

Role of CHRYSO admixtures in self compacting concrete

Self compacting concrete (SCC) – a technology that has been in South Africa for approximately ten years – has an amazing ability to flow into complex shapes and penetrate inaccessible spots while achieving high strengths and superior surface finishes. This would be nearly impossible to achieve without new generation superplasticisers.

CHRYSO, a construction chemical materials company, has been supplying admixtures to the construction industry for nearly 70 years and has two different ranges of superplasticisers for SCC.

Eddie Correia, the general manager for technical services at **CHRYSO**, explains: “Our **CHRYSO® Fluid Premia** range of products is geared towards SCC within the precast industry, while the **CHRYSO® Fluid Optima** range of products is used by the readymix industry to produce SCC.”

With SCC in the precast industry, one basically looks at a high quality finish – reducing blemishes and the need for concrete repairs. Another big positive for SCC in the precast industry is that it aids in a fast placement rate and improves the mould turnaround time.

“The molecules in the Premia range are very effective water reducers and offer workability retention between 30 and 45 minutes. These features are particularly appropriate for the production constraints within the precast industry, achieving high early strengths,” adds Correia.

With SCC in the readymix industry, an advantage lies in the fact that SCC does not require mechanical vibration for placing and compaction. This reduces noise levels and allows construction to take place in built up residential areas during the night and assists companies in meeting occupational health and safety requirements.

The Optima range (for the readymix industry) is designed through a unique, patented phosphonate technology that allows the readymix industry to produce cohesive, low viscous concrete.

“CHRYSO is particularly good at matching superplasticisers with the cement chemistry. We look at the soluble alkalis and soluble sulphates in the cement and then choose a suitable superplasticiser, thus optimising the dosage of superplasticisers for cost purposes. CHRYSO finds the best possible admixture/cement compatibility. This is why there are so many products within the Optima range,” says Correia.

One such product is Optima 100 – a superplasticiser that extends slump retentions of concrete and is compatible with the majority of cement types. “Optima 100 is an extremely unique product as it is not water sensitive. Some competitors’ products become very sensitive should too much water be added to the mix, however Optima 100 is a robust admixture with regard to water control and allows one to produce SCC that is not too water sensitive. The aim with SCC is to produce robust, non sensitive mix designs that can be easily implemented,” states Correia.

A significant challenge with regard to SCC lies in the fact that South Africa typically uses dry batch plants. This provides little room for error as the mix design has to be correct the first time around. Therefore it is incredibly important to receive the correct technical advice.

Brenton Brouard, CHRYSO’s technical manager: concrete, mentions that CHRYSO provides technical support. “CHRYSO evaluates a customer’s raw materials, selects the appropriate admixtures and optimises mix design to meet all requirements.

“The mix design principles of SCC are far more sophisticated than those used for standard concrete. Therefore, in order to manufacture SCC with consistent accuracy and acceptable quality, it is imperative that the quality of the major components within the SCC mix design is not compromised. Although the new generation of superplasticisers has assisted in the development of SCC technology, they will not be able to mask a substandard mix design.

“One has to create a homogenous mix that is closely controlled and monitored. For example – the same cement from the same supplier from the same factory should be used. The size and shape of aggregate can affect the cost effectiveness of SCC, and should the size and shape vary, there may have to be adjustments made to the mix design. Variations make it very difficult to produce SCC with consistent accuracy.

SCC is used in vertical and horizontal applications. With the horizontal applications, one has 600 mm to 650 mm slump flows. The vertical applications are far wetter, with 700 to 750 mm. Horizontal applications need to provide swift and easy coverage of large surfaces and flat toppings.

The Premia and Optima range of superplasticisers have played a noteworthy role in SCC. The Nelson Mandela Bridge used a number of CHRYSO’s superplasticisers. where the Optima combination was designed to be robust enough to accommodate variations in water content in the mix formulation. With Soccer City, Optima 100 and Optima 207 helped to obtain a smooth shutter finish for the columns, despite highly congested reinforcement. A range of CHRYSO plasticisers was used in construction of the N14 bridge in Muldersdrift, where a combination of Chryso’s Optima range of admixtures was used to achieve extended workability and high fluidity, as well as ensuring that the concrete mix did not segregate.

CHRYSO also supplies superplasticisers to major readymix concrete producers, for their in house proprietary SCC product ranges.