

# Effect of leaching on compressive strength

Master's project for the Master Program Structural Engineering and Building Performance Design

## Background

It has been well documented that leaching of calcium leads to increased porosity and reduced compressive strength. Normally this has a limited effect, but in some cases it may have an impact, e.g. for hydraulic structures. However, one case where the leaching could have an impact is when assessing compressive strength of cement prisms according to the standard SS-EN 196-1. The cement prisms have the dimension 40x40x160 mm. In the European standards for cement SS-EN 197-1 cements are classified according to the compressive strength and three strength classes exist, namely 32.5, 42.5 and 52.5. The compressive strength is determined at 28 days and the prisms are demoulded 20 to 24 hours after casting and then stored in water until testing. In SS-EN 196-1 it is stated that tap water is used for the initial filling to obtain a constant level in the storage tank. Moreover, not more than 50 % of the water shall be replaced at any one time. This means that the storage conditions are not very specific and that the storage water can have varying pH and ion content and concentration. Within inter laboratory tests, such as Atilh, it has been found that there can be considerable differences between labs, see Figure 1. Based on some initial studies conducted at Thomas Concrete Group it has been found that the pH of the storage water influence the compressive strength and that a low pH leads to lower strength while a high pH leads to a much higher strength.

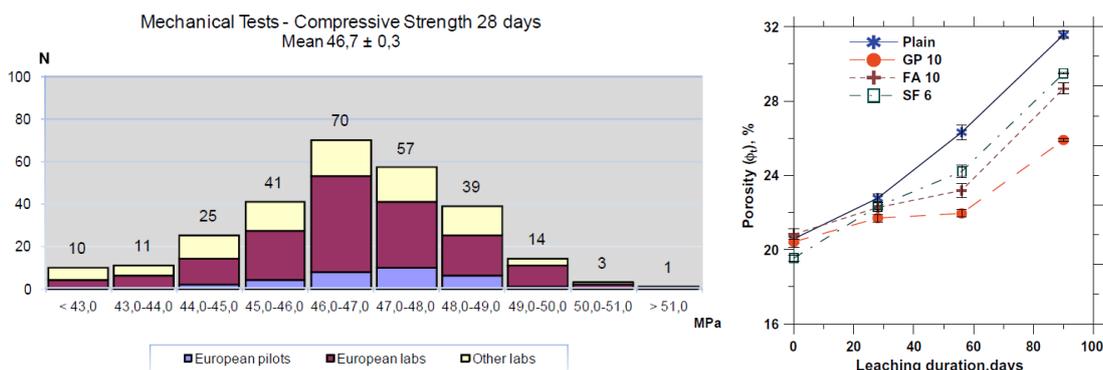


Figure 1. Comparison of compressive strength acc. To SS-EN 196-1 in Atilh inter laboratory study 2015. Effect of leaching on porosity<sup>1</sup>.

## Purpose/Method

This master thesis proposal aims to investigate the impact of the storage conditions for cement prisms. The influence of calcium leaching will be assessed by examining the leached zone and the influence this has on porosity and how much this influence compressive strength. The analysis will include SEM-EDS which will be used in conjunction with micro-mechanical models. The storage water (from several testing labs) will be analysed with respect to pH and ionic concentration.

## Thesis setup information

The master thesis will be carried at Chalmers University of Technology, and at Thomas Concrete Group in cooperation with Cementa (Cementa Research, Slite). This Master Thesis work is suitable for students interested in experimental work, concrete technology and numerical micro-modelling.

## Supervisors

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<sup>1</sup> J. Jain, N. Neithalath / Cement & Concrete Composites 31 (2009) 176–185.