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The Recovery of Depressant Based On The Gossypol Resin And Flux Oil (DPN -1.2)

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ABSTRACT

Finding ways to produce new, more effective depressant oil and petroleum products is currently especially important. The action of depressor additives results to their influence on processes of crystallization and structure formation of firm, first of all, paraffin hydrocarbons. We investigated the influence of some physical and chemical properties of Kumkol oil field depressant based gossypol resin and flux oil (DPN-1.2) in the given work. The concentrations of additives and their effectiveness depend on the entry temperature of the additive composition and the amount of paraffinic hydrocarbons, resins and asphaltene content as well as their relationship.

Keywords: depressant, oil, gossypol resin, flux oil, polycondensation, sulfonation, congelation temperature, paraffin hydrocarbons.

INTRODUCTION

Today in Kazakhstan there is no production of depressant for oil to transportation and processing. In this regard, the development and application of new high reactants is important.Widely used depressant additives in Kazakhstan are imported, mainly in Russia and abroad. Supplied depressants chemical nature and physical-chemical properties similar, as they basically are acrylate and vinyl acetate, or a mixed type of additives [3]. Effectiveness of their application depends not only on the formulation, the ratio of the components on dilution and heating step, at a dosage of oil, and the composition and properties of the oil. Also an essential element in the development of recommendations for application of additives is the selection of the solvent, as it will affect the shape of the macromolecule polymers. In this connection, in recent years, as a solvent used the aromatic hydrocarbons.

Currently, highly paraffinic oils is good depressors azoles - ester ethanol amines and high molecular compounds of fatty acids, they reduce the congelation temperature at 28-30^{0}C, DN-1, depressor AzNII - dialkylnaphthalenes "Depran" (Russia), Danox PSPERSE and R-140 (Japan), RAO (UK), Proshinor AP-7 (France) and Serwa (Netherlands).

It is known that [2] when determining the optimum performance it is important to select the minimum depressant its concentration, provides maximum depressor effect, since, in the amount of oil flowing continuously structuring processes to provide the necessary additive congelation temperature oil at all times during transport with some margin time, which sets the consumer, as well as during storage (from 2 to 90 days).

MATERIALS AND METHODS

Kumkol oil is relatively light (0.81-0.83 g/sm^3), with significant content of light fractions and the virtual absence of secondary impurities. High paraffin content of the oil leads to settling of underground and surface oil well equipment. Particularly intense of settling was observed during the development of chalky horizons, which are characterized by lower reservoir pressure and temperature as compared with Jurassic[4]. The physico-chemical properties of Kumkol oil are shown in table 1.

Table 1. Main rheological and physico-chemical characteristics of Kumkol oil

Indicator	Value	GOST and methods
1	2	3
Density at 20°C, kg/m^3	811,7	3900-82
The molecular weight	230	
Kinematic viscosity at 50°C mm^2/s	3,53	33-82
Congelation temperature, °C	12	20287-74
Acid number, KOH /mg	0,04	5985-79
Coking weight, %	1,61	1933-74
Content: %		
Asphaltenes	0,3	
Silica gel	6,5	
Paraffin melting temperature °C	13,9/51	11851-85
Total sulfur	0,1	Methodology Institute of NP
Total nitrogen	0,12	
Carbon	85,74	
Hydrogen	13,9	
Oxygen	0,14	
Vanadium, mkg g	0,3	
Mercaptan sulfur nickel in fractions:	L.b.- 120°C absence.	17323-71
	120-230°C absence.	
	180-350°C absence.	

RESULTS AND DISCUSSION

The application of depressants is considered the most promising and economically advantageous, in this regard. It is known that the effectiveness depressants are determined by the decrease congelation temperature of petroleum and petroleum products providing maximum depressor effect. The depressant additives to oils on their chemical nature are usually polymeric substances. The concentration depressant is selected depending on the purpose and application of the additive. The optimum temperature of the depressant input in the high paraffin oil lies in the range of 50-70^{0}C [1,5,6]. Kumkol oil refers to the highly paraffinaceous oil. Therefore supplied depressants do not meet the growing demand for low efficiency and the different conditions of applications.

One of the most effective depressants were naturally occurring depressant i.e. liquid resinous oil components. Gummy oil can be added a paraffinic to reduce congelation temperature. In connection with this, methods for producing depressant based gossypol resin and flux oil were developed to improve the running abilities of the Kumkol oil field.

Gossypol resin is a slop of vacuum distillation of fatty acids derived from cotton seeds by processing of seeds and cottonseed oil. This is a plastic homogeneous mass of dark -brown to black color. Typical composition of gossypol resin (Shymkent fat-and oil plant): 98.29% organic substances; 1.71% inorganic substances; 100% ether soluble substances; acid number 68.5 mg KOH g^{-1}; iodine value 97g; saponification number 200 mg KOH g^{-1}; essential number 135 mg KOH g^{-1}; hydroxyl number 91%; fatty acid liberated by hydrolysis from 52 to 64%; raw fatty acids and their derivatives, and the rest is gossypol condensation products of polymerization reactions and resulting from the extraction of oil mainly in the distillation process of soap stock fatty acids, 38% non-fat substances; 0.2165% phosphorus (calculated as P_2O_5); 8.78% of calcium in the calcium salts. The properties of the gossypol resin depend on the quality of feedstock following the technological modes of fat decomposition depth distilling of obtained fatty acids and other factors. 12% of nitrogen-containing compounds were found in gossypol resin, 36% conversion products of gossypol and 64% of the fatty acids and oxide-fat acids. Fatty acid content of the resin is, as mentioned, 64%. Apart from free, there is also the presence of bound fatty acid in the di- and triglycerides. DPN-depressant 1.2 was obtained on the basis of waste oil industry - gossypol resin and flux oil by the method of semi condensation in alkaline medium at a temperature of 80-90^{0}C for 2-2.5 h. Thereat occurs simultaneously semi condensation and saponification of oil hydrocarbons and gossypol resin. For extraction of unsaponifiable fractions through a vacuum evaporator are entered mineral spirits followed by discharge of these fractions. The obtained intermediate is 60-70% of the sodium salts, mainly of unsaturated fatty acids with a predominant fraction of C_{11}-C_{17}. This intermediate was added with sodium sulfite Na_2SO_3 until obtaining uniform mass. For definition of the effectiveness of synthesized depressant on the congelation temperature is identified oil fractional composition and their influence on the congelation temperature of oil is investigated. Table 2 shows the fractional composition of the investigated Kumkol oil, which is processed in the Shymkent refinery (LLP "Petro Kazakhstan Oil Products").

Table 2. The fractional composition of oil of the Kumkol oil field

Temperature, ^{0}C	Fractional composition
100	10
120	13,5
150	21
160	23
180	26,5
200	29,5
220	33
240	36,5
260	40
280	44
300	48

The total of all light fractions in the volume 48% of the studied oil have insignificant effect on the decrease of oil congelation temperature. To reduce oil congelation temperature are used synthetic depressants DPN-1.2 based on waste oil industry - gossypol resin and flux oil.

The dependence of the congelation temperature change of Kumkol oil from concentrations of depressants is shown in table 3. The carried out investigations with the application of depressanst show decrease of congelation temperature of oil from 12 to 7^{0}C. The congelation temperature of oil without depressant oil is 12^{0}C.

Table 3. Experimental data on the application of additives DPN-1,2 GOST 20287-74

Oil	Volume,ml	Volume of additives, %	$T_{congelation}$ °C with additives	
			DPN-1	DPN-2
Kumkol oil	100	-	12	12
	100	0,005	12	11,5
	100	0,001	11	11
	100	0,05	10	9,5
	100	0,025	9	8,5
	100	0,01	8	8
	100	0,1	7	7,5

The investigation of the concentration effect (0,1-0,005%) synthetic additives DPN-1.2 on the congelation temperature of Kumkol oil showed that by adding them from (0,1-0,005%) decreases the congelation temperature of Kumkol oil.

APPLICATIONS

This study is useful for allowing additives to reduce the congelation temperature of crude oil and to improve its fluidity, to reduce the pressure in the pipeline and to improve the completeness of the oil tank car.

CONCLUSIONS

However, the concentrations of additives and the effectiveness of its action depends on input additive temperature ,from composition and the amount of paraffinic hydrocarbons, resins and asphaltene content as well as their relationship. As noted above, the input of DPN-1,2 allows additives to reduce the congelation temperature of crude oil and thus improve its fluidity and correspondingly reduces the pressure in the pipeline and improves the completeness of the oil tank car. Thus, it was found that the effectiveness of the additive series of DPN-1,2 depends on the content of asphaltenes, resins, paraffins in the oil.

REFERENCES

[1] R.A.Terteryan, Depressant additives to oils, fuels and oils, M. *Chemistry*, **1990**, 238.
[2] N.K.Nadirov, P.I.Tugun, R.A.Brot, Pipeline transportation of viscous oils, *Almaty: Science*, **1985**, 264.
[3] G.K.Mamytbekov, S.S.Kozhabekov, Improvement of methods of synthesis depressants for abnormal oils, International Scientific and Practical Conference "Problems of innovative development of oil and gas"
[4] L.S. Vasilyanova, Some features of Kazakh oil, *Oil and gas*, **2006**, 2, 81-87.
[5] L.V.Taranova, P.Gurov Yu, V.G. Agayev, The mechanism of action of depressant additives and evaluation of their effectiveness, *Modern scientific technology*, **2008**, 4, 90-91.
[6] V.G. Bondaletov, M.A. Kopytov, I.V. Prozorova, I.G.Antonov, Synthesis and investigation of dark petroleum resins as regulators of the rheological properties of middle paraffin oils, News of the higher educational institutions of the series, "Chemistry and chemical technology" **2004**, 47(8), 110-113.