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FINPLAST, A PROCEEDING FOR OPTIMIZATION THE PERFORMING OF ANTIFRICTION MATERIAL SURFACES

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Abstract: **FINPLAST** *it's a solution for up grating the trybological performing of antifriction material surfaces of sliding bearings. Finplast is an extension of the cold plastic deformation proceeding in the domain of finishing of sliding bearings. This proceeding was researched by the author in the field of production after studying the effect of metal cutting by finishing surfaces of sliding bearing. The paper presents the device for obtain the surfaces for study of the influents of FINPLAST proceeding parameters over most important tribological parameters. The paper presents the visual aspect and roughness profile of surfaces obtain by FINPLAST proceeding.*

1. GENERALITIES

The ideea of the original procedure proposed by the authors has started from the necessity of bearing surface treatment in naval repairs. Therefore the author had to finish the bearing contact surfaces by cutting procedures only. In these circumstances the author had to find a solution and conceived this type of procedure.

The performances obtained have been more than satisfactory. The deep modifications of materials as a result of cutting procedure constitute another argument for using this type of procedure [1], [2]. According to these evaluations, as a result of cutting procedure, the superficial layer of the treated material presents a modified structure on a certain depth.

This modified structure contains more layers with different structures. The values of the layers' thickness are variable according to the cutting procedure used [1].

Among these layers, the Beilby layer, highlighted since 1903 and experimentally confirmed after three decades, presents a fine crystalin structure (with a great density of dislocations) up to an amorphous state, rougher than the basic material. It is important to obtain this layer and maintened after the finishing [2].

The distortion wave, which is formed during the deformation caused by the cutting procedure, due to the high degrees of deformation to which the crystallin structure is subject to, gives birth to a stronger cold-hardening of the Beilby layer. From the same reasons the thickness of this layer increases.

2. THE DESCRIPTION OF THE PROCEDURE AND THE TECHNOLOGICAL PARAMETERS

The originality of the procedure is given by the use of the cold plastic deformation when finishing the contact surface of antifriction material of the sliding tribological couplings.

Previously, these surfaces were obtained through a cutting procedure. According to the literature of speciality[1] (as in the description above), as a result of the cutting procedure the surface presents in depth a layer with different characteristic structural modifications which is named by the author „a layer influenced by cutting". For this layer the author proposes its notation with SIA [1]. Also as a result of the cutting procedure, on the surface plane geometrical deviations are obtained under the form of ondulations, asperities, etc. Having in mind that the posibilities of finishing the antifriction alloys through cutting are reduced, the improving of the performances both on the surface plane and in depth plane is solved by the help of other procedures. Besides other procedures known in the literature of speciality, the author considers the proposed procedure very useful. As we can see in figure 1 the procedure is very simple.

This one deals with the sag of the semifinished material transformed through cutting, under the action of the lay-on roller. The main technological parameters of the procedure are:

- *F – rotary force;*
- *N – number of passings;*
- *If the contact is or is not lubricated during the processing.*

Besides these parameters, the processing results could be influenced by other measurements too, such as: rotary speed, which is equal to the displacement of the device mass, the asperity of the lay-on roller and its roughness, the hardness of the device and the precision of the relative position between the roller axis and the mobile mass plan, the steadiness of the rotary load and speed, the thickness of the antifriction material, etc.

The roller diameter is necessary to be correlated to the thickness of the antifriction alloy layer first. In order to avoid the adherance of the antifriction material on the roller surface, liquid and solid lubricants can be used.

3. THE DESCRIPTION OF THE DEVICE IN USE TO OBTAIN STUDY SAMPLES

For the study of the proposed procedure, two rectangular steel (OL 37) plates, one coated through plastic deformation with alloy AlSn10 and the other with alloy CuPb5, deposited through warm sintering. Both materials are used in the series production to get sliding bearings.

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Fig.2. Detailed view of device

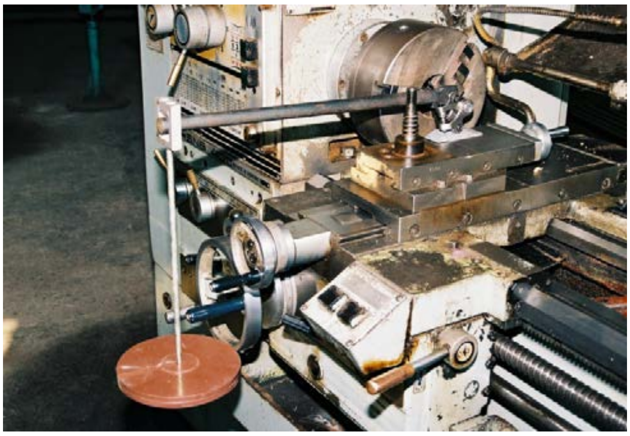


Fig.1. General view of device for finishing test surfaces

To obtain the study surfaces and the thickness of the antifriction layer, the frontal facing of the semifinished materials on a normal lathe has been used. In order to do this the study plates have been fixed on a rigid plan support, fixed in the lathe universe. The facing of the alloy AlSn10 has been achieved with the following technological parameters: rotation n=60 rot/min, radial advance s=0.14 mm/rot, and the cutting depth t= 0,57mm. For the alloy CuPb5 have been used: n=460 rot/min, s=0.18 mm/rot, t =0.5 mm.

In order to get study samples a very simple device has been conceived in conformity with the pictures in figure 1.

In tabel 1, are presented tehnological parameters of FINPLAST, for obtaind the study surfaces, and test identification number.

Tabel 1

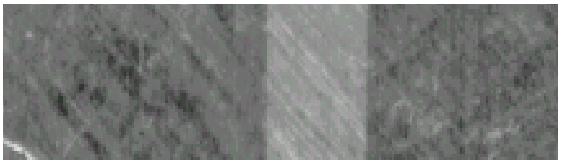
Ident. number AlSn10	*F rotary force* [daN]	*N number of passings*	*Lubri-fication ?*	*Ident. number CuPb5*	*F rotary force [daN]*	*N number of passings*	*lubrifi-cation ?*
1.1.	248.2	1	now	Reference standard			
1.2.	248.2	2	now	2.1	77,5	1	now
1.3.	248.2	1	yes	2.2.	248,2	1	now
1.4.	248.2	2	yes	2.3.	248,2	2	now
1.5.	248.2	3	yes	2.4.	248,2	3	now
1.6.	328.5	1	yes	2.5.	328,5	1	yes
1.7.	328.5	1	now	2.6.	328,5	2	yes
1.8.	456.2	1	yes				
1.9.	143	5	now				
1.10.	143	5	yes				
1.11.	77.5	1	yes				
Reference standard							

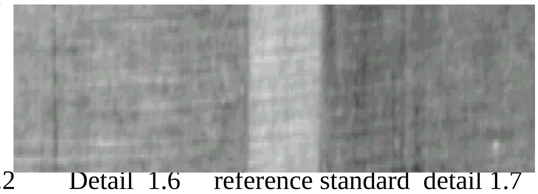
4. OBSERVATION AND CONCLUSION

As we can see in the picture, the device allows a wide range of modifications of the technological parameters descibed above.

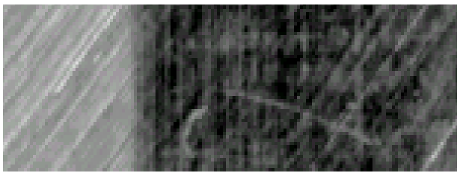
1.1 1.2 1.3. 1.4. 1.5 16. 1.7. 1.8. 1.9. 1.10. 1.11.

The scaned image of samples for ALSh10 scale 1/1





Detail 1.1 reference standard details 1.2 Detail 1.6 reference standard detail 1.7

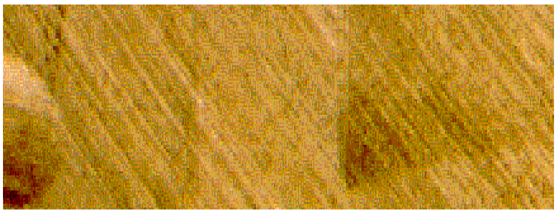


Reference standard detail 1.10

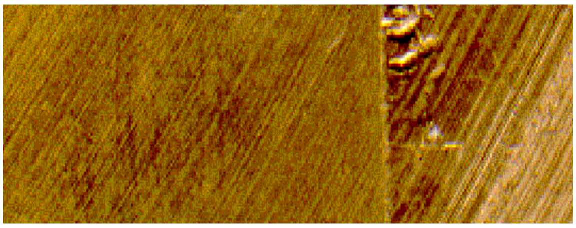
Fig.3 The scanned image of the sample study from AlSn10, next to the larged details of the sample studio surfaces

2.1 2.2 2.2 2.3 2.4 2.5 2.6

The scaned image of samples for CuPb5 scale 1/1



Detail 2.1 reference standard detail 2.2 Reference standard detail 2.5



Detail 2.6 Finishing mistake and next it disappears after using Finplast

Fig.4 The scanned image of the sample study from CuPb5, next to the larged details of the sample studio surfaces

With the help of this device more study samples have been obtained under the form of plane bands. From the details presented, one can observe that the study surfaces present visible modifications. In the same time on can also observe differencies between details according to the technological parameters used. This aspect expresses with no doubt the utility of the proposed procedure and the influence of the technological parameters.

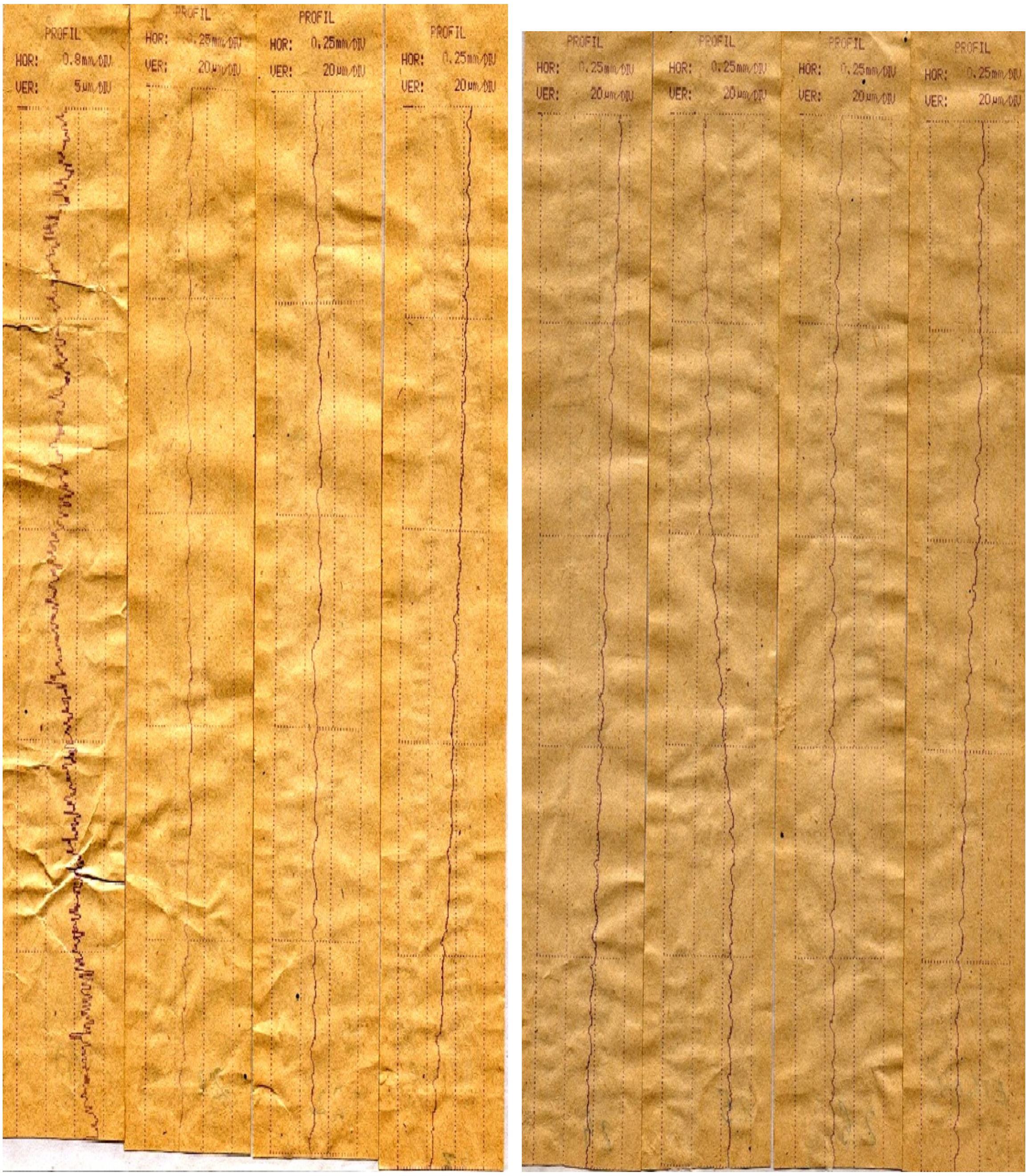
From fig.4, in comparison with figure 3, one can observe the different effect of Finplast finishing according to the antifriction alloy. In the same time ona can also observe the better homogeneity of the finished surfaces in comparison with those obtained through sintering. One can remark how the sintering defects shown in fig. 4, detail 2.6 are corrected. The result is a surface which is no different from the surface with no defects.

Test 1.1 test 1.2 test 1.3 test 1.4 test 1.5 test 1.6 reference standard original bearings surfaces

Fig. 5. The profilogrammes of some study surfaces together withthe surface resulted after chip remuving proces and original bearings surfaces from AlSn10 .

A more obvious effect is presented in fig.5 and fig.6. Here are presented the profilogrammes of some study surfaces together with the surface resulted after chip remuving proces, considered a reference standard. No matter the finishing parameters used it is observed the lack of asperities with a very sharp shape, characteristic to the profilogrammes of the cutting surfaces.

Thus, the detachement risk of these asperities (the piting phenomenon on the soft antifriction materials surfaces of the couplings) due to the weak links with the base state, respectively the fatigue due to oscillatory solicitations is highly reduced.



Reference Standard test 2.1 test 2.2 test 2.3 Test 2.4 test 2.5 test 2 test 2.7

Fig. 6. The profilogrammes of some study surfaces together with
the surface resulted after chip remuving proces and original bearings surfaces from CuPb5

In the same time, using this procedure one can achieve the possibility of a best structural configuration of the antifriction materials in the way defined by the author with structural preconfiguratin name.

5. REFERENCES

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[2**]** [3] **DASCALU D**., *FINPLAST, an ecological process*, proceedings of SNOM, Brasov, pp 109-112, ISBN 973-635-520-9, ,,TRANSILVANIA", University of Brasov, 9-10 June, 2005, Brasov, ROMANIA;