

Heavy crude rheology improvement using natural and commercial surfactant

Ahmed Abdul Hadi
AHCET, India

When temperature falls below wax appearance temperature (WAT) during pipeline flow of crude oil, paraffins and asphaltenes present in the crude oil starts to agglomerate. This agglomeration results in the deposition of wax in the inner walls of the pipelines. This in turn decreases the internal diameter of the pipeline thereby restricting the flow of crude. Highly viscous crude oils also pose similar threat. Due to hindrance in flow ability of heavy crude oil through pipelines because of their high viscosity, oil industries suffer heavy expenditure for restarting of pipelines and sometimes the well gets abandoned temporarily. Also, due to their high pour point and high wax content transportation of heavy crude oil through pipelines is often hindered. The contributing factors are usually temperature, pressure and flow rate. The objective of this research article is to investigate experimental techniques to determine applicability of a natural surfactant on crude oil rheological behaviour through pipelines.

Crude oil sample was obtained from ONGC, Gujarat, India. The sample was characterised by SARA analysis, pour point, density, acid number and API gravity. The surfactant was extracted in laboratory using fruits from a tropical Indian plant *Sapindus mukorossi* soap nut. The effect of this surfactant on wax crystal structure and crystal size distribution was analysed using Cross Polarized light Microscope. The flow characteristics investigated included pour point and viscosity before and after addition of 1000 ppm and 2000 ppm surfactant. The study also determined the possible mechanism behind improvement of rheological properties through Fourier Transform Infrared Spectroscopic analyses.

Microscopic studies showed change in size and structure of wax crystals establishing effectiveness of surfactant. Pour point reduced by 6°C and viscosity decreased by 68% after adding 2000 ppm surfactant at 30°C. Viscosity of crude with 2000 ppm surfactant at 30°C was almost same as that of pure crude at 50°C. FTIR spectroscopic studies showed the decrease in concentration of alkanes, aldehydic groups and ketonic groups present in the crude oil sample when 2000 ppm surfactant was added to it. The test results were compared with similar test that included a commercial surfactant namely IGPEL CO 720. In all the cases, *Sapindus Mukorossi* was the better surfactant among the two as it improved rheological characteristics to a maximum.

The availability of raw material for extraction of this surfactant in enormous abundance makes it a strong contender for use as a pour point depressant and as a surfactant for better pipeline transportation of heavy crude oils. The exceptionally reasonable cost of extraction

Biography:

Ahmed Abdul Hadi is currently a B Tech final year. Apart from regular curriculum, He has participated in various technical competitions in some of the finest institutions in India, which has helped him to compete in multicultural environment and withstand tough competition. He has presented his topic "heavy crude rheology improvement using commercial and natural surfactant" at the Middle East petrotech 2016 held in Bahrain on 27-29 September as a poster presentation. He is confident of being an active, open minded and useful member of any team, willing to contribute his best efforts. His most notable achievements include first place in quiz competition and debate at the SPE PETROEXPRO 2016 organized by RGCE student chapter, Chennai, India. At the same event he also bagged the third place for paper presentation.