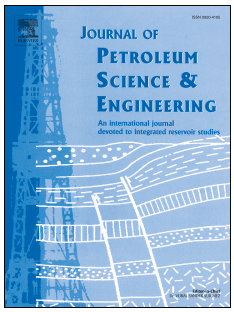
Accepted Manuscript



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PII: S0920-4105(18)30709-5

DOI: 10.1016/j.petrol.2018.08.040

Reference: PETROL 5220

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

Received Date: 23 April 2018

Revised Date: 7 August 2018

Accepted Date: 15 August 2018

Please cite this article as: Quan, Q., Ran, W., Yang, L., Gao, G., Wang, S., Gong, J., The effect of pressure on wax deposition from wax-solvent mixtures with natural gas, *Journal of Petroleum Science and Engineering* (2018), doi: 10.1016/j.petrol.2018.08.040.

The Effect of Pressure on Wax Deposition from Wax-Solvent Mixtures with Natural Gas

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Abstract

Wax deposition occurs when the temperature of the pipe wall falls below the wax appearance temperature. This deposition reduces the effective flow area of the pipelines, leading to a significant pressure drop, which increases the transportation consumption and leads eventually to complete blockage. Most wax deposition studies have neglected the influence of natural gas, but natural gas is present in the actual pipelines and must be accounted for in field operations.

A self-developed cold-finger apparatus was used to investigate the effects of pressure on wax deposition with natural gas (with 89% methane). The wax solvent mixtures consisted of a wax (C_{22}–C_{37}) dissolved in a paraffinic solvent (C_{11}–C_{15}). The wax deposition experiments were performed with 5, 7, and 10 mass percent wax solutions, for pressures ranging from 1–6 MPa. The experimental results indicated that the maximum amount of wax is deposited at ordinary pressure. The amount of wax deposited increased at pressures ranging from 1 MPa to 2 MPa and decreased thereafter (at pressures ranging from 2 MPa to 6 MPa). In addition, the pressure corresponding to the maximum wax deposition varied with the wax content. Furthermore, the wax crystal morphology was observed using a polarizing microscope, and the morphology was quantitatively described via the fractal dimension. The analysis showed that the fractal dimension decreased with increasing pressure.

This study confirms that natural gas plays a vital role in wax deposition studies, especially those aimed at predicting the wax deposition in actual pipelines, using a wax deposition model based on the laboratory experiments.

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