THE PROBLEM

Fluid catalytic cracking (FCC) is the most important conversion process used in petroleum refineries, and FCC regenerator is a key part of an FCC unit to recover solid catalyst activity by burning off the coke deposit on the catalyst surface. There are very limited ways to observe the flow and reactions inside. BP Refining and Logistics Technology would like to have a numerical model of one of its FCC regenerator developed, which will be used as a tool to find possible design or operational improvements to the regenerator.

THE PROJECT

The objective for this project is to develop a three-dimensional multi-phase and multi-species reacting flow computational fluid dynamics (CFD) model to provide a detailed look at the flow characteristics and reaction details inside the regenerator. After validating the model, a Virtual Reality (VR) environment was developed to help visualize the simulation results. The model developed will be used to carry out further optimization, including various operation conditions and boundary conditions, modify geometry and install new facilities, to improve the performance and efficiency of the regenerator.

THE OUTCOME

A 3D CFD multi-phase and multi-species reacting flow model of the industrial regenerator was developed. The flow characteristics and reaction details are well predicted, which are validated against plant data. The simulation results are also visualized in three-dimensional environment through Virtual Reality (VR) technology. The CFD model developed will be used by BP Refining and Logistics Technology to study regenerator design or operational improvements in the future.

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