



“This study, which was carried out with two laboratories and four partner firms, lies fully within the expertise of the GeM which owns all the necessary mechanical and physico-chemical testing devices. In 2010, we will carry out full-scale testing of beams on the “test deck” at the École Centrale. The official recognition granted by the PGCE has made it possible to obtain subsidies. However, as a researcher, I also expect the PGCE to facilitate communication between laboratories and industry.”

Ahmed Loukili, Lecturer at the école centrale de Nantes, researcher at the Institute for Research into civil engineering and mechanics (GEM)

HOW THE PROJECT FITS IN WITH THE PGCE'S CONCERNS :

- STUDYING STRUCTURES IN COMPLEX AND/OR EXTREME SITUATIONS
- SUSTAINABILITY AND LIFE CYCLE OF BUILDINGS AND INFRASTRUCTURES
 - SAVINGS IN RESOURCES
 - ENVIRONMENTAL PERFORMANCE OF CONSTRUCTIONS AND FACILITIES
- OBSERVATION AND MODELLING FOR THE DESIGN AND MANAGEMENT OF SUSTAINABLE URBAN PROJECTS
 - ECO-INNOVATIVE DISTRICTS

ÉCOBÉTON

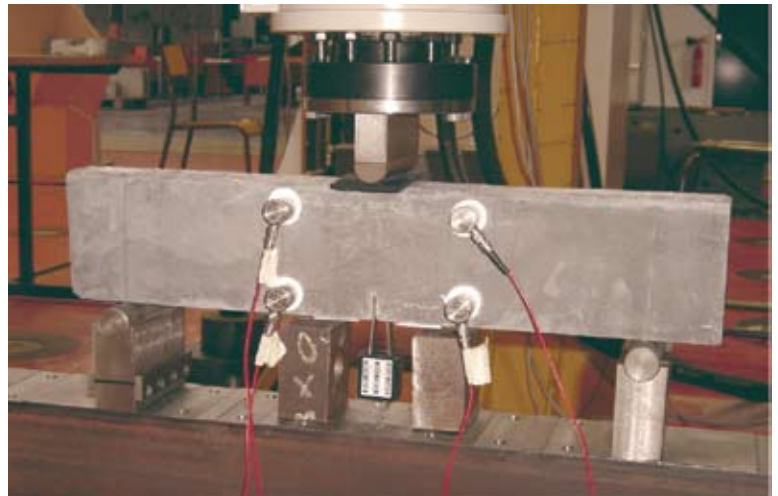
Looking for the mix design that produces the least CO_2

2007 – 2010

producing a tonne of cement, which is an essential component of concrete, generates about a tonne of CO_2 . In view of this, how can we reduce the environmental impact of concrete?

The initial idea was to use a significant proportion of industrial by-products (flyash from coal-fired power stations and blast furnace slag) instead of cement during concrete manufacture.

ÉCOBÉTON is an applied research programme aiming to provide the industrial and building sectors with an in-depth study of these environmentally innovative concretes.



Acoustic emission testing of an ecoconcrete beam on the test deck at the école centrale de Nantes

A PROJECT THAT WAS GIVEN OFFICIAL PGCE APPROVAL IN 2006

Research into new mix designs for concrete sets out to save raw materials while retaining the strength and durability of the material. ÉCOBÉTON is a response to rising demand from public sector, and more recently private sector project owners for sustainable public works and buildings.

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THE R&D PROGRAMME

This project investigates the impact of adding large amounts of mineral poly additives on the rheological, microstructural and mechanical properties of concretes. This study comprises 4 areas of research and a full-scale feasibility study in a concrete mixing plant.

- **Area 1** : characterization of fresh concrete to determine how the type and amount of mineral additives affect the rheological properties of concrete.
- **Area 2** : The characterization of early age and very early age concrete (early age shrinkage and cracking) using novel test methods developed in recent years by research teams at the GEM.
- **Area 3** : The characterization of the mature state (durability). The principal indicators of durability (porosity, permeability to water and gases, hydraulic diffusivity) will be measured with an assessment of the effects of environmental attack on these indicators.
- **Area 4** : microstructure and hydration. The results of the in-depth investigation of the development of the microstructure (hydrate scales) will be used to analyze macroscopic behaviour.

The feasibility study will make it possible to propose technical and technological solutions for industrial manufacture (additive supply procedures, procedures for feeding into the mixing drum, optimum mixing time).

COST OF THE PROGRAMME :

€ 1,065k, with € 345k of funding from the national Research Agency (ANR).

THE CONSORTIUM

3 LABORATORIES

- **GEM** (École centrale de Nantes and Saint-Nazaire University Technology Institute (IUT): mix design and durability studies
- **LEPTIAB** (Université de La Rochelle) : investigation of transfers
- **BATIR** (Université Libre de Bruxelles): study of microstructure

4 FIRMS

- **SURSCHISTE**, recycling of by-products from thermal power stations
- **VM MATERIAUX**, construction materials and ready mix concrete
- **ECOCEM** (Ireland), use of blast furnace slag
- **VINCI-CONSTRUCTION**

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on the ECOBETON project

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