World Academy of Science, Engineering and Technology
International Journal of Aerospace and Mechanical Engineering
Vol:17, No:08, 2023

An In-Depth Experimental Study of Wax Deposition in Pipelines

Authors : Arias M. L., D'Adamo J., Novosad M. N., Raffo P. A., Burbridge H. P., Artana G.

Abstract : Shale oils are highly paraffinic and, consequently, can create wax deposits that foul pipelines during transportation. Several factors must be considered when designing pipelines or treatment programs that prevents wax deposition: including chemical species in crude oils, flowrates, pipes diameters and temperature. This paper describes the wax deposition study carried out within the framework of Y-TEC's flow assurance projects, as part of the process to achieve a better understanding on wax deposition issues. Laboratory experiments were performed on a medium size, 1 inch diameter, wax deposition loop of 15 mts long equipped with a solid detector system, online microscope to visualize crystals, temperature and pressure sensors along the loop pipe. A baseline test was performed with diesel with no paraffin or additive content. Tests were undertaken with different temperatures of circulating and cooling fluid at different flow conditions. Then, a solution formed with a paraffin added to the diesel was considered. Tests varying flowrate and cooling rate were again run. Viscosity, density, WAT (Wax Appearance Temperature) with DSC (Differential Scanning Calorimetry), pour point and cold finger measurements were carried out to determine physical properties of the working fluids. The results obtained in the loop were analyzed through momentum balance and heat transfer models. To determine possible paraffin deposition scenarios temperature and pressure loop output signals were studied. They were compared with WAT static laboratory methods. Finally, we scrutinized the effect of adding a chemical inhibitor to the working fluid on the dynamics of the process of wax deposition in the loop.

Keywords : paraffin desposition, flow assurance, chemical inhibitors, flow loop
Conference Title : ICAFM 2023 : International Conference on Advances in Fluid Mechanics
Conference Location : London, United Kingdom
Conference Dates : August 17-18, 2023