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Investigation of Traces of Interaction between Flap Wheel and Aluminum Alloy Plain Surface

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Abstract

The work deals with the investigation of the model KK751 P80 flap wheel interaction with the plain surface of B95пчT2B aluminum alloy during screw-cutting lathe machining. According to the results, the dependence between the amount of the removed material and the processing modes; and the distribution of the surface roughness and intensity of material removal along of the contact patch were established. The graphs of removal and roughness on the contact surface of the flap wheel and the processed sample are presented. The distribution pattern of the removal intensity on the proceeded surface is shown. The findings show that the value of the achievable roughness and removal are determined by physical-mechanical properties of the processed material and cutting properties of the flap wheel. The analysis of the kinematics and dynamics of flap wheel interaction with the sample surface during processing was made. It was found that the feed direction during surface conditioning that provides the smallest value of the obtained roughness must be opposite to the direction of linear velocity of the wheel on the wheel-to-sample interface, i.e. the feed should be associated.

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Keywords: surface conditioning; flap wheel; contact patch; forces; metal removal; roughness

1. Introduction

Currently, the surface conditioning with flap wheels finds a wide application in production of large parts with double curved surfaces [1-7]. Today there are a large number of designs and types of elastic grinding wheels and processed materials and at the same time a relatively small number of works devoted to the study of the conditioning

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process by these wheels, so the problem of the study of the pattern and parameters of the interaction of specific type wheels with the processed surface of a particular material is very relevant [8-15].

2. Main content of the work

Flap wheel model KK751 P80 (which is quite often used in industry) was used for studies of interaction pattern of the flap wheel with a plain surface of samples of aluminum alloy В95пчТ2В; samples overall dimensions were 110x110x5 mm [16, 17]. The diameter of the wheel in the initial state was 325 mm, width – 100mm. The experiments were carried out at various values of wheel rotation speed (rpm) and the hold-down value (mm) on screw-cutting lathe JET GH-1880 ZX DRO RFS. During the experiments, the sample processing in the selected processing mode lasted for 30 seconds. Figure 1 shows a photograph of the interaction of the flap wheel and a processed surface of the sample.

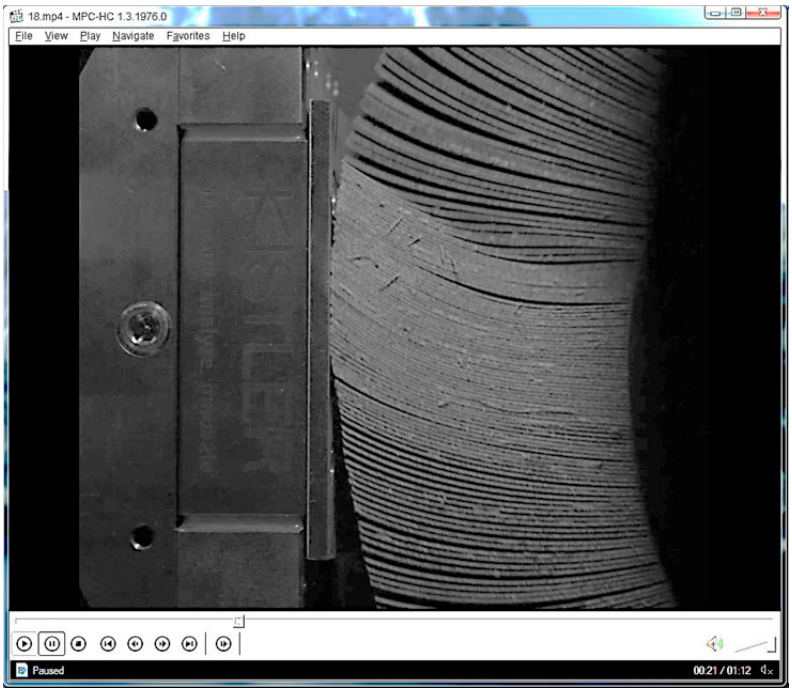

Fig. 1. Positions of the flap wheel and the sample during treatment.

Table 1 demonstrates the conditioning mode values while 30-seconds sample processing of aluminum alloy В95пчТ2В without the feed motion and the measurement results of the maximum depth of the processing trace for these samples. The measurement of the grinding trace depth was carried out using gantry coordinate measuring machine (CMM) ACCURA production of Carl Zeiss. The measurements were performed in the direction of grinding trace on a length of 100 mm. All measurements were made with record of the trace maximum depth.

Table 1. Processing modes of the samples.

Sample number	12	13	14	15
Hold-down value, (mm)	6	6	6	6
Flap wheel rotation speed, (rpm)	315	870	1400	1800
Measurement results of the maximum depth of the processing trace, (mm)	0,0333	0,2054	1,1106	1,1105