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Experimental methodology for the integrated online monitoring in the dry machining of light alloys

Advanced and innovations in manufacturing processes / Trends in manufacturing systems and automation

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Abstract Text
Machining is one of the most used manufacturing processes for components in the aeronautical and automotive industry. Usually, these parts have very demanding quality requirements. One of the main problems in improving the performance of these processes is the large number of variables involved, such as the cutting forces, cutting temperature, tool wear, chattering or power consumption, among others, as well as the synergy between them. The control and supervision of the cutting process are important aspects to consider in improving the machining performance. Monitoring can be carried out both offline and online. However, the current trend in the industry is carrying out online monitoring, which reduces assembly and disassembly times and makes the decision process faster.
Nevertheless, there are difficulties involved in the monitoring of various signals simultaneously, obtained through different devices, regarding their synchronization and integration. This step is crucial, in order to make a correct interpretation of the process evolution in real time and to make decisions about the parameters involved in it. The aim is to achieve an early reaction, through corrective actions, minimizing costs and unnecessary time.
Hence, in this work, an experimental methodology has been designed and developed to facilitate the capture, interpretation and joint analysis of several machining output signals. This methodology has focused on dry machining of light alloys for aeronautical use. To do this, various turning tests have been carried, collecting and analyzing the signals from several devices (dynamometer, thermographic camera, laser vibrometer, among others). In addition, this methodology can be applied to collect data and feed an expert system, based on machine learning, that allow predicting the behavior of several output variables based on the values of the cutting parameters applied (cutting speed, feed and depth of cut).