7th INTERNATIONAL MULTIDISCIPLINARY CONFERENCE
Baia Mare, Romania, May 17-18, 2007
ISSN-1224-3264

EXPERIMENTAL RESEARCH REGARDING THE HD RADIAL BEARINGS IN THE CASE OF STATIC CHALLENGING WORKING

Marius Alexandrescu[1] , Eugen Pay[2], Radu Cotetiu[3], Mihai Tiron[4]
Lect. Ph.D. Eng.[1], Prof. Ph.D. Eng., Dr.h.c.[2], Prof. Ph.D. Eng.[3], Lect. Ph.D. Eng.[4]
[1,2,3] North University of Baia Mare, [4] "Gh. Asachi"Technical University of Iasi, Romania

***Abstract**: In the static charge, the scope of our experiments was to determinate the influence of the peripheric speed, of the start flow, of the pressure on the placement of the pressure, and we observe the dimension of the contact spot and the position of the maximal pressure.*
***Key words** : pressure distribution, radial hydrodynamic bearing, the lubricant film geometry.*

1 INTRODUCTION

This paper presents an experimental assessment made on a radial bearing with HD lubrication concerning the some results on the lubricant film geometry at hydrodynamic lubrication. The assessment was made on the experimental stand of the Tribology and Manufactural Engines Lab from the North University of Baia Mare (Fig. 1), making use of the modern technology concerning the results'processing and acquisition [5].

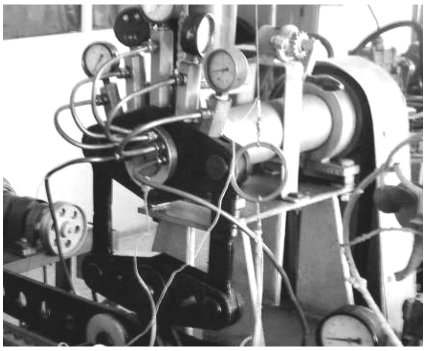
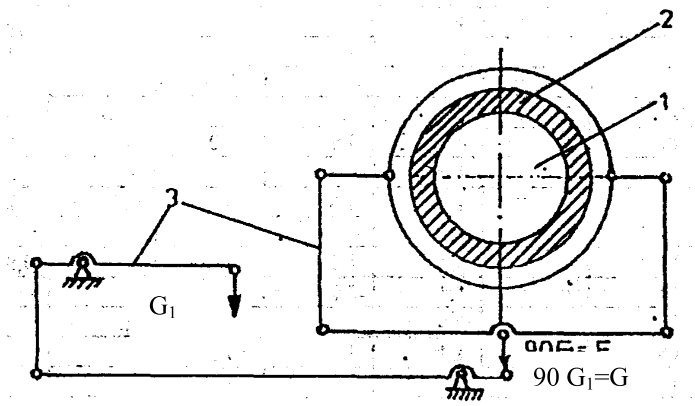


Fig. 1. *The testing experimental devices*

The experimental stand is made up of three parts: the drive system, the lubricating system and the static and dynamic strain systems [3].

The drive system task is to ensure the rotation movement of the main axis at a constant number of rotations, the variation of the number of rotations between certain limits, respectively the start and decoupling of the motion [5]. The lubricating system ensures the quantity of lubricant at a variable start pressure and flow. The task of the strain system, is to ensures a corresponding force applied to the bearing by a system of levers.



Legend: 1– bearing pin; 2– bearing bushing; 3– the lever system

Fig. 2. *The strain system [4]*

The research was made using a HD radial bearing with L/D=0,5 and the spindle's diameter d_e =59,86 mm, and the bushing diameter D_e =59,93 mm, spindle's asperity 58-62 HRC, made of 18MoCr10, bronze bushing made of 88% Sn, 8%Sb, 4%Cu. The HD radial bearing is put into function by an electric engine with a power of 3 kW, and the entrance rotation is made due to a gear box, which assures the rotation of 960, 600 and 370 rot/min.

All the tests were made at a 40 °C of the lubrifiant, being constant, pressure distribution p_{in} having the following values, from 0,5 bar to 10 bar [3],[4]. Using a lubrifiant oil for bearings of LA 32 STR 5152-89 type, with the viscosity of 31,3 cSt at 40 °C, it was focussed on the determination pressure distribution from the film to be lubricated in various places of the bearing's body. In static charging conditions, the pressure distribution was determined in the lubricated film in those 5 points on the bearing's body with the help of the manometers mounted on the periphery of the bearing body.

We considered that in the contact points and in the contact lines the pressure is equal with the lubricate film pressure, and in the start and finish point of the lubrifiant film the pressure is equal with the atmospheric pressure [6]. Minimal in one of the end points of the lubrifiant film the temperature is constant [1].

In the static charge, the scope of our experiments was to determinate the influence of the peripheric speed, of the start flow, of the pressure on the placement of the pressure, and we observe the dimension of the contact spot and the position of the maximal pressure.

2. EXPERIMENTAL RESULTS

The paper presents some experimental results on the lubricant film geometry at hydrodynamic lubrication. During experiments, we considered the various hydraulic parameters as input pressure, the number of rotation of the bolt of the journal bearing [2].

The pressure distribution on the peripheric side of the bushing, depending on the available supply pressure, at different spindle's rotations are presented in figure 3 for n=370 rot/min, p_{in} =0,5 bar; figure 4 for n=600 rot/min, p_{in} =1,5 bar and figure 5 for n=960 rot/min, p_{in} =10 bar [4].

The pressure distribution on the peripheric side of the bushing, depending on the spindle's rotations, at different available supply pressure are presented in figure 6 for n=370 rot/min; figure 7 for n=600 rot/min, and figure 8 for n=960 rot/min [4].

The static pressure distribution on the peripheric side of the bushing depending on the different spindle's rotations , at different static charging conditions (p_{in} =1,5 bar) is presented in figure 9 [4].

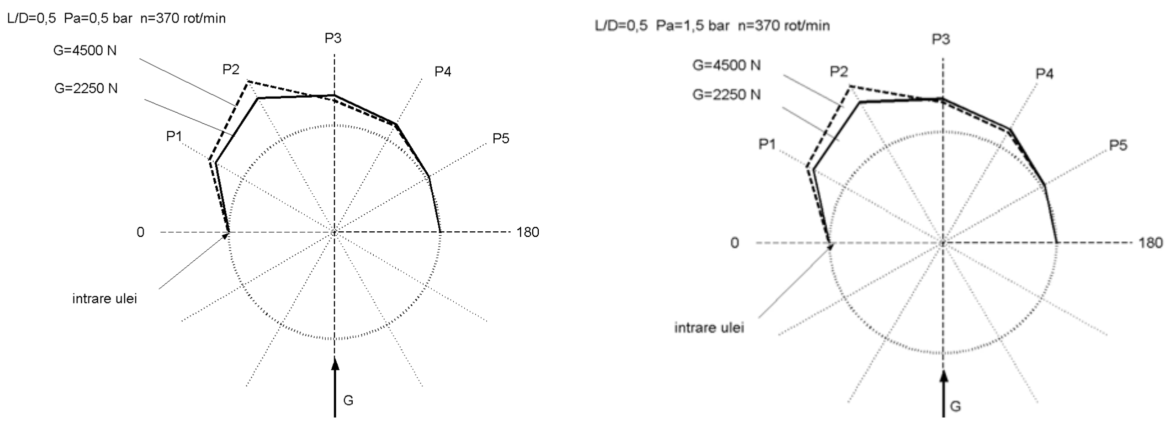


Fig 3. *The static pressure distribution on the peripheric side of the bushing depending on the available supply pressure (n=370 rot/min, p_{in} =0,5 bar)[4]*

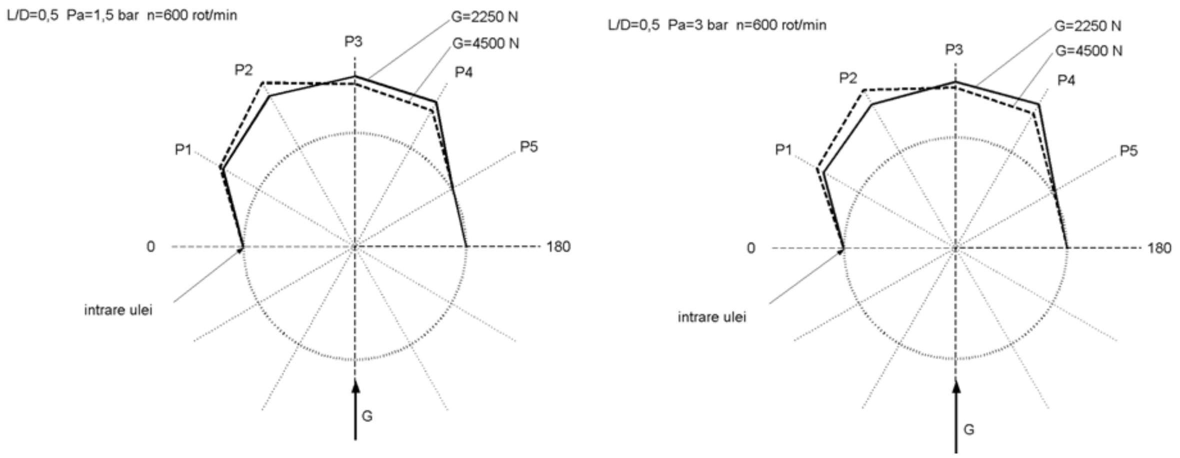


Fig 4 *The static pressure distribution on the peripheric side of the bushing depending on the available supply pressure (n=600 rot/min, p_{in} =1,5 bar)[4]*

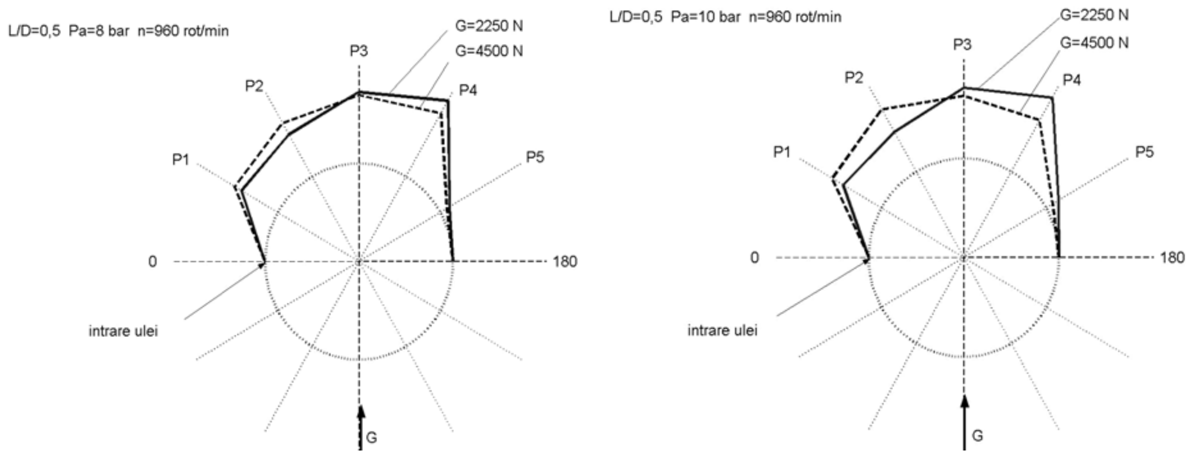


Fig 5. *The static pressure distribution on the peripheric side of the bushing depending on the available supply pressure (n=960 rot/min, p_{in} =10 bar)[4]*

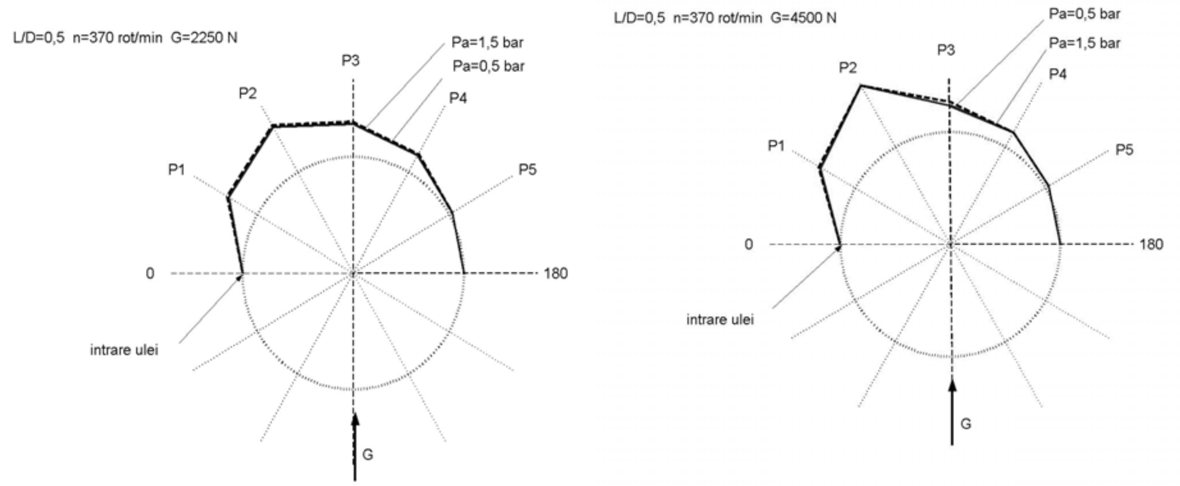


Fig 6. *The static pressure distribution on the peripheric side of the bushing depending on the available supply pressure, at different static charging conditions (n=370 rot/min)[4]*

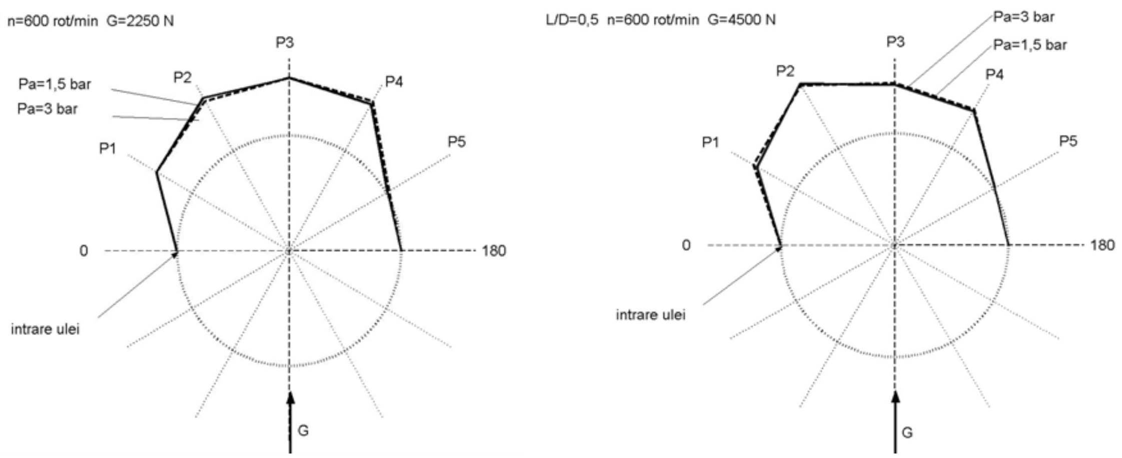


Fig 7. *The static pressure distribution on the peripheric side of the bushing depending on the available supply pressure, at different static charging conditions (n=600 rot/min)[4]*

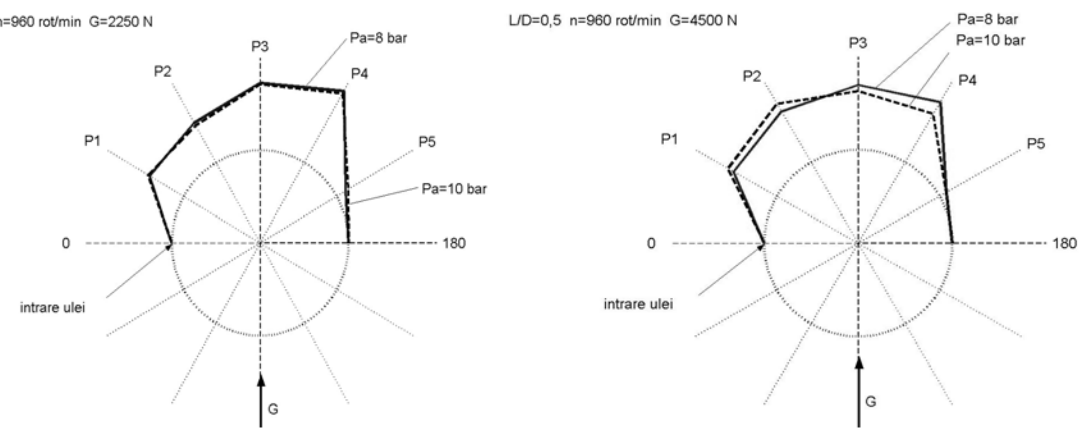


Fig 8. *The static pressure distribution on the peripheric side of the bushing depending on the available supply pressure, at different static charging conditions (n=960 rot/min)[4]*

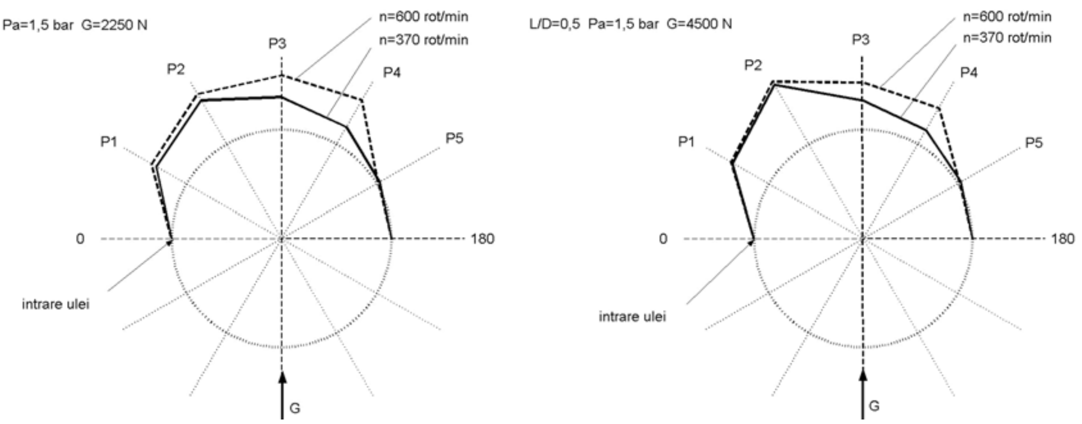


Fig 9. *The static pressure distribution on the peripheric side of the bushing depending on the different spindle's rotations , at different static charging conditions (p_{in} =1,5 bar)[4]*

3. CONCLUSIONS

The following conclusions may be taken into consideration:

- the static charging conditions of the bearing does not have an important influence regarding the changing in the pressure's values, as the static charging conditions gets bigger, so as the static pressure is bigger;
- the study demonstrates that if we introduce lubricant under great pressure between the pin and the bushing we obtain the lubricant film, which increases the durability of the bearing and decreases the necessary time for thermic balance;
- for the P3 position, at the same time with the rise of static charging, the static pressure decrease;
- maintaining the journal's revolution constant at the same time with the growing static charge, the pressure curve is moving in the sense of the growing pressure guided to the P3, P4 position on the peripheral side of the bushing;
- the existence of an optimum point from the viewpoint of carriage: any change in the functional parameters of the bearing leads to straying from the optimum value from the viewpoint of carriage.

4. REFERENCES

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