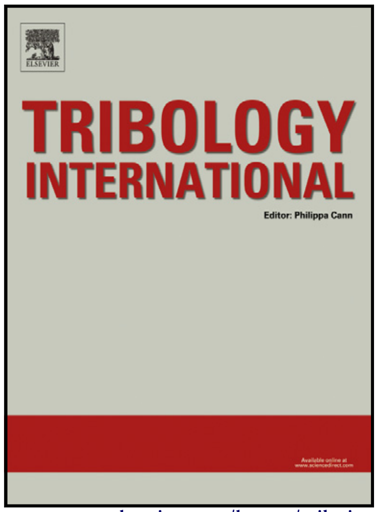
Author's Accepted Manuscript



www.elsevier.com/locate/triboint

Friction control by multi-shape textured surface under pin-on-disc test

Dawit Zenebe Segu, Pyung Hwang

PII: S0301-679X(15)00283-2
DOI: http://dx.doi.org/10.1016/j.triboint.2015.06.028
Reference: JTRI3733

To appear in: *Tribology International*

Received date: 25 March 2015
Revised date: 28 May 2015
Accepted date: 29 June 2015

Cite this article as: Dawit Zenebe Segu, Pyung Hwang, Friction control by multi-shape textured surface under pin-on-disc test, *Tribology International,* http://dx.doi.org/10.1016/j.triboint.2015.06.028

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

Friction control by multi-shape textured surface under pin-on-disc test

Dawit Zenebe Segu[1],* and Pyung Hwang[1],*

[1]School of Mechanical Engineering, Yeungnam University, Gyeongsan, 712-749, Republic of Korea

Abstract

Most of laser surface texturing (LST) research has been conducted on the use of single-shape dimpled effect on the tribological properties. Though, under multi-shape LST, the dimpled surface may have a different effect on the tribological properties due to the combined dimples. This paper discussed the effect of multi-shape LST on tribological properties under different conditions. The multi-shape textured surface was fabricated by laser ablation process by combining different geometric patterns. The tribological tests were conducted by a flat-on-flat tribometer. It was found that the multi-shape LST significantly reduce friction under dry and lubrication conditions, when compared with untextured surfaces. The beneficial effect of textured surface are more pronounced at higher sliding speeds.

Keywords: Surface engineering; Multi-shape texturing; Friction; Lubrication

*Corresponding authors. Tel.: +82-53-810-2448; Fax: +82-53-810-2729; E-mail: zenebedawit@ynu.ac.kr (Dawit), phwang@yu.ac.kr (Pyung)

1. Introduction

The reliability and performance of mechanical systems that experience sliding under contact depends on the friction and wear characteristics at the sliding interface. There is an increasing demand for improved performance and reliability of mechanical systems that use advanced materials and surface-engineering techniques, which would increase efficiency, conserve scarce material resources and reduce energy losses through reduction of friction [1-3].

Laser surface texturing (LST) onto a sliding surface, which involves flat and smooth regions being interrupted by local depressions, has become a promising surface engineering process to improve the tribological performance of sliding contact surfaces [3]. The formation of patterned micro-dimples may affect hydrodynamic lubrication and load carrying capacity of the textured surface [4-6]. The dimples are expected to act as reservoirs of the fluid enhance hydrodynamic action that helps in reduction friction and at the same time they may trap wear particles also which is expected to reduce wear [3-7]. Furthermore, the dimples formed provide a micro-hydrodynamic bearing in cases of full or mixed lubrication to generate additional hydrodynamic pressure to increase the load-carrying capacity [3-8].

In recent years, surface texturing has been successfully used in many applications to improve the tribological properties of sliding surfaces, such as piston rings, mechanical seals, hydro-static gas seals, journal bearings, thrust bearings, and soft elasto-hydrodynamic lubrication [9]. Fundamental research work on various forms and shapes of surface texturing for tribological applications has been carried out by several research groups worldwide and various texturing fabrication techniques have been employed, such as machining, ion beam texturing, etching techniques and laser texturing [10]. Among these methods, laser surface texturing is considered as the most promising texturing technology. The main reason is that textures fabricated by LST could be precisely controlled and this process is friendly to the environment [9, 10]. Experimental results in this filed shows that significant improvement can be achieved by laser surface texturing [7, 10-13]. Recently, with the aim of minimizing the friction coefficient, Xiong et al. [7] experimentally investigated the micro-dimple influence on tribological properties under starved oil lubrication. Kovalchenko et al., [12] have shown that the dimple texture expands the range of the lubrication regime and the accelerated wear changes the contact geometry and facilitates the transition of lubrication from a high-

Accepted manuscript

Download English Version:

https://daneshyari.com/en/article/614409

Download Persian Version:

https://daneshyari.com/article/614409

Daneshyari.com