

## Mitigating Environmentally-Assisted Cracking Through Optimisation of Surface Condition – MEACTOS

## Objectives of the project

The goal of the MEACTOS project is to improve the safety and reliability of Gen II and III nuclear power plants by improving the resistance of critical locations, including welds, to environmentally-assisted cracking (EAC) through the application of optimized surface machining and improved surface treatments.



## Concept & methodology

The effect of surface machining and treatment techniques on the material's EAC initiation behaviour will be quantified using accelerated testing methods developed in NUGENIA+ projects MICRIN+ and ASATAR, e.g., constant extension rate tensile (CERT) testing using tapered specimens. The link between laboratory testing and component behaviour will be examined in terms of EAC models.

The MEACTOS project will contain two phases: (1) qualitative screening phase and (2) verification phase to demonstrate quantitatively improved EAC initiation performance. The link between surface machining/treatment parameters and EAC initiation performance is the characterisation of the material surface and sub-surface regions in terms of properties (hardness), residual stress and microstructure.

Finally, both the screening and verification phase will produce technically-relevant information on mitigation of EAC initiation. This information will be incorporated into guidelines for modern surface machining and treatment techniques.



The project has received the label of the NUGENIA Nuclear Gen II & III Association and tackles key issues of their roadmap.

Project coordinator: CIEMAT (Spain), project period: September 2017 – February 2022



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## Review of the state-of-the-art & workshop (WP 3)

The objective of WP 3 is to collect and review the state-of-the-art on the role of surface conditions on EAC initiation susceptibility, crack initiation testing and characterisation. This will develop and produce a consensus regarding the needs of industry on the role of surface conditions on EAC initiation susceptibility, and how this shall be taken into consideration within the MEACTOS project. This ensures that the MEACTOS project will advance the current knowledge and experience base on the effect of machining/surface treatments on EAC susceptibility. Existing experience among the partners on the role of surface conditions on EAC initiation susceptibility, on initiation testing and mitigation through modern surface treatments was shared in the framework of a workshop, held in November 2017 at VTT (Espoo, Finland). 22 experts were giving interesting presentations and had fruitful discussions during the 2-days workshop. The results from this workshop, as well as from three relevant projects, undertaken as part of the NUGENIA+ project (7<sup>th</sup> EU framework programme), i.e., MICRIN+, ASATAR and McSCAMP, were summarised in an excellent report, which is available for download on the MEATOS website: [here](#).



# NuCoSS-19

## NUCLEAR CORROSION SUMMER SCHOOL 2019

July 7 - 12, 2019  
Hotel Špik, Gozd Martuljek, Slovenia

**Organizers:** ZAG, PSI, MANCHESTER, cea, MEACTOS, EFC WP4

**Sponsors & supporters:** CORMET, IPS, SCK-CEN, Western University, VATTENFALL, framatome, EDF, PPC

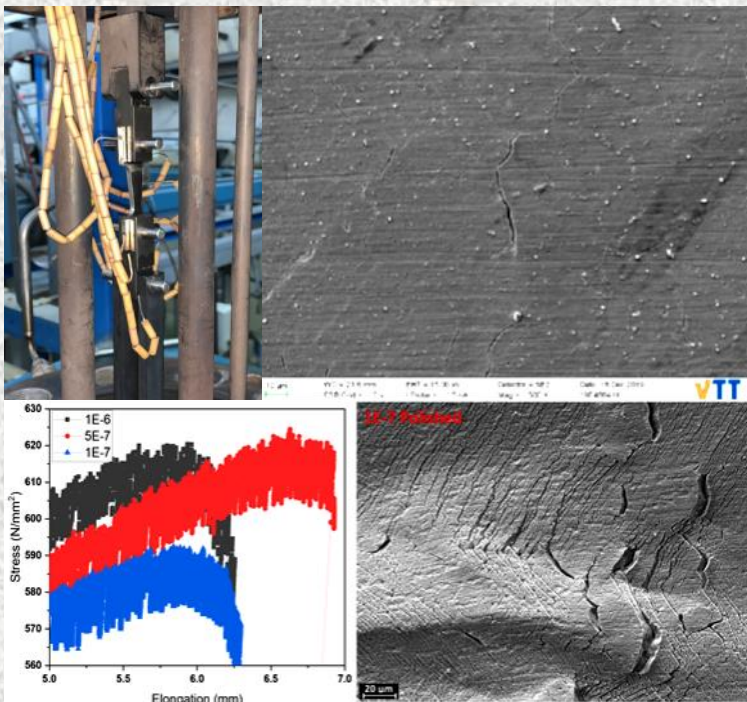
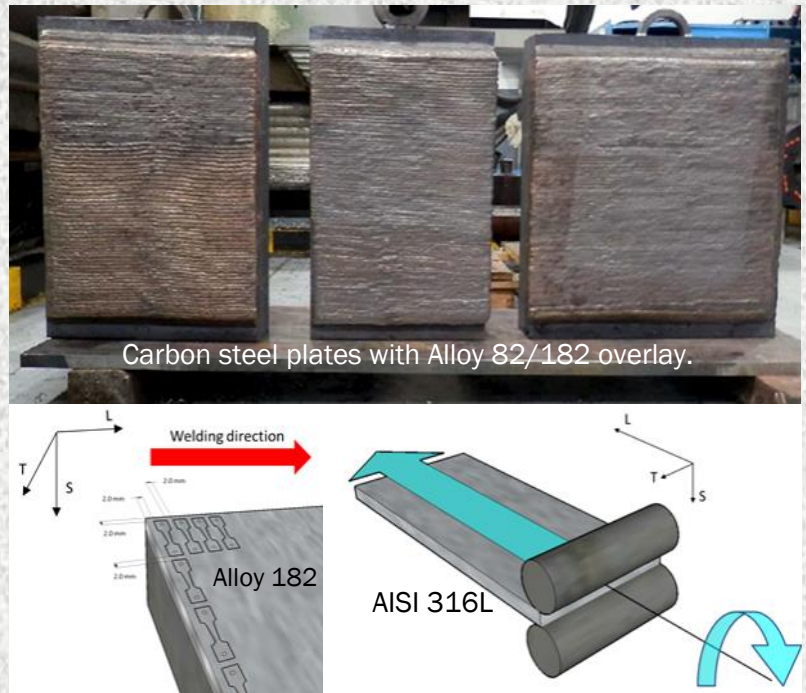
This event receives funding from the Euratom research and training programme 2014-2018 under grant agreement no. 755151.

One important task of the MEACTOS project is the education of young nuclear engineers and scientists in the field of nuclear corrosion and environmentally-assisted cracking in light water reactor plants. Also the knowledge transfer from the senior experts towards the next generation is supported by the project. Therefore, as one of the highlights of the project, a nuclear corrosion summer school (called “NuCoSS-19”) has been organised in July 2019, in a beautiful alpine resort in Slovenia. It was a great success with 37 attendees (25 students and 12 scientists or engineers) and 12 lecturers from 14 countries, even from outside Europe. Also thanks to the perfect preparation by the local host (Slovenian National Building and Civil Engineering Institute – ZAG) it became a memorable event, not only from a technical/scientific point of view. A detailed report can be downloaded from the MEACTOS website: [here](#).



## Progress on materials manufacture, characterisation & testing (WP 4, 5 & 6)

Two structural materials are investigated in the framework of this project, a Ni-base weld metal (Alloy 182) and a 13% cold-rolled type 316L stainless steel. Both materials were provided by Ensa. The weld metal was produced by shielded metal arc welding of a layer of Alloy 182 on a carbon steel plate (with a layer of Alloy 82 in between). The surfaces of the Alloy 182 and 316L plates were then treated in different ways (by Ensa & NAMRC), resulting in four different surface finishes on the tensile test specimens: “reference surface finish” (polished), “industrial standard surface finish”, “advanced machined surface”, and “shot peened surface”. The steels and specimens were characterised in detail by the University of Manchester and some further partners.



The stress corrosion crack initiation testing phase 1 (“screening”) consisting of constant extension rate tensile testing with flat tapered specimens is currently ongoing and should be finished during the next few months, whereas testing of phase 2 could not yet be started. It needs to be stated that currently the Corona crisis is severely affecting the progress of the project!

Also a lot of preparation work has been done on the database MatDB of the Online Data and Information Network ([ODIN](#)) of the EC-JRC.

Of course also plenty of project meetings (“normal” ones and, especially during these days, many via web/video) have been held.



The next edition of the newsletter will certainly present more details on the materials characterisation, on the database and first preliminary SCC test results.

## Finally we wish you and your family good health and all the best during these challenging times!



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