

Research Paper

Effect of inhibitors on asphaltene precipitation for Marrat Kuwaiti reservoirs

Ebtisam F. Ghloom*, Misfera Al-Qahtani, Abeer Al-Rashid

Kuwait Institute for Scientific Research, P.O. BOX 24885, 13109 Safat, Kuwait

ARTICLE INFO

Article history:

Received 4 August 2006
Accepted 9 October 2009

Keywords:

Asphaltenes
Crude oil
Inhibitors
Precipitation
PVT
Marrat Reservoir

ABSTRACT

The main objective of this paper is to investigate the asphaltene precipitation problem and the performance of some asphaltene inhibitors for some of the Marrat Jurassic wells located in producing areas in West Kuwait and South East Kuwait. Kuwait Oil Company (KOC) is currently facing the problem of asphaltene deposition in oil well tubing which has a severe detrimental effect on the economics of oil production. Therefore, this paper summarizes the results obtained on the inhibition effect of three commercial and three non-commercial inhibitors. The effect of these inhibitors was investigated on four crude oil samples by a series of titration tests using the PVT cell with the laser technique. The four crude oils and inhibitors were evaluated for their physical properties and chemical composition. The asphaltene and resin fractions were characterized for their elemental compositions. It was found that all asphaltene fractions have low H/C ratios indicating high instability. Furthermore, the solubility class of the asphaltene fractions was evaluated as part of the asphaltene precipitation remedy study. The inhibitors screening tests revealed that the base-based inhibitors are more effective with most crude oils because of the inhibitor's high resins content of 75%. On the other hand, acid-based inhibitors are more effective with some other crudes because of their high polarity and compatibility with the asphaltene fraction.

Therefore, from scientific and economic points of view, it is recommended to use low dose of commercial inhibitors (0.8%–1%) rather than high dose of non commercial inhibitors (30–50%) in order to have the same degree of inhibition (85%).

© 2009 Elsevier B.V. All rights reserved.

1. Introduction

The phenomena of asphaltene deposition have become a severe problem to almost all petroleum production, processing and transportation facilities. The precipitation of heavy organic solids especially asphaltenes in reservoirs, wells, and facilities has a detrimental effect on the economics of oil production because of reduction in well productivity and clogging up of the production facilities. These solids consist mainly of carbon, hydrogen, and a minor proportion of heteroelements such as oxygen, sulfur and nitrogen. They remain in solution under reservoir temperature and pressure conditions and begin precipitating when the production temperature or pressure drops below onset conditions. The precipitation of asphaltene is caused by a number of factors including changes in pressure, temperature, chemical composition of the crude oil, mixing the oil with diluents or other oils, and during acid stimulation (Kokal and Sayegh, 1995).

Asphaltene deposition in oil well tubing has been a serious problem in some of the Marrat Jurassic wells located in producing areas in West Kuwait and South East Kuwait. The phenomena of asphaltene deposition in West Kuwait have become severe only after the wells were extinguished from the fire that started during the Iraqi

invasion. The wells were flowing to atmosphere for a period of time and as a result the reservoir pressure has declined considerably.

In West Kuwait (WK), the Jurassic production is primarily from the Marrat. Out of about 45 wells in WK-Marrat, 50% of the wells have a historical record of asphaltene clean-outs. These wells contribute around 7% of the total oil production from WK, which can amount to as much as 50 thousand barrels of oil per day (MBOPD). Here the reservoir pressure (around 9500 psi) is considerably above the Asphaltene Onset Pressure (AOP), which is estimated to be between 2000 psi and 4000 psi. Therefore, there is no likelihood of asphaltenes deposition in the reservoir. However, during production, as the pressure of the produced fluid inside the tubing goes below the AOP, asphaltenes start to flocculate from the crude. The asphaltenes gradually deposit in the tubing, reducing its diameter. This causes the oil production rates to drop and eventually the well completely ceases to flow. Once this has occurred, the tubing in the well must be cleaned out to restore the well to production.

A possible way of avoiding asphaltene precipitation is by adding an asphaltene stabilizer, i.e. inhibitor. Asphaltene inhibitors act in a way similar to resins, peptizing the asphaltenes and keeping them in solution. The effectiveness of an inhibitor is controlled primarily by its chemical and structural characteristics. However, the inhibitor ability to stabilize asphaltenes depends also on the solvent or dispersion medium (Chang and Fogler, 1993). Many commercial inhibitors and dispersants have been developed by different companies to prevent

* Corresponding author. Tel.: +965 23987672; fax: +965 23987673.
E-mail address: efolad@prsc.kisr.edu.kw (E.F. Ghloom).

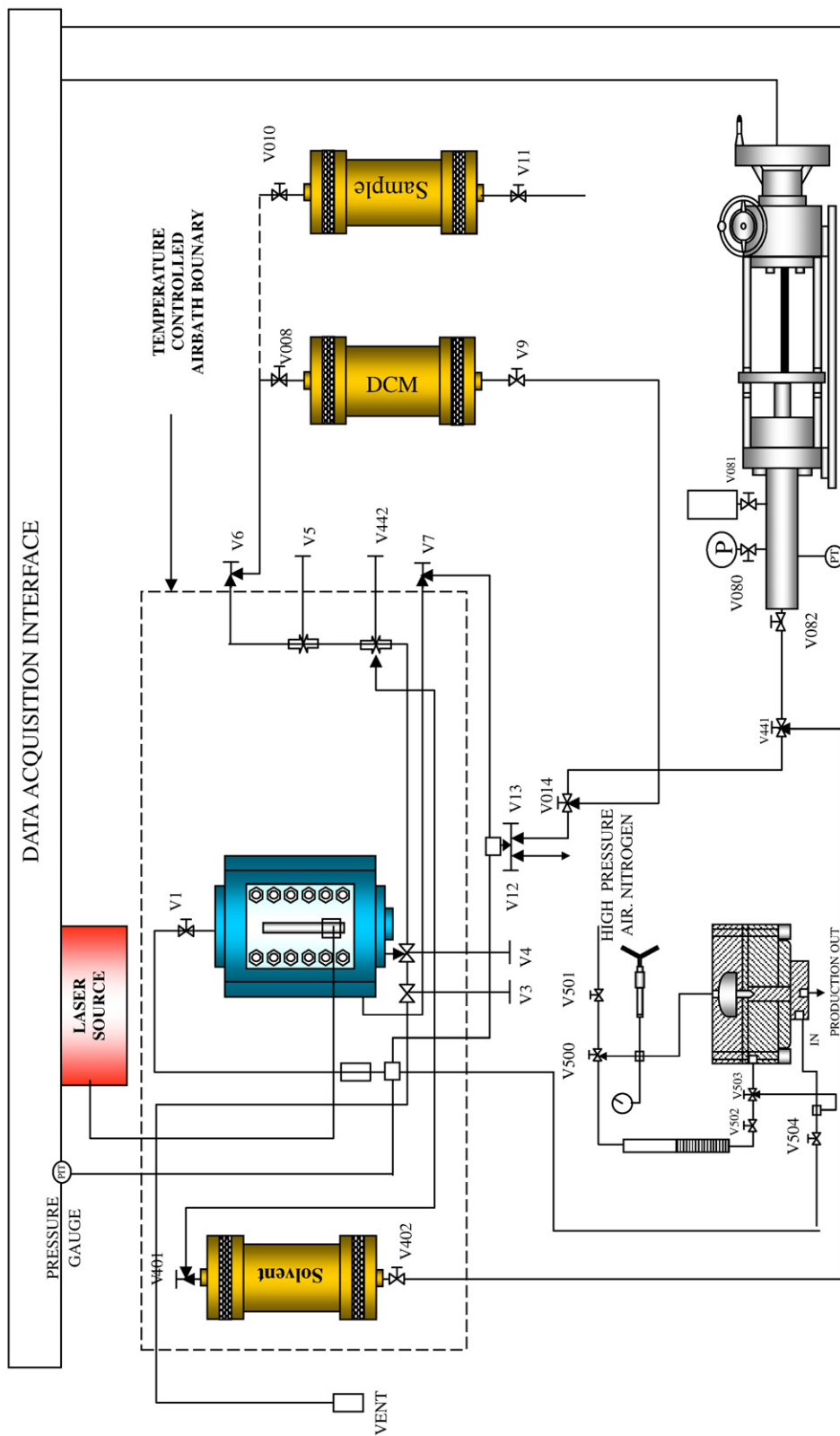


Fig. 1. Schematic diagram for the solid detection system (SDS).

Download English Version:

<https://daneshyari.com/en/article/1756012>

Download Persian Version:

<https://daneshyari.com/article/1756012>

[Daneshyari.com](https://daneshyari.com)