NUMERICAL SIMULATION OF THE FLOW BEHAVIOUR OF SELF-COMPACTING MORTAR

Stephan Uebachs[1)]
Wolfgang Brameshuber[1)]
Institute of Building Materials Research (ibac). RWTH Aachen University

For a numerical modeling of the flowing process of self-compacting mortars and a Newtonian fluid with comparable viscosity investigations are conducted applying fluid mechanical approaches. The numerical modeling was conducted using the L-Box test. To validate the calculation results, experiments with the L-Box were carried out. These tests were evaluated using video recordings. It became obvious that the experiment delivered well reproducible results and that the chosen test setup and the evaluation by means of a special software were very well suited.
The flow curves shown in figure 1 were determined by means of the Viskomat NT. Additionally, the absolute rheological characteristic values of the Newtonian fluid were determined with a coaxial cylinder viscometer. The results showed that the properties of the Newtonian fluid are very similar to those of the mortar.

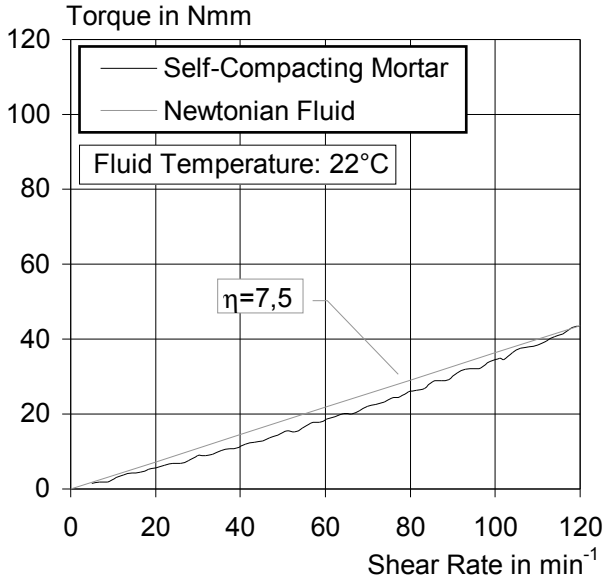

Figure 1. Rheological characteristics of the Newtonian fluid and the self-compacting mortar

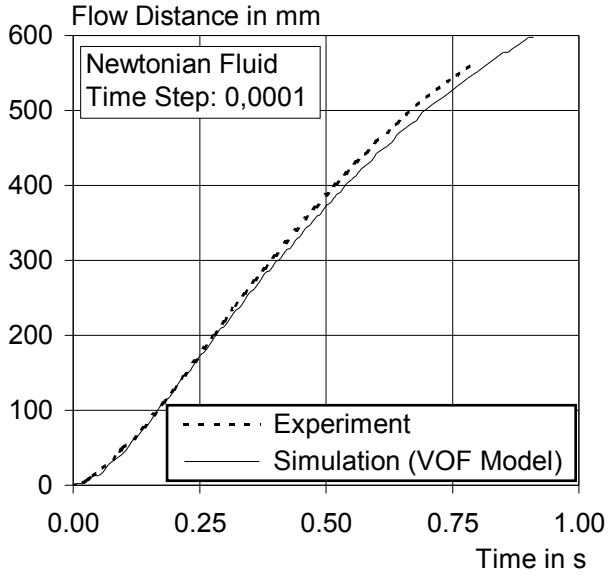

Figure 2. Comparison of the flow distance-time diagrams of experiment and simulation

Despite a comparable viscosity, both fluids feature significantly different flow velocities in the L-Box. The flow velocity of a fluid is thus not determined by the viscosity alone. The numerical modeling with a commercial CFD-Code yielded good results for the Newtonian fluid (see figure 2).
With respective modifications, also the flowing processes of the self-compacting mortar can be simulated. The next step will now be the expansion of the model by an additional phase, the coarse aggregate, in order to be able to simulate the flowing behavior of self-compacting concretes.

[1] Schinkelstr. 3, 52062 Aachen, Germany email: uebachs@ibac.rwth-aachen.de
phone +49 241 80-95 101, fax +49 241 80-92 139