Applied Mechanics and Corrosion

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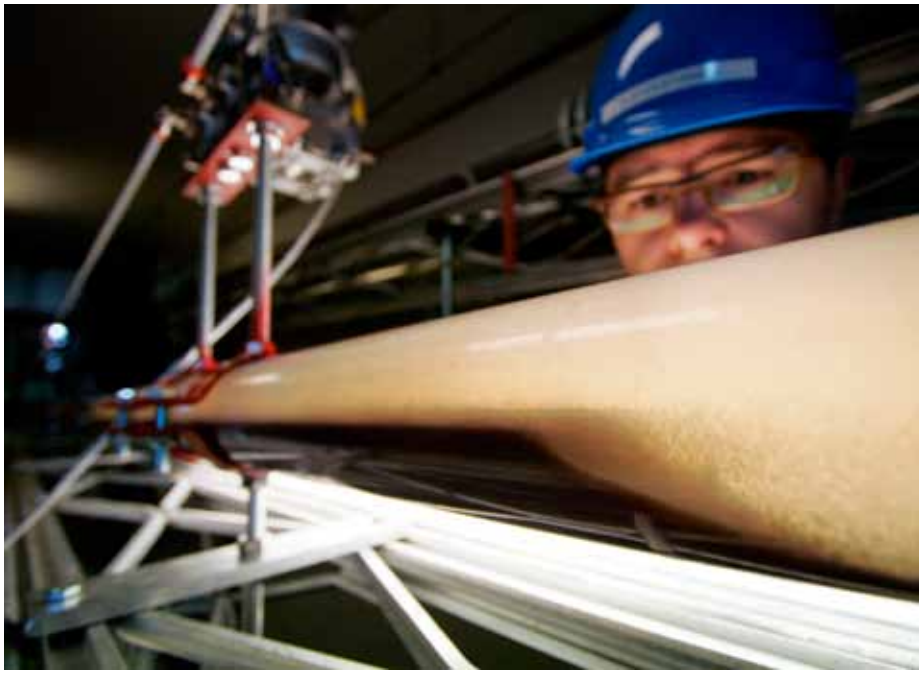
SMOOTPIPE- Surface Technology for Multiphase Pipelines

Pressure drop along the pipeline is the main obstacle to transportation of unprocessed or partly processed wellstream over long distances. Decreasing the pressure drop will enable subsea-to-shore field development with no surface installations, and is therefore an attractive solution with respect to economy, environment and safety.



Pressure drop testing in two-phase fluid

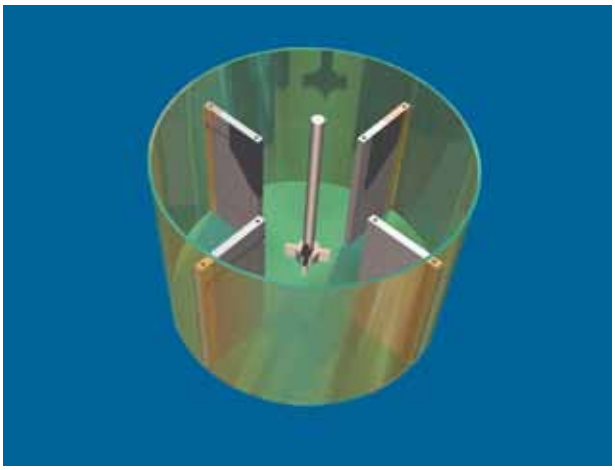
Pressure drop in single phase pipelines is fairly well understood, and available models are able to predict pressure drop with reasonable accuracy. Surface roughness is the most important material parameter in this respect. Pressure drop in multiphase flow is more complicated and less well understood. Several parameters contribute to pressure drop in multiphase flow, e.g. liquid hold-up, precipitations, gas-liquid surface drag forces and surface roughness.

SMOOTHPIPE is an ongoing research project at SINTEF and NTNU addressing pressure drop in multiphase pipelines, focusing on material properties.
The main objective is to understand how surface properties of the pipeline material can be modified by coatings in order to reduce pressure drop.

The specific goals for the project are:

1. To understand how various coatings protect against corrosion and how they are degraded in pipelines carrying multiphase fluids
2. To find methods for making coating lifetime estimates
3. To understand the mechanisms for deposition of wax on the internal surfaces of multiphase pipelines
4. To understand how properties of the internal pipeline surface and coatings (chemistry, thermal conductivity, microstructure, surface energy etc.) affects deposition of wax and asphaltenes
5. To establish the potential for using nanosized particles and capsules for preparing coatings or modifying functional properties of conventional coatings

In addition we will be running experiments in our meso scale multiphase flow loop to study the effect of various coating properties on pressure drop. The first test campaign is now completed, which has demonstrated the beneficial effect of internal coatings in multiphase pipelines.



Tank for studying wax deposition as function of pipeline coating properties, temperature and flow rate.

Corrosion testing of coated steel in pipeline environment

The SMOOTHPIPE R&D project is a three year project that started in 2007. The project is sponsored by the Research Council of Norway and the companies listed below.

SINTEF

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