

## Accepted Manuscript

Title: Application of signal to noise ratio and grey relational analysis to minimize forces and vibrations during precise ball end milling

Authors: Szymon Wojciechowski, Radosław W. Maruda, Grzegorz M. Królczyk, Piotr Niesłony



PII: S0141-6359(17)30273-8  
DOI: <https://doi.org/10.1016/j.precisioneng.2017.10.014>  
Reference: PRE 6680

To appear in: *Precision Engineering*

Received date: 9-5-2017  
Revised date: 1-10-2017  
Accepted date: 19-10-2017

Please cite this article as: Wojciechowski Szymon, W.Maruda Radosław, M.Królczyk Grzegorz, Niesłony Piotr. Application of signal to noise ratio and grey relational analysis to minimize forces and vibrations during precise ball end milling. *Precision Engineering* <https://doi.org/10.1016/j.precisioneng.2017.10.014>

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 proof before it is published in its final 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.

# Application of signal to noise ratio and grey relational analysis to minimize forces and vibrations during precise ball end milling

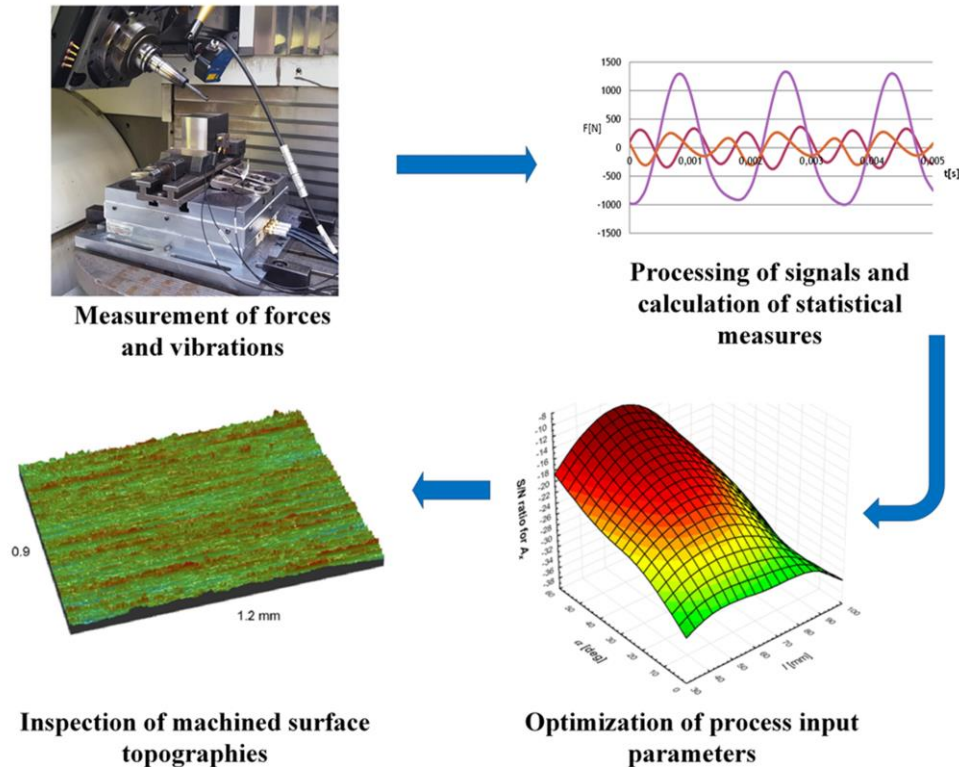
Szymon Wojciechowski<sup>1\*</sup>, Radosław W. Maruda<sup>2</sup>, Grzegorz M. Królczyk<sup>3</sup>, Piotr Niesłony<sup>3</sup>

<sup>1</sup>Poznan University of Technology, Piotrowo 3, Poznan 60-965, Poland, E-mail address: sjwojciechowski@o2.pl, <sup>1</sup>

<sup>2</sup>University of Zielona Gora, 4 Prof. Z. Szafrana street, 65-516 Zielona Gora, Poland

<sup>3</sup>Opole University of Technology, 76 Proszkowska St., Opole 45-758, Poland

Graphical Abstract



## Highlights

- minimization method of forces and vibrations during precise ball end milling
- application of Taguchi method and Grey Relational Analysis
- optimal milling parameters are: inclination angle  $\alpha=60^\circ$  and tool overhang  $l=63$  mm
- ball end milled surface topography affected by inclination angle and overhang

**Abstract.** In this paper, a method for the minimization of cutting forces and vibrations during precise ball end milling of hardened 55NiCrMoV6 steel is developed. The aim of this work concentrates on the optimal selection of surface inclination angle  $\alpha$  and tool's overhang  $l$ , which enables the minimization of cutting forces and vibrations in order to improve the machined surface quality. The experiment includes the measurement of cutting forces and acceleration of vibrations during the milling tests with variable input parameters. The next step focuses on the optimization of the ball end milling process with the consideration of the acquired signals. This procedure is carried out by the minimization of process responses with the application of signal to noise S/N ratio and grey relational analysis (GRA). Subsequently, the obtained optimal values of process input parameters are validated during the ball end milling tests involving the measurements of machined surface topographies. Research reveals that surface inclination angle and tool's overhang have significant influence on generated forces and vibration values. Moreover, the selection of the optimal values of  $\alpha$  and  $l$  enables significant improvement of machined surface quality.

متن کامل مقاله

دریافت فوری ←

**ISI**Articles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات