The Investigation of Tool Wear in Forming of Advanced High Strength Steels (AHSS)

Researcher: Dr. Matthias Weiss

Supervisor(s):

Professor Peter Hodgson
Dr. Bernard Rolfe

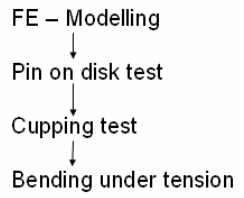
Main aims

The Economical reduction of tool wear in forming of AHSS using appropriate tool steel solutions and surface treatments.

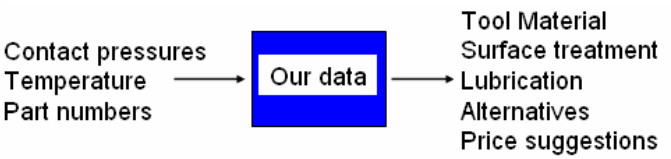
This project will generate tooling standards for the forming of AHSS that will enable the determination of the most economical tool steel and surface treatment solution depending on the forming process and material to be formed.

Background

Automotive and steel companies are rapidly introducing new advanced high-strength steels (AHSS) for body structures. The high strengths of these materials allow for mass-efficient designs for improved fuel economy, while simultaneously increasing crashworthiness. Challenges in implementing these new materials come in forming. As steel strength increases, formability generally decreases. A major AHSS stamping and forming challenge is tool wear; hardened inserts and shear edges can wear out during a single production run as a result of the AHSS material hardness nearly equaling the hardness of the die material itself. Possible ways to improve tool wear are the use of improved tool steel materials and the surface treatment of the tool surface.
However, significant cost differences exist between the different tool material and surface treatment solutions. In order to keep the tooling costs low it will be necessary to generate tool steel standards for the forming of AHSS. These will allow for the fast determination of the most economical tool solution for a particular material and forming process. The outline of this project is shown below:



Using Finite Element Modeling (FEM) the maximum contact pressures generated on the tool surface are determined for different process and material conditions. Than different tool material/surface treatment solutions are tested using the pin on disk test and the wear rate is determined. This allows for a pre-judgment of the particular tool material/surface treatment solutions. The best performing tool solutions are further investigated in cupping tests to determine if tool wear can additionally be reduced by lubrication and in channel bend tests to confirm previous modeling results.
The data will be collected and organized and can than be used to support the tool finding process for a particular forming process and material as shown below:



Contact

Dr. Matthias Weiss
Email: mwei@deakin.edu.au