

Lyodov COMPANY Ltd., Saint-Petersburg State University of Industrial Technologies and Design

Our main activities are the design development, production and supply of clutch kits for the automobile (or motor) assembly factories.

The high quality of our products is achieved through the use of innovations and nanotechnologies in the production and process design.

With orders from the Russian industrial companies, and companies of the CIS countries, we are actively moving in building strong long-term partnerships with companies around the world.

Our geographical location in St. Petersburg, gives us additional advantages in cooperation with many enterprises of the North-West, Central, Southern and Ural regions of Russia.

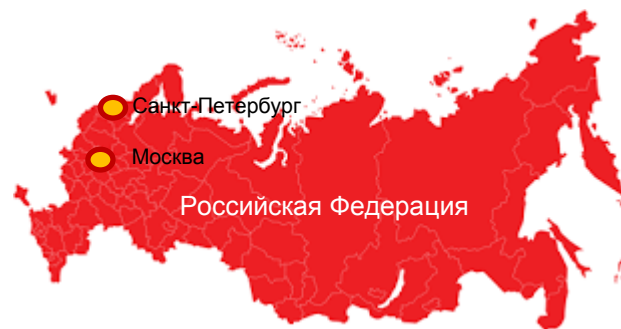


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www.sutd.ru

**High-tech manufacturing,
design and innovation**
Saint-Petersburg



ADVANTAGES

The advantages of the application of nanotechnology to power units and transmission

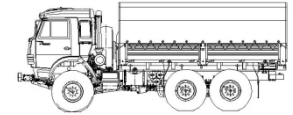
- improving survivability in the clash
- moving from place easy, without jerking
- increased driving dynamics (speed set)
- ensuring operation of the engine and transmission with the maximum possible torque transfer to the wheels without slipping when shifting gears (more typical for automatic transmissions)
- less wear on the splined parts
- the lack of micro-distortions during the movement of the slave disk
- the lack of unbalance and run-out (a reduction of physical fatigue of driver)
- the noise reduction of operation of the power units (stealth)
- improved lubrication of the bushings of the differential
- increasing the technical life of seals
- elimination of violations of integrity of seals auto tire inflation of car wheels (with the exception of oil seals with mechanical damage)

PROJECTS

Clutch kits - constructive design and innovations

Project Mustang 5350 (6x6), engine KAMAZ 740.63-240 (1100 Nm), garage №173 - clutch kits of "Lyodov Company" Ltd. MFZ-430

- Constructive innovations
- Using nanotechnology (in assembled clutch kit)
- With a guarantee of at least 80000km



The BTR – 82A, the product of AMZ, double disc clutch kit 2x350, engine 740.14-300 (1100Nm)

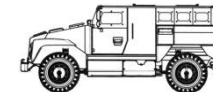
- with a guarantee of at least 60000km mileage



The project "Tiger", "Wolf" and "Bear", YMZ, Cummins, etc.

Engineering and manufacturing capabilities of the company

MF-362	MF-395	MFZ-430
500 – 700 Nm	800 – 1200 N	1400 – 2800 Nm
SAE 1 3/4"	SAE 1 3/4"	SAE 2"



- up to 60,000 pieces/year

For significant improvements in the above indicators, our company plan to implement nanotechnology for machining of clutch. This will increase by 18-20% achieved during benchmark testing technical resource of 5.5 million cycles.

PROJECTS

Clutch kits - constructive design and innovations

The clutch mod.142 disc, dry friction, the dimension of the pads 350x200x4,5, with peripheral springs with maintenance-free coupling constant contact

- Transmitted torque 1100nm, the safety factor is 2.5
- Used for smooth switching and transmission of the torque from the engines KAMAZ 740.10-210, 740.11-210, 740.14-300 etc., with a CAT mod.142, with the original (non SAE) mounting size flywheel housing and flywheel
- Used on a/m KAMAZ 55111, 53205, 43114, etc.
- Products "AMZ" (Arzamas) and BTRZ-81 (Armavir)

Objectives:

- To increase the longevity of the pads
- Delete the adjustment during operations
- Delete service (or Vice versa to provide for the compulsory periodic lubrication of the clutch bearing clutch release)
- Independence from Import



TESTS RESULTS

The results of the application of nanotechnology in our company is illustrated in the example of changing the values of compression in the cylinders of the engine ZIL-131.

Change compression:

	Cylinder number							
	1	2	3	4	5	6	7	8
Before the introduction of the product	6,70	8,10	7,20	7,10	7,10	7,00	7,10	7,20
After introduction of the product								
After 200 km of mileage	7,60	8,50	8,25	8,00	8,00	8,00	8,10	8,20
After 700 km of mileage	7,50	8,40	8,00	8,10	8,10	7,90	7,90	8,00
After 1000 km of mileage	7,50	8,40	8,00	8,00	8,00	8,00	7,90	8,00

Changing a free coasting of the vehicle:

	Free running (metres)
Before the introduction of the product	288
After introduction of the product	
After 200 km of mileage	300
After 700 km of mileage	370
After 1000 km of mileage	370



Change of consumption of fuel and oil:

	Fuel consumption for 100km	Oil consumption for 100km
Before the introduction of the product	30,700	0,045
After introduction of the product		
After 200 km of mileage	28,840	0,042
After 700 km of mileage	27,172	0,039

TESTS RESULTS

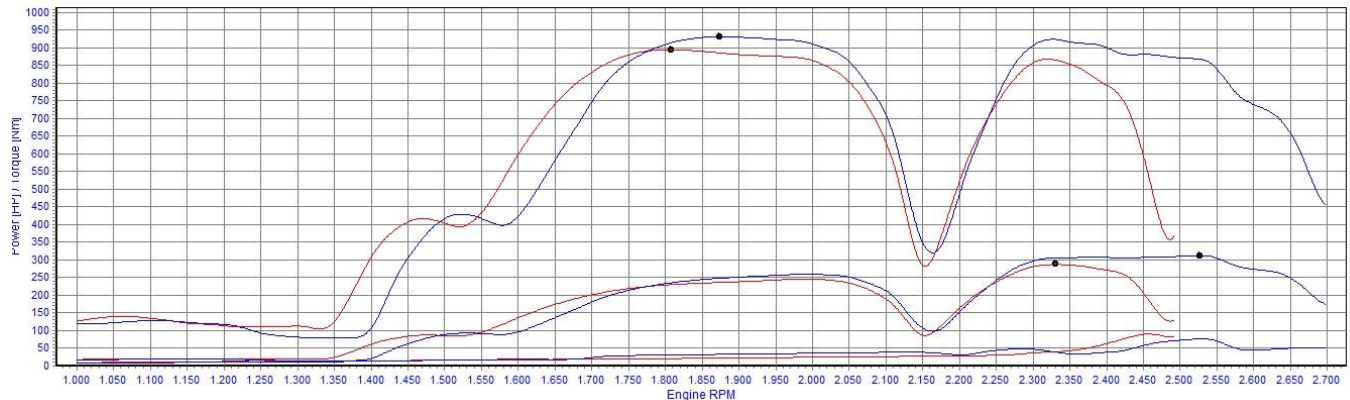
Bench testing at the circuit near the TOYOTA plant, where preparing cars for the rally “Paris-Dakar”, “silk way” etc.

Conditions:

New car Toyota Tundra (mileage 10000km), lubrication system - max level mark - according to the technical recommendations, front bench tests replaced oil and oil filter. Fuel - according to the technical recommendations. The number of restarts of the engine 5. The tests were carried out with the help of a specialized booth, a computer program with results output to an oscilloscope and a video camera. The measurements were carried out for the following components: engine, gear box, transfer box, automatic transmission (MT). Due to the confidentiality of data, the chart shows only the indicators related to the engine, a time interval of 50 min. before and after application of nanotechnology.

On the chart, indicators measuring before application of nanotechnologies highlighted in red
 The performance measurements after the application of nanotechnology in 50 min, 4 hours, 24 hours. highlighted in blue

Dyno v4 9.16.318 2016-10-14
 #1: PMAX=287,0 [HP] @ 2331 RPM NMAX=894,4 [Nm] @ 1807 RPM test2
 #2: PMAX=312,1 [HP] @ 2526 RPM NMAX=930,5 [Nm] @ 1873 RPM test2-5
 #3:
 #4:
 Client: | Registration: 268 | Brand: Toyota | Model: Tundra



TESTS REPORTS

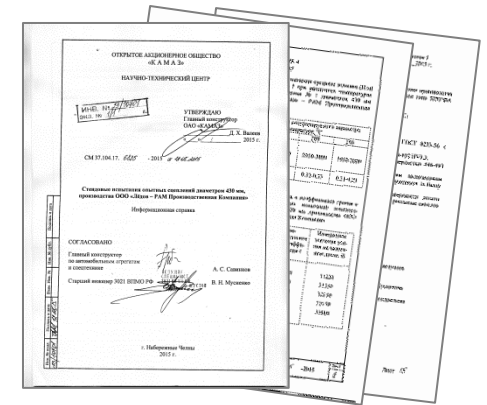
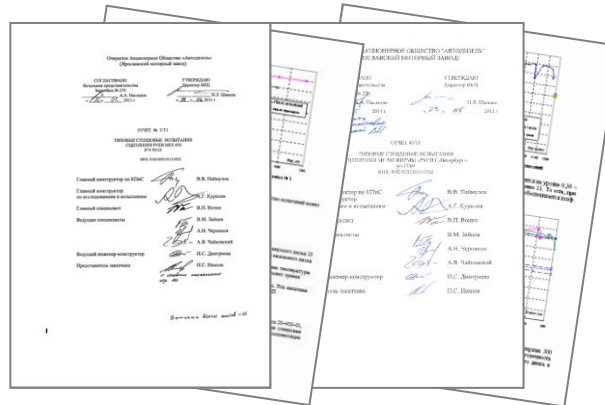
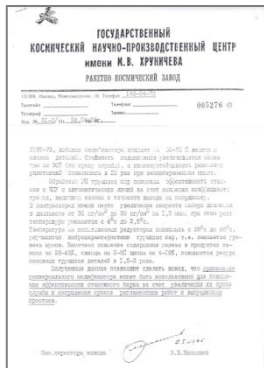
The quality of products of LLC “Ice company” (clutch dimensions 362mm and 430mm) confirmed by the results of tests on the leading enterprises of Russia

- KHRUNICHEV STATE RESEARCH AND PRODUCTION SPACE CENTER
- “AVTODIZEL” YMZ
- STC OF PJSC "KAMAZ"

Positive results were obtained on the MAZ Minsk and JSC "Ural AZ", Miass



“AVTODIZEL” YMZ



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Nanotechnology

Usage

- Processing of hard and porous surfaces
- Moisture resistance, protection of surfaces against corrosion and dust
- Cooling lubricants

Application

- Processing of loaded friction pairs, punching and extracting tools, casting mold aluminum, aluminum-magnesium and other alloys, protection coatings, parts, precision instruments and mechanisms friction units and other surfaces
- to produce a protective coating

Goals

- Comprehensive protection and strengthening properties of surfaces of friction units, heavy duty steam, hydraulic and pneumatic systems
- Imparting properties of anti-friction, water repellency, anti-corrosion, anti-adhesive, resistance to microorganisms, mold, radiation.
- The improvement of operational properties of parts and units of machines, equipment and machinery.



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Nanotechnology

Technologies

- Technology of anticorrosive processing of pipelines with CIP method
- The technology of improving the wear resistance of drilling equipment
- Technology application of de-icing composition
- Technology hardening of rubber products
- Processing technology support bearings turbines
- Guiding machine processing technology
- Technology PCB hydrophobic
- Coating molds technology



Application methods

- "Hot" - in a sealed airtight container under the influence of temperature and other activation sources - dipping pieces;
- "Cold" - in a closed or open container;
- "Manually" - a brush, swab and other tools application;.
- "Ultrasound" - in a hermetically sealed ultrasonic bath;
- "Aerosol" - spray from a pressurized container.

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Nanotechnology

Features and Benefits

- High penetration and wetting ability, the protective shell is firmly adhered to almost any surfaces, including metals, glass and other materials.;
- Ability to use in confined spaces (substances not only have themselves significant gas separation, but also inhibit gas isolation material covered).
- Surface treatment intended to make them wear resistance, corrosion, adhesion resistance, lower surface energy, protection from humidity and hydrophobicity.



Applications:

Machine - automotive, instrumentation, process equipment (production and operation), production of rubber and plastic products, manufacture and operation of tools for different purposes, auxiliary materials in the metal (GM), oils, chemicals and lubricants.

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Nanotechnology

Usage examples

- Power steering. Application technology saves not only on high-friction and wear, but also prevents the accumulation of fluids in the waste generated during the friction loads.
- Transmissions. Less friction and increased wear resistance
- Bearings.
 - Reducing friction by separating the contacting surfaces.
 - Heat removal.
 - Protection against corrosion (grease) from contamination.
- Seals. Eliminates infringement of tightness seals automatic paging system for car wheels tires (unless mechanical damage)
- Reducers. Load reduction in 3-4 times



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Nanotechnology

Usage examples

- Composition for the protection of hard surfaces from fouling biomass has a high adsorption and chemisorption ability



The results of the usage

Nodes machine friction engines, gearboxes, compressors, tools, machines, etc..

- Reduced friction coefficient of > 10 times.
- Reducing the value of torque from a standstill in the state of motion of up to 100 times.
- Exception "supercritical" displacement of the lubricant;
- Reducing energy consumption to 25%;
- Reduction of acoustic noise of up to 12%, the fuel consumption up to 15-17%, oil 60%;
- Reducing fuel consumption, lubricant (60%);
- Starting aid;
- Wear resistance (Fig. 3), the reliability and accuracy.



The results of the usage.

Metal cutting, grinding, abrasive tools (with the exception of the instrument on an organic binder).

- Increased durability average 2-fold;
- Increasing the surface finish on 1-2 Δ .
- Preventing damage of gear teeth



Stamping, punching tools (including plastics)

- Increased durability average 2-fold;
- Increased turnaround in 1,4-2 times;
- Decline of defects by 30-60%.



The results of the usage.

Rubber products (RTI)

Finishing RTI (the thickness of the adsorbed layer 250 nm):

- Reduced coefficient of friction to metal and most other solids > 10-fold;
- Improved wear resistance, resistance to aging, ozone cracking;
- Exception "sticking" to the metal in air, vacuum and water;
- Increasing the operating temperature range;
- Relief seals the connector;
- Acquisition of water repellency, reduced permeability.

Handling the press and injection molds (thickness 40-70Å layer):

- Increased wear resistance more than in twice
- Exception of a stage of surface chroming



The results of the usage

Lubricating systems

- Creating a protective and lubricating layer 40-70Å on the surfaces of parts and units of machines and equipment.
- Preserving the quality characteristics of the base oil (lubricant).
- Resistance to 1000°C and shock loads up to 300 kg / mm².
- Reduced coefficient of friction up to 10 times.
- Reducing the magnitude of the moment when starting from standstill up to 100 times.
- Reducing energy consumption to 25%;
- Reduction of acoustic noise of up to 12%, the fuel consumption up to 15-17%, oil 60%;
- Reducing fuel consumption, lubricant (60%);
- Motor starting aid



The results of usage.

Coolant Systems, Instruments for resin bond (bakelite, phenol-formaldehyde resins, and others.)

- Wear resistance equipment and tools 2 times.
- Providing non-fired grinding and polishing.
- Increased speed cutting, grinding, polishing 2-5 times.



Products of Powder Metallurgy

- Improved removal of products from the press - forms.
- Increasing the hardness of products by 20%.
- Increasing product flexural strength by 1.7 times.



Pipelines

- Reduced corrosion.
- Reduction of sediments on the internal surfaces of pipes
- Reduced pressure loss of any liquids 20%.



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Nanotechnology

- Release of competitive export-oriented auto components
- Strengthening intra-and inter-sectoral cooperation between small businesses and large enterprises of the Russian Federation
- Improving the status of Russian companies in the automotive world trade
- Increase the production in Russia created and enabling development of the automotive industry in the Russian Federation

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