

Research and development of welded joints in advanced materials using up-to-date welding technologies

Research programme leader

Prof. Dr. Ing. Antonín Kříž, IWE

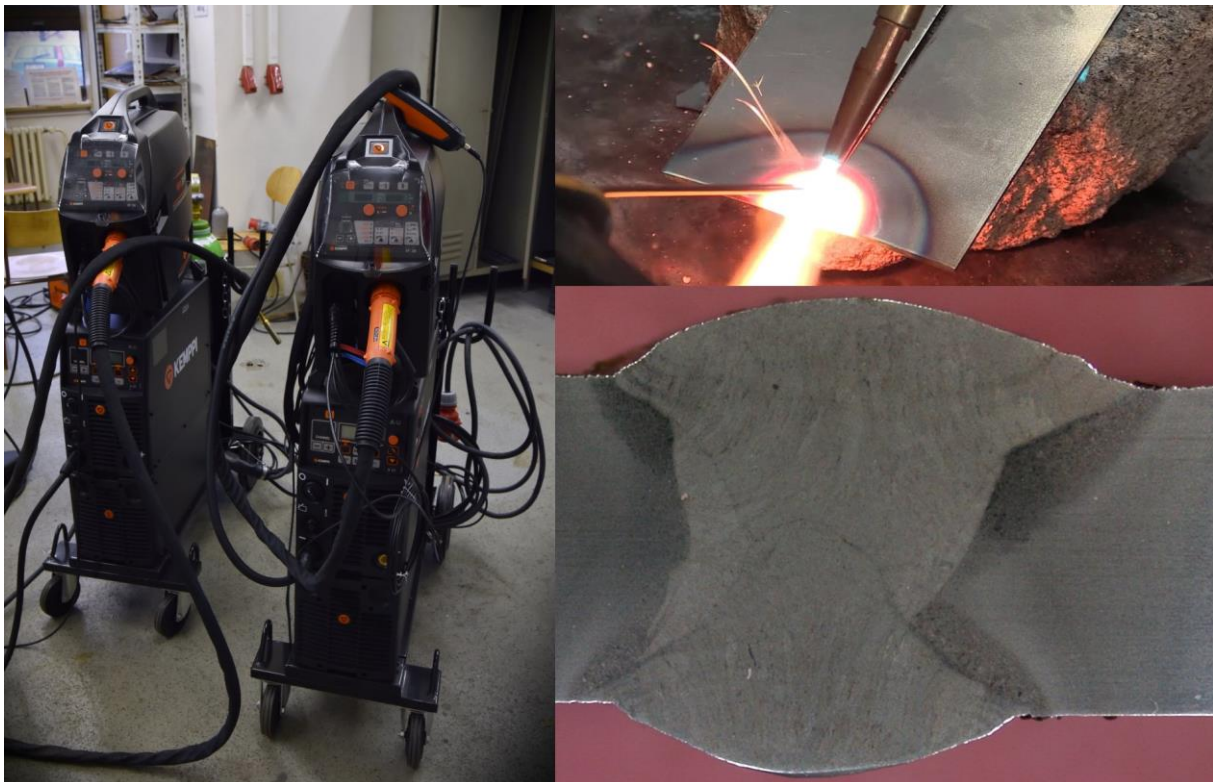
e-mail: kriz@kmm.zcu.cz

tel: +420 377 638 300

The mission of this research programme is to produce welded joints in high added value materials, for instance in the power generation industry. Due to their unique properties, these materials often exhibit conditionally-guaranteed weldability (1b according to ČSN 05 1309 standard) or good weldability (2 according to ČSN 05 1309 standard).

Key research topics

- *Numerical modelling of welding techniques*
- *Testing of welded joints and welding procedure selection and qualification*
- *Application of new welding methods*
- *Welding of advanced materials for special industrial applications*



Materials testing and expert investigation of engineering parts for industry

Research programme leader

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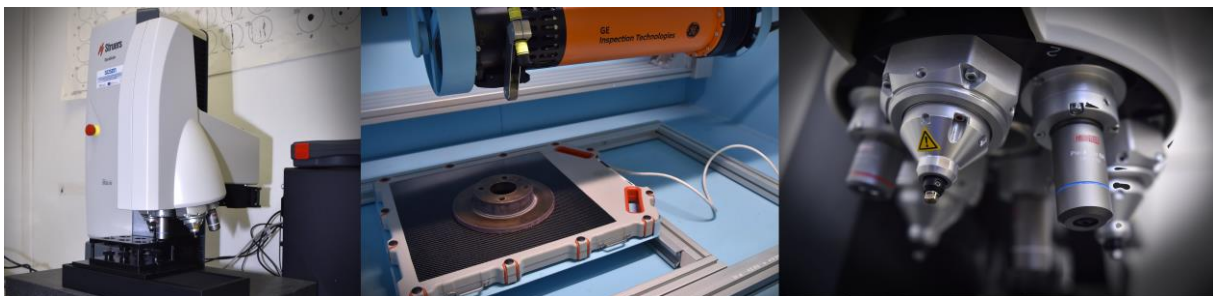
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This research group focuses on materials testing, identifying the causes of product failures, and prediction of residual life of products. Based on the findings gathered, the group develops expert reports which can be used in claim proceedings, in negotiations with suppliers and in developing project applications. Materials analyses are performed using available instruments. They benefit from many years of experience of the research team members. Based on these expert reports, alternative materials can be selected and manufacturing processes and treatments adjusted, including surface treatment operations.

Key research topics

- *Mechanical testing (tensile, compressive, bend, hardness, and impact toughness testing)*
- *Non-destructive testing (liquid penetrant, wet magnetic particle, ultrasonic and eddy current testing, and radiographic inspection)*
- *Metallographic and fractographic analyses – evaluation of structure, microcleanliness, grain size, image analysis, assessment of fracture surfaces*
- *Assessment of corrosion properties using a corrosion chamber, environment test chamber, and measurement of potential curves*
- *Tribological properties – evaluation of tribological properties, including wear resistance, using cyclic impact testing*



Research and development of forming technologies

Research programme leader

Prof. Dr. Ing. Antonín Kříž, IWE

e-mail: kriz@kmm.zcu.cz

tel: +420 377 638 300

Forming stands out as a group of mechanical working processes which have the most favourable impact on materials properties. It alters the structure and properties of materials, as it imparts the desired shape to them. Often, it is the only technique that is capable to deliver the final properties in a material. Numerous forming processes are available. The newly-established research team is concerned mostly with open-die forging but also with closed-die forging processes. Numerical modelling is employed for upgrading the manufacturing process.

Key research topics

- *Open-die forging – developing process sequences*
- *Numerical modelling using the DEFORM package*
- *Designing forming fixtures and open dies to attain optimal properties*
- *Transfer of knowledge to practice*
- *Optimization of heat treatment of forged parts*

