

# **Flow And Sedimentation In Industrial Solid Bowl Centrifuges: A Numerical And Experimental Study**

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## **ABSTRACT**

Centrifugal separation equipment, such as solid bowl centrifuges, is used to carry out an effective separation of fine particles from industrial fluids. These solid-liquid-separation systems are suitable, for example, to maintain the purity of coolants and other process fluids used in the metal, glass and ceramic processing. Because of the growing stringent environmental requirements, stricter quality specifications and cost pressure, their operation performance demands an optimisation.

The knowledge of the streams and the sedimentation behavior inside such solid bowl centrifuges is necessary to determine the geometry and the process parameters that lead to an optimal performance. An appropriate strategy to investigate this behavior is to solve the multiphase flow numerically using Computational Fluid Dynamics.

Regarding a given industrial centrifuge geometry, a three dimensional grid was built. The multiphase flow of water and air was then calculated with a CFD software. Particle traces were calculated in a discrete manner in this numerical flow field. A particle-particle interaction model was implemented to consider the sediment formation. The simulation results allow a systematic study of the effect of the rotation speed, flow rate and geometrical features on the flow patterns and on the particle traces.

Experimental work on the industrial solid bowl centrifuge was carried out to confirm the simulation results. Suspensions of water and quartz were used to determine the separation efficiency and to compare it with the one calculated. For the validation of the simulated flow field, a downscaled transparent replica of the centrifuge was built. It permits the optical entrance necessary for the flow measurements via Laser Doppler Anemometer (LDA). The multiphase flow in the replica was simulated with the same models used for the industrial centrifuge and these results were compared with the measured velocities. Therefore, the employed simulation models can be considered as generally valid for the multiphase flow in a centrifugal field.

## **BIOGRAPHY, SHORT SKETCH**

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### **Bio**

Born in Santiago de Compostela (Spain) in 1982.  
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