Abstract

Planning an HPHT well is a complicated process that takes more than a year to complete. It requires complete integration of the subsurface and drilling for safe execution.

This paper will touch upon the key technologies involved in both.

For the subsurface side we need to be able to predict reasonably accurate lithologies from the shallowest overburden to TD along the well track. Significant sand bodies have to be mapped kilometers away from the prospect. This in turn allows us to build a basin model, which helps in the prediction of fluid migration and pressure regressions. Huge efforts are made to accurately predict pore pressure and fracture gradient. Knowledge of the location of pressure ramps drives the depths of casing points.

From the drilling side, key technologies like Managed Pressure Drilling have been major enablers to BP's track record for the deepest Mediterranean wells. However, almost all aspects of the traditional drilling operation have had to be reviewed from mud chemistry to logging tool survivability.
Managed Pressure Drilling  Threading the narrow ES margins needle

The Challenge

- **New Prospect Inventory in New Stratigraphy**
  - Increasingly difficult HPHT. High volume, Rich wet gas prize

- **Increasing number of low Effective Stress wells**
  - Nile Delta HPHT characterised by very narrow <0.5ppg PP-FG windows and rapid pore pressure variations

David Cowper & Lorraine Wild BP Egypt

New Stratigraphy

New Oligocene PI
Managed Pressure Drilling

**Threading the narrow ES margins needle**

**What We Did**

1. **Conventional Drilling**
   - Drill
   - Correction
   - Drill
   - Pumps off
   - Drill
   - Correction
   - Drill

2. **MPD Drilling**
   - Drill
   - PPG ->
   - PPG ->
   - MPD traps constant ECD

Repeated alternations between ECD to Static results in micro ballooning and weakened formation.

- **Difference between the ECD and Static can sometimes = Effective Stress**
- **Undrillable**

- **MPD holds ECD constant by trapping pressure in annulus**

Rotating head installed on top of rig’s annular BOP

Rotating head installed below mini telescopic joint
Managed Pressure Drilling  Threading the narrow ES margins needle

Results

Performance
- BP Egypt has drilled 5 out of the 7 BP Portfolio wells with smallest effective stress windows
- Drilled Deepest well in the Med 22128 ft (6750m) with 0.3 ppg margin
- Cut deepest Core in the Med
- BP can drill into Fairways that have defeated other Operators.

Safety
- Reduces the probability of taking a kick and reduces size of kick

Efficiency
- Reduced NPT associated with Losses and Ballooning

Risk being able to drill but cannot evaluate – Logging/mud technology is lagging behind
MASP is the new issue- 20k wells are the future

BP successfully transferred technology from J/Up to Semi Sub

BP successfully Reached planned TD @6750m 1 km (3280 ft) deeper than ncn MPD wells.