Suitable welding technologies as a criterion for market competitiveness

Requirements for railways have increased in recent decades. The project partner voestalpine Schienen GmbH is producing and developing modern rail steel grades in order to meet their customers’ needs. An in-track suitable and well-optimised welding process for these specific materials is indispensable in order to make the modern steel grade remain competitive in the market.

Instrumented flash butt rail welding

In this project a dedicated experimental concept had to be developed in order to successfully capture temperature cycles at multiple locations in the heat affected zone (HAZ) as well as the secondary welding voltage during a flash butt weld (FBW) of rails. Based on the exact knowledge of temperature evolution in the close proximity of the weld’s cross section it was possible to attribute its influence on the final properties of the joint.

Impacts and effects

The gathered in-depth process knowledge represents a unique insight to FBW of rails in the central European rail market and thus an important competitive advantage for the company partners. As a result, for the first time the combination of data from thermal measurements of
FBW was successfully combined in a simulation to predict the metallurgical transformations in the HAZ. This essentially contributes to a successful alignment of the development work of an envisaged new welding process for rails.

![Thermal and metallurgical simulation of rail welding.](image)

Only an in track suitable welding process makes the installation of modern rail steel grades a reasonable investment for track operators. As a result railways can remain a competitive means of transport due to improved life-cycle-costs of tracks. An important contribution to realizing environmentally friendly mobility in present and future thus was successfully accomplished in this project.

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