Accepted Manuscript

Comprehensive investigation on mechanisms of dry belt grinding on AISI52100 hardened steel

Wenxi Wang, Ferdinando Salvatore, Joël Rech, Jianyong Li

PII: S0301-679X(18)30019-7

DOI: 10.1016/j.triboint.2018.01.019

Reference: JTRI 5050

To appear in: *Tribology International*

Received Date: 11 September 2017

Revised Date: 25 December 2017

Accepted Date: 8 January 2018

Please cite this article as: Wang W, Salvatore F, Rech Joë, Li J, Comprehensive investigation on mechanisms of dry belt grinding on AISI52100 hardened steel, *Tribology International* (2018), doi: 10.1016/j.triboint.2018.01.019.

Comprehensive investigation on mechanisms of dry belt grinding on AISI52100 hardened steel

Wenxi WANG*[1] Ferdinando SALVATORE[2] Joël RECH[2] Jianyong LI[1,3]

1. School of Mechanical, Electronic and Control Engineering, Beijing Jiaotong University, Beijing 100044, China;

2. Université de Lyon, CNRS, École nationale d'ingénieurs de Saint-Étienne, LTDS UMR5513, 42023 Saint-Étienne cedex 2, France;

3. Key Laboratory of Vehicle Advanced Manufacturing, Measuring and Control Technology, Ministry of Education, Beijing 100044, China.

*Corresponding author. Tel.: +86 15210579790; fax: +86 10 51685015.

E-mail address: 14116345@bjtu.edu.cn(W. Wang).

Abstract

In order to further understand the grinding mechanisms of dry belt grinding process, this paper provides a comprehensive investigation both on the evolution of the belt wear and the evolution of part's surface texture, simultaneously. The results have shown that grains' wear mode can be evaluated by surface roughness parameters *Sz*, *Sdq* and *Spc*. The belt wear in open-loop belt grinding has been quantitatively proved to keep stable after a few of turns due to constant working conditions. The blockage has been found in this paper and primary studied. It has been revealed that the blockage can further improve the surface roughness, ignoring the limit set by original working condition, but with a sacrifice on material removal and waviness improvement.

Keywords

Dry belt grinding, Grinding mechanism, Surface roughness, Belt blockage

1. Introduction

Nowadays, with the improvement in performance of belt grinding, the scope for applying abrasive belts is expanding considerably, belt grinding technology has been widely equipped with industrial robots[1-3], applied in aerospace industry[4,5], and also introduced into the mobile industry[6-9]. Zhang et al.[1] have developed a new model using support vector regression technology to meet the real-time requirement of the robotic online process. Then, to improve cutting accuracy, an acting force calculation model based on the local geometry information of the workpiece has been proposed, and it successfully improved the accuracy to below 5%[2]. Wang et al.[3] have primarily calculated the deformation of contact wheel due to the tensile force of belt, and therefore, further reduced the prediction error of cutting depth less than 3.1%. Wang et al.[4] and Xiao et al.[5] applied close-loop and open-loop belt grinding technology to aero-engine blisk finishing, separately. Besides, a surface removal contour (SRC) model and a constant-load adaptive belt polishing (CABP) method were introduced successively to enhance dimensional precision and consistency of the surface quality. According to the works of Khellouki et al.[6,8], the lubricant belt finishing technology with an open-loop structure was able to perfect surface integrity of super hard steel after hard turning, which ensured a more homogeneous