

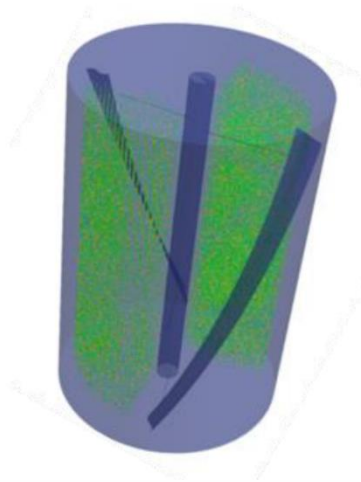


Chemistry

## Evaluation of the performance of a mixer through particulate analysis

### Objective

Blending, the art of transforming several components into a homogeneous product by mixing them, is very important in the biochemical industry. In order to avoid the costly penalties associated with poor mixing and to meet the growing demands, these systems must be developed quickly and efficiently. Digital simulation comes in therefore, as an essential tool that's capable of testing numerous designs in record time, thereby improving the production chain. In this project, Zelin diligently assessed the performance of an industrial mixer in terms of quality of the mixture. A parametric study was also carried out in order to optimize its design.



### Result

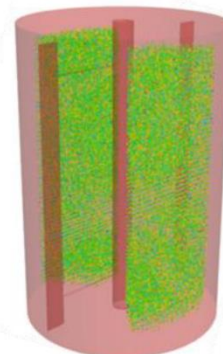
The simulations carried out enabled us to understand the key physical phenomena of the flow, as well as the interactions between solid and gas phases. Predicting the distribution of particles and their trajectory within the mixer then makes it possible to estimate the quality of the mixture.

Several parameters of the mixer (rotation speed, the quantity of particle, particle size, the blade design) were investigated in order to determine the optimal mixing conditions. In addition, this study made it possible to design the mixer (shape of the blades, number of blades, etc.) in order to make the system even more efficient.

### Implementation

Zelin has set up a calculation process that is dedicated for modeling this type of flow:

- 3D model of the mixer and its components
- Material resources: HPC cluster (64 cores) & Yade / Fluent v18 calculation code
- Some examples of analysis:
  - o Modeling of blade rotation using a reference rotating frame (steady MRF approach)
  - o Analysis of particle trajectories by discrete phase model (DPM).
  - o Advanced post-processing : velocity fields, turbulent intensity, particle concentration, segregation intensity.
  - o Parametric analysis on the geometry of the blades



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