Recovery of heavy oil from Nigerian Tar sands.

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Abstract:

Solvent extraction of heavy oil from Nigerian tar sands has been investigated using toluene. Pulverization, followed by sieving of the tar sand resulted in spherical agglomeration of the tar sand particles. The agglomeration was found to beneficiate the tar sands in terms of increased percent oil content to the tune of and 13% for the rich and lean tar sands respectively.

The effects of solid/liquid ratio, temperature and agitation on the extraction process were evaluated factorial experimental design. Extraction. efficiency was found to increase with increasing agitation speed and cuss transfer driving force, expressed in terms of solid/ liquid ratio, but decreased with increasing temperature.

Of the three variables, the solid/liquid ratio the greatest effect on extraction efficiency. The rate of oil extraction, expressed as extractibility showed a great dependence on agitation. Twelve and thirteen fold increases creases in extractibility were obtained at solid/liquid ratios of 1/20 and 1/5 respectively for 2.8 fold increase in agitation (250 r.p.m to 700 r.p.m).

The asphaltenes content of the heavy oil extracted at 50C was about 12% lower than that of the heavy oil extracted at 25°C for extraction times below 10 minutes. The implication of this reduction in asphaltenes level could be very significant in terms of the cost of upgrading the heavy oil.

Stage-wise extraction gave high extraction efficiency at a low solid/liquid ratio. An efficiency of about 99 was obtained at a total, solid/liquid ratio of 2/3 w/v (43wt% solid loading) and agitation speed of 430 r.p.m in a three stage extraction. From an analysis of the power consumed and time ±or extraction, it was found that 440 r.p.m, 26 minutes and 440 r.p.m, 18 minutes could be the most economical agitation and time levels of operation at solid/liquid ratio- of 1/5 and 1/20 respectively.

Keywords: Tar sand/ heavy oil/ toluene/ pulverization/ agglomeration/ extraction/ agitation/ asphaltenes level

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