

New equipment results in better safety, efficiency

DRILLING EQUIPMENT manufacturers **National Oilwell** and **Varco International**, which will become one company in the near future, view new product development with several things in mind, not the least of which is safety. The equipment should be simple to operate, reliable and easily maintained. There should also be a need for the equipment. Executives from both companies, speaking at the 2004 IADC Annual Meeting, believe the best thing that has happened to the drilling industry is the advent of control systems and accompanying software.

AUTOMATION ERA

"If you look back over the past 20-25 years," said **Pete Miller**, Chairman, President and CEO of National Oilwell, "SCRs, top drives, pipe handling systems and dual activity systems were all big advancements, but the one thing that helped all of them is the ability to control the rig effectively."

Today's rigs have joystick and touch-screen controls and computers. Video cameras to view what is happening in the derrick provide absolute control of the equipment on the rig, whether it is an AC or DC unit.

"This has the added effect of helping us maintain people in this industry," Mr Miller said. "This is a much better environment in which to work."

Michael K Williams, President-Drilling Equipment for Varco, puts the timeframe of automation in the mid-1990s when the equipment industry provided the driller with a tremendous amount of information with which to work.

"With the advanced systems, the driller could get into the drilling, tripping or casing mode and he can see the critical information that is relevant to the process," Mr Williams said.

Additionally, the rig automation era resulted in an almost insatiable desire to install technology on big rigs. One of the significant technologies in the automation era was the ability to work off the critical path, the ability to do things simultaneously while continuing to drill ahead.

"This technology added tremendous effi-

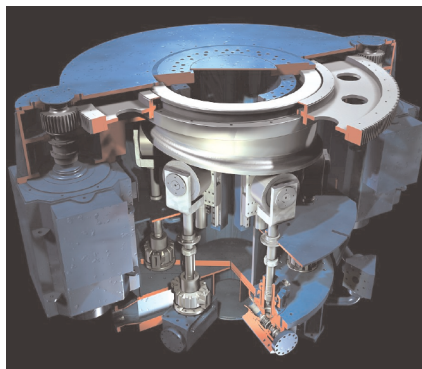
ciency to what we do in the industry," Mr Williams noted.

COLLISION AVOIDANCE

Both Mr Williams and Mr Miller emphasized the safety factor related to such automation. Even with dual activity systems, drillers and assistant drillers work in an enclosed cabin, as does the pipehandler, so workers are removed from the rig floor and out of harm's way.

In the event that a worker should be on the rig floor, National Oilwell is developing technology that allows the driller to know everyone's location as the various equipment moves in. This is accomplished with a computer chip attached to each worker so the equipment can sense where that particular employee is in relation to the piece of equipment.

For example, if an Iron Roughneck is beginning to move in to make up or break out pipe and it senses a worker in its path, the equipment stops at a predetermined distance from the worker. As he moves out of the way, the Iron Roughneck will continue toward the pipe.



National Oilwell's Hex mud pump is one-half the weight and one-half the size of a typical mud pump.

PIPE HANDLING

National Oilwell has also taken what it has learned in pipe handling and applied that to handling marine risers with reductions in the time it typically takes to run a riser. Such a system has been used in the Caspian Sea with good results.

"You can have the same sort of mecha-

nization to run your riser that is used to handle drillpipe and casing, with limited riser damage, much more effectively and efficiently," Mr Miller said. "This is the sort of thing that electronics has allowed us to do."

MUD PUMPS

National Oilwell has developed its Hex mud pump that has half the weight and half the footprint of a traditional mud pump while still generating up to 7,500 psi in greater volumes than some of the 2,200 hp pumps, according to Mr Miller. The AC controlled pump produces a pulseless flow, which is advantageous when mud pulse telemetry is utilized.

Additionally, because of its smaller size and weight, three Hex pumps can be installed on a rig to replace two traditional pumps utilizing the same space, upgrading the rig's pressure and volume capacity and resulting in a much better performing rig.

"As you look in the market today," Mr Miller noted, "the jackups and semisubmersibles that are staying busy are the ones that have three mud pumps, the rigs that can generate the necessary pressures and volumes."

LAND RIG TECHNOLOGY

"Land drillers are about as efficient as you can get," Mr Miller said. "They are all pushing for more efficiency and they have done a wonderful job."

A major issue with land drillers is deploying the rig from one wellsite to the next more rapidly and with minimum time. National Oilwell has developed technology based in part on earlier design rigs and produced a rig that results in quicker moves.

"Traditional release of a 2,000 horsepower rig might have been five days," Mr Miller said. "Today that can be cut to two or 2 ½ days depending on the crew."

Another thing that has worked well is being able to transfer some of the handling technology from offshore to onshore drilling operations on a cost efficient basis. For example, land rigs can take advantage of hydraulically actuated slips and Iron Roughnecks.

Pipehandling systems are also being adapted for use on land rigs to bring some of the same advantages that offshore rigs have been experiencing: better efficiency and increased safety during operations.

With the significantly different economics on a land rig, the price of such equipment is a primary factor. "We have been able to reduce the price of an Iron Roughneck into the \$150,000 range," Mr Miller said.

Original Iron Roughnecks for offshore rigs were as much as \$1 million.

"This makes it cost effective for a land rig," Mr Miller continued, "and cost effectiveness is how we can get this equipment on the rig and help the safety aspect."

AUTOMATION RESULTS

While automation resulted in better safety and efficiency on the rig, there were some mixed results, according to Mr Williams. Drilling contractors were approached by different companies, resulting in automation systems that were assembled from different vendors, not all of which worked in harmony.

There were fewer people working on the rig floor, and in some cases a general reduction in the number of people required to operate even the most technologically advanced rig. The industry definitely reduced workers' exposure rates by removing them from repetitive and dangerous jobs.

On the other hand, Mr Williams noted, the industry needed new technicians. "Every end of these modern rigs were blessed with the IT representative, from the office to the rig."

The industry dramatically improved drilling. "We are drilling wells today that were inconceivable just a few years ago," Mr Williams said.

"The industry also had expectations for reliability," he explained. "We had some good examples of reliability and some I know were disappointing."

EFFICIENCY IMPROVEMENTS

The industry has designed land rigs that can move from well to well in about two days, sometimes less, compared with conventional rigs that may take twice as



National Oilwell's Ideal 1500 rig requires only about 15 minutes to raise and pin the rig floor and the mast once they are in place at the rig.

long or even longer.

Offshore, Mr Williams said that some 5th generation deepwater rigs have more displacement than the largest aircraft carrier the US Navy has ever built. The rigs have in excess of 20,000 tons of variable deck load capacity.

"What is interesting is that they burn the same amount of fuel as the 3rd generation rigs," Mr Williams noted. "We continue to build big rigs yet they are efficient and effective."

The industry continues to run casing faster. The average in the US Gulf of Mexico, according to Mr Williams, is 17.6 joints of casing per hour.

"We have some examples of well past 52 joints per hour consistently," he explained. "Of course, it depends upon the offline capability to do doubles and then ultimately triple stands."

THE FUTURE

"One of the keys to the future is that we as an organization, the operator, the contractor and the service and equipment designers and suppliers, have to work in concert," Mr Williams said.

"The industry must continue to reduce the cost of drilling."

Mr Williams said the industry must continue to work to reduce flat spots and non-productive time. Non-productive time can still account for as much as 25% of the time to drill a well.

The industry must continue to increase rate of penetration (ROP), even as fast as the industry is drilling today. He also said that the industry needs to continue to improve safety and to enhance the reliability and simplicity of equipment.

Some of the technologies that have the potential of moving the industry into the next technological phase, according to Mr Williams, includes managed pressure drilling, underbalanced and near balanced drilling, casing drilling, dual gradient, expandable tubulars and surface BOP operations.

"In the age of automation, the industry will build better, smarter and simpler control systems at lower costs," Mr Williams said.

Simulation also plays a key part in the future, he explained, for example, taking a rig design and generating the software for it to simulate how the rig will work before it is even built.

"A byproduct of this provides an automatic training tool for rig crews with a portable simulator at a fraction of the cost of some of the million dollar simulators in the industry," Mr Williams said.

Another advantage is that with the systems that exist today, service companies can connect to the rig remotely and monitor what is happening on the rig.

"Many things can be fixed without actually sending a technician to the rig," Mr Williams said. ■