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ГЕОЛОГИЯ, ГОРНОЕ И НЕФТЕГАЗОВОЕ ДЕЛО (ДОКЛАДЫ НА АНГЛИЙСКОМ И НЕМЕЦКОМ ЯЗЫКАХ)

USING OF DRAG REDUCING AGENTS TO IMPROVE CAPACITY OF PIPELINE PALKINO-KIRISHI

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The aim of this paper is to show how drag-reducers can improve capacity of pipelines due to flow laminarization. Calculations were made on Palkino-Kirishi stage of Baltian pipeline system.

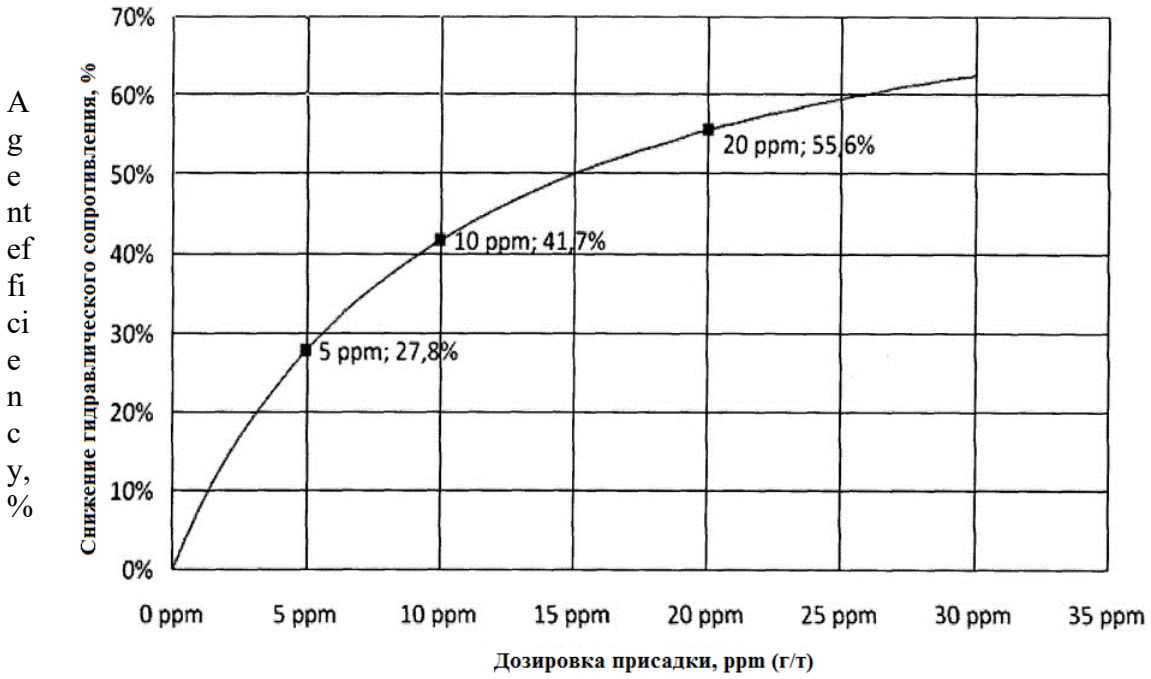
Drag-reducers decrease turbulence of flow by suppressing pressure pulsations by macromolecules. Macromolecules of agent destruct after distance, which is 200 kilometers, what has been calculated for most pipelines.

The most important property of drag-reducing agent is efficiency ψ, which is calculated by equation:

$$\psi = \frac{\lambda_0 - \lambda_f}{\lambda_0} \cdot 100\ \%$$

where λ_f, λ_0 – hydraulic resistance coefficients of flow with and without drag-reducer.

Theoretical efficiency curve is showed in figure 1.



Amount of reducer, ppm

Required hydraulic resistance coefficient λ_f is calculated by equation:

$$\lambda_f = \lambda \cdot \left(\frac{Q}{Q_1}\right)^2,$$

where Q – initial flowrate, Q_1 – required flowrate (10% more), λ – initial hydraulic resistance.

Calculations resulted in required agent efficiency is 17.355 %.

Three drag-reducers were analyzed: FLO MXA by Baker Hughes, USA; COLTECH 3170 by Coltech International, Russia and M-FLOWTREAT by Mirrico, Russia. Their experimental efficiency curves are shown at figure 2. Required concentrations are: FLO MXA – 4.1 ppm, COLTECH 3170 – 4.08 ppm and M-FLOWTREAT – 3.82 ppm. M-FLOWTREAT is the most economically effective in this case.

Drag-reducer assembly is simple to install, so that technological process with drag-reducing agent can start rapidly.

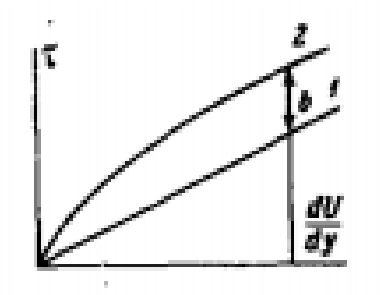
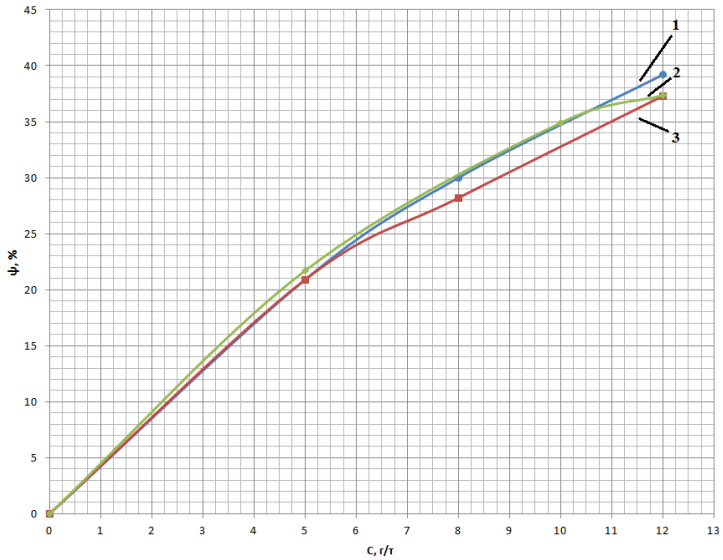


Fig. 2 - 1) Newtonian fluid (solvent)

2) Solution



Concentration of agent, ppm

Fig.3 Efficiency curves

1 – FLO MXA; 2 – M-FLOWTREAT: 3 – COLTECH 3170.

Table 1

Properties of M-FLOWTREAT agent

Indicators	Standart value
Appearance at 20 °C	Suspension, from white to light-brown in color. Stratification is allowable
Solidification temperature, °C, max	-50
Density at 20°C, kg/m³	from 820 to 1200
Brookfield Viscosity at 20°C, mPa·s (cPs), below	1000
Closed cup flash point, °C, min	63
Sedimentation stability (start of stratification), hours, min	72

In conclusion, M-FLOWTREAT is the best choice because its concentration is the smallest in comparison with others.

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