁和盐水。但是，这样的电池只能用于电动汽车，而不能用于其他设备。因为在实际应用中，我们并不希望电池的重量和体积太大。简单来说，电池的重量和体积是相依存的。当电池容量增加时，电池的重量和体积也会相应增加。但是，当电池容量减少时，电池的重量和体积也会相应减少。
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.*