Looking into the future with

Alan Orr, H&P IDC

By Jerry Greenberg, contributing editor

ALAN ORR IS executive vice president of engineering & development for **Helmerich & Payne International Drilling Co**.

DC: What are some of the technologies under development now to meet the issues and challenges the drilling industry may face as it goes forward in terms of deeper wells, high pressure/high temperature wells?

Alan Orr

ORR: Helmerich & Payne has commitments to build 73 rigs on long-term contracts. Virtually all those rigs are directed at natural gas, and most of that is the unconventional gas plays. Operators first and foremost want a rig that is as safe as it can be and with reliable systems. Once you get those down as a foundation, they want the technology on those rigs to help leverage the technology that they employ from other service companies. It can be rotary steerable, new and improved bits, improved mud systems, but they want a rig that can help them leverage that technology as well.

DC: What are the technologies the operators want as far as the rig is concerned?

ORR: The technologies include VFD AC drives and controls that provide much improved speed and torque combinations for drawworks, top drives and pumps. An AC drawworks provides better control of fast line payout in terms of steady state weight on bit and regenerative braking. Some of the rigs that we are building are Flex 4S (the "S" refers to skidding capability). We have borrowed from offshore platform arrangements whereby we can skid and access multiple rows of wells on a land location. In some cases where an operator previously might be able to get 2 or 3 wells on a location, with this arrangement he would be able to get as many as 22 wells on the same site. With today's improved directional capabilities, that is going to save a lot of rig moves and other traffic associated with location building. Perhaps most importantly, environmental disturbance is greatly reduced.

Helmerich & Payne's Flex 4S rig (shown above) borrows from offshore platform arrangements "whereby we can skid and access multiple rows of wells on a land location," said Alan Orr, H&P executive vice president. The S in 4S refers to skidding capability.

DC: Are there other iterations of the FlexRig planned for the future, taking into account different enhancements operators are requesting?

ORR: We think there will be a Flex 5, but right now with the current building campaign, it is a glimmer out on the horizon.

DC: Are operators requesting any particular equipment or new applications for existing equipment or technology that would be used on future rigs?

ORR: Rotary steering is a very powerful tool that has great potential, especially in terms of a rig sitting on a pad and drilling directional wells off to other parts of a reservoir. We will see energy put into linking downhole information back to the rig's control system, for example, intelligent drillpipe and algorithms in place to take that information from downhole sensors and command the control system automatically to make certain adjustments. The driller will still be able to intervene and do whatever is necessary, but these systems will move more and more towards autopilot in certain aspects of the process.

There will be continued efforts to minimize the drill site footprint. Anything we can do to lighten loads and be more mobile, eliminates the need for rig moving heavy specialized equipment. All of those things are going to be attractive in terms of a more friendly industry to society and regulatory agencies.

DC: Are your rigs utilizing rotary steering when they drill multiple wells from the same wellpad?

ORR: We have had FlexRigs drilling wells with rotary steerable systems, and it has been very successful. We will continue to see it evolve. You think back to the mid-1980s when MWD began to emerge. It was utilized in the offshore environment with high spread costs, but since that time it has proliferated to where it is used on a lot of onshore jobs. I think rotary steerable will follow that same path but at an accelerated rate.

As I mentioned earlier, operators want the right power and control systems. They want the hydraulic horsepower available to maximize new bit and motor technology. Rigs today have more horsepower; we are putting 1,600 hp pumps on most of these rigs, so it is bigger pumps and more hydraulics. Ultimately, we are going to see more and more desire by operators to have, as much as possible, closed-loop systems to eliminate reserve pits.

Customers also want the ability to control trips into the hole at a certain rate of speed and not break down a formation. Operators want to employ technology to be cost-effective in today's competitive environment. Again, technology employed on new rigs today not only must be cost-effective standing on its own but also needs to be able to ensure and enhance the performance of other industry technology such as bits, downhole motors and rotary steerable systems.

DC: Is Helmerich & Payne making use of high-tech drillers cabins and other state-of-the-art drilling and pipe-handling systems?

ORR: Yes. One thing that drilling contractors must do to continue to attract people and motivate them to make a career in this business is to provide a better work environment. A lot of what we have done on the FlexRigs is to create a better work environment. The Flex3 rigs have full BOP handling systems that can transport a stack, upright it to vertical, and deliver it to the well center. It takes away the manual labor associated with that task.

We have put in climate-controlled drillers cabins where information is displayed to the driller in a more communicative and friendly manner. He is able to make better decisions. The driller is not outside on the brake handle. He has a joystick control in a climate-controlled cabin so he doesn't have to stand outside in the weather and physically exert himself all day long to control block movement. With the new PLC control systems, various block movements are done automatically by the system. The driller is more like a pilot with his aircraft set on a course, and it is cruising. Just like a pilot, the driller has to know his job and be alert for both surface system and downhole problems. We have done that on all the FlexRigs, and with each tranche of rigs that we have built, we have improved that system.

Since the first tranche of Flex3 rigs, the new rigs have **Varco** ST80S Iron Roughneck, and on some of these rigs we are building a No Touch Tubular Handling System.

DC: Is it literally an untouched-by-human-hands system?

ORR: That is the vision we are trying to get to, and again that goes back to creating a better and safer work environment for people. The no-touch system is already on some of our rigs.

The "no-touch" system works in concert with the Varco ST-80 for drill pipe and with the **Tesco** casing running tool to run casing. On many of the new rigs we are building, we are eliminating the conventional mechanical or manual tongs and relying on more modern technology. Tongs have been around a long time, probably too long. They are very dangerous, and there have been a lot of people hurt and killed using the tongs. We are forcing ourselves to develop the technology to be reliable and not resort back to that hazard.

DC: Has rig automation reduced the size of the rig crew, as well as apparently increased safety, as was once touted as one reason to automate a rig?

ORR: These rigs go to work and start reducing cycle times, meaning there is more work to be done in a shorter period of time. We haven't reduced crew size dramatically, but we have given the rig crew a better job in terms of not requiring so much from the neck down and creating an environment in which employees can use their resources from the neck up in terms of how they approach the business. We are trying to take a lot of that physical exertion and manual labor out of these operations so they can think ahead in terms of delivering value to the customer.

DC: With the high price of oil today and expectations that those prices won't decrease significantly, some operators have increased the base economic estimates to as high as $30 per barrel with a margin that is higher than that. Against this scenario, what technological advances in drilling do you see 5 years from now?

ORR: Even without the "bright horizon" scenario, the drilling industry will be working to advance largely the same technologies with 2 principle objectives. First, we will want to be drilling wells similar to those we are drilling today, but at a lower total well cost. Second, we will want to advance technology and capabilities so that we can drill even deeper, more difficult wells to cost effectively access new reserves that were previously not economical.

Over the next 5 years we will see continued improvements in materials for bits, tubulars and electronics, downhole sensors and downhole-to-surface information transmission, e.g., intelligent drill pipe.

As I mentioned earlier, the industry will see the proliferation of rotary steerable systems to enable more cost effectively drilling multiple wells from a single pad.

With regard to drilling fluids, we need materials and techniques to reduce or eliminate lost circulation.

To reduce the drill site footprint, the industry will continue to move toward closed-loop systems that reduce or eliminate reserve pit requirements. We will see more emphasis and interest in drilling underbalanced and getting to the pay zones with minimal formation damage.

If one extrapolates the achievements of the drilling industry in relatively recent times, much improved ROPs, wells that took 150 days in the early '80s are now routinely drilled in 30 days or less. In light of the tremendous strides in terms of directional, horizontal and extended-reach drilling and the industry's truly astounding advance into deepwaters, what is advanced and accomplished in the next 5 years could be amazing. I think there is a great future for natural gas in this country.

Alan Orr holds a bachelor's degree in general engineering from the United States Military Academy. As executive vice president of engineering and development, he is responsible for development of all H&P engineering functions, technology, new rig construction and upgrade projects.