

Sand and particle transport

Research related to sand/particle transport in oil & gas wells and pipelines since 1999.

Our focus

Develop predictive models and software tools for the industry to manage particle transport issues:

- sand transport capacity in production wells and pipelines
- sand bed formation and erosion
- sand transport in multiphase flow
- sand transport in heavy oil
- cuttings transport capacity during drilling
- transport of other particles (e.g. hydrates)

We also test process and subsea equipment with respect to sand transport issues.

Projects

- SINTEF Sand transport (1999-00): in oil-water flows in horizontal and near horizontal pipes
- SINTEF-IFE Sand transport (2001-03)
 - Phase 1: in single-phase water and single-phase oil pipe flow
 - Phase 2: in stratified two-phase air-water and two-phase air-oil pipe flow
 - Phase 3: in two-phase air-water and two-phase air-oil pipe slug flow
- Sand demo loop (2003)
- STRONG (2005-09): Modelling and experiments on sand transport in liquid and gas-liquid pipe flow

Competence

- experienced multiphase flow laboratory staff
- skilled model development team

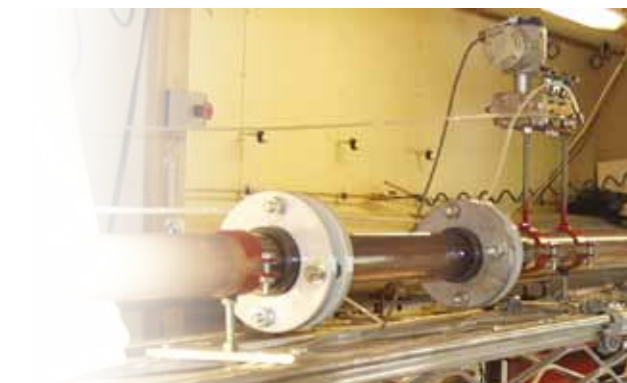
Software tools

- fluent (model implementation using UDF)
- PFC
- EDEM
- generic tools for development of stand-alone applications

Research

Particle transport in single phase and multiphase flow with

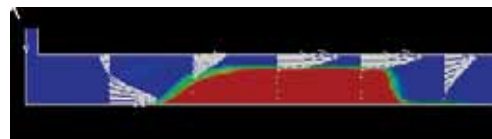
- prediction of particle deposition onset
- prediction of particle transport rate flow loop experiments
- modeling of particle transport in multiphase pipeline flows



Experiments provide closure laws and validation of models.



Multiphase flow experiments. Sand settling in middle of slug body.



CFD simulation of sand bed settling experiment.

Facilities

Unique laboratory facilities for research on most aspects related to particle transport in wells and flow lines. A new laboratory building with a new and improved medium scale three phase flow loop became available in spring 2009 allowing detailed flow measurements.

The STRONG project

- "Prediction of deposition and transport of sand in sand-liquid and sand-gas-liquid flows"

Objective

STRONG is a Joint Industry Project developing transient one (1D) and multi-dimensional (MD) sand transport models with best possible accuracy in single-phase liquid flow (MD) and two-phase gas-liquid flow (1D) in pipelines and wells. Models developed in the project can be implemented in software tools for prediction and analysis of sand-laden flows in oil production systems.

Participants

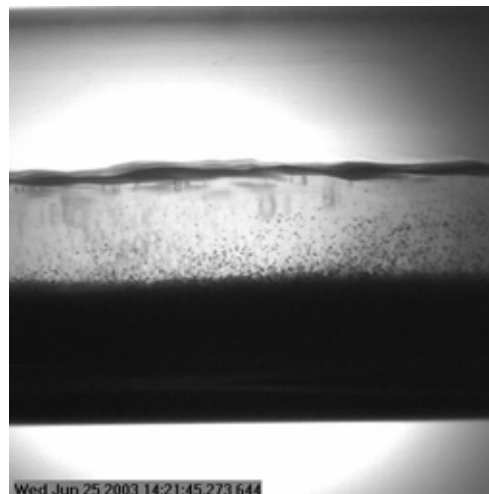
- ConocoPhillips
- Petrobras
- Total
- Research Council of Norway
- SINTEF

Duration

2005 - 2009

Budget

14.2 MNOK



Stratified flow with entrainment.

Advanced Models for Particle Transport in Wells and Pipelines

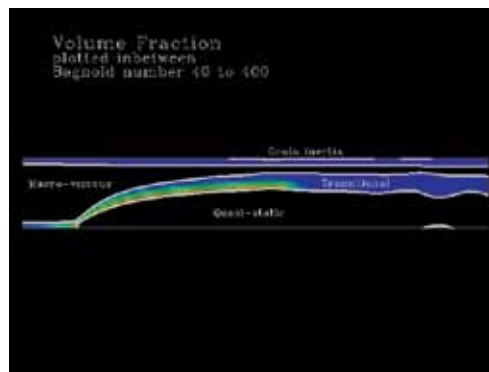
- R&D proposals for project starting 2010

Opportunities are open for sponsoring R&D projects on

- Sand transport in multiphase flow
 - experiments
 - development of transient one-dimensional models
- Particle transport with applications to gravel packing and sand control
 - experiments
 - development of transient multidimensional models

More detailed information will be provided upon request.

Final scope of work will be agreed based on company interest and available funding.



Flow with stationary bed requires modelling different fluid-particle force regimes.



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