

Full Field Implementation of Cyclic Steam Stimulation to Enhanced Oil Recovery for a Sudanese Oil Field

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Abstract

Steam Injection is to inject steam to heat the oil to higher temperatures and to decrease its viscosity so that it will be more easily to flow; cyclic steam stimulation(CSS)consists of three stages and happened in single well , CSS is particularly attractive because it has quick payout, however, recovery factors are low (10-40% OOIP). In a variation, CSS is applied under fracture pressure,

FNE reservoirs are highly porous (~30%), permeable (1000-2000 mD and unconsolidated in nature. the fluid properties include viscous crude with 15 to 17.7 API. Corresponding viscosity are in the range of 727 cp and 3800 cp at reservoir conditions, and the current recovery factor is 3.1 %.

The objective of this paper is to illustrate and analyze the performance of CSS phase's implementation starting from the first pilot up to full field scale through different stages. The first pilot has been conducted in FNE-16 well and the results shown that the CSS can produce double the production and then additional wells have been added at each phase, Up to 2016 the total CSS wells reach to 67 wells including 37 wells under the first and second cycle, 24 wells under the third and fourth cycle, 6 wells under the fifth cycle.

In this Paper overall analysis for the CSS performance implementation including the injection parameters in FNE field will presented , and detail comparison between CSS cycles and cold production will be discussed, and finally the challenge for this project.

Steam injection temperature of 270 °C, with 5~7 MPa injection pressure, steam injection quality of more than 0.6, and steam injection rate of 192t/h ; were used as steam injection parameters for all cycles while additional 10% of steam volume is added when changing from cycle to another.

The result showed that the CSS is very successful and the average oil rate is almost 1.6 times compared to cold production, the CSS only can increase the recovery percent from 32.5 - 34.2% which makes it more attractive method as development scenario for FNE oil field.