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HYDRODYNAMICAL PROCESSING OF MINERAL OIL

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The basic directions and technologies of reception of commodity oils with the improved operational properties additional influence - hydrodynamical processing are generalized and synthesized.

Key words: tractor, motor oil, the engine, additives.

Introduction. Longevity of tractors and cars work is mainly limited to motor of engines, that in a considerable measure depends on quality of the applied oil products, in particular, motor oils. Task of forcing the engine, creation of its optimal construction is also closely associated with the oils properties. That is why conducted works on the increase of life time and the decline of motor expense by the increase of operating properties of oils and optimization of the modes of their use have a primary value [1,2,4].

Problem. The increase of operating reliability of tractors belongs to the number of major problems of modern engineer, their solving allows to save money and to free a lot of production capacities. On repair of tractors and making of awaiting-parts more powers are used in four times, than for producing new wares. Annual charges on repair and technical maintenance of tractors present 25-30% from their cost [4,6].

Analysis of the last researches and publications. The largest part of money (close 65%) expended on awaiting-parts, is money spent on tractors engine. However not all details wear out evenly. By intensities of wear the first place is occupied by a pair "piston ring-shell", second - a "neck of shaft bushing", third - "finger a bushing upper connecting rod and piston boss", and also "fist of distributive shaft - pushrod". Therefore, as a rule, the first sorting out of engine for repair is produced through a wear only of pair a "piston-ring a shell". As a result, position is violated at the other friction surfaces, that conduces to their more intensive wear during the running [1,2,4]. Tension of work of oil in force engines by 1,5...1,7 times more in comparing to the classic models [4,6,7]. But the oils in a pure form, got from natural raw material (oils) even the greatest qualities, can not provide lasting exploitation of modern and perspective models of engines. In order to add to oils necessary qualities they are added the special connections - additives. This time the agile oils used in agriculture for diesel engines consist of 89...95% basis, that is petroleum oil, and 5.11% additives [4,6,7]. Influence of additives on the improvement of quality of agile oils is very large. Thus, application of the alloyed oils allowed to increase motohours of diesel engines of Д - 65H at 1,5...2,0 time. Test, conducted on more forced engine Д - 65H, with application of oils of different quality, that contain the 2...6% additives the ВНИИ

НП, - 360, showed that during work on the second standard of oil the contamination of pistons diminished by 1,5 times, wear of the first compression ring by 4,9 times, and cylinders liners by 2,7 times as compared to the first standard [4,6,7]. However, only with the increase of amount of additives it is impossible to get oils of necessary quality, and on occasion it results even in negative results. So, the increase of part of metalconsuming additives sharply reduces deterioration and antiteases properties of oil, violates normal work of the highly loaded details of cylinder - piston group of engine. New dispersive and antioxidizing ashless additives were lately created as a befenol antioxidant, and also washings additives on the base of different alkyl salicylate metals, that considerably improve operating qualities of agile oils for force engines. However, it is set by experiments, that part of additive from agile oils for tractor engines falls out in sediment in a storage period, part is removed by oilfiltr of engine that in generally speaking considerably reduces their quality, and it, in turn, negatively influences the longevity of work of mechanisms.

The purposes of researches: In this time reserve of upgrading of agile oil is an increase of dispersion of additives, that allows to get the best results with the least running expenses.

Results of researches. Hydrodynamic treatment of oils can be performend by two methods, namely: on stationary vehicles; by emitters, built in the construction of the system of engine greasing [4,5,6]. Lets consider these methods. A basic factor that influences firmness of additives solution in agile oil is a size of their parts. If the size of parts is identical and small enough (near 10 нм.), then terms that arise up during work of an engine and storage of oil can not render noticeable negative influence on firmness of additives. Dispergating of home additives in oils reduces speed of their coagulation and sedimentation, that is, promotes firmness. The most acceptable method of dispergating of additives in commodity oils is hydrodynamic influence on them . It gives an opportunity to get parts of enough shallow sizes without the contact of instrument with the processed parts, and it takes place far quicker as compared to another ways [3,4,5]. At distribution of ultrasonic waves in a liquid environment there are three effects - voice wind, voice pressure and cavitation. Thus destruction of hard parts takes place due to cavitation, the origin of that needs certain power. Minimum power of ultrasound, necessary for the origin of cavitation in mineral agile oils within the limits of 9...50 kW/m . For a receipt in a liquid any powerful ultrasound, it is needed to be excited there. For this purpose three types of electromechanics emitte are applied : electrodynamic, magnetostriction and piezoelectric. Magnetostriction transformers can give power of sound to a few hundred kilowatts on a square meter at an output-input of 50...60% ratio. Advantages of these transformers in that they can radiate the ultrasound of high-frequencies, work proof, can be made of different sizes, do not have circulating details. Thus, magnetostriction transformers most full satisfy the requirements that are made before treatment of oils [3,5]. Impact assessment of quality of agile oils on longevity of engines was conducted on tractors with the engine of Д - 65Н.

In the process of test next works were executed: rolling-off of tractors 60

motohours on plant instruction was done heads from the blocks of engines were taken and artificial bases were marked on the internal surface of cylinders liner in a zone of their most wear. In the same zone it is conducted measurements of cylinders liner. Engines of Д - 65Н, tucked in by commodity and improved oil worked 480 motohours. Every 120 motohours of engine work samples of engine oil and sedimentations from oilfiltr were taken with simultaneous determination of general mass of sedimentations in oilfiltr. In the tests of engine oil an ash-content, viscosity kinematics, mass part of insoluble precipitations and alkaline number after ДСТ 17479.4-87 were determined. The results of analyses of tests of oil and mass of sedimentations in oilfiltr are given in the table.1. The previous analysis of the got results of tests of oils shows that mass part of insoluble precipitations in the improved oil in two times less than, than in a commodity, and alkaline number at the end of tests is by 0,3 mgs KITTY on a g. of oils more. Viscidity in commodity oil by 0.5 CCT more than in improved. The value of indexes of oil gives an opportunity to suggest, that wear of details of engine, that worked on commodity oil with the improved operating properties by additional single hydrodynamic influence on it, will be less than that worked on commodity oil. The analysis of results of measuring confirms suggestion about reduction of wear of engine details, that work on the oil improved by treatment. So average and total wear of engines sleeves that work on commodity and improved oil accordingly is 0,015 and 0,01мм. Thus, wear of engine that works on the improved oil less than on 33%. The stand tests of engines are conducted also. The stand tests of engines are advantage as compared to operating, that allow to get results quicker. In addition, the stand tests of engines on commodity and improved oils pass in equal terms, that is practically difficult to attain at operating tests. Stand tests were conducted on the engines of Д-65Н. First cycle of stand tests was conducted at loading of engine power on 75-90 % from maximal during 320 motohours on commodity oil of brand of M-10M ГУ and oil processed by a hydrodynamic device.

Table 1. Value of indexes of engine oil depending on time of its work in the engines of brand of Д-65Н during realization of operating tests.

Indexes	Standard of motor oil	Time of work of oil,m/ hour				
		03	120	240	360	480
Ash-content, %	improved	1,51	1,54	1,55	1,59	1,61
	commodity	1,53	1,57	1,56	1,59	1,64
Viscosity kinematics 1000, cCT	improved	10,61	11,25	11,43	11,57	12,5
	commodity	10,52	11,57	11,36	11,3	11,99

Mass part of Insoluble sediment, %	improved commodity	0,034 0,020	0,109 0,103	0,232 0,094	0,258 0,114	0,269 0,104
An alkaline number of oil, is. KOH on the g of oil	improved commodity	4,31 4,34	3,65 3,52	3,04 3,15	2,71 2,97	2,56 2,87
Mass of sediment in oily filters, g	improved commodity	- -	45 45	40 40	45 45	48 40

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Table 2. **Degrowth of piston-rings of engine of Д-65Н.**

Number piston	Degrowth to the complete set of rings		Degrowth of 4 complete sets of rings	
	Improved	Commodity	Improved	Commodity
1	0,3741	0,6562	2,1592	2,8548
2	0,4682	0,7561		
3	0,7877	0,5330		
4	0,5292	0,9095		

The degrowth of 4 complete sets of piston-rings during an engine performance on oil with the improved operating properties made 2,1592 m, and during work on commodity oil 2,8548 m, that by 25 % more. These data are brought without influence of time of engine work on speed of wear of details. Application of oils with the improved operating properties, by additional influence life on commodity oil - by an irradiation, can give an opportunity to increase service life of engines by 20-25 % without their technological and designer additional changes.

Conclusions. Basic physical and chemical and operating properties of the oils improved by hydrodynamic treatment, are higher as compared to commodity oils. Wear during work on the improved oil by 33 % less than, than on a commodity. The optimal modes of operations of generator of cavitation of the lubrication system, that consist in that before filtration oil yields to treatment in the field of ultrasonic vibrations with frequency of 3 - 10 κG ц and voice pressure 0,5 -2,0 W/a m for providing of coagulation of parts of admixtures of inorganic origin, thus dispersion is carried out in the field of ultrasonic vibrations with frequency of 20 - 25 κGц and voice, by pressure 3-5 W/ Application of oils with the improved operating properties, by additional influence on commodity oil - by hydrodynamic treatment, gives an opportunity to increase service life of engines by 20-25 % without their technological and designer additional changes.

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ГИДРОДИНАМИЧЕСКАЯ ОБРАБОТКА НЕФТЕПРОДУКТОВ

Уминский С.М.

Ключевые слова: трактор, моторное масло, двигатель, кавитация, присадки.

Резюме

Обобщены и синтезированы основные направления и технологии получения товарных масел с улучшенными эксплуатационными свойствами дополнительным воздействием - гидродинамической обработкой.

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Summary

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