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PII: S0924-0136(18)30204-8
DOI: https://doi.org/10.1016/j.jmatprotec.2018.05.007
Reference: PROTEC 15756

To appear in: *Journal of Materials Processing Technology*

Received date: 4-1-2018
Revised date: 1-5-2018
Accepted date: 3-5-2018

Please cite this article as: Li W, Li X, Yang S, Li W, A newly developed media for magnetic abrasive finishing process: material removal behavior and finishing performance, *Journal of Materials Processing Tech.* (2010), https://doi.org/10.1016/j.jmatprotec.2018.05.007

A newly developed media for magnetic abrasive finishing process: material removal behavior and finishing performance

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Abstract：

Magnetic abrasive finishing (MAF) is one of the most important final machining processes, and the performances of finishing media play an important role in the finishing effects and efficiency. In this study, a new magnetic finishing media with semi-solid state was presented and prepared, and finishing setup for the inner ~~and~~ or outer rotary surface was developed. In order to determine the optimum angle between N pole and S pole, simulation was performed using ANSYS Maxwell 14.0. Mathematical modelling of the material removal ratio (*MRR*) was built as a function of magnetic pressure and velocity based on Archard wear model, and the developed model predicted the ~~material removal ratio~~ *MRR* as a function of magnetic flux density, mass ratio, rotational speed of magnetic poles, rotational speed of cam, and diameter of abrasive particles and ferromagnetic particles. The material removal coefficient of the predicted model was determined. The model was validated by experiment, and the relative error between the experiment value ~~with~~ and the theoretical value was 4.51 %. Finishing experiments of main parameters on surface roughness *Ra* and ~~materials removal ratio~~ *MRR* were examined. Experimental results indicate~~d~~ that the percentage change % Δ*Ra* in surface roughness *Ra* and the material