



CEMENT ADDITIVES POZZOLANS IN CEMENT BLENDS

ENABLING A REDUCTION IN CLINKER FACTOR

BUILDING TRUST



SUPPLEMENTARY CEMENTITIOUS MATERIALS (SCM)

Reduction in clinker factor



Use and demand for
alternative
SCMs is exponentially growing.

SCMs are different and their increased
use per weight of cement induces
a variety of
performance issues.

Tailor made solutions
enable
the cement industry to make the
transition towards lower CO₂ cements.

MODERN SOCIETY is facing extremely challenging conditions, such as limited access to certain raw materials, increasing energy prices, more complex supply chains, and higher environmental regulations. Moreover, demanding quality requirements are forcing a redesign of well-established and traditional production processes.

Cement remains the largest manufactured product on earth by mass. Taking into account its global CO₂ emissions, it is necessary to consider how to reduce its impact on global warming by optimizing and developing new production processes, as well as adopting alternative fuels and raw materials.

The trend of using more environmentally friendly supplementary cementitious materials (SCMs) is growing exponentially. Cement producers are in the process of developing new binders with reduced clinker, including the use of higher dosages of lower-quality SCMs or experimenting with new, alternative cementitious materials.

Considering that SCMs are typically not reactive and contribute little to the early strength development of concrete, the dilution of clinker with SCMs in blended cements generally leads to a decrease of performance. This must be compensated with the use of more powerful quality improvers during cement production.

At Sika, our commitment is the continuous development of customized and high-performance chemical additives, specifically designed for the cement industry. Through our innovations, we enable the cement industry to make the transition to lower CO₂ cements.



POZZOLANA CEMENTS

More availability than other SCMs

Natural pozzolans, while found only in specific regions, have re-gained global interest due to the increasing scarcity and cost of other SCMs in many markets. The potential and opportunities for pozzolana cements remain linked to CO₂ reduction costs and the requirement to develop more sustainable cements.

Depending on the deposit from where pozzolans are mined – either from extrusive (lava) or pyroclastic (ash) origins – and their intrinsic physical-chemical properties, their use in cement production brings new challenges.

Pozzolana cements generally improve the consolidation and durability of concrete at late ages but suffer from slower strength development. Some pozzolans can additionally require rheological correction to avoid high water demand and / or high dosage of superplasticizers in concrete mixes. Additionally, the use of pozzolans as clinker replacement can cause significant and uneven compromising of performance, posing a considerable challenge for cement producers to ensure a finished cement with consistent and robust properties.

Evaluation of several natural pozzolans sourced on a global scale and their performance using specific cement additives has been verified in field tests with customers. It was discovered that many chemical compounds in traditional cement additives were not performing because they tend to be absorbed and immobilized by the pozzolans. This means that most generic multi-purpose cement additives are either not effective or require higher dosages.

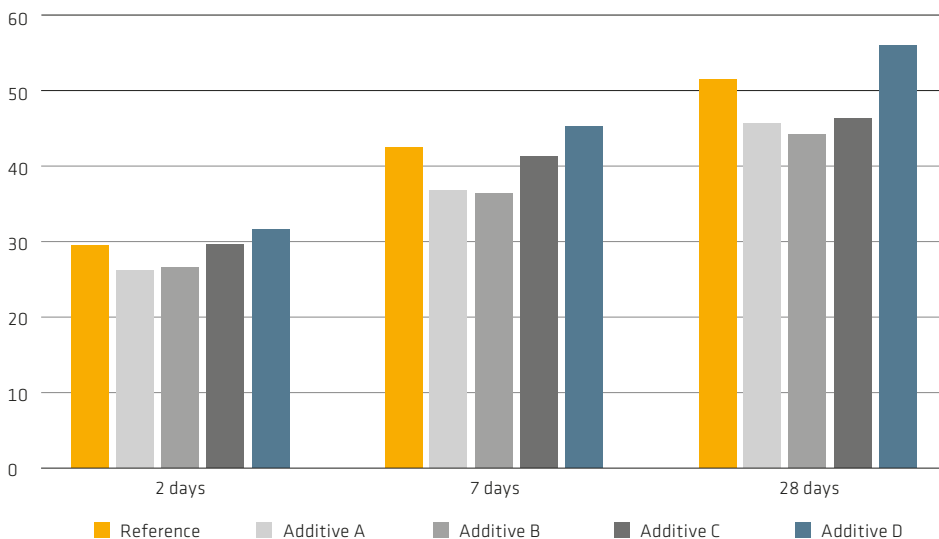
Newly developed cement additives enable the production of composite pozzolanic cements with around 20% clinker reduction compared to the benchmark market cement of the same class.

The **SikaGrind® POZZ Booster** is a series of strength enhancers intended for pozzolana cements in cement production. SikaGrind® POZZ Booster enables clinker reduction while maintaining similar mechanical performance. This series has been designed to compensate the early strength drop due to the slow reactivity of pozzolans and even increase the late strength in the case of ternary blends with limestone. These cement additives contain specifically designed chemical building blocks which are not absorbed by pozzolans, enabling activation at regular dosages. They also may mitigate the variable water demand which depends on the quality and quantity of the pozzolans used.

Our corporate products serve as a reference toolbox which can be adapted to any local situation with tailor-made, optimized products.

Field tests with different customers have been carried out based on different requirements. In one specific case, cements such as CEM II/A-LL 42.5R and CEM II/C-M (P-LL) 42.5R were analyzed. During the field tests trying to reduce the clinker factor, the performance of the new additives was benchmarked against the current basic cement additive already being used in the plant. The target performance and the product requirements defined by the customer were fulfilled: the cement's strength class was maintained with up to 20% clinker reduction.

Strength Development [MPa]

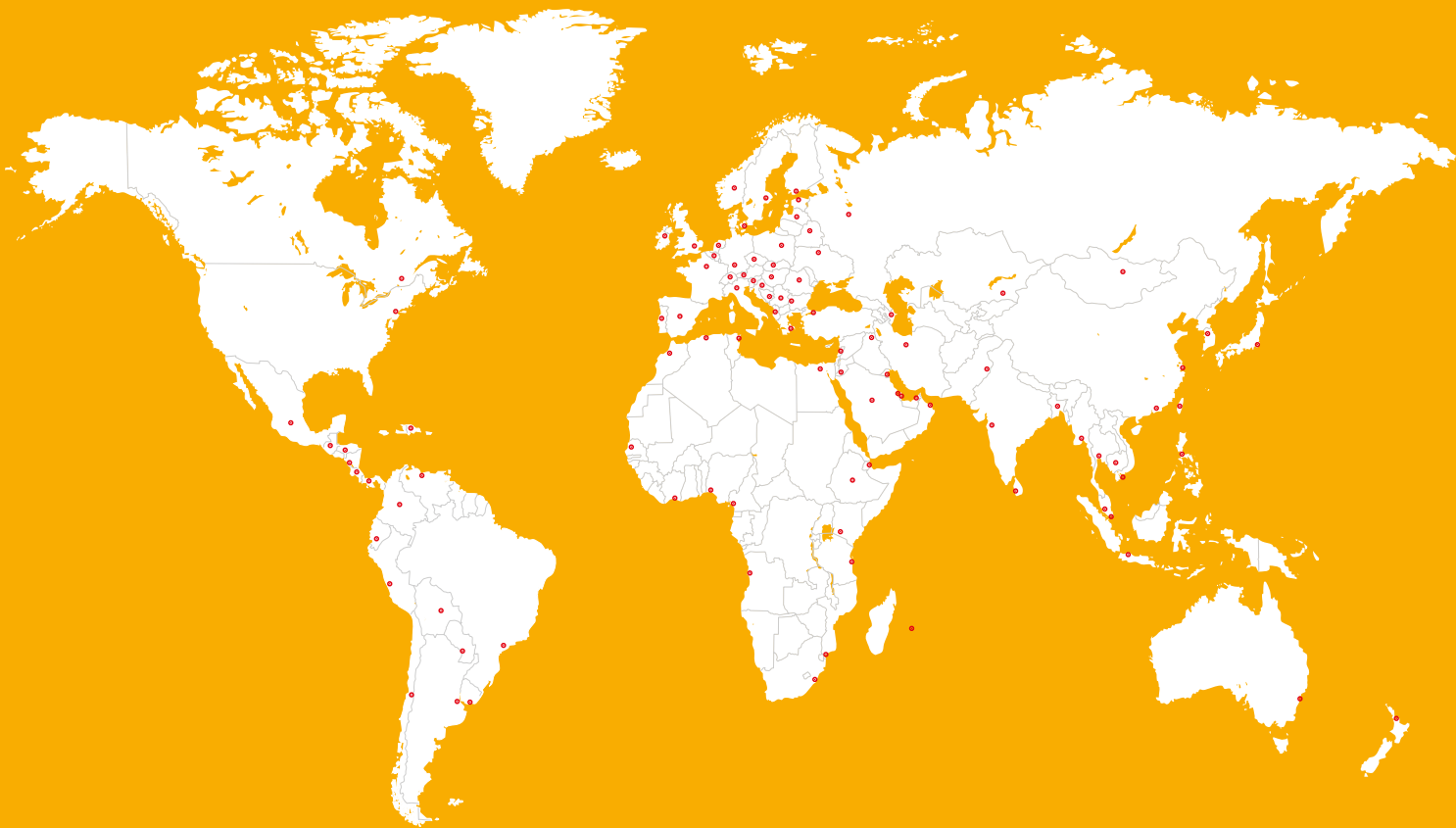


Testing with different Sika Additives

From: CEM II/A-LL 42.5R
To: CEM II/C-M (P-LL) 42.5 R

-> 20% clinker reduction

GLOBAL BUT LOCAL PARTNERSHIP



FOR MORE INFORMATION ON POZZOLAN CEMENTS:



WHO WE ARE

Sika is a specialty chemicals company with a leading position in the development and production of systems and products for bonding, sealing, damping, reinforcing and protecting in the building sector and the motor vehicle industry. Sika's product lines feature concrete admixtures, mortars, sealants and adhesives, structural strengthening systems, industrial flooring as well as roofing and waterproofing systems.



since 1986



since 1997



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