Well methods put control in drillers' hands

DUAL DENSITY DEEP DRILLING

DUAL GRADIENT DRILLING methods have been proposed as a means to provide simpler, safer and more economic deepwater well designs. This research investigates riser gas lift as a potential means to implement a dual gradient system.

The specific concerns addressed in this study were kick detection, cessation of formation feed in, removal of kick fluids, and re-establishing hydrostatic control with a constant bottomhole pressure method. These concerns were studied using a transient, multiphase simulator.

Two alternatives for stopping formation flow were considered, a "load up" method of reducing the nitrogen rate versus closing a subsea BOP. BOP closure was shown to be more reliable for stopping flow and minimizing kick volume. Further, a relatively conventional approach of circulating up a gas-lifted choke line against a surface choke was compared with a dynamic approach based on reducing the nitrogen rate and to the use of a seafloor choke. It was concluded that methods using a choke were much simpler and more effective for controlling pressure than controlling the nitrogen rate.

Analysis of Alternative Well Control Methods for Dual Density Deepwater Drilling (IADC/SPE 98957) M Stanislawek, ENSCO; JR Smith, Louisiana State University.

ANALYZING GAS KICKS

Many operators are drilling multilateral wells with limited knowledge of the pressure characteristics in the multiple wellbores.

This paper reports the results of a study conducted using a Multilateral Well Control Simulator developed at Seoul National University and Texas A&M University. This simulator calculates and records the pressure profiles in all laterals on a continuous basis during tripping, drilling and well kill operations. From these simulations, we can determine the effect that the changing annulus pressure profile can have on all of the laterals.

This tool will allow a better understanding of the pressure changes in multiple lateral sections that will occur during well kill operations.

Analysis of Gas Kicks in Multilateral Wells Utilizing Computer Simulation (IADC/SPE 99028) JJ Schubert, Texas A&M University; DT Dreher, Halliburton; J Choe, Seoul National University; HC Juvkam-Wold, Texas A&M University.

BARGE DRILLING

Although considered a mature drilling province from an exploration standpoint, the United States offers excellent opportunities for exploiting developed gas fields due to its extensive processing and transportation infrastructure. However, natural gas production from major US basins is not expected to sufficiently supply US demand in the near term. Deep Miocene gas exploration programs in the Gulf of Mexico have been developed to exploit this supply shortfall. While attention has been focused on jackup rig designs for shallow offshore prospects in this market, recent discoveries lie in less than 10 ft of water in Louisiana — the traditional operating area of the conventional swamp barge fleet.

Deep gas drilling typically addresses issues such as penetration rates, hole stability and mud properties. Deep gas targets have comparatively more compacted formations in the region, higher temperatures and low margins between flowing wells and lost returns, thus well control is a driving factor in well design.

This paper describes the re-engineering of a conventional 3,000 HP barge rig to deliver a new-generation HTHP and High Flow barge rig, designed for increased reliability and specification for drilling programs in the Deep Miocene. Upgrading the main engines, main VAC distribution, SCR systems and high performance pump configuration are discussed, as well as resulting auxiliary system modifications.

A case study is presented of the first prospect drilled with the rig in Iberia Parish. This study describes how each system upgrade on the rig impacted drilling improvement over offset wells and operator expectations. The successful integration of drilling technologies, including real-time formation evaluation, under reaming, bit selection and rotary steerable drilling are discussed from the rig perspective.

Reengineering Barge Drilling for Deep Miocene HP/HT Frontiers in a Mature Basin (IADC/SPE 99210) FJ Husband, G Bitar, T Begnaud, T Petticrew, Parker Drilling Co.

SUBSEA GAS WELLS

The Mexilhao field is the largest undeveloped gas accumulation in the Brazilian Continental Shelf, in Santos Basin, in water depths ranging from 320 m to 500 m. The field is situated approximately 140 km from the coastline, and reserve estimates are in the 90 billion cu m of gas and 6 million of oil range.

The field development plan is based on the construction of eight subsea wells connected to a subsea manifold that will be responsible for exporting the production to a fixed platform located in 170 m of water depth, about 20 km from the field. The start of the production is scheduled for 2008, reaching the production peak of 10 million cu m of gas per day in 2009.

As the gas production flow rates of the horizontal wells will be higher than 1 million cu m/day, the planned drilling and production on the Mexilhao field meet considerable challenges for safety in drilling and well operations.

This study focuses on the various aspects involved in elaborating a complete blowout contingency plan for Mexilhao. Most of the practical implications of a blowout intervention project were addressed, including intervention strategy, rig requirements, pumping equipment, mud storage tank facilities, logistics and personnel.

The paper also presents details of the blowout rate calculations and relief well kill requirements.

Substantial efforts also have been put into practice for reducing the overall operational risks. A comprehensive Hazid/Hazop, including risk assessment, were performed, and the main findings will be presented.

Blowout Contingency and Risk Reduction Measures for High Rate Subsea Gas Wells in Mexilhao (IADC/SPE 99164) AC Lage, FS Martins, OL Santos, CC Jacinto, GS Vanni, JF Moreiras, Petrobras.