

Solvent-Aided Dilution Approach for Heavy Hydrocarbon Liquid Evaluation in the Eastern Dahomey Basin, Southwestern Nigeria: Case Study of Agbabu Bitumen in Ondo State.

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Abstract : Solvent-aided dilution processes are often employed to recover bitumen by reducing its viscosity. In this study, methanol, toluene, and xylene were investigated as potential hydrocarbon solvents for solvent-aided hydrocarbon recovery of Agbabu bitumen. Solubility, Viscosity, and Saturate, Aromatic, Resin and Asphaltene (SARA) Analysis tests were carried out to determine the solubility of the bitumen in the solvents, the viscosity, and the SARA fraction of the natural bitumen and bitumen-solvent mixtures. Agbabu bitumen was found to have a high content of saturates and aromatics. Viscosity decreases as pressure increases, while solubility reduces as temperature increases. The experimental diffusivity of the sample decreases with temperature and increases with pressure, indicating that the presence of additional solvent molecules in the oil phase facilitates diffusion. Agbabu bitumen was found to be most soluble in toluene, and its viscosity was reduced most in it. Xylene exhibited a similar effect as toluene on the sample, though lesser but better than methanol. Methanol reduced the saturated content and significantly raised the asphaltene content, keeping the mixture viscosity high, a condition that, in turn, favors its colloidal stability. The colloidal instability index (CII) values, which account for the asphaltene stability of the mixture, show that the bitumen-methanol system with a CII of 0.874 will have mild asphaltene deposit issues while others are unstable. This approach of combining multiple tests with the CII can accurately predict the behavior of Agbabu bitumen in solvents and enhance the decision on the choice of bitumen recovery technology.

Keywords : asphaltene, bitumen, diffusivity, hydrocarbon solvent, SARA

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