metal JOINing

K-Projekt Network of Excellence for Metal JOINing

Programme: COMET – Competence Centers for Excellent Technologies

Programme line: K-Projects

M3, 09/2014 – 08/2018, multi-firm:

Post Weld heat treatment of ultra-high strength steel welds

Welds of ultra-high strength steels made by innovative, beam based processes, could exhibit local hardening and reduced toughness in the weld metal in comparison to welds made by conventional arc based processes. A specific and localized short-time post weld heat treatment (PWHT) can reduce hardness peaks and thereby improve the toughness properties.

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 can be reduced and thus the total weight reduced. These steels are used amongst others for railway cars, utility vehicles and crane trucks. Weldability is a key factor for industrial application. Especially innovative welding techniques such as laser- or laser hybrid-welding gain in importance from an economic point of view. Extensive welding trials showed the possibility to successfully weld steels of the strength level S960 via laser- or laser hybrid- welding and reach the required strength and toughness properties. However, less heat input leads to higher cooling rates which could result in increased
hardness and reduced toughness in the weld metal.

**Post weld heat treatment**

A specific and localized short-time post weld heat treatment (PWHT) of the welds reduces the hardness and increases the toughness at the same time. However, it is important to stay below the tempering temperature of the material to prevent softening of the base material. PWHT with precise temperature control facilitates improved toughness in the fusion zone of ultra-high strength steel welds.

**Impact and effects**

An increase in toughness in ultra-high strength steel welds, reduces the risk of brittle failure and consequently improves the structural safety of the welded component.

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 lives.

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

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**Fig. 1: Crane truck (copyright voestalpine)**

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**Contact and information**

K-Project M3

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**Projektkoordination**

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**Project partners**

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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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