

# **PS Managed Pressure Drilling - Threading the Narrow ES Margins Needle\***

**David Cowper<sup>1</sup> and Lorraine Wild<sup>1</sup>**

Search and Discovery Article #41085 (2012)\*\*

Posted November 30, 2012

\*Adapted from poster presentation at AAPG International Convention and Exhibition, Singapore, 16-19 September 2012

\*\*AAPG©2012 Serial rights given by author. For all other rights contact author directly.

<sup>1</sup>Exploration, BP Exploration Egypt, Sunbury on Thames, United Kingdom ([cowperdr@bp.com](mailto:cowperdr@bp.com))

## **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

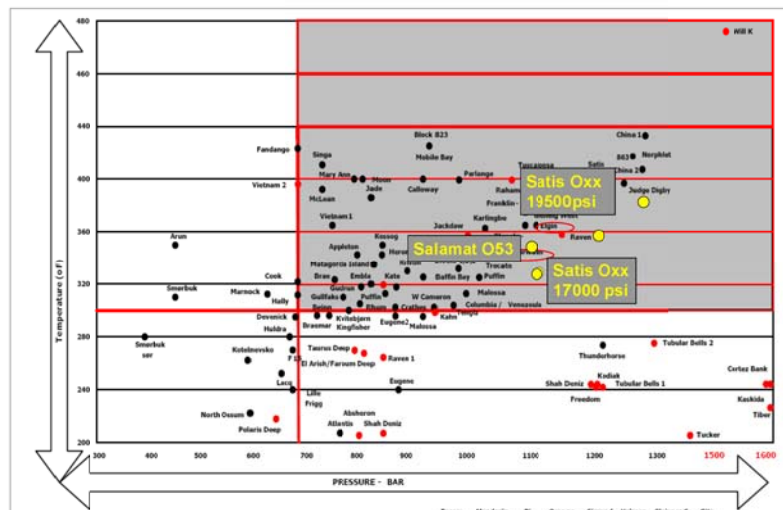
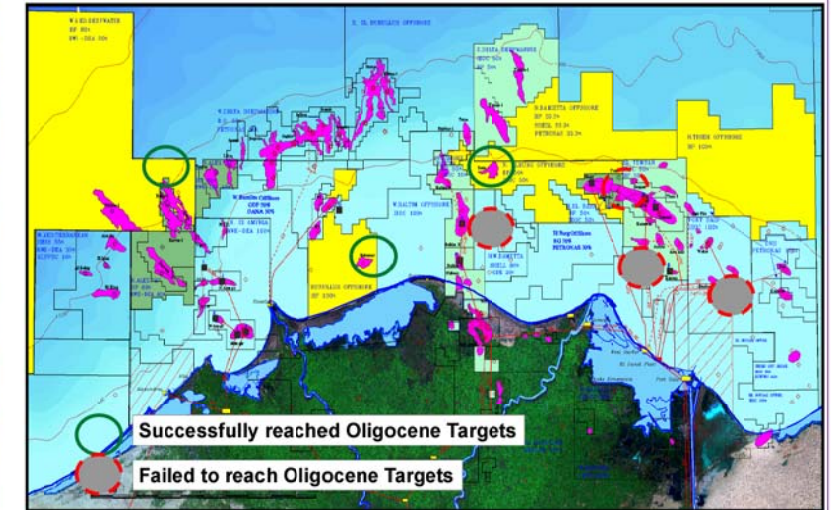
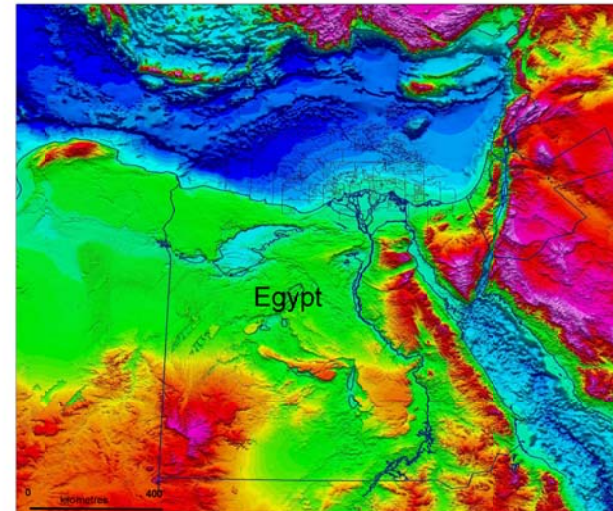
### ✧ New Prospect Inventory in New Stratigraphy

- Increasingly difficult HPHT . High volume, Rich wet gas prize

### ✧ Increasing number of low Effective Stress wells

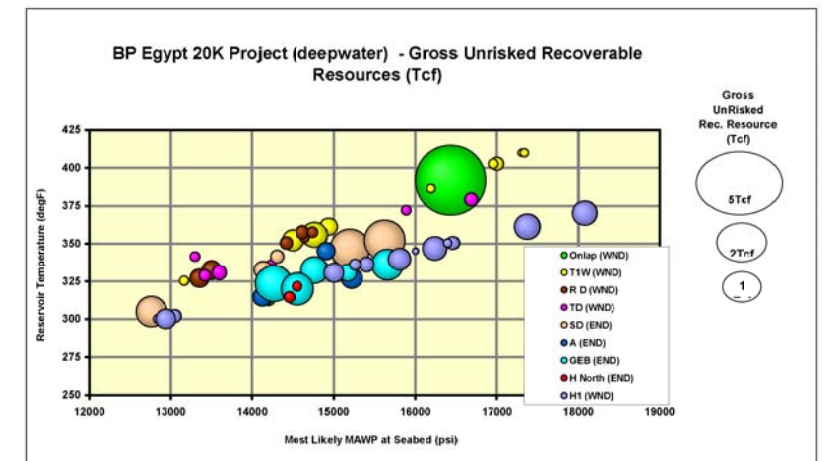
- Nile Delta HPHT characterised by very narrow <0.5ppg PP-FG windows and rapid pore pressure variations

## David Cowper & Lorraine Wild BP Egypt



| Ma | Epoch       | Stage       | BP strat | BP Fields | Fairways         |
|----|-------------|-------------|----------|-----------|------------------|
| 0  | Pleistocene | Late        | Pt10     |           | Plio-Pleistocene |
|    | Pliocene    | Early       | P50      |           |                  |
| 5  |             | Messinian   | P00      |           | Messinian        |
| 10 |             | Tortonian   | M90      |           | Tortonian        |
| 15 | Miocene     | Serravalian | M65      |           | Serravalian      |
| 20 |             | Langhian    | M50      |           |                  |
|    |             | Burdigalian | M40      |           | Early Miocene    |
| 25 |             | Aquitanian  | M15      |           |                  |
| 30 | Oligocene   | Chattian    | O60      |           | Oligocene        |
|    |             | Rupelian    | O50      |           |                  |
| 35 | Eocene      | Präbrian    | O15      |           |                  |

## New Stratigraphy



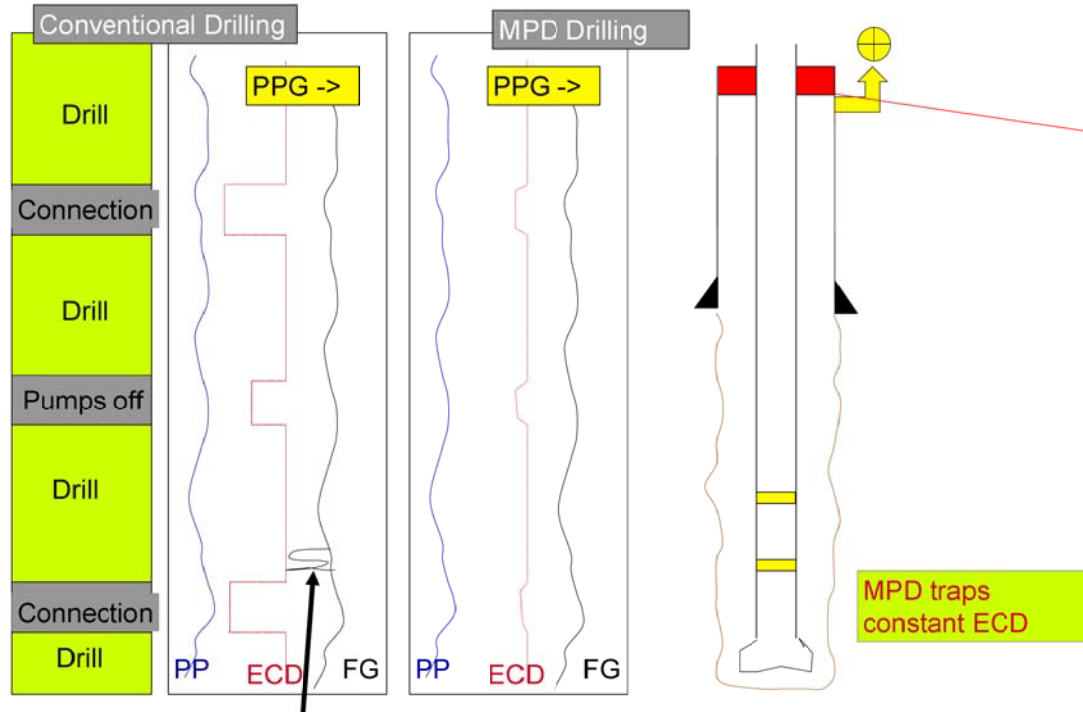
## New Oligocene PI



# Managed Pressure Drilling Threading the narrow ES margins needle



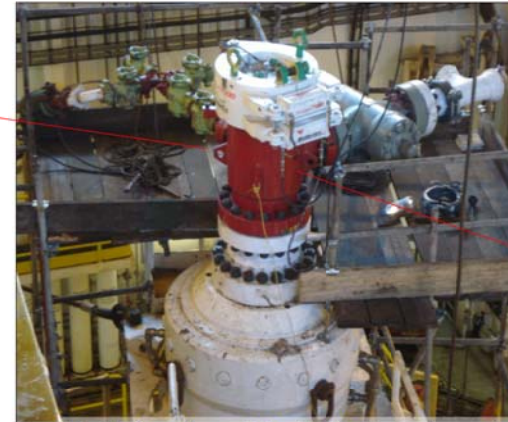
## What We Did



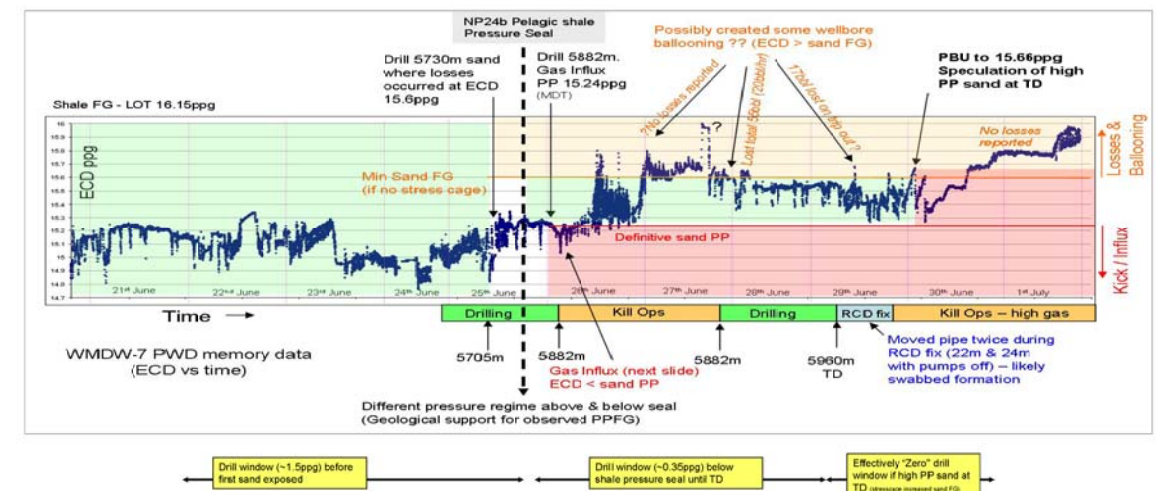
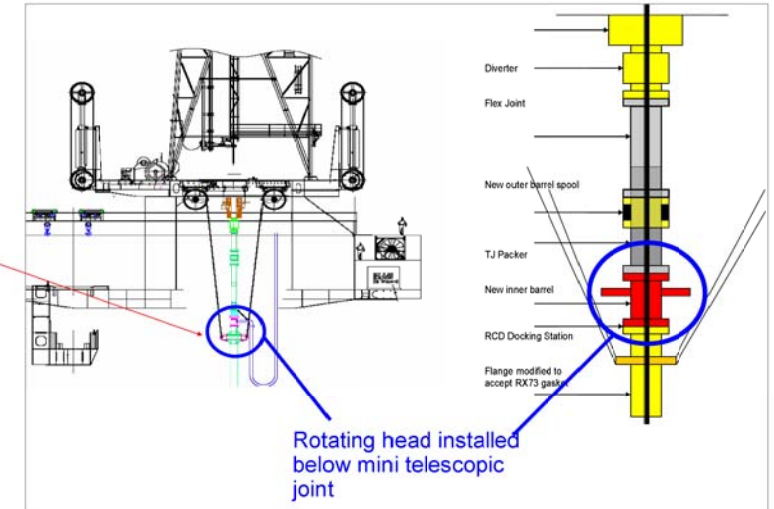
Repeated alternations between ECD to Static results in micro ballooning and weakened formation

≠ 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





# Managed Pressure Drilling Threading the narrow ES margins needle



## Results

### Performance

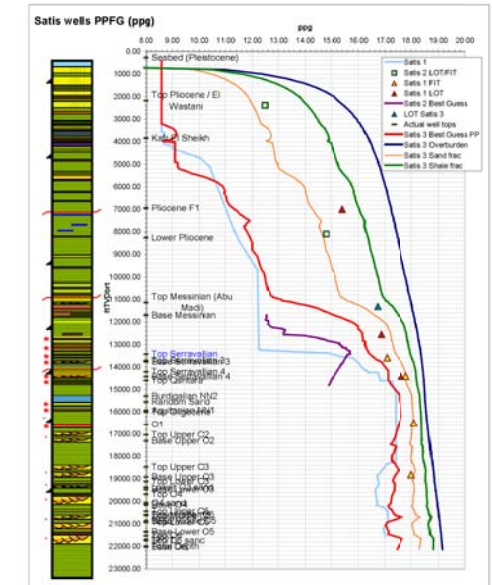
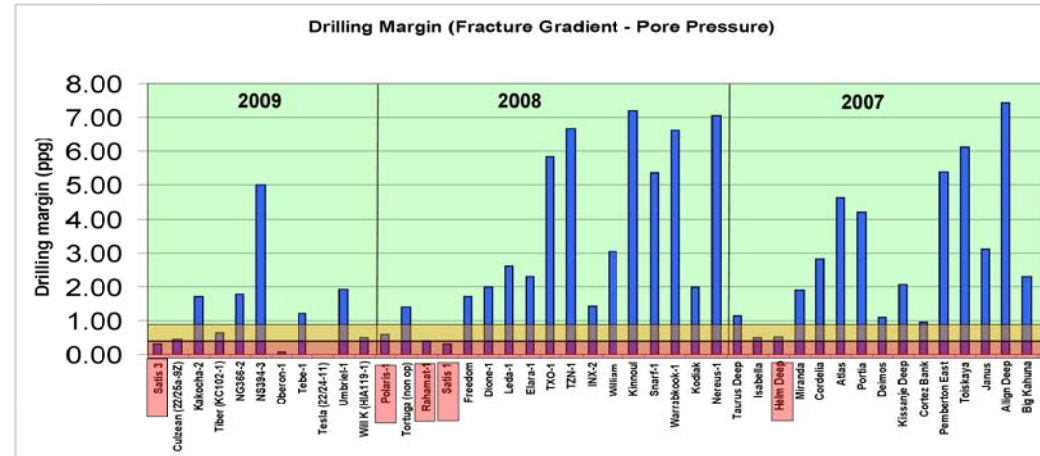
- ✖ BP Egypt has drilled 5 out of the 7 BP Portfolio wells with smallest effective stress windows
- ✖ Drilled Deepest well in the Med 22120 ft (6750m) with 0.3 ppg margin
- ✖ Cut deepest Core in the Med
- ✖ BP can drill into Fairways that have defeated other Operators.

### 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

