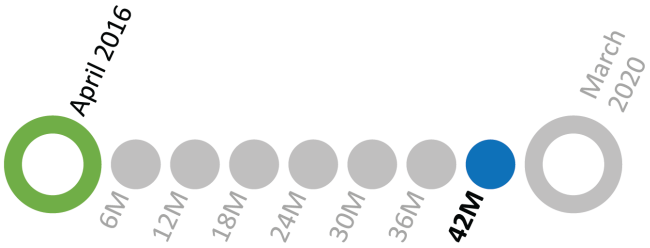
LORCENIS

LOng Lasting Reinforced Concrete for ENergy Infrastructure under Severe Operating Conditions



Progress at month 42

The public LORCENIS **Workshop on self-responsive materials for concrete** was organized by CSIC, ACCIONA and SIKA Spain in Madrid at M36 as a networking event designated to "Predictive, Preventive and Corrective Constructions (PPCC-19)" with the challenge of "NON-active Maintenance" of concrete structures as durability strategy for long lasting service life with invited speakers from LORCENIS, the construction industry, ministries and academia. Stakeholders involved in R+D&I from the construction sector took actively part in the plenary discussions.

From the still on-going **demonstration activities** of LORCENIS prototypes at M42, a more complete picture comparing and compiling the conclusions from testing in both, WP3 and WP5 is expected by M45. Therefore, an internal **workshop** will be arranged at M46 to finally conclude the promising project progress towards all LORCENIS objectives from a technical point of view but also from a market point of view.

Pictures of demonstrators from different scenarios

International LORCENIS conference

"Durable concrete for infrastructure under severe conditions – smart admixtures, self-responsiveness and nano -additions"

10 – 11 September 2019

Ghent, Belgium

86 participants, 38 LORCENIS partners

attendees from universities

industry and

research centres

62 presentations, 17 LORCENIS presentations

6 posters

All authors are invited to submit full papers for a special issue on "Self-healing and smart construction materials" in the open access journal *Materials* (IF 2.467).

Proceedings are available on the LORCENIS website https://www.SINTEF.no/projectweb/LORCENIS /conference/ (ISBN: 978-9-463-88638-3)
PDF version

When reinforced concrete structures are in contact with seawater or salt from deicing of roads in winter, **chlorides** enter the concrete. Once the chloride has penetrated through the concrete and reaches the steel reinforcement bars, they start to **corrode**. Rust takes more volume than steel, so concrete is pushed away causing the concrete to crack. The cracks accelerate the ingress of chlorides and require repairs, otherwise the reinforcement bar will eventually corrode through, which can cause a catastrophic **failure** of the structure. Structures are designed with a target **service lifetime**, and the engineers' role is to ensure that severe damage due to cracking of concrete should not occur during service life.

By M40, LORCENIS reached an essential milestone verifying that **the advanced engineering software tool** (AEST) for the computation of the evolution of **chlorides in concrete**, and the prediction of the **time to cracking** around the rebars due to the expansion of corrosion products, called **SEBASTOS**, a tool for engineers designing concrete structures for operation in harsh conditions was developed working stable with simplified multiscale input parameters towards applicability on standard computers. To achieve fast computations, the software simplifies the physical processes considerably: simplified material relations are based on input from other tasks in WP4.

Expected final results and potential impacts

LORCENIS aims at addressing this European infrastructure construction and maintenance challenge through the development of new added value products and predictive tools to increase their efficiency and performance in severe operating conditions.

By M42, a variety of optimized **nano-additives** capable of providing both **internal curing, self-sealing and self-healing and self-diagnosis functionalities** and compatible with the concrete matrix were produced with scaling-up protocols beneficial for the construction industry. **Prototypes** with concrete mix designs implementing self-responsive LORCENIS technologies are exposed for validation (TRL5) and demonstration under relevant industrial conditions (TRL6) as well as in operational conditions (TRL7).

Innovation strategy, initial exploitation and business plan, training and **dissemination** will include strategic activities with project partners and stakeholders that will take part in a user committee; definition of business models for exploitation with IP roadmap; training, formation and mobility of personnel; publication in practitioners' magazines, in international journals, on a dedicated website; presentation at professional forums and conferences, industry seminars and trade fairs; organisation of international workshops; interaction with (inter) national standardization bodies.

The different ways of **exploitation** of the project results depend on the different roles of the partners. Each project partner is able – within the limitations of his role – to contribute to the promotion of customized LORCENIS solutions or services:

- Research Institutes and SME as technology supplier for additives
- Research Institutes as technology suppliers for concrete
- Research Institutes as provider of modelling technology
- Industrial partners as materials and technology suppliers for cementitious binders and concrete admixtures and
- Industrial partners as technology suppliers and end users of the developed technology

Furthermore, including the **AB members** actively in the strategic LORCENIS development in all aspects will boost the exploitation. Their input based on the **questionnaire** sent out will be considered in future activities. Especially, for the end-of-life strategy to be evaluated in WP6, their valuable insights are welcome. Involving **end-users** will ensure technology uptake (e.g. CAPEX – OPEX discussion). Also, exploitation outside the scope of the project is important and will be considered.

LORCENIS is registered to the **AMANAC-cluster** (https://www.amanac-cluster.eu/projects) bringing together EU funded R&I projects focused on nanotechnologies and advanced materials for the construction industry. LORCENIS project is also registered in the **NanoSafety** Compendium List since 2016.

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