



# COLLOQUIUM

Group: Engineering Fluid Dynamics

As part of his MSc thesis assignment

**Erwin Zeekant**

will give a presentation, entitled:

## **Performance Evaluation of a Centrifugal Compressor Under Wet Gas Conditions**

**Date: Thursday April 4, 2013**

**Time: 14:00**

**Room: HR N109**

### **Summary:**

Recent developments in the oil and gas industry focus on the application of the gas compression process closer to the wellhead. This focus is driven by cost-effective development of natural gas fields, as for instance in subsea compression. One of the consequences is the need to expose the turbo compressor to wet gas conditions. Wet gas compression is defined as the compression of a gas containing up to 5 volume percent of liquid, which has a significant influence on the performance and mechanical load of a compressor. Siemens has developed the STC-ECO compressor unit, which forms the basis for subsea operation and handling wet gas.

The present study, performed at Siemens Hengelo, investigates the performance of the STC-ECO compressor under wet gas conditions. Numerical simulations have been performed using the commercial CFD program ANSYS CFX. A typical two-phase flow regime, present in a compressor under wet gas conditions, is annular flow. This flow regime is firstly investigated in more detail to enable usage of the results for the numerical simulation of wet gas compression.

Secondly, the wet gas performance of a single stage of the STC-ECO compressor is investigated. This investigation is based on the Eulerian-Eulerian method and proceeds from a previous study which was based on the Eulerian-Lagrangian method. The Eulerian-Eulerian method is used in order to extend the range of particle volume fractions that can be handled. To explore the influence of wet gas on the compressor performance, the liquid volume fraction has been varied. Compressor performance evaluation correlations have been addressed and compared with correlations found in the literature. Extensions to the compressor performance correlations have been proposed to account for the effects of multiphase flows.

### **Assessment committee:**

Prof.dr.ir. H.W.M. Hoeijmakers

Dr.ir. N.P. Kruyt

Ir. G. de Boer

Dr.ir. Y. H. Wijnant

Dr.ir. E.T.A. van der Weide

(chairman)

(mentor)

(mentor)

### **Chairman:**

d.d.