

ANALYSIS OF THE CHEMICAL COMPOSITION OF POLLUTANTS IN THE WORKING FLUID OF HYDRAULIC EXCAVATORS

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Abstract

Recently, the main problem in the operation of hydraulic excavators is the contamination of hydraulic fluids with various minute dust impurities of rocks. As a result, there is a rapid wear of the parts of such machines. The article is devoted to the clarification of the composition of contaminated impurities. Microscopic analysis was used to study the clogging of hydraulic oil. The viscosity of the studied samples after their distillation decreased in comparison with the initial ones.

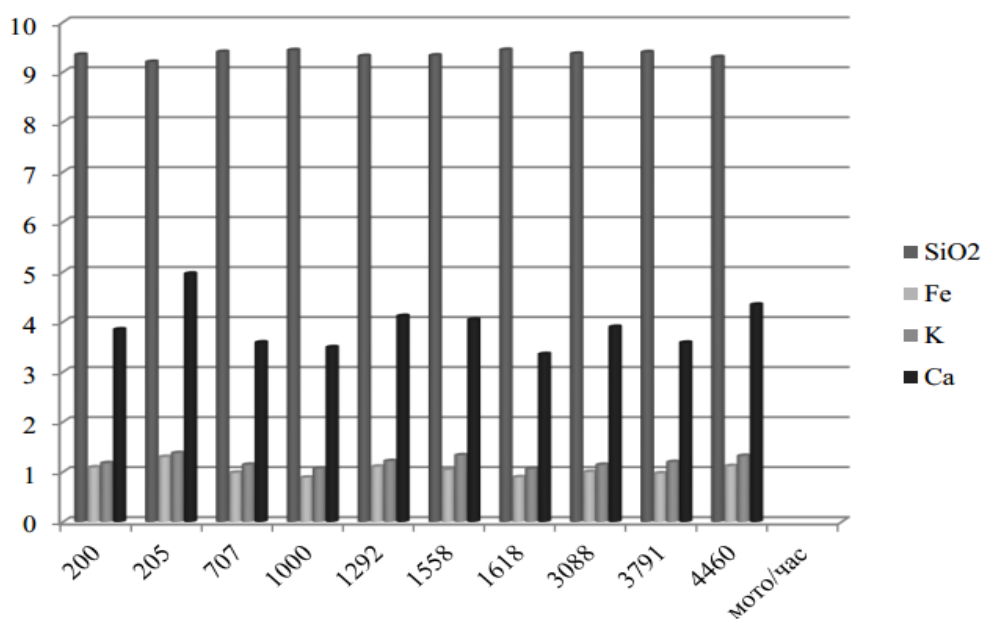


Figure 1. Composition of pollutants

Hydraulic fluids Tellus-68, Tellus-46, Chilon-68, Chilon-46 original and working states.

The physical characteristics of hydraulic fluids were studied, the results of which are given in table 1 [1-4].



Table 1 Physical characteristics of used hydraulic fluids

No	Hydraulic fluid Grades	Solvents					Density d, g/ml	Time t,s	Viscosity n
		water	butanol	siglogeksan	ortageksan	benzin			
1	Chilon-46	HP	MP	MP	HP	P	0,869	15,5	13,46
2	Chilon-68	HP	MP	MP	HP	HP	0,874	16,2	14,16
3	Chilon-68(viscosst)	HP	MP	MP	HP	P	0,827	12,5	10,34
4	Tellus-46	HP	MP	MP	HP	P	0,863	13,1	11,31
5	Tellus-68	HP	MP	MP	HP	MP	0,865	18,0	15,57
6	Tellus-46	HP	MP	MP	HP	P	0,752	5,6	4,21
7	Source hydraulic liquid	HP	MP	MP	HP	P	0,880	20,5	18,04

HP - insoluble; MP - slightly soluble; P – soluble

IR -spectra of the studied samples on infrared spectrophotometer JR Tracer – 100 Shimazu in the body 4000 - 400 cm^{-1} .

The results show that used brown hydraulic fluids turn dark brown and darken after use due to contamination. The influence of various organic solvents was studied, thus determining the kinematic viscosity, density and some physical characteristics of hydraulic fluids [5-8].

The density of hydraulic fluids varies in the range of 0.827 to 0.880 g/ml and the decreasing the viscosity of the exhaust fluids compared to original viscosity.

Results in images V, D, G, and E), the dust is seen as tiny particles and metal chips are seen as light brown particles with irregular edges of particles. In photos A and B a piece of piece of rubber with the presence of small metal chips. The oil was used for 3,088 engine hours at Vostochny mine in the hydraulic system RH-40E excavator. Microscopic analysis fouling of hydraulic oil Tellus-68, that worked 3,560 moto-hours is shown in Fig. 2.



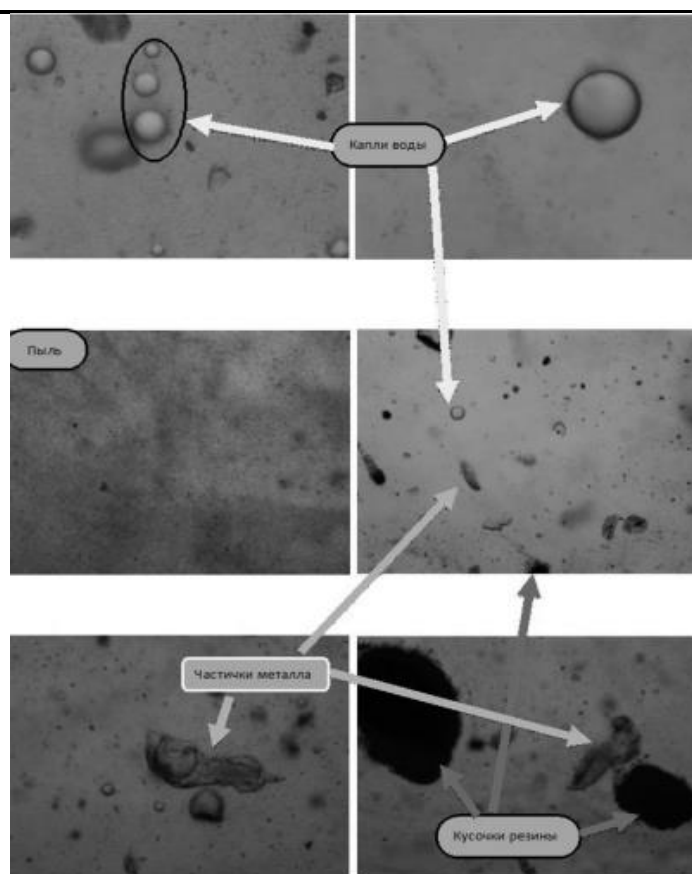


Figure 2. Microscopic analysis of Tellus-68 hydraulic oil clogging, after 3,560 engine hours

It has been established that the specific operating conditions of hydraulic mining machines significantly affect the physico-chemical composition of impurities in hydraulic fluids. Proposed various methods of analyzing the working fluid of a hydraulic volumetric power unit for hydraulic mining machines are acceptable, and they fully and completely correspond to the modern requirements. It is established that abrasive particles in hydraulic oil lead to early wear of pumps' rubbing components with their subsequent destruction. This results in clogging of the hydraulic system and is one of the main reasons of the failure of pumps and hydraulic system components. This is one of the main causes of failure of pumps and hydraulic system elements.

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