**Numerical Simulation of Battery Slurry Cavity Flows**

**Author: Keith L. Runyon**

**Contributors: Joseph Six, Cynthia Olson**

**Ross Keaton,**

Presented at the 20th International Coating Science and Technology Symposium

September 20-23, 2020

Minneapolis, MN, USA

ISCST shall not be responsible for statements or opinions contained in papers or printed in its publications.

**Extended Abstract (ten pages maximum):**

The development and application of Computational Fluid Dynamics (CFD) for analyzing fluid flows has received much publicity in the coating field. It is often a splashy topic for generating papers which does not require coating equipment making it a primary target for academic research institutions. However, in industrial applications close adherence between model predictions and reality in physical pieces of equipment are critical to the successful application of CFD.

The simulation results can be applied to offer insights to deviations in ideal equipment function and real physical equipment maintained in inventory. In this work the process for developing and analyzing a coating flow for a new solution is performed then compared to a CFD model for internal die flow. This is used to validate the model and generate a calibrated model for operating ranges on the precision designed equipment. The performance of the model applying different convergence conditions, and boundary conditions is tested. The comparison between performance in Newtonian, Non-Newtonian and Non-Newtonian Slurry Solutions is performed. These results are compared to the model outputs to generate a better understanding of the performance gains in speed of compute time versus, accurate model predictions. Finally, Methods for measuring the widthwise uniformity is captured to elaborate a method which can be applied at other Facilities to perform model calibration. The modeling demonstrates the challenges presented when coating a highly non-Newtonian fluid such as a battery slurry. The research demonstrates the ability to sample both by thickness measurement and by volumetric flowrate measurements. These are both compared to the model output. This demonstrates a multi-prong tactic to calibrate a numerical simulation to evaluate different coating chemistries and die configurations. The merits and challenges of the different methods are discussed.