Drilling management results in successful projects

DEEPWATER SUCCESS

DEEPWATER PROJECTS INVOLVE multiple challenges of new technology, geological uncertainty and, often, a fast track approach. The well's portion of the total project cost often exceeds 50%. The huge price for intervention activities later in the life of these wells requires that the initial completion remain in place and function as planned for a long time.

The author will describe a methodology that has been successfully applied with repeatable best in class results in the North Sea and Gulf of Mexico. This methodology addresses the need that teams are organized to fit the project (not the other way around) and that systems integration is treated as a high priority. Deepwater exploration and development wells will be discussed, including a horizontal development well and an exploration well drilled from a semisubmersible rig.

The author will also describe how the projects were organized; how the teams were aligned to their objective and goals; the tools that support these successful teams; how the teams were motivated to perform; and how web-based support functions to create co-location through the virtual world.

The author will contrast this form of organization with traditional operations.

Deepwater Success Through Predictable and Distinctive Drilling and Completion Performance (IADC/SPE 87117) **John P de Wardt**, **De Wardt and Company**.

VALUE PARTNERSHIPS

British Gas (BG) began an exploration program in the West Delta Deep Marine concession offshore Egypt in 1998, and hired the Atwood Oceanics semisubmersible Atwood Eagle to drill this initial program. The early exploration program was successful, and led to an exploration, appraisal and development program lasting 4 ½ years and consisting of 36 wells drilled and eight wells completed with Atwood Oceanics rigs. The Atwood Eagle drilled 19 wells, the Atwood Southern Cross one, and the Atwood Hunter drilled 16 and completed eight wells.

The authors will outline the major steps taken by BG and Atwood Oceanics in accomplishing outstanding performance including:

• A combined 1.5 million man hours achieved with three rigs on contract with BG, Rashpetco and Burullus (BG companies) in a challenging deepwater drilling and completion environment;

• Drilling the first deepwater exploration well in the area;

• Best in class drilling performance compared to other operations in the area over 4 ½ years without compromising safety;

• Operations that approached or surpassed the expected technical limit;

• Hiring and training of local employees into a world class safety program;

• No damage to the environment.

Delivering the Limit Without Compromise: Understanding a True Operator/Contractor Value Partnership (IADC/SPE 87118) **Alan Quintero**, **Atwood Oceanics**; **M A Cockram**, **BG Group**.

The semisubmersible Atwood Hunter drilled 16 of the 36 wells for development of the West Delta Deep Marine concession offshore Egypt for British Gas in 1998. Other Atwood rigs used in the 4 1/2 year project were Atwood Eagle and Southern Cross. IADC/SPE 87118

BREAKTHROUGH PERFORMANCE

Drilling the structurally complex overthrusted fault blocks associated with the Andes foothills of Colombia has always presented a number of distinctive challenges. Borehole instability, hard and abrasive formations, undesirable hole deviation associated with multiple fault planes, low progress rates and frequent drill string failures are the most common problems encountered while drilling wells in the area.

The authors will discuss how proper planning and understanding issues that previously restricted drilling performance led to the identification of improved drilling practices and the application of the proper technology that resulted in breakthrough drilling performance including new world records for impregnated and PDC bits.

To measure the effectiveness of the initiatives, the authors will document savings relative to offset wells. The average well drilled in the Colombian foothills averages 188 days per 10,000 ft to complete. However, with application specific technology, to date, the team has cut the average time required to drill these wells to 123 days per 10,000 ft with the consequent savings in time and money to the company.

Beyond the Best Initiative and Technical Limit Processes Delivery Breakthrough Performance: Deep Exploration Well, Colombia (IADC/SPE 87120) **A E Frazelle**, **J F Samiento**, **R V Navarro**, **British Petroleum Explo-**

ration Company Colombia Ltd; **J Garoby**, **R Krasuk**, **Baker Hughes OASIS**.

ANALYSIS PARADIGM

Drilling analysis is a phase of drilling engineering that is assumed to be practiced routinely, but is seldom done. Over the past 30 years, disciplines such as reservoir engineering evolved pressure transient analysis, and production engineering developed nodal analysis. Yet drilling engineering has not formalized tools and processes that would be recognizable as drilling analysis. This is understandable since drilling engineers are rewarded mostly for planning and managing well construction. Implicit in this assumption is the fact that somewhere in the planning process, there has been some form of drilling analysis. With a few exceptions, this is not always the case. Another deterrent to drilling analysis not being an integral part of drilling engineering has been a lack of organized knowledge-based data management systems that can cross-correlate relevant drilling parameters.

For nearly two years, there has been an on-going formalized initiative to develop such a drilling analysis methodology and tools with encouraging results. The authors will present some of the key processes, tools and select field applications. Routinely acquired drilling, geologic, mud-log, and logging data are shown to be amenable to organization into a knowledge-based structure.

Methodology and Benefits of a Drilling Analysis Paradigm (IADC/SPE 87121) **A W Iyoho**, **K K Millheim**, **B K Virginillo**, **A R Adeleye**, **M J Crumrine**, **Anadarko Petroleum Company**.

HORIZONTAL DRILLING

The introduction into Siberia of Western horizontal drilling techniques has achieved outstanding results for Sibneft, a Russian independent operator. Before 2000, vertical or directional s-shape wells were being drilled to develop the Sibneft-NoyabrskNeftegaz oilfields using local techniques provided by Siberian drilling contractors.

An alliance with a major Western service provider made possible a Western-Russian design group familiar with all available options. The group created an ideal marriage of Western and Russian fit-for-purpose equipment, procedures and techniques for a cost-efficient horizontal well design.

The methodology applied in this project is a fusion of classic Russian drilling techniques, i.e., compact rigs skidding on a rail system, aluminum drillpipe with Russian turbines to drill tophole sections, coupled with modern horizontal technology such as steerable motors and mud pulse telemetry MWD and LWD systems.

To date, 71 wells have been drilled with a progressive learning curve enabling wells to be drilled to around 4,000 m (with more than 1,000 m of horizontal section) in less than 48 days that at the start of the campaign were taking more than 100 days.

Successful Horizontal Drilling in Western Siberia: Use of Appropriate Cost-Effective Technology Solutions to Increase Well Productivity (IADC/SPE 87122) **L Prakash**, **G Aker**, **O B Angel**, **Schlumberger**; **I Diyashev**, **V Lishcuk**, ***Sibneft NoyabrskNeftegaz***.

DRILLING RISER MANAGEMENT

In early 2003, the Glomar Jack Ryan dynamically positioned drillship drilled a well in the Great Australian Bight in 4,308 ft of water. This well was unique in that retrieval of the riser was required in advance of developing seastates.

Accurate seastate forecasting and onsite measurements were key elements provided by the operator to ensure that enough time was allowed to pull the riser in case well-specific operating criteria were to be exceeded.

These seastates were established based on discussions between operator and drilling contractor personnel supported by riser analysis results. Riser recoil analysis was used to investigate the potential for damage to the BOP stack and slack in the tensioner lines in case of an emergency disconnect.

The authors will present an overview of the riser management carried out for this well, with emphasis on the riser recoil analysis.

Drilling Riser Management in Deep Water and Developing Seas using a DP Drillship in Great Australian Bight (IADC/SPE 87123) **J N Brekke**, **M Wishahy**, **GlobalSantaFe Corporation**; **M Stahl**, **F Barker**, **Stress Engineering Services**; **M F Barker**, **Texas A&M University**.

OPTIMIZING DRILLING PROCESSES

Drilltronics is the project name of a new and innovative system for drilling automation and simulation using real-time drilling data to optimize the drilling process. The system is composed of several elements, including software modeling with algorithms that reflect the wellbore behavior and its interaction with the drilling equipment.

Currently under development are transient flow and heat transfer models, a drillstring torque and drag model, weight on bit optimization, and stick/slip analysis. Links to an external formation stress model for improved prediction of rate of penetration and hole stability are planned.

Selected, critical sub-operations will be automated for fast and reliable reaction, e.g., automatic control of the drawworks based on dynamic surge and swab calculations, and automatic detection and first action after easily recognized symptoms on hole problems like pack off or stuck pipe.

In order to realize the full potential of Drilltronics, surface and downhole drilling data must be available in real time. The drilling equipment will need to be computer controlled with an interface that provides automatic responses to the model's analysis.

Testing of the Drilltronics system is conducted at the research facilities of RF-Rogaland Research in Stavanger.

The test-site drilling rig (Ullrigg) with its existing wellbores is used for proof of concept. The author will present results from the first tests. The system will be field tested on the Statfjord Field in the North Sea upon completion of the testing phase.

Drilltronics: An Integrated System for Real-Time Optimization of the Drilling Process (IADC/SPE 87124 – Alternate) **K S Bjorkevoll**, **R Rommetvit**, **RF – Rogaland Research**; **A Merlo**, **Eni-Div E&P**; **L N Nossaman**, **M N Sweep**, **ChevronTexaco EPTC**; **K M Silseth**, **Statoil ASA**; **S I Odegard**, **National Oilwell**.