Self-healing and repair of concrete structures: COST action CA15202 SARCOS and lessons learnt from FP7 project HEALCON

Nele De Belie [(1)]

[(1)] Magnel Laboratory for Concrete Research, Ghent University, Belgium.

ABSTRACT

The appearance of small cracks in concrete can result in a loss of performance and functionality in the long term. Smart self-healing materials are developed as preventive solutions to avoid the need for extensive repair works. Although several approaches for promoting the self-healing of concrete structures have been developed during recent decades, they will only be viable when comparative characterization techniques for assessing their performance and efficiency are properly established. Furthermore, modelling the healing mechanisms taking place for the different designs and predicting the associated service life increase will help consolidate the implementation of these preventive repair approaches.

The SARCOS Action is focused on the concept of preventive repair, with the objective of sealing small cracks at the earliest stage of damage, both for new and existing structures, and on looking for standardizing methodologies to evaluate the mechanical and durable performance of the treated structures, with continuous feedback from the modelling of self-healing mechanisms. This is reflected in the scopes of the three SARCOS Working Groups. The presentation aims to give a general vision on the advances attained within the SARCOS Action, including the revision of the state-of-the art of the different aspects addressed within the Action: self-healing approaches, techniques for characterizing self-healing performance and self-healing modelling.

Furthermore, an overview of the results of the recently finished EU-FP7 project HEALCON is provided. Its aim was to design smart concrete with self-healing properties to create durable and sustainable concrete structures. While superabsorbent polymers and bacterial healing agents were used for healing of early age cracks in structures which require liquid tightness, elastic polymers were proposed for healing of cracks under dynamic load. The efficiency with regard to mechanical behaviour, liquid-tightness and durability was quantified by (non)-destructive monitoring techniques in small and large scale tests. Computer models were developed to simulate fracturing and self-healing.