Serbian Tribology Society

SERBIATRIB '13

13th International Conference on Tribology

Faculty of Engineering in Kragujevac

Kragujevac, Serbia, 15 – 17 May 2013

MEASUREMENT INSTRUMENTATION FOR DETERMINATION OF STATIC COEFFICIENT OF ROLLING FRICTION

Petar Todorović[1], Ivan Mačužić[1], Branislav Jeremić[1], Marko Đapan[1], Branko Tadić[1]

[1]Faculty of Engineering Kragujevac, Serbia, petar@kg.ac.rs, ivanm@kg.ac.rs, bane@kg.ac.rs, djapan@kg.ac.rs, btadic@kg.ac.rs

Abstract: *This paper is considering the influence of temperature, at normal load and bend radius of contact elements on the coefficient of rolling friction. Contact pairs are made of steel DIN 17230 (100Cr6). Measurement results in a condition of high temperatures, variation of the normal load and bend radius of contact element indicate complex influence of temperature in this specific test condition. Authors' future research would be in direction of determination of static friction coefficient on the higher temperatures of contact pairs made of different materials.*

Keywords: *Measurement instrumentation, coefficient of rolling friction, high temperatures, inclined plane*

1. INTRODUCTION

For every engineer and constructor, who is engaged in design and development of mechanical constructions, knowledge of friction coefficient is very important and crucial. However, there are multiple issues, doubts and problems regarding using of friction coefficient values during experiments. These problems occur primarily because of poor applying of standard tables and under which conditions these values are measured. This is all because friction coefficient values are different from laboratory to laboratory, and depend on equipment, measuring methods and a number of other parameters that may influence on diversity of measured values. Peter J. Blau [1] has represented review of friction force and ways of its measurement. He made a list of standard measurement methods for static and dynamic friction coefficient as well as the way of its potential use.

As we know, friction occurs when two bodies are in contact and based on velocity of relative motion, friction can be static or kinetic. The static friction coefficient depends on many different parameters, primarily from surface contact, normal load, atmosphere conditions and temperature, surface absorption, quality of processing and material in contact [2-5]. There have been several studies regarding the influence of surface roughness parameters with the static friction coefficient and concluded that the coefficient of static friction will increase if surface roughness coefficient increases [3, 4]. Also, some of them concluded that some roughness parameters, like skewness and kurtosis, have a greater influence on coefficient of static friction compared to other parameters [6, 7]. Complete understanding of the coefficient of static friction is impossible without various analyses of mechanisms under which this is occurring. This issue is a goal for numerous research efforts [8-10].

As a start, some authors represented conditions under which the value of static friction is greater than the dynamic friction value, in terms of temperature influence on creep motion. Generally, at temperature above zero, static friction coefficient is higher compared to kinetic friction coefficient due to different heat activated processes. But, we cannot say that the static friction coefficient has only one value because it depends on contact and initial velocity. In order to determine static friction coefficient, Chang et al. [8] analyzed adhesion force and load in contact at rough metal surfaces. The study showed that the coefficient of static friction depends on characteristics of the material and topography of the surface in contact as well as that depends on external load versus general defined friction law. In this paper, researchers were