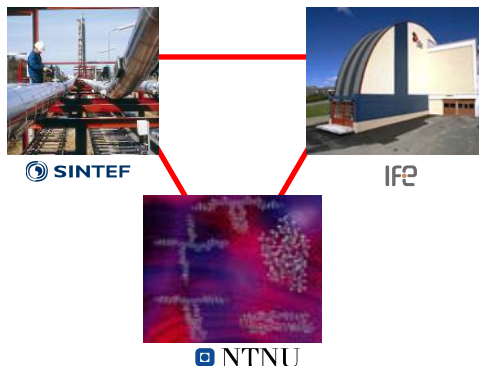


FACE



the Flow Assurance and Innovation Centre



Academic network

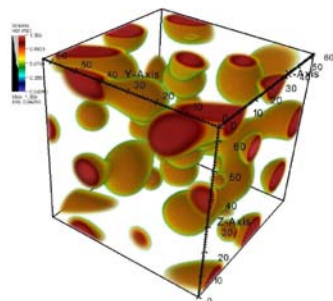
NTNU – the Norwegian University of Science and Technology
 UiO – University of Oslo
 University of Newcastle
 University of Twente
 City University of New York
 University of Toulouse

FACE is

- A long-term collaboration between Institute for Energy technology (IFE), The foundation for industrial research (SINTEF) and Norwegian University of Science and Technology (NTNU)
- A Centre for Research-based innovation funded by industry partners and the Research Council of Norway (NOK 200m, 2007-2014)
- An international research and innovation network comprising Academia, research institutes and industry
- An educational arena for Flow Assurance, educating tomorrows experts
- A centre that combines Surface and Colloid Chemistry with Fluid Mechanics to develop tomorrows standards for Flow Assurance

...delivering world class applied and fundamental research and education focused on production, transportation and separation of complex well fluids

Industry partners



FACE – the research projects



overall goal: develop generic methods to describe complex fluid systems in tools that can be incorporated into scalable and robust multiphase flow assurance models needed by the petroleum industry for developing new production solutions for oil fields with complex well fluids.

2010-2012 research programme consists of 4 subprojects:

SUSPENSIONS

Improve our knowledge of particle transport in pipelines and its effects on the carrier phase.

Transport of sand and hydrate particles in pipelines

Two way coupling, suspension, sedimentation and re-suspension processes

Rheological properties of suspensions, suspension dynamics

SEPARATION

Increase our understanding of the underlying processes governing water oil separation.

Impact of surfactants on the separation process

Micro and macro scale modelling of separation

Use to improve models and understanding of real production systems

Core: model fluids that mimic crude oil properties used in all projects

MULTIPHASE TRANSPORT

Better understanding of key multiphase flow phenomena that dominate the behaviour of two-phase gas/oil and oil/water pipe flow with viscous oil.

Particular focus on heavy, viscous oil transport processes

Improve Flow Assurance modelling capabilities in OLGA or LEDAflow type models

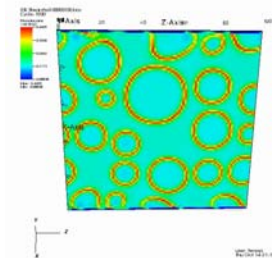


FACE ACADEMY

Improve understanding of basic processes in surface and colloid chemistry and to be a coordination forum for education in FACE by providing courses and training sessions for FACE students and scientists

Characterize crude oils and develop model fluids that mimic the crude oil properties and behaviour in multiphase flow systems → Reference fluids

Particle stabilized emulsions, influence of surfactants on fluid mechanics, Rheology

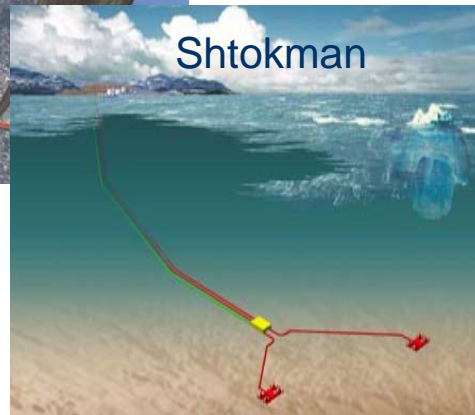
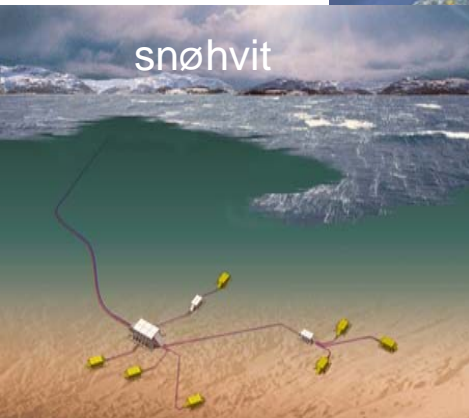
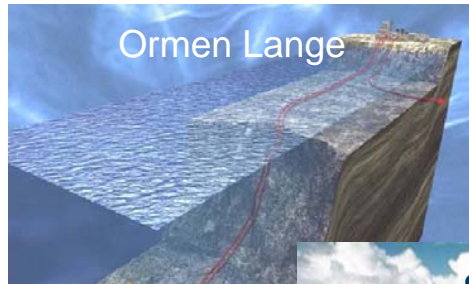


FACE – the challenges

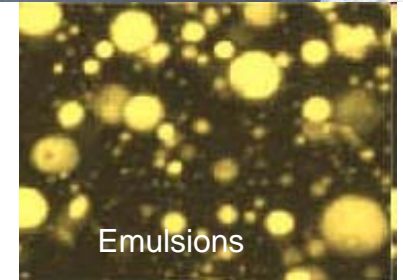


Challenges break down to complex fluid issues

Longer, deeper, colder
production of viscous crude oils
Tail-end production



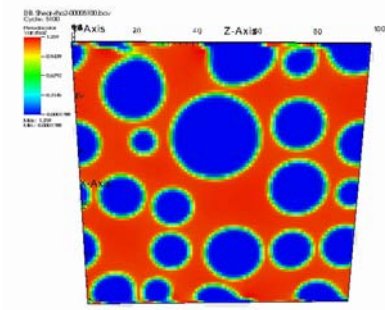
Surfactants,



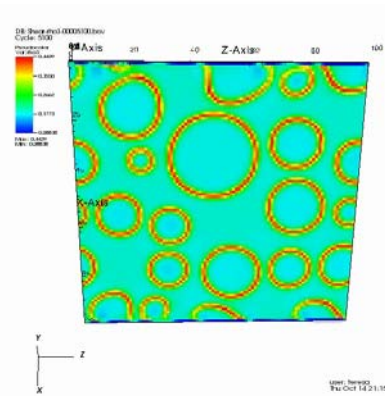
FACE – some results



- Patent application: Model fluid that mimics crude oil properties
- Industrial outlook:
 - Reference fluids could become a standard for equipment testing and verification
 - Perform realistic model testing in atm. pressure and room temp
 - Significant HSE improvement
 - Qualification of equipment simplified
 - No need for large well samples
 - Equipment performance easily compared
- Scientific outlook:
 - Review classic fluid mechanics with ref. fluids (e.g. Kolmogorov-Hinze and drop breakup at an orifice....)



Emulsion with no surfactant



Emulsion with surfactant

Furtado and Skartlien, Phys. Rev. E 81, 066704 (2010)

