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UTILIZATION OF ENGINEERING PLASTIC MATERIALS IN ROLLING MILL COOLING BED CONSTRUCTION

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Abstract: In this paper is presented experimental research and simulation with finite element regarding at possibilities of using engineering plastic material in bearing construction of small shape cooling bed mechanism. Engineering plastic mechanism used in researches is Ertalon66SA, Ertacetal C, Ertalyte and PTFE. All these materials are studied relative at antifriction alloys based of Cu, Sn, Zn, Pb, in similar testing and exploitation condition.

1. INTRODUCTION

Cooling bed, component part of small shape rolling mill at Arcelor Mittal Steel Hunedoara, is one of most complex constructive-functional cooling bed. In construction of this cooling bed is present mechanism for each work phases, like deviation, brake and exhaust of rolled shape to cooling surface, [1].

This mechanism is composed from multiplication of base subassembly (like an myriapod mechanism), upon 120m. In construction of braking mechanism, line 1 and 2, is a lots of bushing made from antifriction alloys based of Cu, Sn, Zn, Pb and bolt made from quality carbon steel (OLC45).

Through large using of technical plastic material (for bearing, gear wheel, etc.) at low price, is possible replaced of antifriction material with this plastic composite. In this condition is studied behaviour of bearing and mechanical sub ensemble in laboratory and exploitation experiment.

2. EXPERIMENTAL RESEARCHES REGARDING ATTRITION BEHAVIOR OF STUDIED MATERIALS

Based of technical specification, is selected four technical plastic material ERTALON 66SA, ERTALYTE, ERTACETAL C and PTFE, [4]. These maybe replace antifriction alloy used now in construction of bushes (bearing), component part of braking mechanism.

In past years, is was reported researches related at replaced of similar bushes with another one made from metallic composite, used at high temperature (max. 250 ... 300^{0}C). For higher temperature, these metallic composite become abrasive and conduct to a premature out of service.

In this case, work temperature is not high, because subassembly is massive and is protected from heat radiation of rolled shape. Work temperature of these plastic composites is up to 100...120^{0}C, and is adequate for this purpose.

From each material category is turning test specimen (Ø4mm) and is cutting at 80mm length, figure 1. Bronze test specimen is made from used bushes (is cutting a part of bushes and is made sample of this part).

Figure 1- Test specimen for attrition behaviour

Test was made on attrition machine, with block diagram presented in figure 2 Measurement it was made in 30 second period, for each period loading it was increase step by step.

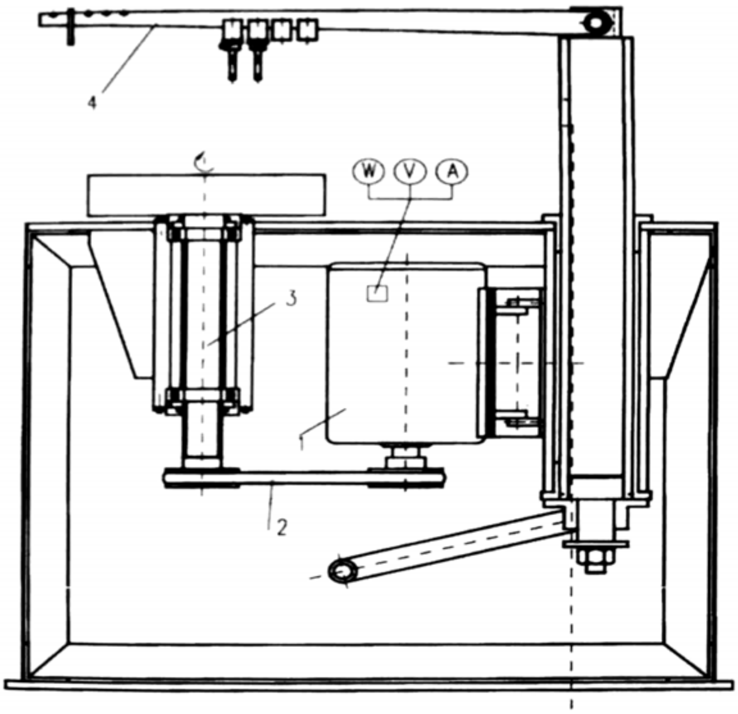

Figure 2- Diagram of attrition machine
1 electric motor, 2 drive belt, 3 vertical axes with revolving disc, 4 lever

Recording of attrition was made with digital electronic Balance Sartorius CP22025-OC, with automatic calibration and 0.01 gram accuracy weighing. In figure 3, 4 and 5 is presented absolute and cumulative attrition depending on loading, for some of studied material PTFE, bronze and Ertalyte. In case of Ertalon66SA testing specimen, is not recorded attrition for max loading, this plastic material having a better mechanical behaviour (is not presented an flexure produced by axial compression tendency like other plastic material).

Based on this experiments, if make a comparison between testing specimen, in case on bronze comparative with Ertalon66SA (per example), is observed an accentuated attrition (ridge formation), for bronze, presented in figure 6. Therefore Ertalon66SA have a better behaviour relative to bronze in this type of attrition test.

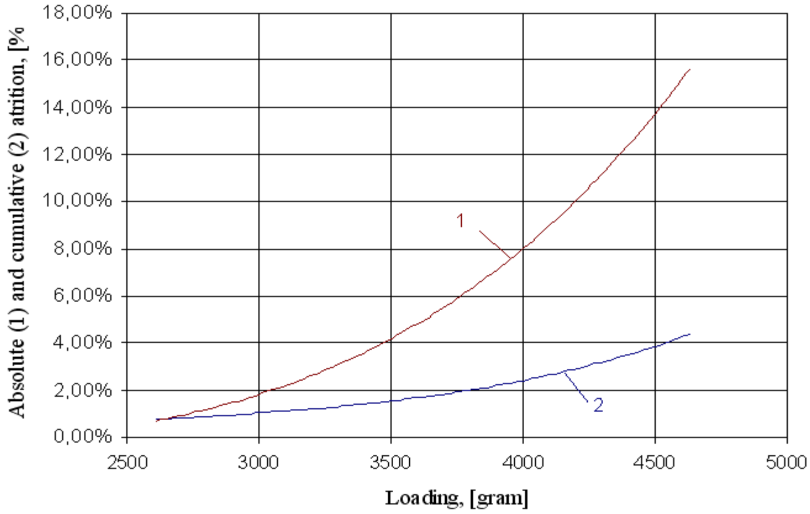

Figure 3- Dependences of attrition related at loading for PTFE

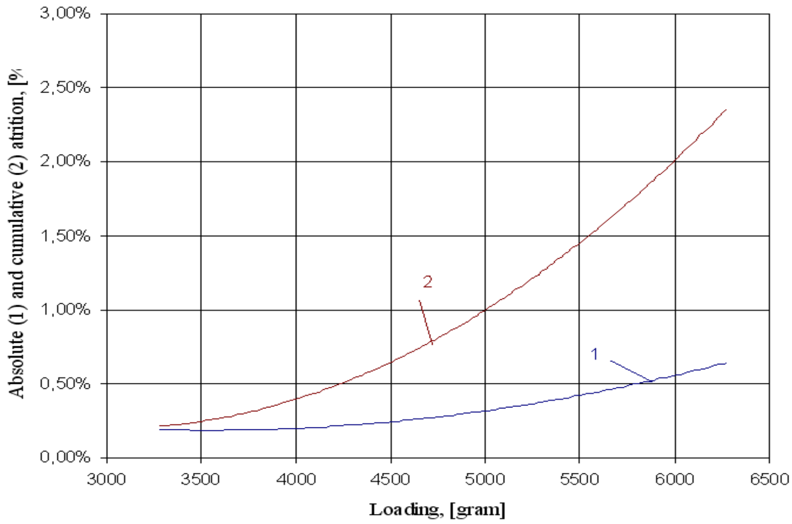

Figure 4- Dependences of attrition related at loading for bronze

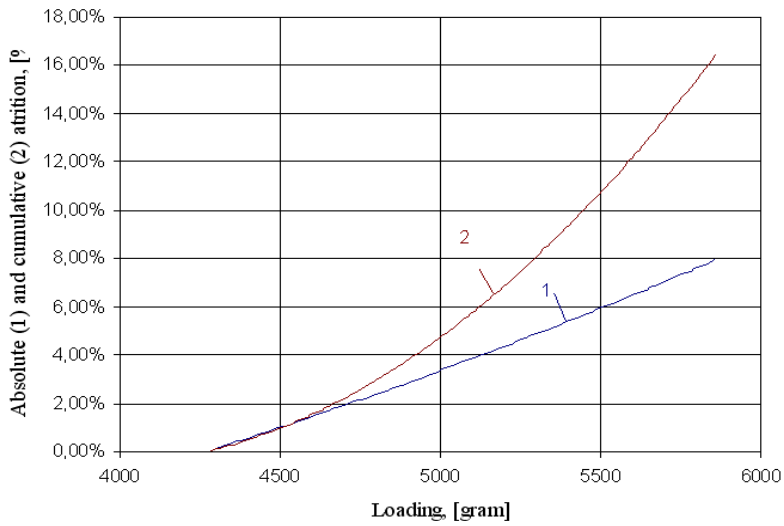

Figure 5- Dependences of attrition related at loading for Ertalyte

Figure 6- Comparison between bronze and Ertalon66SA test specimen

Using this researches, I made an experimental studies at 1:1 scale mechanism, where the bushes made from this plastic material is assembled, and is get a try out in exploitation, over the running in period, [3]. Angular velocity of crank is 60 rot/min, from continuous voltage motor and rotative speed is measured with a tachometer. Attrition after the running in period (more than 336 h and 10^6 cinematic cycle), [2], is measured also with Sartorius CP22025-OCE digital balance, before and after mounting and demounting in subassembly. Also Ertalon 66SA and Ertalyte are the lowest attrition from this engineering plastic material.

3. CONCLUSIONS

The studied bush is representative for the all bush component of these mechanisms. Replacing of bush material (composite alloys) with this technical plastic material is possible step by step when functional bushes is wear, and conducts to decreasing of exploitation costs and energy consumption, etc.

Materials with the best mechanical behaviour is Ertalon66SA and Ertalyte, but at the first one is not presented attrition, specially because is not presented an flexure produced by axial compression tendency, and for this is selected as principal replace material.

REFERENCES

1. Ardelean M., Ardelean E.: *Contributions to the improvement of cooling beds mechanism of profiled rolling mils*, Works of the 7th International Symposium “YOUNG PEOPLE AND MULTIDISCIPLINARY RESEARCH”, Reşiţa, 22th-23th September 2005;
2. Ardelean M., Ardelean E.: *Parameterisation and simulation of plastic composite bearing*, a VI-a Conferinţă Naţională cu participare internaţională Sebeş, Editura AGIR 2006;
3. Constantinescu V., ş.a.: Lagăre cu alunecare, Editura tehnică, Bucureşti, 1980;
4. *** - Dotmar engineering plastic products, Ertacetal C, Ertalyte, Ertalon 66SA.