

Master thesis at Building Technology

Title

Sustainability assessment of concrete pavement with low-carbon cement binder

Background

Cement-based concrete pavement for road construction has many advantages compared with asphalt-based pavement, especially its longer service life, lower local stress on the substrate, and more flexible choices for the pavement surface (pattern and colour). In Sweden there is a certain distance of highway which was built with Portland cement concrete in 1990's. The practical performance of the concrete pavement after twenty years in service will supply valuable information about the durability of concrete pavement. At the present Chalmers is involved in an EU project Ecolabel aimed at developing a novel eco-labelling European harmonized methodology for cost-effective, safer and greener road products and infrastructures. With the development of low-carbon binders (Portland cement replaced with fly ash, slag, meta-kaolin, etc.) for cementing concrete and the eco-labelling methodology for sustainability it is greatly possible to apply cement-based concrete as road pavement material more cost-effectively and environment-friendly.

Aim/Purpose

The main purpose of this examination work is to assess the sustainability performance of Swedish concrete pavement with different types of low-carbon binder with regard to their technical functions, economic, social and ecological aspects.

Method

After a thoroughly literature study the following work may be carried out:

- Evaluating the technical functions including mechanical properties and durability of concrete pavement in laboratory taking into account Swedish climate.
- Investigate the practical performance of Swedish concrete pavement after 20 years in service (a certain distance on E20 to be determined after contact with Trafikverket).
- Evaluating the KPI (Key Performance Indicators) of concrete pavement with different types of low-carbon cement binder in comparison with traditional Portland cement concrete pavement, hot mix asphalt pavement, and cementitious mortar (such as Densiphalt) modified asphalt pavement, using the Ecolabel's methodology.

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