Opleiding Werktuigbouwkunde

Universiteit Twente
de ondernemende universiteit

COLLOQUIUM

Conform artikel 4.6.8 van het SSNS-wb.

Vakgroep: **Technische Stromingsleer**

In het kader van zijn doctoraalopdracht zal

Bram Janssen

een voordracht houden getiteld:

A Numerical and Semi-Analytical Study in the Structure of Stationary Vortices

Datum: 20 maart 2008

Tijd: 14:30 uur

Zaal: OH115

Summary:
In the design of modern cruise-liners reduction of on-board experienced noise is one of the major design issues. One of the sources of this sound is cavitation induced by the propeller that advances the ship. Over the last decades there has been a tendency in propeller design to apply skewed blades. This causes propellers with noise requirements, such as propellers of cruise-liners, to only feature leading-edge cavitation and tip vortex cavitation. For these propellers a broadband noise is experienced, and since no other types of cavitation are present on the propeller, this must be the source of the sound.

There is no clear understanding of the physical phenomenon underlying the broadband noise due to the lack of theoretical models of cavitating vortices. At the moment an inviscid 2D potential vortex model is assumed to describe the vortex structure outside the cavity. This is an inaccurate description since it can be derived that a viscous boundary condition holds at the liquid / vapour interface.

For a cavitating vortex two existing analytical vortex models have been adapted to describe cavitating vortex models. The first model describes a leading-edge vortex, as occurs above highly skewed blades and slender delta wings. The second vortex model describes a trailing vortex as can be observed several chords downstream of a propeller.

At MARIN a new RANS method, FreSCo, has been developed which is capable of modelling cavitating flows. As a first test case of a cavitating vortex a Venturi with a swirling flow is considered. The flow solution exhibits an unsteady cavitation bubble in the throat of the Venturi.

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