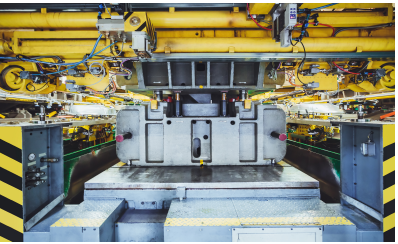
Part temperature measurement inside forming tools

This invention for the first time allows for precise temperature monitoring of components during hot forming, semi-hot forming and related processes like press hardening or hydroforming. Utilizing the thermoelectric Seebeck coefficient it offers dynamic temperature data for the entire workpiece fully enclosed by the mold - ideal for process analysis and monitoring.



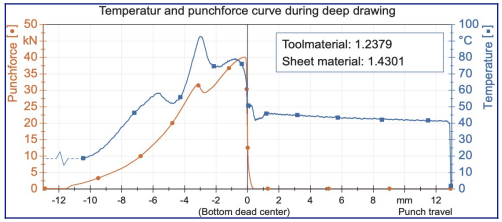
IP RIGHTS
EP filed
2021

The tool itself turns into a thermoelectric measuring system

The thermal curve inside the mold has a great influence on the component quality, but up to now it has hardly been possible to monitor it. The new patent-pending process opens up new ways of optimizing the component properties.

01 Improves component quality
02 Simplifies process optimization and process control
03 Compatible with standard presses
04 Simple retrofitting

REFERENCES:
View patent application



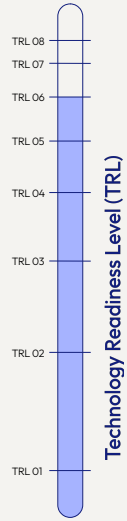
The blue graph shows the contact temperature averaged over the contact surface between tool and workpiece. Negative values on the X-axis show a downward movement of the cutting tool, positive values upwards.

CHALLENGE

Common temperature measurement methods, such as contact or radiation thermometers, are often inaccurate or not applicable. Typically, contact thermometers embedded in the mold lack sufficient dynamics and accuracy. Radiation thermometers, are generally unssuitable for temperature determination during the manufacturing process of workpieces completely enclosed by the mold.

INNOVATION

This invention, based on the thermoelectric effect, was developed by a research team at the Technical University in Munich. It enables highly accurate and highly dynamic workpiece temperature determination. Instead of determining the temperature indirectly, for example via a separate thermocouple, the tool itself becomes the thermocouple. Two tool parts in direct contact with the workpiece each composed of materials with distinct Seebeck coefficients are used as the segments of a thermocouple. The thermoelectric voltage that results correlates with the temperature of the workpiece.



01 Basic principles observed · **02** Technology concept formulated · **03** Experimental proof of concept · **04** Technology validated in lab · **05** Technology validated in relevant environment · **06** Technology demonstrated in relevant environment · **07** System prototype demonstrated in operational environment · **08** System complete and qualified

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