# 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.

According to the World Health Organization (WHO), today, already over 785 million people do not have access to basic drinking water services and at least 2 billion people are consuming drinking water from contaminated sources.

With an estimated global population of 9.7 billion people by 2050, the problem of water loss and access to water is further aggravated. A United Nations (UN) report in 2015 estimated that the world will face a water shortfall of 40% by as early as 2030.

Apart from the vital necessity of access to clean drinking water, water loss 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). The cost for this non-revenue water (NRW) is estimated at 2.6 billion USD per year. In 2013 the EPA estimated that it would have to spend 200 billion dollars over the next 20 years to upgrade transmission and distribution systems.

Moreover, rising global water scarcity is putting pressures on governments to increase their spending on rehabilitating and expanding water and wastewater treatment facilities. Research firm Global Water Intelligence (GWI) expects operating and capital expenditures by utilities and industrial water users on water and wastewater to grow by 19% to 914.9 billion USD in 2023 compared to 2018.

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.

Concrete structures, such as water tanks, reservoirs, dams, pumping stations, pipelines, canals, treatment tanks, drainage systems, desalination plants and others are an integral part of modern water management and supply facilities.

Water loss in concrete structures occurs as a result of cracks, pores and capillaries, which render concrete permeable. In addition, poor mixing, placement and/or workmanship (incl. too much or too little vibration and insufficient curing) can create segregation, honeycombs and other concrete faults that further increase concrete permeability. These areas pose as possible entryways for water into and out of the concrete structure.

In addition, a variety of chemicals and corrosive agents enter concrete in an aqueous solution. These substances initiate deterioration processes in the concrete that lead to further cracking and degradation in concrete. This increases permeability, which in turn promotes even more water loss.

Potable water approved and not containing any volatile organic compounds (VOC), PENETRON crystalline products can prevent water loss and improve infrastructure in water management and treatment facilities by reducing concrete permeability of water retaining structures.

Penetron effectively seals microcracks, pores and capillaries in concrete by forming insoluble, crystalline formations that prevent the passage of water – even under high, hydrostatic pressure. Once sealed, the concrete matrix becomes a self-healing barrier that is impermeable to water.

The self-healing capabilities of Penetron-treated concrete will result in the sealing of new cracks that may develop throughout the life of the concrete. This substantially reduces the need for maintenance due to the autonomous repair of potential leakage issues in areas with low accessibility (e.g. concrete pipes, canals, etc.).

In addition to the protection against penetrating water, Penetron protects concrete against a variety of chemicals (pH 3-11) and significantly reduces the ingress of chlorides, sulfates and acids. Due to this, treated concretes display increased resistance to critical environments (e.g. sewage water, waste water) when compared to untreated concrete.

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.

That means that Penetron-treated water infrastructure is not only protected against potential leakages and water loss, but with an extended service life it usually has a considerably lower lifecycle cost compared to conventional concrete structures – as a result of significantly reduced repair costs and a potentially longer overall use of the structure (before demolition/rebuilding).

Due to the substantial costs involved with 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.

The use of impermeable, self-healing concrete in urban and national water management, treatment and supply facilities not only reduces maintenance downtimes and ensures prolonged usage of new and existing infrastructure, but also increases the overall amount of water available to consumers as well as operating revenues due to the reduction of non-revenue water.


PENETRON
PENETRON application
Mornos Canal
Athens, Greece


PENETRON
PENETRON application
EMBASA Potable Water Tank
Salvandor, Brazil


PENETRON
TOTAL CONCRETE PROTECTION
PENETRON ADMIX-treated concrete cast on
Angat Water Transmission Improvement Project
Norzagaray, Philippines


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TOTAL CONCRETE PROTECTION
PENETRON ADMIX
Angat Water Transmission Improvement Project
Norzagaray, Philippines


PENETRON
PENETRON / PENEBAR SW-45
El Salitre Wastewater Treatment Plant
Bogota, Colombia


PENETRON
PENETRON ADMIX
La Mina Hydroelectric Power Plant
San Clemente, Chile


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PENETRON ADMIX
Grandview Water Tanks
Harrisonburg, VA, USA


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PENETRON ADMIX
Crown Gardens Potable Water Tank
Gauteng, South Africa