Looking into the future with

Bob Hinkel, Enventure

BOB HINKEL IS president and CEO of **Enventure Global Technology**.

DC: What does the well of the future mean to you?

HINKEL: Rather than well of the future, I think it should more accurately be called the "will of the future" because, if we are to develop the technologies required for exploring and extracting sufficient quantities of oil and natural gas in the decades to come, we will need even more of the will that has characterized our industry for the past 100 or so years. We will have to forge the shift in how we approach innovation, technology commercialization, and then utilization to create true value.

Bob Hinkel

DC: How do you envision the environment of future wells?

HINKEL: I believe wells of the future will be constructed in an environment of high demand, high cost, greater risk and greater reward. From my perspective, we are in the first part of a 10-15 year cycle of fairly high commodity prices and relative shortages of equipment and personnel. It is, however, possible that there will be periods where supply will outstrip demand by a large enough margin to force prices down into the mid-$30 range. This could be due to the initiation of production from large new fields offshore West Africa, near Sakhalin Island and in the Northern Caspian, as well as increased production in the Middle East. However, this "surplus" will likely only last a short time, and there are no significant discoveries coming on to back-fill after that time. Therefore, the "next wave" of production will need to come from new technology and new applications of existing technology. We need to expect and plan for a sustained period of high demand for new technology, people and equipment.

The simple fact is world demand for energy is growing — faster than projected. No matter how much "will" there is for alternative energy, the reality is that hydrocarbon fuels — including coal, tar sands and heavy oil — will continue to be the main sources for that energy. But the gas we'll need in the future is deep, and most of our drilling activity has been focused on the easiest — meaning shallow — recoveries. We've yet to really tap the undiscovered and recoverable "deep" natural gas resources below 15,000 ft.

However, we are moving in that direction. The National Petroleum Council predicts that by 2010, 41% of natural gas production will come from depths below 10,000 ft. The question is: Will we have proven technologies and created feasible solutions for their deployment? And will we do so in time for these harder-to-reach targets in extreme drilling conditions, such that it makes economic sense to pursue them?

The answer is we'll have to. Certainly, the costs will be higher, but the potential returns promise to be greater. The US Department of Energy reports there are significantly higher average production rates of deep versus shallow wells. In 2002, 6% of gas produced came from deep wells below 15,000 ft; however, this represented less than 1% of producing gas wells.

An offshore crew makes up Enventure inner string. Enventure president and CEO Bob Hinkel said the company has "found a variety of promising materials, which lead us to believe the industry has only just begun to scratch the surface of materials innovation."

DC: What do we need to do in order to tap "unconventional" resources?

HINKEL: The total amount of those unconventional resources — including tar sands, oil shales, coal seam gas and tertiary recovery projects like CO_2 injection — exceeds all conventional oil and gas accumulations in place today. To tap these resources, we'll need to drill and complete wells we've not conceived of yet, using materials that may not even be used in the oilfield today.

A key manner in which technology will make these wells possible is through combinations of existing, developing, and new technologies. SAG-D, or steam-assisted gravity drainage, wells combine horizontal drilling technology with steam-assisted gravity drainage — 2 technologies that were only conceived of

in the past 20 years, and yet, the wells utilizing this combination are showing the potential to quadruple production over the next 10 years.

With thermal recovery technology growing at a rapid pace, I believe that by drilling multilaterals and putting the heat-generation downhole, there will be a further incremental breakthrough in the drilling of these wells. Multilaterals have moved beyond the experimental stage and are being implemented in a variety of applications. However, downhole steam generation is only starting to move out of the laboratory. My prediction is that we are only 2-3 years away from explosive growth in multilateral drilling driven by combinations of this technology with other techniques, including coiled-tubing drilling, expandable tubulars and more efficient hole-opening tools.

Previous experiences in combining technologies include PDC bits with synthetic oil-based drilling fluids, the semisubmersible with the subsea wellhead and tree, and even the MWD/LWD tools in combination with the steerable directional drilling systems. I believe these combinations will play an even greater role in the well of the future.

DC: What kind of trends do you see in rig designs?

HINKEL: I know many people believe subsea processing equipment will be the next big breakthrough in deep and ultra-deep water. However, my belief is the industry will also go another way and find new and less expensive ways to build lightweight, easily installed surface facilities with new types of mooring systems, dry trees and barge-supported workover and drilling rigs. This means we will slowly start to move away from the super-sized rigs and equipment that have become predominant in the current ultra-deepwater markets. Several operators have already started on deepwater developments using these concepts, and more will follow.

This combination of new and existing technologies will make ultra-deep waters, small plays and redevelopment of existing fields economically accessible. A very fertile area for advancement here lies in the area of material development. Steel will remain the key component of our projects, but there will be an increasing need for new, high-strength, low-weight materials. Right now, the weight and strength of the micro-alloyed steel used in facilities, casing and drill pipe is starting to limit our ability to drill and complete the kind of wells we need. However, the industry has already started using carbon-fibers for mooring systems, and nanotechnology seems to be evolving in this direction as well. At Enventure, we've experimented in the advancement of expandable casing and found a variety of promising materials, which leads us to believe the industry has only just begun to scratch the surface of materials innovation. As these materials change, so will the limitations on water-depth and transportation distances. Even in the next few years, I think we will see drilling in water depths well over 10,000 ft and to vertical depths of close to 40,000 ft.

DC: What about the high-cost, high-impact wells with complex trajectories?

HINKEL: For the ultra-long-reach wells and wells drilled to great depth through complex geological structures, commonly referred to as extreme extended-reach drilling, a lot of synergy will be required. Our ability to drill and case wells with lateral reaches greater than 10,000 m and to vertical depths greater than that number has almost expired. We just can't make steel strong enough, thin enough and light enough to take us beyond this threshold.

However, as indicated by the recent pre-tertiary ultra-deepwater discoveries in the Gulf of Mexico, the need is there to drill such wells. These challenges will require more of a paradigm change than we may think. The lead time to acquire non-standard tubulars and purpose-built rigs is approaching 2 years for these projects. However, in 2 years, there is a strong likelihood the industry will have developed improved traction devices, better wellbore protection and isolation materials, and even a mono-diameter solution to minimize or eliminate wellbore telescoping. In fact, I believe we will see the all-time extended-reach drilling records extended significantly to well beyond 10,000 m of departure in the next few years. By the end of this decade, we should see the 15-km mark exceeded. Most importantly, I can see these wells becoming very cost-effective options in comparison with long lead-time templates and high-cost intervention systems.

DC: What will it take to achieve objectives like the 15 km extended reach well?

HINKEL: I think that companies will have to become less risk adverse when it comes to implementing new technologies and most importantly, in planning these technologies into long lead-time developments. Game-changing technologies are all around us, but we can't simply sit back and wait for them to prove themselves. Remember what happened after the last oil "boom." Think of all the companies that went away, all the jobs we lost, and all the dislocations that took place. It wasn't due to technology but the lack of planning, foresight and industry leadership.

DC: How will the roles and responsibilities of the companies and individuals have to evolve to make this possible?

HINKEL: First, I think everyone will need to have more "skin in the game," so to speak. Historically, the major oil companies carried the burden of R&D until it was shifted to the service companies over the past 20 years. Unfortunately, they have not seen a commensurate return on much of that investment until quite recently. While the number of patents secured by service companies has continued to increase, the total amount of R&D spending is on the decline. Additionally, most companies today are under pressure to maximize short-term shareholder returns on a quarter-to-quarter basis. That automatically puts them in a zero-sum game with both their service providers and their partners. This is extremely damaging to the growth of technology.

In the future, production companies and service providers will need to be increasingly aligned in their technology development plans. We are seeing this already with respect to private and national oil companies. The real resource holders, which frequently are foreign governments or these same national oil companies, actually want and need their service providers to cooperate and provide more comprehensive, integrated solutions rather than simply compete with each other.

Unlike other technology-dependent industries, the energy sector invests just 1% of its revenues in R&D, compared with 4.5% of revenues other industries spend. Our uptake of technology is also far slower. Where other industries incubate, prove and commercialize technologies in 7-15 years, the E&P industry takes 30 years on average to adopt a technology as a proven and viable solution.

DC: What are the reasons for that?

HINKEL: They're multiple, including the pressures on operations people to meet short-term production targets, contain costs and avoid risk. This precludes field testing of new technologies and puts the onus on the service company to educate users about what their technologies can do.

The service companies, in turn, more often opt not to go it alone since the capital markets don't reward them for technologies that take decades to produce a return. Small bootstrap entrepreneurs, who may promise the most technical genius, simply don't have the wherewithal to survive this type of R&D climate. In the past decade, we've seen only 3 significant new drilling technologies: underbalanced drilling, drilling with casing and expandable tubulars.

A crew runs the inner string inside the liner from an offshore rig in the GOM.

DC: So what's needed to create a better environment to foster new technologies?

HINKEL: The key will be to create collaborative, expertise- and resource-sharing entities not mired in bureaucracy or subject to competitive issues with their service provider partner.

The example most familiar to me, of course, is Enventure Global Technology, which has been a successful model of **Halliburton** and **Shell Technology Ventures** understanding they will both best be served by creating a funded, entrepreneurial company to deliver solid expandable tubulars to the market. With the ability to test and prove the technology due to the commitment of the joint venture partners, expandables have reached commercialization in just 15 years, half the industry average.

What would significantly improve the environment for new technology would be more commitment from industry leadership to lead the charge for innovation. Obviously there were companies that demonstrated that leadership in exploring and developing the deepwater. And, they did so at a time when oil supplies were fairly plentiful and prices were below average.

DC: What made that leap possible and what lessons can we learn and apply today?

HINKEL: First, management has to adopt long-term vision and strategy. Then they need the consistency to stick with that strategy. They need to understand and agree with their directors and shareholders as to the most effective ways to grow and increase value using technology. Then they need to invest in the drilling and completion technologies available in the market today as well as incubate future breakthroughs.

Producers must become more strategic in their use of technology before their technicians can realize the benefit of that technology. Today at Enventure, we see many senior managers from small and mid-sized companies, as well as large national oil companies, taking the time and effort to understand what new technology can bring to their strategic plans. One well-publicized example of this is the Aramco Maximum Reservoir Contact well program, whereby the world's largest oil producer is striving to increase ultimate oil recovery in their reservoirs to as much as 60%. **Saudi Aramco** is employing a variety of new technologies, including intelligent completions, multilaterals, expandables and next-generation electrical semisubmersible pumps, to make this oil recovery possible.

The predominance of hydrocarbon fuels will not end due to a shortage of hydrocarbons. But shortages of technology, vision and leadership can cause premature changes in our industry. We have to have the will to develop and utilize the technologies, talent and cooperative working relationships needed to drill the well of the future.

Bob Hinkel earned a BS degree in petroleum engineering from The University of Texas at Austin and a MBA in international management from Thunderbird University in Phoenix.