Marie Curie Actions

Innovative Training Networks – ITN projects

28/01/2023

Massimo Penasa

CAEmate
Engineering, Made Easy

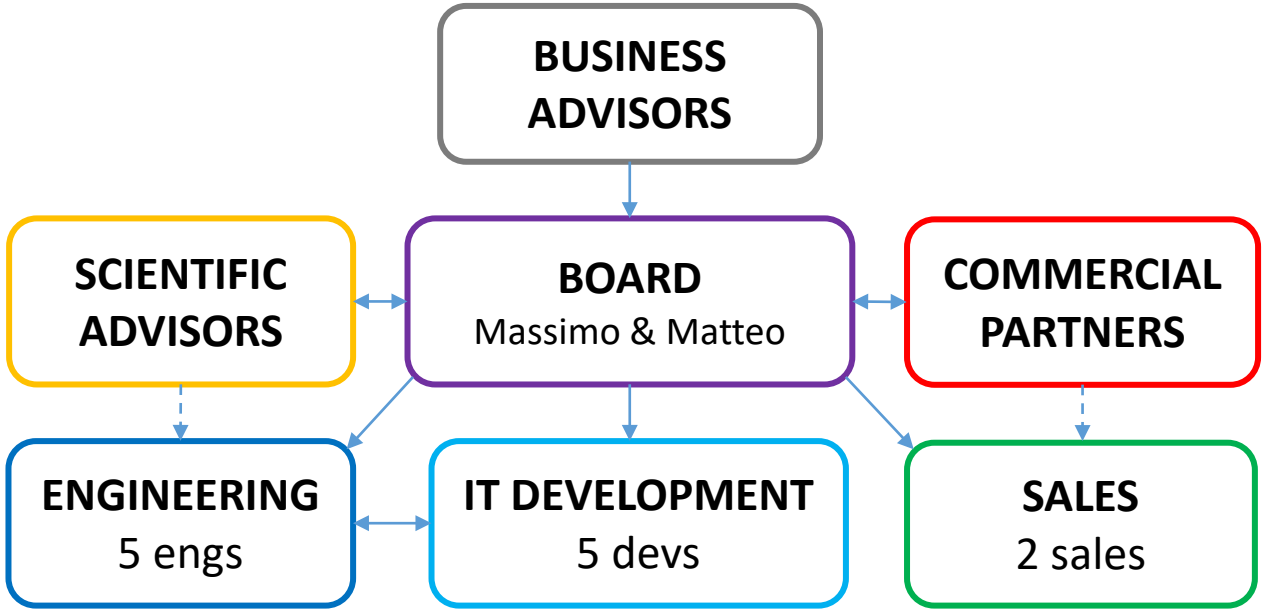
H2020-MSCA-ITN-955944

LIGHTEN

H2020-MSCA-ITN-956547

The CAEmate Team

- **Two owners: Massimo Penasa** and **Matteo Penasa**
- A **growing team** of **16 engineers** and **IT developers** (+7 last year)
- **European Research** projects with **18 international Universities** and **10 international Companies**
- **11 PhD students involved - 6 at CAEmate**



Digital twin for Infrastructure Monitoring

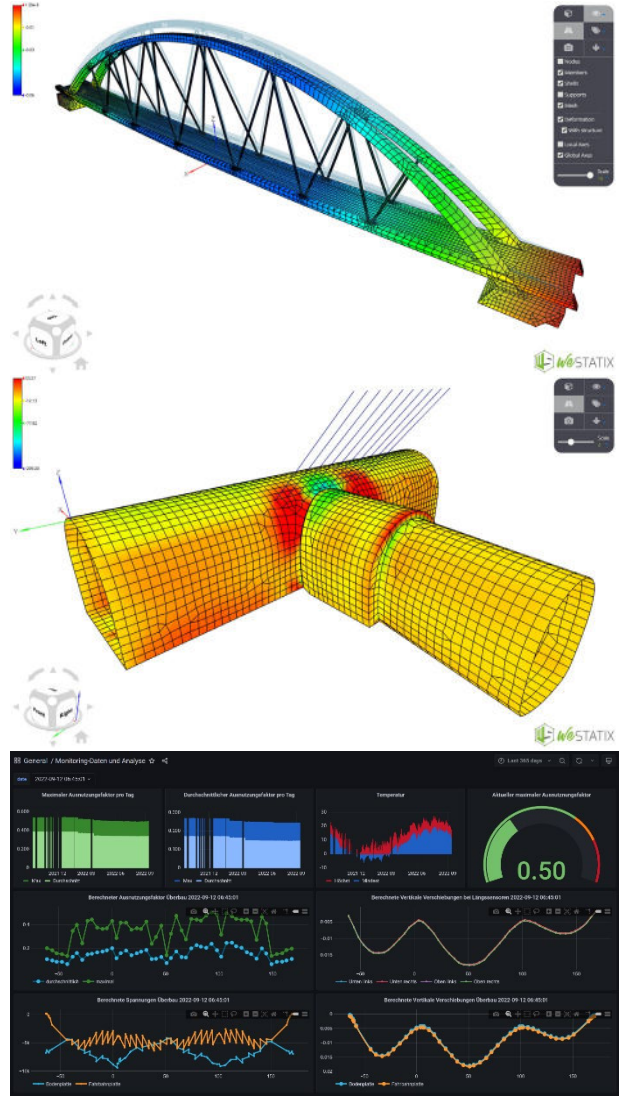
- WeStatiX SHM is a **unique Software** for **Monitoring** and **Predictive Maintenance** of **Infrastructures** (bridges, viaducts, railroad overpasses, tracks, tunnels, slopes, buildings etc.).

- The system enables the creation of **Digital Twins** of **Infrastructure**, which are **automatically** and **continuously updated** with data measured by any type of sensor installed on the work (e.g. fiber optics, inclinometers, total stations, load cells).

- Through **Simulation** and **Artificial Intelligence**, the system makes it possible to calculate if and how safe the structure is, and to predict its **future behavior**, **optimizing maintenance costs** and **greatly reducing them**.

- The solution is flexible: it is completely **cloud-based**, can be integrated with pre-existing solutions and systems and is fully **BIM compatible**.

- The system applies to both existing and newly built **structures**, and has already been applied and validated on multiple works both in Italy and abroad.



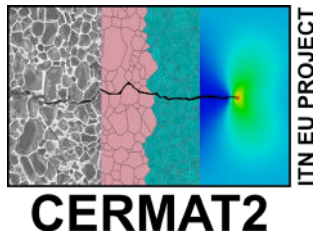
CAEmate Marie Curie Actions

H2020-MSCA-ITN-956547-**LIGHTEN**

Ultralight membrane structures towards a sustainable environment

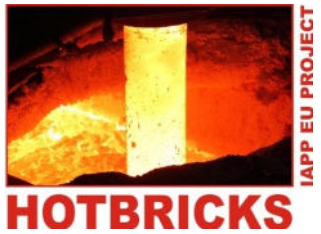
H2020-MSCA-ITN-955944-**RE-FRACTURE2**

Modelling and optimal design of refractories for high-temperature industrial applications for a low carbon society



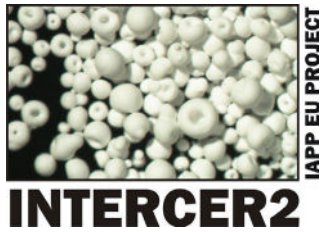
PITN-GA-2013-606878-**CERMAT2**

New ceramic technologies and novel multifunctional ceramic devices and structures



PIAPP-GA-2013-609758-**HOTBRICKS**

Mechanics of refractory materials at high-temperature for advanced industrial technologies



PIAP-GA-2011-286110-**INTERCER2**

Modelling and optimal design of ceramic structures with defects and imperfect interfaces

Innovative Training Networks

How it Works:

- ITN supports competitively selected **joint research training** and/or **doctoral programmes**, implemented by partnerships of universities, research institutions, research infrastructures, businesses, SMEs, and other socio-economic actors from different countries across **Europe** and **beyond**;

- Partnerships take the form of collaborative European Training Networks (ETN), **European Industrial Doctorates (EID)** or European Joint Doctorates (EJD).

- Training responds to well **identified needs** in defined **research areas**, with appropriate references to inter- and multidisciplinary fields and follows the **EU Principles for Innovative Doctoral Training;**

- In order to increase the **employability of the researchers**, the research training should be complemented by the **meaningful exposure** of each **researcher** to the **non-academic sector**.

RE-FRACTURE2 ESR4 project overview

Title: Computational implementation and validation of constitutive models and fracture mechanics applications for heat resistant devices

Main Supervisors: Dr. M. Penasa (CAEmate) and Prof. V. Buljak (University of Belgrade)

Duration: November 2021 – November 2024

Main objectives:

- Computational implementation and validation of user material subroutines to be linked to commercial/open-source FE software;
- Extension of FE software (e.g. implementation of new material laws) for simulation of thermoplastic material instabilities;
- Numerical simulation of experimental tests at high temperature and thermal shock of industrial components.

LIGHTEN ESR2 project overview

Title: A novel method to determine the time and temperature-dependent onset of plasticity in structural membranes

Main Supervisors: Dr. M. Penasa (CAEmate) and Prof. F. Bosi (UCL) and

Duration: M7-36 (May 2021 – April 2024)

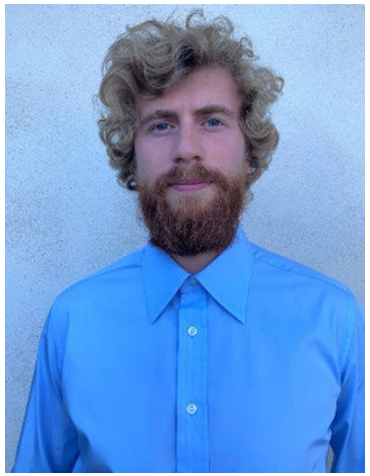
Objectives:

- Development of a novel method to detect the onset of plasticity in structural membranes
- Viscoelastoplastic solution for the inflation of thin films with different shapes
- Temperature and strain-rate dependent yield criteria for building skins
- Validation, numerical implementation and application of the yield functions

Secondment:

- UCL – 16 months – M19-35 (May 2022-August 2023)
- SBP – 2 months – M36-37 (September 2023-October 2023)

LIGHTEN ESR1 project overview



Title: Nonlinear thermomechanical response and constitutive modelling of viscoelastic building skins - ETFE membranes.

Main Supervisors: Prof. F. Bosi (University College London) and Dr. M. Penasa (CAEmate)
Duration: July 2021 – July 2024

Main objectives:

- Thermomechanical characterisation of viscoelastic ETFE membranes;
- Nonlinear thermoviscoelastic modelling to capture the material response;
- Implementation and validation of the model through in a user material subroutine for commercial/open-source/in-house FE software.

RE-FRACTURE2 ESR5 and ESR6 project overview

Title: Topology and geometry optimization of refractory devices

Main Supervisors: Prof. V. Buljak (University of Belgrade) and Dr. M. Penasa (CAEmate)

Title: Inverse analysis procedure for calibration of constitutive models for mechanical behavior at high temperature

Main Supervisors: Prof. V. Buljak (University of Belgrade) and Dr. M. Penasa (CAEmate)

Main Partners

TU Delft
Delft University of Technology

UNIVERSITY OF TRENTO

VESUVIUS

TENSYS
Engineering • Analysis

CAEmate
Engineering, Made Easy

UCL

UNIVERSITY OF BELGRADE

sbp
schlaich
bergermann partner

1872 PRIFYSGOL ABERYSTWYTH UNIVERSITY