

SE-14.2 Smart Melting: Increasing efficiency in melting and die casting plants with failure management (S)

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With a market share of more than one third Germany is the leading production location in the die-casting industry in Europe. With an annual turnover of around 13 billion euros and 5 million tons of cast iron it is one of the industries with the highest business volume. About 1.1 million tons of the produced casts are non-ferrous material and 88 % of these are cast from aluminum. There is a particularly large energy saving potential since the branch is one of the most energy-intensive industries. Assuming an energy input of 200 kWh per ton good casting the annual energy consumption of the non-ferrous cast iron industry reaches up to 2.2 billion kWh. Consequently a small percentage of energy saving means a high absolute reduction of energy consumption.

In Germany a large range of die-casting companies are medium sized ones with fewer than 500 employees. Due to the small size and the relatively low investment funds in most companies, the automation level is very low. The Competence Center of Industrial Energy Efficiency (KIEff) at the University of Applied Sciences in Ansbach has implemented a process monitoring system at a die-casting industry partner in order to promote automation. Thereby the process and production data of all melting furnaces and die-casting machines are collected and visualized on several terminals.

The analysis of the malfunction reports of the producing die-casting machines reveals downtimes of 25 %. 60 % of these shutdowns are caused by unplanned interruptions and must be remedied by a member of staff. The duration of the downtimes usually takes less than 2 minutes and is exponentially distributed (see Figure 1). However, the duration of a single failure can occasionally exceed 30 minutes, which results in an average fault duration of 10 minutes. Incident management based on the automated capture and appropriate display of disturbances reduce s their duration and thus leads to higher productivity. Based on the knowledge of the production process and the use of simulations the savings in energy consumption per product can be calculated. The results will determine the impact of a failure management system on productivity and energy efficiency.

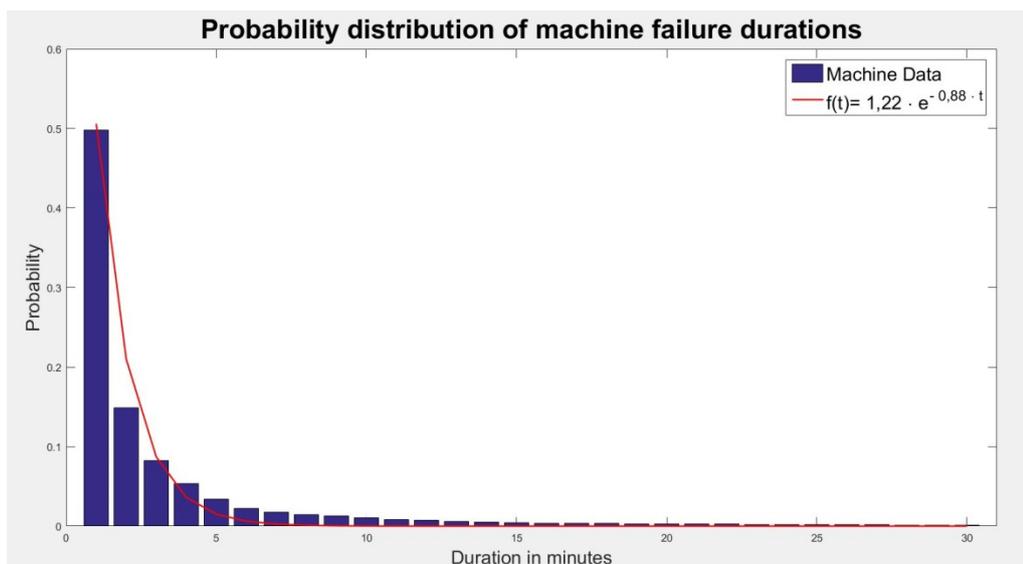


Fig 1. Probability distribution of machine failure durations