

Effect of Calcium Nitrate as Accelerator for Cement blended with Blastfurnace Slag

Effekten av kalsiumnitrat som akselerator for sement blandet med masovnslagg

Prosjekt nr.:2022-02

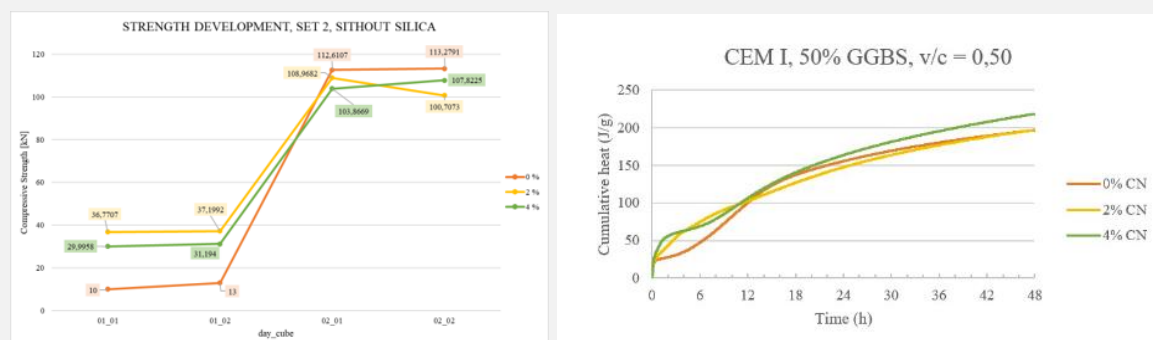
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The adding of NitCal indicates an increase in early compressive strength.



Concrete samples containing NitCal indicate a high early compressive strength. This trend is observed in both the compressive strength test results and the cumulative heat development of the isothermal calorimetry test results.

As seen from the graphs 24h results show an early production of calcium hydroxide which caused high early strength in the concrete. This discovery can potentially create a much simpler construction process for workers dealing with cold weather concreting.

Curing in cold weather can be challenging.

Freezing of pore water will halt the hydration, and therefore also the curing process.

OUT WITH THE OLD..

Traditional methods for curing in cold climate are challenging, costly and time consuming.



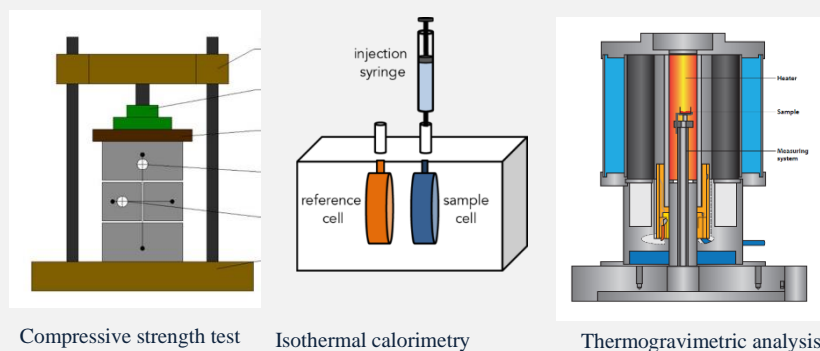
.. IN WITH THE NEW

NitCal, developed by Yara, is a mixture of purified nitrate salts that can optimize the curing processes.



The main goal of this research has been to investigate the effect of calcium nitrate as an accelerator in cement blended with blastfurnaced slag, cured in a cold climate.

TESTS CONDUCTED:



3 sets of samples were casted, all with different concentrations of CN. To investigate the effect of NitCal the following tests were conducted:

- Compressive strength test
- Thermogravimetric analysis
- Isothermal calorimetry

NitCal – the solution for cold weather concreting?

An adding of Calcium Nitrate indicates a high strength development early in the curing process. However, the results from test day 2 and 7 indicate a similar or decrease in strength development, compared to the reference sample (0% CN).

The results from day 28 show a significant increase in compressive strength for the samples containing CN. The results show a correlation between the percentage of CN and the strength development. However, these results are not taken into consideration as a power outage caused the cold storage room to stop function. Therefore, the samples cured in a warmer temperature than intended.

