



Subdepartment **Engineering Fluid Dynamics - CTW**  
Department **Mechanical Engineering**

As part of his / her masterassignment

**Gerben van Houwelingen**

will hold a speech entitled:

***Preliminary study on the design of an acoustic flow meter***

Date: 29-06-2016

Time: 10:00 hr

Room: Horst building, Room OH 113

**Summary:**

Invasive flow measurement of elusive tubes, such as blood vessels or underground piping is not always possible or desirable. Several non invasive flow measurement methods exist, but all methods have disadvantages resulting in the need for a new method. This study focuses on the principle of an acoustic flow meter, using the sound induced by the flow itself.

An experimental setup is designed and built, featuring a water column which is drained through a horizontal copper tube. The water flow is gravity driven and is regulated by ball valves. The mass of the column is monitored in time, using three single point load cells, resulting in a known volume flow. The acoustic measurements are performed using a clip on contact microphone and a piezoceramic disk which is glued on the copper tube.

Audio spectrograms are used to visualize the audio signal in time and prove to be a good tool for comparison between different experiments. The spectrograms demonstrate a relation between the water height and the audio signal rather than the Reynolds number and the audio signal. The audio signal is characterized by the statistical moments of the frequency spectra, which are determined on short time intervals to create time dependent functions.

With the use of standard block filters and curve fits on ten measurements , a set of reference moments is created, calibrating the setup. This study shows that when comparing the measurements to the calibrated system, the Reynolds number can be reconstructed with an accuracy of two percent.

**Assessment committee:**

prof.dr.ir. C.H. Venner  
dr.ir. R. Hagmeijer  
dr.ir. Y.H. Wijnant  
dr.ir. J.B.W. Kok

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d.d.