MODELING FCC SPENT CATALYST REGENERATION WITH COMPUTATIONAL FLUID DYNAMICS

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The coke laden spent catalyst from oil cracking in the FCC riser is burnt off in the regenerator. The heat generated which is used to raise the circulating catalyst temperature provides the heat for cracking of oil to valuable products in the riser. Regeneration of spent catalyst is there key to successful operation of the FCC unit. Efficient regeneration depends on good spent catalyst and combustion air distribution. Ideally, the air is distributed to match the spent catalyst distribution.

The FCC regenerator has been modeled using various modeling techniques. Technip S&W is using computational fluid dynamic (CFD) techniques to develop a tool to simultaneously model both hydrodynamics and spent catalyst regeneration in the FCC regenerator. Coke burning kinetics descriptions are provided through proprietary combustion kinetic equations with appropriate kinetic constants. The results provide detailed qualitative mapping of the regenerator behavior in terms of flue gas composition, temperature distribution including afterburning, regenerator bed density in both axial and radial planes. The CFD coupled with spent catalyst regeneration kinetics can be used to quantitative evaluate regenerator performance and show benefits of technology upgrade. This paper discusses the development of the CFD tool including a case study of a commercial regenerator unit.