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Novel Method for Determining Paraffin Inhibitor Performance (PIP)

Background

The paraffin problem in crude oil has been exacerbated by the shift to shale reservoirs. Some oil companies spend hundreds of millions of dollars per year to chemically inhibit paraffin production in oil wells, lines, tanks, and other areas to prevent wax plugging. Thus, the industry runs continuous testing to measure paraffin inhibitor performance of chemical additives for each crude flow to tailor the treatments.

Invention Description

Researchers at the University of Tulsa have developed a new method that uses only a small sample to take impedance measurements for each concentration of inhibitor above and below the alkane crystallization temperature to arrive at an Electrochemically-Derived Paraffin Inhibitor Performance Score (EPIPS). The EPIPS yields excellent agreement with traditional methods. The small sample size and more rapid screening tests save both time and money.

A new spectroscopic cell was invented to measure highly resistive liquid systems on the order of tera-ohms with a small sample volume.

This allows attainment of temperature equilibrium much more quickly than current methods. The new methodology provides excellent agreement with current screening technologies (cold finger and viscosity measurements) in less time and with smaller sample size.

Above: Comparison of the performance of three inhibitors with a condensate as measured by cold finger technique and the EIS technique.

Potential Applications

Rapid screening of paraffin inhibitor performance in crude oils, condensates, and

model oils is the targeted application, but the new patent pending cell design will allow impedance measurements on other high-resistivity liquid systems, and so has broader application. In the oil industry, those might include corrosion, drilling, and completion measurements.

Benefits and Advantages

- Rapid screening methodology uses electrochemical impedance spectroscopy
- Uses only small (15-20 mL) crude oil sample
- Excellent agreement with cold finger analysis and viscosity measurement methods