Journal of Petroleum & Environmental Biotechnology

Liu and Fang, J Pet Environ Biotechnol 2013, S7
DOI: 10.4172/2157-7463.S7-e001

Editorial Open Access

Petroleum and Flue Gas Pollution Control

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It's well known that the world demand of fuels especially gasoline and diesel is increasing greatly due to the industries and daily life requirement. And fluid catalytic cracking (FCC) is the most important process of oil refining to provide the transportation fuels. In US, the primary function of FCC units is to produce gasoline. About 45% of worldwide gasoline production comes either directly from FCC units or indirectly from the combination with downstream units, such as alkylation and hydrotreating process. In general, the FCC system is composed of three sections, reaction part, and regeneration part and product stabilization system. In the regenerator, coke is burned off the catalyst with air in a fluid bed to supply the heat requirements of the process and restore the catalyst's activity. In FCC regeneration process, the high-temperature flue gas contains NO, NO_2, O_2, CO, CO_2, SO_2, SO_3, and H_2O simultaneously. Due to the partial combustion of coke, 6~10 % CO is generated in the flue gas which is the main pollutant source of refineries. In addition, SO_x and NO_x are also produced in the coke combustion process, due to the existence of sulfur and nitrogen compounds respectively. According to the statistics, the emission of SO_x and NO_x from FCC regeneration unit covers a percentage of 6~7% and 10% of the total emission to the atmosphere respectively. The usage of catalytic additive for regeneration combustion would lower the content of CO, and the temperature of the regenerator can be stabilized, meanwhile, the regenerator can be prevent from being corrosion due to the effect of SO_x, NO_x and water, and the FCC catalyst can be protected from deactivation. In fact, among different technologies employed for the treatment of undesirable emissions from FCC regeneration unit, the usage of catalytic additives (combustion control catalysts) in the circulating cracking catalyst, which usually contain small amount of platinum, and are capable of oxidation of CO and reduction of NO_x emissions in-situ, is the most attractive one.

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Received January 14, 2013; **Accepted** January 15, 2013; **Published** January 17, 2013

Citation: Liu J, Fang Y (2013) Petroleum and Flue Gas Pollution Control. J Pet Environ Biotechnol S7: e001. doi:10.4172/2157-7463.S7-e001