Advanced model for drilling and well operations

A general dynamic model for single and multi-phase flow operations during drilling, completion, well control and intervention.

**ADVANCED HYDRAULICS MODELING**

The SINTEF model is an advanced, transient, integrated hydraulics and thermal wellbore model, based on many years of development and use in offshore drilling operations. The main features are:

- **Transient thermo-hydraulic model.** See how pressure/ECD, temperature, return rates and pit volume respond to changes in pump rate, string rotation, surge/swab, cuttings, and more
- **Two-phase flow and compositional PVT for well control.** Calculate effects of getting reservoir fluids in the well
- **Pressure and temperature dependent fluid properties.** Get it right downhole
- **Real-time enabled.** Used for decision support and automation

PROJECTS AND COMMERCIAL PRODUCTS

The SINTEF model or a similar fit-for-purpose model is an essential part of many projects, products and solutions for both automatic control and monitoring and advisory systems, including:

- eDrilling Software Suite
- Auto-viscosity
- Drilling Mud Process Control
- Gullfaks C and Kvitebjørn MPD Projects
- Drilling Training simulator
- Dual Gradient Drilling
- Well Control Simulator
- Validation of New Drilling Concepts
- Topside mud handling
- Gas influx evaluation


Photo: Statoil
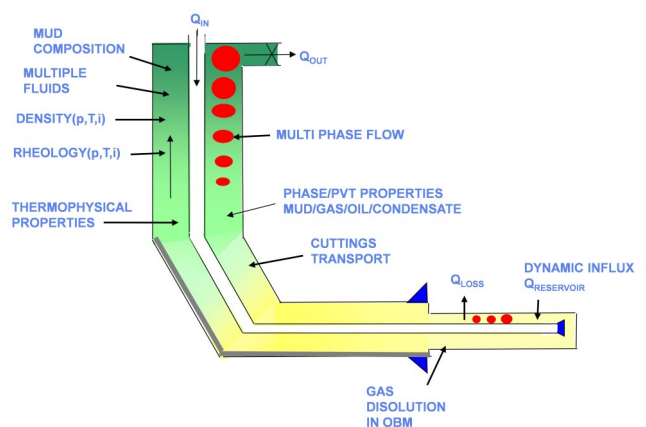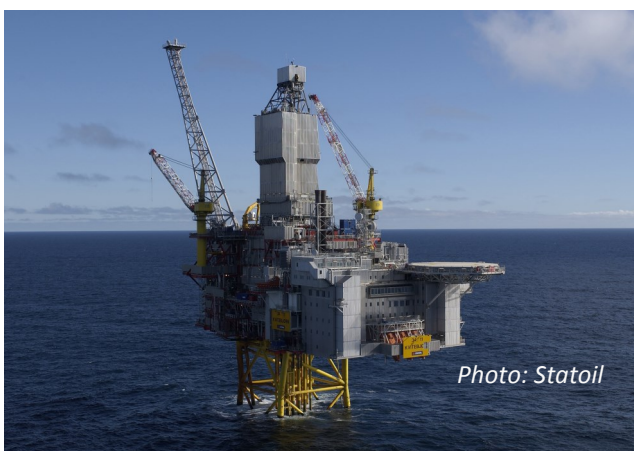
The physics of a well and flow.
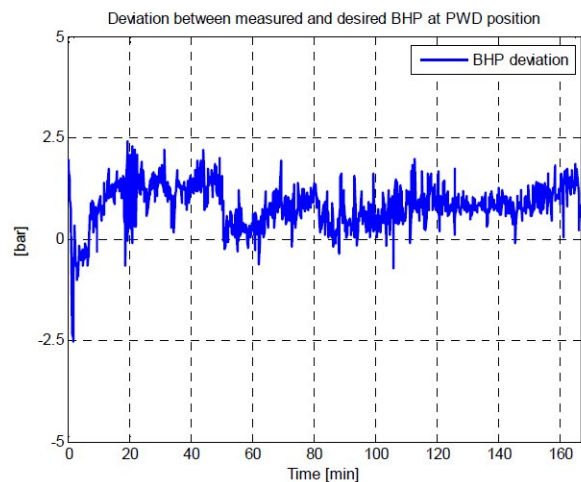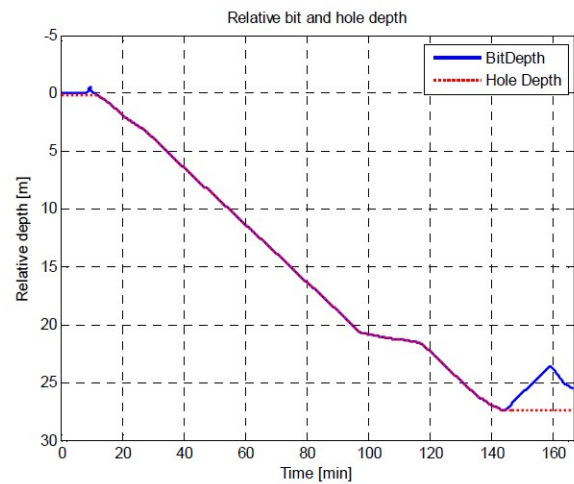
OFFSHORE OPERATIONS

The model has been used successfully in many managed pressure drilling operations with automatic pressure control in the North Sea. The model is an essential part of the control loop, by calculating the necessary surface pressure to keep a constant bottomhole pressure. In addition to use for planning up-coming operations, the following operations have been performed with automatic control based on the SINTEF model:

- Drilling and tripping
- Running of 7" liner
- Cementing a 7" liner
- Displacement operations
- Placement and displacement of "balanced mud pill"
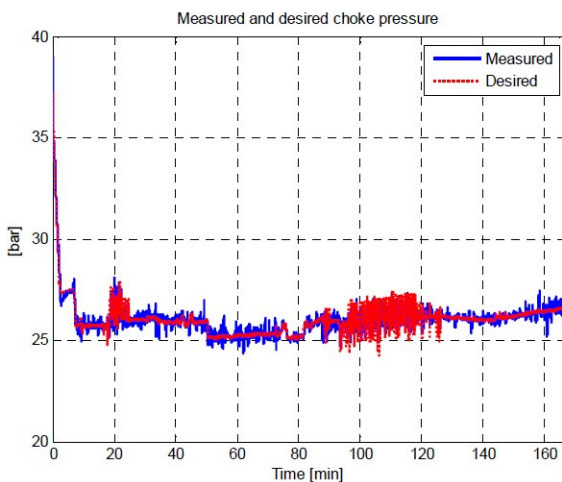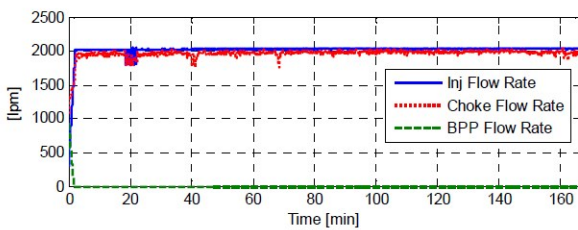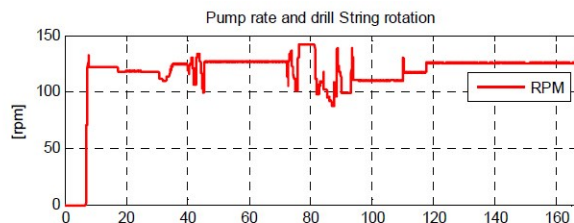
SELECTED PUBLICATIONS

- SPE/IADC 130311, 2010. Successful use of real time dynamic flow modelling to control a very challenging managed pressure drilling operation in the North Sea.
- IADC/SPE 114688, 2008. A General Dynamic Model for Single and Multi-phase Flow Operations during Drilling, Completion, Well Control and Intervention.
- IFAC 48-6 (2015) p134. Use of High Fidelity Models for Real Time Status Detection with Field Examples from Automated MPD Operations in the North Sea.
- SPE 184710, 2017. Predicting Gas Loading Capability in Oil-Based Drilling Fluids.

Drilling in MPD mode, example from a Northe Sea Operation.

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