

Simulation Reduces Operational Testing Costs of Dynamic Separators by Approximately 30 Percent

Holcim (Brazil) S.A. is a leading global supplier of cement, aggregates and concrete products in Brazil. With an annual cement production capacity of five million tons, the company operates four cement plants, two aggregates quarries and 55 concrete plants that employ more than 1,600 people in nine regions.

The size of particles used in creating cement can have a significant effect on the efficiency of the cement production line. The regulation of particle size is handled by two processes: raw/cement milling, which grinds materials to decrease their size, and dynamic separation, which classifies and partitions particles by size.

To sustain its global position, the company has been trying to identify technology gains that can reduce operational costs and increase production efficiency. When the company needed to analyze the gas-solid flow for one of their first-generation, traditional-design dynamic separators, they brought in Engineering Simulation and Scientific Software Ltda. (ESSS), a leading engineering simulation solution company based in Brazil, to help support the project.

TECHNOLOGY USED

ANSYS® CFX®, ANSYS® ICEM CFD™

CHALLENGES

Challenges of the analysis included:

- replacing expensive and time-consuming trial-and-error testing of separator performance with computer modeling
- simulating and classifying the particles' paths as a function of particle diameter to consider possible improvements that would increase separation efficiency

SOLUTIONS

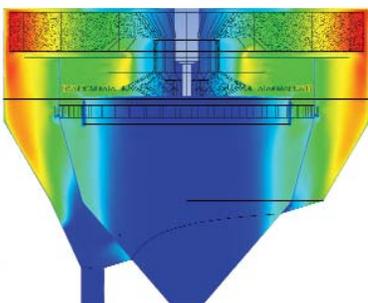
With the support of ESSS, Holcim chose ANSYS CFX technology to analyze the gas-solid flow for one of their first-generation, traditional-design dynamic separators.

- A mesh of 2.7 million nodes was generated using ANSYS ICEM CFD meshing software
- Simulation of the stationary state was performed using the ANSYS CFX SST turbulence model for the continuous phase
- The dispersed phase was modeled using the Lagrangian approach with one-way coupling to the continuous phase
- The dispersion of particles due to turbulence was accounted for in the simulations, along with the particle drag and weight

BENEFITS

With the support of ESSS, CFD results allowed Holcim engineers to:

- Compare the influence of particle classification on dynamic separator efficiency improvements
- Gain an understanding of complex flow paths, influenced by changes in internal geometry and operating conditions, that otherwise would be achieved only through extensive trial-and-error testing



- Evaluate equipment modifications and identify improvements without repeated physical modifications of existing equipment, thus reducing the cost of operational testing by approximately 30 percent

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Cross section of a dynamic separator showing contours of velocity. The top section is made up of a rotational bed, while the bottom region is a fixed bed with particle collectors.

COMPANY INFORMATION

Country: Brazil

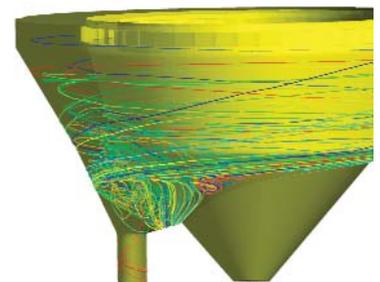
Industry: Cement Manufacturing



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“Prior to ANSYS CFX analysis, it had been impossible to understand completely the physical process occurring in the dynamic separator. Along with the support we received from ESSS, we’re now able to effectively evaluate “what if” scenarios, supplement our operators’ knowledge, and help our managers make decisions regarding costs and benefits of equipment and process modifications.”

Tety's Rocha
Production Manager
Holcim (Brazil) S.A.



Pathlines in a dynamic separator show recirculation zones representing the flow interaction and the residence time.