

# COLLOQUIUM

Group: Engineering Fluid Dynamics

As part of his MSc thesis assignment

**Jan-Jaap Mastenbroek**

will give a presentation, entitled:

**Performance Evaluation of a Compressor Operating Under Wet Gas Conditions**

A study performed by using a numerical approach of multiphase flow

**Date: Friday March 23, 2012**

**Time: 14:00**

**Room: Zuidhorst 286**

**Summary:**

A new way of producing fossil fuels, in particular in remote areas such as the arctic, is by applying subsea compression. A challenge in sub-sea compression is the handling of wet gas. Wet gas compression is defined as the compression of gas that contains up to 5 volume percent of liquid. Compared to dry gas, wet gas has a significant impact on the compressor performance. Siemens has developed a next generation upstream compressor, the STC-ECO, which is a candidate for future subsea operation and should be mechanically suitable to handle wet gas. The question is how this machine performs while compressing wet gas. Numerical simulations have been performed to obtain insight in the performance of the machine.

The present study, performed at Siemens Hengelo, presents a numerical study of the flow through one of the three compression stages of the STC-ECO. The study has been performed employing Ansys CFD. The accuracy of the numerical simulation of the flow through the stage is validated by using Siemens' test data. Subsequently the computational grid used for the validation is used to perform multiphase flow calculations in order to determine the STC-ECO performance under wet gas conditions. For the multiphase flow calculations an Euler-Lagrange method has been used, in which the liquid volume fraction (LVF) as well as the liquid droplet size has been varied. It is concluded that this study is a first step in exploiting numerical simulations of multiphase flows to analyze compressors operating under wet gas conditions.

**Assessment committee:**

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Dr.ir. N.P. Kruyt (mentor)  
Ir. G. de Boer (mentor)  
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**Chairman:**

d.d.