



PENETRON NEWSLETTER

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Dear reader,

Welcome to the newest edition of the *Penetron Concrete Durability Update*.

This issue looks at a problem that concerns all mankind and is rapidly becoming an ever larger concern. Water loss in urban and rural infrastructure is adding to increasing water scarcity caused by global warming.

Penetron crystalline technology can provide a vital contribution to help curb water loss in existing and new water storage infrastructure. Countless water projects around the globe that have benefitted from Penetron solutions point a way to help preserve earth's most precious resource.

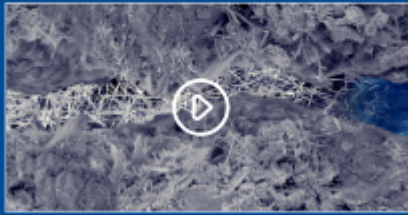
Recognizing the importance of innovative building materials, a number of products from the Penetron System have recently been awarded Building Material Awards in gold and silver categories. Penetron continues to set new benchmarks in the industry!

Think ahead. Think Penetron.

Stay safe and healthy,

Florian Klouda
Director, International Account Coordination

HOW PENETRON WORKS



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WITNESS PENETRON'S CRACK HEALING ABILITY



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PENETRON WORLDWIDE

Combating Water Loss and Improving Water Management Infrastructure

Penetron Wins Gold at the Building Material Awards 2020 in Greece

Tidagundi Branch Canal & Tikota Aqueduct Canal, Bijapur, India

EMBASA Potable Water Reservoir, Salvador, Brazil

EPAR Boa Vista, Campinas, Brazil

Mornos Canal, Athens, Greece

Hitoma 1 Hydropower Plant, Hitoma, Philippines

Crown Gardens Water Tower, Gauteng, South Africa

Campotec Sewage Treatment Plant, Torres Vedras, Portugal

Canale Maraldi, Pordenone, Italy

Angat Water Transmission Improvement Project (AWTIP), Norzagaray, Philippines

Tocopilla Desalination Plant, Tocopilla, Chile



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Combating Water Loss and Improving Water Management Infrastructure



Water is our planet's most precious resource. However, due to climate change more volatile weather patterns, ensuring a reliable water supply is becoming increasingly difficult in many regions around the world. Therefore, preventing further loss of water in the global water infrastructure is of utmost importance.

Water loss also has severe financial impacts on water facility operators. In the United States the Environmental Protection Agency (EPA) estimates the annual volume of water loss through distribution systems at 1.7 trillion gallons (6.4 trillion liters).

Moreover, rising global water scarcity is putting pressures on governments to increase their spending on rehabilitating and expanding water and wastewater treatment facilities.

One of the objectives is to increase the effectiveness of water supply and storage systems and water treatment facilities to help reduce water loss caused by faulty infrastructure – in both existing and new facilities.

Water loss in concrete structures occurs as a result of cracks, pores and capillaries, which render concrete permeable. In addition, poor workmanship and the penetration of chemicals and corrosive agents can contribute to further increases in concrete permeability.

Penetron effectively seals microcracks, pores and capillaries in concrete. Once sealed, the concrete matrix becomes a self-healing barrier that is impermeable to water.

Penetron solutions can be applied to new and existing structures to completely restore and seal leaking concrete or waterproof previously untreated, existing concrete surfaces. New concrete is treated with Penetron Admix, a unique durability admixture, that has been proven to extend the service life of concrete in critical environments by up to 60 years or more.

Due to the substantial cost of maintaining and rebuilding conventional concrete-built water networks an increasing number of operators and municipalities are looking for smart, sustainable and economic solutions to protect their investments in the long run.

One solution to this problem is the specification of self-healing concrete structures.

Read the full article [here](#).

Penetron Wins Gold at the Building Material Awards 2020 in Greece

Golden Awards for **PENETRON®** & **PENETRON ADMIX®**, in all categories of Crystalline Technologies and **Silver Award** for **PENESEAL™ FH-PS** in the category of Innovative Products - Nanotechnology



Established by the Greek media and publishing company, Boussias Communications, the Building Material Awards recognize construction companies active in Greece and Cyprus that focus on the R&D and design of innovative building materials and systems. The awards honor companies committed to the highest quality standards, with solutions that enable the production and application of products with a lower environmental footprint, and with an overall record of business excellence.

The jury, 15 individuals from both the academic and construction community, was headed by Mrs. Antonia Moropoulou, Professor at the School of Chemical Engineering at the National Technical University of Athens.

The awards were presented for the very first time and both PENETRON and PENETRON ADMIX won a Gold Award in the crystalline category (foreign brand). PENESEAL FH-PS also won a Silver Award in the nanotechnology category.

Penetron Hellas SA represented by Mr. Theodor Mentzikofakis (Managing Director), Mr. Dimitris Bouraimis (Sales & Marketing Manager) and Mr. Kyriakos Petrou (Technical Support – Head) accepted the awards on behalf of Penetron.



(from left to right) Mr. Dimitris Bouraimis, Mr. Theodor, Mentzikofakis and Mr. Kyriakos Petrou of Penetron Hellas SA accepting the awards on behalf of Penetron

Tidagundi Branch Canal & Tikota Aqueduct Canal, Bijapur, India



The US\$3.85 million project comprised the 14.73km-long Tidagundi Branch Canal, the longest and tallest aqueduct in India. It features an elevated (30 m high) canal topped by a road that sits on over 400 pillars – stretching from Bhuranpur Godown to Bhutnal. The aqueduct consists entirely of precast concrete elements with pre-stressed tendons.

The aqueduct irrigates 63,190 acres (255 square kilometers) of land, which includes the 29 villages of Vijayapura and Indi Taluks. Moreover, the canal is also expected to fill 25 lakes and ponds in the region.

In order to ensure a completely impermeable and durable structure, the Water Resources Department of the Government of Karnataka relied on Penetron for a waterproofing solution. A total surface area of 98,500 m² of the Tidagundi Canal was treated with a PENETRON coating to ensure a durable waterproofing solution. All joints were repaired with PENECRETE MORTAR.

In another location in Bijapur, the construction of the Tikota Aqueduct, a 4.2 km-long canal, used PENETRON ADMIX-treated concrete mix. All 180 precast girders required a total of 11,520 m³ of concrete. Construction joints were fully sealed with PENEBAR SW-45 swellable-type waterstops. The Penetron System guarantees a completely impermeable concrete structure to help prevent water loss through cracks in the concrete.



Precast elements at Tidagundi Canal

EMBASA Potable Water Reservoir, Salvador, Brazil



EMBASA is the water supply company for the state of Bahia, Brazil. When building their new potable water tank in the Brotas neighborhood of Salvador, they required an efficient strategy to prevent water loss in the 8,700 m³ tank, increase the chloride resistance of the concrete, and also ensure durability and an extended service life. Moreover, it required waterproofing products that meet potable water regulations in Brazil (NBR 12.170/2017, MS 2.914/11).

Penetron Brazil provided a solution – the Penetron System – that enables the concrete tank to withstand high hydrostatic pressure and also self-heal any potential cracking in the future.

The bottom slab of the tank was treated with PENETRON coating. PENETRON ADMIX was added to the concrete mix for the retaining walls to ensure low permeability and durability. All construction joints and inserts/pipe penetrations were sealed using PENEBAR SW-55, a hydrophilic, swellable-type waterstop.

Tests performed after the disinfection of the concrete with hydrochloric acid showed that PENETRON and PENETRON ADMIX fulfilled all 92 requirements of the Brazilian potable water standard.



EPAR Boa Vista, Campinas, Brazil



The new Boa Vista wastewater treatment plant in Campinas, Sao Paulo uses ultrafiltration membranes that deliver treated water that's 99% pure. Treating 180 liters of effluent per second, the facility serves over 55,000 residents. The addition of the US\$11.6 million plant, which started operations in 2020, allows the city of Campinas to treat 100% of its sewage – the first city in Brazil to do so.

In order to prevent water loss in the various concrete treatment tanks and increase the resistance and durability of the concrete structures, contractor Augusto Velloso/ENFIL once again turned to Penetron Brasil, thanks to their success with Penetron products on previous projects.

A PENETRON coating was applied to all concrete surfaces, including the tanks, pump station and the reuse water tank at the Boa Vista wastewater treatment plant.



Mr. Claudio Ourives and Emilio Takagi from Penetron Brasil Ltda during the site visit

Mornos Canal, Athens, Greece



Home to over three million Greeks and one of the oldest cities in the world, Athens depends on the Mornos Canal for drinking water. A combination of PENEPLUG, PENETRON and PENECRETE MORTAR were recently used on the exterior and interior surfaces to repair leaks in the canal.

The Mornos Canal is the main source of drinking water for Athens, delivering 380 million m³ (over 100 billion gallons) of water to the largest Greek metropolis every year. The main canal is 192 km (119 miles) long and alternates between underground tunnel structures and above-ground canals. It is also connected to a number of supporting canals.

The Mornos Canal, managed by the Athens Water Company, starts at the site of the Mornos River dam. This reservoir, which holds 780 million m³ (over 206 billion gallons) of water, is one of the largest in Europe, located about 200 km (124 miles) northwest of Athens. The Athens Water Company also maintains a network of water treatment plants, dams, pipe systems, filter tanks, etc.

Penetron Hellas, the Greek subsidiary of Penetron International, carried out the repair work on the canal. The project consisted mostly of repairing and sealing numerous cold joints and cracks that had developed in the concrete. In a first step, PENEPLUG, a rapid setting plugging mortar, was used to stop active leaks. PENETRON, a crystalline topical waterproofing material, together with PENECRETE MORTAR, was topically applied to the concrete surface to repair and seal the remaining leaks.



Hitoma 1 Hydropower Plant, Hitoma, Philippines



The Hitoma 1 is a 1.5MW mini-hydropower plant in Caramoran on Cataduanes Island. It is operated by Sunwest Water and Electric Power Co. Inc. (SUWECO). In 2020, active leaks were detected in the plant. Sternbild Corporation under the supervision of Penetron Philippines was asked to carry out waterproofing repairs on the plant's forebay walls and slabs.

Subsequently, all leaks were stopped using the Penetron System comprising PENETRON, PENECRETE MORTAR and PENEPLUG. Once all leaks were stopped, a PENETRON coating was applied to a total surface area of approximately 3,400 m².

Crown Gardens Water Tower, Gauteng, South Africa



The 2020 commissioning of the new water tower in Crown Gardens, Gauteng (South Africa) restores much needed drinking water capacity to that community. PENETRON

ADMIX was specified to ensure waterproofing and durability for the tower's concrete superstructure.

The 30 m (99 feet) high water pressure tower in Crown Gardens, a suburb of Johannesburg with about 4,000 inhabitants, holds 2,000 m³ (528,344 US gallons) of drinking water (more than double that of the original water tower from the 1970s) and adds 2.9 bars of natural gravity pressure to the local water pipeline.

During the planning phase of the Crown Gardens water tower project, the project engineers at Tri-M-con Engineering needed a durable and permanent waterproofing solution for the water tower's concrete structure. Due to the success of Penetron in a number of municipal infrastructure projects across South Africa, the Tri-M-con engineers reached out to Penetron South Africa about a solution that could extend the service life of conventional concrete.

PENETRON ADMIX was specified for all the major concrete elements of the water tower, from the below-grade foundation to the main water-containing superstructure far above ground. Pronto, the ready-mix supplier, treated 2,000 m³ (2,615 cubic yards) of concrete with PENETRON ADMIX. PENEBAW SW-55 swellable waterstop strips were installed along the construction joints of the water-containing structure by Maxlife Solutions, a Penetron-approved applicator, to ensure waterproof construction joints. In a final step, PENETRON and PENECEMENT MORTAR were used to repair areas of light honeycombing on the surface as a precaution by the contractor.

Campotec Sewage Treatment Plant, Torres Vedras, Portugal



Campotec SA is a fruit and vegetable company in Torres Vedras. On their 20,000 m² processing facility, the company preserves and packs potatoes, apples, pears and legumes as well as other products. It also owns refrigeration facilities for 7,500 tons of produce.

In order to guarantee a completely durable and waterproof structure for their new US\$5.9 million sewage treatment facility, Campotec relied on a solution from Penetron. Designed by Carlos Fernandes, the project architect, in cooperation with Detalhes Cautelosos consultants, all concrete structures used a PENETRON ADMIX-treated concrete mix. All construction joints were sealed with PENEBAW SW-55 swellable-type waterstops

Canale Maraldi, Pordenone, Italy



Maraldi Canal is water canal that supplies regional hydropower plants in the Pordenone Region of Northwest Italy and farms (for irrigation).

Over time, this underground canal had begun to deteriorate, which led to increasing water losses from the canal as well as seepage of groundwater into the water storage areas, especially after heavy rainfall. The water penetration expedited the deterioration of the concrete structure and a repair solution was urgently needed. The client, Consorzio di Bonifica Cellina Meduna called on Penetron Italia to provide a waterproofing solution that would restore the canal and enhance concrete durability for many years to come.

To repair the Maraldi Canal, it was first emptied, and the concrete surfaces were cleaned. All identified repair points were treated and PENETRON was spray-applied to approximately 40,000 m² to protect the concrete from further water penetration from any direction.



During and after the PENETRON application

Angat Water Transmission Improvement Project (AWTIP), Norzagaray, Philippines



The Angat Water Transmission Improvement Project (AWTIP) is part of the modernization and expansion of the Metro Manila Water Distribution Network. The project will help restore the full capacity of the AWTIP systems, ensure a sustainable water supply distribution system, and mitigate the risk of a serious water loss for the Metro Manila area and portions of the Cavite and Rizal provinces. These objectives are deemed essential for the stable economic growth of Metro Manila and the Philippines.

The scope of these improvements included construction of a 6.3 km hydraulic tunnel and new intake structures at the Ipo water reservoir, and a water channel to connect the tunnel outlet to existing aqueducts.

The design and construction of the project was carried out by CMC di Ravenna, Alpina and EG Team were the design consultants.

Due to their past experience with the Penetron System, CMC di Ravenna and the design consultants relied on PENETRON ADMIX to ensure an impermeable and durable concrete structure for the conveyance channel.





Tocopilla Desalination Plant, Tocopilla, Chile



Part of the Empresas Públicas de Medellín (EPM), a Colombian conglomerate with holdings in the water and sanitation industry, the Aguas de Antofagasta (ADASA) is a Latin American leader in water desalination. In operation since 2003, ADASA currently provides clean water to 546,000 inhabitants in seven Chilean towns. In total, the company treats 2.11 m³ (560 gallons) of water per second, with about 30% originating from seawater. For this purpose, it has desalination plants in Taltal and Antofagasta, the latter considered the largest water desalination plant in Latin America, with a production of 600 liters (160 gallons) per second.

The new, US\$26 million desalination plant in Tocopilla uses reverse osmosis technology, a water purification method based on a semipermeable membrane to remove ions, molecules and larger particles from drinking water. The initial

production capacity of the plant will be 75 liters (almost 20 gallons) per second, or about 6,480 m³ (1,712,000 gallons) of water every day. The plant design has a capacity of 100 liters per second (about 26 gallons) or 8,640 m³ (2,283,000 gallons) per day. Once the desalination process is fully ramped up this year, the plant will provide 100% of the drinking water needed by the community.

Before construction of the Tocopilla project began in October 2017, Penetron Chile was asked to demonstrate how PENETRON ADMIX could be used to guarantee a higher permeability reduction and sealing of cracks throughout the service life of the concrete than the originally specified competitive crystalline admixture.

PENETRON ADMIX was mixed into the concrete for the walls and foundation slabs of the desalination plant's massive water storage tanks. Because PENETRON crystalline products are non-toxic and contain no VOCs, PENETRON ADMIX is NSF 61-certified for potable water applications like the Tocopilla project. Penetron also meets all main manufacturing and environmental compliance certifications including ISO 9001, ISO 14001, NSF 61, DWI, Singapore Green Label, CE mark, GB-18445.

