Porous and sponge-like particle behaviour within a rotary drum and spray coating

Andreas Aigner* and Christoph Kloss*

* DCS Computing GmbH
Industriezeile 35, 4040 Linz, Austria
e-mail: andreas.aigner@dcs-computing.com, web page: http://www.dcs-computing.com/

ABSTRACT

Manufacturing processes in several industrial fields like agricultural and customer goods use the spray coating technique to process their products. The behaviour of the product itself may vary significantly depending on physical, in particular surface, properties.

Within this study DEM (Discrete Element Method) simulation models for porous as well as sponge-like materials are presented. The former are characterized by soaking in the sprayed fluid into their core while keeping a constant volume. Sponge-like materials change their volume due to absorption of fluid. The capability to model the influence of those material characteristics within a DEM simulation allows to optimize the process; in two respects: (i) the product quality as well as (ii) an efficient usage of the spray liquid.

As an example for industrial application the influence of the models was studied by taking the example of a simplified rotary drum with one spray nozzle inside.

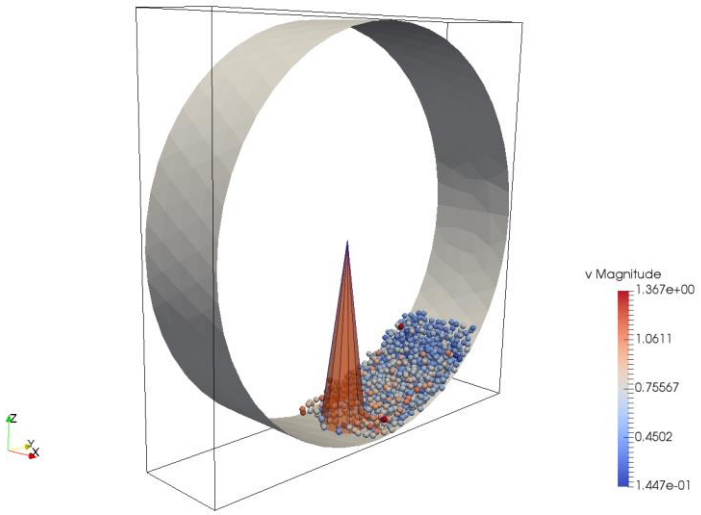

Figure 1: Slice of simplified rotary drum with sketched spray area (orange)

Within the proposed model, liquid volume is computed and tracked per-particle. Liquid bridges between the particles are accounted for, and an additional per-particle equation is being solved for inter- and intra-particle liquid transport. All presented models and simulations were implemented within LIGGGHTS®, an open-source DEM simulation code (cf. [1]).

We present results on saturation effects, and compare different process parameters with respect to their impact on product uniformity.

REFERENCES

[1] C. Kloss, C. Goniva, A. Hager, S. Amberger and S. Pirker, "*Models, algorithms and validation for opensource DEM and CFD-DEM*", Progress in Computational Fluid Dynamics, An Int. J. 2012 - Vol. 12, No.2/3 pp. 140 – 152, (2012)