Modeling and simulation of coke deposition in transfer line exchanger (TLE) of olefin plant

The formation and deposition of coke in thermal cracking reactors of naphta feed and also in the quenching systems is a common problem. The quenching and cooling of the cracked hydrocarbons are carried out in the transfer line exchanger (TLE). The exchanger characteristics and operating condition, such as the temperature of the exit gas stream, the operating pressure of the gas stream and the coke thickness inside the tubes, are the key factors in monitoring the operation of the olefin plant its troubleshooting. In the present study, a new mathematical model for investigation of coke deposition in TLE of naphta pyrolysis reactor was developed and the coke formation in TLE of Arak petrochemical complex olefin plant was simulated musing developed software. The results include 10 profiles such as the prediction of deposited coke thickness, the temperature and pressure profiles of the gas product stream and the concentration distribution profiles of the product stream. The coking precursors included in the model are: ethylene and propylene (as olefins), butadiene (as a diolefin), benzene, toluene, xylene and styrene (as aromatics). The obtained results of the modeling showed a good compromise with the actual plant data of olefin plant of Arak petrochemical complex.

Keywords: Coke deposition; Olefin plant; Simulation; Thermal cracking; Transfer line exchanger

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