ACTIVE SILICA, SILICON AND NOW NEW GLASS FIBERS (AR).

Hello, friends!

We announce this sixth edition of the Tecnosil Solutions Newsletter with great news: our Fiberglass line (AR).

Investing and innovating in technology is part of our DNA, and we found a fiber that meets the needs of a special, high-performance and durable concrete, providing buildings with a longer life in accordance with the concepts of sustainability.

Another highlight that I want to share with you is the series of lectures that we are doing the Universities of Brazil. An opportunity to show an academic audience the advantages of Nanotechnology (Nanoscience), which are now a reality provided by Tecnosil.

We also had the satisfaction of participating in the work of the Rio de Janeiro Museum of Art (MAR), in a bold roofing project with great challenges - thickness, durability, strength - which included Active Silica in its specification.

Tecnosil is continually expanding its operations in the construction area, always providing sustainable solutions that unite the economy of natural resources to increase the lifetime of concrete structures. Finally, we have to warn about silicosis. Our Active Silica product does not affect health because it is an amorphous product, unlike other products that are crystalline in form a condition under they become harmful. Learn more about it on our website: www.tecnosilbr.com.br.

Best regards and happy reading!

Alciro Gomes Flores

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Commercial Director

A NEW CULTURAL CENTER FOR

RIO DE JANEIRO, WITH QUALITY TECNOSIL.

Rio de Janeiro already boasts another important cultural space, the Rio Art Museum, one of the pillars of the revitalization of the Port Zone. Two buildings are installed in Praça Mauá: the Dom João VI Palace, tumbled and eclectic, and the neighboring modernist style building - originally a bus station. The Palace houses the museum's exhibition spaces. The neighboring building houses the Escola do Olhar, an environment for the training of educators in the public school system. In addition to the school and the exhibition halls, the complex has an auditorium, café and restaurant on the terrace.

A BENCHMARK PUBLIC SPACE FOR ACCESS TO CULTURE.

The proposal is to bring major Brazilian art works together in its collection, always with its own exhibitions. In less than a year, the MAR already has a collection of more than 3,000 items.

STRUCTURAL CHALLENGE.

According to Prof. Ivan Ramalho, the definition of the concrete mix suitable for the MAR fluid roofing had to overcome some challenges: the material would have to be tough (fck of 40 MPa), durable because it is a work in front of the Port's pier, a strong and aggressiveness region, and especially workable to allow the 30 meters of height, the penetration in dense reinforcement double mesh and uphill "free climb" of over 20º incline and 1.5 m in height at adjacent point, with no upper mold.

"The Active Silica was essential in developing the intermediate workability of the concrete that the project required."

Engineer and Professor Ivan Ramalho

ROOFING INSPIRED BY SEA WAVES.

The two buildings that make up the institution are joined by means of a square, a glass walkway and fluid roofing, in the form of waves - the most striking feature of the architecture. The idea of integration underscores one of the key concepts of the museum, of education.

Concrete volume in the roof: 320 m3

ACTIVE SILICA, THE KEY INGREDIENT FOR THE SUCCESS OF THE WORK.

To meet the specific demands of this project, the composition of the concrete incorporated superplasticizer, synthetic micro-fibers, a crystallizing agent and part of the water was replaced by ice. But the most important role was played by the active silica, which in addition to its properties recognized for promotion of resistance and durability of the concrete, was measured in the most appropriate ratio to obtain the optimum viscosity of the concrete.

So, a concrete was developed that was not too dry to prevent moving it by pump, and was perfect for filling the forms and involving the reinforcement, not so fluid that it wouldn't secrete, remaining cohesive in the many hills and troughs of the structure, even during compaction by vibration.

NEW PETRÓPOLIS BREWERY.

MORE RELIABILITY IN THE FLOORING WITH THE USE OF NANOSILICA.

The sizing processes of concrete flooring are becoming increasingly more modern. Today we have more knowledge of the structural frame systems and are therefore able to more efficiently determine the ground support capacity.

CONCRETE WITH LOW HYDRAULIC, AUTOGENOUS AND BY CARBONATION SHRINKAGE.

Studies indicate that concrete with added nanosilica have a more reliable concrete matrix regarding strength and shrinkage. The cement grain has the ability to "copy" the perfect format of hydration of the nanosilica crystals, which will improve the adhesion between the matrices, and so we achieve a concrete with less shrinkage and higher resistance.

WITH THE USE OF NANOSILICA, WE REDUCED THE SHRINKAGE OF THE CONCRETE FROM 0.07% TO 0.03%.

In the work on the Petrópolis brewery we used this technology in the internal and external flooring of the factory. Using a traditional concrete, we obtained a decrease to the order of 0.07% and with the new brand of concrete, with the use of nanosilica, we achieved values well below the conventional concrete values, to the order of 0.03%.

This difference is given by reducing the water mixed in the concrete, by a continued granulometry of the aggregates, and by the use of nanosilica, which is transported by polycarboxylate.

The Petrópolis brewery is currently one of the largest companies in the sector in this country. It already has its fifth plant, built in the city of Alagoinhas, Bahia and more recently constructed a plant in Pernambuco. Thanks to the innovative nanosilica technology, we can obtain greater control of concrete flooring, surpassing the parameters

required in the design and providing a more reliable floor system.

DATA SHEET:

CONSTRUCTOR: Odebrecht CONCRETE SUPPLIER: Cimpor – Intercement FLOORING DESIGN AND CONSULTING: Mixdesign Engenheiros Associados AREA: 75.000 m_2 (approx.) LOCATION: Lagoinha - BA*Source Petrópolis brewery website*.

NEWEST GENERATION OF CONCRETE ADDITIVES:

STABILIZED NANOSILICA

A NEW, MORE EFFICIENT CONCEPT.

The main distinguishing feature of stabilized nanosilica is that in a single product, it is dispersed homogeneously in the additive, which enables its perfect dispersion in the concrete mass. It is not colloidal nanosilica or precipitated, it is a new proposal. By presenting the same chemical composition as quartz, the same amorphous physical constitution as Active Silica and much smaller particles, nanosilica reacts more efficiently when added to mortars and concrete, providing them with better cohesion and lower permeability.

WHY IS IT WORTH USING STABILIZED NANOSILICA?

Reduces the use of water for preparing the mix, mortar or concrete;

. Promotes ease of application and dispersion of nanosilica in the material;

. Greater modulus values;

. It increases the mechanical strength (flexural, tensile and compressive), both new and old concrete, giving greater durability in concrete structures.

. Durability against harsh environmental factors.

GLASS FIBER

The solution for reinforcing cement matrices. Alkali resistant (AR) glass fibers have been used for over 40 years in over 100 countries, providing a unique resistance to tension for concrete. By having a density close to the concrete, the glass fiber marketed by Anti-Crak® and sold by Tecnosil provides a dispersion and homogeneity of the fibers beyond that obtained with other fibers,

and thus improves workability and finishing.

Due to the strong affinity between alkali resistant (AR) glass fiber and the cement matrix, AR glass fibers are an excellent alternative for the reinforcement of concrete floors and paths. Fiber-reinforced concrete (FRC) increases the total load capacity of the structure and reduces plastic and thermal shrinkage, partially or totally replacing conventional reinforcement.

WHY USE ALKALI RESISTANT GLASS FIBER?

Developed to replace primary (structural) and secondary (cracking) reinforcements, alkali resistant glass fibers are much more advantageous because, unlike conventional fibers, they are resistant to harsh environments.

C_3S, C_2S + H_20 -> CSH + $Ca(OH)_2$The lime continues to be released over time, during the hydration process of the concrete, as shown in *Figure 2*. The lime (calcium hydroxide) is extremely aggressive and seriously attacks both the surface and the molecular structure of conventional glass fibers *(Figure 3)*. Alkali resistant fibers have been especially designed for use in concrete and mortar and are stable in the harsh environments produced by lime *(Figure 4)*.

PROPERTIES OF DIFFERENT REINFORCEMENT FIBERS

Synthetic Fiber Polyvinyl Alcohol good

Concrete reinforced with fiber

Concrete reinforced with conventional glass rapidly loses strength in the deformation, however concrete reinforced with Anti-Crak® AR fibers retains most of its ductility. Another measure of the

fiber's resistance to chemical attack is the ability to determine the loss of mass of the fiber when submerged in alkali solutions (pH> 12).

The following results were obtained through a comprehensive study on the chemical resistance of the fibers, conducted by the Swedish Institute of Corrosion *(Figure 5)*. Sodium hydroxide was used as a 2M solution at 30°, which is an alkali resistance test. As can be seen, the Anti-Crak® fibers resist this extreme medium with a tiny loss of mass and demonstrated excellent resistance to the alkaline attack. The conventional glass fiber showed a significant loss of mass.

Figure 5 - Resistance to alkaline attack in a 2M NaOH solution.

THE OUTPUT FOR A SHORT TERM, HIGH PERFORMANCE REQUIREMENT.

With the new challenges of construction, such as short deadlines, shortage of space on the construction site, competitive costs and qualification of manual labor on the rise, it was necessary to innovate in the materials for the work of expansion

of the Barra Shopping mall, one of the biggest in RJ, now operating for 23 years.

One of these innovations was the use of the concrete, which increasingly is being done according to the specifics of the projects, in the shortest possible time. In the case of work on the Barra Shopping mall, characteristics were established such as compressive strength, elastic modulus, strength in bending, with a period in which to achieve these performances of between 20 to 28 days, as the pace of the work could absorb this setting time of the concrete.

BARRA SHOPPING MALL WILL EXCEED 50 THOUSAND M_2 AND AN EXTENSIVE

STRUCTURE FOR LEISURE, ENTERTAINMENT AND CUISINE.

To meet these requirements in a shorter period, we adopted the new nano technology, nanosilica. With the use of Silicon with the addition of Active Silica, we were able to achieve the modulus and resistance to deformation, as well as to provide the use of the optimized structure in a period of 7 days.

A polycarboxylate additive was applied to the concrete, with nanosilica in its composition to the order of 0.7%/cement weight, to be able to assist with the initial resistance. In order to not affect the final resistance, 5% Silica Active was added. We also applied a CP III RS type cement and normal aggregates for the region.

BENEFITS OF NANOSILICA AND ACTIVE SILICA MIX FOR CONCRETE:

1. Increased resistance in up to 28 days, without increased cement consumption;
2. High resistance at low ages without the use of ARI (high early strength) cement;
3. Deformation modulus achieved at low ages, without the use of special aggregates;
4. Low shrinkage of concrete and no emergence of shrinkage cracks.

TECNOSIL AND INNOVATION SIDE BY SIDE.

Tecnosil always works closely with universities. One way to exchange information and enrich our work with the very latest in research and development of materials and technology for the construction industry.

This partnership has already been in place for a long time, with the sponsorship and donation of products to teams participating in the IBRACON, also offering our laboratory and office to undergraduate and graduate students.

While we improve our solutions with the technical knowledge provided by the universities, we encourage scientific development in the sector by collaborating with several researchers. Because we believe that this way we can create even better products, that respond to sustainability issues and the new challenges of construction.

In addition to lectures, we participated as Sponsors and Speakers at the 15th FATEC Technology Conference, which took place in October.

WE HAVE ALREADY VISITED:

USP SÃO CARLOS - welcomed by professors Dr. Eng José Samuel Giongo and Dr. Eng Libânio Miranda Pinheiro.

UFMG BELO HORIZONTE - welcomed by professors Dr. Eng Marcio José Calixto and Dr. Eng Adriana Guerra Gumieri.

PUC Campinas - welcomed by professors Dr. Eng Marco Carnio and Dr. Eng Nádia Cazarim da Silva Forti.

UNESP- Ilha Solteira, welcomed by the academic center.

FATEC SP - 15th TECHNOLOGY CONFERENCE, speakers and sponsors, we were welcomed by Profo Me. Paulo Hidemitsu Ishikawa and Profo Me. Celso Couto Júnior.

ALL OUR THANKS FOR THE ATTENTION AND CONGRATULATIONS BY THE WORK DEVELOPED IN ITS INSTITUTIONS.

PERFECT SYNERGY WITH ACTIVE SILICA.

The very different size of the particles causes stabilized nanosilica materials and Active Silica to complement each other, both for efficiency and for the basis of its performance, which provides even better properties when compared to concrete produced with these inputs separately. Both additive products can and should be incorporated together in the production of durable concrete for any environment. The Silicon line unites all these benefits of stabilized nanosilica, plus a new product from Tecnosil that meets the requirements of sustainability and durability, increasing the life cycle and reducing the maintenance frequency of concrete structures.

JUST COMPARE AND SEE THE BENEFITS. IT IS THE BEST PERFORMANCE FOR YOUR

CONCRETE.

Silicon: a new generation of additives with permanent action. The Silicon additives exert permanent effects on the concrete, starting when fresh and extending throughout its lifetime. The CSH gel that originates from stabilized nanosilica, before producing the concrete hardening, are formed with better quality (mechanical properties and chemical stability). The result is a fresh mixture, more resistant to bleeding and segregation, with greater mechanical resistance, especially to flexion and tension, coupled also with an increase in the elasticity modulus of the concrete.

Editorial Sheet

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