Geo Estimations for Field Development

and temperature for an evaluation of the potential and risks. The geological model needed to be coarse. The permeability on a regional scale, together with geometry and communication between layers and fault ramp zones were shown to be key uncertainty factors. The model was used for simulation sensitivities and guided the decision to proceed with the CO2 project through the DG1 decision gate.

In all of these examples of recent geological modelling projects we have been conscious to focus on the main objective, the key factors, and to not complicate the workflows, modelling techniques and steps. This has also allowed our clients to reproduce the models with tidy workflows. Our workflows were also prepared for uncertainty evaluations, either by stochastic methods or in a scenario-based deterministic approach. And last but not least, the models were suited to answer the most important issues in order to guide the decision to be taken.

Our view on trends in geological modelling

With regards to modelling techniques they have in many ways been similar for decades. Most times we base our models on constructing a grid which is designed to, and constrained by, the flow simulation needs. Quite often we experience that compromises of geological concepts and representing details at small scales have to be done.

These kinds of compromises can be dealt with by applying the well established principles of multi-scale modelling. Further trends go in the direction of grid-independent ways of modelling, surface based or process based, where the geological surfaces and/or processes are "static" and the grid is custom for each simulation purpose.

While these concepts and ideas are exciting and mind-inspiring, the established methodologies should be adequate for most modelling projects as long as we are conscious of the objectives, the key factors and what decision the model is supposed to guide.

We have described how the demand from our clients to some extent has shifted from holistic full-field models to decision models where a specific objective is addressed, what these decision models constitute as well as summarised some examples of recent decision modelling projects that AGR has undertaken. We have stated and argued that for these models we would rather simplify than overcomplicate the modelling techniques and workflows.

Well Engineering

Separating solids during CT Clean Out & optimizing well production North Sea August - September 2017 Case study

by G. Malinauskaite, FourPhase

Giedre Malinauskaite
Marketing Manager

Challenge

FourPhase was requested by a well service company to assist in a coiled tubing (CT) well clean out operation which was to be performed offshore for a major North Sea Operator. Initial scope of the operation included solids separation from return flow during CT clean out of three wells. However, during the operation, the scope was expanded to also include post-clean out production test on two of the wells. The aim of the test production was to remove accumulated solids from the wellbore and to identify potential flow rates in correlation with sand lifting rates. This would provide data for optimizing well production and establishing operational boundaries.

Operational considerations:
- High rates of solids were expected from one of the wells scheduled for CT clean out after fracking. High rates of returning proppants could potentially result in high erosion.
- Limited access to empirical data prior to production testing operation.
- Limited knowledge about the solids in wellbore – amount, size/composition of particles and expected solids rates while producing wells.

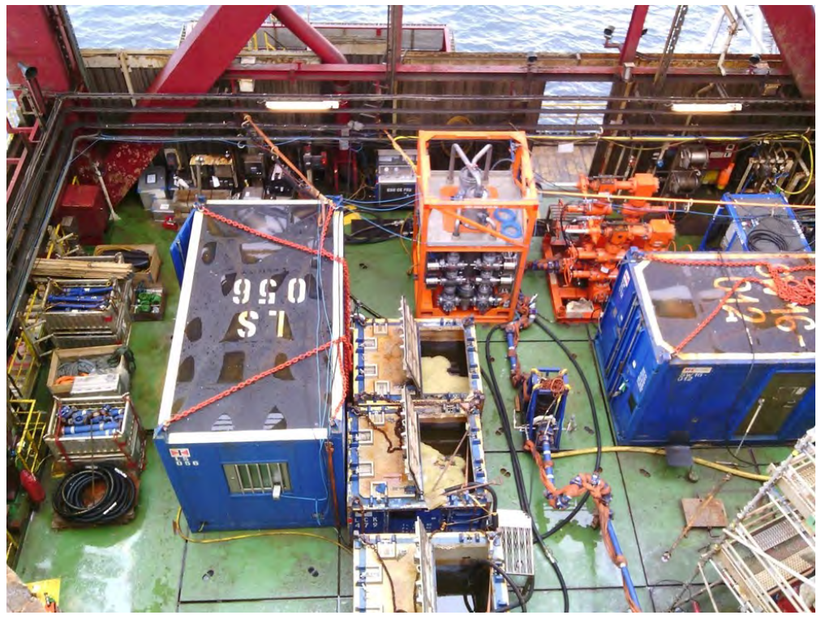
Solution

FourPhase 5K DualFlow unit was used in a CT operation allowing for safe removal of fracturing proppants and other types of solids. Minimal real estate due to deck load limitations and good separation efficiency were critical, therefore 5K DualFlow (2m X 2m X 3.2m) was mobilized.

Result

DualFlow has showed excellent separation efficiency during CT clean out and flowback operations. The total amount of solids separated during post-fracking clean out and flowback operation from one of the wells was 23 044kg with the separation efficiency of 96,5% during post-fracking clean out and 99,8% during flowback operation. During well CT clean out operations and test-production, the overall combined separation efficiency of the DualFlow unit was never below 98,1%.

Key operational outcomes:
- No recorded HSE incidents.
- No recorded equipment downtime.
- 26 351kg of solids, including fracturing proppants, removed.



Overview of DualFlow on the BOP deck.