COLLOQUIUM

Group: **Engineering Fluid Dynamics**

As part of his MSc thesis assignment

N. Kamphuis

will give a presentation, entitled:

Optimization of a Supersonic Gas Conditioner II

Date: **Friday March 7, 2014**

Time: **14:00**

Room: **Horstgebouw HR N109**

Summary:
The purpose of a supersonic gas conditioner is to remove specific gas components from a mixture of gases. The process relies on rapid expansion, such that the gas component becomes supersaturated and small droplets will form. Subsequently these droplets are removed from the flow by swirl.

To optimize the removal of the liquid with this method, it is important that the amount of liquid and the size of the droplets are as large as possible. The fluid investigated is Argon, such that the gas mixture consists of only a single component. The condensation process is described with Hill's Method of Moments, which is a reduced model of the master equations, but still represents the important physics of condensation. Instead of a flow through a nozzle, an isentropically expanding volume is considered with a fixed expansion rate. The density is prescribed as a linear function of time. This analysis leads to interesting relations between different time scales. Three different asymptotic regimes can be recognized, for small, for intermediate and for large time scale. Both the frozen limit and equilibrium limit are considered.

Furthermore a relative simple method to approximate the induction time of condensation is presented. It is investigated which functions along the nozzle axis can be prescribed to design the nozzle. It turns out to be fundamentally impossible to prescribe the condensation moment along the axes. However, an alternative method is discussed and demonstrated for a model problem.

Assessment committee: **Chairman,**
Prof.dr.ir. H.W.M. Hoeijmakers   (chairman)
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