

Multi-scale modelling of particulate and multiphase in industrial processes

Research Expertise

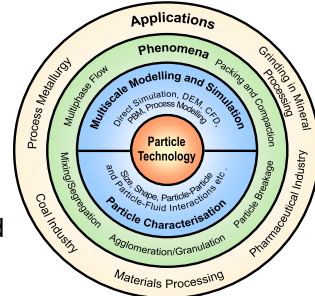
Our main expertise is to study the behaviour of particulate systems and their interactions with surrounding fluid flow through rigorous modelling at multi-scales, aiming to improve the design and optimisation of industrial processes.

Research Areas and Industrial Partners

Our research areas covers from mineral processing, process metallurgy to cement and pharmaceutical industries and pollution control. We are collaborating with many world leading companies, including Rio Tinto, BaoSteel, Xstrata and Bluescope steel.

Research Tools

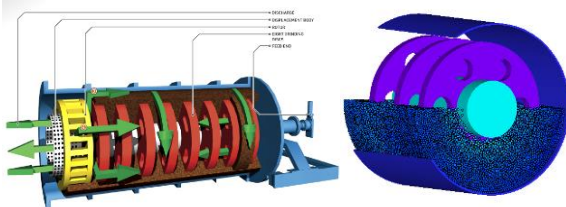
Our main research tools include the state-of-art numerical techniques (e.g. CAD, FEA, DEM, CFD and PBM) supported by the advanced particle characterisation facilities.



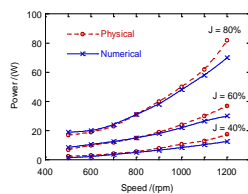
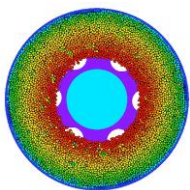
Project 1 : VirtualMill

- Grinding is a low efficiency, energy intensive process. Current methods are based on the trial-and-error approach which is expensive, laborious and has no general applications
- VirtualMill is a model based on a combined CAD, CFD and DEM approach to simulate particle flow and comminution in mills
 - ✓ Ball, SAG and Stirred Mills
 - ✓ Particles with larger size distributions
 - ✓ Dry and wet systems, disc wear.
 - ✓ Facilitate the design and optimisation of grinding processes.

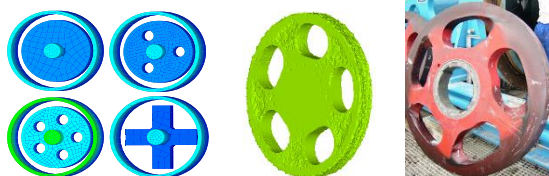
High-speed stirred mills



- ✓ Particle flow and energy consumption

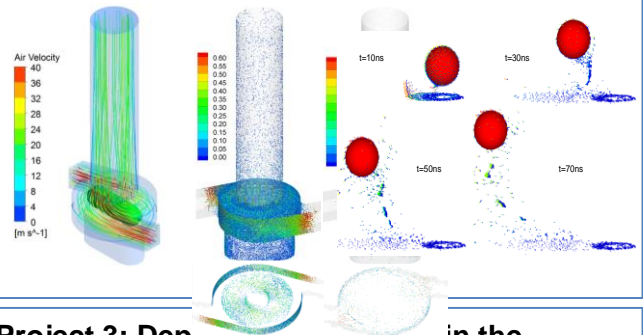


- ✓ Stirrer design and wear prediction



Project 2: Modelling of DPI

- Dry powder inhalers (DPIs) are used for asthma treatment. The current DPIs have low efficiency (<30%) and large dose variation, causing powders depositing on the throat and upper airway.
- This project is to applying the combined CFD-DEM approach to simulating particle dispersion in inhalers, aiming to improve the device dispersion efficiency.
- Simulation of Aerolizer
 - ✓ Air flow and particle behaviour



Project 3: Deposition of aerosol in the respiratory tract

- Study of the deposition of aerosol in the respiratory tract helps understand aerosol drug delivery as well as the effect of air pollution on human health.

