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# Experimental study of the steam distillation mechanism during the steam injection process for heavy oil recovery

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**ABSTRACT:** Steam distillation can effectively enhance heavy oil recovery during steam injection process in heavy oil reservoirs. However, the mechanism of steam distillation is complex, and the changes in oil properties during distillation remain unclear. In this study, three comparative steam distillation experiments were designed and conducted, including distillation processes employing saturated steam, steam superheated by 10 °C, and steam superheated by 40 °C. Heavy oil samples were derived from the Jin-1 Block in a typical heavy oilfield, in China. The density, viscosity, SARA fractions, and carbon number distribution of the residual oil were compared to those obtained before conducting steam distillation experiments. The steam distillation rates obtained with steam superheated by 40 °C, steam superheated by 10 °C, and saturated steam were 11.158%, 10.903% and 10.423%, respectively. The results indicate that the steam distillation rate of heavy oil increases significantly with increasing degree of superheating. During the steam distillation process, the density and viscosity of residual oil increase, the contents of saturated hydrocarbons and resin decrease, and the contents of aromatic hydrocarbons and asphaltenes increase. In addition, analysis of the distilled components indicates that lightweight components with smaller carbon numbers are removed firstly by steam distillation, followed by heavier components with larger carbon numbers. Moreover, all hydrocarbons with carbon numbers less than C<sub>22</sub> are removed from heavy oil in the distillation process, while the maximum carbon number of the distilled components was C<sub>34</sub>. This study is favorable for understanding the changes in the properties of residual oil after distillation during the steam injection process for heavy oil recovery.

**Keywords:** Heavy oil; Steam distillation; Distillation rate; Superheated steam; Degree of superheating

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