

Flow assurance challenges: Deposition of Paraffin and Asphaltenes

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Paraffin can precipitate from crude when equilibrium conditions change slightly, causing a loss of solubility of the wax in the crude. Loss of wax solubility, however, does not necessarily cause deposition. Wax crystals have a needle-like shape, and if they remain as single crystals, they tend to disperse in the crude instead of depositing on a surface. A nucleating material is usually present that gathers wax crystals into a bushy particle that is much larger than single crystals; these agglomerates may then separate from the crude and form deposits in the well's producing system. Asphaltenes are frequently the nucleating material that causes paraffin crystals to agglomerate. Other nucleating materials are formation fines and corrosion products.

Injecting cold fracturing or acidizing fluids into an oil reservoir can cause a significant cooling of the crude and formation. If the crude is cooled below its cloud point, paraffin can precipitate in flow channels. If all of the wax is not re-dissolved after formation temperature is restored oil production may be limited or even blocked. Paraffin on tubing or casing can be scoured from these metal surfaces and forced into perforations or into the formation during fracturing, acidizing, well workovers, or paraffin removal operations. Many wells have been severely damaged or totally plugged in this manner. Once damage has occurred, restoring a well to full rates is frequently difficult to achieve. Clean injection tubing or casing is essential where a well stimulation or fluid injection procedure is being conducted.

Asphaltenes can form micelles that have polar characteristics. Their deposition in well systems is not as that of paraffin, but problems can be very severe in wells producing high asphaltene content oils. Tests have shown that the asphaltene micelle is negatively charged. Deposition of asphaltenes on the formation sand grains near the wellbore will oil-wet the sand, reducing the relative permeability to oil and reducing oil production. Physical plugging with asphaltene further reduces production.

Biography:

Shivanjali Sharma completed her doctorate under the supervision of Prof. V. P. Sharma in Petroleum Engineering from Indian School of Mines, Dhanbad. She was awarded the PhD degree in May 2015. From then she have been working as an Assistant Professor in the Department of Petroleum Engineering at Rajiv Gandhi Institute of Petroleum Technology, Jais, Amethi, India (An institute of national importance). She have published papers in several national and international journals. She have also helped in setting up drilling fluid and cementation laboratory and reservoir laboratory at Rajiv Gandhi Institute of Petroleum Technology. She have won best research paper award at ICPST conference held at IIT Madras on Dec, 2012. Her research interests include Pipeline Transportation of crude oil, Drilling fluids design, Shale rock characterization, Enhanced oil recovery etc.