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Energy self-sufficient mould log

One of the most important processes in the production of plastic parts is the injection moulding process. As a primary moulding process, i.e. as the first process in a series of different production sequences, high quality is essential. Usually, defects only become visible at the end of the production chain. If a company does not have its own production line, it has its products produced by a contractor. However, it has no control over the compliance of the process parameters, such as cycle time and temperature.

The aim of this bachelor thesis is to develop a prototype for monitoring the most important process parameters. This mould log must be able to monitor the process window in an energy self-sufficient way and detect limit violations. The recorded data should be stored persistently. An e-paper as well as an Android application are used to read and display the data.

To achieve this, the existing prototype from our previous project must be analysed and a concept for the further development to an executable device must be created. A major part of the project is the creation of a user interface. Also, a measuring principle for data acquisition and monitoring of the mould must be developed.

The result is a functional prototype, which consists of a device, called mould log, and an Android application for wireless operation of the mould log. The app communicates via Bluetooth Low Energy with the mould log. The mould log monitors the configured process parameters with an energy-efficient system on chip and various sensors. Additionally, the most important data are displayed on an e-paper directly on the mould log. The energy for this monitoring is generated from a thermoelectric generator. Excess energy is stored in a supercapacitor. With a full storage the device can continue monitoring the mould for additional 11 days.
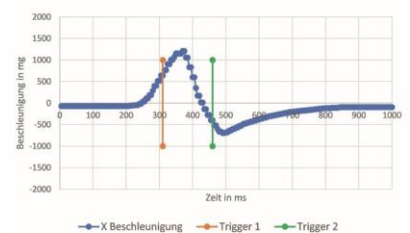
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The mould log with the user button (left), the e-paper display and the temperature sensor (bottom) as well as a connector for the thermoelectric generator (right).

Recorded acceleration data in X-direction, with detection of the start and the stop movement of the mould.