

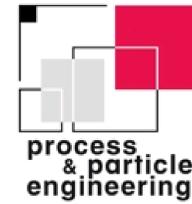
# Computational Analysis and Experimental Evaluation of a Drum Coating Process

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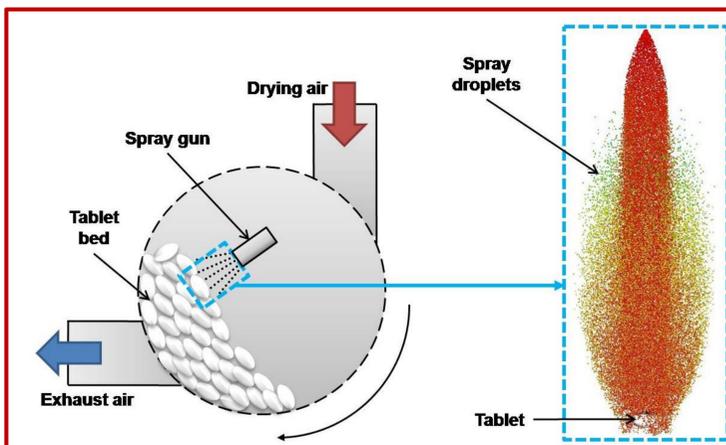
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## Introduction

Drum coating technology is widely used in the pharmaceutical industry to produce tablet films fulfilling functional and non-functional purposes. In this, a rotating drum accounts for the mixing of the tablets and the coating solution is injected from above by means of an atomizing nozzle. Trial-and-error practices and experience are often the basis for the choice of process parameters. This work aims at obtaining a deeper understanding of the factors influencing the process quality by means of modern simulation methods.



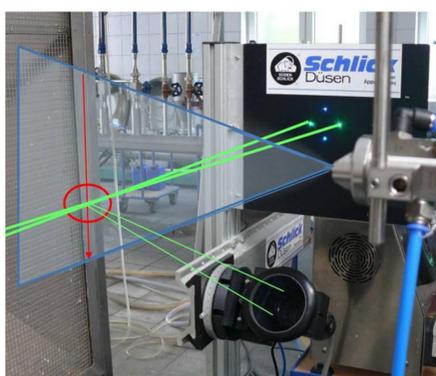
## Goals

- Numerical simulation (CFD-Solver „AVL FIRE“) of the turbulent air flow inside a large-scale coater and its effects on the spray droplets motion.
- Analysis of the reasons for operative problems such as coating solution losses, over-spray, low transfer efficiency, filter plugging, too early evaporation and polymerization of spray droplets
- Definition of critical parameters for the optimization of an industry-scale process.

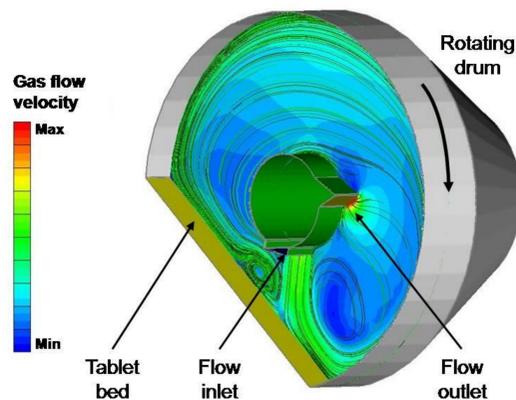
## Numerical Method

- Simulation of the spray droplets in the air flow using an Euler-Lagrange approach.
- Splashing model for the interaction between droplets and tablet bed (Mundo-Sommerfeld).
- Multi-component evaporation of the spray droplets (modified Abramzon-Sirignano approach).
- Solution of the two-dimensional transport of the wall film.

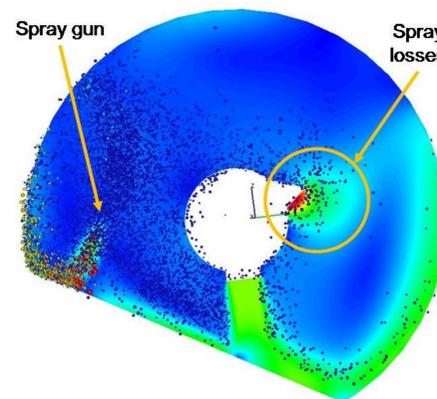
## Results



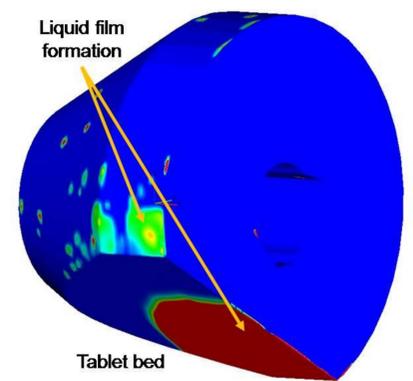
Experimental spray analysis via Phase-Doppler Anemometry (PDA) system



Simulation of the gas flow in a section of the coater



Droplets colored corresponding to water concentration



Film formation on tablet bed and coater walls

## Conclusions

- The interaction between air flow, spray and tablet bed in an industry-scale drum coater has been analyzed by means of detailed numerical simulations.
- Parametrical studies can be used to enhance the performance of existing coating devices (e.g. reduce spray loss) and to develop improvements for future systems.

## References

- Suzzi D., Radl S. and Khinast J.G., 2009, submitted to Chem. Eng. Science.
- Mundo C., Sommerfeld M. and Tropea, C., 1995, Int. J. Multiphase Flow 21, 151-173.
- Brenn G., Deviprasath L.J., Durst F. and Fink, C., 2007, Int. J. Heat Mass Transfer 50, 5073-5086.