Real time power consumption monitoring for energy efficiency analysis in micro EDM milling - DTU Orbit (21/03/2019)

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Sustainability has become a major concern in many countries and is leading to strict regulations regarding the impact of products and services during their manufacturing, use, and disposal. Power consumption monitoring in manufacturing companies can lead to a reduction of machine tools energy wastes and consequently to lower expenses. To this end, a complete transparency of energy usage among the entire manufacturing facilities is required. Despite the small volume of material processed, micro manufacturing processes are energy intensive and the optimization of energy usage becomes critical for manufacturing sustainability. Electrical discharge machining (EDM) is considered an attractive solution for the manufacturing of microcomponents. In this paper, a low cost and modular data acquisition system, based on open-hardware and open-source software, for online energy consumption monitoring, is presented. The system described is applied for energy efficiency analysis of the micro EDM milling process by using a state of the art commercial machine tool. A number of sensors is connected to the data acquisition system to measure the energy consumption of the main sub-systems of the machine tool, data is recorded through a microcontroller, and sent to the main computer via Wi-Fi for data storage and analysis. Results show that the process efficiency depends on machine parameters but it is always far below 0.01 %. Solutions are suggested to improve the energy efficiency of the machine tool considered in this work.

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