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MEASURING THE COEFFICIENT OF FRICTION IN THE BEARINGS IN THE ADOPTED FOUR-MEMBER MECHANISM FOR UNSTEADY MOTION

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Abstract: *The bearing shell on which the measurements were performed have three different diameters. The material of the bearings is polytherafluorethylen (PTFE) and polyamide 6.6 with addition of molibdenite (MoS_2). The mechanism is analyzed for two different angle velocities of the operating part. Forces in the mechanism were determined using the computer. These forces were derived without taking in account the variable load on the bearings, and the results were presented graphically.*

Key words: *bearings, sliding bearings, lubrication of the bearings, the coefficient of friction*

1. INTRODUCTION

If designed and lubricated correctly, the plain (Sliding) bearings can carry heavy loads at a high rotational speed. These bearings are light in weight, have small radial dimensions and do not require special equipment for manufacture.

Plain bearings offer the advantage of noiseless operation and a high damping ability under cyclic and impact loads.

The reducing friction in bearings is often important for efficiency, to reduce wear and to facilitate extended use at high speeds and to avoid overheating and premature failure of the bearing. Essentially, a bearing can reduce friction by virtue of its shape, by its material, or by introducing and containing a fluid between surfaces or by separating the surfaces with an electromagnetic field.

2. MEASUREMENT METHODS AND MATERIALS FOR BEARINGS

We used these materials for our experiments:

Poly (difluoromethylene), which is produced under various names (U.S. teflon; Japan-polyflon, etc.), belongs to thermoplastics most resistant to high and low temperature $(190^{\circ} - 260^{\circ}\mathrm{C})(83 - 535\ \mathrm{K})$.

These materials manufactured in the form of plates, profiles, tubes and more recently in the form of foil.

Polyamide 6.6 with the addition of molybdenum disulphide (MoS_2) is also known by various names (U.S. plaskon, Zytel, Germany-ultramid, durethan;

England-maarnyl, etc.), and is one of the thermoplastic poly condensate (Pllana, 1984).

Materials	The coefficient of friction	Fraying (μm/Km)
POLIAMID 6.6+ MoS2	0,32 to 0,35	0,7
TEFLON (PTFE)	0,22	21

Tab. 1. Coefficient sliding friction and the amount of consumption in dry friction

Mechanical Properties by			Materials	
			TEFLON (PTFE)	POLIAMID 6.6+ MoS2
DIN 53 455 53 371	Yield on the train	N/mm^2	15	(80) 50
DIN 53 452	Yield bending	N/mm^2	19	(94) 27
DIN 53 371	modulus	N/mm^2	400	(3200) 1500
DIN 53 455 53 371	Elongation at break	%	400	(130) 250
	Volume weight	kg/m^3	2200	1150

Tab. 2. Some mechanical features of these materials (*Values in parentheses for polyamide refer to dry material, *Values outside brackets refer to polyamide 4 months after the normalization of the air at 20^0 C and 65% relative humidity (the manufacturer)

In our experiments, we performed measurements of the impact force moments of friction, coefficients of friction and angle of friction in the bearings, for this purpose a specially constructed mechanism which is shown in Fig.1.

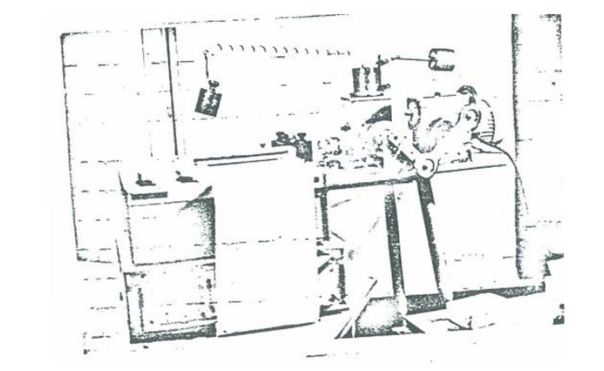

Fig. 1. The special device, designed for the research of the friction coefficient in sliding bearings

3. PLACENTA SLIDING BEARINGS

The influence of the forces on the bearings investigated by changing the placenta of sliding bearings in the working link mechanism.

These placentas were done in three dimensions inside diameter, and to 60 mm, 70 and 80 mm. The fig. 2 shows the two test sample.

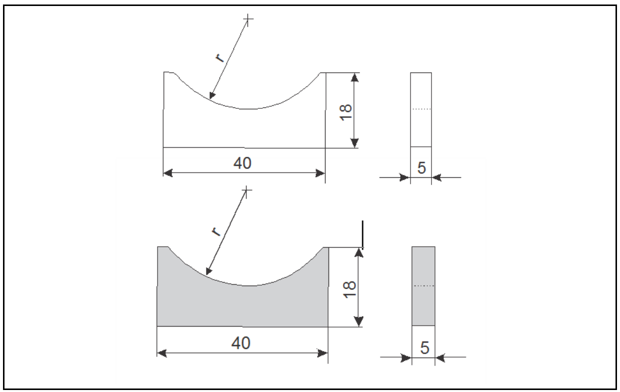

Fig. 2. Dimensions of test samples: a) TEFLON (PTFE), b) POLIAMID 6.6+MoS2

4. THE CALCULATION OF THE FRICTION COEFFICIENT

Based on the diagrams for all combinations of loads, of speed of the samples of sliding bearings and of change of the angle oscillating link mechanism, and by using the calibrated chart, and the above mathematical procedure, were constructed tables of calculated moments of friction.

From these results the appropriate coefficient of friction for the defined characteristic points of the oscillatory link mechanism has been calculated radial forces of different weights:

	G (N)	F_R (N)
1	20	189,3
2	40	378,4
3	60	567,6
4	80	756,6
5	90	851,4

Tab. 3. Calculated friction coefficients

5. RESULTS

For each radial force were obtained curves for the case with lubrication (LIS grease and without lubrication), Fig. 3 and 4.

a) the case when the experiments were carried out without lubrication

b) the case when the experiments were performed with lubrication (grease LIS).

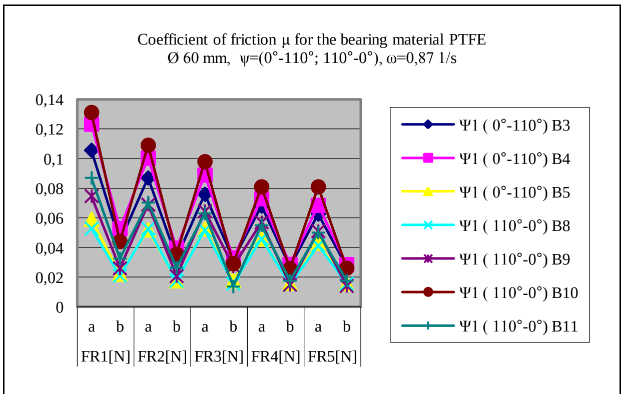

Fig. 3. Coefficient of friction µ for the bearing material PTFE Ø 60 mm, ψ=(0°-110°; 110°-0°), ω=0,87 1/s

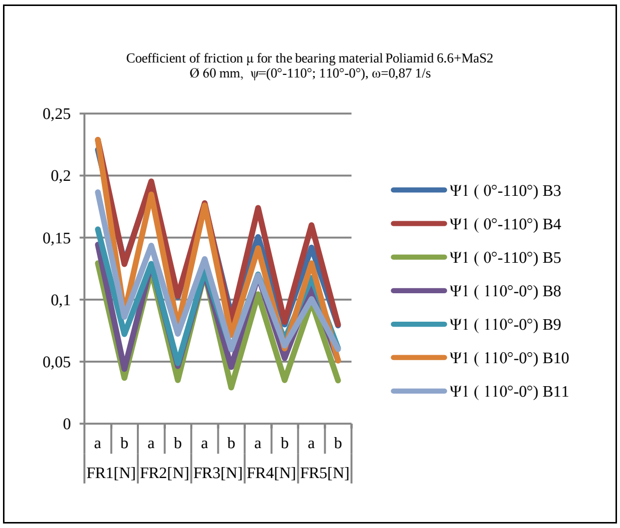

Fig. 4. Coefficient of friction µ for the bearing material Poliamid 6.6+MaS2; Ø 60 mm, ψ=(0°-110°; 110°-0°), ω=0,87 1/s

6. CONCLUSION

On the basis of experimental tests in the adopted four-member mechanism of the device for testing the placenta sliding bearings, this can be concluded:

1) In most experiments it has been confirmed that the friction coefficient in the sliding bearings decreases by increasing the radial forces in the placenta of the sliding bearings.

2) In terms of lubrication, the coefficient of friction is reduced by approximately half the value without lubrication. 3) Considering the low values of the coefficient friction for both materials, there is the possibility of replacing the expensive Teflon with polyamide 6.6 with the addition of molybdenum disulphide (MoS2).

4) With the measurements it is proved that by increasing the dimensions of sliding bearings it comes to the decreasing of the friction coefficient, and thus also to the decreasing of the moment of friction.

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