AMANAC – Thematic Workshop

Arianna Amati, Italy

December 3rd, 2015, Brindisi

ECO-Binder Project:

Development of insulating concrete systems based on novel low CO_2 binders for a new family of eco-innovative, durable and standardized energy efficient envelope components.

"This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 637138."

Brindisi, December 3°, 2015

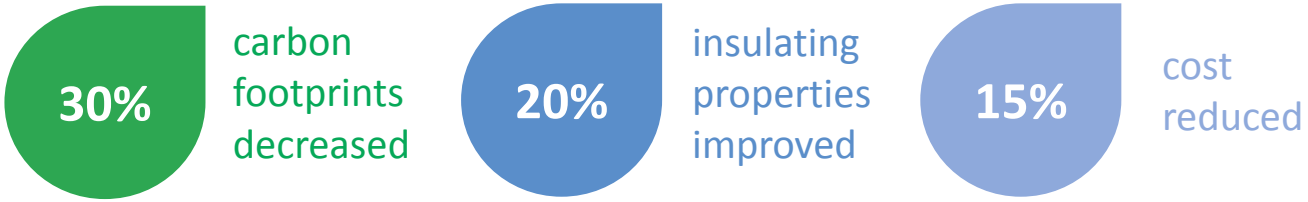
The Challenge

- Concrete is the most widely used man-made material on Earth (annual consumption of around **10 billion m³**).
- Traditional Ordinary Portland Cement (OPC) provides desired levels of strength and durability, however, its production is associated with **high CO_2 release**.
- The CO_2 emissions related to the fabrication of currently around **3.5 billion tons p.a.** are amounting to approximately **5%** of the worldwide anthropogenic GHG emissions.
- Prefabrication/precasting are indeed key to address the challenge of retrofitting the **210 million existing buildings** in Europe.
- Reduction of the **embodied energy** of the construction materials employed and the energy demand during the usage phase through applying better performing insulation materials and lightweight systems.

Project Objectives

- The main objective of the project is to demonstrate the feasibility of replacing **Ordinary Portland Cement** (OPC) and OPC based concrete (products) with new products based on the innovative **Belite-Ye'elimite-Ferrite** (BYF) class of low-CO_2 binders.

- ECO-Binder aims to address the vast market for envelope retrofitting and new construction with a new generation of prefabricated building envelope components with:



relative to current solutions based on Portland cement.

Project Objectives

In order to be cost-effective and sustainable in a highly-competitive market, the new building envelope solutions will integrate even more functions in a single product package.

HIGHER PERFORMANCES IN TERMS OF SAFETY AND COMFORT

acoustic insulation / absorption, fire and mold resistance, dimensional stability, indoor air quality

SUPERIOR DIMENSIONAL STABILITY

to allow precise dimensional fit into existing buildings while avoiding air or water leaks

REDUCED PRODUCTION COST

reduced manufacturing costs to allow affordable mass applications in building retrofitting

The Concept

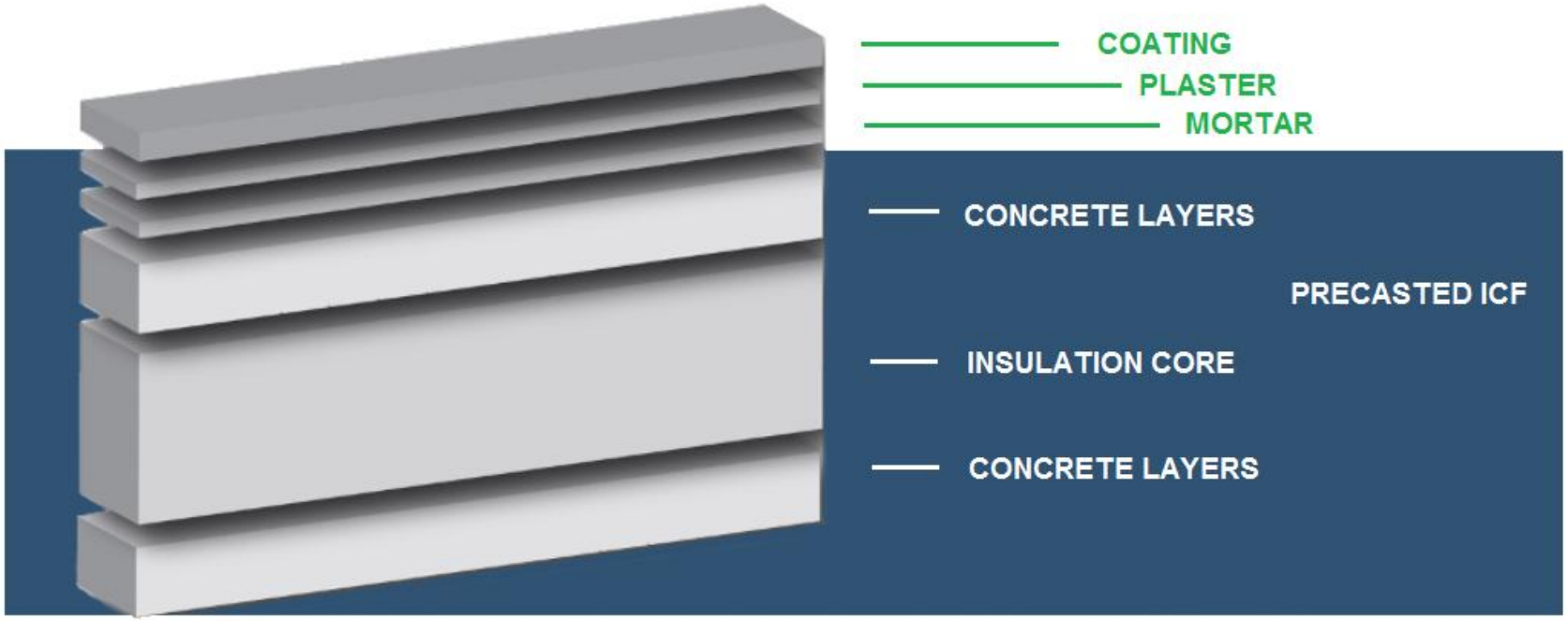
- The overall concept of the project builds on previous work by Heidelberg Cement, Lafarge and Vicat to develop a novel family of low CO_2 binders based on **Belite**, **Ye'elimite** and **Ferrite phases** (BYF cements).
- In BYF technology, the superior early age strength contribution of **calcium-sulfo-aluminates** (CSA) is combined with durability provided by **belite**.
- The raw materials and the production process for BYF cements, are similar to those of OPC, but the CO_2 emissions are lower as shown in preliminary LCA calculations due to:
  - ✓ lower calcium content of the raw materials (less limestone usage)
  - ✓ lower clinker burning temperature of around 1250-1300°C
  - ✓ lower grinding energy demand.

These same factors also results in a significantly **lower embodied energy** than OPC.

The Concept

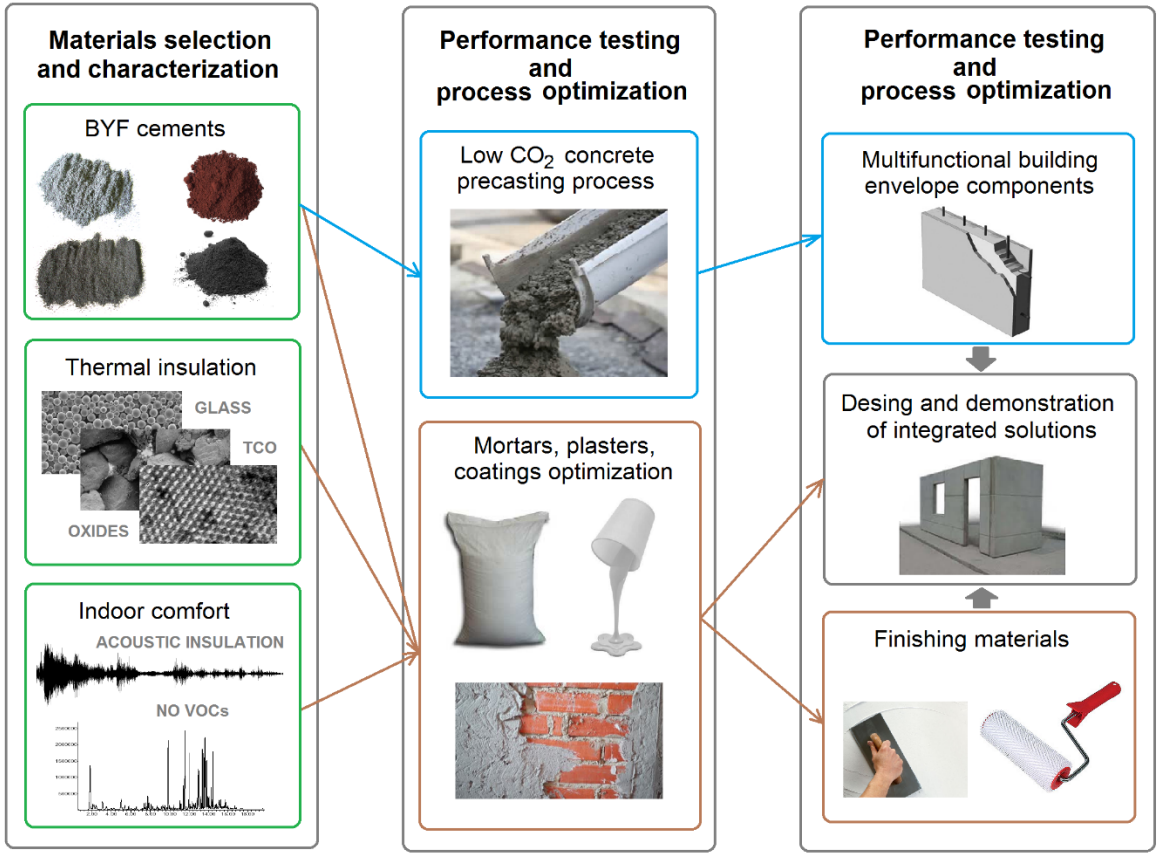
- Combining these novel binders with insulating materials and advanced functional finishing methods will permit the development of novel concrete systems with **low CO_2** and **low embodied energy** suited for a wide range of **envelope components**, without compromising technical, health and environmental standards.
- Material science research on BYF cement and concrete and on advanced finishing materials like mortars, plasters, paints or coatings, will lead to the development of concrete elements with **reduced embodied energy**, **improved insulation** properties and providing multifunctional surface properties like:
  - ✓ thermal reflection
  - ✓ antibacterial
  - ✓ anti-stain
  - ✓ self-cleaning

Insulating Concrete Forms



Methodology

- Innovation activities and bridging barriers to market for building envelope components made with low CO_2 BYF binders.

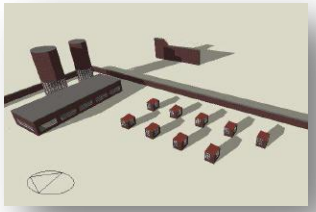


Demonstration

- Prefabricated concrete systems of different complexity (from ordinary blocks to sophisticated insulated wall panels) and end-use will be installed in **different climatic conditions** for demonstration purposes and their environmental performance will be validated through dedicated LCAs.
- Pre-cast products developed in this project are intended for **new construction** as well as for deep **retrofitting**, as for example the renovation of commercial buildings or social housing construction.
- The approach taken within the ECO-Binder project will lead to the development of a novel family of cement binders. This will enable the construction materials sector to progress towards commercializing eco-sustainable products with comparable performance to traditional products.

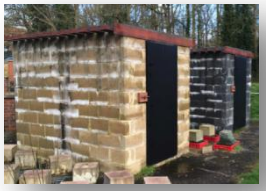
Demonstration

1 ACCIONA´s Demo-Park (ES)



2 Retrofitting at Tecnalia´s KUBIK (ES)

3 Durability and performance testing at BRE (GB)



4 Durability and performance testing Severin Municipality (RO)

Consortium

Partner name	Country
D'APPOLONIA SPA	Italy
HEIDELBERGCEMENT AG	Germany
LAFARGE CENTRE DE RECHERCHE SAS	France
VICAT	France
BUILDING RESEARCH ESTABLISHMENT LTD	United Kingdom
TEKNOLOGISK INSTITUT	Denmark
NATIONAL TECHNICAL UNIVERSITY OF ATHENS	Greece
NOVEL TECHNOLOGIES CENTER SRL	Romania
GEONARDO ENVIRONMENTAL TECHNOLOGIES LTD	Hungary
ACCIONA INFRAESTRUCTURAS SA	Spain
NUOVA TESI SYSTEM SRL	Italy
FUNDACION TECNALIA RESEARCH & INNOVATION	Spain
FENIX TNT SRO	Czech Republic
MUNICIPIUL DROBETA TURNU SEVERIN	Romania

For further project information

Please contact:

Federico Meneghello
D'Appolonia S.p.A.

federico.meneghello@dappolonia.it

+39 02 518 00562

www.ecobinder-project.eu

Follow us on social network profiles:

Brindisi, December 3°, 2015

Thanks for your attention!

Contact details

Arianna Amati, D'Appolonia S.p.A.