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STUDIES AND RESEARCHES CONCERNING ABRASIVE WEAR RESPONSE OF THE STEEL-BRONZE FRICTION COUPLING

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ABSTRACT: The present work presents the research method, materials used as well as testing equipment for abrasive wear checing of friction coupling type ring- block, steel bronze.In the Conclusion paragraph, after the description of the machine, the experimentally resultats for the friction coupling stel-bronze(rinng-block) are showns, under the form of tales and diagrams,After the experiment, it was concluded that the wear for this coupling raises with the pushing force and relative velocity.

1. Introduction

The abrasive wear is caused by the presence of hard particles between contact surfaces or due to rougher asperities of one of the contact surfaces, the respective wear being easily recognizable by the disperse or oriented traces of micro-cutting.

The hard particles could result subsequent to a previous shearing of some junctions (adhesion wear), breaking of metal pieces from the rougher surface layer (stress wear) by detachment and evacuation of the material resulted from some pitting.

The abrasion wear is a complex phenomenon; the necessary condition for the occurrence of abrasive wear is represented by the difference in hardness, however it could be produced by a surface of higher hardness following the friction with a softer surface, if the metal transfer intervenes.

The first qualitative dependence which connects the wear to materials' characteristics and the conditions not connected to friction has been enunciated in 1937 by Tonn, Hrusciov and Babicev (1956-1958) globally recognized for the researches undertaken in this domain; they have asserted and developed the researches performed by Tonn by assimilating the asperities as cones, if these would be considered pyramids, the proportionality constant would be modified.

2.Wear-testing machine

Due to a multitude of factors that are involved within the wear process of machinery, the research of member's wear directly under operation is difficult.

This, it is necessary to ensure some identical testing conditions for all pieces subject to testing and at the same time the selection of a more appropriate method of study is needed in order to analyze the erosion phenomenon of the superficial layer thorough the wear process.

The wear-testing machines allow the study of each factor which influences the wear process.

The wear process could be studied on the built machine depending on the following factors:

- the contact specific pressure which can modify by adding some weights on the pan fixed at the end of the sample testing lever causing the increase or reduction of contact pressure;
- the rotative pin speed is achieved by modification of belt driving report;
- type of study material and its use either as a bearing or as a pin; thus, many friction couplings could be obtained.

The wear-testing machine is displayed in Figure 1, as well as its main components.

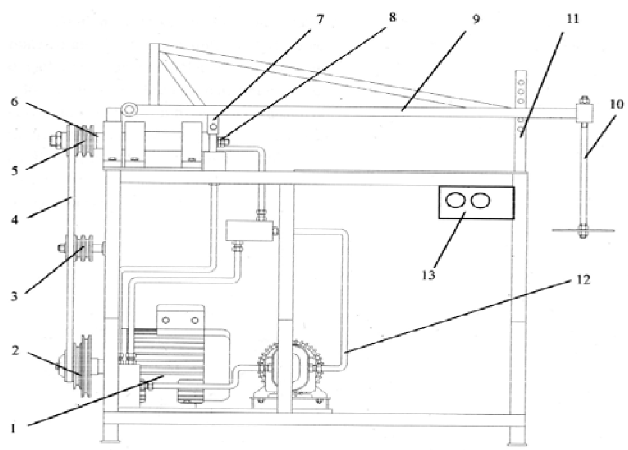


Figure 1. Wear-testing machine

1 – electromotor; 2- inferior belt pulley; 3- belt idler; 4 – belt; 5 – superior belt pulley; 6- shaft; 7 – special device for clutch gripping; 8 – adjusting nut of spindle on the motor shaft; 9- lever; 10 – seat for loose poises; 11-lever guide suspension device; 12 – lubrication system; 13 – keyboard.

3.Work procedure

A. The bushes dimensions shall be taken (internal diameter, outer diameter, length). The experimentation rotative speeds shall be established by modification of belt driving report.
B. Weights shall be placed on machinery pan with the purpose of measuring the pressure force.
C. During working hours, the stop watch shall be set to start in order to find out the testing period and the samples' behaviour at wear shall be noticed. After an already established time interval, the chronometer shall be stopped.
D. After operation, the samples are removed from the gripping device and the contact surfaces are analyzed, by determining their wear rate. The wear shall be observed by means of weighting method.

The ring has been made up of OLC45 and the friction clutch of CuSn 8.

4.The interpretation of results

A. Many tests have been performed on samples having the same sizes, of the bronze clutch type and steel ring by changing the pressure force during a three-minute interval.

Following these experiments it has been noticed that the wear process increases as the pressure force increases.

The rotative speed at which these experiments have been executed amounts to 1500 rot/min. The results are displayed in table 1 where the wear on a 1000-metre distance has been noted by ΔM/ 1000.

B. Many tests have been performed on samples having the same sizes, bronze clutch and steel ring by changing the rotative speed from 750 rot/min to 1500 rot/min, during a three-minute interval.

Following these experiments it has been noticed that the wear process increases as the rotative speed force increases, if the pressure force remains constant.

The results are displayed in table 2 where the wear on a 1000-metre distance has been noted by ΔM/ 1000.

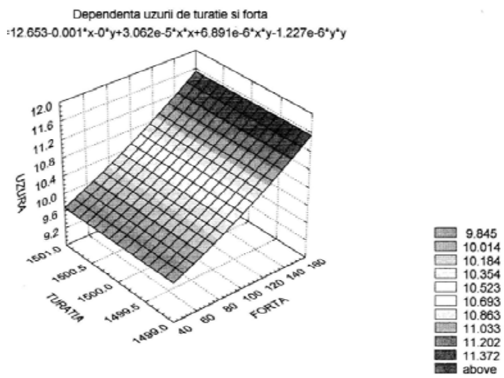
The results from table 1 and 2 are showed in figures 2 and 3, with regards to ring wear process (figure 2) which has been made of steel, and the bronze clutch wear is represented in figure 3.

Table 1 – The influence of contact pressure

Nr crt	Couple Ring - Clutch Steel-Bronze	Force [N]	Initial weight [g]	Final weight [g]	Weight variation [mg]	Time [min]	Rotation [rot/min]	ΔM/ 1000m [mg]
1	Ring	50	73,8992	73,8890	10,2	3	1500	9,0
2		100	73,8992	73,888	11,4			9,9
3		150	73,8988	73,8864	12,4			10,9
4	Clutch	50	30,6089	30,6077	12,0			10,6
5		100	30,6083	30,6067	12,6			11,1
6		150	30,6199	30,6065	13,4			11,8

Table 2 - The influence of rotative speed

Nr crt	Couple ring-clutch Steel-Bronze	Rotation [rot/min]	Initial weight [g]	Final weight [g]	Weight variation [mg]	Force [N]	Time [min]	ΔM/ 1000m [μγ]
1	Ring	750	73,8992	73,8891	10,1	100	3	8,9
2		150	73,8992	73,8876	11,6	100		10,2
3	Clutch	750	30,6199	30,6079	12,0	100		10,6
4		150	30,6199	30,6067	13,2	100		11,6



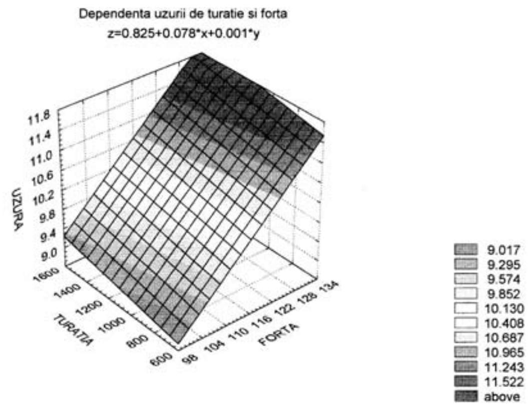


Figure 2.

Wear process influence by force
Steel ring (OLC 45)

Figure 3.

Wear process influence by force and and speed speed
Bonze clutch (Cu Sn8)

5.Bibliography

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