

CONTRIBUTION TO THE USE RHEOLOGICAL PROPERTIES OF MATERIALS IN MACHINING WITH A LUBRICANTS

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Abstract

The aim was to focus on the use of rheological properties in Engineering Technology. The lubricant is closely related to friction and wear very process. One of the factors affecting the quality of machined surface are lubricants that protect material of workpiece and have a positive effect on wear. Using the cutting tool with lubricants less heat goes into the workpiece.

Key words

rheological properties, friction, wear, lubricant, materials, plasticity

Introduction

The lubricant is one of the part in machining process which has ensured a lifetime of tools, providing a reduction in friction between the cutting wedge and working materials. The lubricant also has a functional role which is corrosion protection. Rheological behavior of lubricants has an important role in technological operations

The science of rheology

Rheology is the scientific discipline that deals with examining the relationship between stress and deformation of matter. It is therefore a special area of mechanics, involving traditional scientific disciplines such as elasticity and fluid mechanics of Newton. It can be applied to material that is not possible to describe the theory of classical disciplines.

Rheology connects seemingly unrelated field of plasticity and non-Newtonian fluids on the basis of the findings that both types of materials under the influence of shear stress permanently deformed. One of the main objectives empiric rheology is the relationship between the deformations and tensions [3].

From the foundations of physics we can divide materials into two categories. In the first group are materials with solid bodies, which are characterized in that retain their shape as they are not subject to external effects, eg. force or pressure.

The second group consists of liquid substances, which themselves include liquids, gases and vapors. Are characterized by giving them the shape of the container in which they are located, for example. cubic or cylindrical vessel, or pipe, etc..

This category is divided into two subgroups. The first contains a liquid whose volume is constant. Group of gases and vapors is characterized by spontaneously expands and occupies a volume of any container.

Rheological properties of liquids are significantly influenced by temperature, therefore in many cases important to know the relationship between temperature liquid and its rheological properties.

Application of rheological or viscosity models for calculating the various parameters of process is not easy, quite the contrary. It is a relatively complex calculations, which are used mostly empiric relations.

Rheology has applications in various sectors in medicine, geology, plastics in the manufacture of very complex shapes forms. Has an important place in the construction industry in food as well as in the engineering industry in the transport lubricants.

Friction and wear surface components

Generally the contact surfaces of two bodies in relative motion there is friction. Wear may have several forms depending on surface topography, surface contact conditions and environment bodies. Intensity of wear of friction pairs can directly influence the choice of a suitable lubricant, or using additives that improve the properties of lubricants at high pressures and temperatures. In the selection of lubricants is necessary to pay attention to the geometric shape of moving parts the quality of their wear, surface roughness, and especially dirt that may get into the functional areas of the environment.

Distribution and properties of lubricants

The lubrication is a separate process, which is semantically equivalent to the processes of friction and wear.

Properties of lubricants can affect [5]:

- lubricating,
- mechanical energy loss reduction and improving the mechanical efficiency of the system,
- ensure heat dissipation,
- functioning as a lubricant sealant,
- corrosion protection,
- Protection against dirt crunches.

Lubricants by type and use in engineering practice to divide [2]:

- oil for internal combustion engines and stationary,
- aviation oil,
- compressor oil,
- oils for steam turbines,
- turbine oil,
- bearing oil,
- gear oil,
- hydraulic oil,
- lubricants for machining,
- special oils.

The lubricant to meet their duties, must have suitable rheological properties and sufficient ability to maintain these properties as the longest time during the application of various effects, which is exposed during operation. It is mainly the effect of temperature, oxygen, pressure, dust, humidity, light, radiation, effects of metals and electric field.

The functional properties include: density, viscosity, rheological properties, surface, electrical and thermal properties, compressibility of liquid lubricants, flash point and fire, explosive and the miscibility of lubricant and solvating power.

For lubricant properties are also affected by time and storage life of lubricants, namely its aging. The technology practice, if the temperature of the oil increases, oil life in the lubrication system is reduced.

One important factor affecting the quality lubricants as additives to lubricants.

In terms of the effect of additives can improve only one or more properties at the same lubricant.

Today, using new synthetic fluids and lubricants, which are particularly beneficial in reducing energy consumption, reduced costs, greater reliability of machines and production increases.

Each group has its lube oil characteristics that are evaluated under laboratory conditions.

Laboratory tests used for evaluation of the lubricants [4]:

- determine the low temperature viscosity oils, ASTM D 2983,
- determination of foaming oil, STN 65 6238,
- determination of evaporation by Noack, DIN 51 581,
- determination demulsification characteristics, STN 656229,
- determining separability air, STN 65 6260,
- determine the penetration cone, STN 65 6507,
- determination of the liquefaction, STN 65 6305,
- determine the colloidal stability of greases, STN 65 6331.

Other analytical methods for assessing the properties of lubricants include [5]:

- determine the freezing point of the lubricant,
- setting colors,
- determination of carbonization residue,
- determination of ash,
- determination of kinematic viscosity.

As well as oil and water soluble lubricants and greases use in engineering technology. Parameter representing the properties of greases is called penetration. Another important feature is the consistency of grease and is dependent on the type and amount of thickener. These lubricants are designed for short-term lubrication.

Conclusion

The allowances were given only some information from the fields of application of rheological properties of lubricants. In practice, we must pay attention and care not only machinery but also lubricants, as well as those subject to wear, thus losing its ability to meet requirements that are imposed on them. Therefore implemented a quality control lubricant as well as relevant laboratory tests.

The area of investigation of the rheological properties of materials is very topical, it requires knowledge of the production, application of lubricants and also need experience of testing and evaluation of properties of lubricants in practice.

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