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## APPLICATION PECULIARITIES OF COMPOSITE MATERIALS FOR RESTORATION OF AUTOMOBILE CARDAN HINGE SPLINES

**Abstract:** The spline connection is used to secure gears, toothed wheels, bushings on the shaft. It has a number of advantages over other types of connections. The component parts of this connection are easier to center. This significantly reduces mechanical deformations at the bushing boundary.

During operation, under the influence of various loads, the spline connection loses its properties. In this case, the splines or grooves in which they are located are restored. The following article looks into the peculiarities of composite materials for the restoration of automobile hinge splines.

**Key words:** restoration, spline, lubricant, viscosity, mechanical stability, distribution, compression, indentation.

**Language:** English

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### Introduction

Factory instructions for the use of machines often give overestimated standards for the frequency of lubricant changes (up to 20 thousand km of run). But due to the heavy load, off-road driving and storage outside the garage, these figures are halved. The use of lubricants prevents the splines from wearing out and increases their service life. To lubricate the splined joint of the propeller shaft, oil-based greases are usually used - with petroleum and synthetic origin. Thickeners (10-20% of the composition) are soaps, paraffin, soot. The size of the dispersed particles of the thickener is 0.1-10 microns. Up to 5% of the composition can be occupied by additives with

extreme pressure, antiwear and conservation properties.

The main performance characteristics of lubricants:

Ultimate strength is the ability to be held in friction units under inertia. Depends on temperature - decreases with increasing.

Viscosity - decreases with increasing temperature, worsens antiwear properties.

Colloidal stability

The dropping point is the temperature at which the first drop of lubricant falls. On the basis of the liquid, there are low-melting (60 degrees), medium (60-100) and refractory (over 100)

Water resistance

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Mechanical stability - with a poor performance, the lubricant quickly collapses, becomes liquid and flows out.

By the type of thickener, liquids are soap (based on thickeners of organic and inorganic nature) and hydrocarbon.

The nature of the wear of the splines indicates the presence of "hot" seizure - the destruction of a thin film under load and increased temperature in the contact zone of the formation of seizure centers. Therefore, it is so important to select high-quality lubricants.

Heavy-duty guides, universal joints for propeller shafts with varying bearing speeds, pivots, splined shafts and threaded connections require a multi-purpose lubricant, as do bearings and other components subject to continuous loads. Correctly selected fluid is cold and hot water resistant and has excellent resistance to contact pressure, lateral deformation and aging. It also needs to protect against corrosion and reduce friction and wear.

To protect the components, liquids with solid additives are selected, which enhance the action of extreme pressure additives. The additives are graphite or molybdenum disulfite. The former is active at high temperatures, the latter during severe wear. With a high load of spline joints, greases with a high welding load should be selected. With a lower load, universal fluids come in handy. Lubrication of splined joints and crosspieces of the propeller shaft

The spline joint needs to be replenished regularly with grease. Otherwise, it wears out, backlash or jamming is formed. This leads to vibration in the driveline and damage to the flexible coupling.

Lubrication procedure:

Locking the front propeller shaft against rotation and swinging the elastic coupling. Make sure that there is no corner plug in the connection.

Inspection of the coupling and intermediate bearing. If there is rubber detachment from metal, rupture or cracks, spare parts need to be replaced.

Cleaning the plug from dirt, unscrewing, installing a grease fitting in its place.

Lubricate with a syringe until grease comes out through the flange gland.

Unscrewing the grease nipple and replacing the plug.

However, the grease nipple does not need to be replaced with a plug - it can remain in the spline connection until the next lubrication.

Lubrication of the splined joint of the propeller shaft can lead to errors, as most modern shafts are made with a plastic coating to provide sliding with a minimum amount of lubrication. Auto specialists may overfill the connection with grease, which will be indicated not by its exit from the spline clearances, but by squeezing out the inner plug and leaving it in the shaft pipe.

This leads to strong vibrations during acceleration. If the lubricant enters the pipe and is distributed unevenly along the walls, then there will be a noticeable imbalance. If this happens, the problem can only be solved by disassembling the shaft - the tube will have to be cut on one side. It is cleaned inside, the plug is welded and the connection of the shaft and the end of the pair is restored. This requires the manufacture of an adapter sleeve, which is inserted into the tube and scalded. The elimination of the problem is completed by fine balancing, which makes the shaft as good as new.

The restoration of spline joints is carried out according to the results of the assessment of the condition of the entire joint. The procedure for carrying out repair or restoration work depends on the type of fit of the product, the degree of wear of each part. The most common ways to troubleshoot found faults include:

- draft;
- distribution;
- compression;
- indentation;
- editing;
- knurling.

The solution to these problems is carried out by the following methods: mechanical processing (using metalworking machines, hydraulic presses, manual processing);

- welding and direction;
- metallization;
- galvanic method.

If minor defects of the slot appear, repairs can be carried out using the distribution method. For its implementation, a hydraulic press is used. Under pressure, the material used for the repair is forced into the bore of the bushing. Then it is re-calibrated. Similar actions can be carried out using the so-called spline broach. All excess metal is removed. Then it is milled and processed until the hole reaches the specified size.

With a high degree of wear, surfacing is carried out using an electric arc apparatus. Another option for repairs with a high degree of wear is edge welding. These methods, after appropriate processing, allow you to obtain the original size of the groove. Repair of splines is allowed when the groove is first widened and deepened. Such an operation allows you to eliminate all kinds of causes of the malfunction. Then a stepped key is made to it. This method is used in cases where other methods are not acceptable.

The distribution is done in two ways. The first involves carrying out the operation manually. The second is with the use of pressing equipment and special tools. Along the slot with a core, a longitudinal risk is applied. Next, the grooves are made with a chisel. To expand them and give the required shape, a minting is used. The final processing is carried out on a lathe or planing machine.

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The resulting grooves are completely welded. The slots are processed, and to give increased strength they are subjected to heat treatment.

Repair of spline joints in which wear in thickness is observed is carried out using welding machines. To fill the grooves, the prepared rollers are applied along the slots. Further welding works are carried out.

Worn parts located in steel hubs are restored by the reduction method. They are heated. Then the prepared slot is placed in the sleeve. Using a special punch, the part is crimped. This operation is performed using a mechanical hammer.

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