



10" MPD CEMENT JOB USING TWIN TRIP LINER SYSTEM AND WELL LIFE SLURRY

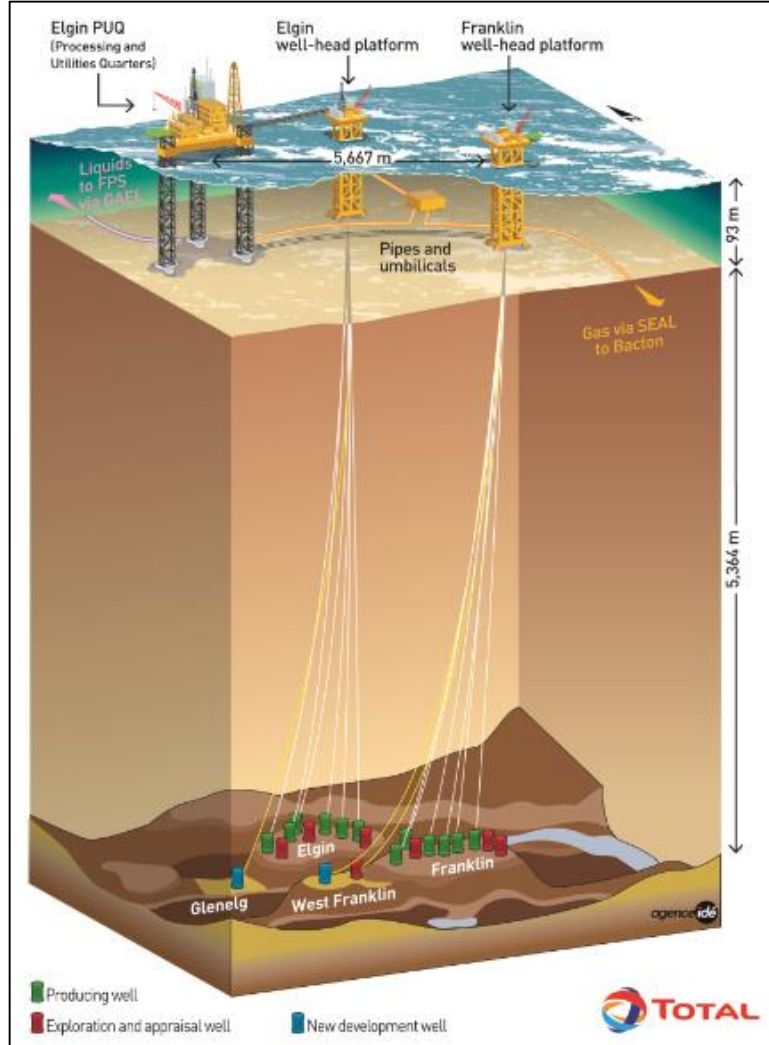
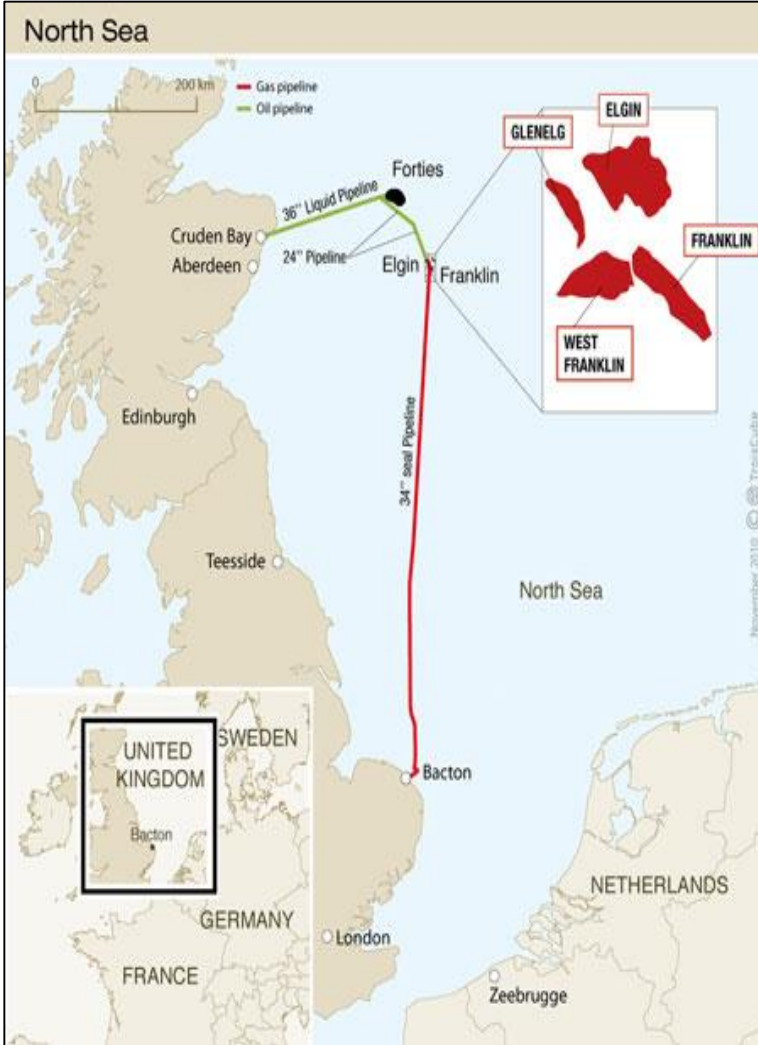
Total: Elgin EIF Well

Prepared by :

Graeme Mathieson

Senior Drilling Engineer

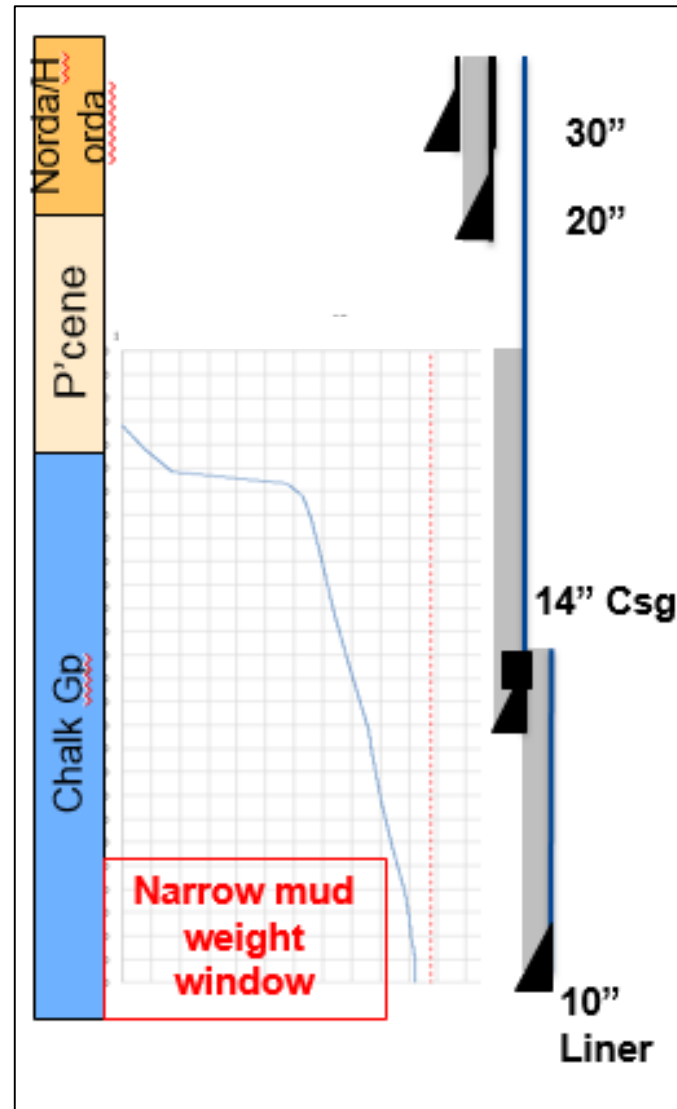
EIF BACKGROUND



- Central Graben HPHT well
- 90m Water Depth
- 5000m HPHT Reservoir
- ~reservoir depletion
- Stress Reorganisation in overburden
- 10" liner cement job critical for well integrity

CEMENTING BACKGROUND

- Performed in very NMWW
- Very high risk of losses
- Performed overbalance w/ low flow rates
- Relied on cement to cure losses
 - No guaranteed
 - Poor formation isolation
- B-Annulus Pressure risk.

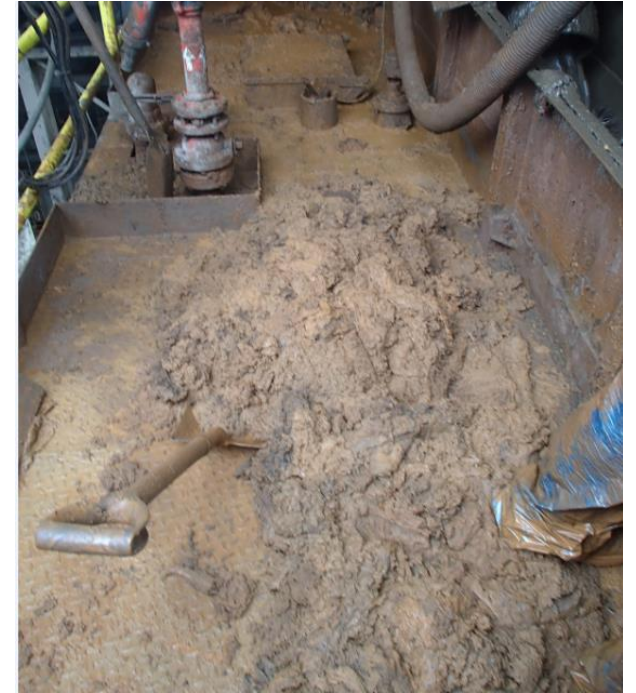


MPD CEMENTING

- Losses can't rely on slurry
- MPC never performed with resilient slurry.
- MPC typically performed using liner with integral packer – not available for EIF.
- Twin trip liner system increases risk of gellified slurry reaching surface.

MP CEMENTING CRITICAL FOR WELL INTEGRITY

RESILIENT SLURRIES



UNACCEPTABLE RISK DURING MPC

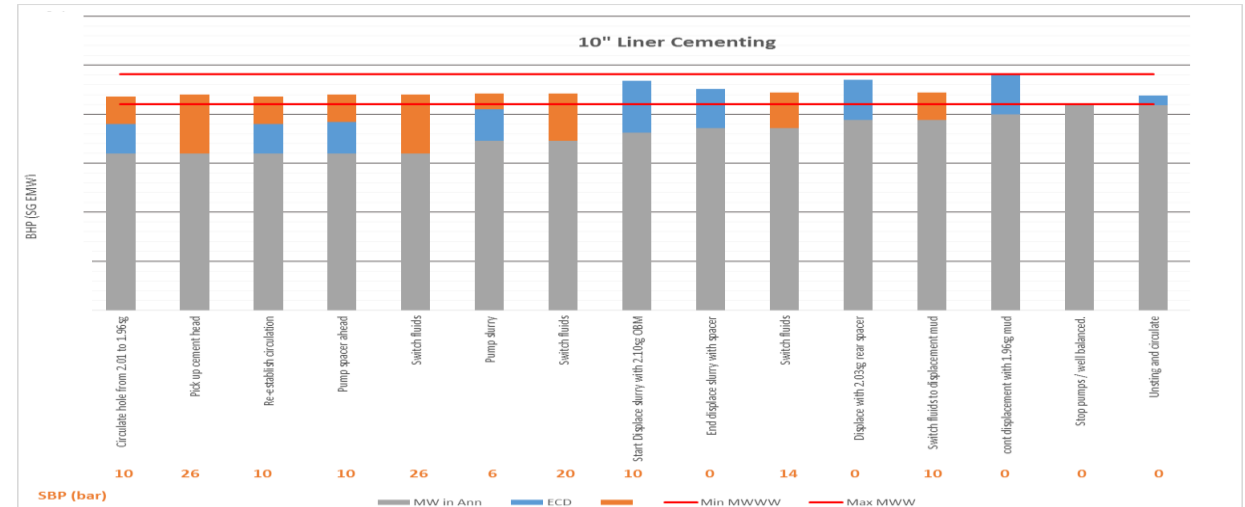
MPC DESIGN

- Job designed to have well on hydrostatic balance at plug bump.
- Allows RT pulled through slurry and circulated, avoiding slurry at surface.
- No floats/FOSV in running string.
- 6 separate fluids built and managed offshore.
- In-House modelling and simulation – manually developed charts.
- Contingency procedures planed.

CONSERVATIVE APPROACH GVIEN NATURE OF RISK

MPC EXECUTION

- Surface Back Pressure step down chart designed for each sequence.
- Removed real-time changes and potential human error.
- Acoustic real-time measurements used during job to calibrate future modelling.
- BHP managed successfully within very narrow MW window.
- Well static at bump, no slurry observed at surface.
- Excellent execution by offshore team.



SIMPLIFIED PROGRAMME FOR OFFSHORE – REMOVE HUMAN ERROR

KEY LESSONS

- **Twin trip liner system and resilient cement is complex**
 - Integral packer is highly recommended.
- **MPC modelling continued to be a challenge.**
 - Resilient slurries are crucial, but 3rd party software may struggle with them.
- **Vendors potentially don't appreciate the entirety of the risks of an MPC job.**
 - Operators must push the risk assessments and mitigations.
 - Everything done in house.
- **MPC PWD – we are constrained at the moment, we need to push it and support the new technology.**
- **Conservative approach can be improved for future.**

MPC WILL PLAY KEY ROLE IN FUTURE COMPLEX WELLS