



19. Conference "Rheology of Building Materials" Regensburg, Germany, March, 10.+11. 2010

FML Concretec GmbH presented their innovative technologies of the "two-step mixing of concrete – energetically modified water / colloidal mixing + homogenization " on the one hand by an animated film and a speech based on a PowerPoint presentation and on the other hand by a practical demonstration during a workshop the next day.

The animated film <http://www.fml-concretec.de/video/video.php?videolang=en> gave an overview of the FMLC *Concrete Technology* and showed the advantages the technology brings in the field of the production of RMC.

It could be seen that the mixing time can be minimized and by this the output capacity can be increased. Also the consumption of cement and water can be reduced which leads to a cost saving effect if the quality improvement, e. g. the increase of spread/slump is not the main goal. Concrete for precast purposes will gain a reasonable earlier strength and the concrete quality will be improved.

The presentation at the beginning introduced the management of the FML Concretec GmbH and the cooperation partner MAT. In the following the constituent process steps of the FMLC *Concrete Technology* were shown.

CEng Holger Reinecke, technical director of FMLC, explained the procedural techniques:

- Adjustable Water Treatment System leading to an energetically modified water (EMW)
Effects: Disintegration of molecule clusters, refining, charging and improvement of the reactivity of the water
- Colloidal mixing of EMW, binding agents and leading to a homogeneous and stable suspension
Effects: Disintegration of agglomerations of binding agents, increase of the reactive surface and complete activation of all cement particles and possible upgrading of lower class cements by a wet milling process, faster disintegration and activation of admixtures

The spoken technological and technical information was supported by drawings and also pictures which showed the procedural system and the technical equipment.

Tables with test results gave evidence of what has been achieved in practice, in the laboratory of the FMLC Technology Center TCA as well as in practical tests at the Holcim-RMC plant in Geesthacht.

Holger Reinecke pointed out that the FMLC technologies can reasonably be used in newly built as well as in existing concrete plants, no matter whether ready mix, precast or on site produced concrete is concerned. The FMLC water treatment system is useful for nearly every concrete plant, whilst the combined system is economical in plants with a higher yearly output.

It has been practically proven and officially stated by cement companies and concrete producers that the FMLC *Concrete Technology* leads to:

Improvement of quality

- + Workability – Compactability – Pumpability
- + Early and 28d/56d-compressive strength - Longevity
- + Homogeneity - Stability
- Capillarity – Bleeding - Segregation

Cost reduction

- Reduced cement content



- Increased substitution of cement by other binding agents
- Upgrading of cement by wet milling
- Decreased demand of admixtures
- Reduced mixing time – increased output capacity
- Short after mixing an just a truck mixer required
- Reduced cycle times/earlier mould stripping – less demand of heating energy

Logistical advantages

- Suspension stations: Production and delivery just in time, no danger of traffic jams, no overheating and no pre-stiffening/-setting of fresh concrete
- Faster production/delivery due to shorter mixing time

Environmental aspects

- Reduction of the energy consumption and the CO₂-emissions, conservation of the environment because of reduced water consumption

During the workshop in the concrete laboratory of the University of Applied Sciences Regensburg on Thursday March 11th FMLC demonstrated some abilities of their *Concrete Technology* by a practical demonstration.

Two FMLC concrete technologists brought FMLC laboratory equipment to Regensburg and allowed an impressive insight in the new, innovative technology of concrete mixing. They showed the 5 min and the 60 min spreads of a reference mixture consisting of sand, gravel, 300 kg of CEM II/B-S 32.5 R and 60 kg fly ash, mixed in a Collomix compulsory lab mixer. In comparison they showed the same mix design, also mixed in just the Collomix, but this time with EMW (energetically modified water). The last demonstration was about a concrete mix which they produced with EMW and suspension, which has been mixed in the FMLC 20 I colloidal lab mixer separately. The homogenizing took place in the Collomix mixer.

The results proved that the FMLC *Concrete Technology*, whether just the water treatment or the combined technology is concerned, has great positive effects on the properties of fresh concrete. The spreads of the comparison mixtures were increased, after 5 minutes as well as after 60/70 minutes.

The improved workability and flowability of the FMLC concrete mixes were also stated by the rheological measurements of Schleibinger testing devices, the BC-SCC Rheometer for Fresh Concrete and the actual novelty, the Viskomat XL Rheometer for Mortar and fresh Concrete.

The tests with the PUTZMEISTER-SLIPER, carried out by Knut Kasten, did not show notable differences. The pumpability is supposed not to be very much better with the FMLC mixes but it needs to be taken into consideration that the concrete mixes contained round aggregates, only a small amount of slag, not very much cement and also a low grade cement and last but not least a quite high water/cement-ratio.

It can be assumed that due to the improved concrete properties the pumpability under harsher conditions will be much better with the FMLC mixes.