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## In-Process Quality Characterization of Grinding Processes: A Sensor-Fusion Based Approach

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### Abstract

The quality assessment of manufacturing processes has been traditionally based on sample measures performed on the process output. This leads to the common “product-based Statistical Process Control (SPC)” framework. However, there are applications of actual industrial interest where post-process quality measurement procedures involve time-consuming inspections strongly related to the operator’s experience and/or based on expensive equipment. Cylindrical grinding of large rolls may be one of them. The assessment of the final acceptability of a ground cylinder, in terms of surface finish, is a challenging task with traditional measuring tools, and it often depends on operator’s visual inspections and on his subjective evaluations. In this frame, a paradigm shift is required to substitute troublesome post-process monitoring procedures with in-process and signal-based ones. The paper reviews the quality control issues in surface quality monitoring of big ground rolls where process vibrations (i.e. chatter) are one of major concerns. A multi-sensor approach for vibration onset detection, based on the use of a multi-channel implementation of the Principal Component Analysis, is proposed. The potential benefits, the implementation issues, and the main criticalities are discussed by analysing data of a real industrial application.

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