

**“CONCEPT AND DESIGN” OF DURABILITY OF CEMENT BASED MATERIALS:
GOING BEYOND THE CURRENT SERVICE LIFE TARGETS**

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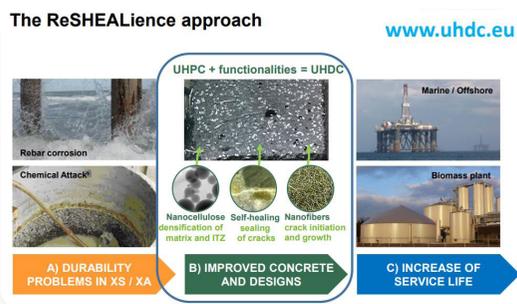
In a world where construction industry represents about 6% of the GDP, on average, the construction industry has to face and exploits challenges and opportunities which the continuous and increasing urbanization of the world population is presenting with likewise increasing dramatic urgency. An innovative strategy is needed for the “management” of the built and natural environment, which is more and more challenged by both anthropic and environment born actions.

In the framework the PC has presented the concept and activities of the project ReSHEALience, which aims to contribute to the challenge above first of all through the development of a Ultra High Durable Concrete (UHDC), i.e. a “strain-hardening (fibre reinforced) cementitious material with functionalizing micro- and nano-scale constituents, including alumina nanofibers, cellulose nanofibers/crystals, crystalline admixtures, especially added to obtain a high durability in the cracked state under extremely aggressive exposure conditions”, also through self-healing functionalities.

The use of these materials is going to be framed into a Durability Assessment based Design approach, which will be formulated shifting from a set of prescriptions, mainly referring to material composition and also including, in case, an allowable level of damage defined and quantified in order not to compromise the intended level of “passive” protection of sensitive material and structural parts (deemed-to-satisfy approach; – avoidance-of-deterioration approach), to the prediction of the evolution of the serviceability and ultimate limit state performance indicators, as relevant to the application, as a function of scenario-based aging and deterioration mechanisms.

This will stand as breakthrough durability-based material concept and design in which durability is not a bonus (as currently is for UHPC/UHPFRCs) but becomes the governing objective, has the ambitious aim of “shaping” cement-based construction materials from “durability passive” spectators, with structural functions, into active players, using “tailored” value-added synergy-acting functionalities.

Such an approach is going to be validated in six pilots in the project, encompassing infrastructures serving geothermal power plants, the floater of an offshore wind-tower and a floating mussel raft and also including, aiming towards an as broad as possible range of applications, the retrofitting of existing r/c structures



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