

UHPC

as maintenance and repair material for enhanced durability of transport infrastructures

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Projektets syfte och deltagande organisationer:

The main purpose of the project is to develop a technology based on the application of ultra high performance concrete (UHPC) to repair and strengthen existing deteriorated concrete structures exposed to harsh environmental conditions, as a long term durable alternative to conventional repair methods. It is created jointly by CBI and LTU and will enable to develop extremely cost-efficient technology due to the characteristics of UHPC, i.e. quick hardening and excellent durability enabling fast repairs and reduced maintenance.

Vad och vilka behövs för att nå hela vägen till innovation?

Main barriers to wide-spread implementation

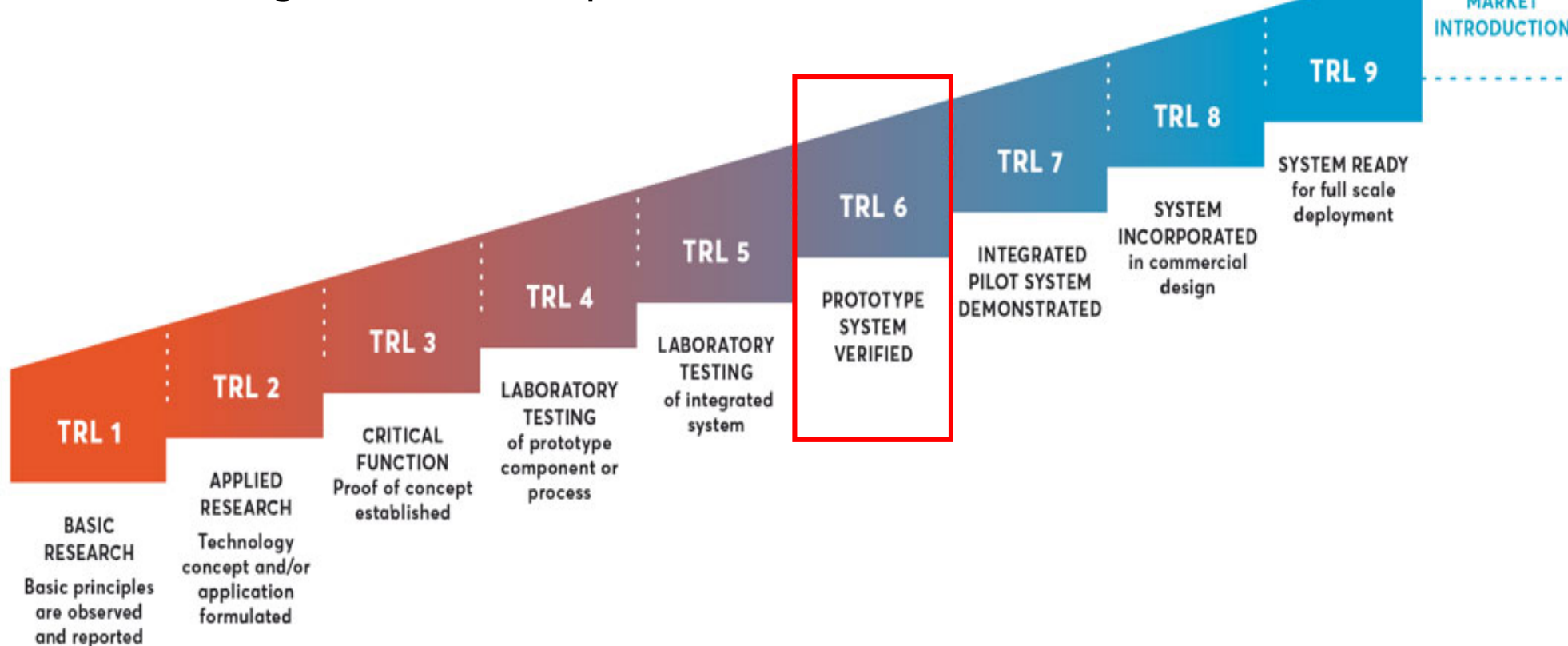
- Higher material costs (compared to normal concrete)
- Insufficient knowledge / lack of experience (raw materials, design, production, properties)
- Durability properties not considered
- Lack of guidelines and design codes
- Strict production and quality control required

Innovation betyder förnyelse. Vari ligger det nya?

The technology developed within this project will enable contractors to make repairs of severely deteriorated concrete elements using very simple and old proven concrete production steps:

1. Preparation of old deteriorated concrete surface (cleaning and replacement of corroded reinforcement);
2. Building standard formwork around the damaged element;
3. Casting of highly flowable UHPC without any additional compaction/vibration;
4. Standard curing practice (no heat treatment required);
5. Removal of formwork already 1 day after casting.

Markering på TRL-skalan visar var projektet befinner sig i innovationsprocessen



Mål i InfraSweden2030 som projektet avser bidra till:

• Technical renovation of transport infrastructures

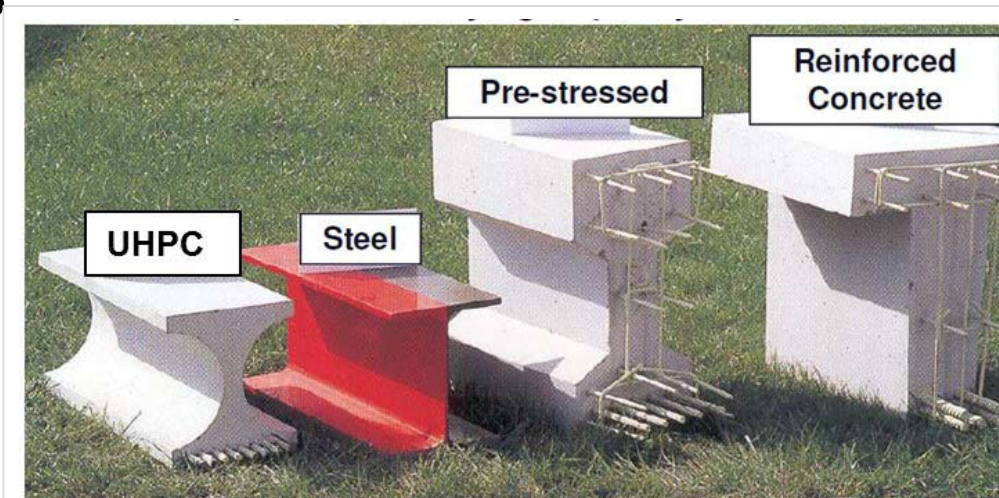
The developed technology can be apply for strengthening of reinforced concrete structures and in this way answer to future demands, e.g. increased traffic circulation.

• Highly technological materials for improved transport infrastructures

The material developed within the project, UHPC, is a promising alternative to conventional repair materials. It has better durability properties and load-bearing capacity and can applied without major training of the workman force.

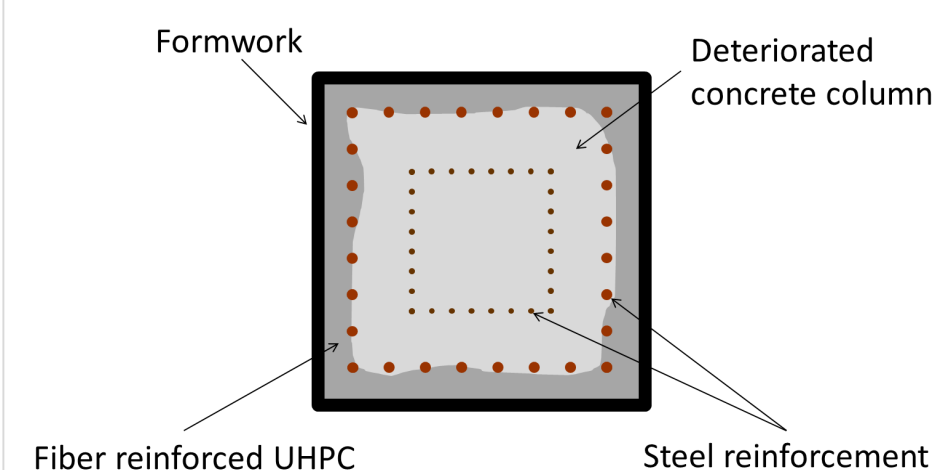
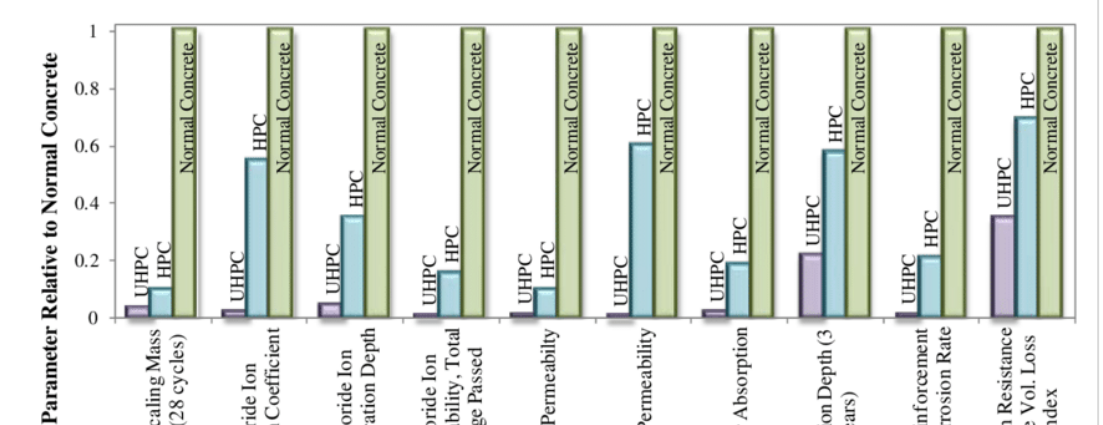
• New and sustainable components for transport infrastructures

Due to the long term durability of the UHPC, the solutions developed with contribute to the sustainability of reinforced concrete components and structures by minimizing the frequency of maintenance interventions.



Comparison between cross-sections of structural members having approximately the same load bearing capacity.

Comparison of durability of normal concrete, high performance concrete (HPC) and ultra-high performance concrete (UHPC).



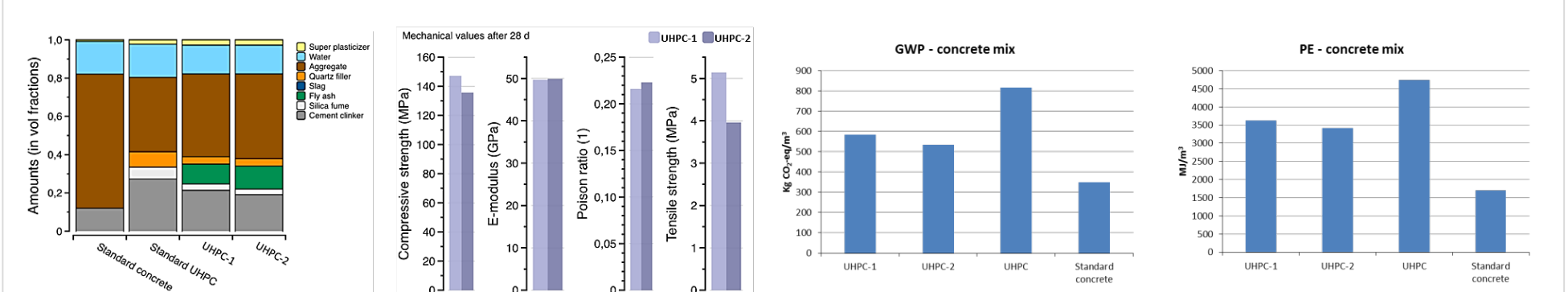
Concept for the application of UHPC for repair/strengthening of deteriorated concrete columns.

Förväntade resultat:

- Material and durability properties of UHPC suitable for repair/strengthening of reinforced concrete elements
- Evaluation of the environmental impact and cost efficiency associated to the newly developed method in comparison with existing methods
- Analytical and numerical design of a UHPC repaired/strengthen reinforced concrete element
- Proof of concept (verification of the feasibility using industrial equipment and workforce)
- Guidance document for the application of UHPC in repair/strengthening

Redan uppnådda resultat:

- UHPC mix design (workability and mechanical properties)
- Preliminary environmental characterization



Förväntade nyttor och för vem:

Impact

- Fast repairs, minimizing traffic constrains and associated costs
- Less maintenance, increasing the long term durability and sustainability
- Availability of new construction techniques without extensive personnel training
- Knowledge transfer and education

Beneficiaries

- Public authorities, designers, engineers, contractors, research/academic community, general public/society