

### Low-temperature reparations of the turbines creep resistance casted components

The goal of the two-years project (1.2.2016-31.12.2017 with 4 stages) is to create methodological procedures focused on the low-temperature reparations of the turbines components. It mainly deals with the defects caused by casting, fatigue defects or eventually technological production defects. That is why as a purpose there is to find such reparations procedures which ensure the serviceability of these devices under the standard regime. Reparations will be applied for materials G17CrMo5-5, G17CrMoV5-10, GX23CrMoV12-1 a P91.

As a main goal and simultaneously also a project output there is experimental try out of the proposed procedurals on the real parts with the subsequent qualification of these procedures by the certificated authorities, creation of the WPQR and settings of the conditions for the subsequent implementation into production. Qualified reparations procedures will be made for the material mentioned above. Partial projects activities which will result in achieving the goals.

For every from the materials mentioned above will be carry out following activities:

1. Proposal of the suitable filler materials, welding procedures and shapes of the primary testing samples.
2. Basic material tests, thermal cycles simulation by the Gleeble device, structural analysis.
3. Numerical simulations to evaluate influence of the different temperature cycles on the material including the residual stresses determination, hardness and structural changes.
4. Experimental verification of procedures on the small parts for the proposed technologies (there are assumed methods 111 and 121 acc. to ISO 4063).
5. Reparations procedures optimization by the numerical simulations including the proposal of the final procedure
6. To carry out reparations on the real part with the subsequent WPQR procedure qualification.
7. Creation of conditions for their implementation into production.

Code	FV10510
State providing funder	Ministry of Industry and Trade of The CR <a href="https://www.mpo.cz/en/">https://www.mpo.cz/en/</a>
Programme	FV – TRIO (2016-2022)
Total eligible costs	7 840 000 CZK
Total project subsidy	4 974 000CZK
Subsidy FME TUL	CZK
TUL project number	17773
Contractor	Siemens s.r.o. <a href="https://new.siemens.com/global/en.html">https://new.siemens.com/global/en.html</a>
Project participant	TUL, Faculty of Mechanical Engineering
Principal investigator TUL	doc. Ing. Jaromír Moravec, Ph.D.
Department	Department of Engineering Technology <a href="http://www.fs.tul.cz/en/technology/welding/research-and-innovations/">http://www.fs.tul.cz/en/technology/welding/research-and-innovations/</a>
Period	2016-2017

CZ: <https://www.rvvi.cz/cep?s=jednoduche-vyhledavani&ss=detail&n=0&h=FV10510>

Costs (year) TUL	2016	2017	Total
Non-investment (CZK)	1 070 000	1 070 000	2 140 000
Investment (CZK)	0	0	0
<b>Total (CZK) TUL</b>	<b>1 070 000</b>	<b>1 070 000</b>	<b>2 140 000</b>

Project results EN		
2017	Proved technology	<a href="#">RIV/46747885:24210/17:00004709 - Ověřená technologie oprav creepově odolných komponent z materiálu GX23CrMoV12-1 (2017)</a>
2017	Proved technology	<a href="#">RIV/46747885:24210/17:00004710 - Ověřená technologie oprav creepově odolných komponent z materiálu GX12CrMoVNb9-1 (2017)</a>
2017	Proved technology	<a href="#">RIV/46747885:24210/17:00004711 - Ověřená technologie oprav creepově odolných komponent z materiálu G17CrMoV5-10 (2017)</a>
2017	Proved technology	<a href="#">RIV/46747885:24210/17:00004712 - Ověřená technologie oprav creepově odolných komponent z materiálu G17CrMoV5-5 (2017)</a>
2018	Article	<a href="#">RIV/46747885:24210/18:00005931 - Application possibilities of the low-temperature repairs on creep-resistance turbine components from material GX23CrMoV12-1 (2018)</a>
2017	Article	<a href="#">RIV/46747885:24210/18:00005931 - Application possibilities of the low-temperature repairs on creep-resistance turbine components from material GX23CrMoV12-1 (2018)</a>
2018	Article	<a href="#">RIV/46747885:24210/18:00005933 - Application possibilities of low-temperature repairs by welding for creep-resistance material GX12CrMoVNb9-1 (2018)</a>
2018	Article	<a href="#">RIV/46747885:24210/18:00005933 - Application possibilities of low-temperature repairs by welding for creep-resistance material GX12CrMoVNb9-1 (2018)</a>