LOW-TEMPERATURE PROPERTIES INVESTIGATION OF FIELD A TANK OIL

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The origin and formation of paraffine deposits in oil treatment apparatus occur due to both indoor and outdoor environment factors: temperature and pressure conditions changes, oils mixing, surface-active agent impact. In view of the high risk of trouble and production volume decreasing up to the accidents in wells and pipelines this problem has to be solved at the reservoir and production engineering stage.

The aim of the research is to obtain the quantity of asphaltene deposits and the viscosity value in low-temperature region, chilling temperature of field A parrafine oil in Tomsk oblast to study the probability of paraffine deposition during the transportation of the oil from preliminary water removal unit to the transfer and assessment point of hydrocarbon liquids as thinning agent.

Field A transfer system includes two sections: 70 m lengthwise and 219 mm in diameter process pipeline without isolation and 29 km lengthwise and 219 mm in diameter interfield pipeline.

Thinning agent application for the preventing or removing high-molecular paraffine deposits is one of the most efficient parrafine deposits control method in the processes of oil production and transportation [1, 2].

Deposition quantitative evaluation was conducted on «cold finger» facility. The investigation results are shown in Table 1.

Table 1

Oil temperature decrease impact on the quantity of deposits

«Cold finger» temperature, ^{0}C	Deposit quantity from field A oil, g per 100 g of oil
Oilflow temperature is 50 ^{0}C	
40	0.1
15	0.19
5	0.8
-5	1.8

The main factor that influences the paraffine crystallisation temperature is the oil temperature decrease. It is known that paraffine solutions are apt to supersaturation. Consequetly, slight balance disruption (pressure decrease, gas escape) causes paraffine crystallisation. However, if oil temperature is higher than paraffine crystallisation temperature, neither gas escape nor pressure decrease leads to wax precipitation.

For the analysis of thinning agent impact on deposits quantity n-decane, heptane, toluol and pentane were chosen. 7 vol.% of solvent were added, «cold finger» temperature was 5 ^{0}C, that is equal to autumn-spring period. The results are shown in Figure 1.

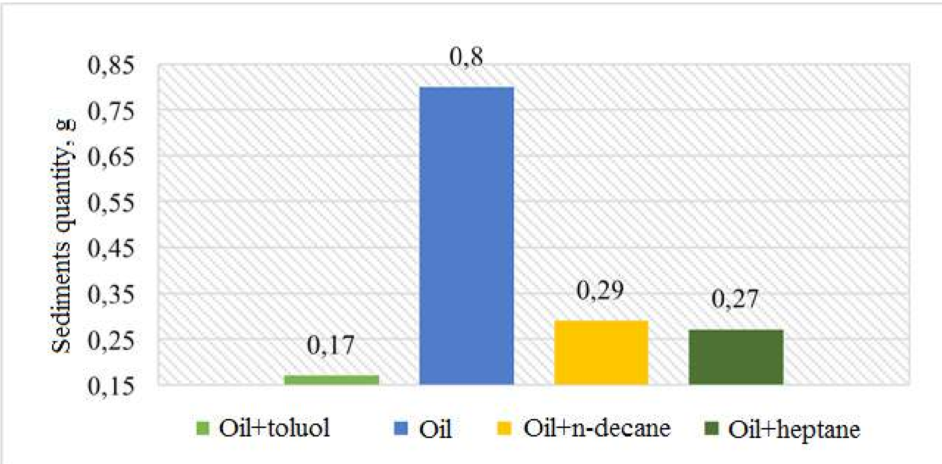

Fig. 1. Solvent impact on deposit quantity

All the solvents significantly decrease the deposit quantity, while the most efficient solvent is toluol: it decreases deposit quantity by 4.7 times.

To define chilling temperature measuring instrument of low-temperature characteristics «Kristall» was applied [3]. The results of this investigation are shown in table 2.

Table 2

Oil chilling temperatures and temperatures with solvents applied

Analyte	Chilling temperature, Tz, ^{0}C
Нефть	0
Oil+heptane	+2.6
Oil+pentane	+1.8
Oil+decane	+1.5
Oil+toluol	–4.9

The lowest chilling temperature, which constituted 4,9 ^{0}C, was reached by adding toluol to oil.

To define the dynamic viscosity in the laboratory conditions measuring instrument of low-temperature characteristics «Kristall» was applied. The results of this investigation are shown in Figure 2.

Thinning agents studied here show the activity in different temperature regions. The most significant viscosity decrease is observed when heptane and decane were added to the oil at the temperature of -25 ^{0}C and -20 ^{0}C, while the highest efficiency of pentane and toluol is achieved with the temperature between -20 ^{0}C and 10 ^{0}C.

It is necessary to notice that the oil viscosity decrease value after adding the thinning agent is not significant, especially in practically important temperature region: below 5 ^{0}C. The most significant decrease is established for system oil-heptane at 25 ^{0}C; it constitutes 753 mPa·s (Fig. 2).

Perhaps, more prospective solvent for the oil is toluol and heptane mixture that will prevent from significant deposit quantity at low temperatures and will maintain the minimum value of system viscosity.

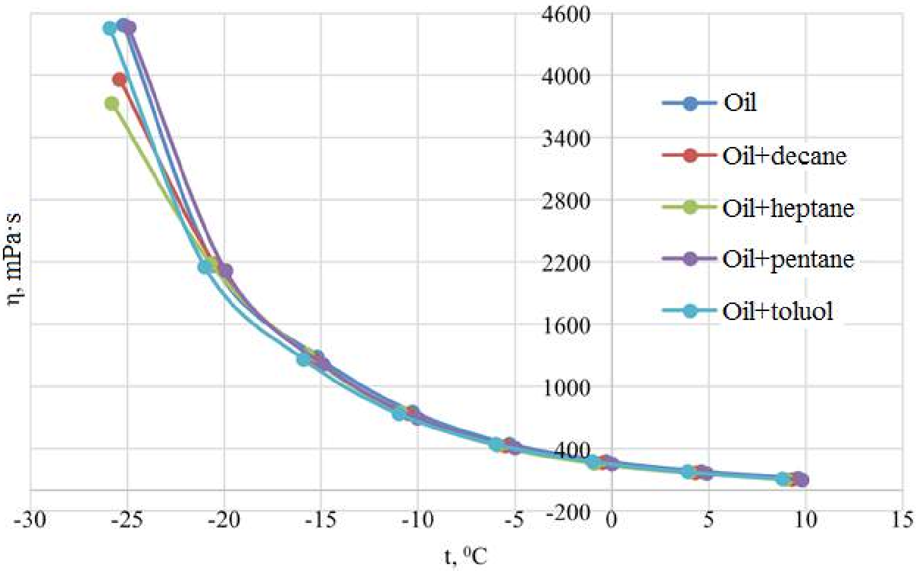

Fig. 2. Dynamic viscosity-temperature relationship

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