

AFRISAM PUSHES THE LIMITS IN ENGINEERING THE CEMENTS OF THE FUTURE

Enhancing the performance and quality of cements for today's infrastructure, while treading as lightly as possible on the environment, are on-going pursuits for AfriSam, which has set the pace in pioneering cement performance characteristics for more than a decade.

"We push the limits in engineering our products to ensure that our industry keeps moving forward," Mike McDonald, manager of AfriSam's Centre of Product Excellence, says. "This is a continuous process that began in 2000 and is still making significant advancements. Although we're not unique in this environment, AfriSam is differentiated by the extent to which we've gone beyond the conventional boundaries.

McDonald explains that while pure Portland cement has served the industry well for more than a century, its high carbon footprint and often relatively inferior performance when compared to composite cements in many concrete applications have rendered it a product of bygone times.

AfriSam has perfected its C-Tech capabilities to produce composite cements that use mineral components such as fly ash, a by-product of coal-fired power stations, and Ground Granulated Blast Furnace Slag (GGBFS) from steel production, as partial replacement for Portland clinker. Not only does this practice of utilising by-products from other industries minimise harm to the environment, but these materials actually enhance the performance of cement and offer several advantages over pure Portland cement.

"The mineral components in these cements have been engineered to make them far superior to pure cement. By comparison the composite technology, or C-Tech products we've introduced, offer an array of functional attributes pertinent to the built environment of the 21st century. Among these attributes is a greatly minimised impact on the environment."

Fly ash particles are spherical in shape and somewhat smaller than cement particles. In concrete mixes, these particles find themselves between the cement particles, displacing water and acting as "ball bearings" that allow other materials in the mix to pass through more easily, while using less

water. The resultant mix is far more cohesive, with less bleed and an improved finish. Ground Granulated Blast Furnace Slag (GGBFS) improves workability because of its smooth surfaces. Compared to the rough particles in Portland cement, GGBFS particles have the appearance of broken glass with smooth angular surfaces. These smooth surfaces also allow the other materials in the mix to slide past each other, resulting in a more workable mix that requires less water.

In addition, the limestone used by AfriSam is softer than clinker and in the grinding process grinds preferentially into very small particle sizes. These particles displace water between the cement particles and provide many more nucleation sites on which the cement gel can form, effectively improving the workability of the mix.

Regardless of whether concrete is being made on a sophisticated construction site or for a DIY application, good workability is important. A naturally workable mix requires less water for the mix to reach the desired consistency and consequently achieves higher strength levels. The improved workability in AfriSam's C-Tech cement is a result of material technology enhancement and the use of chemical admixtures.

Another superior attribute of these cements is reduced heat of hydration. C-Tech cements typically generate heat over a longer period of time, substantially lowering these thermal gradients and reducing the likelihood of cracking.

The use of fly ash results in a more dense concrete matrix that prevents deleterious materials such as aggressive chemicals and sulphate containing liquids from entering the concrete. This resistance to ingress of deleterious elements gives the composite cements their corrosion resistance properties. While any steel reinforcement exposed to chloride ions in solution is prone to corrosion, GGBFS is known to capture the chloride ions that cause corrosion in steel reinforcement, thereby enhancing the corrosion resistance properties of composite cements.

The finer particles in GGBFS, fly ash and limestone afford composite cements reduced permeability properties. This resistance to water and sulphate penetration from the refined pore structures helps protect the concrete from attack, preventing deterioration.

AfriSam C-Tech cements also contain mineral components that produce superior long term strengths when compared to pure cements, where strength gain typically flattens from 28 days onwards.

In addition, the use of extenders allows AfriSam to significantly lower its carbon footprint. With a reduced clinker factor, the AfriSam C-Tech cement product range has proved a viable solution to the cement industry's environmental challenges.

CEMENT AND CONCRETE TECH PIC 01 : C-Tech personifies AfriSam's ethos of innovation, aimed at ensuring that its customers enjoy the benefits of high performing products.

CEMENT AND CONCRETE TECH PIC 02 : C-Tech cements offer a spectrum of functional attributes that provide customers guaranteed quality performance.

CEMENT AND CONCRETE TECH PIC 03 : C-Tech reduces the carbon intensive clinker content of cement ensuring that AfriSam cements tread more lightly on the environment.

CEMENT AND CONCRETE TECH PIC 04 : AfriSam C-Tech cements contain mineral components that produce superior long term strengths compared to pure cements.

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