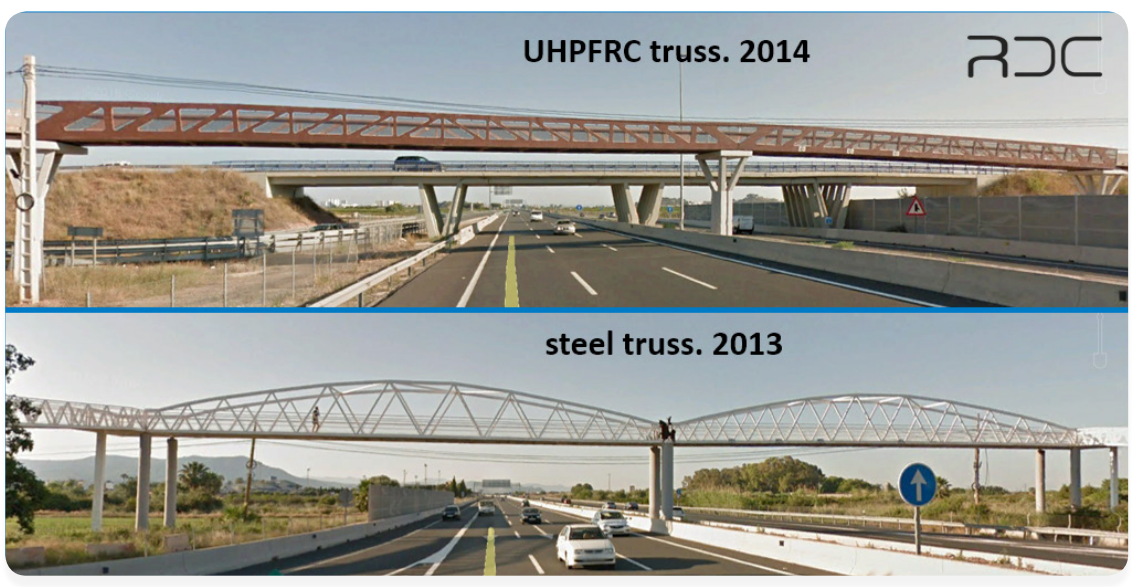
REDUCTION OF COSTS THROUGH EXTREME DURABILITY CONCRETES: TWO SUCCESSFUL STORIES

ESTEBAN CAMACHO - RESEARCH AND DEVELOPMENT CONCRETES, SPAIN - RESHEALIENCE PROJECT

A significant increase of the durability in construction materials can lead to a remarkable reduction of the life-cycle costs of a structure. In aggressive exposure environments, this benefit can be experienced already at short-term. An example of this is the UHPFRC footbridge that RDC designed in 2014 for the Valencian village of Puçol, which can be compared with a streel truss footbridge made a year before in the nearby town of El Puig with a similar span.

Despite that the last one had construction costs (€/m2) 30% lower than the first one, from its entry into service the painting requirements and a rehabilitation of the deck have reduced this difference to a 2%. The indirect costs associated to closing the footbridge during the reparation works (user costs) are not included due to the difficulty of estimating them in monetary terms but have the greatest impact on the citizens. On the other side, after 5 years under operation, the UHPFRC structure has not required any reparation or maintenance action, proving that a higher initial investment can return already at short-term.



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APPLICATION OF HIGH DURABILITY CONCRETE (UHDC) IN THE INDUSTRY

FRANCESCO ANIMATO - ENEL GREEN POWER, ITALY - RESHEALIENCE PROJECT

From the point of view of geothermal electricity plants, the use of Ultra High Durability Concrete (UHDC) is of particular interest due to the benefits that this advanced concrete can bring. Civil works of the geothermal power plants are exposed to aggressive environments (XA), characterized mainly by the presence of sulphates and chlorides, both in the atmosphere and in the water in direct contact with the plant structures.

Some of the damages that the concrete suffers in this environment are concrete expansion thereby ejection of the cover (spalling), fast corrosion of steel reinforcement, degradation of waterproofing systems and reduction in watertight for basins. This has a relevant maintenance cost associated and a lack of production linked to the plant shutdown. The use UHDC could solve most of these problems through:

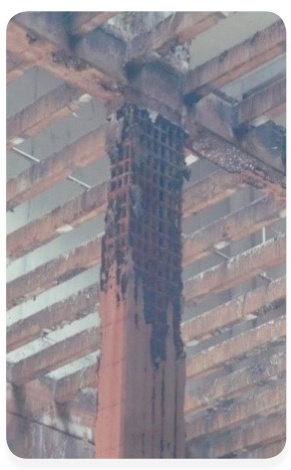
• **Production**: improve plant operation reducing the shutdowns and the timing connected to the maintenance works for the civil structures;

• **Maintenance works**: simplify the maintenance works considering that a UHDC concrete with high tensile strength reduces crack width, protecting efficiently the steel reinforcement, and even removing the bituminous waterproofing systems used for basins and water tanks;

• **Environment**: increase safety in terms of liquid tightness for mud and water basins;

• **Sustainability**: reduce the use of materials such as steel and concrete by a design that reduces up to 70% the volume of resources used.

The experimentation ongoing in ReSHEALience project aims to test the behavior of UHDC exposed to XA environment, through the design, construction, and operation of two pilots; the first one is a water basin for a cooling tower (small-scale) while the second one is debris basin for drilling pads (full-scale). Both the pilots will be built close a geothermal power plant in operation and monitored for about two years.



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DEVELOPMENT OF CONCRETE PANELS REINFORCED WITH TECHNICAL SENSORIZED FABRIC

PAOLO CORVAGLIA - RINA CONSULTING / TESI SYSTEM, ITALY - ENDURCRETE PROJECT

Sensorized Textile Reinforced Concrete (TRC) is an innovative precast solution under development in the framework of the EnDurCrete Project, allowing both enhanced durability and real-time structural health monitoring. TRC is based on replacement of steel rebars with sensorized textile reinforcement. It is particularly suited for the purpose of EnDurCrete, namely durability, thanks to the following factors:

• High corrosion resistance of the non-metallic fibres;

• Enhanced crack control characterized by multiple cracking upon loading.

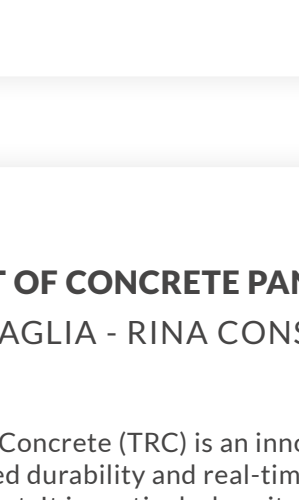
In the framework of EnDurCrete, the innovative TRC technology, which is state of the art, is further enhanced by studying textile sensorization, so potentially providing structural self-monitoring capability to the components.

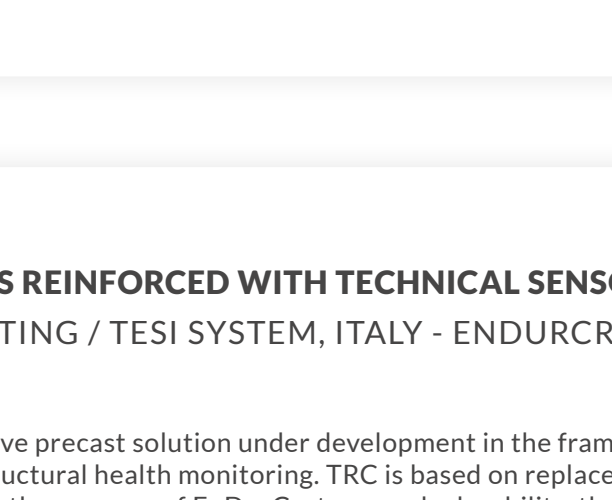
The speech given at MADE fair by Paolo Corvaglia presented the main steps already carried out for the product development, namely:

• Design, development and testing of the sensorized reinforcing system;

• Definition of an operating procedure for integration of the sensorized reinforcing system inside concrete components;

• Technological integration tests, providing all the necessary indications regarding sensor protection and cabling, mould filling, textile clamping, concrete compaction and concrete-textile adhesion.





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