



# COLLOQUIUM

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Vakgroep: Technische Stromingsleer

In het kader van zijn doctoraalopdracht zal

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een voordracht houden getiteld:

## **Load Mitigation for Wind Turbines by means of Separation Control**

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### **Summary:**

The drive for a reduction of the cost of wind energy stimulates a growth in rotor blade size. This trend in up-scaling is constrained by material properties. Therefore, technologies that help reduce wind turbine loads are called for. There are indications this can be achieved by the use of 'active flow control' such as the control of flow separation on the blade.

In this research it is investigated how flow separation on a rotor blade can be delayed by the use of blowing from jets. This leads to lift enhancements that allow for new, more cost-of-energy efficient blade designs. The advantages/disadvantages of this principle of using separation control for load reduction is compared to other techniques using flow control.

A model is proposed to calculate the economic impact of a blowing system. Results show that the aerodynamic effects induced by a blowing system and its energy consumption are of significant influence on the entitled reduction in cost of energy. Specifically, improved insights on the influence of airfoil dimensions on the economics of the blowing system have to be pursued.

To address these issues a methodology has been developed, which includes numerical simulations of the three-dimensional flow based on the RANS equations. The flow field has been computed around three airfoils with different chord lengths, thicknesses and different blowing configurations. Based on these results, new insights and recommendations for the design of a flow-controlled wind turbine blade are presented.

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