Solid segregation of limestone-coal mix discharged on a conoid system

CIVIL • ENVIRONMENTAL • **MANUFACTURING** • MINING • OIL & GAS • POWER GENERATION

PROJECT DESCRIPTION

SOLVAY S.A.

France

PFC3D™

SOLVAY S.A. wanted to assess the capability of the discrete-modeling approach to reproduce the behavior and the segregation of a mix of blocks (limestone + coal) discharged on a spreading system (conoid).

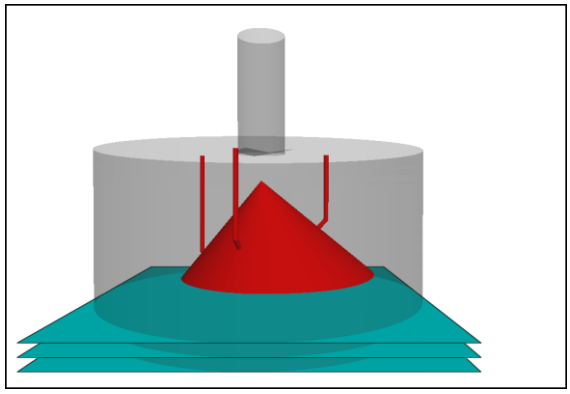

Figure 1. Layout of the system for the discharging sequence and position of planes to detect block passages

ITASCA'S ROLE

A *PFC3D* model was developed to reproduce this complex system. Blocks were simulated through *PFC3D* clumps, whose constituent particle positions were defined by using CAD tools (Rhino and Kubrix) to reproduce the block morphologies. Six block shapes with different elongation ratios were used. Block interaction properties were calibrated using the angle of repose of the mix. The hopper was filled with about four tons of blocks, approximately 45,000 clumps. Once the silo was filled, bottom silo doors were opened and the material discharged on the spreading system. During the process, the positions of blocks passing through three virtual horizontal plans below the conoid base were analyzed. This analysis allowed the block trajectory and the material distribution during the discharging process to be studied.

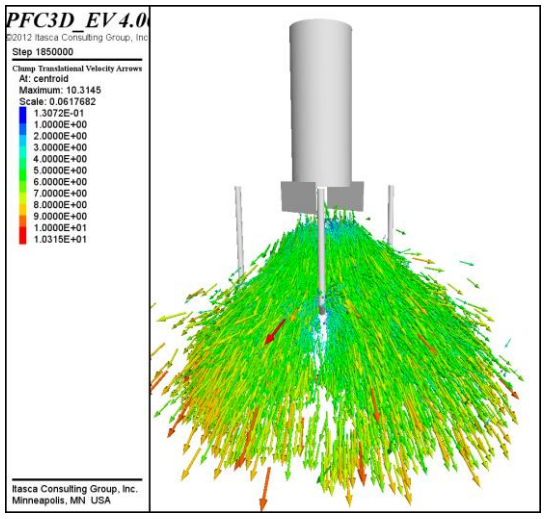

Figure 2. Snapshot of the falling process after the complete opening of the doors: clump translational velocity vectors →

PROJECT RESULTS

- The discharging process over the kiln is mainly driven by geometrical constrains (conoid geometry, silo door orientation, rod positions).
- Due to the conoid geometry, the material is mainly collected in the inner radial region of the kiln, while outer regions are more penalized.
- Coal particles are more concentrated in outer sectors, because of the sensitivity of lighter particle trajectories to collisions with the conoid surface.
- Considering grain size distributions for different kiln sectors, homogeneous curves are observed for the limestone and the coal, indicating a limited segregation of the discharged material.

ICSAS14-CST-MFG-34028-01

Itasca Consultants S.A.S.
64 Chemin des Mouilles
69134 Ecully Cedex, France | +33 (0)4 72 18 04 20 | consulting@itasca.fr
www.itascainternational.com
www.itasca.fr