

Solutions offered for casing deformation problems

INTEGRITY OF THE CASING string is a fundamental requirement in any well. At the 2002 IADC/SPE Drilling Conference, 26-28 Feb in Dallas, a session on "Formation Driven Casing Design" explores casing deformation. The session is chaired by **M L Payne, BP plc**; and **D C Dupuis, Pride Forasol**.

BP IN COLOMBIA

Casing deformation (ovalisation) has occurred in many re-entered wells in BP's acreage in the Colombian foothills. Operational problems attributed to this include restricted access and failures due to the reduced collapse rating.

While drilling in the area has been plagued by the problems associated with severe wellbore instability, there is now compelling evidence that the somewhat unusual rock stresses also cause deformation of casing strings after wells have been completed.

IADC/SPE paper 74560, "Casing Deformation and Integrity in a Tectonic Setting: Evaluation, Impact and Management," describes the situation. It was prepared for the Conference by **N C Last, BP plc**; **S Mujica, BP Colombia**; **P D Pattillo, BP plc**; and **G T Kelso, BP Colombia**.

Previously available techniques predict a dramatic reduction in collapse resistance as ovalisation increases, but field experience in Colombia refutes this.

New, more representative equations have been developed based on numerical simulation and experimental validation. This provides a new basis for planning well interventions and important input to assessments of field economics.

COLOMBIA CASE STUDIES

Ultrasonic logging has been used extensively in Colombia in the Andes foothills to quantitatively evaluate casing wear and deformation. Casing strings can be lost due to casing buckling, shearing and excessive wear. Active stresses applied to the casing strings from the active movement of faults contribute to the degradation of casing integrity and strength.

These deformations are very costly and often cause the well bore to be abandoned or re-drilled.

Imaging of the casing in planar view, 2d cross-section and in 3d perspective view is often helpful to better understand the deformation extent, location, and possible causes.

IADC/SPE paper 74561 analyzes somewhat extreme examples of casing deformation due to active stress regimes.

"Case Studies of Casing Deformation Due to Active Stresses in the Andes Cordillera, Colombia" was prepared for the Conference by **M E Markley, Schlumberger**; **N C Last, BP plc**; **S Mujica, BP Colombia**; and **S M Campos, Schlumberger**.

SALT LOADING

In the next decade, significant new oil field developments will be brought on-stream in the deepwater Gulf of Mexico. A large number of these wells will be drilled through salt. Assuring the integrity of these wells is a major drilling engineering challenge.

To address these challenges, advanced numerical finite analyses of salt/casing interaction were undertaken by **Sandia National Laboratories** using state-of-the-art computational modeling developed as part of extensive research supporting the Strategic Petroleum Reserve (SPR) and the Waste Isolation Pilot Plant (WIPP) projects.

IADC/SPE paper 74562 summarizes salt mechanical behavior of relevance to well integrity. "Assessment of Salt Loading on Well Casings" was prepared for the Drilling Conference by **S M Wilson, BP plc**; and **A F Fossum** and **J T Fredrich, Sandia National Laboratories**.

The results of numerical modeling of casing loading show the importance of assessing the possibility of both uniform and non-uniform loading by the salt and the impact that production-induced heating of the salt has on the rate and magnitude of casing loading.

By selecting appropriate loading cases in the casing design, and knowing the timing of the loading over the well life, unduly conservative load cases were ignored. This led to a simpler casing design (eliminating a planned tieback string), saving time and cost in the development phase.



An 11 3/4-in. OD liner was installed through a whipstock window cut in the 13 5/8-in. casing.

WHIPSTOCK FOR CASING

A technological breakthrough in the well construction process was recently accomplished in the deepwater Gulf of Mexico. An 11 3/4-in. OD liner was successfully installed through a whipstock window cut in 13 5/8-in. casing. It was the first attempt to run casing larger than 9 5/8-in. OD through a 13 5/8-in. window.

IADC/SPE alternate paper 74563, "Whipstock Casing Installation Advances Well Construction Process," was prepared for the Drilling Conference by **D R Mayfield, Murphy E & P Co**; **J Buster, Grant Prideco**; **E M Rodriguez, Baker Hughes Inteq**; and **E V Nordenstam, Baker Oil Tools**.

Murphy E & P Company was planning delineation drilling of their Medusa Prospect in Mississippi Canyon Blocks 538 and 582. The operator had decided that the most economical option for delineation drilling was to sidetrack the existing wellbore.

The casing program of the original well and the proposed bottomhole location of the sidetrack dictated that the well be kicked off below the 16-in. casing shoe.

The evaluation program of the sidetrack hole included a conventional core and it was determined that a minimum hole size of 8 1/2 in. was required to cut and recover a core large enough for evaluation. Well operations dictated that the 11 3/4-in. liner be run through the 13 5/8-in. window to achieve the desired 8 1/2-in. hole size at total depth. ■