The Non-Destructive Electromagnetic Characterisation of Cover Concrete

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1. The Marie Curie TEAM project (Training in European Asset Management), of which my research project forms part, gives young researchers the opportunity to contribute to the preservation and management of a very valuable asset: the European transportation network. Not only is this network valuable due to the large investment that was initially made in terms of construction costs, but also because a good transport network forms the basis of any healthy economy, enabling economic growth and prosperity.

The project that I am involved in focuses on the health monitoring of the reinforced concrete bridge structures that form a crucial part of our transport network. Many of the bridges that were constructed in the 20th century are reaching the end of their design life (usually 50 years), but the question is whether this necessarily means that they are no longer serviceable.

In an aggressive environment the thin layer of concrete protecting steel reinforcement in concrete structures can be penetrated by aggressive agents such as water and chlorides, leading to corrosion, damage to the concrete and subsequent deterioration. To investigate this risk of corrosion, destructive tests are traditionally performed. However, my research project aims to characterise cover concrete by combining several non-destructive electromagnetic evaluation methods, namely Direct Current Resistivity Tomography, Ground Penetrating Radar and Capacimetry. These methods can serve as indicators of the condition and quality of the concrete, due to their sensitivity to moisture content and chloride content and also to concrete porosity. If the areas of high risk in the cover concrete can be identified by routine non-destructive electromagnetic evaluation, remedial measures can be taken to prevent further ingress of aggressive agents before serious damages are incurred. These actions can extend the lifetime of concrete structures to be significantly longer than their initial design life and save the costs, inconvenience and the environmental impact that goes along with the construction of new structures.

2. Marie Curie has given me the unique opportunity to perform research in the field of civil engineering transport infrastructure, something that forms an integral part of all of our daily lives. Coming from a developing country that currently experiences rapid growth, the correct approach towards asset management can make a substantial difference to the future of the transport network – I therefore hope to take home new expertise after my studies.

As a Marie Curie fellow, I have the opportunity to work with experts in my field and meet people with great passion for science and research. I am encouraged to interact with different research institutions, universities and partners from industry – which has introduced me to the different approaches of the respective role-players in infrastructure management. Training sessions also forms an integral part of my project structure and I have had the chance to network with my fellow students and spend time on career development and planning.

Marie Curie provides excellent support to young researchers and it is clearly the aim of each project to develop not only researchers who are an asset to their various fields, but researchers who are capable of working across the boundaries of countries and fields of specialisation.