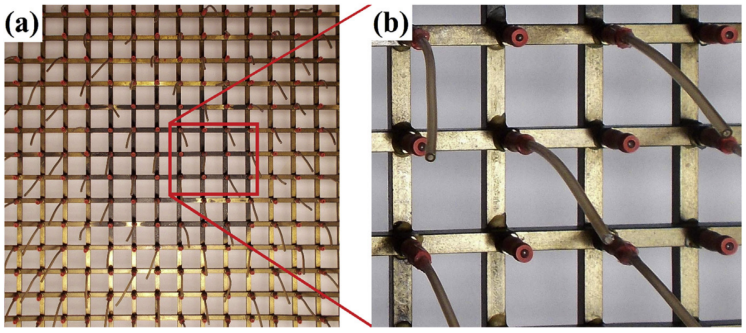
OTTO VON GUERICKE UNIVERSITÄT MAGDEBURG

FACULTY OF PROCESS AND SYSTEMS ENGINEERING

Development of an Active Turbulence Grid for Artificical Turbulence in Experimental Flume Model Tests (LSS-M-/23)

Master Thesis at *Lehrstuhl für Strömungsmechanik und Strömungstechnik, OvGU*

Laboratory flume model tests commonly suffer from low or transitional turbulence ranging in Reynolds numbers from several 10,000 to some 100,000. This is due to scaling effects, because the flume models are restricted in size. To give a rough estimation : any obstacle of more than 10% of the channel cross section will generate a remarkable confinement with artificially increased velocity. For the LSS lab flume with a cross section of 1200 x 600 mm² a turbine diameter of more than 300 mm will provoke a significant flow confinement and in consequence bias the experimental results. Running the flume at maximum flow speed of 0.8 m/s a Reynolds number of 240,000 can be reached. In this regime transitional effects at the boundary layer will make it impossible to directly transfer the results to a full scaled turbine with a diameter of several meters.



With aim to generate transferable results from flume scaled models, the LSS researches the usability of an active turbulence grid for the flume. It is planned to design and test a turbulence generating structures such as fractal grids with additional active components to increase the turbulence production. These will be based on small water jets (nozzle diameter of 2 mm) which provide additional chaotic flow structures. In terms of the Master thesis a test bench based on a reduced number of nozzles will be realized and a parameter analysis will be performed investigating the influence of nozzle diameter, tube length, flow rate, etc.

Experiments will be performed in the flume facility in the laboratory hall.

The work to be conducted comprises the following steps:

- Understanding the physics and the state-of-the-art of passive and active turbulence grids
- To design and build an experimental model apparatus of an active turbulence grid for subsequent parameter tests
- Derive design guidelines for a full scaled turbulence grid for the lab flume
- Documentation of the work and evaluate the results

Aim of the work is a thorough literature research on existing methods and devices and to build a model apparatus for a future application in turbomachinery tests in the lab flume.

Student:	**N.N**
Matriculation:	**XXXXXXXX**
Start:	**XX.XX.XXXX**
End date:	**XX.XX,XXXX**

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