

# SMART DRILLING

## The New American Gold Rush

Noble Corporation is a drilling service provider for the oil and gas industry specializing in offshore drilling rigs.

Noble has been successful by positioning itself to adapt to the ever-changing world energy market and meeting customers' needs and demands. Noble Engineering and Development, LTD. (NED) is an engineering organization inside the Noble Corporation. The primary goal of NED is to research and develop solutions to optimize drilling operations. Noble's partnership with B&R on the OptiDrill project started in late 2002, at a critical time as the project was encountering severe technical problems. Noble had invested considerable time and effort into another HMI/PLC control system with limited success.

### Optimizing drilling procedures with servo motors

OptiDrill is a patent-pending stand-alone electronic drilling optimization system or, in other words, a band brake control system capable of precisely controlling drum speed, bit weight and standpipe pressure. Additionally, OptiDrill can be operated with DrillSmart, a proprietary algorithm that constantly seeks the WOB (short for "Weight on Bit", the actual weight load on the drill bit) to achieve an optimum penetration rate.

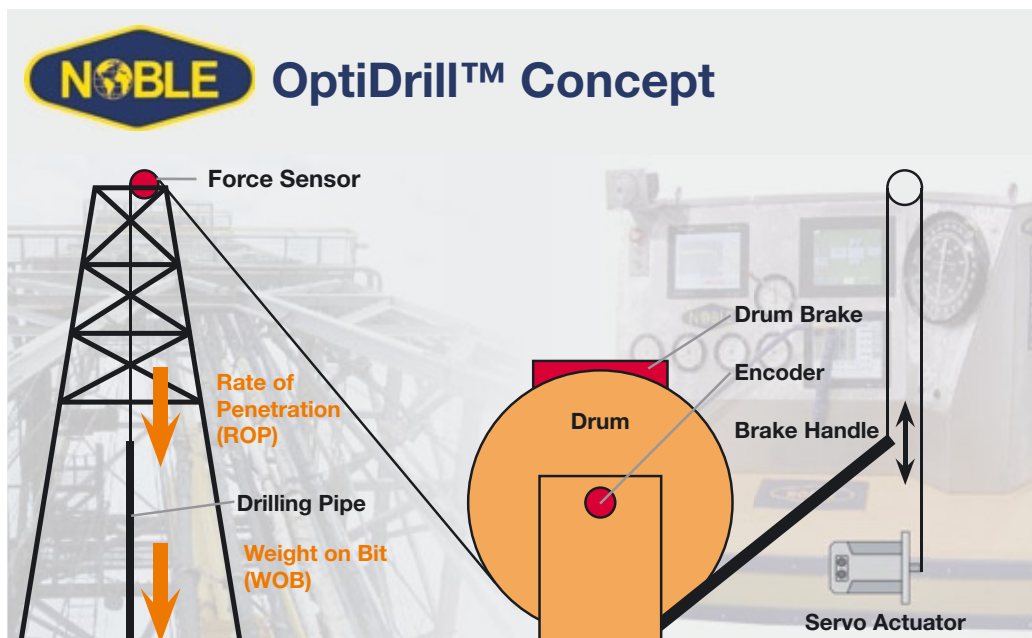
After Noble decided to develop the drilling system with B&R, the company

chose to field test a prototype system on a simulated drilling rig in January, 2003. The ROP (short for "Rate of Penetration" - indicates the progress speed of the drilling operation) demo of the B&R ACOPOS servo drive operated system on the test rig showed excellent performance for high and low penetration rates.

"With onsite technical support from B&R, we were able to quickly demonstrate the performance required to continue on to a field test in March, 2003, with a full system on a working drilling rig. From this initial field test, on through the design and implementation of the 8 working units in the field, and the second generation design (result of optimization of hardware and software in the following months), B&R has remained a part of the technical design and problem resolution team," says Mr. Jason Power.

### Precise synchronization

The most critical processes of the drilling system were solved with high speed PID loop control of ROP and WOB control cascade. This requires a high resolution drum encoder, real-time and deterministic high speed controls with precisely synchronized communi-



cation. To achieve these requirements, the Noble OptiDrill drilling solution was developed using ETHERNET Powerlink for real-time communication and faster cycle times with fast ETHERNET Powerlink communication to drive and remote I/O. Multitasking operating systems with deterministic cycle times were also required. The application furthermore consists of an industrial PC running Automation Runtime 105 which allows monitoring of the application onsite and on remote terminals. The communication to the remote terminals is realized using PVI over wired and wireless Ethernet. Additionally, the system features the B&R ACOPOS Servo Drive solution and B&R System 2003 Powerlink I/O as well as a sine, cosine drum encoder and explosion-proof rotary actuator. OptiDrill is certainly the result of the successful combination of B&R's controls expertise and NED's drilling know-how.

#### Risk reduction through continuous feed rate


The benefits of the Noble OptiDrill drilling solution with this newly developed system from B&R can be described as follows: OptiDrill provides a more consistent feed rate of the bit into the formation. This improves the drilling rate and reduces risk of damage to equipment downhole. 20% improvement of the drilling performance is regularly observed due to faster rate of penetration (ROP) of the PC controlled operation compared to manual operations. The system is easy to install, light weight and therefore facilitates transportation and setup. The most important benefit, however, is that the OptiDrill system can be easily installed as a retrofit

for existing rigs with a minimum amount of investment. Noble's competition offers systems where the user needs to replace the complete braking system – a critical component of the drilling rig – resulting in increased costs and rig downtime. This allows Noble to penetrate a much wider market with its OptiDrill system since the investment pays off very quickly and results in lower operating costs.

“The equipment used was selected based on specifications from the catalogues and have been accurate for our needs. The only issue that comes to mind was promoting a product spec for a relatively new product that was not commercially available or tested (i.e. embedded Windows operating environment). We worked around this by using other equipment to run the Windows tasks,” describes Mr. Power.

#### Positive prospects

The production of the drilling equipment is outsourced by NED to Canrig. Canrig is the machine manufacturer who builds the drilling equipment for both Noble Corporation and Nabors Industries Ltd. Nabors is one of the customers of Noble who licensed the OptiDrill technology for use in its own rigs around the world. After the successful implementation of the first 40 systems in the field, Nabors Industries Ltd. has plans to equip the majority of their land rigs with the OptiDrill technology. “We are accelerating our implementation of the automatic driller system and have completed our implementation of internet data transmission throughout our fleet”, states Gene Isenberg, Chairman and CEO of Nabors Industries Ltd.

The economical outlook is certainly promising. The Baker Hughes rig count shows 2477 active working rigs worldwide for February 2004. Estimates are that approximately one third of the rigs can benefit from the OptiDrill technology. This indicates a high market potential for the OptiDrill technology. 

[www.noblecorp.com](http://www.noblecorp.com)



**Jason Power**  
Operations Manager  
Noble Engineering  
& Development, LTD

*“We were suffering from equipment limitation problems and vendor technical support issues. B&R made the assurance that the hardware limitations could be overcome and that technical support was available through Atlanta or Austria if necessary.”*

B&R has shown tremendous flexibility in the commercial side as well as the technical side of our relationship. In addition, the quality of the B&R products has been extremely high with very high reliability.

The basic thing we have tried to achieve with the development of the OptiDrill is to give the customer the pricing and ease of installation of the low end automatic drilling systems on the market with the performance of systems that cost 10 times as much and require much more time/cost to install. This has been achieved using B&R hardware and a combination of intelligence from the B&R and Noble team.

B&R was chosen mainly based on the delivery as promised of certain levels of product performance and support in the field trial stages. The equipment is also very flexible and easy to implement, which was a requirement from a project staff retraining and equipment replacement point of view. B&R product support has been exceptional throughout the development of this product, even for a relatively small customer. The value of this cannot be overstated, since this type of support is not available with the larger vendors who focus on larger customers.

Summarizing this, I would definitely recommend B&R.

#### The benefits of the OptiDrill™ for customers

- Increased safety and equipment protection.
- Enhanced ROP with finite WOB control and the DrillSmart ROP enhancement algorithm.
- Increased equipment life with finite drum control and WOB control.
- Modular, computer based platform allows for easy upgrades, plug-in modules, custom applications and troubleshooting.