

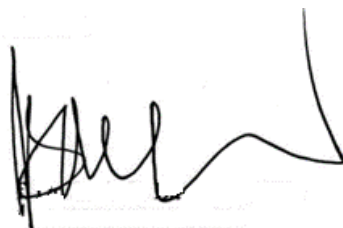
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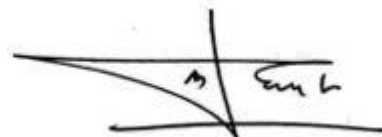
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 NIP. 196205201989021001
 Unit Kerja : Departemen Teknik Mesin FT UNDIP

Semarang, 11 Maret 2021

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Dr. Agus Suprihanto, ST, MT
 NIP. 197108181997021001
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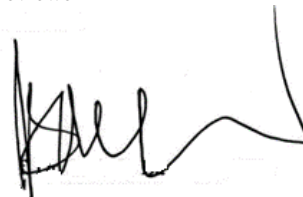
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NIP. 196205201989021001
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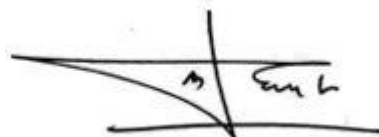
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Key Engineering Materials
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A method for characterizing running-in of sliding contacts (Article)

Ismail, R.^a, Tauviquirrahman, M.^a, Jamari, J.^a, Schipper, D.J.^b

^aLaboratory for Engineering Design and Tribology, Department of Mechanical Engineering, University of Diponegoro, Jl. Prof. Soedharto, Tembalang, Semarang, 50275, Indonesia

^bLaboratory for Surface Technology and Tribology, Faculty of Engineering Technology, University of Twente, Drienerloolaan 5, Postbox 217, Enschede, 7500 AE, Netherlands

Abstract

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Although in terms of conservation wear is undesirable, however, running-in wear is encouraged rather than avoided. Running-in is rather complex and most of the studies related to the change in micro-geometry have been conducted statistically. The purpose of this study was to characterize the running-in of sliding contacts using finite element analysis based on measured micro-geometries. The developed model combines the finite element simulation, Archard's wear equation and updated geometry to calculate the contact pressure distribution and wear depth. Results show that the proposed model is able to predict the running-in phase of sliding contact system. © 2016 Trans Tech Publications, Switzerland.

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A method for characterizing running-in of sliding contacts

R. Ismail¹, M. Tauviquirrahman¹, J. Jamari^{1,*} and D.J. Schipper²

¹Laboratory for Engineering Design and Tribology, Department of Mechanical Engineering, University of Diponegoro, Jl. Prof. Soedharto, Tembalang, Semarang 50275, Indonesia

²Laboratory for Surface Technology and Tribology, Faculty of Engineering Technology, University of Twente, Drienerlolaan 5, Postbox 217, 7500 AE, Enschede, The Netherlands

*j.jamari@gmail.com

Keywords: running-in, sliding contact, wear, finite element analysis

Abstract. Although in terms of conservation wear is undesirable, however, running-in wear is encouraged rather than avoided. Running-in is rather complex and most of the studies related to the change in micro-geometry have been conducted statistically. The purpose of this study was to characterize the running-in of sliding contacts using finite element analysis based on measured micro-geometries. The developed model combines the finite element simulation, Archard's wear equation and updated geometry to calculate the contact pressure distribution and wear depth. Results show that the proposed model is able to predict the running-in phase of sliding contact system.

Introduction

Changes which occur between start-up and steady state of contacting surfaces during rolling/sliding motion are associated with running-in (also called breaking-in or wearing-in). Although in terms of conservation wear is always undesirable, running-in wear is encouraged rather than avoided. GOST (former USSR) Standard defines running-in as: "The change in the geometry of the sliding surfaces and in the physicomechanical properties of the surface layers of the material during the initial sliding period, which generally manifests itself, assuming constant external conditions, in a decrease in the frictional work, the temperature, and the wear rate" [1].

Running-in is very complex problem. There are many tribological characteristics, such as friction, wear quantity and surface topography during the running-in process. Changes to the surface micro-geometry during the running-in phase of a sliding contact are usually related to a mild wear processes, as described by the Archard's wear concept [2] and by later researchers in more details [3], that includes wear particle removal and abrasive wear [4]. On a macro scale, the sliding contact between two contacting bodies is often referring to an elastic contact situation. The macroscopic wear volume has been studied extensively. Most of the researches are essentially experimental. The change in surface topography and the transition from the running-in phase to the steady-state phase is expressed using statistical surface roughness parameters. The local change of the surface topography of simple repeated contact has been studied by Jamari and Schipper [5]. However, the local changes of the surface topography during the running-in process did not get much attention. When sliding occurs, it is known that the elastic-plastic contact situation on asperity level plays an important role in the change of the asperity shape. The coefficient of friction and the wear rate of the contacting materials are the main parameters to distinguish the running-in and steady-state phase.

In attempting to predict the local changes of the surface topography during running-in of sliding contacts, a developed elastic-plastic finite element analysis based model is presented in this paper. The model combines the finite element method, the Archard's wear equation and the updated geometry.

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Computational Wear and Contact Modeling for Fretting Analysis with Isogeometric Dual Mortar Methods

 1195


Abstract:

A finite element framework based on dual mortar methods is presented for simulating fretting wear effects in the finite deformation regime. The mortar finite element discretization is realized with Lagrangean shape functions as well as isogeometric elements based on non-uniform rational B-splines (NURBS) in two and three dimensions. Fretting wear effects are modeled in an incremental scheme with the help of Archard's law and the worn material is considered as additional contribution to the gap function. Numerical examples demonstrate the robustness and accuracy of the presented algorithm.

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