Optimized tool utiliasation

Optimisation of tool utilisation in sheet metal forming

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Abstract

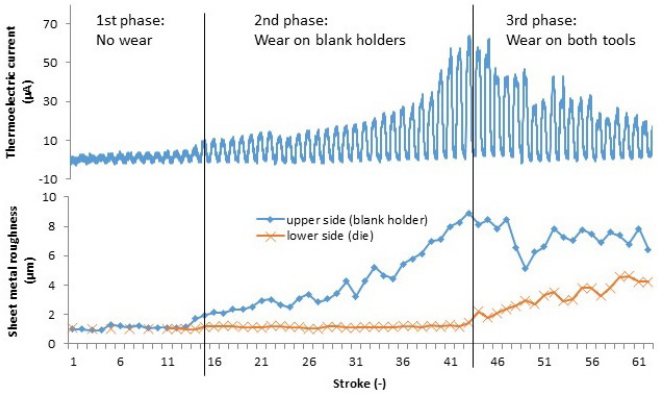
The aim of the research project is to analyse and predict the fundamental procedures and phenomena of advanced wear development and tool failure in sheet metal forming. In particular, the wear behaviour in the transition of the wear development from steady state to failure is investigated. In addition, the influence factors contributing to tool wear are being researched. With these results, it is possible to estimate the tool life and to improve the planning of tool maintenance intervals in the future.

Project description

The increasing use of high and ultra-high-strength steels in sheet metal forming leads to new industrial challenges. One of the main problems is the high tribologically demanding conditions during forming, which leads to premature failure of the lubricating film and subsequent product failure.
That further leads to premature failure of the forming tools. In order to meet this challenge, it is essential to expand knowledge regarding tool life span and wear development. A precise knowledge of wear mechanisms and the interactions between tool and sheet metal makes it possible to estimate tool life and thus to optimize the tool utilization. This holds significant potential for increasing economic efficiency, quality and process stability in the sheet metal forming industry.

Results

The results show that the measurement of thermoelectric current can be used to detect severe wear or tool failure. Unlike the previous assumption that the conductivity of the contact between tool and sheet metal is altered by wear, the change of thermoelectric current derives from the roughening of the surfaces due to the occurrence of wear. This heat generates a thermoelectric current according to the Seebeck effect. With this principle, the acquisition of wear data with high time resolution is possible. Based on the wear data, the start of severe wear can be defined (see Figure).



[1] Wear detection through measurement of thermoelectric current

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