Cracking of heavy oil residues in a continuous flow reactor, initiated by atmospheric oxygen

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PII: S1385-8947(17)30855-0
DOI: http://dx.doi.org/10.1016/j.cej.2017.05.104
Reference: CEJ 17003

To appear in: *Chemical Engineering Journal*

Please cite this article as: V.F. Shvets, V.N. Sapunov, R.A. Kozlovskiy, A.I. Luganskiy, A.V. Gorbunov, F.S. Sovetin, T.N. Gartman, Cracking of heavy oil residues in a continuous flow reactor, initiated by atmospheric oxygen, *Chemical Engineering Journal* (2017), doi: http://dx.doi.org/10.1016/j.cej.2017.05.104

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A B S T R A C T

The article presents the results of processing heavy oil residues initiated by atmospheric oxygen. We found that the introduction of a small amount of atmospheric oxygen (2-6%) in the thermo cracking reactor (thermo-oxidative cracking) significantly increases the yields of light fractions. E.g. a thermo cracking of vacuum residue (visbreacking) with the air supply to the soaker camera gives twice more light fractions than traditional visbreacking process (36% of petrol and diesel fractions compared to 10-15% in conventional process). Thermo-oxidative cracking of atmospheric residue gives up to 60% of light fractions. In order to obtain a mathematical description of the process needed for its subsequent industrial implementation we conducted experiments on thermo-oxidative cracking of atmospheric and vacuum residues in a continuous flow reactor with a wide variation of the process parameters. Based on the analysis of the experimental data a common scheme for thermo-oxidative cracking, a mathematical model of the process and its parameters were established. The model adequately describes all the experimental data obtained in the temperature range 430-460℃, pressure 2-8 atm, retention times 4-33 min and relations oxygen/raw material 0,9-2,5 % wt. Industrial implementation of thermo-oxidative cracking needed just minimal modification of the existing thermal installations through the organization of air supply in the soaker chamber. This modification will increase the output of light fractions in the thermal processing heavy oil residues in 2-3 times with minimal capital investments.