

THERMIC BEHAVIOUR SPINDLE OF MACHINE TOOLS

Marian-Cornel CEAUSESCU¹, Cleopatra CEAUSESCU², Mădălina CIUPITU³,
Claudiu Florinel BISU⁴

Rezumat. *Anticiparea comportamentului termo-mecanic al arborelui mașinii-unealtă este esențial în funcționarea fiabilă a mașinilor-unealtă la viteze foarte mari. În particular, performanța la turații înalte ale arborelui principal este dependentă de comportamentul termic al acestuia. Principala sursă de generare de caldură a arborelui este cuplul de frecare în rulmenții cu bile de contact unghiular.*

Abstract. *The prediction of the thermo-mechanical behaviour of machine-tool spindles is essential in the reliable operation of high speed machine tools. In particular, the performance of these high speed spindles depends on their thermal behaviour. The main source of heat generation in the spindle is the friction torque in angular contact ball bearings.*

Keywords: thermic, mechanical, spindle, high speed, machine-tools.

1. Introduction

Machining, in general, remains a major manufacturing process in various industries. Almost all metal parts undergo machining at some stage of their production. High speed and high precision machine tools have become a major trend of machining industries in recent years.

The performance and reliability of these machines are also influenced by the high speed spindles that are essential to the process. High speed spindles are known to suffer from lack of reliability and sudden failure, which derives, mostly, from thermal loads. In order to ensure the reliable operation of spindles, it is necessary to predict the thermo-mechanical behaviour of high speed spindles. The major sources of heat in a spindle system are contact forces at bearings and the friction force with an environmental air and rotor/stator in motorized spindles. Angular contact ball bearings are the most commonly used types of bearing in machine tools. These bearings are usually subjected to preloads, in addition to externally

¹ Eng. Marian-Cornel CEAUSESCU, Engineering and Management of Technological Systems, Politehnica University of Bucharest, Romania (ceausescumariancornel@yahoo.com).

² Eng. Cleopatra CEAUSESCU, Engineering and Management of Technological Systems, Politehnica University of Bucharest, Romania (cleopatra.ceausescu@yahoo.com).

³ Eng. Mădălina CIUPITU, Engineering and Management of Technological Systems, Politehnica University of Bucharest, Romania.

⁴As. Prof. Dr. Eng. Claudiu Florinel BISU Engineering and Management of Technological Systems, Politehnica University of Bucharest, Romania.
