Faculty Engineering Technology
Program Mechanical Engineering

UNIVERSITY OF TWENTE.

COLLOQUIUM

Group: **Engineering Fluid Dynamics**

As part of her MSc thesis assignment

Joni Terpstra

will give a presentation, entitled:

Model of the softening process of a shear thinning material

Comparison of different production methods using CFD simulations

Date: 12-02-2016
Time: 14.00
Room: **Horst Building Room OH 210**

Summary:
The objective of this research is to scale up the softening process of a shear thinning material. The material studied is a shear thinning material, i.e. the viscosity decreases with increasing shear rate. During the softening process the micro-structure is changed by applying shear and as a result the consistency decreases. In the present setup, when applying a shear stress for approximately 10 hours, the consistency will reach a stable level. The shear stress should be chosen in a way that this stable level is the desired consistency. In the present process the desired consistency is reached and for this reason the present process is analysed using CFD to find the requirements for the continuous production.

In the present process, the material is sheared in a dough mixer. Ten samples are taken during the process. The shear thinning behaviour of each sample is described by a power law, which fitted to data from rheological experiments. Steady state CFD simulations are performed on the present process to find the shear stress and distribution for each sample point. These parameters are compared to different continuous processes to find the best suitable shearing method. For the continuous shearing process two mixers are chosen to be analysed: a helical static mixer and a x-grid static mixer. A method is found to decrease the number of design parameters and to predict the mean shear stress and pressure drop in the mixer. The continuous softening process is designed using the results from the CFD simulations.

This thesis project is performed at SKF Engineering and Research Centre in Nieuwegein

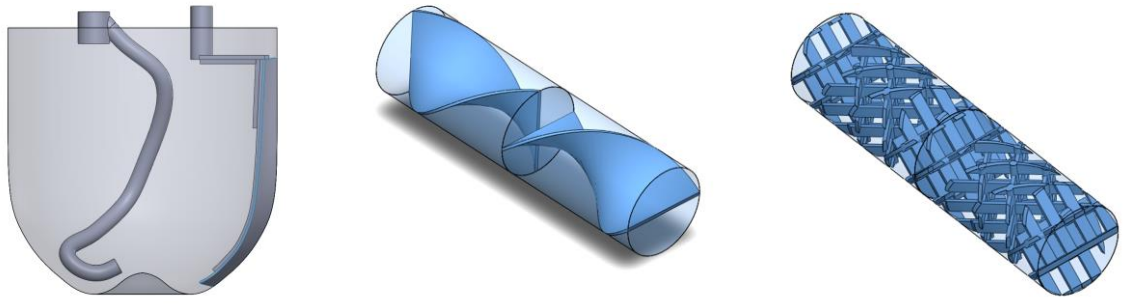

Figure 1: Dough mixer, helical static mixer and x-grid static mixer

Assessment committee: **Chairman,**

Prof.dr.ir. C.H. Venner (chairman)
Dr. M.C.P. van Eijk (supervisor SKF)
Ir. E. Norde
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d.d. _____