#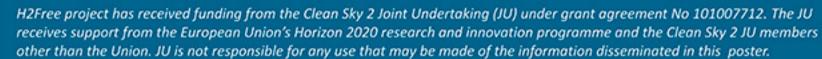 Investigation and modelling of Hydrogen effusion in electrochemically plated ultra-high-strength-steels used for landing gear structures

H2Free

Introduction

One drawback associated to UHSS coated components is the risk of hydrogen embrittlement (HE) and delayed hydrogen fracture of the part. The standard degassing process is applied equally to the components regardless UHSS or coating composition/morphology. However, it is known that the nature and structure of both the base material and the coating have a great influence in the hydrogen intake and degassing efficiency.

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The objective

The main objective of the H2Free project is to develop a practical guideline for hydrogen degassing of UHS-steels plated with LHE-Zn-Ni, with the aim of saving production costs and allowing Zn-Ni to overtake Cd coatings. The guideline will contain simple rules/formulas to provide criteria to design the degassing process, based on experimental data and on modelling to predict the hydrogen effusion in coated UHSS, the remaining hydrogen concentration in the components and so the probability of hydrogen embrittlement. With its digital approach, H2Free will accelerate materials modelling uptake into European industrial decision making and link all partners to central European materials modelling platforms and activities.

The project in numbers

3SP/1BE/2GE	28	1M€	6
COUNTRIES	MONTHS	BUDGET	PARTNERS

Partners

cidetec
surface engineering

AZTERLAN
MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE

elsyca
The electrochemical reference in software & engineering

hereon

MAX-PLANCK-INSTITUT
FÜR EISENFORSCHUNG GmbH

elhco
electroless hard coat. s.a.

Topic Manager

LIEBHERR

Industrial challenges

➢ Understanding of HE phenomena
➢ Tool to predict HE probability in complex coated parts
➢ Minimizing industrial rework and scrap
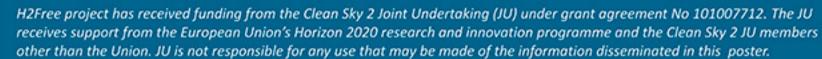➢ Cd replacement

Expected results

• 4 different UHSS will be studied during the project to be classified according their facility to degas.

• 3 coating layer microstructures / morphologies will be studied.

• Permeation parameters of all heterogeneities and Hydrogen thresholds (retained H vs. HE) will be determined for all the materials.

• A model able to predict retained H and degassing time of a part will be developed,

• Determination of all undesirables morphologies/ structures/zones and the possibility to local rework undesirable structures detected instead of full reprocessing.

• Reduction of average degassing time.

• Energy consumption (in the heating process) reduction for different plated UHSS compared to current procedure (AMS2759/9 standard).

✈ Find out more!

https://www.cidetec.es/en/projects/surface-engineering-6/h2free-3

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Investigation and modelling of Hydrogen effusion in electrochemically plated ultra-high-strength-steels used for landing gear structures

H2Free

Clean Sky 2

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LIEBHERR

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