

Numerical analysis of the effects of fiber distribution on FRC structural components [Civil Engineering, Concrete Technology]

Motivation

The use of innovative concrete technologies in the construction of transport infrastructures has numerous advantages. Fiber reinforced concrete (FRC) is a high-performance mixture where the addition of fibers aims to improve the performance characteristics of the standard one, increasing the ductility and the tensile strength. However, the distribution of the fibers has a key role in the final mechanical properties of the structure.

Short Description

In this thesis, the student will study the effect of fiber distribution to unlock the performance improvement of concrete mechanical properties. After an initial literature review, a theoretical analysis of the distribution of fibers during casting will be studied. Then, the analysis will look at the effect on the strength of structural components with a given distribution of fibers. Effects such as increased shear strength, confinement and reduction of crack formation will be studied as well. The analysis can be performed both with analytical calculations and numerical tools. Finally, the result will be compared with the existing norm and the experimental results from literature.



| | |
|------------|---------------------|
| Type | Master thesis |
| Partner | EuroTube Foundation |
| Supervisor | Lorenzo Benedetti |

Possible work packages

- Literature review (previous studies, experiments and norms)
- Concrete mechanical properties baseline
- Fiber for FRC: steel, polymer, carbon, etc.
- Definition of representative model problems
- Review of the analytical methods to represent fiber distribution
- Analytical prediction of mechanical properties
- Development of numerical models
- Exploration of results with comparison of existing literature

Requirements

- High motivation and interest in the topic
- Able to work independently and be creative
- Methodological and goal-oriented approach
- Knowledge in concrete technology
- Knowledge in advanced structural design
- Knowledge in numerical modeling for complex problems

Application

Please email your CV, transcript and motivation letter to lorenzo.benedetti@eurotube.org