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Analysis of Mixing Chambers for the Processing of Two-Component Adhesives for Transport Applications

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Introduction

In cooperation with Rublic+Canzler GmbH (Germany), the Chemnitz University of Technology develops innovative system technology for the user-friendly, mobile and energy-efficient processing of two-component adhesives with electrical drive.

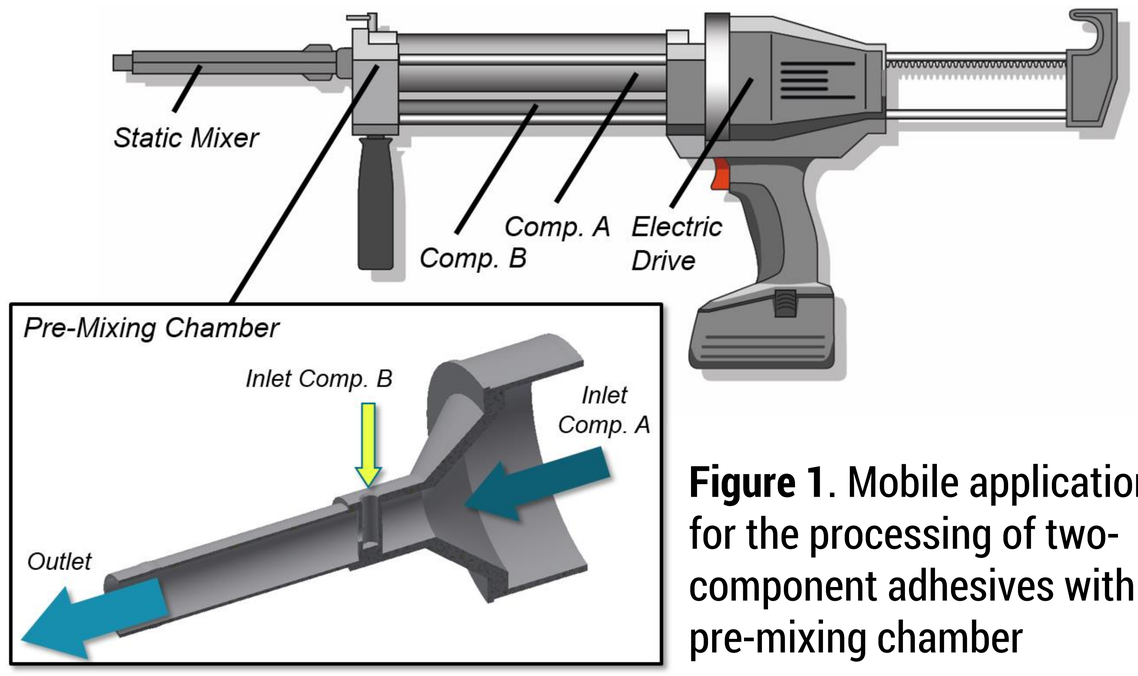

Figure 1. Mobile application for the processing of two-component adhesives with pre-mixing chamber

Numerical Model

A fluid-dynamic simulation model of the pre-mixing chamber with two inlets for a main adhesive component and an accelerator component was established.

Navier-Stokes Equations

$$\rho(\vec{v}\,\nabla)\vec{v} = -\nabla p + \eta\,\nabla^2\vec{v};\ \rho\,\nabla\vec{v} = 0$$

Convection-Diffusion Equation

$$\vec{\nabla}\,(\Phi\vec{v}) = \vec{\nabla}\,(v\,\vec{\nabla}\Phi)$$

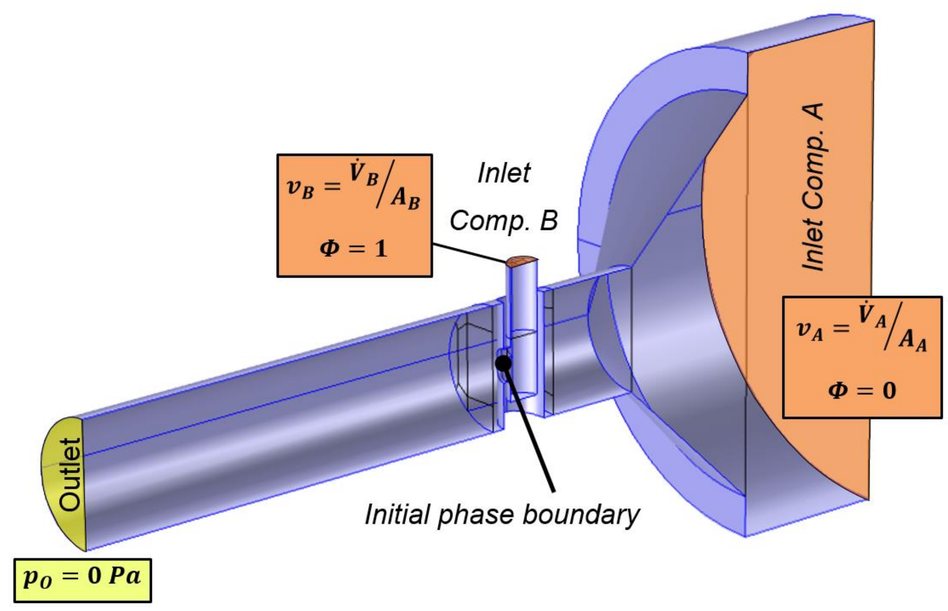

Figure 2. Boundary conditions of the simulation model of the pre-mixing chamber

Results

Phase distributions Φ were calculated and analyzed for different designs of the accelerator component inlet.

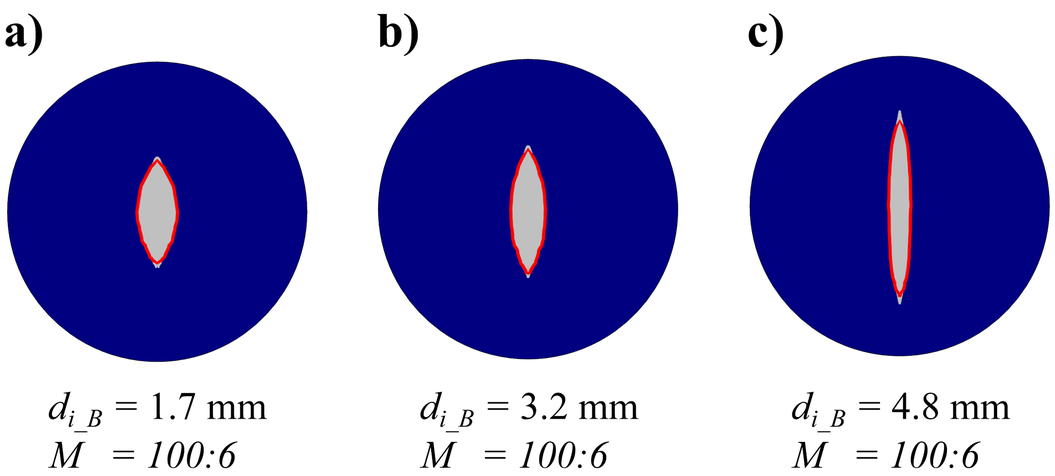

Figure 3. Phase distribution Φ at the outlet of the pre-mixing chamber

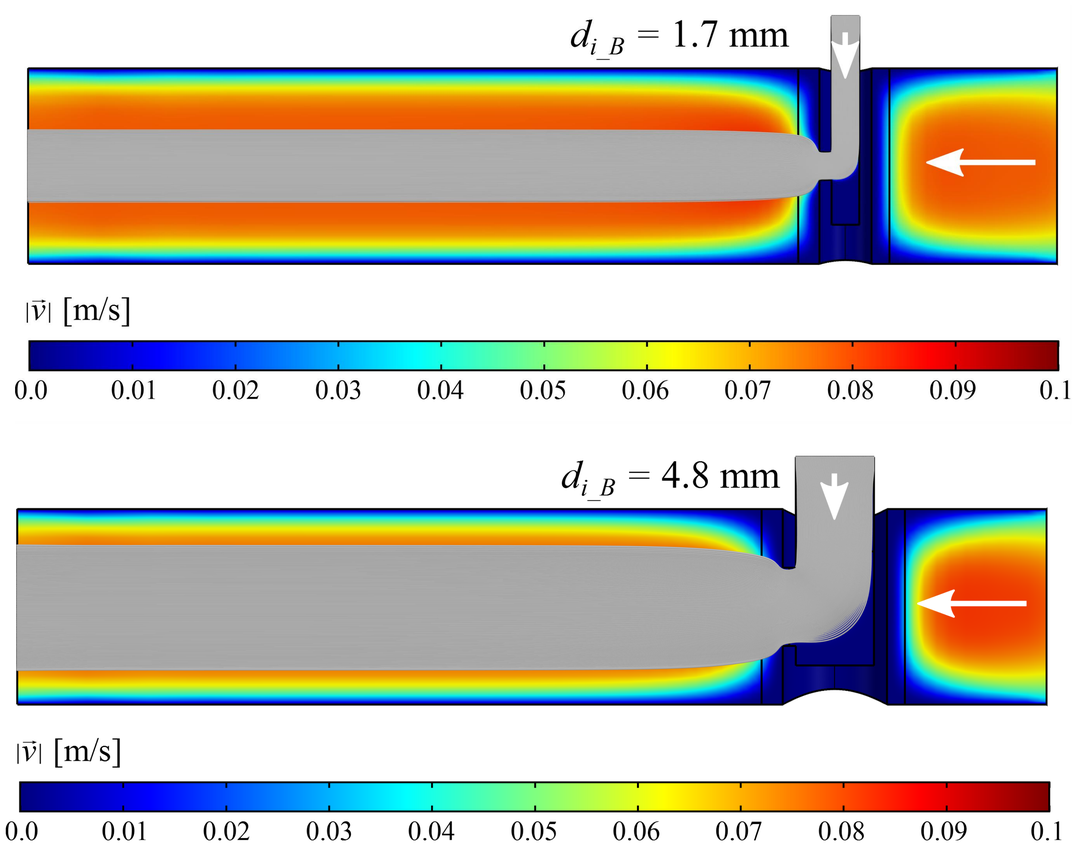

Figure 4. Phase distributions Φ for different inlet diameters d_{i_B}

Conclusions

Simulations with COMSOL Multiphysics® led to a better understanding of the fluid dynamic behavior in the pre-mixing chamber. With the simulation results a suitable design for the inlet of the accelerator component could be identified.

Acknowledgements

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