

## metal JOINing

### K-Project Network of Excellence for Metal JOINing

Programme: COMET – Competence Centers for Excellent Technologies

Programme line: K-Projects

COMET subproject, duration and type of project:

**M3 - Impact of innovative welding technologies on ultra high strength steel welds, 09/2014 – 08/2018, multi-firm**

### Weldability of ultra high strength steel

Extensive welding trials proved the feasibility of welding ultra high strength steels reliably with innovative welding techniques, such as laser beam welding. Thereby the advantages of the innovative welding processes regarding construction as well as of the ultra high strength steels for lightweight design can be combined.



#### Ultra high strength steels

High strength and ultra high strength steels play a pivotal role in innovative light weight design. Due to their higher strength, component thickness and thus the total weight can be reduced. These steels are used amongst others for railway cars, utility vehicles and crane trucks.

Weldability is a key factor for industrial application. Typically gas metal arc (GMAW) or submerged arc welding (SAW) are used for these steels. However, the high heat input of those processes can lead to reduced joint strength especially if used with inadequate filler metals. Furthermore, the combination of high heat input and high weld seam volume can lead to distortions which have to be corrected after welding.



#### Innovative welding techniques

To compensate the disadvantages of conventional welding processes, innovative welding techniques, such as laser beam- laserhybrid- or plasma beam welding, are more and more used.

Due to the higher energy densities, the distortions of components can be reduced.



Fig. 1: Crane truck (copyright voestalpine).

Additionally these welding processes need no or considerably less filler metals, which entails a significant cost benefit.

Less heat input leads to higher cooling rates, which often leads to a hardness increase and reduced toughness in the weld metal.

Extensive welding trials proved that innovative welding processes are a reliable option for welding ultra-high strength steels with a yield strength of 960 MPa. These joints exhibit very high strength with adequate toughness and thereby achieve the given requirements.

Light weight design in transportation for example reduces polluting emissions as well as noise disturbance. This directly improves the quality of life.



### Impact and effects

The Know-How of welding ultra-high strength steels reliably with innovative welding techniques allows for a wider use of these steel grades. Thereby innovations in many sectors are promoted, which directly influence our daily life.

#### Contact und information

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**Further information on COMET – Competence Centers for Excellent Technologies:** [www.ffg.at/comet](http://www.ffg.at/comet)

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