**publisher:**"Publisher Name"
**author:**(Smith OR Jones)

# Case Study of the Impact of Cold and Hot Waterflooding Performance by Simulation and Experiment of High Pour Point Oil Reservoir,, Liaohe Oilfield, North-East China

Authors
Zhou Wei | Zhong-Hua Tang (China U. of Geosciences) | Oyinkepreye David Orodu (Covenant University)

DOI
http://dx.doi.org/10.2118/128873-MS
Document ID
SPE-128873-MS
Publisher
Society of Petroleum Engineers
Source
SPE Oil and Gas India Conference and Exhibition, 20-22 January, Mumbai, India
Publication Date
2010



## Abstract

Block Shen-95 has been under cold waterflooding for 17 years. Of particular interest is the low recovery of 11.27% for the North Block due to crude oil cloud point being very close to the reservoir temperature. Formation damage near the wellbore region is controlled at production wells by hot-oiling and low injection rates of non-isothermal waterflooding.

Optimizing production necessitated looking at core-scale experiment and reservoir-scale simulation waterflooding performance at different temperatures. The intent also, is basically to condition core-scale flooding observations to properly initialize the numerical model.

Based on experiment carried out on core samples, sharp decline in oil displacement efficiency occurred, increase in residual oil saturation and increase in the intensity of formation damage below the cloud point. Reservoir simulation depicted decline in production with decreasing flooding temperature captured specifically by change in viscosity around the wellbore region. Change in flow dynamics due to change in relative permeability was not efficiently captured and formation damage impact on porosity and permeability.

Reservoir-scale performance for high pour point oil reservoir can better be understood by considering the effects of formation damage on storativity and transmissibility, and fluid rheology. The irreversible process of wax precipitation may cause permanent damage if further from the wellbore region.

**Introduction**

Block Shen-95 has been under cold waterflooding for 17years of the 23years in which the oil-block have being on production. Oil recovery for the North Block is 11.27% and South Block is 14.99%. Recovery is low as a result of average crude oil cloud point being close to the reservoir temperature. Furthermore, flooding pattern of inverted 9-spot and 5-spot for both blocks respectively have affected recovery. Pertinent issue is prevention of formation damage near wellbore region at production wells by hot oiling at injection wells by low injection rates to prevent paraffin crystallization, precipitation and deposition with adverse effect to optimal flooding.

Prior study[1] after commencement of full development and initiation of secondary recovery had suggested non-isothermal flooding will have adverse effect and suggested enhanced recovery schemes of hot waterflooding and polymer flooding. Studies of non-isothermal flooding had brought to fore the effect on fractional flow due to change in viscosity causing adverse mobility ratio and the establishment of a cold water bank with increase in skin effect[2,3,4] and reservoir damage. Sweep efficiency is considerably affected at the later flooding stage from 1-D displacement analytical and graphical methods taking into cognizance paraffin precipitation[5]. Other influence includes change in wettability from water-wet to oil-wet and variation in end-point saturation[6,7,8]. Experimentally, the influence of non-isothermal (cold) waterflooding has been acknowledged to cause increased water saturation and relative permeability for flooding below cloud point temperature[9]. For Shen-95, crude oil is characterized as having high point (42-60$^0$C); wax, 37%; resin and asphaltene, 12-20%; API$^0$ gravity, 25.8-36.25 and cloud point of 58.5-63$^0$C. This brings to fore the window of paraffin crystallization and precipitation with the resulting consequences of non-isothermal flooding as highlighted above.

**File Size** 305 KB **Number of Pages** 8

# This article's rating: (Average from 0 ratings)

Combined technical
Readability
Applicability / Insight