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TCM system in contour milling of very thick-very large steel plates based on vibration and AE signals

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Abstract

This paper describes the design and test of a tool condition monitoring (TCM) system during a milling process with an especial king-size multiple insert tool for machining very high thickness and length steel plates. The system focuses on the study of acoustic emission and vibration signals in order to correlate both physical phenomena with tool wear condition. By combining acoustic emission signals and vibration signals, it is possible to identify the tool condition with more reliability. Each of these signals provides complementary results, in different spectral bands. The use of different statistical measurements (RMS, kurtosis and skewness) together with the analysis by frequency bands allows identifying the tool condition and the transition between wear conditions (progressive, intermediate and advanced). The design of the TCM system for signals acquisition and processing is described (instruments and strategies). This work is innovative since there is no prior information about TCM systems applied to machining processes in such severe conditions. This type of control is essential in operations where very high value parts and tools are involved, such as milling of very thick-very large steel sheets.

Keywords:
TCM, acoustic emission, vibration signal, milling, tool monitoring

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