



Case Study

Reducing Dust Emissions in Iron Ore Transfer Chutes with Advanced Simulation

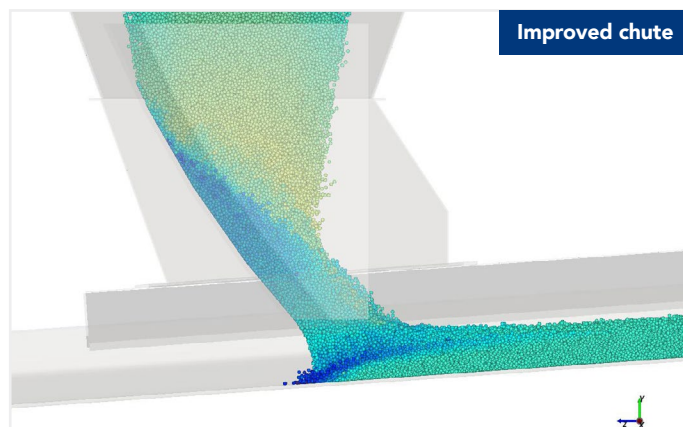
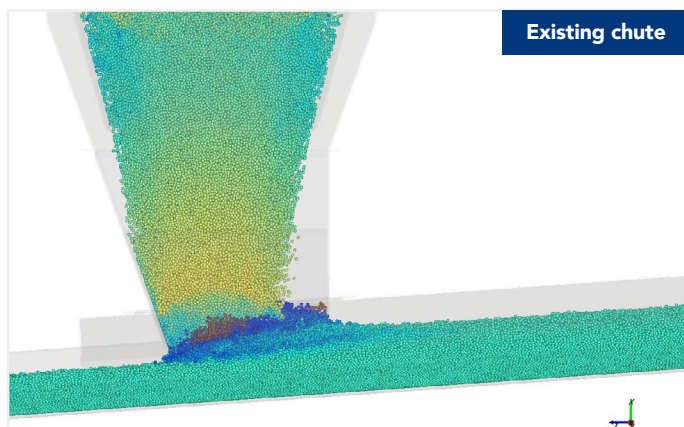
Client

A client operating an iron ore processing facility was experiencing significant dust generation from an ultra-fines iron ore transfer chute.



The excessive dust not only posed environmental and health risks but also increased operational costs due to the need for secondary dust control measures such as conveyor covers, active dust extraction, sealing, and water addition. Seeking a more effective and sustainable solution, the client engaged EMtek to redesign the chute using advanced simulation techniques.

DEM Model of ore flow through transfer chute

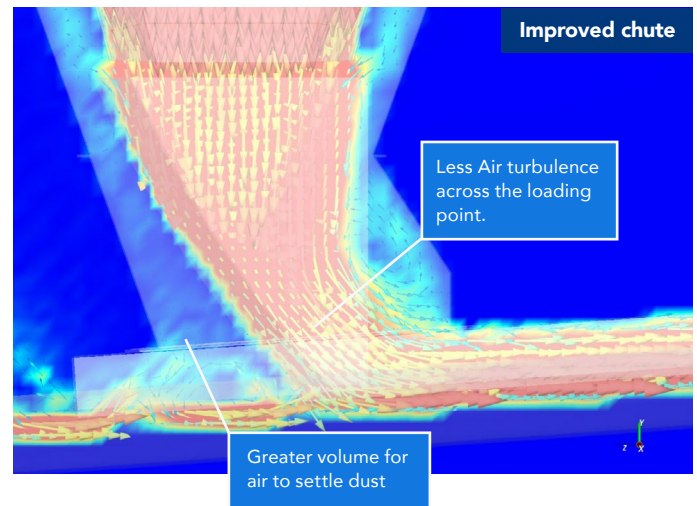
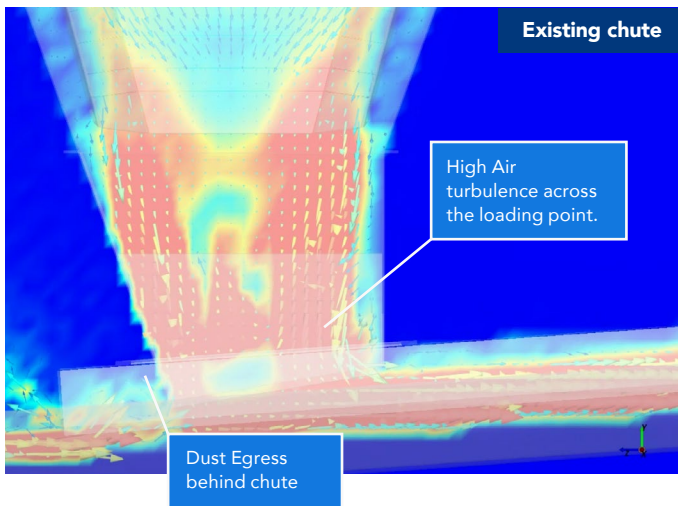


EMtek's Approach

To accurately diagnose and address the issue, EMtek leveraged a coupled Lattice Boltzmann Method (LBM) and Discrete Element Method (DEM) simulation. This powerful computational approach enabled engineers to:

- **Model Airflow Dynamics** – The LBM component simulated the air currents generated by the flow of ultra-fines within the chute.
- **Track Material Behavior** – The DEM component modeled the movement and interactions of the iron ore particles to understand their impact on airflow.
- **Identify the Root Cause** – By combining these simulations, EMtek pinpointed regions where airflow disturbances were leading to excessive dust liberation.
- **Optimize Chute Design** – Insights from the simulation were used to modify the chute geometry, improving product flow, minimizing dust dispersion, improving maintainability, and increasing wear life.

Transfer Chute Airflow model developed using coupled DEM/LBM simulation



Outcome

The redesigned transfer chute was successfully commissioned on-site and delivered significant reductions in dust emissions. By controlling airflow within the chute, the need for additional dust suppression measures such as water addition and active dust extraction was greatly reduced.

Key Benefits

- Improved Environmental Performance – Minimized airborne dust, enhancing site air quality.
- Reduced Operational Costs – Lower reliance on costly secondary dust control measures.
- Enhanced Equipment Longevity – Reduced dust accumulation improved the lifespan of downstream equipment.
- Data-Driven Engineering – Advanced simulation provided a clear understanding of dust generation mechanisms, leading to a precisely targeted solution.

This case highlights how EMtek's expertise in advanced simulation and materials handling engineering can deliver practical, high-impact solutions for challenging industrial environments.

