Success Story
COMET

MPPE
Materials, Processing and Product Engineering
Programme: COMET – Competence Centers for Excellent Technologies
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COMET subproject, duration and type of project:
Tool Health Monitoring (A5.21), 10/2014-12/2017, strategic

Development of intelligent production facilities

Modern production facilities often produce immensely high numbers of products with highest precision in very complex operations. Due to the complexity of the operations and the very short times of the individual operation steps the operator often recognizes a failure during the production at the very end of all operations, i.e. in the finished products. Intelligent production facilities learn to recognize failures during the individual operations in time to react, e.g. to automatically exchange a defective tool before the production of scrap.

Fine blanking - precise and complex production in high quantities

In modern industrial production the quantity of equal parts often increases while the time of production for each part continuously decreases. Fine blanking is such a production process where parts with complex geometries (Fig. 1) are cut out of sheet metal with thicknesses of several mm using a specific press.

Modern fine blanking presses allow the production of over 500.000 parts per day. As a rule of thumb the blanking forces increase linearly with the thickness and the strength of the blanked sheet metal. The increase of blanking forces leads to an increase of the local tool loading, especially for complex part geometries with small radii.

The tool as the "heart" of the cutting process

In fine blanking, the punch that is pressed through the metal sheet, is besides the matrices the highest loaded part of the fine blanking tool.

Fig. 1: Parts that are produced via fine blanking today (copyright: Fritz Schiess AG, CH-9620 Lichtensteig)

This punch is installed deep inside the fine blanking tool and can´t be visually inspected during a production run. Thus it happens that - due to the high abrasive loading - parts of the

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punch are chipped off during the cutting process and produce imprints on subsequently produced parts. In the worst case chipped-off parts damage the whole cutting tool.

Automated surveillance of the tool's "health"

Today, the time when a specific punch has to be replaced is scheduled based on the operators know-how and depending on the punch geometry, its material and the blank material. However it still happens that punches break prior to their expected life time.

In future, intelligent fine blanking machines shall recognize an emerging tool failure in time to automatically replace the tool before the production of scrap.

The big challenge is that the readily available global machine data are not sufficient to reliably assess the tool condition. Instead the information has to be obtained directly at the tool and has to be analysed correspondingly.

To this end scientists at the Materials Center Leoben and the institute for Automation of the Montanuniversität Leoben have started a collaboration with the inventors of the fine blanking process, Fritz Schiess AG by means of a COMET research project.

Big data and real time: a challenge

The development of future fine blanking machines includes the application of up-to date sensors and the development of new mathematical algorithms. First, these algorithms enable the interpretation of the high amount of data that are collected via continuous monitoring during production for several months in a fast, yet reliable way.

Next, the speed of the algorithms will be further optimized to enable data analysis directly at the production site, i.e. on the fine blanking machine, in real-time. In this context real time means that the data analysis is fast enough to enable an automated intervention between cutting operations.

Contact and information

MPPE / A5.21 "Tool Health Monitoring"

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