2017 **Title:** **CFD Modeling Evaluation of Black Liquor Spray Nozzles**

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Presented: 2017 International Chemical Recovery Conference, May 24-26, Halifax, Nova Scotia, Canada

Ref. No.: TP2017A

ABSTRACT:

Spraying of black liquor is an integral part of operating recovery boilers. The velocity and diameter distribution of drops in the spray can have a large influence. Engineering correlations are available to predict these parameters in some cases. CFD modeling has the potential to evaluate any nozzle over a wide range of conditions.

Two-phase modeling of the complex phenomena of drop formation from industrial spray nozzles requires creative mathematical schemes and significant computational resources. A simple case of a single drop falling into a pool, that has been well documented, demonstrated some of the challenges. The CLSVOF scheme gave the best agreement with experiments.

The CLSVOF scheme was used to simulate black liquor spray nozzles under flashing and non-flashing conditions. The tangential-swirl nozzle proved to be unstable under flashing conditions. The resulting spray was characterized for one period in time with a mean drop size of 4.8 mm. The primary spray breakup from splash-plate and vee-jet nozzles could be simulated to determine factors such as local velocities, spray angle, and sheet thickness, but secondary spray breakup into drops was not possible for routine engineering work.