Spray Investigation for Entrained Flow Gasification

Atmospheric Spray Test Rig - ATMO

T. Jakobs, S. Wachter, A. Sänger, T. Kolb

Overview Diagrams

→ Inconsistent dependency of SMD on pressure described in literature
→ Clarification mandatory!

Technical Data:
• $\dot{M}_{\text{liq}} = 5 - 40 \, \text{kg/h}$
• $\eta_{\text{Liq, max}} = 1000 \, \text{mPa s}$
• Explosion proof exhaust
• Operated via PC

Model for determination of $\eta_{\text{liq, eff}}$ quantitatively proven for one NN-liquid

→ Viscosity of NN liquids is relevant for jet breakup but not available!

Successful Atomization of Stabilized Straw Coke Suspension Fuel

• Addition of a small amount of a second immiscible fluid to a suspension changes the rheological properties drastically
→ Transition from fluid-like to gel-like behavior (NN)

Associated Publication: A. Sänger, T. Jakobs, T. Kolb, Using primary instability analysis for determination of apparent liquid viscosity at jet breakup atomizing non-Newtonian fluids, ILASS Brighton, 2016

Ongoing Work

• Atomization of suspensions
• Improved CFD-Modelling
• Data-based model atomization of viscous suspensions

Future Work

• Experimental investigation of different nozzle geometries
• Derive rules for burner scale up
→ Virtual Spray Test Rig