



# CEMENT ADDITIVES SLAG IN CEMENT BLENDS

ENABLING A REDUCTION IN CLINKER FACTOR

# SUPPLEMENTARY CEMENTITIOUS MATERIALS (SCM)

Reduction in clinker factor



Use and demand for **alternative** SCMs is exponentially growing.

Slag remains **economically more attractive** than clinker and performance wise outperforms other SCMs.

Tailor made solutions **enable** the cement industry to make the transition towards lower CO<sub>2</sub> 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 CO<sub>2</sub> 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 alternative 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 cementitious materials.

Considering that SCMs typically 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 CO<sub>2</sub> cements.



# SLAG CEMENT

More attractive than other SCMs

Slag is a by-product of smelting ores and recycled metal. It has environmental expectations related to CO<sub>2</sub> reduction and its availability is limited to markets with domestic steel industry.

For the cement industry, the use of slag remains economically more attractive than clinker and its performance is higher than other SCMs. The potential and opportunities for slag cements remain linked to CO<sub>2</sub> reduction, costs, and availability of the slag.

At 1 and 3 days post mixing, the slag hardly reacts with the water and the reduced amount of clinker in slag cements leads to a marked performance decrease. For this reason, there is often a requirement for quality improvers in countries that have easy access to slag.

It has been observed that many cement additives on the market are more generic and not specifically formulated to increase the early strength in a significant way. For the use of slags in cement production, it needs to be taken into account that the chemical activation strongly depends on the chemical and mineralogical composition of the clinker too.

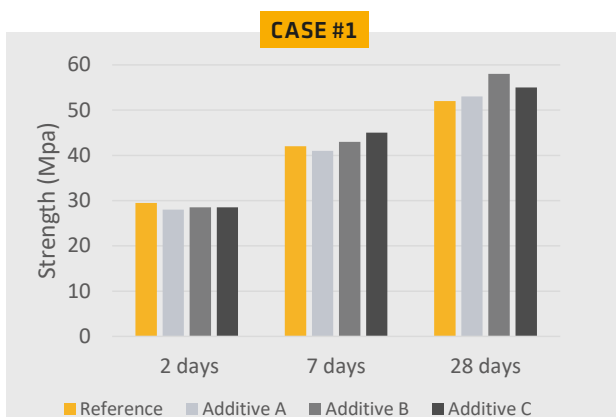
The **SikaGrind® Slag Booster** range is a series of cement strength enhancers. This range of products are intended to be used at cement production level for slag cements or slag composite cements. It enables customers to reduce their clinker factor while maintaining similar mechanical performance, either at early or at all ages.

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

Field tests with several grinding strategies were performed. Customers producing various low clinker cements (around 50% clinker factor) were involved. During field tests, the performance of new additives was benchmarked with the current basic cement additive already being used in the plant. In all cases, the target performance, the product requirements and specifications defined by the customers were reached. The cement's strength class was maintained with up to 20% clinker reduction.



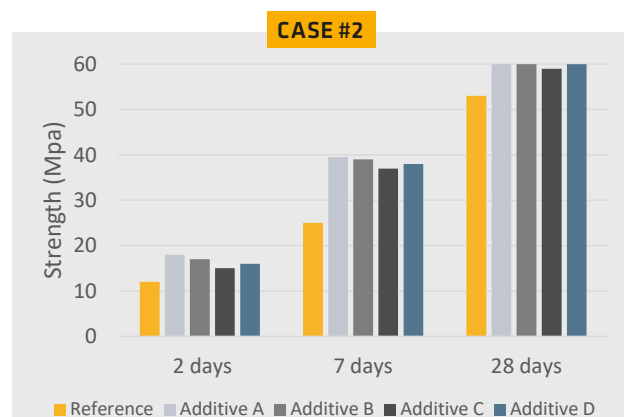
## Strength Development [MPa]



Benchmark cement: CEM II/A-LL 42.5R  
 Target cement: CEM II/C-M (S-LL) 42.5R  
 → 19% clinker reduction

Requirements:

- High early strength requirement (R type cement)
- Enhanced late strength (high filler amount)
- Limited chlorides

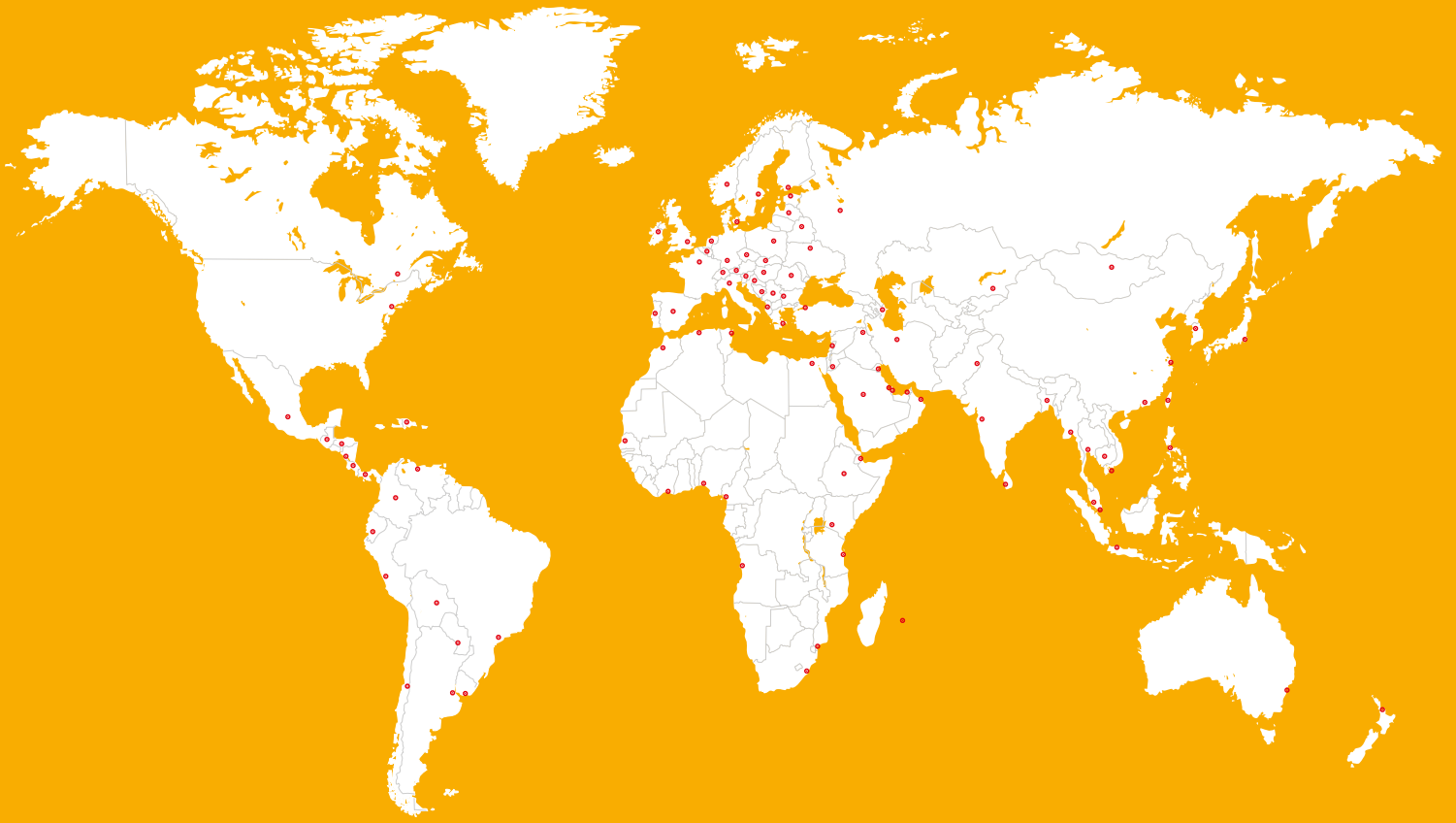


Benchmark cement: CEM III/A 42.5N  
 Target cement: CEM III/A 42.5N  
 → Strong clinker reduction

Requirements:

- Early strength requirement
- Late strength (low reactivity slag)
- Limited chlorides

# GLOBAL BUT LOCAL PARTNERSHIP



## FOR MORE INFORMATION ON SLAG 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.



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