

## The Role of Fluid Catalytic Cracking in Process Optimisation for Petroleum Refineries

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**Abstract :** Petroleum refining is a chemical process in which the raw material (crude oil) is converted to finished commercial products for end users. The fluid catalytic cracking (FCC) unit is a key asset in refineries, requiring optimised processes in the context of engineering design. Following the first stage of separation of crude oil in a distillation tower, an additional 40 per cent quantity is attainable in the gasoline pool with further conversion of the downgraded product of crude oil (residue from the distillation tower) using a catalyst in the FCC process. Effective removal of sulphur oxides, nitrogen oxides, carbon and heavy metals from FCC gasoline requires greater separation efficiency and involves an enormous environmental significance. The FCC unit is primarily a reactor and regeneration system which employs cyclone systems for separation. Catalyst losses in FCC cyclones lead to high particulate matter emission on the regenerator side and fines carryover into the product on the reactor side. This paper aims at demonstrating the importance of FCC unit design criteria in terms of technical performance and compliance with environmental legislation. A systematic review of state-of-the-art FCC technology was carried out, identifying its key technical challenges and sources of emissions. Case studies of petroleum refineries in Nigeria were assessed against selected global case studies. The review highlights the need for further modelling investigations to help improve FCC design to more effectively meet product specification requirements while complying with stricter environmental legislation.

**Keywords :** design, emission, fluid catalytic cracking, petroleum refineries

**Conference Title :** ICCPE 2019 : International Conference on Chemical and Process Engineering

**Conference Location :** Stockholm, Sweden

**Conference Dates :** July 15-16, 2019