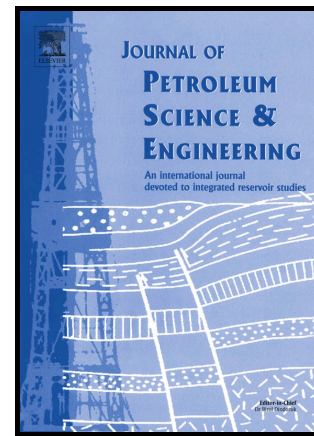


Author's Accepted Manuscript

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PII: S0920-4105(17)30151-1
DOI: <http://dx.doi.org/10.1016/j.petrol.2017.01.037>
Reference: PETROL3846

To appear in: *Journal of Petroleum Science and Engineering*

Received date: 8 September 2016
Revised date: 4 January 2017
Accepted date: 17 January 2017

Cite this article as: Mohammad Askarian, Ali Vatani and Mohsen Edalat, Heavy Oil Upgrading via Hydrodynamic Cavitation in the Presence of an Appropriate Hydrogen Donor, *Journal of Petroleum Science and Engineering* <http://dx.doi.org/10.1016/j.petrol.2017.01.037>

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Heavy Oil Upgrading via Hydrodynamic Cavitation in the Presence of an Appropriate Hydrogen Donor

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Abstract

The high viscosity and density of heavy oils make the transportation, upgrading and exploitation of these heavy crudes a difficult and costly task. The cavitation technique, through which the thermal energy produced is converted to desirable physical and chemical effects, can be used to pre-upgrade these heavy stocks before transportation or exploitation. Cavitation is defined as the formation and subsequent dynamic life of cavities or bubbles in the liquid. The very fast collapse of these bubbles would generate very high localized temperature, pressure and turbulence. This work investigated the upgrading of an Iranian refinery heavy fuel oil as a kind of heavy feed in a hydrodynamic cavitation setup. The experiments were carried out at 80°C, atmospheric pressure and in 10-15 minutes time scales. The results indicated that adding 2 vol% gasoline as hydrogen donor into the heavy oil cavitation upgrading process (HCUP) can reduce the viscosity of heavy oil by about 33%. In addition, in a several stage HCUP, diesel cuts and API gravity increased 6.5 vol% and 2.9° respectively; and extra heavy cuts and viscosity decreased 20 vol% and 84%, respectively.

Keywords: Hydrodynamic cavitation, Viscosity reduction, Heavy oil, Upgrading, Hydrogen donor

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