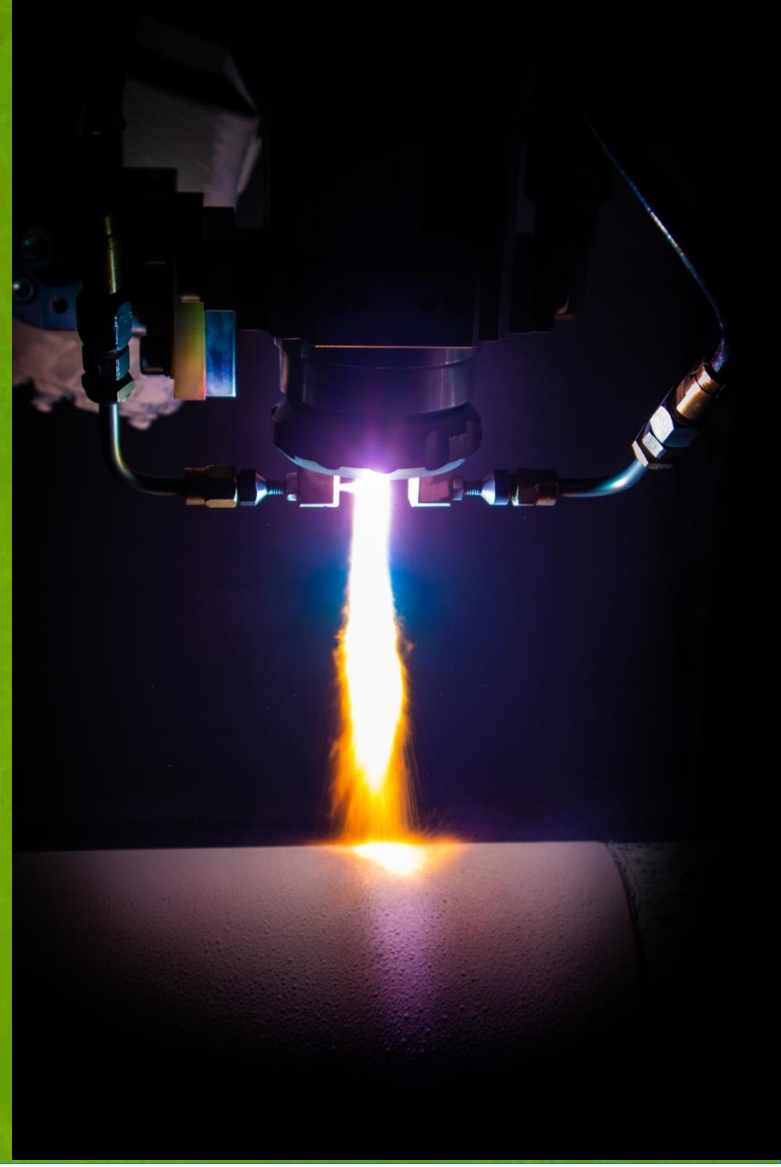
Centrum Výzkumu Řež Innovations s.r.o.

Technologies for Surface Treatments and Repairs at Nuclear Power Plants



Jan Schubert

iCVŘ | Centrum Výzkumu Řež Innovations

CVŘ | Research Centre Řež

SKUPINA ČEZ

Skupina ÚJV
LIDÉ | INOVACE | TECHNOLOGIE

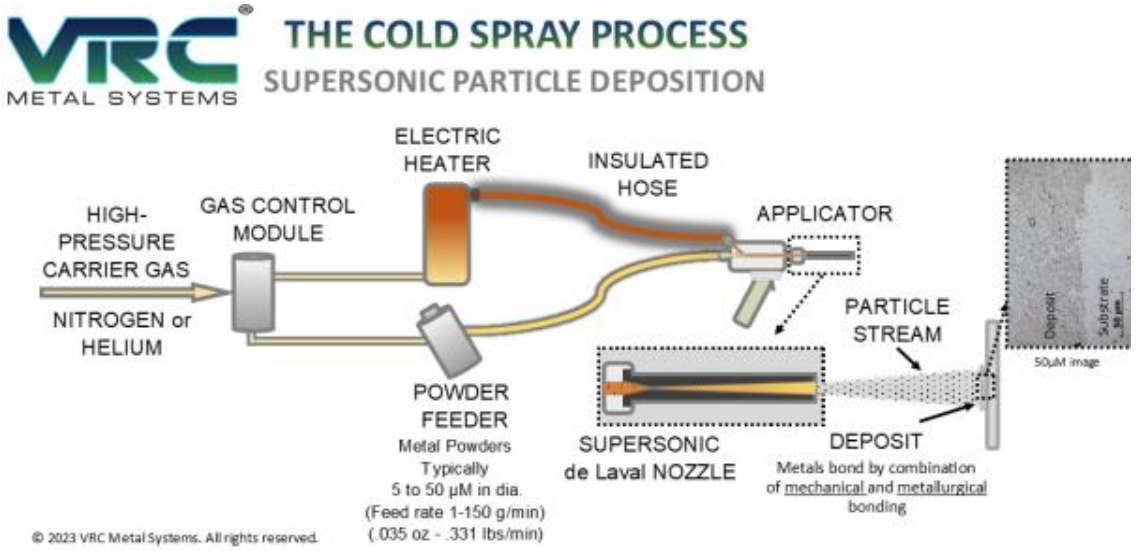
iCVŘ – Unique production and research capacities in central Europe



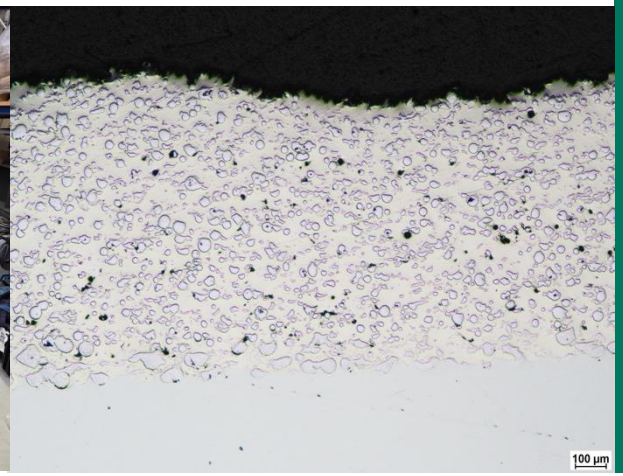
- **5 fully robotic working stations / cabins**
- **Maximum dimensions:** 6 m length, 1,6 m diameter, 6 tons
- **EN ISO 14922**

- **Cold Spray – EvoCSII**
- **Mobile Cold Spray- VRC Raptor CGS**
- **APS – SinplexPro**
- **2x HVOF – Woka JET, HV-50**
- **4x TWAS – SmartARC, EAS4**
- **2x FS – FST, GTV**
- **Mobile - HVOF/HVAF**
- **Sponge JET**
- **ID Gun Coating device for CGS**
- **ID Gun for HVOF**

Mobilní technologie CGS







- Using mobile VRC Raptor CGS system
- Also having smaller VRC Firefly system

Benefits

- Excellent adhesion
- Ability to fill large areas to depths of several centimeters
- Ability to join non-weldable materials
- Deposition rates of up to 40 kg/h

Most common applications

- Joining of non-weldable materials
- 3D print
- Sealing cracks
- On-site repairs

Materials

- Fe, Ni based alloys
- Cu, Al, Zn based alloys
- Titan





Repair of High-Pressure vessel (NPP Temelín TG2)

2024

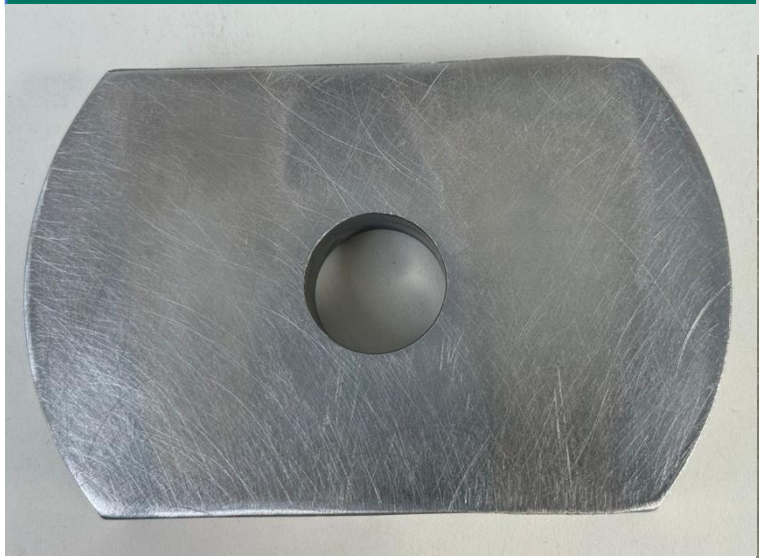
iCVŘ | Centrum Výzkumu Řež Innovations

Skupina ÚJV
LIDÉ | INOVACE | TECHNOLOGIE

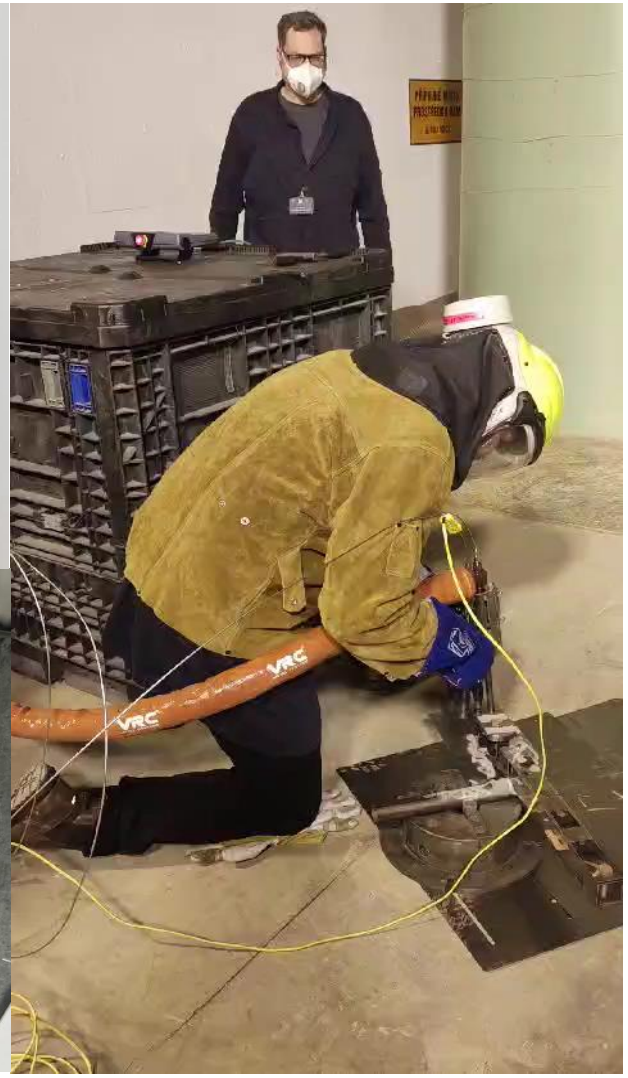
Mobile repair of HP Vessel leakage

- Flexible
- Without preheating and after repair processing
- No risk of deformation
- No thermally affected zone
- Quick repair shortening outage time

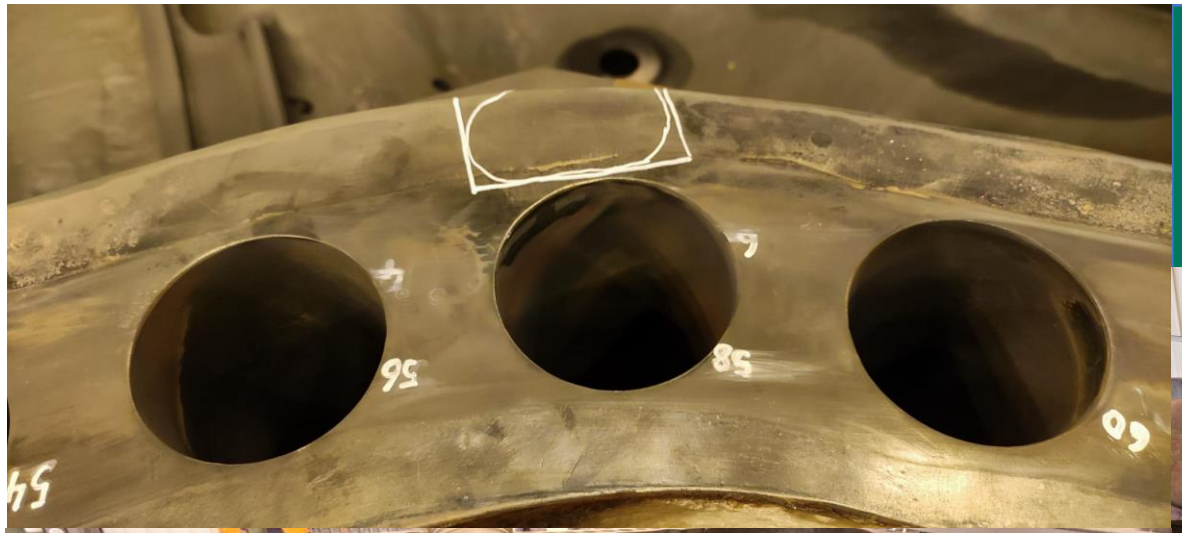








Repair area





- Usable in FME space
- Usable in close quarters



Surface preparation

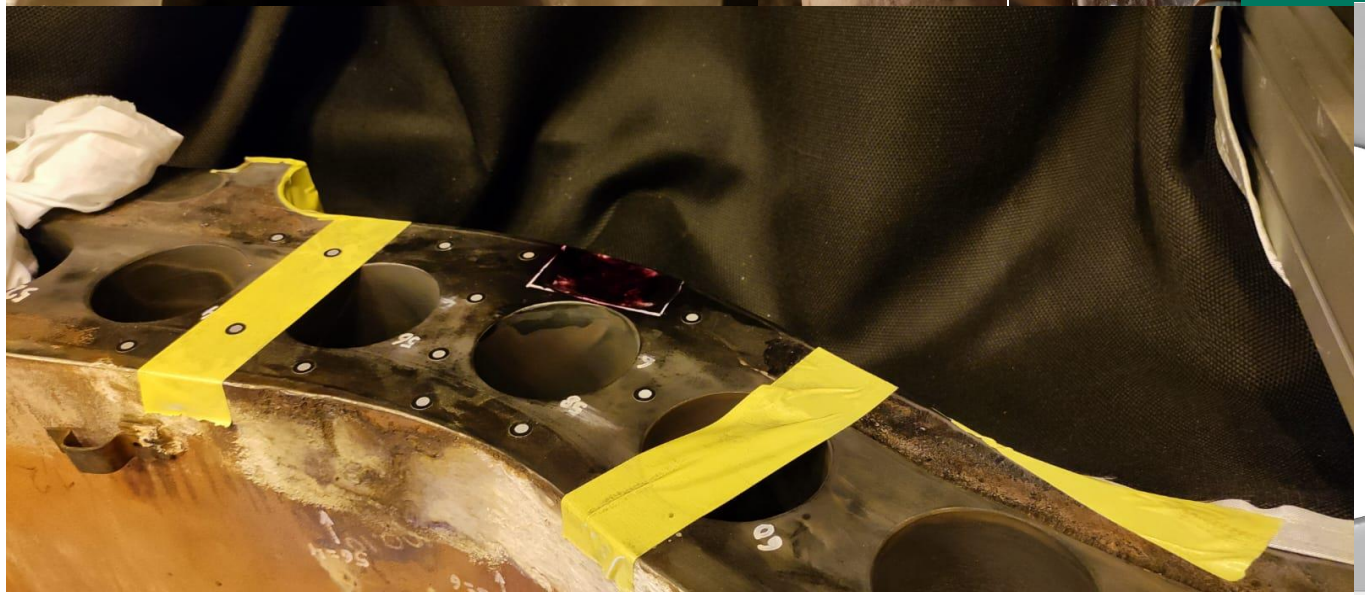


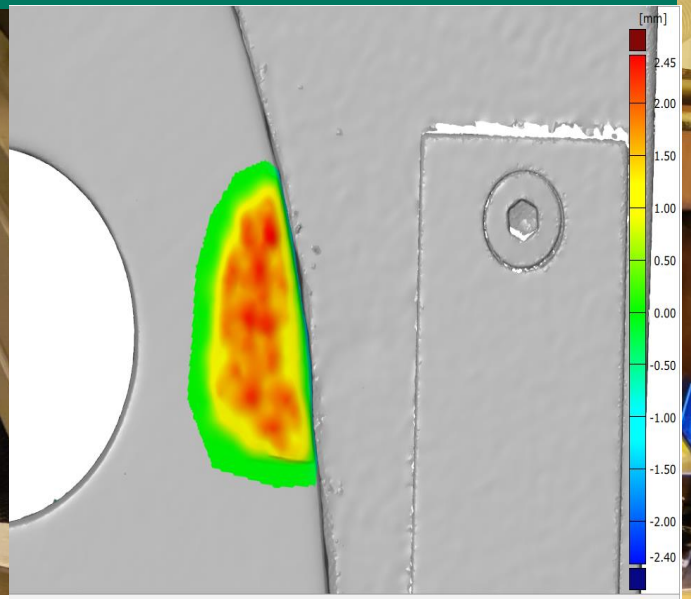




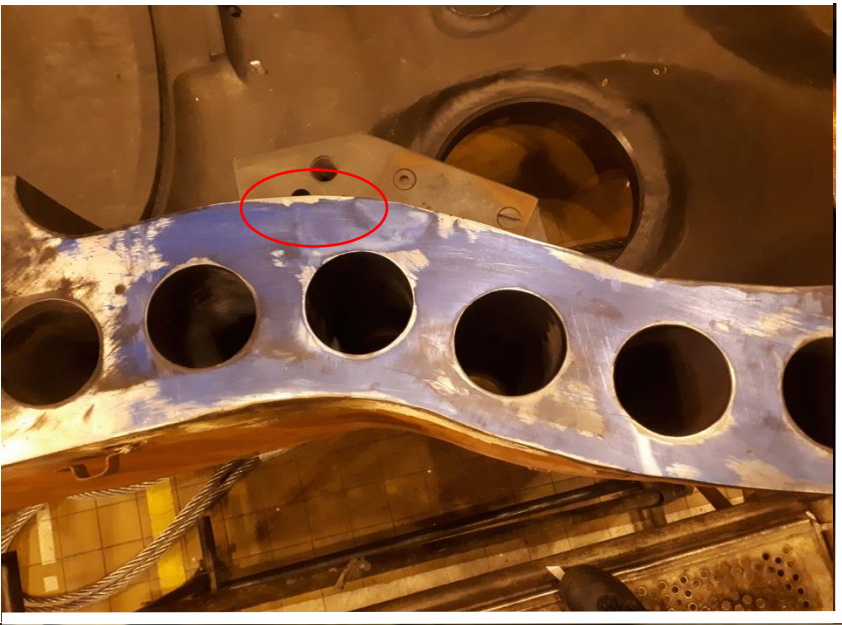
- Results fully in range of requested parameters
- Standard surface preparation
- Standard pre-repair NDT inspection

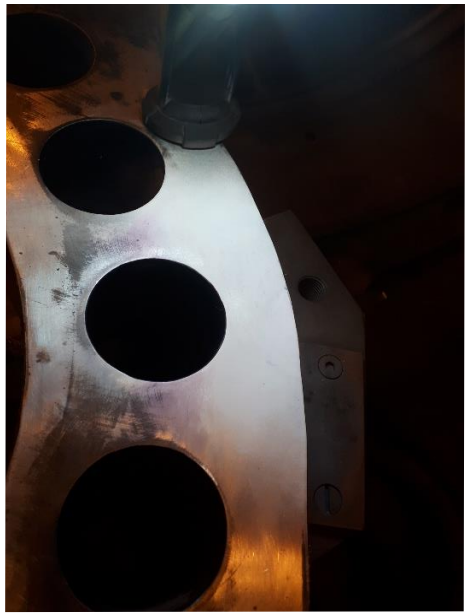






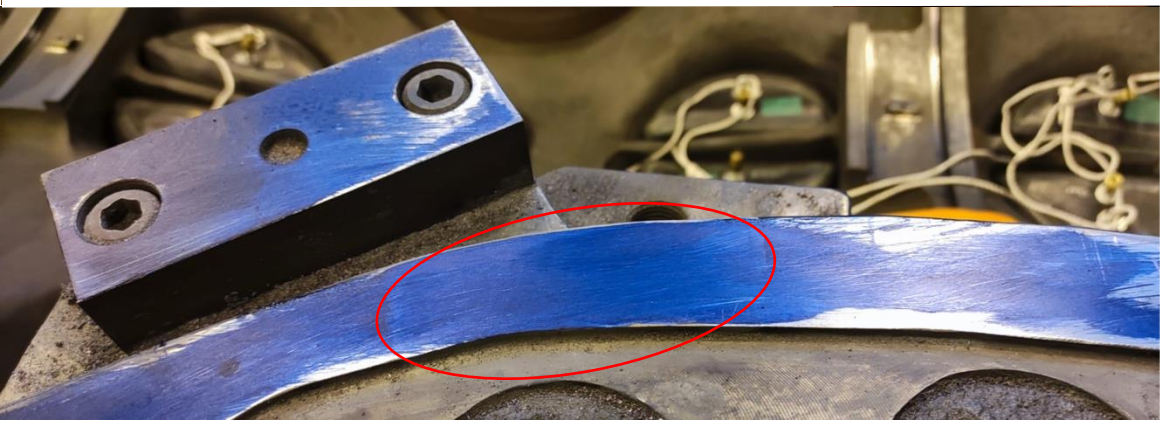
Results of repair







- Results fully in range of requested parameters
- Perfect continuous repair of sealing area
- NDT showing no indications







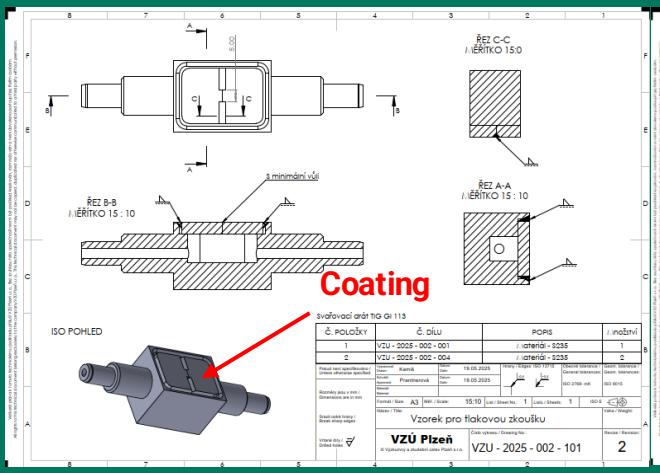
Repair of Generator Hydrogen leakage TG1 (NPP Temelín)

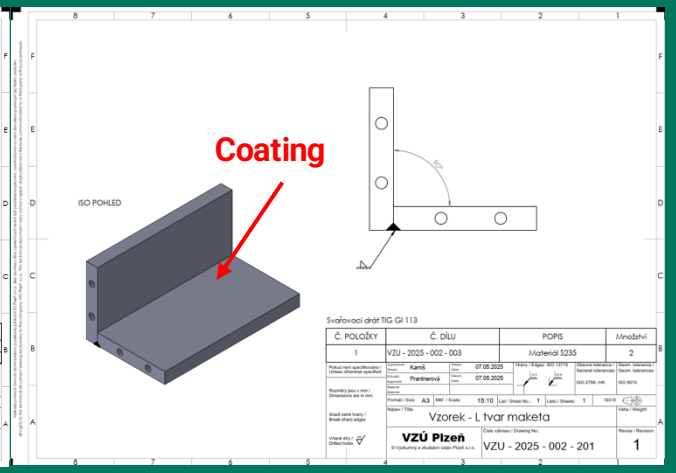
2025

iCVŘ | Centrum Výzkumu Řež Innovations

Skupina ÚJV
LIDÉ | INOVACE | TECHNOLOGIE

Qualification





PT after coating



PT before coating





Before coating



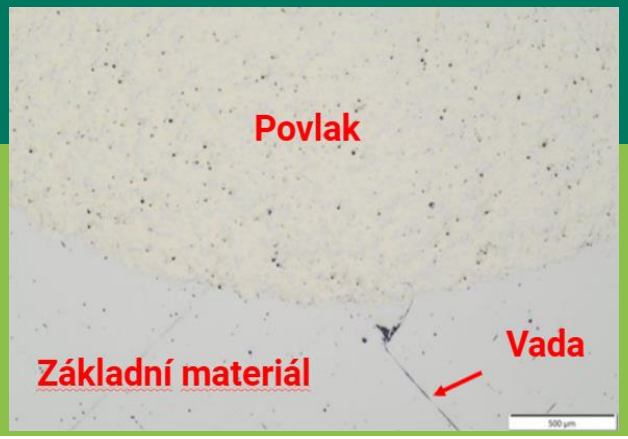
After sealing with coating





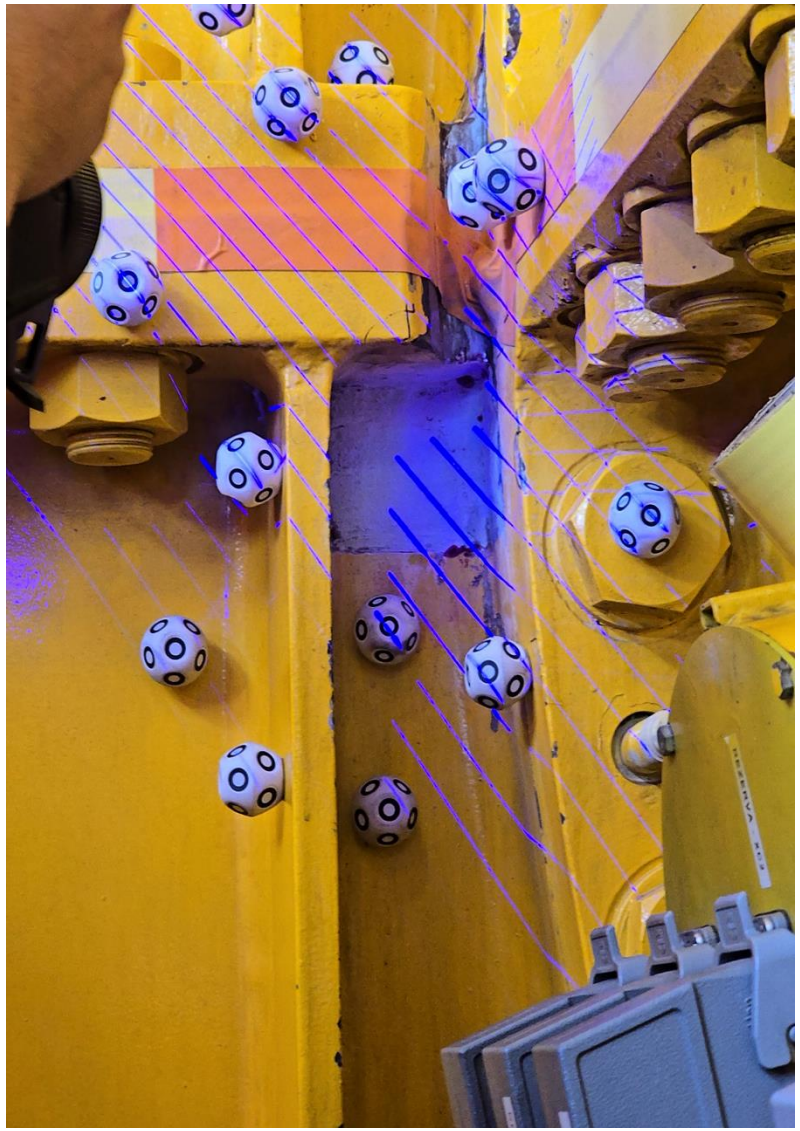


Cross section of MOCAP sample



3D scan



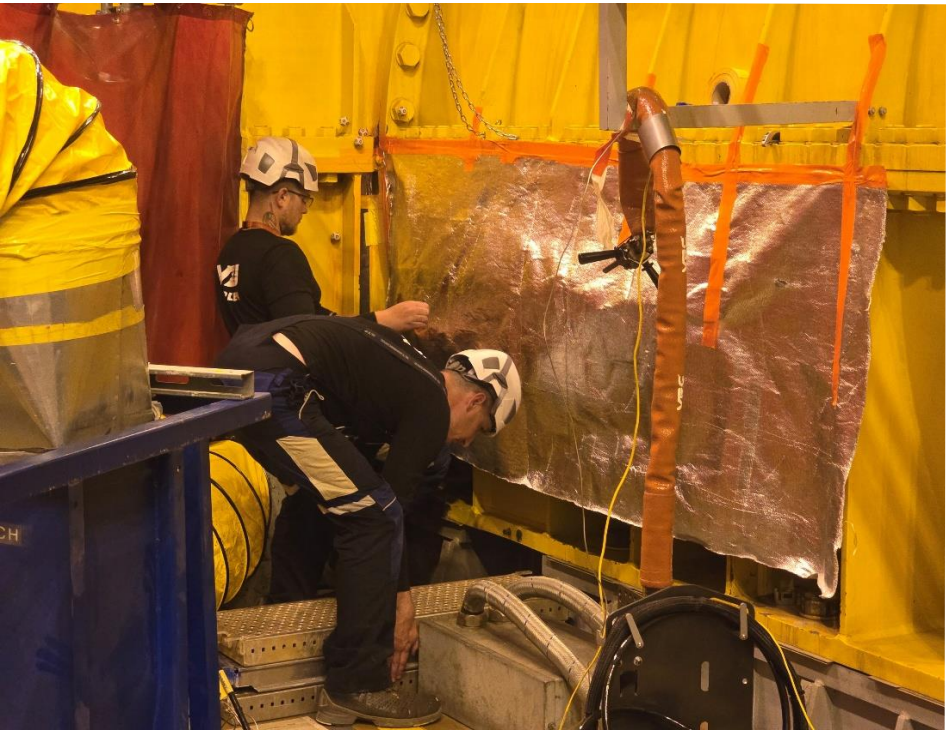


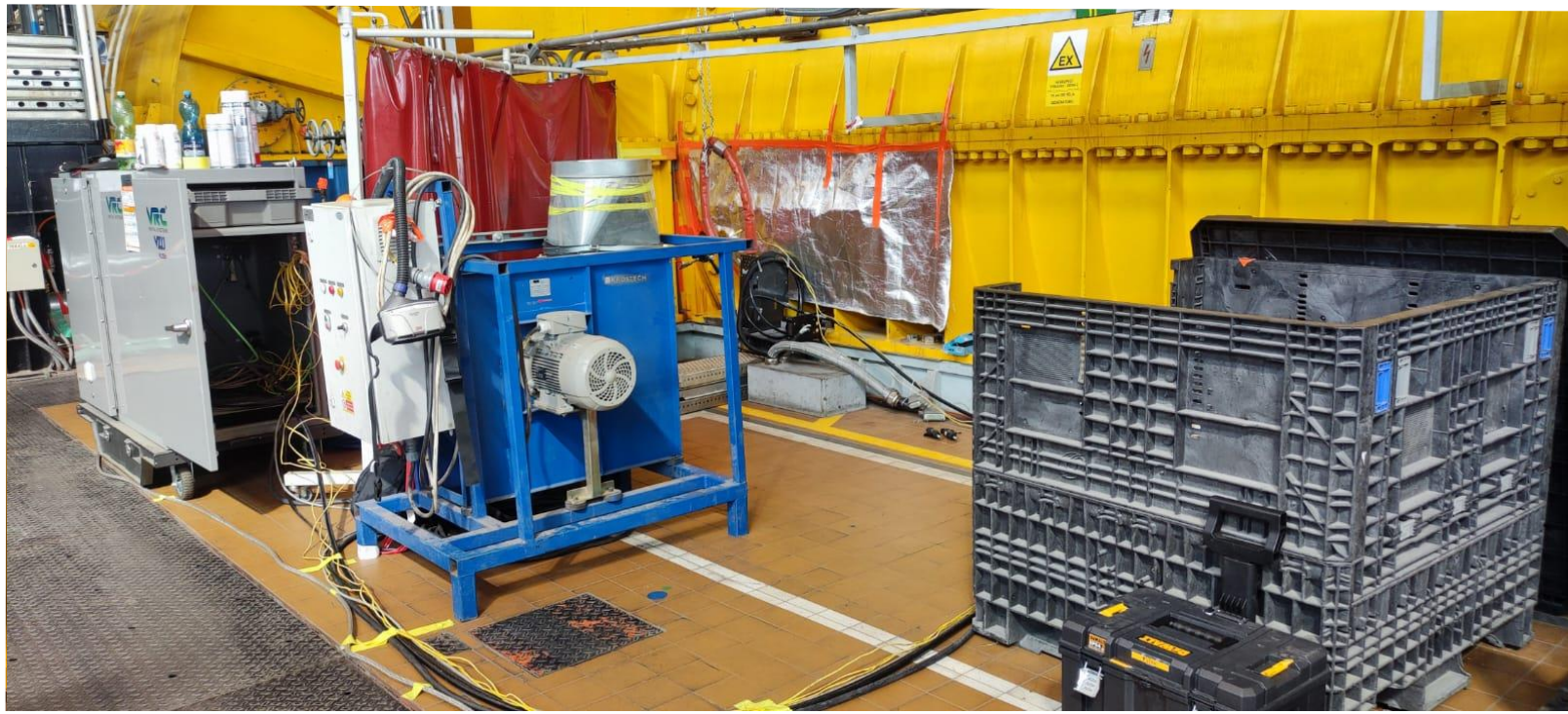
- Necessary for such repair
- Allows to continuously control the preparation of surface and thickness of added material

Workspace for repair

- Masking
- Filtration
- Technology VRC – Raptor
- Dimensionally compact setup fully portable

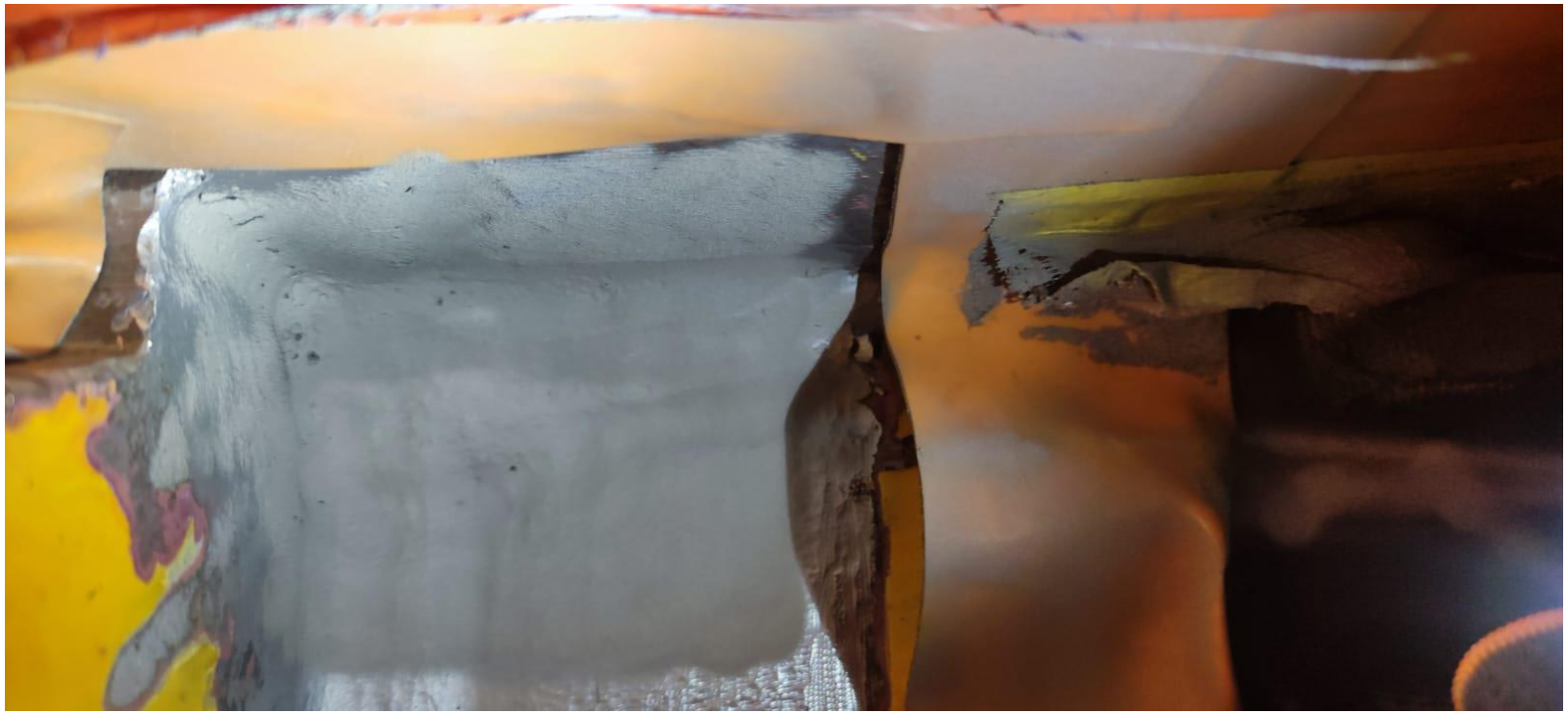






Result

- Bond Coat BC01
- Functional layer CrC01





Ongoing qualifications and new applications

Complex repair of sealing areas

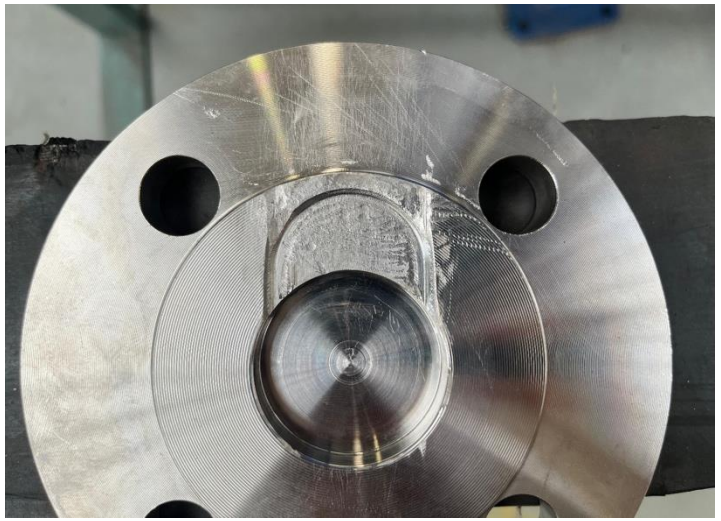


- Complex qualification allowing repair of any sealing areas
- Scope of qualification is from outer objects through secondary up to primary circuit



Example of damaged sealing area repair

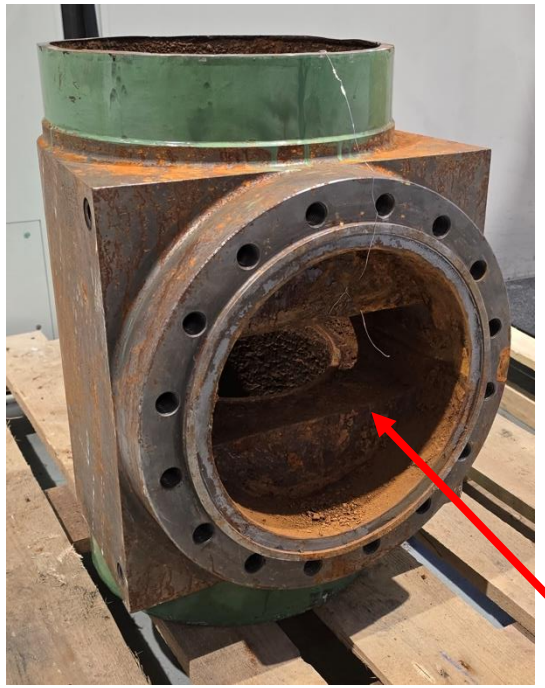
Thickness up to 5 mm

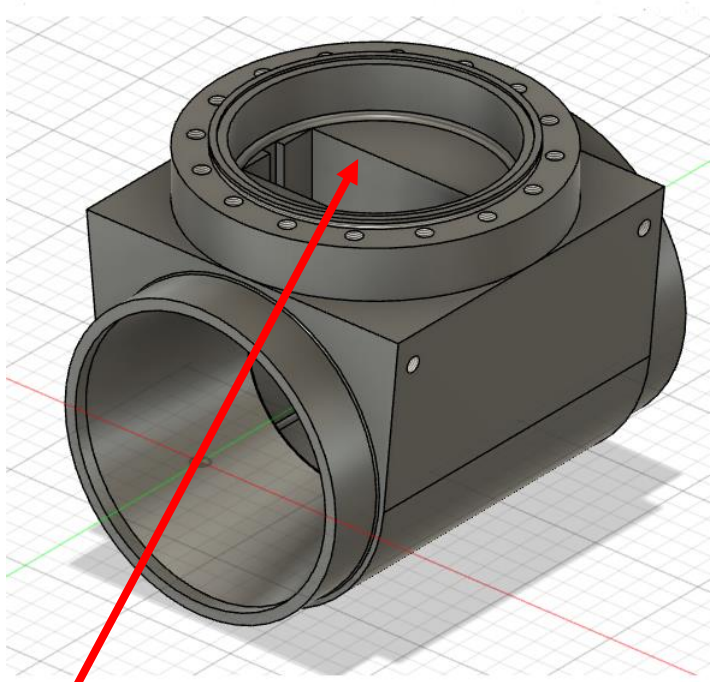


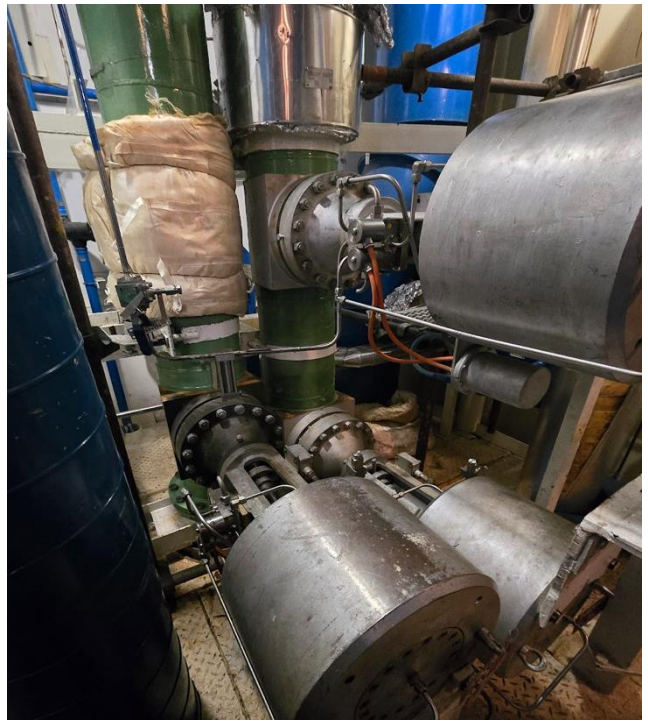




Restoration of sealing areas and inner dimensions of high-speed valve





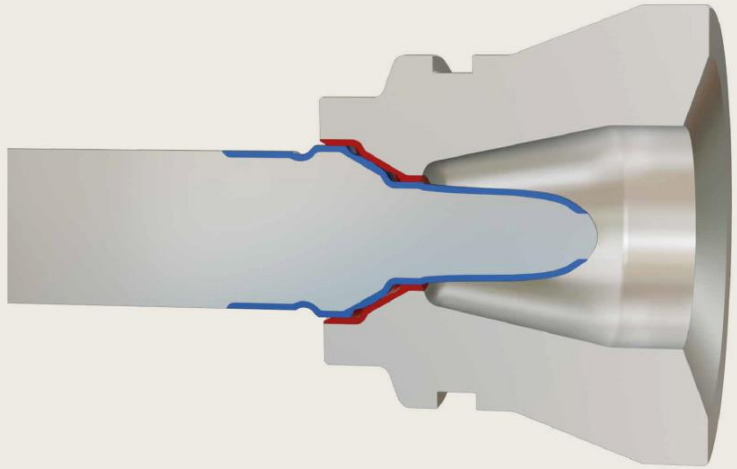


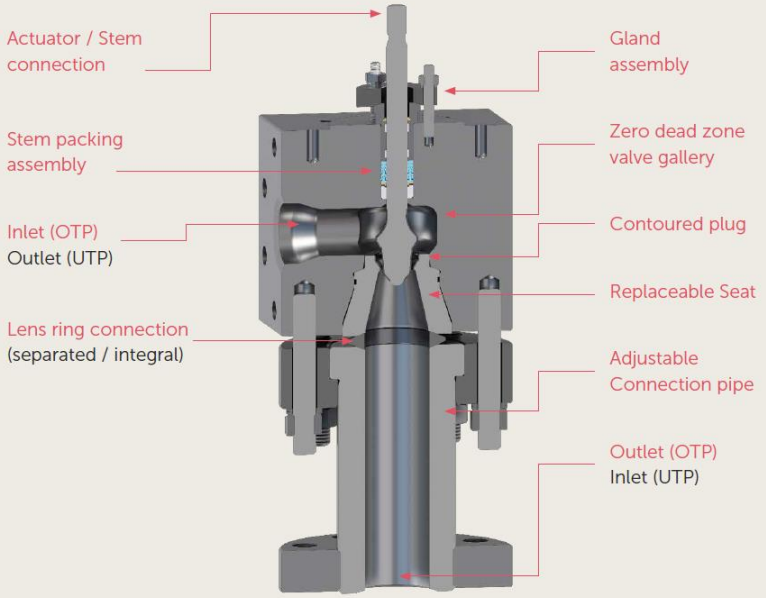
Inner dimension restoration using mobile CGS 3D printing

Valves – Zirconium alloy Repairs and New Build Construction

IMI CCI IMI

- Design of new valves
- Application of zirconia or other cobalt free materials
- Excellent corrosion and wear resistance
- Cavitation resistance
- Allows restoration of surfaces







iCVŘ | Centrum Výzkumu Řež Innovations

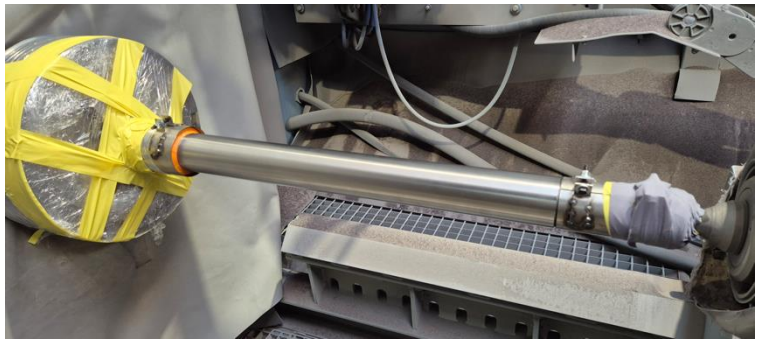
Renovation of valve spindles

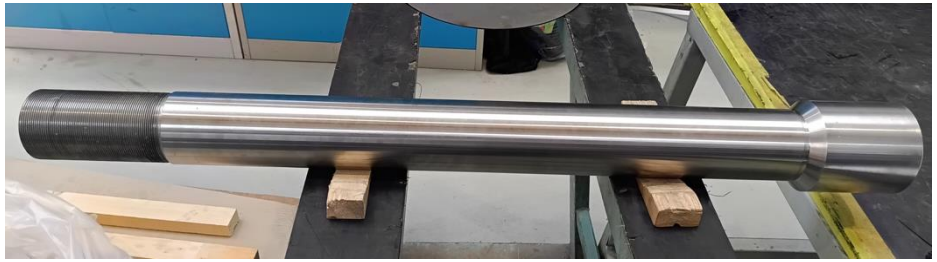








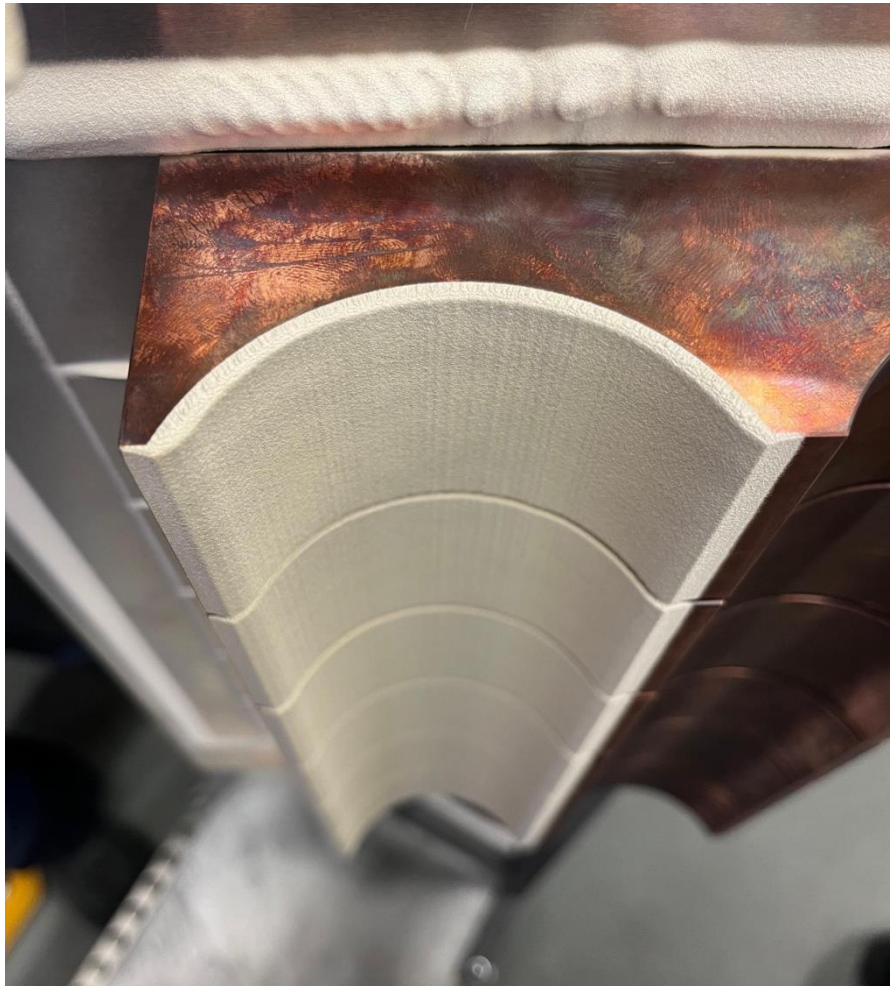






Increase of electric conductivity

Deposition of Ag on copper contacts





Local surface restoration

Capable to mitigate uneven deformation

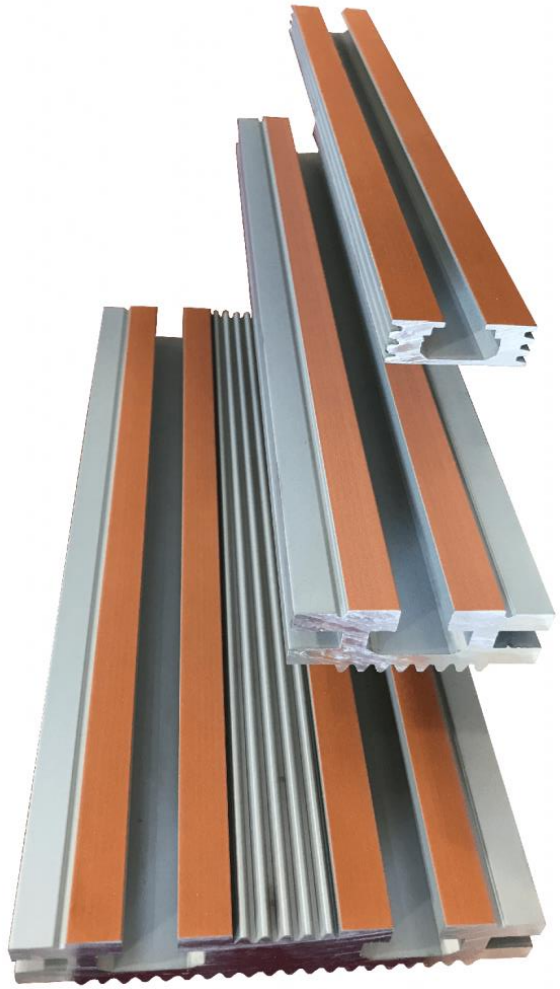






Busbar – 3D printing

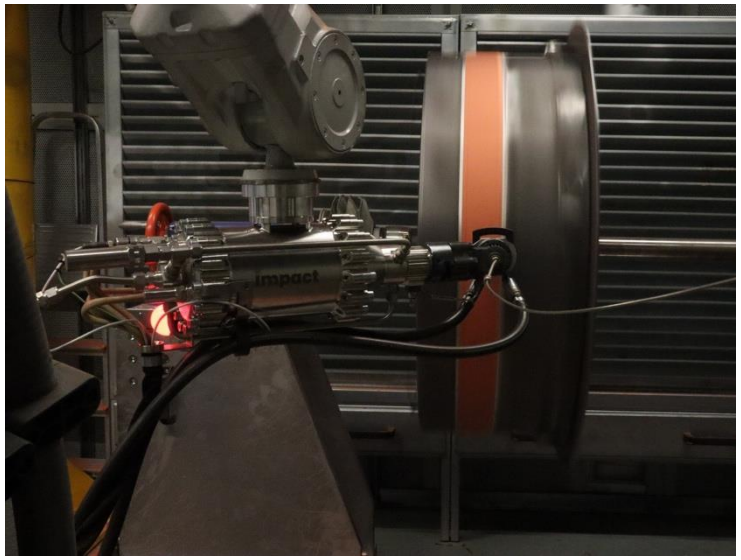
- High voltage application
- No risk of cable loosening or puncture
- Adaptive design by customer needs

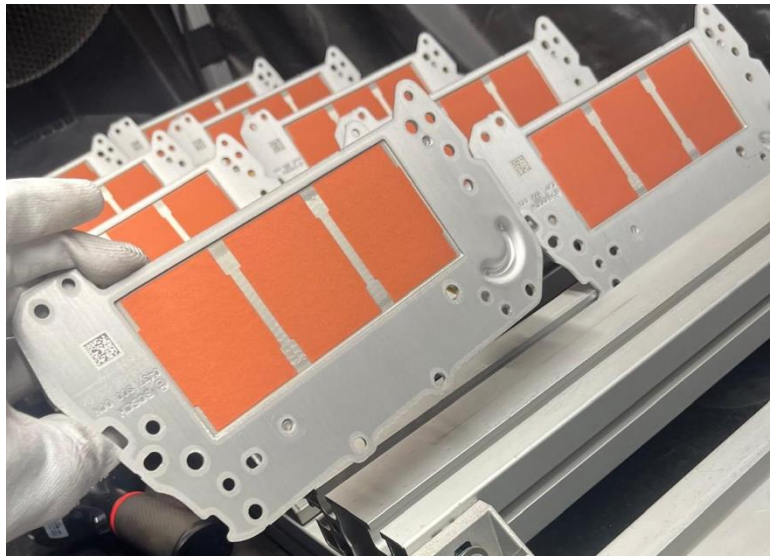


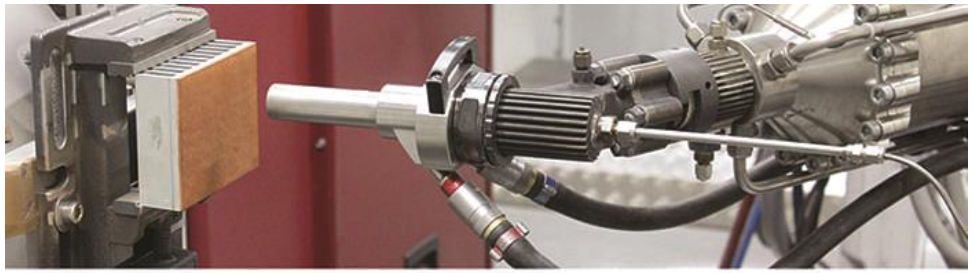


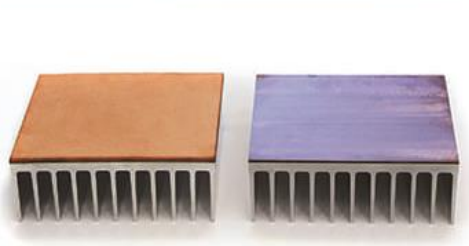
Increase in thermal conductivity

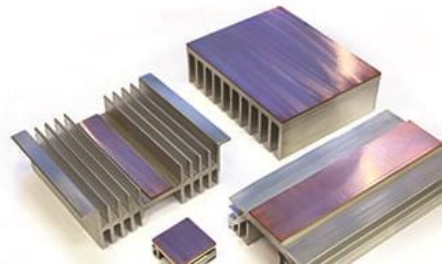
Application of Cu on aluminum coolers











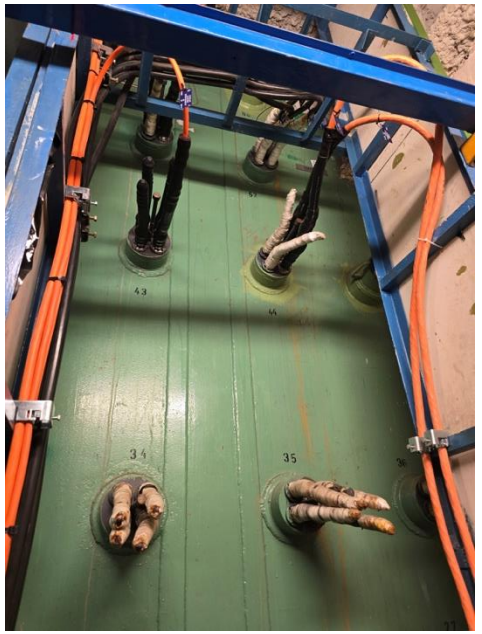
Grommet repair - Firefly

- Repair of leakage and cracked welds
- Availability to reach closed quarters





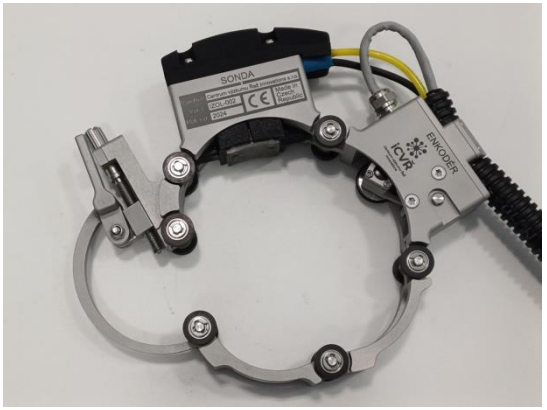






Autonomous repairs and measurements

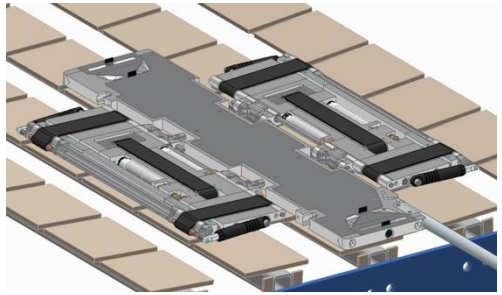
- Autonomous repairs
- Custom build measurements

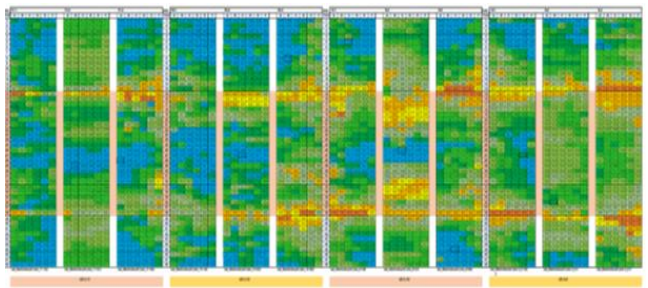


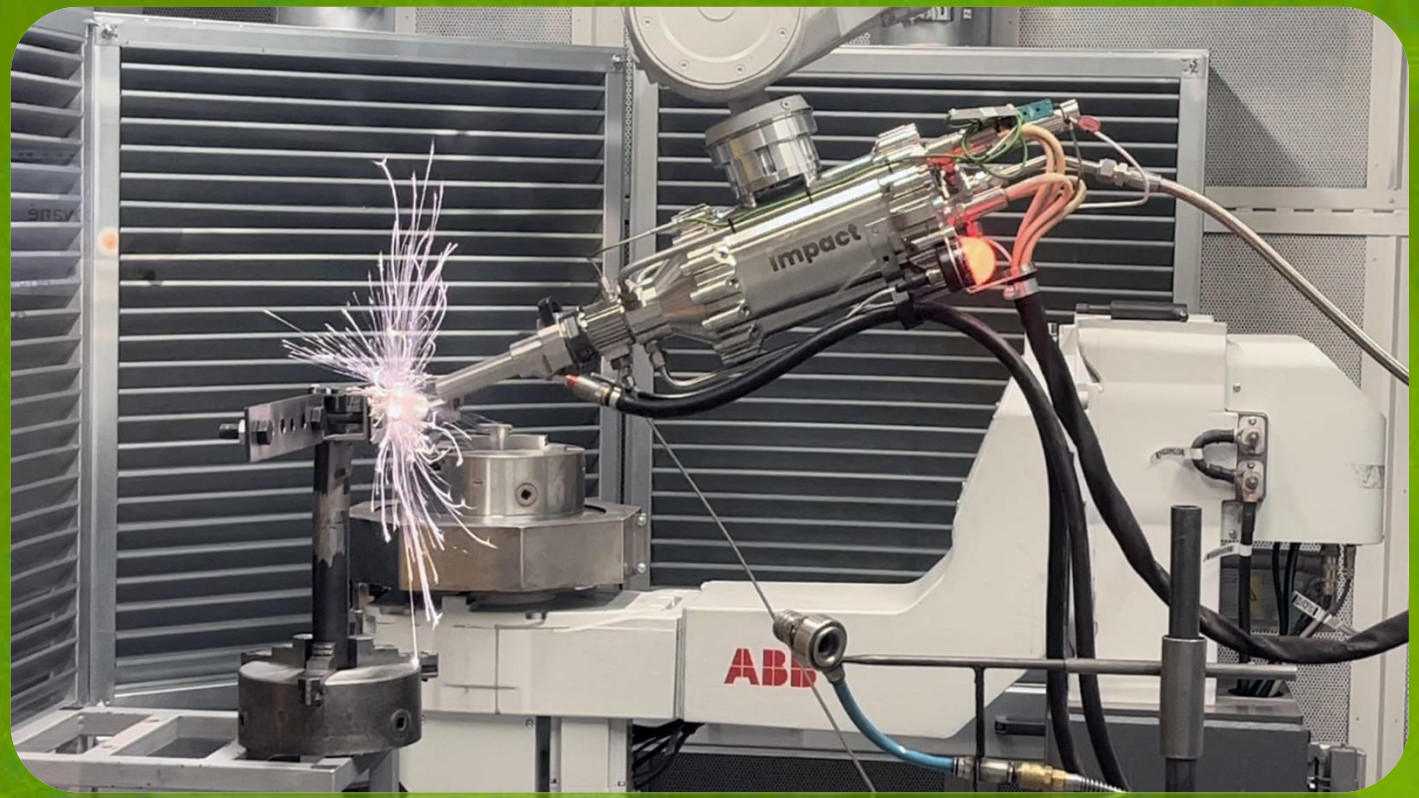












Thank you for attention

Jan Schubert

Application and business development

jan.schubert@icvr.cz

+420 737 237 986