

APPLICATION OF ORGANOELEMENT POLYMERIC COMPOSITION (OPC) IN THE VEHICLE.

The main applications of OPC in the automotive industry:

1. The engine
2. Transmission
3. Airborne Electronics and Electrical Engineering
4. Suspension bracket
5. Body and paintwork
6. Lighting

Automotive is the widest field for OPC applications, it used in engines (carburettor, injector, diesel, rotary and any others, because there are friction and wear and tear with which you have to fight.) The same applies to transmission, gearboxes, suspension, braking systems, various hinges, bearings and so on.

The general trend in the automotive industry - the increase in the specific gravity of non-metallic materials (rubber, plastics, composite materials, ceramics, glasses, etc.), in the manufacture of products from these materials, OPC have excellently proven themselves as separating and fluids in the processing of the above materials by pressing, injection molding, sintering and so on.

The use of OPC makes it possible to impart new properties to the above materials, to increase their abrasion resistance, mechanical strength, resistance to long-term environmental effects. The modern car is increasingly saturated with electronic systems that react negatively to certain parameters of the external environment, for example, temperature and humidity, the use of OPC allows relatively cheap and effective hydrophobic e-location, contacts, relays, electronic circuits, connectors, etc., allow to exclude the failure of electronic systems during long-term operation in an atmosphere of acid fumes (contamination of the environment environment)

OPC, due to their vigorous interaction with the surfaces, as a result, show an excellent washing effect, forming monomolecular surfactant films, they "displace" almost all the substances that were there from the surface.

Our experience has shown that the elements of the engine friction parts treated by OPC already show excellent results during the initial break-in (significant reduction of the impurities in the engine oil, better condition of the surfaces after a certain period of operation), in addition, engine start-up is improved, especially in cold weather, and other parameters, which is reflected in the tables below.

Changing the compression in the cylinders of the engine ZIL-131
before and after the introduction of OPC.

Measurement	Engine Cylinder Numbers							
	1	2	3	4	5	6	7	8
Before the introduction of OPC	6.7	8.1	7.2	7.1	7.0	7.0	7.1	7.2
After 200 km of run	7.6	8.5	8.25	8.0	8.0	8.0	8.1	8.2
After 700 km of run	7.5	8.4	8.0	8.1	8.1	7.9	7.9	8.0
After 1000 km of run	7.5	8.4	8.0	8.0	8.0	8.0	7.9	8.0

Changing the car's free running out.

Conditions of measurement	Free running out, m
Before the introduction of OPC	288
After the introduction of OPC:	
- After 200 km of run	300
- After 700 km of run	370
- After 1000 km of run	370

Change in fuel and oil consumption.

Conditions of measurement	Fuel consumption per 100km, kg	Oil consumption per 100 km, kg
Before the introduction of OPC	30.7	0.045
After the introduction of OPC:		
- After 200 km of run	28.34	0.042
- After 700 km of run	27.172	0.039
- After 1000 km of run	26.94	0.036

As an example - when working on the diesel generator ADG-5000 (OKB Russian Diesel, St. Petersburg), work was carried out on a diesel engine 87G (18 DPN 3A 23/2 h 30) - an 18-cylinder diesel engine with a rated output of 5150 kW, with a crankshaft rotation speed 800 rpm. The total operating time of the diesel engine was 783 hours, of which 230 hours in the maximum power mode. After every 50 hours, sediments were taken from the separator, their spectral and chemical analysis was performed (the dynamics of wear was determined). The results are shown in Table, the wear of the cylinder bushings (by Fe) is reduced by 17%, of the pistons (by Sn and Cu) by 2 times, of the compression rings (by Mo) by 15%.

Average wear rates for the main elements (per cylinder) g / h * 10⁻³

Element	Basic diesel 68BR	Experienced Diesel 87G	
	By report	Actual, when operating without the OPC additive	Actual, when working with the OPC additive
Fe	9.40	8.30	4.85
Sn	0.96	0.85	0.50
Cu	1.06	0.93	0.45
Mo	0.30	0.27	0.23

Reducing the friction torque of the pivot knot when OPC is introduced into the lubricant

Knot type	Grease	Frictional moment of friction, kg * m		Run time, number of cycles (*)	Reduction of the moment of friction, %		Notes
		From place	In motion		From place	In motion	
The pivot pin of the front axle MAZ-642222	Litol-24	46.5	34.5	0	-	-	Load in the sliding bearings of the assembly (steel-bronze) P = 37 mPa V ≤ 0.1 m / s
	Litol-24 with OPC	42	27	0	9.7	21.7	
		19.5	15	100600	58.1	56.5	
		24	8	300000	48.4	65.2	

(*) - 300000 cycles of operating time of the stand corresponds to 115,000 km of car run.

As antifauling:

- ✓ The body of the car (increasing the chemical resistance of varnishes and paints, protection from dirt, snow, ice, etc.). There are data on the effect of OPC on the physico-chemical and physico-mechanical properties of some (pentaphthalic) enamels (and LCP based on them). OPC were introduced into the enamel in an amount not exceeding 0.15%. Enamels were applied to a standard prepared steel surface. The following parameters were evaluated: hardness of the coating, adhesion to the substrate, spreading of the enamel, porosity of the resulting coating, swelling in water. The analysis of the obtained results showed that the introduction of OPC in the composition of enamels significantly affects their physico-chemical and physico-mechanical properties. It has been established that with an insignificant decrease in hardness (max of 40%) and adhesion of coatings, spreadability significantly improves (up to 1.7 times), porosity decreases (max 7.8 times) and swelling in water (max 5.5 times), while in acidified water (up to pH = 5), the swelling of the enamel without OPC after exposure is 2.5 times worse, and the same enamel with the OPC additive did not change its properties at all. Films produced on paintwork, varnishes, metal and glass surfaces are not polar, i.e. as a consequence, it is hydrophobic, water does not wet surfaces covered with OPC films, collecting it in droplets, it "rolls down" under gravity or in the direction corresponding to the direction of the incoming air flow when the car moves, i.e. The surfaces are less polluted, if any dust and sits, then it is easily removed without significant effort. Hydrophobization of the surface is important to combat the possible icing of it, the lower the free energy of the surface, the greater the chances that ice will form less, in addition, it "does not hold well" on it. OPC windshield treatment of the car does not eliminate the appearance of stains from "killed" insects when driving in the summer, but these contaminants are easily removed from the surface by simple washing of water without detergents and efforts
- ✓ protection of the car's bottom, wheel casing, etc. The same (see above) applies and is relevant for wheel disks, which under normal conditions are heavily contaminated by wear products of brake pads and discs, OPC treatment makes their cleaning simple procedure.
- ✓ windows. Please look higher, the same applies to headlight glasses (or plastics).
- ✓ Knots of machines and mechanisms (specify which, for example gearbox, etc.) Example: OPC are embedded in trolleybus. parks in Moscow, in the course of this work, a decrease in the

specific resistance to movement (SRM) of trolleybuses was investigated with the use of the OPC additive in the rear axle reducer and onboard reducers.

Mileage , km	SRM, kg / tonne				Reduction SRM,%
	1	2	3	Average SRM	
0	6.3	6.0	6.3	6.2	-
1250	4.0	3.9	4.1	4.0	35
3270	4.1	4.3	4.2	4.2	32
5420	4.7	4.8	4.8	4.76 (rain)	23
8170	4.7	4.2	3.8	3.9	37

- ✓ pipelines of hydraulic systems, compressors, pumps, etc. OPC are widely used for processing fuel supply system elements:
 - Fuel pump of diesel engines - reduces friction and wear, increases reliability and service life,
 - Fuel lines - their hydraulic resistance decreases, the pressure difference between the pump and injectors decreases (up to 80-100 kg / cm²),
 - nozzles and sprayers - wear of nozzles and sprayers is reduced due to ash content and watering of the fuel, their geometry does not change, due to the non-wetting of the material of injectors and sprayers (and the above factors too), the quality of atomization of fuel and the economy of the engine improve.
 - OPC also processed the mechanisms of hydraulic systems with an increase in service life of at least 2 times, rubber seals - an increase in life up to 10 times, knots of oxygen compressors and leather sealing cuffs with an average life of 3 times.

The first full-scale tests were carried out on the transport refrigerator "Uragan", the tanker "Cape Khrustalny", the fishing vessel "Nikolay Filchakov", the test results (increase in the life of the fuel equipment by about 2.5 times, fuel economy) are positive and correspond to the above. In the association with YUGHOLODRIBLOT OPC were used massively.
- ✓ internal combustion engine and transmission (comment - shaft inserts, chain, transmission belt, sprayers, etc.); In addition to all the above, it should be taken into account, and our experience proves this - OPC-treated engines show the best results from the ecological point of view - the fuel burns more fully, in the exhaust gases it is less than CO, oxides of nitrogen, hydrocarbons.
- ✓ seals. As mentioned above, the resistance of OPC-treated rubber-metal, rubber, plastic seals increases significantly (abrasion resistance, swelling resistance in media, reduction in the rate of aging, etc.)