UNIVERSITÄT SIEGEN

FLB
Lehrstuhl für Fahrzeugleichtbau

Siegen, den 02.06.2020

Master-, Bachelorarbeit

‘’ Effects of adiabatic heating and strain rate on the dynamic response of steel’’

The predictive capability of crash simulation concerning material failure is still in need of improvement due to the complex influences of stress state, strain rate and temperature. In crash simulation, the computation of temperature field is often omitted. This is due to the higher computational costs in thermal-mechanical analysis and the significant uncertainties in the definition of thermal boundary conditions. However, the effect of the thermal softening plays an important role in the post-necking range. To improve the predictions of purely mechanical analyses, the temperature filed is calculated based on the approach of Taylor-Quinney β and the specific heat capacity C_p, as shown in following equation.

$$\Delta T = \int_0^{\varepsilon} \frac{\beta}{\rho \cdot C_p} \cdot \sigma_{iso} d\varepsilon$$

With the measurement of temperature rise by thermal camera, the Taylor-Quinney coefficient β under different strain rates can be calculated. The aim of the project is to study the effects of adiabatic heating and strain rate on the dynamic deformation of steel.

Following tasks have to be executed:

- Quasi-static tensile tests for the temperature sensitivity parameter identification
- Measurement of temperature increase ΔT under adiabatic heating condition (high-speed)
- Strain rate sensitivity parameter identification and adiabatic heating correction
- Model development for strain rate and temperature dependence in LS-Dyna

Your profile:

- Studies of Material Science /Mechanical Engineering / Vehicle /, etc.
- Responsible and work independently

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