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IMPACT OF METAL WIRE ON THE TRIBOLOGICAL PARAMETERS OF THE FICTION LINING

FOR THE MOTOR VEHICLES CLUTCHES

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***Abstract*—Clutch is a friction mechanism, which is placed between the engine and the gear box. It transfers the torque from driving to working part. The clutch should have stable working characteristics, working life as an ecological environment. The main reason for the insufficient life of the clutch is the occurrence of sliding in the process of engagement/ disengagement, overload of the clutch and the number of engagement. In order to the increase the working life of the clutch a big effort has been done to improve the quality of friction linings. Since most of the factors which impacts on the lining quality is the percentage of metal wire in the lining. This paper shows results of extensive experimental testing.**

Key words: motor vehicles, friction clutches, linings, parameters of the friction

I. INTRODUCTION

The friction material is one of the important features of the clutch. The friction material is composed of the impregnate and thread. The friction materials may generally be divided into two groups:

- asbestos (which is banned for use in multiple countries)
- non-asbestos materials

Both of them have basically same structure, determined by four main components:

- string (mesh)
- charger
- adhesion means and
- friction modifiers.

There are two technologies for the manufacture of friction linings:

- adhesive means on the basis of caoutchouc and resins, are predominant
- adhesive means on the basis of water dispersion (synthetic latex), are less frequently used.

Components of the lining can be divided into two parts: thread and impregnate

Impregnate composition is:

- latex (main raw material),
- networking,
- fillers,
- stabilizers,
- modifiers etc.

The thread is drawn:

- glass,
- organic materials (cotton, rayon, etc.),
- metal (copper, brass)

Depending on the method of spinning the thread there is:

- the copper (brass) wire with glass and rayon filaments spin together
- the copper wire is located on the surface of the thread (glass and rayon)

Characteristic of the thread is that the copper wire is located on the surface of the thread.

This is of great importance because copper has a specific thermal conductivity **λ=372[W/m°K]**, glass filaments **λ=0.76 [W/m°K]**, rayon filaments- cotton **λ=0, 07[W/m°K]**. Copper contact with impregnate, metal parts (flywheel, pressure plate) is larger, and thus the heat drainage is greater. [2],[3],[4],[5].

II. AIM OF THE RESEARCH

The aim of the research is to determine the impact of the metal wire (copper, brass) on the lining tribological parameters.

III. RESEARCH

In order to get the information about the impact of the metal wire (copper, brass) on the tribological parameters linings of the motor vehicle clutches, the following testing, based on the following approach, is done:.

-The tested linings are made of material produced by the adhesive means on the basis of water dispersion (synthetic latex),

- Linings with dimensions **ϕ350/ϕ195/3.5**

- The composition friction linings:

- Thread (glass 67%, rayon 25%, **copper 8%)**52%, impregnate 48%
- Thread (glass 64%, rayon 25%, **copper 11%)**52%, impregnate 48%
- Thread (glass 62%, rayon 25%, **copper 13%)**52%, impregnate 48%
- Thread (glass 58%, rayon 25%, **copper 17%)**52%, impregnate 48%
- Thread (glass 62%, rayon 25%, **copper 20%)**52%, impregnate 48%

-The testing was made on a testing stand for friction clutches with the following way of work:

- number of the revolutions: **n=1600** [rpm];
- inertial momentum of the rotating mass: **J=10.22** [kgm^2];
- specific workload: **a=107** [J/cm^2];
- engaging frequency : **f=1.5** [1/min];
- number of cycles: **N=1000** [-].

-The linings are hammered to a disc and are placed on the testing stand. The lining is worked up by a minimum of 500 plugging-ins, in order to get a contact surface of the lining with 75% of its total surface.

IV. 4. RESULTS

Results of the testing are presented in table. 1

TABLE I. THE RESULTS OF THE TESTING LININGS

a) Composition (%)		Coefficient of friction μ	Coefficient of specific wear υ [cm^3/10MJ]
B. Thread (**copper**)	*C. Impregnate*		
52 (**8**)	48	0,342	0,84
52 (**11**)	48	0,352	0,83
52 (**13**	48	0,362	0,81
52 (**17**)	48	0,374	0.72
52 (**20**)	48	0,380	0,69

The relation of the coefficient of friction and the specific wear with the copper/other substances ratio is presented on Fig. 1.

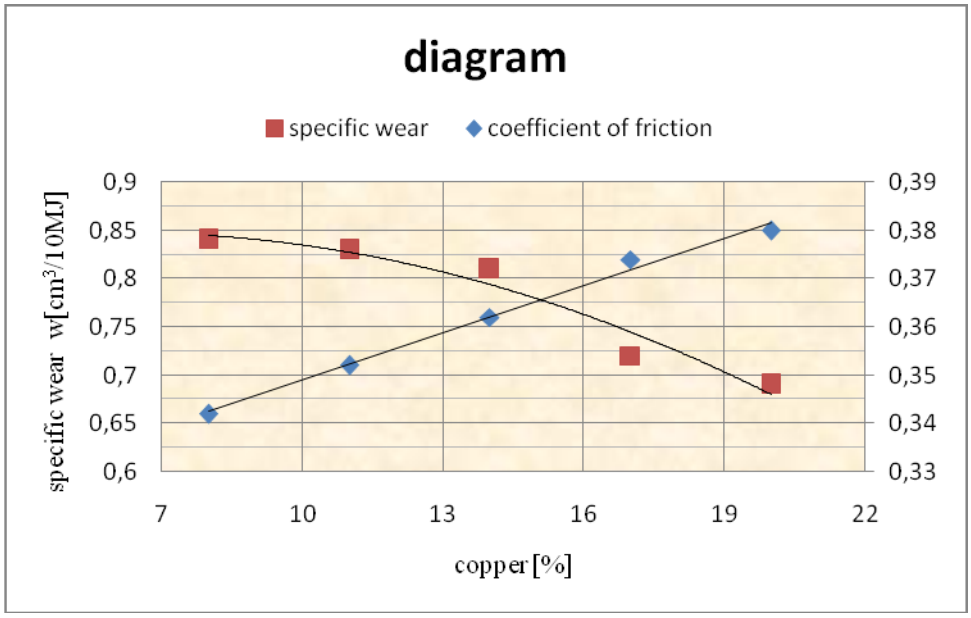

Figure 1. Fig.1 Dependence on the linings tribological parameters from the percentage of copper

V. ANALYSES AND CONCLUSION

The diagram shows that the higher the percentage of the copper, the larger the coefficient of friction is, and the specific wear is smaller. Copper such a good conductor of heat, it carried to the metal parts of the clutch, and thus has a lower temperature of friction surfaces lining. At lower temperatures there is less wearing of linings, and a higher coefficient of friction.

These dependence are shown with a second-order curve and linear curve

- **$y=-0,0009x^2+0,0108x+0,8139$** (specific wear)
- **$y=0,0033x+0,3163$** (coefficient of friction)

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