

## RESEARCH OF HIGH ALUMINA CEMENT UTILIZATION FOR CAPACITY ENHANCEMENT OF GLASS FIBRE REINFORCED CONCRETE ELEMENTS

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*This paper connects to previous research of high alumina cement influence on setting and hardening of mixtures based on Portland cement. Evaluation of physical-mechanical properties of glass fibre reinforced concrete elements made of Portland cement and high alumina cement blend. Research of modified proportions of selected Portland cements and high alumina cements from different producers. Selection of most suitable variant for mix setting acceleration, better utilization of moulds and higher production efficiency.*

### **Introduction**

Influence of high alumina cement addition to the mixture on the basis of Portland cement was monitored on mixtures with replacement of 10, 20, 30 and 50 % of Portland cement with high alumina cement. Positive effect on early strength development was found out, but also significant negative effect on maximum achieved values of monitored properties and also on long-term durability.

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## Cement pastes

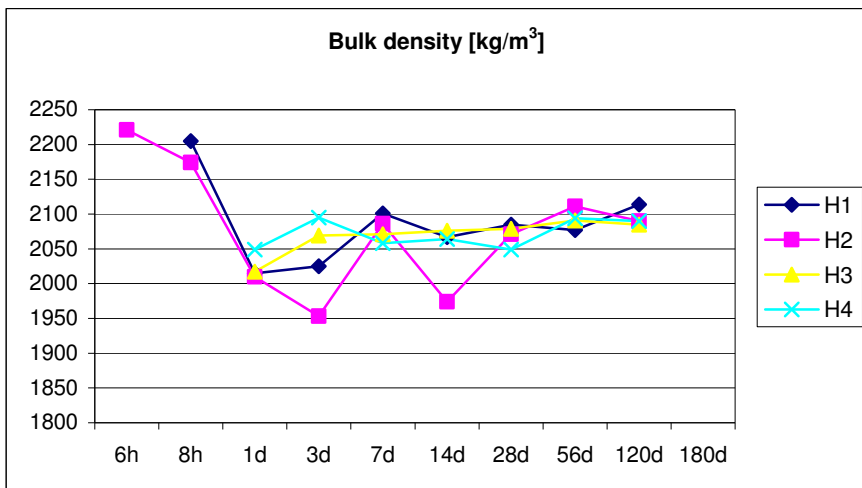
Further test for identification of suitable replacement of Portland cement with high alumina cement were carried out on cement pastes. Setting and hardening of cement pastes, development of hydration heat, flexural strength and compressive strength were monitored. 2 Portland cements and 5 high alumina cements with replacements 3, 8 and 12 % were used. Flexural strengths in initial days of ageing and also negative decreases of long-term strengths were taken into account by selection of variant for test specimen production from modified glass fibre reinforced concrete.

## Four variants

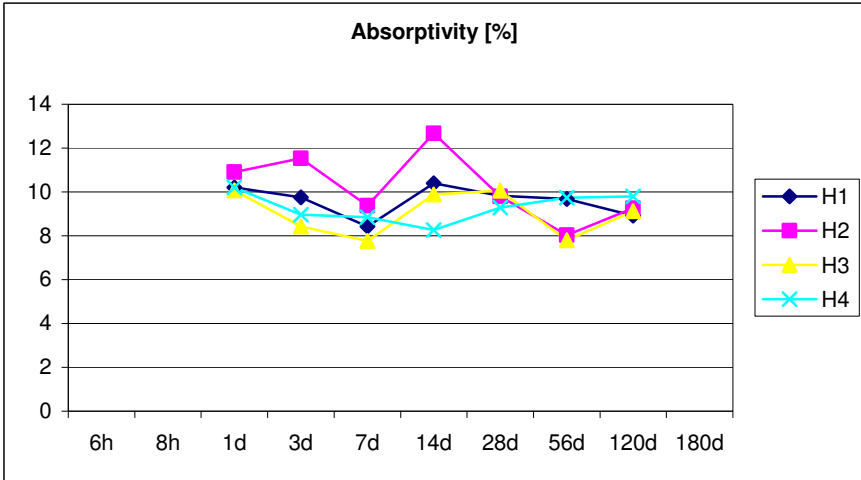
Four variants for 3% replacement of Portland cement with high alumina cement were selected – combinations of Portland cement Mokrá 52,5N and Hranice 52,5R with high alumina cement Górkal 70 and Ciment Fondu.

## Results of physical-mechanical tests

Bulk density, absorptivity, flexural strength and impact strength were monitored during ageing after 6, 8 hours and 1, 3, 7, 14, 28, 56, 120 and 180 days.

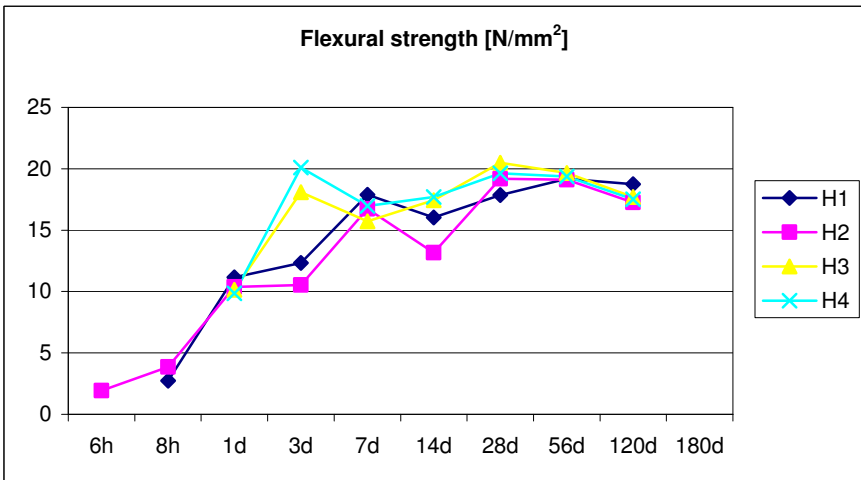


Graph 1 – Bulk density during ageing



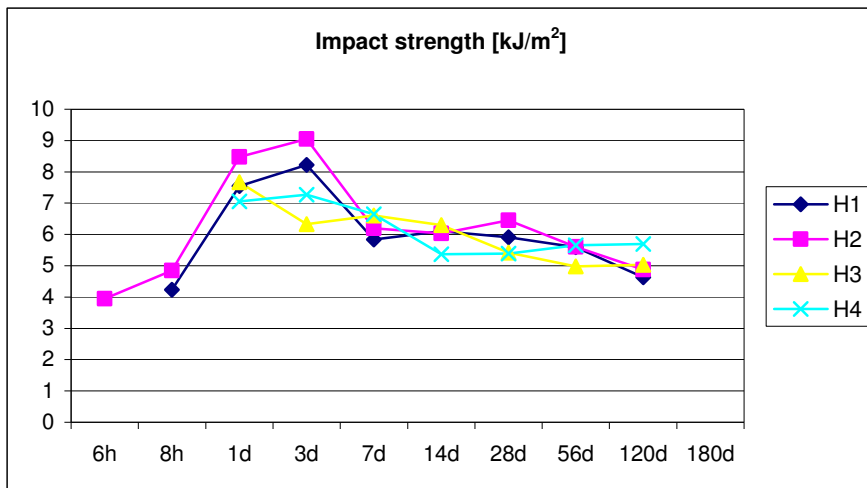
**Graph 2 – Absorptivity during ageing**

Slightly increasing bulk densities (Graph 1) and decreasing absorptivities (Graf 2) correspond to common ageing of glass fibre reinforced concrete.



**Graph 3 – Flexural strength during ageing**

During 28 to 56 days the flexural strength (Graph 3) was increasing to maximum values, but later this strength decreased.



**Graph 4 – Impact strength during ageing**

Impact strength (Graph 4) achieved its maximum during 3 days and later the values decreased.

### **Conclusion**

Main determining parameter was demoulding strength, which allowed two demouldings during one working shift. Only one variant from four monitored variants was possible to demould earlier than after 8 hours of ageing. This parameter was fulfilled by 3% replacement of Portland cement Mokrá 52,5N with high alumina cement Ciment Fondu.

### **Acknowledgement**

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