Available online at www.sciencedirect.com

ScienceDirect

Procedia Manufacturing 13 (2017) 146–152

Procedia MANUFACTURING

www.elsevier.com/locate/procedia

Manufacturing Engineering Society International Conference 2017, MESIC 2017, 28-30 June 2017, Vigo (Pontevedra), Spain

Analysis of the dressing process using stationary dressing tools

L. Godino[a,*], I. Pombo[a], J.A. Sanchez[a], I. Mendez[a], X. Cearsolo[b]

[a]*Faculty of Engineering of Bilbao, University of the Basque Country (UPV/EHU), Plaza Torres Quevedo 1, Bilbao 48013, Spain*
[b]*Machine-tool Institute (IMH), Azkue Auzoa 1, Elgoibar 20870, Spain*

Abstract

Grinding process is a very important process in machining industry to manufacture high quality part. The correct preparation of grinding wheel involves dressing process taking importance to optimize grinding process. Due to the different dressing tools types, it is very difficult to find the most adequate tool for a particular application. In this work, a systematic analysis of stationary multipoint and blade dressing tools have been carried out attending to the influence of dressing parameters in wheel performance and in its wear. The obtained results reflect the importance of a correct choosing both of the dressing tools and dressing parameters.

Peer-review under responsibility of the scientific committee of the Manufacturing Engineering Society International Conference 2017.

Keywords: grinding; dressing; performance; wear; wheel

1. Introduction

Grinding process is a very important machining process that is characterized by the high quality of ground parts and by its capability to machining hard materials. One of the most important aspects in the process is the grinding wheel. Dressing process is employed to regenerate the abrasive capability of the grinding wheel once it has loose it due to the excessive wear after having worked some time.

There are a lot of types of dressers in the industry including static and rotary ones or single point multipoint and needle ones [1]. This variability in dressers types make very difficult to analyze their performance systematically. This

* Corresponding author. Tel.: +34 94 601 7347
E-mail address: leire.godino@ehu.eus

2351-9789
Peer-review under responsibility of the scientific committee of the Manufacturing Engineering Society International Conference 2017.
10.1016/j.promfg.2017.09.023

fact reflects in the grinding industry where the choosing of the correct dresser and adequate dressing parameters for a particular application is one of the most important and difficult aspect to be defined [2].

This way, is very difficult to find in the specialized bibliography references analyzing the influence of the dressing parameters in the process performance. One of the first works that can be found in bibliography is the work by Inasaki and Okamura [3]. In that work the authors analyzed the influence of dressing parameters in grinding process when dressing with single point stationary dressers using acoustic emission. Their results showed that the most important parameter was the feed speed (v_{fd}) employed in dressing process. Additionally they tried to correlate the acoustic emission signal with the obtained roughness in the ground surface.

The results obtained by Inasaki and Okamura [3] were later confirmed by Coelho et al. [4] in a later work in which the authors could correlate the acoustic emission, the wheel sharpness and the dressing parameters. They conclude that for high values of both v_{fd} and a_d, the wheel sharpness increases.

In a very extensive work Shi et al. [5, 6] analyzed the blade dresser behavior attending to the influence of dressing parameters on wheel performance and dresser wear. They firstly defined the dressing wear ratio and used it to evaluate the wear suffered by dresser. They found that the dresser wear was dependent of the value of chosen dressing parameters so the wear trends were different for high values of ad and v_{fd} comparing with those obtained for low a_d and v_{fd} values.

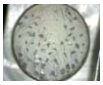
Linke and Klocke along two works [7, 8] made a complementary study to that made by Shi et al [5, 6] and confirmed the different trends of dresser wear depending on the values adopted by dressing parameters.

The analyzed works reflect the importance of the dressing process in grinding performance but the big variability of the dressing tools existing in the industry makes very difficult to have a general idea of the process behavior. In this work the performance of different dressers type is going to be analyzed attending to two different factors, the influence of dressing parameter in the process performance and the wear of the proposed dressers. In this case multipoint and blade stationary dressing tools will be analyzed. Taking into account the industrial importance of this kind of dressers the author thinks that the contribution of this work has a very big relevance both from scientific point of view and from the industrial one.

2. Materials and methods

The analysis of the performance of static dressers will be done in two steps. The first step will consist of an experimental work focused on the analysis of the dressing parameters in the dressing process and in the quality of the ground part. For this purpose an industrial case is chosen and six types of static dressers are analyzed. The proposed dressers can be seen in the Table 1. Dressers 1 to 5 (D1-D5) are multipoint dressers in which diamond grains are inserted in the metallic matrix of the dresser. The sixth one (D6) is a blade dresser in which the diamonds are square section needles inserted in the metallic body of the diamond. The tests have been carried out in a BLOHM Orbit 363 CNC surface grinding machine. The reference of the employed grinding wheel for the experimental work is: 4MBA 46G12V489P20P (400x40x203.2).

Table 1. Dressers employed for the experimental analysis.

D1			D2		
	Type	Multi-point		Type	Multi-point
	Dimensions	20 x 7		Dimensions	20 x 6
D3			D4		
	Type	Multi-point		Type	Multi-point
	Dimensions	Ø13		Dimensions	Ø17
D5			D6		
	Type	Blade tool		Type	Blade tool
	Dimensions	20		Dimensions	20