Standby Indication and Energy Management on Machine Tools

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Objectives

- Methodology and Results

**Fig. 1:** Multichannel measuring

Measuring

A multichannel measuring system for effective power and compressed air flow measurements at the component level; enables detailed optimization potential analyses.

**Fig. 2:** Power area plot

Analysis

The analysis of power usage in discrete part manufacturing reveals saving potentials in the field of machine tool standby and non value add machine tool modes.

**Fig. 3:** Literature research

Standby consumption is important

The use phase dominates the environmental impact (95.5\%). The most important influencing factor is the energy consumption (99.6\%). 47\% of energy is used in “no production” mode.

Methodological approach

Seizing the above mentioned potential, this methodology should help to quantify and to reduce the power consumption in non value add machine tool modes and lead to micro optimization in machine tool monitoring at the component level (Area 1, Fig. 4).

**Fig. 4:** Discrete part manufacturing

An analysis of available methods in the context of the standby analysis was done, revealing that no current analysis method focuses on the non value add time within manufacturing by compromising machine tool reliability and process quality.

A representative measurement of the machine tool components and all operational modes must be made.

**Fig. 5:** Reference scenario

Based on this measurement a component selection approach is used to address components that are machine tool safety- and quality independent.

**Fig. 6:** Component selection

These components are analyzed bases on the selected algorithm of Srivastava et al. to set and predict standby times and component control.

**Fig. 7:** EMod simulation

This algorithm will be further used online within a monitoring system as an adaptive control on the machine tool auxiliaries.

**Fig. 8:** Saving potential

Example results from a case study on a 5-axis milling machine tool.

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