

Welcome to the June 2019 edition of our Concrete Durability Newsletter.

Exciting developments are taking place in the Penetron world! We are proud to announce the arrival of our latest addition to the Penetron product range: PENETRON BIOMIC – an effective solution to prevent microbial-induced corrosion and protect sewage infrastructure.

In March 2019, another successful Penetron International Technical and Application Training was held in Athens, Greece. The training session sharpened the skills and knowledge of our international distribution and application network, helping them to provide better solutions and support to our customers worldwide.

Penetron products are used in over 100 countries globally. Take a look at our PENETRON WORLDWIDE section (below) to learn about a few of our latest projects that benefit from Penetron solutions.

*Jozef Van Beeck
Director, Sales & Marketing
Penetron International*



PENETRON WORLDWIDE

PENETRON BIOMIC – The Answer to Preserving Our Sewage Infrastructure

Never Stop Learning: Penetron International Technical and Application Training 2019

Jewel, Singapore

Regatta Phase 2, Jakarta, Indonesia

Cala del Forte, Ventimiglia, Italy.

La Serena Hospital CDT, La Serena, Chile

Gökmen Space and Aviation Center, Bursa, Turkey

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PENETRON BIOMIC – The Answer to Preserving Our Sewage Infrastructure



Bacterial attack on concrete infrastructure causes an estimated US\$ 50 billion in damages every year and has become a major problem for global maintenance efforts.

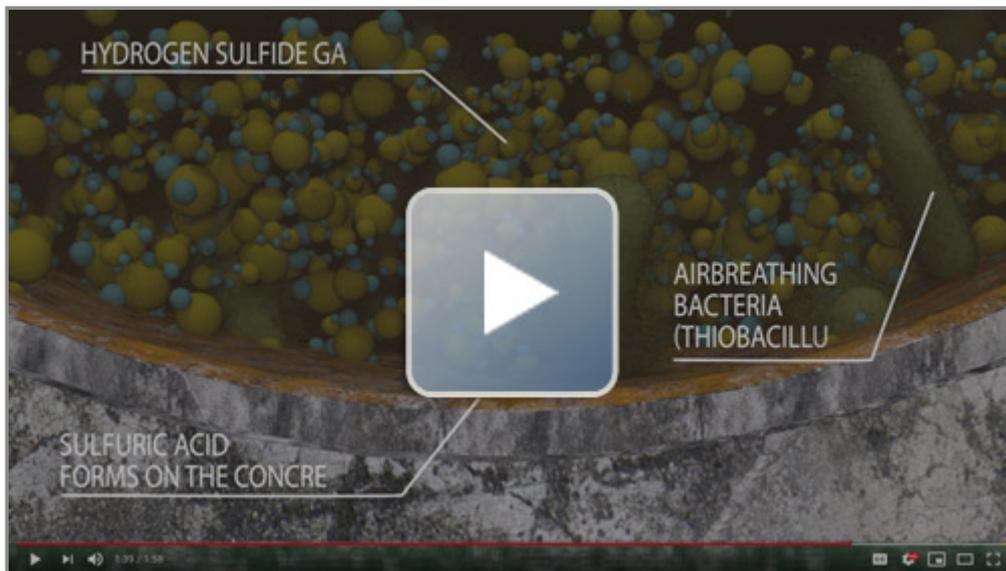
Microbial-Induced Corrosion (MIC) rapidly deteriorates concrete pipes and manholes in sewage systems. This jeopardizes the structural integrity of overlying construction, such as sidewalks, roads and buildings.

Anaerobic bacteria prevalent in raw sewage generate hydrogen sulphide gas when agitated by the flow of the sewage or in inlet areas. This gas provides nutrition to the air-breathing thiobacillus bacteria present on the surface of the concrete, resulting in the secretion of sulfuric acid. The sulfuric acid eats away the cement paste, causing the aggregate to be exposed and the concrete to deteriorate rapidly. As the acid seeps deeper into the matrix, the concrete deteriorates; its pH decreases and attacks the reinforcement steel, ultimately undermining the sewer structures.

PENETRON BIOMIC is an antimicrobial admixture added to the concrete mix at the time of batching. It forms a molecular bond with the concrete, preventing microbial-induced corrosion damage and inhibiting the growth of other product-damaging and odor-causing microorganisms, such as bacteria, algae and fungi.

PENETRON BIOMIC kills 99.9% of the sulfur/acid producing bacteria within 24 hours by means of electro-physical destruction mechanisms that rupture the cell walls of the microbes. This prevents the formation of acid, which would otherwise cause corrosion and deterioration of the concrete element, resulting in *Total Concrete Protection* for the lifespan of the concrete.

PENETRON BIOMIC is now available from your local Penetron supplier. Click on the image below to view video.



Never Stop Learning: Penetron International Technical and Application Training 2019



The 2019 Penetron International Technical and Application Training was the first ever training session hosted by the Penetron Hellas Training Academy in Athens, Greece. It was also the biggest international training event yet, with 45 attendees from 27 different countries.

The three-day program kicked off with a full-day “Concrete Overview” presented by experienced guest speakers and focusing on the design of durable concrete structures.

The Penetron training program mainly focused on the Penetron System: including PENEBAR SW, liquid sealants, repair materials, and – last but not least – how to enhance concrete durability and service life with PENETRON ADMIX. During the classroom part of the training, attendees gained an understanding of the numerous solutions offered by the Penetron System from presenters Theodor Mentzikofakis, Managing Director & Partner of Penetron Hellas SA, and Florian Klouda, Director, International Account Coordination of Penetron International).



The Training 2019 session will help Penetron distributors and applicators apply their knowledge and skillset to properly install Penetron solutions and guarantee the performance of the application. The program's practical session featured professional applicators demonstrating the required tools and correct application of each component of the System. Participants were able to experience hands-on training to learn about the ease of application and the efficacy of the Penetron products.



The Penetron training sessions help improve the knowledge and skills of our international partners, distributors and applicators – and enable them to provide quality applications and enhance the level of support to our global customer base.

PENETRON WORLDWIDE

Jewel, Singapore



A place where Singapore and the world meet: Jewel, Singapore's latest architectural showcase at Changi Airport connects Terminals 1,2 and 3. Five years in the making, the S\$1.78 billion (US\$ 1.3 billion) project opened in April 2019 and set a new benchmark in international airport design and air travel.

Designed by renowned architect Moshe Safdie and RSP Architects, Jewel spans over 137,000 m² and 10-floors high, providing a unique experience for both tourists and local Singaporeans alike. Under the impressive glass dome, a lush 5-floor high rainforest, made up of more than 2,000 trees and thousands of flowers and shrubs, encircles Jewel's centerpiece, a 40-meter rain vortex – the world's tallest indoor waterfall. From an opening in the center of the dome structure, recirculating rainwater falls 7-floors down into the basement below to cool the opulent, indoor Forest Valley.

The rainforest is made up of different plant species from China, Malaysia, Spain, Thailand and the USA, and underlines Singapore's reputation as the "City in a Garden." Above it all, the 14,000 m² Canopy Park invites visitors to enjoy walking trails, Sky Nets and flower sculptures.

Located in the center of Changi Airport, Jewel not only offers services and facilities for international air travelers to unwind, relax and explore during layovers in the Lion City, but it is a place to relax for local residents, as well. Jewel also comprises a world class shopping and dining experience with over 200 local and international restaurants, bars and retail outlets, including the first Pokemon Center outside of Japan.

For the convenience of air travelers, Jewel provides a 130-room hotel, a self-check-in lounge and early bag-drop facilities that entice passengers to discover Changi Airport's latest attraction to its fullest.

Penetron solutions have been used throughout Changi Airport in the past. Their proven performance made PENETRON the product of choice for protecting Jewel's vital concrete elements against water ingress and deterioration. PENETRON ADMIX was added to over 32,000 m³ of concrete supplied by Pan United and Alliance Concrete for the basement slab, elevator pits, water tanks, and the numerous passenger ramps.



PENESEAL PRO liquid sealant was applied to the exposed concrete surfaces of the planters, fire engine access sites, drop-off points, AHU rooms, Forest Valley slabs and RC equalization tanks.

Regatta Phase 2, Jakarta, Indonesia



The Regatta is a mixed-use development of 11 skyscrapers – 10 apartment towers and the 40-floor luxury Regatta Hotel – all overlooking the Java Sea at Pluit, Jakarta. The 11-hectare site also includes a 2.4-hectare aqua park.

Designed by Atkins and awarded the Prix d'Excellence by the International Real Estate Federation (FIABCI), the project's towers resemble elegant sailing yachts arranged along the points of a compass. Each apartment tower is named after an international port city and orientated towards the direction of that city.

As "The Regatta" is adjacent to the Java Sea, the high groundwater table and hydrostatic conditions were a challenge for the waterproofing and durability of the underground structures. To avoid any water ingress into the basement parking facilities of The Regatta, a >14,000 m² raft foundation was successfully treated with PENETRON.



Luigi Tanzil, Managing Director of Penetron Indonesia (right) and Florian Klouda, Director, International Account Coordination, Penetron International, visit the Regatta construction site.

Cala del Forte, Ventimiglia, Italy

Cala del Forte, Monaco Ports' third Mediterranean port, is located in Ventimiglia, Italy, in the Marina S. Giuseppe area, 7.9 nautical miles from Monaco. Designed by Studio Pro Iter Architects, the port was shaped as a natural extension of the existing coastline.



Once completed, Cala del Forte will provide 178 berths (for 6.5 m up to 70+ meter yachts), adjacent storage facilities, 24/7 mooring assistance, a light-service shipyard for yachts up to 30m, 39 shops, a 577-car parking lot, 15,000 m² of promenades and gardens, and a direct connection to the historic town center of Ventimiglia – via a newly-built elevator.

For the critical underwater concrete structures of the refueling and water lifting facilities, CEM Spa, the Cala del Forte project contractor, chose to rely on the Penetron System. As proven in similar projects, Penetron's integral crystalline system is the only way to ensure waterproofing and durability for the precast concrete elements, which were airlifted and placed into position.

PENETRON ADMIX was added to the four insulation boxes (secondary basins), which contain the fuel tanks for the yachts (total fuel capacity of 150,000 liters). They will be permanently immersed in seawater.

In addition, the concrete for five submersed tanks for the dock's hydraulic lifting system were treated with PENETRON ADMIX. All treated concrete also received an additional PENETRON coating to replace the originally specified epoxy coating in the insulation boxes and tanks.

La Serena Hospital CDT, La Serena, Chile

After a two-year tendering process, construction on the long-awaited La Serena Hospital expansion started in June 2018. The new Therapeutic Diagnosis & Treatment Center (CDT) will be the first in the Coquimbo region (approximately 470 km north of Santiago). The hospital was originally designed to treat 50,000 residents when it first opened in 1947. However, the current population of 700,000 residents in the region made an upgrade urgent.



The US\$ 105-million project features a new 40,130 m² complex of three buildings with 115 consultation rooms, six operating suites, a patrimonial module, 20 dialysis chairs, an oncology unit, and a clinical laboratory, as well as an MRI unit.

La Serena CDT is built on the grounds of the former La Serena prison and strives to maintain the façade of this heritage building.

Due to the significance of the La Serena CDT to the region, the Penetron System was chosen to ensure the durability of this critical infrastructure project. By reducing concrete permeability and providing self-healing properties, the Penetron System delivers an optimal waterproofing solution.

PENETRON ADMIX was added to 8,000 m³ of concrete supplied by Soc. Petreos SA to protect all retaining walls and the basement slab. Additionally, 400 meters of PENEBAR SW-45 were installed to completely seal all non-moving construction joints.



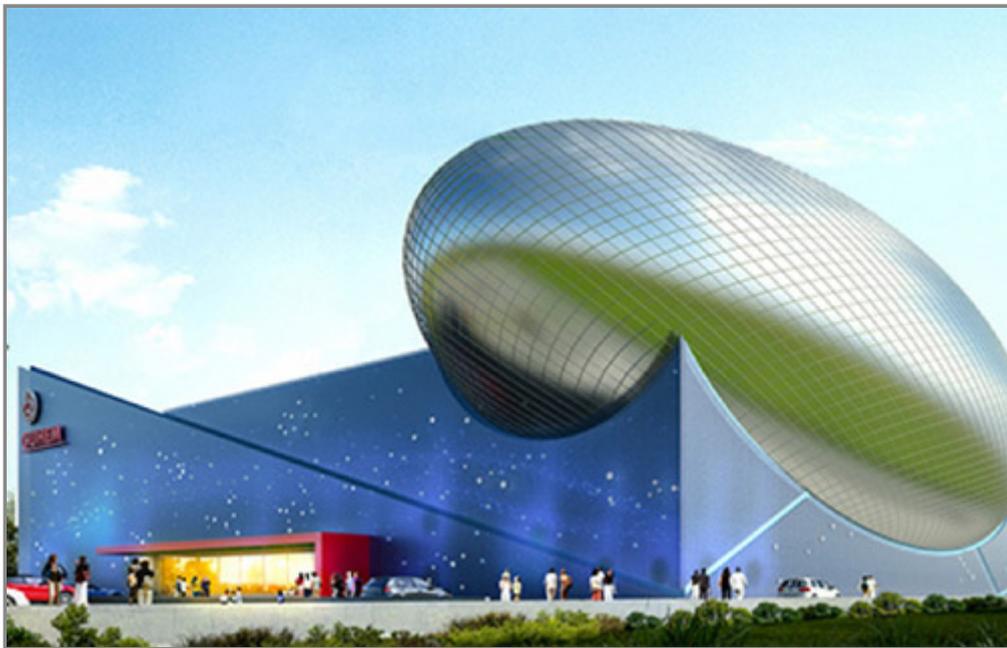
Gökmen Space and Aviation Center, Bursa, Turkey

When completed later this year, the Gökmen Space and Aviation Education Center (GUHEM) will be the largest of its kind in Europe and one of the top five space and aviation centers in the world. The project was developed by the Bursa Metropolitan Municipality and Turkey's Ministry of Science, Industry and Technology (TUBITAK). It will cover a total area of approximately 13,000 m².



The US\$ 40-million project is aimed at raising awareness for space exploration and aviation through 154 interactive installations, aerospace learning centers, space innovation centers and vertical wind tunnels. Lectures on atmospheric events, the planets of the solar system and galaxies, and even a gravity-free zone are all specifically designed to attract a young audience and motivate them to consider careers in this industry.

Thanks to many similar projects completed in the Bursa area and the need for long-lasting concrete protection and waterproofing, the Penetron System was specified to treat GUHEM's 3,000 m³ foundation slab, supplied by Bursa Beton. PENEBAR SW waterstops were installed to seal all non-moving construction joints.



Toachi-Pilatón Hydroelectric Power Plant, Ecuador

The 254.3 MW Toachi Pilatón Hydroelectric Project is located in the provinces of Pichincha, Santo Domingo de los Tsáchilas and Cotopaxi in Central Ecuador. The power plant consists of three hydroelectric power stations: Alluriquín (204 MW), Sarapullo (48.9 MW) and Toachi (1.4 MW), which are all powered by the waters of the Toachi and Pilatón rivers in the western range of the Andes Mountains.



The electricity is supplied to nearly 500,000 residents in the communities located between the cities of Quito and Santo Domingo: La Hesperia, La Palma, Mirabad, Pampas Argentinas, Unión del Toachi, La Libertad de Alluriquín, Santa Rosa, Palo Quemado and Praderas del Toachi.

Built by CWE China International Water and Energy Corporation with concrete supplied by Sinohydro, this project required a very specific waterproofing solution for the interior of its powerhouses, located at a depth of -50 meters. A further parameter was a waterproofing system that could effectively be applied from the negative side of the interior of the powerhouses. Due to the lack of air ventilation, the solution required a product that does not emit strong odors and sets well in closed areas.

The PENETRON coating application ticked all the boxes and was subsequently applied to treat a total surface area of approx. 14,000 m².

