

PRACTICE NEEDS FOR CRACK SEALING

U. MUELLER (SWEDEN), RISE-CBI, (LORCENIS PARTNER, RTD)

At the moment the total appearance of cracks in the concrete cannot be avoided, only the partial reduction of the cracks can be reached, minimizing them. One of the causes that generate their appearance is related to the changes of volume and the shrinkage of the material. The second cause of cracking is degradation, caused by external environmental agents such as ice, the degradation of the reinforcement by corrosion, alkali-silica reaction or sulphate attack. The third cause is the stresses to which it is subjected, depending on the structural function.

In order to minimize the appearance of cracks, the most important actions were focused on the construction process, during the hydration process, as well as on the structural optimization of the design of the elements. However, another way to control the appearance of cracks is specifically in the design of the mixtures, reducing the heat of hydration by decreasing the amount of cement or on the other hand with the incorporation of crack reducing additives, volume compensating agents and finally with superabsorbent polymers such as self-curing and self-healing mechanisms.

Practical needs crack controlling and sealing

- Crack monitoring: Visually (e.g. by robots/drones) or by internal sensors
 - Challenge: Data processing and temporal data consistency
- Smart admixtures for crack healing
 - Challenge:

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EXPECTANCES FROM SELF-HEALING SYSTEMS

J. VERA (SPAIN), ACCIONACONST, (LORCENIS & ENDURCRETE PROJECTS PARTNER, IND)

From the contractor's point of view, the self-healing technology systems is one of the most appropriate solutions to minimize the problem of cracks appearance in concrete structures. However, it must be considered that its appearance is the sign that something is not working properly. So, many of the cracks are due to a deficient execution of the material or the effect of aggressive environmental conditions that trigger the appearance of cracks.

The presentation showed a series of types of cracks in different works, analysing the cause of their appearance and how it could have been avoided or minimized with the use of LORCENIS technology (self-curing and self-healing) depending on their origin.

CRACK SELF-HEALING TECHNOLOGIES AND CHALLENGES

K. VAN TITTELBOOM (BELGIUM), UGENT, (LORCENIS PARTNER, RTD)

The implementation of the functionality of self-healing materials in construction is based on the natural ability of some materials to regenerate. This ability has been incorporated into non-biological materials and there has made the leap for the incorporation into building materials, both through natural mechanisms and engineering processes in the self-repair of cracks. The process of self-repair is subsequent to the appearance of cracks for different reasons: Physical, chemical and mechanical.

At the laboratory level, the University of Ghent has made three approaches with three different types of solutions: encapsulated polymers, super-absorbent polymers and bacteria that precipitate calcium carbonate. These three different mechanisms have different processes that achieve the objective of sealing cracks. The process of checking the effectiveness of the techniques is subsequent to the generation of cracks through manual processes. It goes through the evaluation of water permeability and the evaluation of recovery of mechanical resistance to compression through load cycles. The results are quite positive and the auto-healing capacity is demonstrated with three different techniques.

Self-healing by CaCO₃ precipitating bacteria

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ACTUAL NEEDS AND FUTURE EXPECTANCES FROM NEW NON-ACTIVE MAINTENANCE

M. ARANA (SPAIN), CONST MINISTRY, HARBORS AFFAIR, (EXTERNAL, MINISTRY, END-USER)

Harbours common damages needs for extending service life.

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THE IMPORTANCE OF SUSTAINABILITY AND RELATED POLICY IN EU RTDI CALLS

L. IÑIGO (SPAIN), CDTI (NMBP NAT. CONTACT), (EXTERNAL, MINISTRY, RDI)

Sustainable development challenges, EU product policy circular economy, LCT/LCA, Global challenges for EU construction sector in H2020, relevant forthcoming priorities.

LCA and the Construction Sector in H2020

KETs like advanced materials as incubator for innovative solutions to tackle the different construction challenges are in the current EU political agenda and acknowledged in policy documents:

- COP21 Paris Agreement → COP24 → ...
- UN's Sustainable Development Goals
- Energy Union Strategy
- Circular Economy Action Plan
- Integrated Product Policy (IPP)

The vision of the goals provides an overall direction... but, how to get there?

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