



# COLLOQUIUM

In accordance with article 4.6.8 of the SSNS-wb.

Group: Engineering Fluid Dynamics

As part of his MSc thesis assignment

## **Pepijn Pennings**

will give a presentation, entitled:

### **Development of an Experiment for Leading Edge Active Fluidic Flow Control of a Wind Turbine Airfoil**

**Date:** Friday April 29, 2011

**Time:** 12:00

**Room:** Horst C101

#### **Summary:**

The blades of a wind turbine experience fast fluctuating loads because of varying wind velocity. These fluctuating loads decrease the life span and the potential size of the wind turbine. The present solution to this problem is to rotate the blades with respect to the wind to increase or decrease the load. This approach is relatively slow and not capable of coping with wind gusts.

A new way controlling the load on wind turbine blades could be active fluidic flow control. In this case air is injected into the flow around a blade through orifices on the surface which alters the loads on the blade. Active flow control is able to respond to fast fluctuations in wind velocity and does not hinder the flow when deactivated. Because this type of control is relatively new and there are a large number of parameters involved a clear understanding of the most efficient implementation has yet to be developed.

In this study an experiment has been developed to study the effects of the velocity and the frequency of injected pulsed compressed air on the flow around an airfoil using pneumatic valves. From two suitable valves the Festo MHE2 was found to be best for generating the pulsed flow. The application of a reduced duty cycle further improved the pulsed flow characteristics. Finally the experimental setup has been tested in a wind tunnel to study the effects of the injected air on the lift, drag and moment coefficients of a NACA 0018 airfoil.

#### **Assessment committee:**

Prof.dr.ir. H.W.M. Hoeijmakers (chairman/mentor)  
Prof.dr.ir. A. Hirschberg  
Dr.ir. N.P. Kruyt  
Dr.ir. R.G.K.M. Aarts  
Ir. H. de Vries

#### **Chairman:**

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