AquaEnergy Expo Magazine

June 2025 Issue 18

Towards a Green | Blue | Smart | Sustainable World

Paving the Way for Circular Water Economy in Egypt:

Egypt's Mega WWTPs – New Delta and Bahr Al Baqar, the Largest in the World

H.E. Prof. Dr. Hani Sewilam

Minister of Water Resources and Irrigation of Egypt

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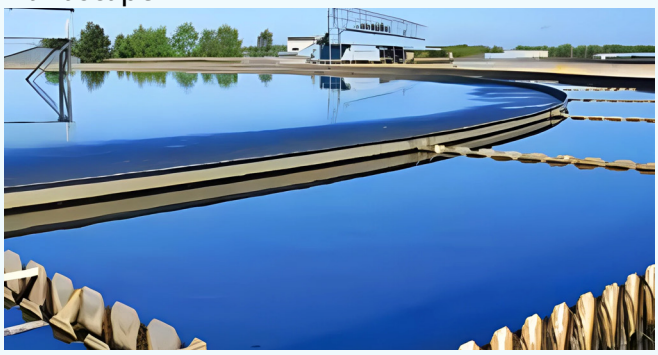

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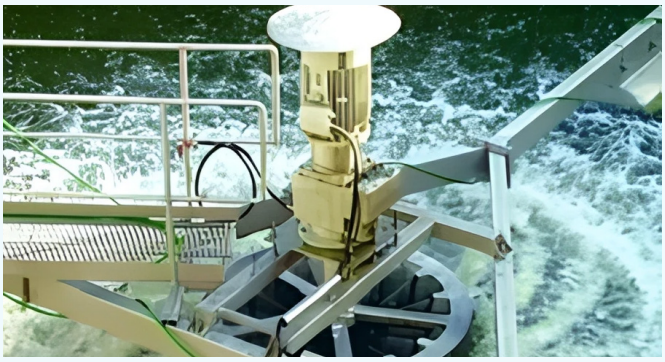

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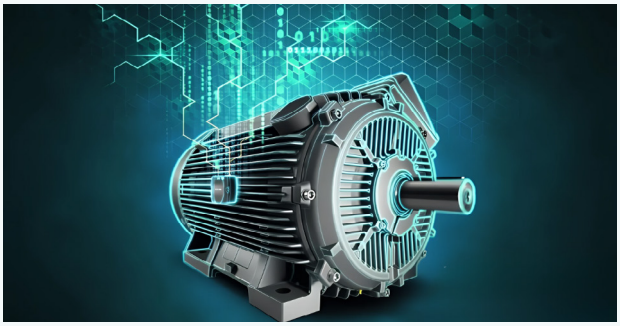
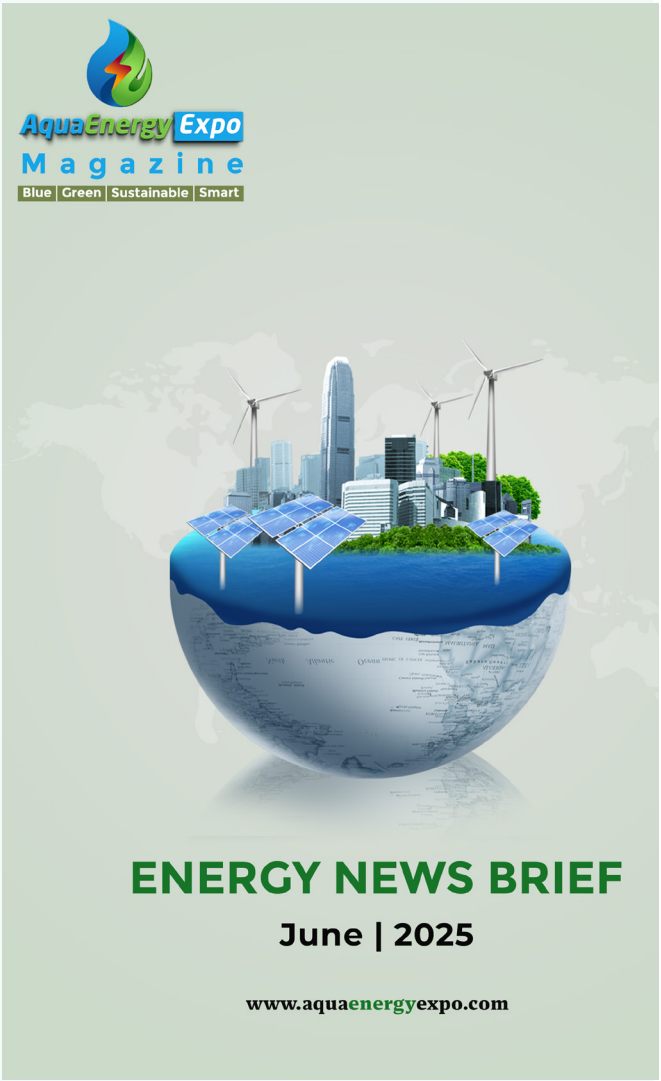


Desalination

Desalination

Stormwater Management



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Innovative Solutions to Achieve Sustainability in Water and Energy

From The Editor

At the forefront is Egypt, whose ambitious pursuit of a circular water economy is making global headlines. The country has taken a monumental leap with the commissioning of two of the largest wastewater treatment plants in the world: the New Delta and Bahr Al Baqar. These mega facilities are more than just engineering triumphs—they are lifelines that reclaim millions of cubic meters of water daily for agriculture and development. They symbolize a shift in mindset: wastewater is no longer a burden, but a vital resource to be recovered, reused, and reimagined.

Equally groundbreaking is the advancement of filtration technology, where materials science is enabling cleaner and more efficient treatment systems. Enter Filtralite®—a revolutionary filtration media that is transforming how we approach both water and air purification. With its lightweight structure, high porosity, and extended lifecycle, Filtralite® offers superior performance compared to conventional media. It stands as a powerful example of how innovative materials can drive sustainability while reducing operational costs and environmental impact.

As technology continues to evolve, so too does its integration into utility systems. In the Kingdom of Saudi Arabia, the Saline Water Conversion Corporation (SWCC) is leading the charge with AI-powered smart desalination. Faced with one of the world's most water-stressed environments, SWCC's use of artificial intelligence is enabling more responsive, energy-efficient, and predictive water production. By embedding digital intelligence into desalination infrastructure, they are not only optimizing operations but also redefining what's possible in water-scarce regions.

Sustainability, of course, is not limited to water alone. The transition to greener energy solutions is central to reducing the environmental footprint of infrastructure. WEG's electric motors exemplify this shift, combining high performance with low energy consumption and extended durability. Deployed across various industries, including water treatment facilities, these motors underscore the critical role of clean energy in achieving long-term environmental goals.

Back in Egypt, another story of innovation unfolds—this time through the lens of local ingenuity. Maskoub's blueprint for reverse engineering has empowered Egypt's water sector with customized, cost-effective solutions that rival international systems. By decoding and replicating complex technologies, Maskoub has accelerated access to advanced treatment systems, enabling faster deployment, easier maintenance, and greater independence from foreign supply chains.

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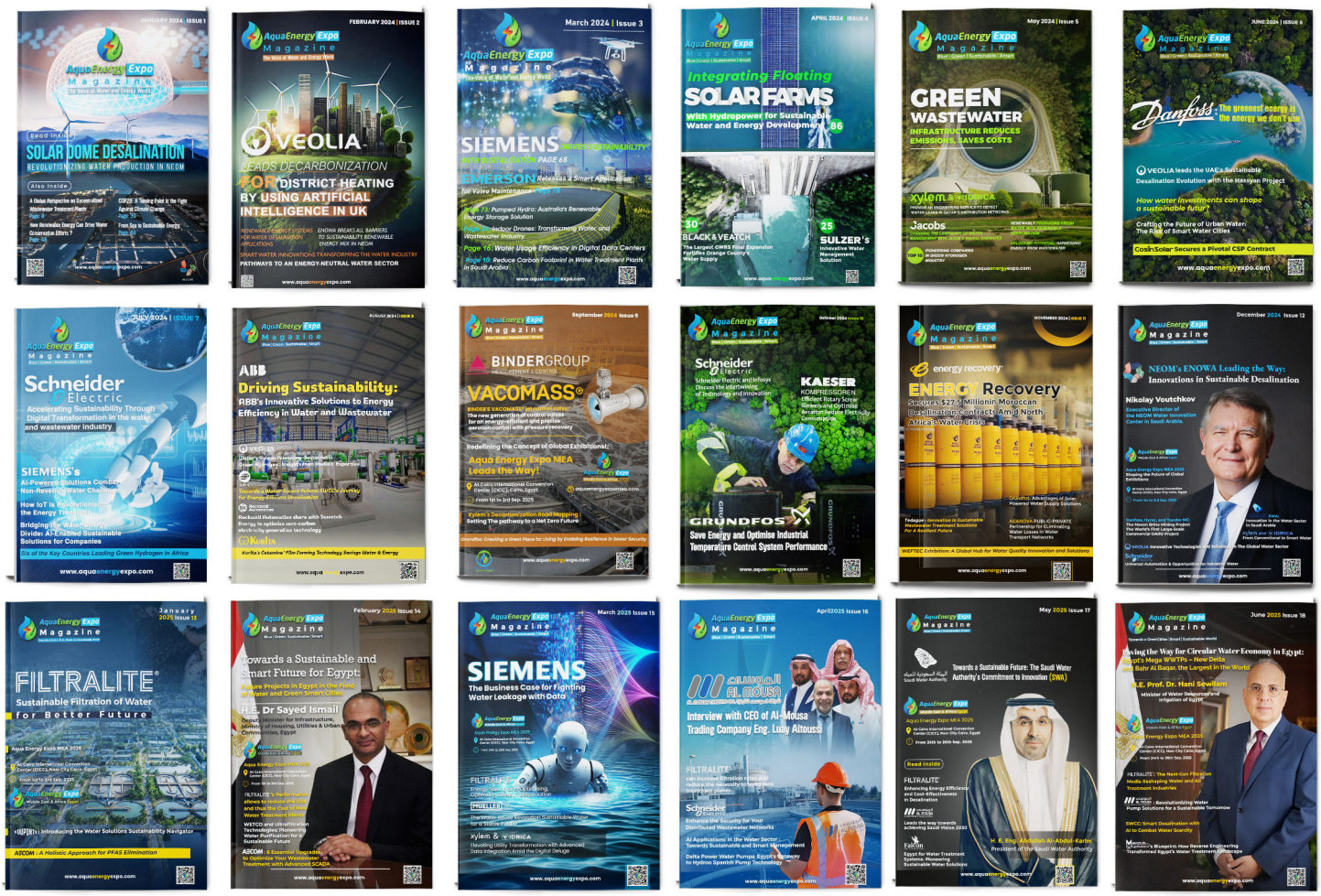

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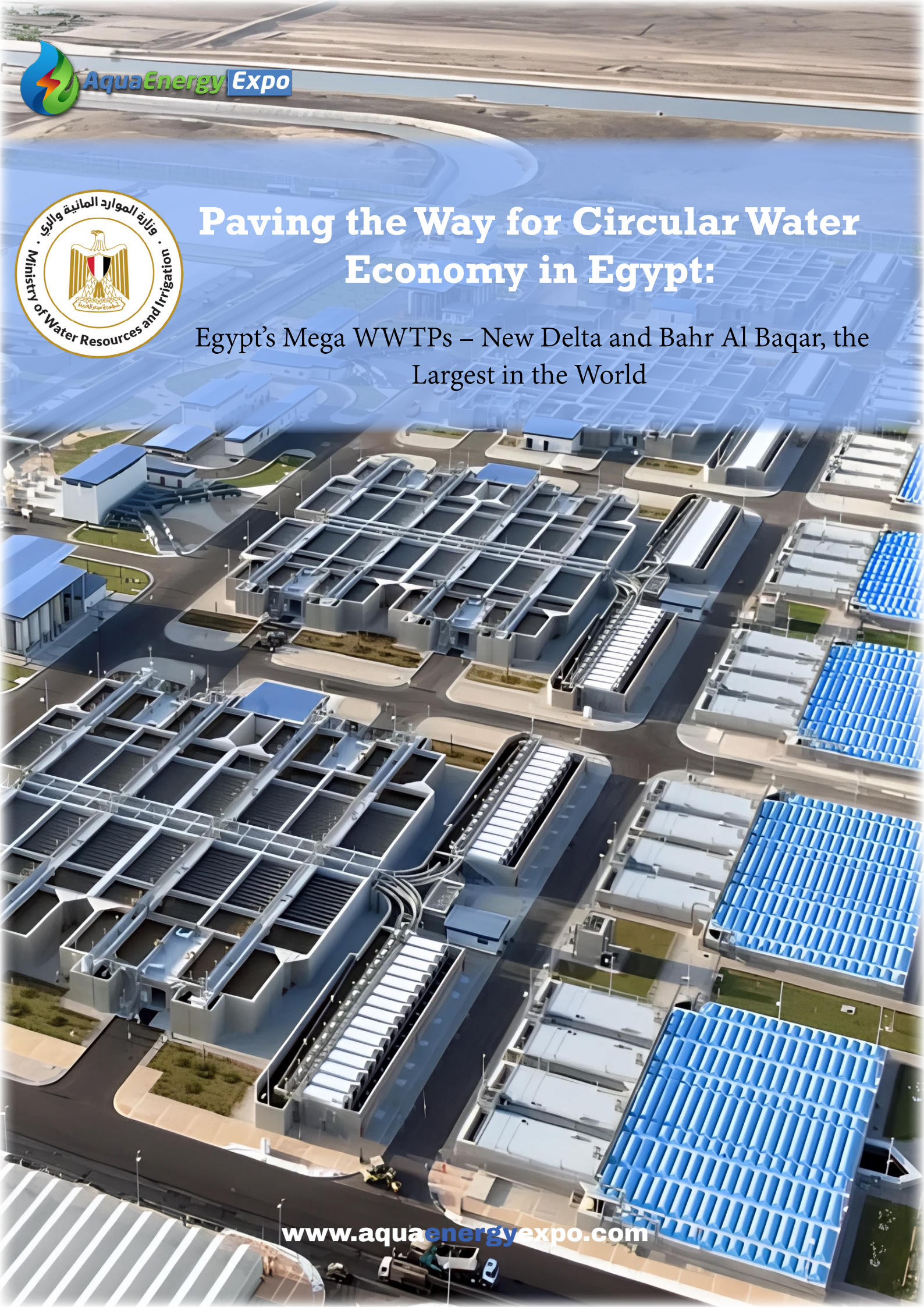
Paving the Way for Circular Water Economy in Egypt:

Egypt's Mega WWTPs – New Delta and Bahr Al Baqar, the Largest in the World



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Egypt faces a severe water crisis driven by climate change, population growth, and economic expansion. According to the UN's Food and Agriculture Organization, Rising temperatures (projected to increase by 1.8–3.6°C this century) will escalate agricultural water needs, intensify evaporation from the Nile, and strain dwindling supplies, threatening water security and economic stability. Climate impacts disproportionately affect freshwater resources and agriculture. Egypt has already limited rice cultivation by 724,000 feddans to conserve water.

Egypt remains heavily reliant on the Nile River, yet its capacity to reuse water is limited. In the 2018-2019 fiscal year, less than 25% of Egypt's annual water supply came from treated wastewater. Of the 80.25 billion cubic meters (BMC) used that year, only 21 BMC was sourced from water treatment plants, with the majority—55.5 BMC — coming from the Nile. Recognizing this critical situation, the Egyptian government has prioritized the construction of additional water treatment plants as part of its water strategy, alongside a multi-billion EGP plan to enhance the country's desalination capacity.

Importance of the Plants and Why They Were Chosen

The selection of these two plants is due to their significant importance as follow:

- **Agricultural Wastewater Treatment:**

Bahr El-Baqar is the largest and most advanced plant in the world for agricultural wastewater treatment. It helps recycle and reuse the treated water to reclaim thousands of acres of land, reducing the pressure on freshwater resources.

- **Land Reclamation:**

The plant contributes to the reclamation of vast areas of land, increasing Egypt's available agricultural land and boosting agricultural production.

- **Environmental Improvement:**

The wastewater treatment process improves the quality of water and soil, positively impacting the surrounding environment.

Addressing Water Scarcity with Mega Projects

Egypt has taken significant steps to address water scarcity and enhance sustainability by establishing two of the world's largest water treatment plants: Bahr Al-Baqar and the New Delta. These facilities, alongside with Mahsama plant enable Egypt to treat about 4.80 BMC of wastewater per year, underscoring its dedication to sustainable development and water security for future generations.

- **Bahr Al-Baqar Water Treatment Plant:** With a capacity of 5.6 million cubic meters per day, this plant is the second largest in the world for treating agricultural wastewater, earmarked for Sinai Peninsula land reclamation projects. Estimated at 20 billion Egyptian pounds, it supports agricultural production and creates job opportunities.

- **New Delta Water Treatment Plant:** As the largest modern plants globally, it treats 7.5 million cubic meters per day, with investments of approximately 60 billion Egyptian pounds. It supports the New Delta land reclamation project and agricultural job creation.

These plants have earned Guinness World Records, showcasing Egypt's leadership in large-scale, sustainable water projects. Collectively, the three plants contribute approximately 14.1 million cubic meters of water daily, aiding in agricultural and developmental needs.

Bahr Al Baqar WWTP: The Second Largest Agricultural Wastewater Recycler

- **Location& Scale**

The plant is located on the eastern side of the Suez Canal, in the Sinai region, approximately 27 kilometers south of Port Said and 17 kilometers north of the Al-Qantara East area. The plant spans an area of 155 acres, equivalent to 650,000 square meters. The plant treats 2 billion cubic meters of water annually, while the amount of dried sludge produced yearly is 460,000 tons.

Innovative Treatment Process

- **Water Treatment Units:**

The project includes 4 water treatment units, each consisting of: (Intake pump building, Rapid and slow settling ponds, coagulation and sedimentation basins, Disc filter building, Ozone contact tanks and Chlorine contact tanks.

- **Sludge Treatment Units:**

The project has 2 sludge treatment units, each consisting of (Sludge pumping buildings, Sludge thickening tanks, Mechanical drying building, and Solar drying units)

- **Auxiliary Buildings:**

The auxiliary buildings for sedimentation and services include (Chemical injection buildings, Chlorine injection buildings, Ozone generation buildings, Backup generator building, Transformer and electrical panel buildings, Workshop buildings, chemical storage building, Labor building, and main administration building).

The sludge line includes thickening tanks, dewatering facilities, and solar drying units.

The production capacity reaches 490,000 tons of dried sludge annually with a drying percentage of 24%, and 165,000 tons annually with a drying level of 75%.

Sludge Valorization: From Waste to Wealth

The sludge produced by the plant is classified as grade (A), meaning it is free from harmful bacteria and nematode eggs. This sludge contains a range of organic materials that serve as essential nutrients for plants, including calcium, carbon, nitrogen, organic matter, sulfates, potassium, and a percentage of iron needed by certain plants.

the production of agricultural soil by mixing it with sandy soil, which allows for the local marketing of this soil instead of relying on the importation of organic fertilizers to improve the quality of sandy soil.

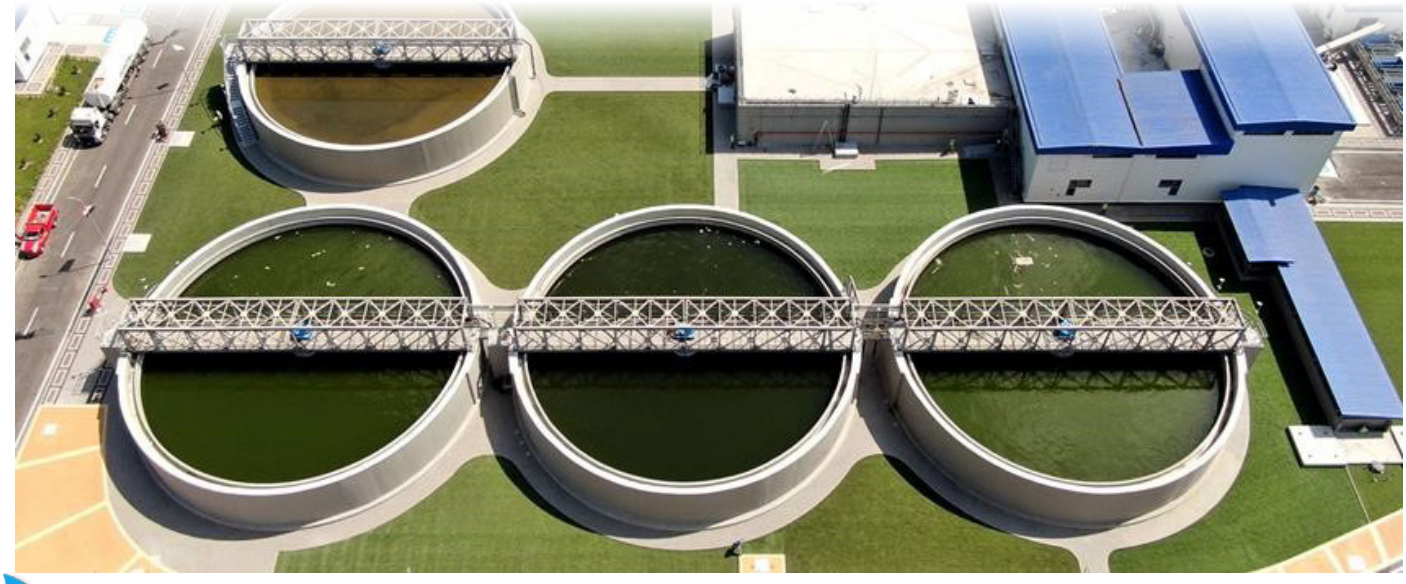
- The sludge produced by the plant can be utilized as follows:

Production of New Agricultural Soil: TThis is done by mixing the produced sludge with sandy soil at a ratio of 1 m^3 of sludge to 10 m^3 of soil. The amount of dry sludge produced by the plant is 422 tons daily, which is approximately 150 m^3 daily. Therefore, the expected amount of agricultural soil that can be produced using the sludge is about 1,650 m^3 per day after the mixing process.

Reclamation and Soil Fertilization: This process involves mixing the sludge with surface soil on-site to a depth of 30 cm at a ratio of 1:10, which helps improve soil quality. In this case, the sludge produced by the plant is sufficient to cover 4,500 square meters of land to be reclaimed for agriculture at a depth of 0.3 meters. Additionally, mixing the sludge with soil helps adjust the salt balance (chlorides) and reduce its concentration, making the soil more suitable for reclamation in saline areas. Large areas of land can also be reclaimed for large agricultural projects in a short time, as well as used in public garden projects, helping to reduce the environmental impact caused by collecting and burning the sludge.

- Industrial Feedstock:

1. Cement Factories: The dried sludge produced by the treatment plant can be used in cement factories as an alternative fuel to biofuels (such as gas) or mazut. The sludge contains organic materials that can be exploited through burning to produce the necessary heat for operating cement drying kilns. This method is considered one of the best ways to safely dispose of the sludge, contributing to environmental protection and reducing cement production costs. Additionally, the sludge can be used by mixing it with cement components to increase the cement's water absorption capacity and speed up the reaction process during the preparation of the mix.



The sludge is added in the final stages of cement production, where 5% of the sludge is mixed with 95% of the other cement components

2. Brick Factories: The sludge produced from water treatment plants, which contains lower levels of organic materials compared to sludge from wastewater treatment plants, is one of the most important materials used in the production of thermal or red bricks used in construction. This technique is used in many Arab and European countries, as well as Japan, China, and others. Different proportions of sludge can be mixed with clay used in brick production, ranging from 50% to 80%, depending on the required specifications and the type of brick.

The mixing process at these ratios has varying characteristics; when using 80% sludge, the bricks' water absorption capacity increases, while the 50% sludge mixture enhances the strength and durability of the bricks. If the weight of one brick is 3.5 kg, the amount of sludge produced by the plant is sufficient to produce approximately 80,000 to 120,000 bricks daily.

New Delta WWTP: A Catalyst for Food Security

Egypt has inaugurated the New Delta Wastewater Treatment Plant in El Hammam city a cornerstone of the nation's agricultural transformation strategy. As the world's largest facility of its kind, this $1.5 billion megaproject will process 7.5 million m^3 of agricultural drainage water daily, channelled through a 114-km path. Its deployment marks a quantum leap in Egypt's pursuit of food security and environmental resilience.

Strategic Objectives

- Land Reclamation: Cultivating 362,000 feddans (≈152,000 hectares) in the Western Desert, creating new agricultural communities and industrial hubs.
- Environmental Remediation: Protecting Alexandria's Marriout Lake and Mediterranean coast by eliminating pollutant discharge.
- National Alignment: Directly supporting Egypt's 2050 Water Strategy and the 2017–2037 National Water Plan.

Record-Breaking Achievements

The facility, co-developed by the Armed Forces Engineering Authority and the Ministry of Water Resources, secured four Guinness World Records:

- Largest water treatment complex (320,000+ m^2 footprint).
- Highest-capacity wastewater plant (86.8 m^3/sec flow rate).
- Most extensive epoxy-coated structure (520,000+ m^2).
- Largest sludge processing unit (670 kg/sec throughput).

Collaborative Leadership

Executed by a consortium of Egypt's top firms—Hassan Allam Construction, Arab Contractors, Orascom Construction, and Metito—the project was celebrated at an official ceremony attended by:

- **H.E. Prof. Dr. Hani Sewilam** (Minister of Water Resources and Irrigation)
- **Maj. Gen. Ahmed Al-Azzazi** (Armed Forces Engineering Authority)
- **CEOs Mohamed El Dahshoury** (Hassan Allam), **Karim Madwar** (Metito), **Hossam El Reefy** (Arab Contractors), and **Ihab Mehawed** (Orascom).

Karim Madwar, CEO Metito Egypt and Managing Director Metito Africa, said: "We are thrilled with Egypt's concerted efforts to expand water treatment and desalination projects and proud to have secured these Guinness World Records. The New Delta mega project, the largest of its kind in the world, is a milestone in Metito's history, which spans more than 65 years and includes numerous iconic national projects in Egypt and around the world."

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This project stands as one of the most significant sustainability initiatives worldwide, incorporating state-of-the-art sustainable technologies and solutions. Completed within a record-setting time of 24 months, the plant serves as a pivotal component of Egypt's national water resources plan, aiming to ensure water security for the country and foster prosperity and sustainability for future generations.

H.E. Prof. Dr. Hani Sewilam
Minister of Water Resources and Irrigation

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In addition to its low density and high porosity, Filtralite® offers high abrasion and impact resistance

Filtralite develops and manufactures quality filter media for all water and air treatment applications:

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Filtralite®: The Next-Gen Filtration Media Reshaping Water and Air Treatment Industries

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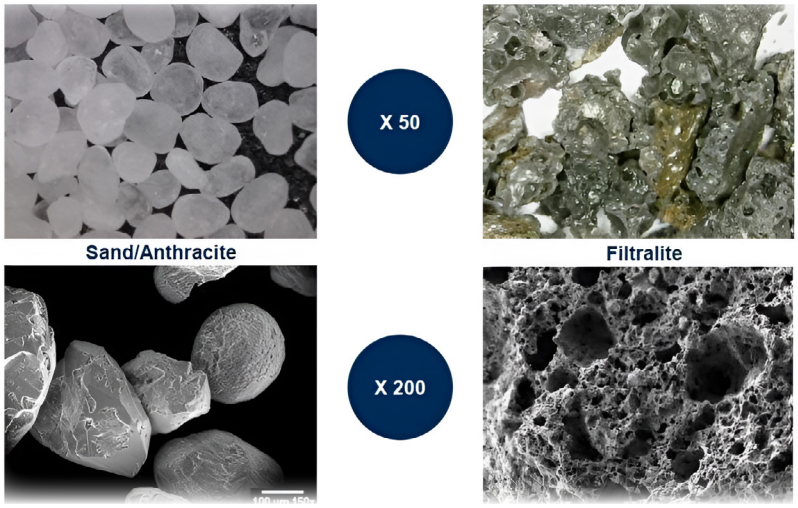
In an era where water scarcity and environmental pollution pose significant challenges, advanced filtration technologies are critical for sustainable industrial operations. Filtralite®, a market-leading porous ceramic and high-performance filter media developed by Saint-Gobain, stands at the forefront of innovation in water and air purification. With applications spanning drinking water treatment (Filtralite® Pure), wastewater purification (Filtralite® Clean), and odor control (Filtralite® Air), this expanded clay aggregate offers superior efficiency, durability, and cost-effectiveness compared to conventional filtration media.

Saint-Gobain, a global industrial leader with a $50 billion turnover in 2024, has leveraged its century-long expertise in clay-based solutions to develop Filtralite®. Manufactured in Norway, Finland, and Portugal, this media is engineered to enhance filtration rates, reduce maintenance costs, and improve water quality—making it an indispensable asset for desalination plants, wastewater treatment facilities, and air purification systems.

From Challenges to Opportunities

Filtration is a crucial aspect of water treatment, directly influencing the quality and efficiency of the final product. Historically, filtration systems have relied on conventional materials such as sand, anthracite, and pumice. These traditional media have provided filtration rates ranging from 4 to 12 meters per hour but are often plagued by issues such as frequent clogging, increased maintenance requirements, and suboptimal water quality. The Silt Density Index (SDI) for these systems typically ranges from 3.5 to 4, which can complicate downstream processes like reverse osmosis that necessitate finer pre-treatment.



In contrast, Filtralite® emerges as a superior alternative, boasting a porous and lightweight structure that allows for filtration rates of up to 20 meters per hour.

The key benefits of Filtralite® include:

- Reduced Clogging: This media addresses the clogging issues common with traditional materials, leading to less downtime and lower operational interruptions.
- Water Savings: Filtralite® requires less frequent backwashing, resulting in significant water savings.
- Enhanced Water Quality: With an SDI consistently below 3, Filtralite® improves compatibility with sensitive downstream processes.

Traditional filtration systems, whether mono or dual media, face inherent limitations, including reduced efficiency in treating poor water quality, mixing of media layers, and increased head loss at higher filtration rates. These systems primarily rely on surface retention, which restricts filtration depth and effectiveness, leading to higher operational and maintenance costs. Filtralite®'s increased porosity accelerates water movement, enhancing filtration rates and retaining more suspended solids.

This depth filtration capability prevents clogging at the surface, allowing for more effective treatment. Moreover, Filtralite® can be seamlessly integrated into existing filtration systems, requiring minimal modifications. This adaptability makes it an ideal solution for both new installations and system upgrades.

Advancing Water Treatment Techniques with Filtralite®

Filtralite® is characterized by its tiny, dark-brown to black clay granules, sourced from the cold climates of Northern Europe. The extraction process involves drilling a 3–5 meter hole underground, followed by the removal of impurities using renewable energy sources like biomass. The clay is then subjected to a 58-meter-long rotary kiln, heated to 1200 degrees Celsius, which transforms the clay into a porous media by converting organic materials into volatile gases.

Filtralite® is versatile in its applications:

- Drinking Water Treatment: It can be employed as a single layer with sand or in dual layers without sand, known as mono-multi systems. This differentiates Filtralite® Pure from anthracite, which cannot function effectively as a standalone alternative.
- Desalination: In the pre-treatment stage, Filtralite® can be utilized in single or dual-layer configurations, optimizing the treatment process based on specific requirements.
- Wastewater Treatment: Filtralite® Clean excels in tertiary treatment, leveraging its high number of macropores to reduce ammonia and lower Chemical Oxygen Demand (COD) and Biological Oxygen Demand (BOD) values.

Filtralite®: Effective Air Purification Solutions

Odor treatment relies on a straightforward yet effective approach: directing contaminated air through a filtration medium, either upstream or downstream, often accompanied by water sprinkling.

Filtralite® Air Filter Material excels in this process due to its unique porous structure, which promotes promotes biofilm growth while ensuring optimal airflow.

Key Advantages of Filtralite® Air

Enhanced Odor Adsorption

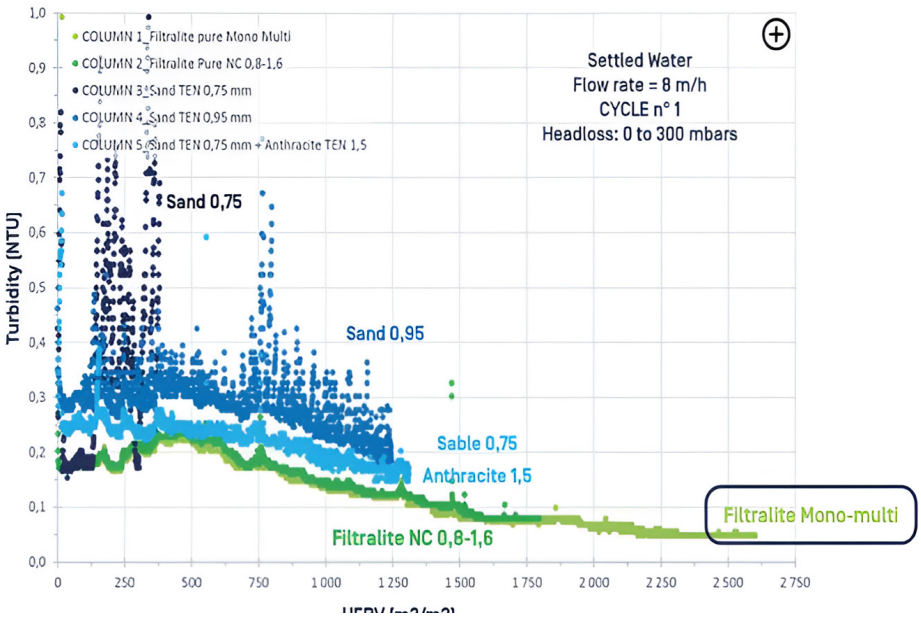
- The material's high porosity maximizes contact area, allowing greater air volumes to be filtered efficiently.
- Effectively adsorbs H□S and other odorous compounds, reducing unpleasant smells even before biofilm develops.

Durability & Structural Efficiency

- Made from natural clay, Filtralite® Air is stable, long-lasting, and free from hazardous additives.
- Its lightweight design exerts five times less structural pressure than conventional materials, lowering construction and removal costs.

Optimal Filtration Performance

- High surface area and permeability ensure low pressure loss, extended service life, and efficient filtration.
- Creates an ideal habitat for biofilm, boosting biological filtration effectiveness.



Case Studies Demonstrating Filtralite®'s Efficacy

Evaluating Filtralite® Performance: Insights from Suez Tests

- **Objective of the Study**

A comprehensive study was conducted to assess the performance of Filtralite® media in particle retention compared to conventional filter media, as well as to examine the impact of raw water quality and filtration flow rate on filtered water quality and filter productivity.

- **Testing Site and Methodology**

This evaluation took place at the CIRSEE in Le Pecq, where a pilot system comprising five filtration columns was utilized. The pilot was successively fed with two types of water:
Coagulated Seine River water with turbidity < 20 NTU
Settled water with turbidity ranging from 0.5 to 5 NTU
Two filtration rates were tested during the study: 8 m/h and 15 m/h.

- **Performance in Turbidity Removal**

The results demonstrated that both conventional filters (sand and sand/anthracite) and Filtralite® media exhibited excellent performance in removing particles, maintaining a filtered water turbidity of 0.2 ± 0.1 NTU. Notably, Filtralite® media achieved the lowest turbidity levels among all tested options.

- **Filter Productivity (UFRV)**

The study also focused on filter productivity (UFRV), revealing that Filtralite® media, especially the Mono-Multi variant, was 1.5 to 2 times more efficient than the best conventional media. Importantly, increasing the filtration rate did not negatively impact the performance of Filtralite®.

Raw Water Quality and Monitoring

Online monitoring revealed the following characteristics of the influent water:

- Average turbidity (raw water): 7.6 NTU (range: 5–20 NTU)
- Average turbidity (settled water): 1.5 NTU (range: 0.5–5 NTU)
- Iron concentration: < 0.05 mg/L
- Natural organic matter: UV254 absorbance = 2.6 m□¹ for raw water and 0.6 m□¹ for settled water.

Overall, both conventional and Filtralite® filters effectively maintained turbidity at 0.2 ± 0.1 NTU for inlet turbidity levels ranging from 0.5 to 20 NTU. The findings complied with French regulations and SUEZ internal objectives, ensuring that filtered water turbidity remained below 0.5 NTU 100% of the time and below 0.2 NTU 95% of the time, highlighting the effectiveness of Filtralite® as a superior filtration media.

Industrial air purification in EnergoUtil Plant in Ełk, Poland

• Background: Initial Challenges with Traditional Biofilter Media

In 2017, the EnergoUtil plant in E□k, Poland, faced recurring issues in its air treatment system, which relied on a biofilter media composed of composted materials and bark chips. These materials frequently caked and collapsed over time, reducing permeability, increasing flow resistance, and necessitating frequent and costly media replacement.

• Implementation of Filtralite® Air

Seeking a more reliable and sustainable solution, plant engineers conducted a thorough review of available technologies and literature. Their goal was to find a medium that could stabilize operations, reduce maintenance, and maintain high performance over time.

The plant introduced 400 m³ of Filtralite® Air 10–20 into its biofilter system—about half the total volume of the filter bed. A layer of birch bark was placed on the surface, and the system was adapted to sprinkle process water over the media three times daily for 20 minutes. This maintained consistent humidity throughout the bed, a critical factor for the biological removal of sulfur compounds.

• Results and Operational Improvements

Thanks to the high water retention capacity and structural stability of Filtralite® Air, the plant no longer faced issues of drying or media collapse. According to the plant engineer, "After using the expanded clay fill, we managed to overcome the operational problems we experienced with the previous media. However, the most important thing is that we get stable parameters of biofilters and satisfactory efficiency."

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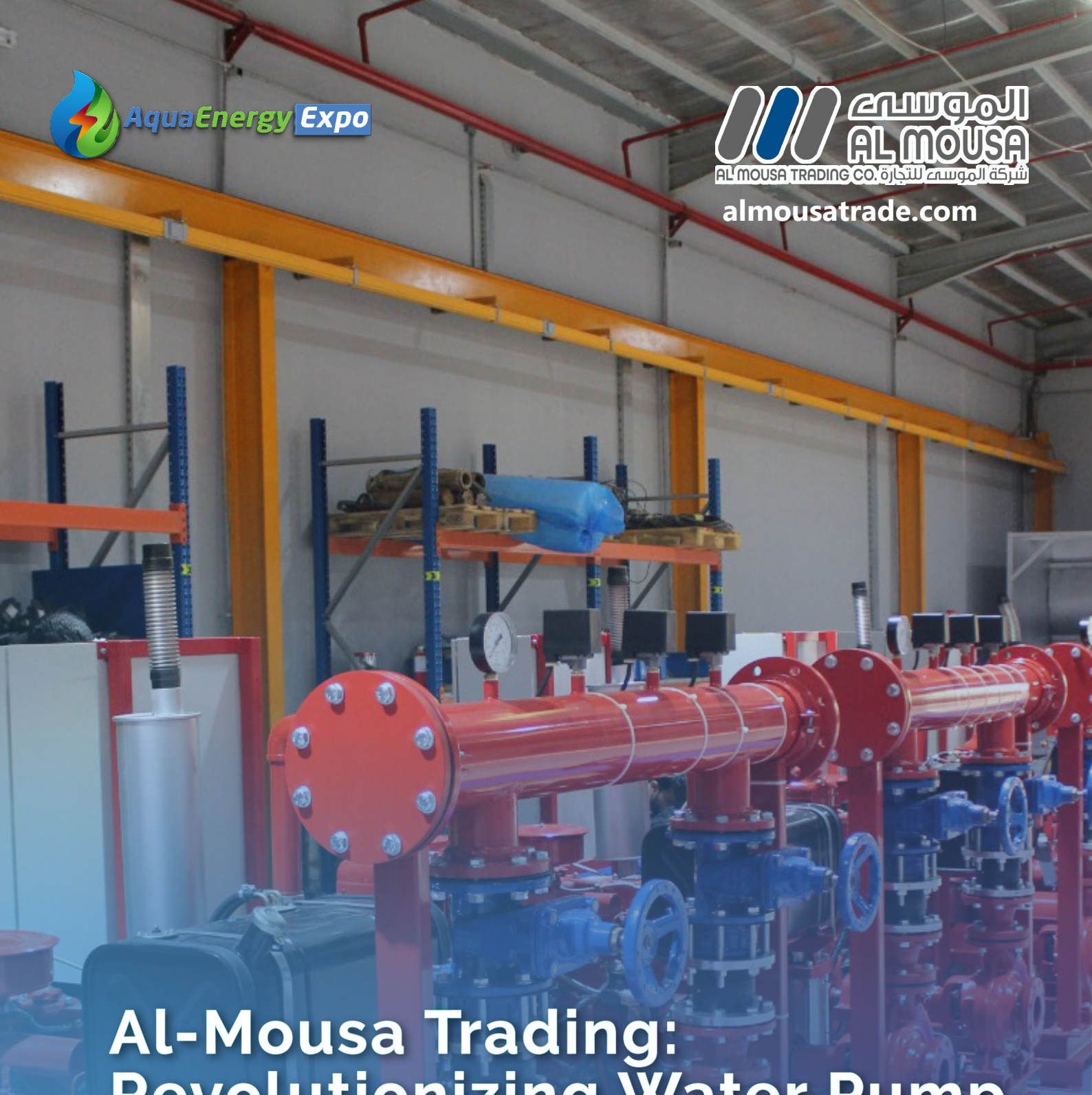

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Al-Mousa Trading: Revolutionizing Water Pump Solutions for a Sustainable Tomorrow

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Al-Mousa Trading Company, the evolved iteration of Al-Mousa Group Ltd., stands as a testament to over two decades of expertise in delivering cutting-edge solutions across water, energy, and infrastructure sectors. Rooted in Saudi Arabia, the company has carved a niche as a trusted partner for governments, commercial enterprises, and contractors, offering end-to-end engineering services—from installation and maintenance to advanced technical studies. With water scarcity and rapid urbanization shaping regional priorities, Al-Mousa's specialization in high-performance water pumps positions it at the forefront of addressing critical challenges in water management, and sustainable infrastructure.This article explores Al-Mousa Trading Company's role in the expanding global water pump market, its innovative product portfolio, strategic partnerships, and landmark projects that underscore its commitment to excellence.

Global Water Pump Market Trends: Opportunities in the Middle East

The global water pump market was valued at USD 71.86 billion in 2024 and is anticipated to expand at a CAGR of 4.4% from 2025 to 2030. Significant growth is being driven by the increasing need for efficient water management systems across various sectors, including agriculture, industrial, and municipal applications. A prominent trend influencing the market is the rising adoption of smart water pumps. These pumps incorporate IoT technology, enabling remote monitoring, predictive maintenance, and enhanced energy efficiency. Smart pumps are especially advantageous in urban water supply and wastewater management systems, where operational efficiency is vital.

Moreover, the water pump market is benefiting from the growth of infrastructure development in emerging economies. As industries, agriculture, and residential areas expand, the demand for water pumping solutions to tackle challenges like water scarcity, irrigation, and water supply rises.

The increase in desalination projects, particularly in areas with limited freshwater resources, also plays a significant role. Additionally, technological advancements, including the development of solar-powered water pumps, are creating growth opportunities in remote and off-grid regions lacking traditional power sources. These trends, along with continuous innovations, are expected to propel the water pump market in the years ahead.

Middle Eastern Dynamics:

- Saudi Arabia: The region's largest market, driven by mega-projects like NEOM and investments in wastewater treatment.
- UAE: Expected to register the highest CAGR (2024–2030), supported by rapid urban development.
- Oman and Egypt: Prioritizing wastewater infrastructure to combat scarcity.

Al-Mousa Trading Company leverages these trends through partnerships with global manufacturers like Grundfos, SPP Pumps, and Wilo, ensuring access to cutting-edge technologies tailored to regional needs.

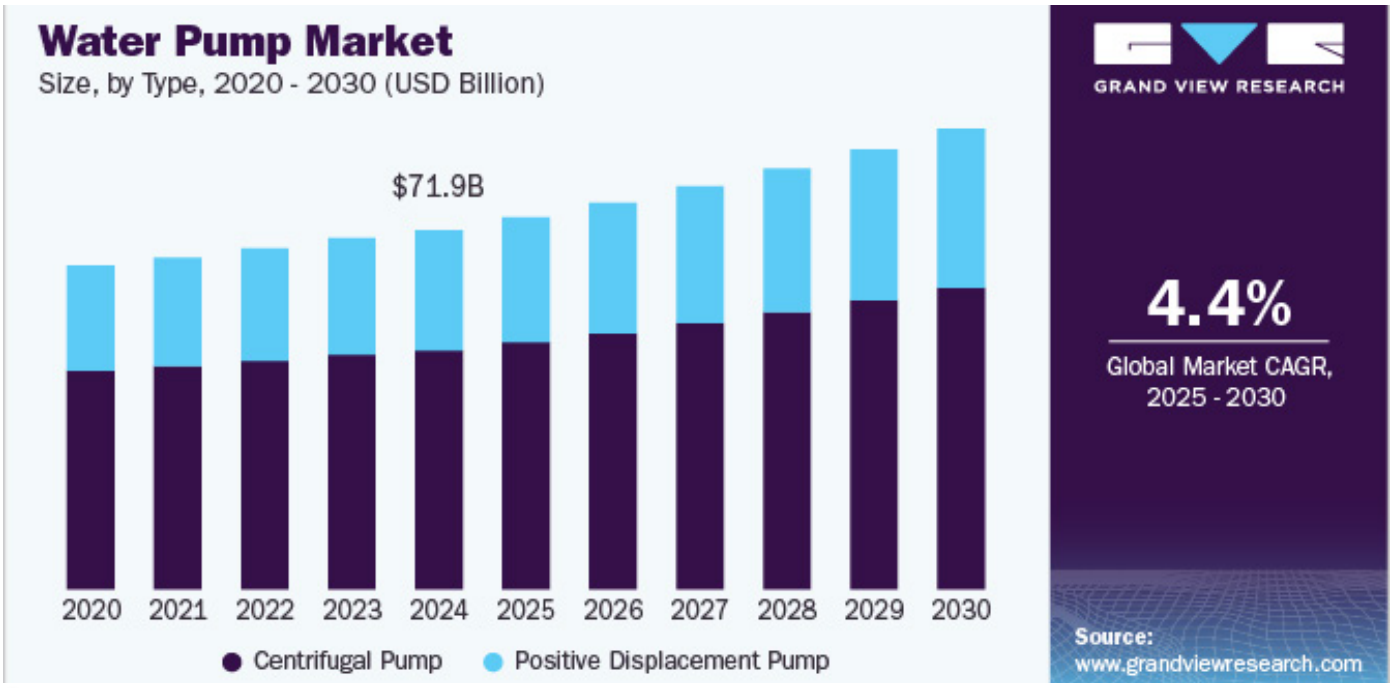
Core Services: Delivering End-to-End Solutions

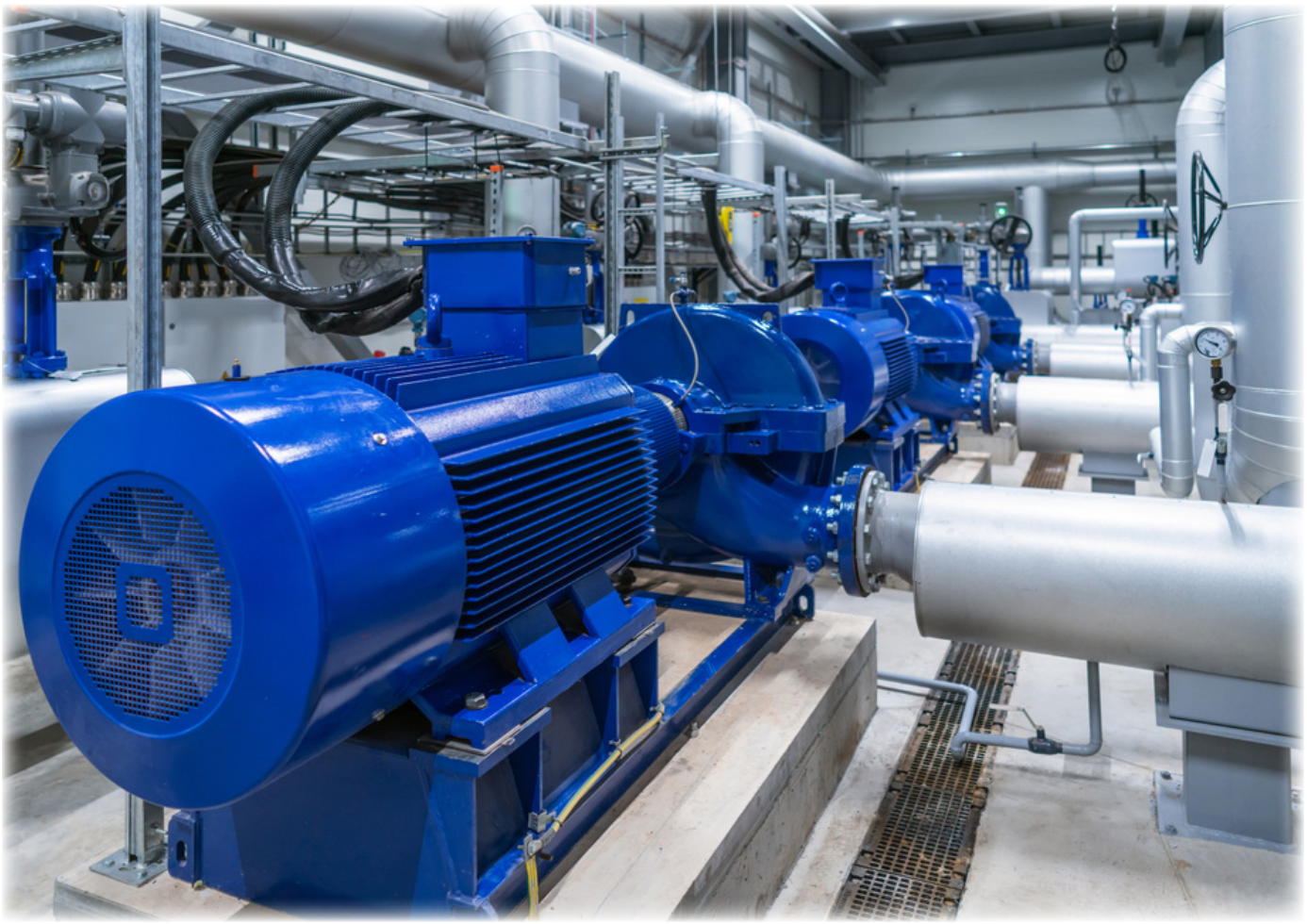
Supply Services

Al-Mousa Trading Company specializes in supplying high-quality engineering equipment necessary for water, energy, and infrastructure projects. With a robust selection of products, including:

- Water Pumps: From submersible pumps to centrifugal pumps, the company provides a wide range of options to meet various operational needs.
- Filtration Systems: Ensuring clean water management through advanced filtration technologies.
- HVAC Components: Delivering essential components for efficient heating, ventilation, and air conditioning systems.

The company prides itself on delivering products that comply with international standards, emphasizing innovative solutions that support sustainable infrastructure development. With partnerships with leading manufacturers, Al-Mousa Trading Company ensures clients receive advanced technologies that enhance project success.





Maintenance Services

To ensure the longevity and optimal performance of critical systems, Al-Mousa Trading Company offers specialized maintenance services, including:

• Surface and Vertical Water Pumps: Preventive care and expert servicing to maintain smooth operations and prevent disruptions.

• Sewage Submersibles: Critical maintenance services that ensure the reliable operation of sewage treatment systems, minimizing the risk of breakdowns and environmental issues.

By focusing on preventive care, regular inspections, and efficient repairs, the company helps clients extend the lifespan of their equipment while improving overall efficiency.

Installation and Operation

Al-Mousa Trading Company excels in providing installation and operation services for essential systems in water, energy, and infrastructure projects. The team's expertise guarantees:

• Seamless Installation: Ensuring all equipment is installed with precision according to industry standards and client specifications.

• Technical Consultation: Offering end-to-end solutions that include equipment setup, testing, and post-installation support.

This hands-on approach helps clients achieve project success while reducing downtime and improving operational efficiency.

Testing and Commissioning

Thorough testing and commissioning services are crucial to ensuring systems operate at peak performance. Al-Mousa Trading Company conducts detailed tests for various systems, including:

• Flow Rate and Head: Verifying that pumps meet required specifications for optimal performance.

• Efficiency and Power Consumption: Monitoring energy usage to ensure reliability and cost-effectiveness.

With a focus on precision and reliability, the company provides post-commissioning support, including training and operational guidance, to ensure systems continue to run smoothly after handover.

Engineering Studies: Data-Driven Decision Making

Comprehensive engineering studies are integral to the success of water, energy, and infrastructure projects. Al-Mousa Trading Company conducts detailed analyses to develop customized solutions, covering:

• System Design and Capacity Planning: Tailoring solutions to meet unique client requirements.

• Environmental Impact Assessments: Ensuring compliance with local regulations and promoting sustainable development. These studies help clients make informed decisions, reducing potential risks and enhancing project outcomes.

Flagship Water Pump Products

Al mousa Trade Products stands at the forefront of industrial and commercial water pump solutions, offering cutting-edge technology through strategic partnerships with global leaders like Grundfos, SPP Pumps, Peerless Pump, and Wilo.

• Grundfos: Pioneering Efficiency and Versatility

Grundfos pumps are synonymous with precision and adaptability, designed to optimize water management in complex systems.

Pressure Boosting Systems

• Hydro MPC: Advanced energy-efficient systems with 2–6 parallel pumps, integrated controllers, and pre-assembled fittings for clean water boosting.
• Hydro Multi-S: Turnkey solutions for hotels, flats, and high-rises, featuring 2–3 parallel pumps and seamless integration.
• Hydro Multi-E: Frequency-controlled pumps (2–4 units) for dynamic pressure adjustment, minimizing energy consumption.

Centrifugal Pumps

• CR/CRE Pumps: Vertical multistage pumps with stainless steel components; the CRE variant includes an integrated frequency converter for enhanced control.
• CM/CME Pumps: Compact horizontal end-suction pumps with modular designs for customization in cast iron or stainless steel.

Smart and Specialized Solutions

• MAGNA: Bluetooth-enabled system control via the Grundfos GO app, ideal for advanced monitoring.
• ALPHA & UPS Series 100: High-efficiency circulators for heating and cooling systems, praised for easy installation.
SL & SEG Pumps: Submersible sewage solutions with grinders (SEG) or vortex impellers (SL), handling wastewater and sludge.

• SPP Pumps: Engineered for Durability and Fire Safety

SPP Pumps excel in fire protection and industrial applications, offering unmatched longevity and performance.

Fire Protection Systems

Split Case Pumps: Robust horizontal pumps with capacities up to 19,000 liters/min, including UL-listed models for large-scale fire suppression.
• Vertical Turbines: Submerged impellers for suction lift scenarios, widely used in refineries, power stations, and warehouses.
• End Suction Pumps: High-temperature-resistant designs (up to 580°F) for hospitals, schools, and hotels.

Vertical In-Line Solutions

• VTF & Vertical In-Line Pumps: Pre-wired packages with jockey pumps and controllers, ideal for sprinkler systems in airports, hospitals, and pharmaceutical facilities.

• Peerless Pump Integration

• PVF (Vertical Turbine) & AEF (Horizontal Split Case): Compact and reliable fire pumps for commercial and energy facilities.
• Wilo: Innovation in High-Pressure and Circulation Systems Wilo combines efficiency with low-maintenance designs for demanding industrial processes.

High-Pressure Pumps

• HELIX V: Multistage vertical pump with laser-welded hydraulics, NSF-61 certification, and corrosion-resistant materials (Stainless Steel 304).

Circulation Solutions

• STAR/STAR-S & TOP-S: Wet rotor pumps with quiet operation, cataphoretic anti-corrosion coating, and easy installation.
• Surface and Vertical Water Pumps: Preventive care and expert servicing to maintain smooth operations and prevent disruptions.
• Sewage Submersibles: Critical maintenance services that ensure the reliable operation of sewage treatment systems, minimizing the risk of breakdowns and environmental issues.

Landmark Projects: Building Saudi Arabia's Future

Al-Mousa Trading Company has established itself as a leader in Saudi Arabia's water and infrastructure sector, executing high-impact projects that align with the Kingdom's Vision 2030 goals. By combining technical expertise with strategic partnerships, the company has built a reputation for reliability, innovation, and precision, earning the trust of both government entities and private enterprises. Its diverse portfolio showcases a pivotal role in shaping the nation's infrastructure landscape, from enhancing hospital safety with advanced firefighting systems to optimizing water distribution in cultural landmarks.

Key projects include:

• Umm Al Qura University (2023): Collaborating with Saudi Aircon Contracting Company and Samir Aboghalia Consulting Office, Al-Mousa supplied chilled water pumps under the Grundfos brand for this government initiative.

• King Faisal Specialist Hospital and Research Centre (2020): Working with the same contractor and consultant, Al-Mousa provided fire pumps from SPP to enhance fire safety in this critical healthcare facility.

• Hilton Hotel (2021): In partnership with United Constructors and Khatib & Alami, the company supplied booster pumps from Grundfos for this private project.

• Civil Defense, Hajj Command & Holy Capital Administration (2020): Al-Mousa delivered booster and fire pumps for the Ministry of Interior, reinforcing safety measures for significant events.

• King Abdullah Park (2021): Al-Mousa provided fire pumps for this government project in partnership with Abdul Aziz
• Al Hajjaj Contracting Est and Khatib & Alami.

• King Salman Park – Visitors' Courtyard (2023): Collaborating with Solid and WSP, Al-Mousa supplied fire pumps for this cultural landmark.

• Dallah Hospital (2022): For this private initiative, Al-Mousa worked with Youssef Marron Contracting Company and Saudi consultants to provide PPR solutions.

Through these landmark projects, Al-Mousa Trading Company continues to contribute significantly to the Kingdom's infrastructure development, demonstrating its commitment to excellence and innovation in the water and infrastructure sectors.

• Surface and Vertical Water Pumps: Preventive care and expert servicing to maintain smooth operations and prevent disruptions.

• Sewage Submersibles: Critical maintenance services that ensure the reliable operation of sewage treatment systems, minimizing the risk of breakdowns and environmental issues.

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Recognition and Achievements

Al Mousa Trading Company has proudly received the 2024 Excellence Distributor Award from Grundfos, highlighting its unwavering commitment to quality, customer satisfaction, and technical excellence. This prestigious recognition underscores the strength of the partnership between Al Mousa Trading and Grundfos, reflecting their shared vision of delivering high-efficiency water solutions throughout Saudi Arabia. The company expresses gratitude to its dedicated team and loyal clients for making this achievement possible and remains focused on enhancing engineering solutions and sustainable performance.

Additionally, Al Mousa Trading Company successfully conducted a comprehensive witness test for Grundfos water pumps at its Riyadh facility, specifically for the Arar University Project. This test involved collaboration with consultants, contractors, and end users to validate critical technical parameters, including flow rate, efficiency, power consumption, amperage, voltage, net positive suction head (NPSH), vibration levels, and RPM. The results confirmed that the pumps met all project specifications, ensuring optimal performance and reliability. This successful witness test demonstrates Al Mousa Trading Company's commitment to maintaining high standards and delivering efficient, dependable solutions for its clients.

CONCLUSION

Al-Mousa Trading Company is redefining water and infrastructure solutions through innovation, strong partnerships, and a commitment to sustainability. By integrating smart technologies, high-performance pumps, and expert engineering, the company supports Saudi Arabia's Vision 2030 and global infrastructure advancements. For cutting-edge water pump solutions, trust Al-Mousa Trading Company—where quality meets excellence.

AquaEnergy Expo

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Al-Mousa Trading Co. is no longer just a supplier of pumps

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Filtralite® is now available through Al Mousa Trading Co. — the perfect complement to your water and wastewater treat-

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Maskoub's Blueprint: How Reverse Engineering Transformed Egypt's Water Treatment Landscape

www.aquaenergyexpo.com

In water-scarce nations like Egypt, where rapid industrialization strains limited resources, innovative treatment technologies are not just advantageous—they're existential necessities. The World Bank estimates that by 2030, the MENA region will face a 50% gap between water supply and demand. Traditional reliance on imported systems proved unsustainable due to exorbitant costs, compatibility issues, and supply chain vulnerabilities.

Enter MASKOUB International for Contracting, an Egyptian engineering firm that transformed this challenge into an opportunity through strategic reverse engineering. Since its 2004 founding, Maskoub has localized 12+ critical water technologies, achieving 60–90% cost reductions while tailoring solutions to regional conditions. This article explores the company's journey, key projects, technical breakthroughs, and the role of reverse engineering in shaping Egypt's water treatment landscape.

Company Background

MASKOUB International for Contracting operates at the intersection of engineering ingenuity and environmental stewardship. Specializing in water and wastewater treatment, oil-water separation, and sludge management, the company serves a diverse clientele spanning government agencies, private industries, and international partners across the Middle East. Beyond turnkey treatment plants, MASKOUB has carved a niche in chemical innovation, producing polymer coagulants and chlorine dioxide systems tailored to regional industrial needs. Its portfolio reflects a dual commitment: solving immediate operational challenges while fostering long-term resource independence.

Reverse Engineering: A Blueprint for Localized Innovation

Egypt faced significant challenges in water treatment that necessitated a new strategy.

Cost barriers were a major issue, as imported MBBR media cost $15/m³ compared to only $6/m³ for localized versions, creating financial obstacles for many projects.

Additionally, performance gaps became evident, with European designs faltering in Egypt's high-turbidity Nile water, which demanded more robust solutions. Furthermore, supply chain risks were highlighted during the 2020 pandemic, which exposed vulnerabilities in import dependencies.

In response to these challenges, MASKOUB's strategic pivot through reverse engineering emerged as a systematic process of adaptation, refinement, and optimization.

The company's engineers dissect global technologies, identify performance gaps, and redesign systems using locally available materials and manufacturing capabilities. This approach has enabled breakthroughs in cost efficiency, energy savings, and scalability, particularly critical for small and medium enterprises (SMEs) previously excluded from high-tech solutions.

High -Efficiency Products

Through the use of cutting-edge analytical and design methods, MASKOUB has established itself as a frontrunner in industrial water treatment, consistently aiming for optimal efficiency in its systems. MASKOUB's product range includes:

- MBBR Media
- Hyperbolic and Mesh Mixers
- Belt Press Systems
- Hydrocyclones
- Dosing Skids
- Chlorine Dioxide Systems
- Poly Ferric Chloride (PFC)
- Biomotex Hybrid Biofilm System

Evolving Technology through Reverse Engineering

• MBBR Media: A Geometry Revolution

MASKOUB's journey with Moving Bed Biofilm Reactor (MBBR) systems began with a simple goal: replicate imported biofilm media at a fraction of the cost. Early prototypes, crafted via 3D printing, revealed shortcomings in surface area and durability. By partnering with a local plastics manufacturer and importing advanced molding machinery from China, the team achieved a breakthrough—media with optimal void ratios and specific gravity. Field trials in food industry wastewater plants demonstrated 40% higher biofilm retention than competitors, slashing costs by 60%.

• Hyperbolic Mixers: Redefining Energy Efficiency

A pivotal moment came from Dr. Ahmed Fayez's insight: traditional paddle mixers consumed excessive energy. MASKOUB's hyperbolic mixer, inspired by fluid dynamics principles, reduced power consumption by 90%. Prototyping involved repurposed motors from Cairo's markets and slow-motion videography to visualize flow patterns. The final fiberglass-impeller design, now a staple in anoxic tanks, exemplifies how theoretical concepts translate into industrial impact.

• Chlorine Dioxide: Overcoming Biofilm Resistance

Biofilms in cooling towers and poultry processing plants posed persistent challenges. MASKOUB's chlorine dioxide generators, developed after failed partnerships with European firms, disrupted biofilms without corrosive byproducts. A landmark trial in a 3,500 m^3 cooling tower eliminated scale inhibitors and biocides, proving self-sufficiency in chemical innovation.

• Belt Press Localization: Triumph over Trial

Egypt's first locally manufactured belt press emerged from iterative experimentation. Initial prototypes faltered in marble sludge but excelled

By refining roller designs and sourcing high-precision belts from China, MASKOUB created a system capable of handling oily wastewater—a feat previously reliant on imported equipment.

• Biomotex: Hybridizing Legacy Systems

The Biomotex system epitomizes MASKOUB's philosophy: modernize, don't discard. By replacing aging RBC (Rotating Biological Contactor) disks with MBBR media, the hybrid design increased surface area tenfold while cutting energy use. Launched in 2021, Biomotex predated similar European systems, showcasing Egypt's potential as an innovation hub.

• Poly Ferric Chloride (PFC): A Local Polymer Breakthrough

MASKOUB has undertaken extensive Jar Testing across various industries to address the needs of industrial wastewater treatment, documenting these trials for future publication. A significant achievement has been the development of a cost-effective local polymer, Poly Ferric Chloride (PFC). Initially faced with challenges related to reaction kinetics and catalysis, MASKOUB successfully established a stable synthesis method at competitive costs. The next phase involves reducing reaction time using microwave technology, which has shown promise in lab trials. The product is now market-ready under the commercial name Poly Ferric Chloride, and MASKOUB is seeking a manufacturer for industrial microwave systems.

• Hydrocyclone for Sludge Thickening

Acknowledging the effectiveness of hydrocyclones for sludge thickening, MASKOUB engineers analyzed their design and built a pilot unit to evaluate its performance. optimize the flow rate.

They used a mixture of sludge and water as the test medium and employed a high-flow pump with a recycle valve to optimize the flow rate. By measuring pressure differentials and comparing actual results with theoretical design data, the hydrocyclone underwent significant enhancements driven by field feedback.

• River Water Clarification System

To enhance river water clarification, Maskoub applied reverse engineering to several design models and developed a prototype unit with a 1 m^3/day capacity. The unit was built using plastic tanks similar to household ones and locally manufactured mixers. Electric current was measured at different stirring speeds to determine energy efficiency. Our engineers mastered the concept of velocity gradient, allowing them to scale tank dimensions in accordance with mixing requirements—greatly improving the system's performance.

• 3D Printing and Design Optimization

With the growth of R&D, 3D printing emerged as a fundamental aspect of engineering design. It facilitated the quick and precise creation of prototypes, enabling iterative improvements informed by real-world feedback. The printer, acquired from a recently established Egyptian mechanical engineering firm, demonstrated exceptional reliability.

MASKOUB's Impactful Projects

MASKOUB has undertaken several notable projects, including wastewater treatment plants utilizing Moving Bed Biofilm Reactor (MBBR) technology for food industries, retrofitting outdated Rotating Biological Contactors (RBC) systems in municipalities, and implementing pilot-scale chlorine dioxide systems for poultry sterilization.

Additionally, they have effectively eliminated scale, biofilm, and corrosion in cooling tower treatments, produced Egypt's first locally manufactured belt press for sludge, and launched a hybrid biofilm system with minimal energy use through Biomotex deployment. These initiatives reflect MASKOUB's commitment to innovation and sustainability in environmental solutions.

Methodology: Maskoub's Structured Innovation Model

Maskoub follows a six-step innovation process:

- Define & Diagnose – Identify industrial pain points.
- Theoretical Modeling – Use reverse engineering and CFD simulations.
- Rapid Prototyping – Leverage 3D printing for iterative design.
- Pilot Testing – Validate performance in real-world conditions.
- Optimization – Refine based on feedback.
- Local Production – Scale using Egyptian supply chains.

Economic & Environmental Impact

The implementation of these methodologies has yielded significant results, including energy savings of up to 90% in mixer operation (e.g., hyperbolic mixer compared to traditional paddle), over 60% cost reduction by substituting imported MBBR media with local alternatives, and enhanced microbial control through improved cooling tower efficiency via local chlorine dioxide generation. Additionally, there has been successful localization of high-tech units, such as belt presses and hydrocyclones, and the empowerment of SMEs by granting access to treatment technology that was previously restricted to multinationals.

Maskoub at Aqua Energy Expo MEA 2025

As the Golden Sponsor of the prestigious Aqua Energy Expo MEA 2025, MASKOUB International for Contracting is set to showcase its groundbreaking innovations that are redefining water and energy sustainability across the Middle East and Africa.Under the Urban Communities; Ministry of Investment and Foreign Trade; Ministry of Water Resources and Irrigation; and the New and Renewable Energy Authority, this event marks a pivotal moment for Maskoub to unveil its next-generation solutions. MASKOUB specializes in delivering advanced solutions in water treatment, desalination, and zero-discharge systems through reverse engineering, energy-efficient designs, and custom fabrication.

Conclusion

Maskoub's journey proves reverse engineering isn't about copying—it's about contextualizing. By combining global knowledge with local pragmatism, they've achieved what development economists call "appropriate technology": solutions that are affordable, maintainable, and scalable for emerging markets. As climate change intensifies water stress, Maskoub's model offers a replicable framework for nations seeking self-reliance in critical technologies.

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Safety Way: Revolutionizing Water Treatment and Environmental Solutions in Egypt and Beyond

www.aquaenergyexpo.com

In an era where water scarcity and environmental degradation pose significant threats to industrial operations and public health, the need for advanced water treatment solutions has never been more pressing. Safety Way for Chemical and Environmental Services and Water Treatment Systems has emerged as a pioneering force in Egypt's water treatment sector, delivering innovative, sustainable, and high-performance solutions tailored to industrial, commercial, and governmental needs.

With over a decade of experience, Safety Way has established itself as a trusted partner for organizations seeking reliable water purification, chemical treatment, and environmental compliance. This comprehensive article explores the company's history, core services, major projects, product portfolio, and competitive advantages, demonstrating why it remains at the forefront of Egypt's water treatment industry.

Company Overview: A Legacy of Innovation and Excellence

Safety Way was founded in Cairo, Egypt, with a clear mission: to bridge the gap in professional water treatment solutions for industries, hospitals, and government institutions. Recognizing the growing demand for clean water, efficient steam systems, and sustainable wastewater management, the company rapidly expanded its operations, extending its reach into Sudan and serving a diverse clientele.

Mission and Vision

Safety Way operates on the principle that water treatment is not just about selling chemicals or equipment—it's about ensuring long-term operational efficiency and environmental sustainability. The company's core objectives include:

- Enhancing water quality through advanced filtration, chemical treatment, and reverse osmosis (RO) technology.
- Reducing environmental impact by implementing eco-friendly wastewater solutions.
- Ensuring compliance with international safety standards, including those set by the Egyptian Ministry of Health and international environmental agencies.

"We strive to work diligently with our clients to achieve our goal: success in reaching standard rates in water treatment operations, rather than merely selling a product or commodity" CEO of Safety Way said.

The Need for Expertise

Safety Way's success is driven by its highly skilled team of engineers, chemists, and technicians who specialize in industrial water treatment (boilers, cooling towers, and chillers), municipal and healthcare water purification, environmental consulting and wastewater management, and marine and oil industry cleaning solutions.

High- Efficiency Service Solutions

Safety Way offers an extensive range of services, ensuring that clients receive end-to-end solutions tailored to their specific needs.

Water Treatment & Chemical Dosing

- Boiler Water Treatment: Prevents scaling, corrosion, and inefficiencies in steam systems.
- Cooling Tower Maintenance: Chemical dosing to inhibit bacterial growth and mineral deposits.
- Reverse Osmosis (RO) & Ion Exchange Systems: For desalination, demineralization, and ultra-pure water production.

Engineering & Installation

- Steam Boiler Supply & Commissioning: Including new and refurbished units.
- Heat Insulation & Aluminum Cladding: Improves energy efficiency and safety.
- Mechanical & Electrical Maintenance: Ensuring uninterrupted operations.

Environmental & Industrial Services

- Wastewater Treatment: Advanced filtration, biological treatment, and sludge management.
- Chemical Cleaning of Industrial Equipment: Removing deposits from boilers, pipelines, and production lines.

- Marine & Oil Tank Cleaning: Degreasing, anti-corrosion treatments, and tank sanitation.

Safety & Monitoring Systems

- Firefighting Systems Installation : Compliant with industrial safety regulations.
- CCTV Surveillance for Industrial Facilities: Enhancing security and operational oversight.
- Periodic Water Testing & Lab Analysis: Conducted in partnership with accredited laboratories.

Major Projects: A Track Record of Success

Safety Way has made significant contributions to high-profile projects across Egypt and Sudan, partnering with government agencies, healthcare institutions, and leading private enterprises.

In the government and healthcare sector, notable initiatives include water treatment solutions for the Egyptian National Railways and military hospitals such as Dar Al-Mashaa, Air Force Hospital, and El-Mashaa Hospital. The company has also collaborated with public healthcare institutions like Al-Demerdash Hospitals, Abu El Rish, French Hospital (Tanta), Assiut University, and the International Medical Center, providing a water treatment system for a 150-bed hospital to ensure sterile water for medical use.

In the industrial and commercial sphere, Safety Way has installed 40 m³/hr and 20 m³/hr RO plants for Delta Fabric Egypt, developed a 1,000 m³/day well-based desalination system for KCG, and established a 75 m³ municipal RO plant for Napco Pharmaceuticals.

The company has also worked with various textile and food industries, including Ice Man, Hapy Tex, and Horus Feed, and has ensured pool and tank sanitation for tourism and hospitality projects at Porto Marina and Porto Sokhna. Additionally, Safety Way has expanded its footprint in Sudan with projects for Afandina for Oils, Al-Ansari Oils, Ain Sudan, and the Engineering Polymer Factory.

Product Portfolio: High-Performance Chemicals & Equipment

Safety Way supplies premium-grade chemicals and treatment solutions, ensuring optimal performance across industries.

Key Chemical Products

Disinfectants & Oxidizers	Hydrogen Peroxide 50%, Sodium Hypochlorite, Potassium Permanganate
Acids & Cleaners	Citric Acid (Anhydrous/Monohydrate), Phosphoric Acid, Sulfamic Acid, Oxalic Acid
Corrosion Inhibitors	Zinc Sulfate, Sodium Hexametaphosphate, EDTA
Alkalinity Adjusters	Caustic Soda (Flakes/Liquid), Sodium Nitrite, Sodium Sulfite
Specialty Chemicals	Wetting Agents (SW-Wet), Anti-Creasing Agents (SW-Slip), Stabilizers

Equipment & Systems

- Reverse Osmosis (RO) Plants: Customizable for industrial and municipal use.
- Media Filters: Sand, carbon, softeners, and deionizers.
- Steam Boilers & Cooling Towers: Installation and maintenance.
- Firefighting & CCTV Systems: For industrial safety compliance.

Driving Progress through Innovation

Safety Way stands out from competitors due to its technical expertise and custom solutions, offering tailored water treatment programs based on industry-specific requirements and in-house R&D for innovative, cost-effective solutions. Our commitment to sustainability and compliance is evident through the use of eco-friendly chemicals that minimize environmental impact, alongside strict adherence to international standards such as ISO, WHO, and the Egyptian Ministry of Health.

We provide comprehensive support with 24/7 technical assistance for emergency maintenance and training programs for clients on water system management. Our proven track record includes hundreds of successful projects in Egypt and Sudan, fostering long-term partnerships with both government and private sector clients.

Contact Safety Way Today

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ELIQUO: ELOVAC®-P's Role in the Water Sector's Net Zero Journey

The wastewater treatment sector faces a critical paradox: while it plays a vital role in environmental protection, its anaerobic digestion processes contribute significantly to methane emissions—a greenhouse gas 28–36 times more potent than CO_2 over a century.

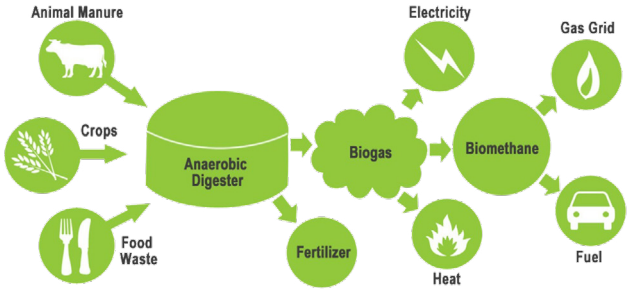
As the global water industry races toward net zero, technologies like ELOVAC®-P, developed by ELIQUO Technologies, are emerging as game-changers. This article explores how ELOVAC®-P addresses methane leakage, enhances operational efficiency, and aligns with climate goals, using Thames Water's Riverside Sewage Treatment Works (STW) trial as a case study.

The Methane Challenge in Wastewater Treatment

Anaerobic digestion (AD) is a cornerstone of modern wastewater treatment, converting organic sludge into biogas for energy recovery.

However, residual methane often escapes during downstream sludge handling, undermining the environmental benefits of biogas. Studies show that methane losses exceeding 4% of total biogas production can negate the carbon savings from green energy generation, jeopardizing compliance with schemes like the UK's Green Gas Support Scheme (GGSS).

For utilities like Thames Water, which aims for carbon neutrality by 2030, tackling these emissions is non-negotiable. Methane's short atmospheric lifespan means reducing its release offers a rapid pathway to curb near-term warming, aligning with global initiatives such as the COP26 Methane Pledge (30% reduction by 2030).



Sludge Treatment: A Balancing Act

Effective sludge management sits at the heart of wastewater treatment's energy and emissions equation. On one hand, sludge disposal is costly and carbon-intensive; on the other, it holds untapped potential as a source of renewable energy and nutrients. The efficiency of sludge digestion directly determines a plant's energy self-sufficiency—or even its ability to generate surplus power. ELIQUO HYDROK's expertise spans the entire sludge treatment chain:

- **Thickening:** Concentrating sludge to optimize digestion.
- **Digestion:** Maximizing biogas yield through advanced AD systems.
- **Dewatering & Drying:** Reducing residual volume for disposal.

Their LYSOTHERM® thermal hydrolysis process (THP) exemplifies innovation here, boosting biogas production by up to 30% while minimizing residual waste. However, post-digestion sludge handling remains a persistent source of methane leakage—a gap ELOVAC®-P aims to close.

The ELOVAC®-P System: A Solution to Methane Emissions

The ELOVAC®-P system targets two critical challenges: methane emissions and struvite scaling. Its vacuum degassing technology removes dissolved and entrapped methane from digested sludge, while magnesium chloride ($MgCl_2$) dosing enables controlled phosphate precipitation.

How ELOVAC®-P Works

The operational principle of ELOVAC®-P is straightforward yet effective:

Functional Principle

- **Vacuum Degassing:** Sludge enters a reactor where a vacuum pump extracts dissolved gases, including methane.
- **pH Adjustment:** The process raises sludge pH, creating ideal conditions for struvite formation.
- **Phosphate Precipitation:** $MgCl_2$ reacts with phosphates to form microcrystalline struvite, which remains embedded in the sludge.
- **Enhanced Dewatering:** Treated sludge exhibits improved dewaterability, reducing polymer use and disposal costs.

Implementation at Riverside STW

The Riverside Sewage Treatment Works (STW) processes thermally hydrolyzed sludge known for its high biogas yield. However, this efficiency results in higher levels of entrapped and dissolved methane, compounded by elevated phosphorus levels that lead to operational challenges like struvite scaling and inefficient dewatering.

Phased Approach to Trial

The ELOVAC®-P trial at Riverside STW was executed in three key phases:

- **Initial Setup:** The system was connected downstream from aerated sludge buffer tanks. While this configuration facilitated an easy start, most methane had already escaped during aeration, limiting capture efficiency.
- **Optimized Configuration:** Sludge was redirected directly from the digesters to the ELOVAC® unit, bypassing aeration tanks to maximize methane capture.

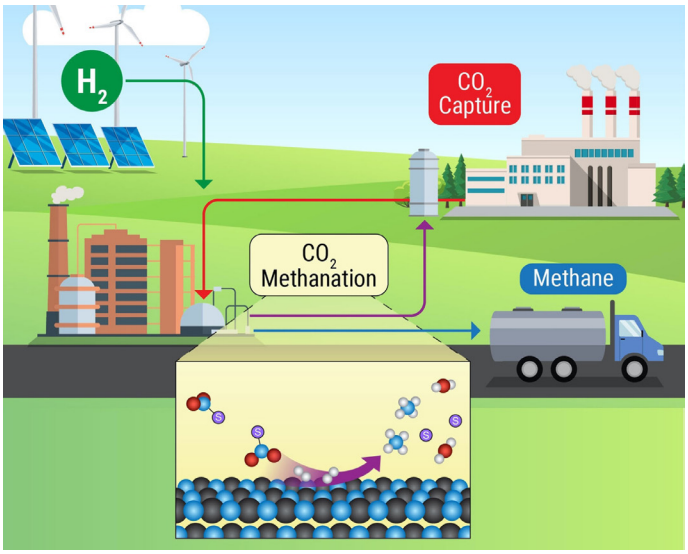
• **Cross-Site Validation:** Sludge from Crossness STW was processed at Riverside, allowing for performance comparisons across different sludge types and dewatering technologies.

Key Results from the Trial

The ELOVAC®-P system demonstrated remarkable outcomes in several areas:

Methane Capture and Climate Benefits

The system captured an average of 545 liters of gas per cubic meter of sludge, with methane constituting approximately 25%. Over a 20-year period, this translates to a reduction of 2,704 metric tons of CO_2 equivalent annually at Riverside. This reduction is comparable to the emissions produced by driving over 62,000 times from Riverside to ELIQUO Hydrok's facility in Cornwall. By targeting methane emissions, ELOVAC®-P aligns with global initiatives such as the COP26 Global Methane Pledge, which aims for a 30% reduction in methane emissions by 2030.



Phosphate Precipitation

The combination of vacuum degassing and $MgCl_2$ dosing achieved phosphate removal efficiencies of up to 90%, reducing phosphorus concentrations in sludge to below 50 mg/L. This reduction not only mitigates struvite scaling but also enhances sludge dewaterability, leading to improved operational reliability.

Dewatering Efficiency

ELOVAC®-treated sludge exhibited significant improvements in dewatering performance:

• **Higher Cake Solids:** Treated sludge achieved up to 32% dry solids, compared to 24-27% for untreated sludge.

• **Reduced Polymer Use:** Polymer requirements decreased by 39%, from 18 kg/TDS to 11 kg/TDS, resulting in lower chemical costs.

• **Better Filtrate Quality:** The filtrate showed lower suspended solids, improving overall sludge handling.

• **Reduced Phosphorus Load:** ELOVAC®-P significantly lowered phosphorus (PO_4-P) concentrations in the filtrate, easing the burden on biological and chemical phosphorus removal processes.

Cross-Site Validation

The trial validated ELOVAC®-P's effectiveness across different sludge types and dewatering technologies, demonstrating its adaptability and reliability in various operational settings. The successful results highlight the potential for Thames Water to replicate these benefits across its broader network.

Implications for Net Zero Goals

The ELOVAC®-P trial is a significant advancement for the water industry's net zero objectives, focusing on methane capture to facilitate rapid emissions reductions. Key benefits of this technology include:

- **Emission Reductions:** By capturing entrapped methane, ELOVAC®-P prevents its release into the atmosphere, thereby improving the carbon footprint of wastewater treatment processes.
- **Operational Savings:** Enhanced dewatering efficiency leads to reduced polymer costs, improved sludge quality, and decreased maintenance related to struvite scaling.
- **Versatility:** The system can adapt to various sludge types and process configurations, making it suitable for a wide range of facilities.

The successful trials at Riverside and Crossness highlight the potential for broader adoption of ELOVAC®-P to help the water sector achieve its ambitious climate targets.

- **Improved Dewatering:** ELOVAC®-P enhances dewatering performance by precipitating phosphates, which improves water binding capacity. This results in higher dry solids content and a significant reduction in polymer demand, exemplified by a 20% savings in disposal costs at the Lingen sewage treatment plant.
- **Prevention of Struvite Scaling:** The vacuum degassing process increases pH, creating optimal conditions for controlled phosphate precipitation. This minimizes the risk of struvite deposits, which can cause operational issues.

- **Improved Quality of Biosolids:** The struvite crystals formed during the process enhance the quality of dewatered sludge, making it a valuable agricultural fertilizer.
- **Compact Design:** ELOVAC® is a ready-to-connect, skid-mounted system, allowing for flexible installation in various settings.

Overall, ELOVAC®-P significantly contributes to the water industry's sustainability efforts and operational efficiency.

Complementary Technologies: LYSOTHERM®

ELIQUO HYDROK Technologies has developed LYSOTHERM®, a unique thermal hydrolysis process (THP) that utilizes tubular heat exchangers and thermal oil instead of traditional steam or chemicals. Designed and manufactured in Germany, LYSOTHERM® offers several distinctive advantages to enhance wastewater treatment processes.

Unique Benefits

- **Minimal Maintenance:** LYSOTHERM® features an optimal heat exchanger design that ensures stable, low-maintenance operation. By using a pressureless thermal oil system for heating and minimizing the temperature difference between sludge and the heat transfer medium, fouling in heat exchangers is significantly reduced.

Additionally, the system includes a Clean-in-Place (CIP) feature, common in the dairy industry, which automates the periodic rinsing and cleaning of the plant.

This process requires minimal operator intervention, with daily rinsing using treated effluent water and chemical cleaning every 20-25 days initiated by a simple button press.

• **Heat Recovery:** One of LYSOTHERM®'s key innovations is its energy recovery mechanism. A regenerative water circuit meets approximately 90% of the heat demand, requiring external energy only during high heating phases. This process heat can utilize exhaust gas from on-site combined heat and power (CHP) units, making LYSOTHERM® an energy-positive system.

The pressureless thermal oil system eliminates the need for steam generation and chemicals, enhancing economic viability, reducing environmental impact, and improving plant operability.

• **Odour-Free Operation:** The LYSOTHERM® process is entirely closed, preventing the release of odorous gases. Hydrolysis gases generated during the process remain in the hydrolysate and are directed to downstream digesters, eliminating the need for exhaust gas treatment.

• **Small Footprint:** LYSOTHERM® is delivered pre-assembled with a compact design, allowing for quick installation and minimal construction risks. Its modular structure enables scalability, with each module capable of processing approximately 15 tons of raw sludge solids per day.

Operational Process

The operational workflow of LYSOTHERM® involves several key steps:

• **Continuous Sludge Pumping:** Sludge is pumped through a multi-stage heat exchanger system at pressures of 12-15 bar.

• **Pre-Heating:** The sludge is pre-heated to approximately 148 °C (9-11 bar) in the initial heat exchanger stage.

• **High-Temperature Heating:** The sludge is then heated to 158 °C (8-10 bar) in the high-temperature stage.

• **Thermal Hydrolysis:** The sludge undergoes thermal hydrolysis at 158 °C for a retention time of 30-60 minutes.

• **Cooling:** Post-hydrolysis, the sludge is cooled to around 50 °C for digestion.

• **Heat Recovery Mechanism:** The regenerative water circuit recycles heat from the cooling stage to the pre-heating stage, providing 90% of the necessary heat. The thermal oil circuit supplies additional process heat, which can be sourced from CHP exhaust gas or a boiler.

Overall, LYSOTHERM® represents a cutting-edge solution for enhancing sludge treatment processes, contributing to sustainability and operational efficiency in wastewater management.

Conclusion

The Riverside trial underscores ELOVAC®-P's viability as a scalable solution for methane mitigation. For utilities, adopting such technologies is no longer optional—it's a strategic imperative. With methane responsible for 30% of current global warming, the water sector must act decisively to meet its net zero pledges. ELIQUO's innovations exemplify how engineering ingenuity can transform waste into value, turning treatment plants from emission sources into sustainability hubs. As climate deadlines loom, the industry's willingness to embrace these tools will determine its ability to safeguard both water resources and the planet.

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WATER NEWS BRIEF

June | 2025

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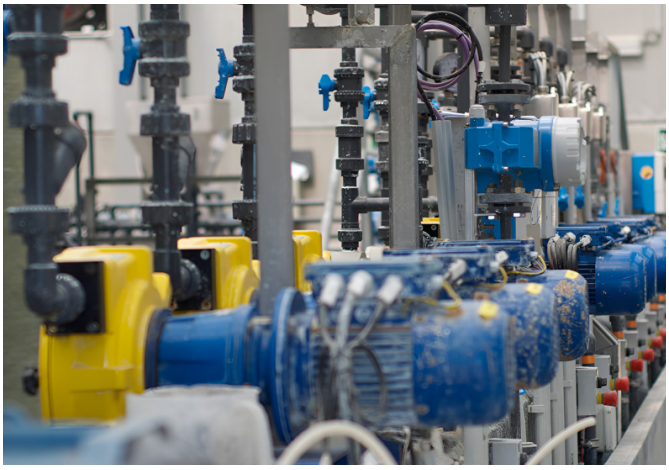
Qatar inks $3.7 billion agreement for Ras Abu Fontas Power and Water Project

Qatar General Electricity and Water Corporation (Kahramaa) has partnered with QatarEnergy, Qatar Electricity and Water Company (QEWC), and Sumitomo Corporation to develop the Ras Abu Fontas Independent Water and Power Plant (IWPP), valued at 13.5 billion Qatari riyals ($3.7 billion). This facility will generate 2,400 megawatts (MW) of electricity and desalinate 110 million imperial gallons of water daily. The project will be executed in three phases, with the first power phase of 836 MW expected to be operational by April 25, 2028, and full completion anticipated by June 1, 2029. The IWPP is projected to supply 23% of Qatar's electricity and 20% of its potable water.

ACCIONA will renovate one of London's main water treatment plants



ACCIONA will renovate the Coppermills Water Treatment Plant, which supplies one-third of Greater London's drinking water. The £400 million (€465 million) project involves designing, constructing, and commissioning new infrastructure before transferring it to Thames Water. Located in the Lea Valley, the 60-year-old plant requires modernization to meet the needs of the growing population. ACCIONA, in collaboration with lead designer Jacobs, will build a new pumping station and implement an advanced filtration and treatment system to enhance water quality. The company has been active in the UK since 2003, previously working on projects like the Edmonton EcoPark and the NESS Energy Project in Scotland.

LG Chem to sell water filter business to Glenwood PE for $692 million

LG Chem has agreed to sell its water filter business to Glenwood Private Equity for approximately 1 trillion won ($692 million), as part of its strategy to enhance financial stability amid market uncertainties. Glenwood PE, selected as the preferred bidder, will acquire the unit's assets, workforce, and intellectual property through a carve-out structure. The water filter business, which produces reverse osmosis membranes for desalination and industrial treatment, generated mid-200 billion won in revenue last year. Glenwood plans to invest 200 billion won to expand manufacturing capacity post-acquisition. This sale aligns with LG Chem's focus on core growth areas like batteries and sustainable materials, following previous divestitures.

NWC launches $613 million sanitation projects across Jeddah

The National Water Company (NWC) has launched 15 development projects worth over 2.3 billion Saudi riyals (US$613 million) to enhance wastewater services for more than 1.3 million beneficiaries. Key projects include the Eastern Tunnel Project in Jeddah, a 14-kilometer sewage pipeline costing over 774 million riyals, designed to improve environmental services and reduce pollution in several districts. Additionally, NWC is implementing an airport sewage lifting project for over 915 million riyals, capable of handling 611,000 m^3 per day. Other initiatives involve sewerage systems in Jeddah and surface water management projects, all aimed at boosting operational efficiency and aligning with Saudi Arabia's Vision 2030 goals.

SUEZ launches €100 million water supply modernisation contract in Angola

Suez and Empresa Pública de Águas de Luanda (EPAL E.P.) have launched a €100 million contract to modernize water supply systems in Luanda, Icolo, and Bengo, benefiting around 12 million residents. Officially starting in April 2025, the three-year project aims to enhance water infrastructure amid climate-related challenges. Key focuses include expanding water production by upgrading five treatment plants and installing new facilities, improving distribution through real-time monitoring and leak detection, and modernizing customer service with a new billing system and 9,000 smart water meters. The contract also emphasizes skills development for EPAL staff using SUEZ's WIKTI methodology, reinforcing Suez's long-term commitment to Angola.

Morocco, TAQA, and Nareva partner on $14.05 billion energy and desalination projects

Moroccan utility ONEE has partnered with the Mohammed VI Investment Fund, TAQA Morocco, and Nareva for various projects, including desalination and renewable energy, with a total investment of 130 billion dirhams ($14.05 billion). Scheduled for completion by 2030, the initiatives include constructing a 1,400 km high-voltage transmission line to connect Western Sahara to central Morocco, capable of handling 3,000 megawatts. The consortium plans to build desalination plants with a total capacity of 900 million cubic meters and develop 1,200 megawatts of new renewable energy. These efforts align with Morocco's goal to increase renewable energy to 52% of installed capacity by 2030, up from 45%.

Osmoflo and CERAFILTEC strengthen partnership to expand use of ceramic membrane technology

Osmoflo and CERAFILTEC have strengthened their partnership to enhance the deployment of ceramic membrane technology in water treatment systems. This collaboration merges CERAFILTEC's expertise in ceramic ultrafiltration membranes with Osmoflo's extensive experience in water, wastewater, and desalination projects. Osmoflo will integrate CERAFILTEC's membranes into its offerings, improving treatment performance in Membrane BioReactors (MBRs), drinking water plants, and tertiary reuse systems. Ceramic membranes are increasingly favored for their chemical resistance, durability, and capacity to manage high levels of suspended solids and oil, thus enhancing system resilience and reducing operational costs. Both companies emphasize sustainability and modernization, with CERAFILTEC leveraging over 25 years of experience in ceramic filtration and Osmoflo's global project delivery expertise.

EQT to acquire Seven Seas Water Group, advancing sustainable water infrastructure

EQT has announced the acquisition of Seven Seas Water Group from Morgan Stanley Infrastructure Partners, marking a strategic move into essential infrastructure aligned with global needs for water resilience. Headquartered in Tampa and Houston, Seven Seas operates over 220 water and wastewater treatment plants in the U.S., Caribbean, and Latin America, utilizing its Water-as-a-Service® (WaaS®) model for over 20 years. This model addresses water scarcity through customized desalination and wastewater reuse solutions. EQT aims to enhance Seven Seas with digital innovation and geographic expansion, emphasizing sustainability and access to clean water. The deal underscores EQT's commitment to investing in critical infrastructure for sustainable development and water equity.

Veolia technology to help turn San Francisco wastewater into renewable local energy

Veolia, through its Water Technologies & Solutions division, has secured a $34 million contract to provide biogas upgrading technology for the San Francisco Public Utilities Commission's Southeast Treatment Plant. This facility, undergoing a $3 billion upgrade, will transition from conventional wastewater treatment to a resource recovery center, converting wastewater byproducts into renewable energy. Veolia will implement its MemGas™ system to purify biogas into biomethane for Pacific Gas & Electric's distribution network. The project aims to produce enough renewable energy for about 3,800 homes annually, significantly reducing greenhouse gas emissions. Scheduled for completion by June 2027, it exemplifies sustainable infrastructure and environmental leadership.

Jacobs awarded contract to upgrade Rockland Water Treatment Plant in Ontario

The City of Clarence-Rockland, Ontario, has contracted Jacobs to upgrade its water infrastructure, specifically the Rockland Water Treatment Plant (WTP) and the Caron Booster Station (CBS). The project includes twinning over 11 kilometers of water transmission mains to enhance system reliability and capacity. This upgrade is crucial as the city anticipates an increase of 9,000 residents by 2046, with neighboring municipalities also seeking to connect to Clarence-Rockland's water supply. Jacobs, with over 20 years of collaboration with the city, will assist in the Class Environmental Assessment process and support the two-phase expansion of the facilities, aiming for efficient delivery to meet growing community needs.

Sacyr awarded $292 million water reuse P3 project in Antofagasta, Chile

Sacyr Water has secured a P3 contract for wastewater treatment and distribution in Antofagasta, Chile, awarded by Econssa. The project, involving an investment of approximately $292 million, aims to enhance the quality of life for local residents and provide water services to regional mining companies over a 35-year concession. The new treatment facility will capture pre-treated wastewater from the existing plant, with a final treatment capacity of 900 liters per second. Scheduled to be operational by 2028, the project will include 16 kilometers of pipeline, creating over 500 local jobs. This initiative is poised to be the largest water reuse project in Latin America, promoting sustainability in the region.

Tetra Tech to expand digital automation capabilities with acquisition of SAGE Group

Tetra Tech, a global leader in consulting and engineering services for water and sustainable infrastructure, has announced an agreement to acquire SAGE Group, an Australia-based firm known for its innovative automation services in municipal water and industrial sectors. This acquisition aims to enhance Tetra Tech's digital systems capabilities, including electrical design, control systems engineering, cybersecurity, and cloud integration. Tetra Tech's Chairman and CEO, Dan Batrack, emphasized that SAGE's digital automation expertise will strengthen their service offerings and support data-driven decision-making. SAGE Group's Managing Director, Adrian Fahey, noted that the partnership aligns with their strategic vision for growth and innovation. The acquisition is subject to customary closing conditions.

Global Water Events

Pump Industry Awards 2025

Date: 13 March 2025
Location: The Hilton at St. George's Park, Burton upon Trent, UK

The Pump Industry Awards is now recognised as one of the leading award ceremonies within the industrial arena. Founded by the BPMA in 2000, the awards programme celebrates the achievements of pump companies and individuals who strive to go the extra mile.

Website: **www.pumpindustryawards.com**

WateReuse 2025 Symposium

Date: From 16 to 19 March 2025
Location: Tampa, FL, United States

The Annual WateReuse Symposium offers the most extensive learning opportunities in water recycling, addressing topics such as policy, technology, operations, and communications for various applications, including irrigation, potable reuse, onsite systems, and industrial processes. In 2025, we celebrate the 40th anniversary of the WateReuse Symposium, with this year's theme being Turning the Tide Toward Reuse.

Website: watereuse.org

7th International Conference and Exhibition Desalination Latin America

Date: From 19 to 20 March 2025
Location: Santiago, Chile

2 days congress, International investment conference and exhibition is the only business platform to develop effective strategies, share experience, present new investment projects and innovations, consolidate the efforts of governments and businesses to implement desalination projects and increase water reserves throughout Latin America.

Website: desalinationlatinamerica.com

Smart Water Systems Conference

Date: From 15 to 16 April 2025
Location: Hilton London Kensington, London

Smart Water Systems is a two-day conference which aims to assist water utility companies, solution/service providers, government officials and finance/investment companies to collaborate, network and examine new technologies and latest developments to ensure more efficient leakage detection and management.

Website: www.smgconferences.com

FiltXPO 2025

Date: From 29 to 1 May 2025
Location: Tampa, FL, United States

FiltXPO™ 2025 at the Miami Beach Convention Center in Miami Beach, Florida, invites you to explore the future of filtration technologies and innovations. Discover the latest advancements from top-tier exhibitors and gain insights into the factors shaping the filtration market. Stay ahead of the competition by learning from industry leaders and positioning yourself as a key player in the field.

Website: www.filtxpo.com

Global Water Summit

Date: From 4 to 7 March, 2025
Location: West Palm BEeach, Florida

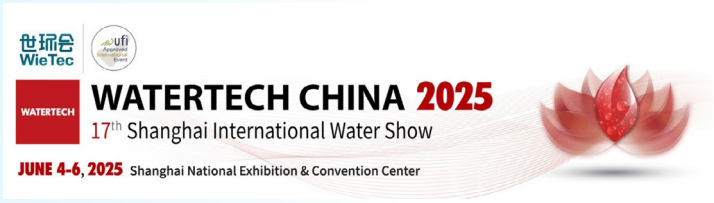
In a world that has crossed the 1.5°C threshold, water security faces unprecedented pressure. The challenge requires an immediate and sharp increase in capital deployment into our sector. At GWS 2025, we're bringing together the leaders who can make this happen.

Website: www.watermeetsmoney.com

Watertech China

Date: From 3 to 5 June 2025
Location: National Exhibition & Conference Center, Shanghai, China

WATERTECH CHINA, a global exhibition platform for water treatment, environmental protection, and energy-saving solutions, returns to the National Exhibition & Convention Center (NECC) in Shanghai, China, from June 3 to 5, 2025.



Website: www.watertechsh.com

IFAT Africa

Date: From 8 to 10 July 2025
Location: Gallagher Convention Centre, Johannesburg, South Africa

IFAT Africa is a three-day trade fair dedicated to presenting cutting-edge technologies and solutions for water, sewage, waste, and recycling tailored to the sub-Saharan African market. Serving as a vital gateway, it connects international companies with the African market and enables African enterprises to access global opportunities. The event brings together key industry players, senior buyers, and decision-makers, fostering collaboration and innovation across the region.

Website: ifat-africa.com

Indo Water Expo & Forum 2025

Date: From 13 to 15 August, 2025
Location: Jakarta International Expo, Kemayoran , Indonesia

Indonesia's water, wastewater and recycling technology event returns with international pavilions, technical product presentations and B2B business matchmaking.

Website: indowater.com

World Water Week

Date: From 24 to 28 August 2025
Location: Stockholm, Sweden

World Water Week is a five-day event on global water issues, organized by Stockholm International Water Institute since 1991. World Water Week is a non-profit event, co-created together with leading organizations. It offers an unusual mix of participants and perspectives, with sessions on a broad array of water-related topics, ranging from food security and health, to agriculture, technology, biodiversity, and the climate crisis.

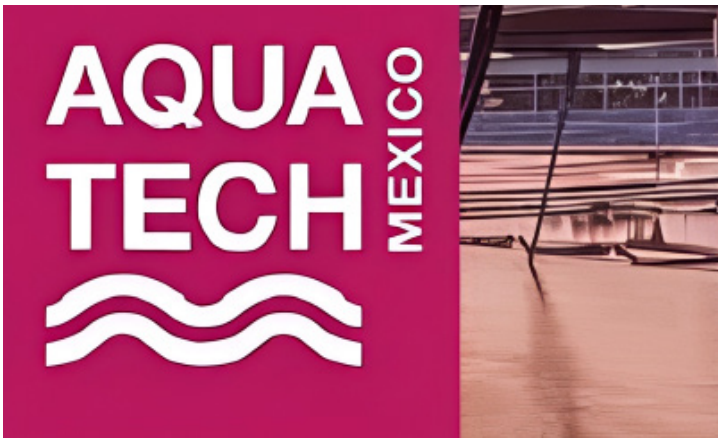
Website: www.worldwaterweek.org

Aquatech Mexico 2025

Date: From 2 to 4 September 2025
Location: Mexico City, Mexico

Discover water innovation at Aquatech Mexico 2025, a premier event connecting professionals, experts, and investors across the Americas. Over three intensive days, September 2-4, participants engage in business networking, knowledge exchange, and exploration of regional water technology opportunities. This dynamic platform facilitates valuable partnerships and insights into the Americas' water technology market.

Website: www.aquatechtrade.com

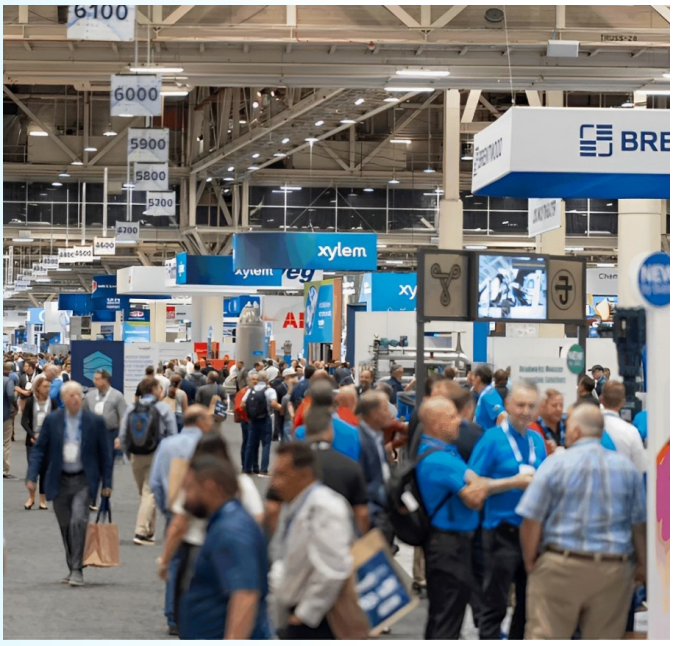


WEFTEC 2025

Date: From 27 September to 1 October, 2025
Location: McCormick Place, Chicago, Illinois, USA

WEFTEC 2025 is the premier water industry event in North America. Connect with over 20,000 water professionals from 100+ countries and 50+ industries, driving solutions and innovations for a sustainable water future.

Website: www.weftec.org



London Climate Technology Show

Date: From 1 to 2 October 2025
Location: ExCeL London, London, UK

The London Climate Technology Show is a two-day event focussing on the climate technology sector. Building on the achievements of previous editions, the event will provide a platform for showcasing disruptive solutions and fostering discussions on effective decarbonisation strategies. The London Climate Technology Show aims to be the largest climate technology exhibition and conference in the world for advancing the global net zero economy transition and shaping a sustainable future with ground breaking and collaborative technologies.

Website: climatetechshow.com

AQUATECH China

Date: From 5 to 7 November 2025
Location: Shanghai New International Exhibition Center (SNIEC), Shanghai, China

Aquatech China is a three-day event that brings together the worlds of water technology and water management, aiming to present integrated solutions and holistic approaches to water challenges that Asia is facing. Aquatech China is the leading water technology trade show in China, covering all aspects of water: drinking water, industrial water, waste water treatment, sludge treatment, smart water solutions and water management.

Website: www.aquatechtrade.com

All Ireland Water & Wastewater Expo

Date: 4 December, 2025
Location: Leopardstown Pavilion, Leopardstown Racecourse, Foxrock, Dublin 18, D18 C9V6, Ireland

The All-Ireland Water & Wastewater Expo is a one-day conference uniting stakeholders to discuss key issues in the water sector. With €6 billion allocated through 2026, investments will enhance infrastructure and treatment facilities. Industries face rising demands for high-quality water, driving investments in efficiency and sustainability initiatives.

Website: www.waterengineering.ie

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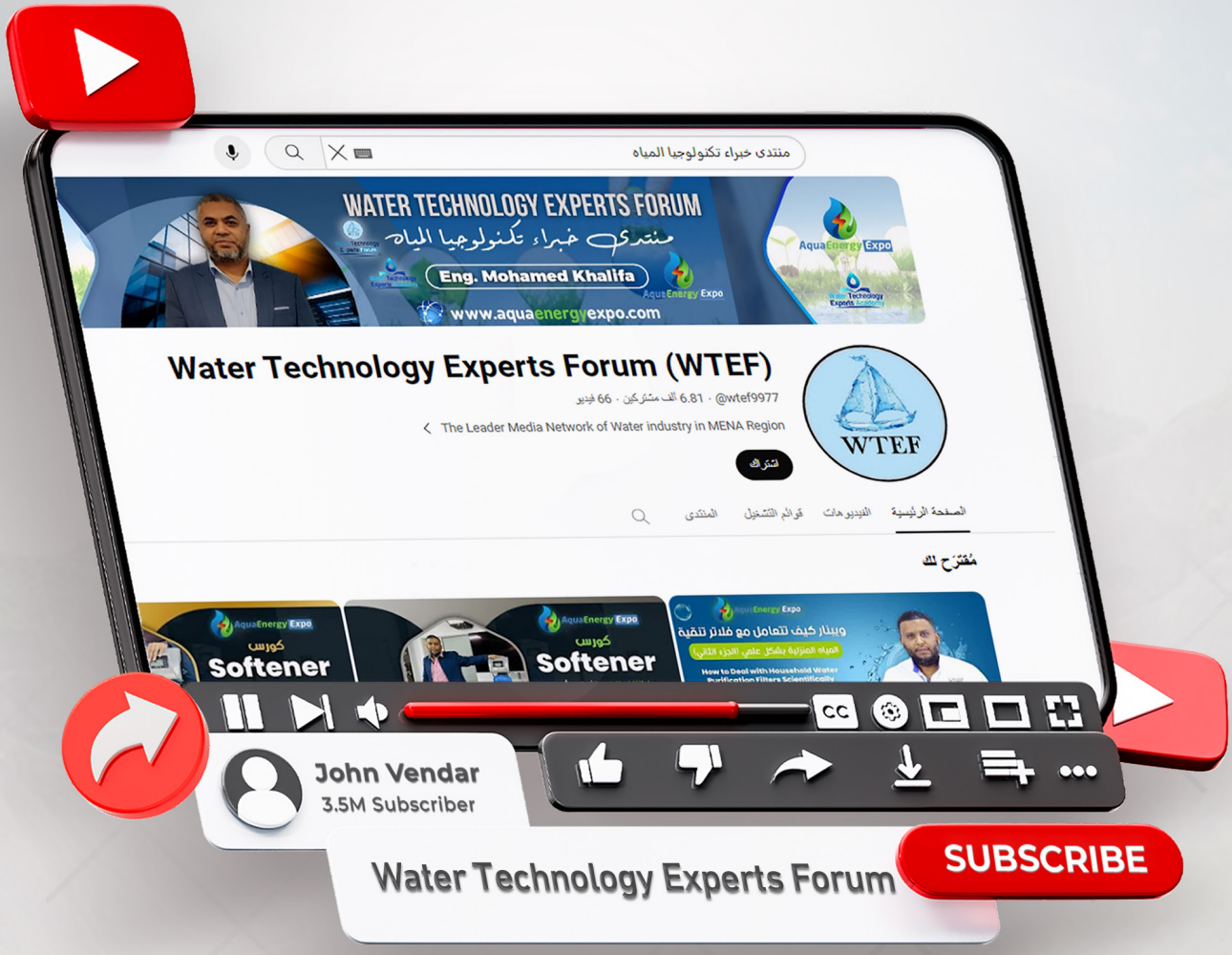

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Delta Power | Water Pump: Egypt's Gateway to Hydroo Spanish Pump Technology

Eng. Hany Naguib
Chief Executive Officer at Delta Power | Water Pump

Tuesday, June 17th
From 06:00 to 08:00 PM (Saudi Arabia Time)

Reverse Osmosis: Principles, Operation, and Maintenance

Senior Chemist / Ragab Gamal Ahmed

Sunday, June 22th
From 08:00 to 10:00 PM (Saudi Arabia Time)

Al-Mousa Trading Co. Leads the Pumps World

Eng. Ahmed Mustafa
Sales Manager - Al-Mousa Trading Co.

Friday, June 27th
From 08:00 to 10:00 PM (Saudi Arabia Time)

Role of Safety Way in Water Treatment Systems

Consultant Chemist / Ibrahim Abdel-Galil El-Senousy

CEO, Safety Way for Chemical & Environmental Services and Water Treatment Systems.

Saturday, June 28th
From 09:30 to 11:30 PM (Saudi Arabia Time)

WEG's Electric Motors Leading the Way in Sustainability and Innovation

Energy efficiency is crucial for sustainable development, particularly in the water sector, where optimizing water and energy use enhances production and operational processes without increasing consumption. This approach aligns with the Sustainable Development Goals (SDGs), especially SDG 6 (clean water), SDG 7 (affordable energy), and SDG 13 (climate action). As challenges like water scarcity and population growth intensify, developing sustainable infrastructure becomes essential. Effective water management involves not just consumption but also producing more water through recovery, reuse, and energy efficiency strategies. By adopting these practices, companies can ensure operational sustainability and help restore water resources.

WEG, a global leader in motor and electrical system solutions, is at the forefront of this transformation. The company provides high-efficiency motors and automation systems that help industries improve energy performance while increasing water availability. These solutions optimize water resource use and enable companies to actively contribute to environmental conservation.

Increasing energy efficiency in the water sector

The design and quality of components significantly enhance efficiency in industrial processes. Products made with advanced materials and technologies help optimize processes and reduce waste. A prime example is the use of high-efficiency motors in desalination plants, where even a small improvement in efficiency can lead to significant energy and cost savings. A study by WEG at a 600,000 m^3/day desalination plant in

Saudi Arabia demonstrated that increasing the demonstrated that increasing the high-pressure motor efficiency from 96.5% to 97.3% could optimize electricity consumption, potentially generating additional water without extra energy costs. This surplus water could yield an annual income of €600,000, based on a Water Purchase Agreement rate of €0.40/m^3.

Improving motor efficiency could save 3.82 GWh/year, translating to over €400,000 in savings and a reduction of more than 2,170 tons of CO2 emissions. With the European CO2 tax at $86.50 per tonne, these efforts could enhance savings by 27%.

For a smaller 300,000 m^3/day desalination plant, optimizing motors could save 2.5 GWh/year, and enhancing Variable Frequency Drives (VFDs) by one percentage point could yield an additional 3.7 GWh/year, resulting in total savings exceeding 6 GWh/year. These improvements underscore the financial and environmental benefits of investing in high-quality components.

The Best of the Best

The latest generation of high-efficiency electric motors significantly reduces energy losses, enhances performance, and contributes to the decarbonization of industrial processes. WEG has positioned itself at the forefront of sustainable engineering solutions, offering motors that comply with international efficiency standards while supporting circular economy principles through increased recyclability, durability, and material efficiency.

• Energy Efficiency Classification

The energy efficiency classification for electric motors has evolved significantly over the years. The International Electrotechnical Commission (IEC) has defined International Efficiency (IE) classes to standardize and improve motor efficiency. The transition from IE2 to IE6 motors leads to substantial energy savings, lower maintenance costs, and reduced greenhouse gas emissions. This shift from basic efficiency standards to ultra-premium efficiency solutions has brought significant improvements, reducing heat losses and improving operational reliability.

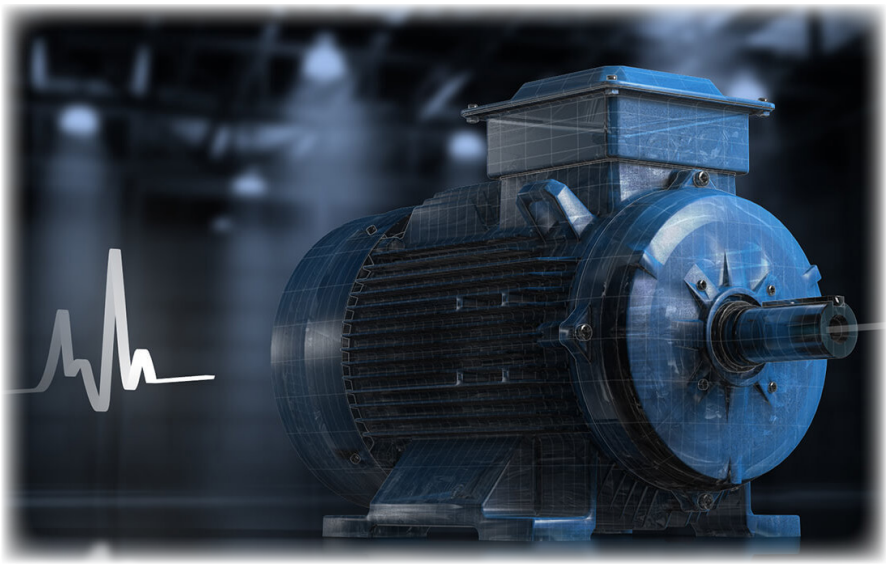
WEG's commitment to developing IE4, IE5, and IE6 motors aligns with global initiatives for energy conservation and industrial efficiency. High-efficiency motors play a crucial role in reducing energy demand, with WEG's IE3, IE4, IE5, and IE6 low-voltage motors achieving up to 98% efficiency. This minimizes energy waste in critical applications. The company also offers Permanent Magnet (PM) motors, which provide higher power density, making them particularly suited for desalination and water treatment facilities. Additionally, WEG has developed Axial and Transverse Flux Motors, a new generation of motors that use fewer materials while delivering greater efficiency.

• Tailored Solutions for Desalination Plants

For high-pressure pump applications in desalination plants, WEG's high-voltage motors are specifically designed to meet precise operating conditions, achieving efficiency levels above 97%. To maintain optimal efficiency even in demanding environments, WEG integrates advanced cooling systems, ensuring reliable motor operation in high-temperature settings. This innovation is crucial as the water industry increasingly faces challenges related to energy consumption and environmental sustainability.

How to Find the Right Motor for water Application?

Selecting the appropriate electric motor for a water treatment plant, desalination facility, or wastewater system requires a comprehensive understanding of various factors. Key considerations include:



- Load Profile and Operational Conditions: Different applications may require specific torque and speed characteristics, affecting performance and longevity.
- Voltage and Frequency Requirements: These must align with grid characteristics and variable frequency drives to maximize efficiency.
- Cooling Methods: Depending on installation conditions, motors may require air or liquid cooling systems.
- Durability: The use of special coatings and corrosion-resistant materials is essential in high-humidity and chemically aggressive environments.

By considering these aspects, plant operators can achieve greater reliability, energy savings, and overall system optimization.

WEG's Cutting-Edge Motor Solutions

• W80 AXgen Axial Flux Motor

The W80 AXgen Axial Flux Motor represents a significant breakthrough in electric motor technology. Unlike traditional induction motors, which require larger axial space, the AX80 utilizes a compact pancake design that enhances power density and optimizes raw material usage. This innovative approach results in ultra-compact structures that save space in installations where footprint is a constraint. With high power density and optimized electromagnetic design, the motor significantly reduces energy losses and ensures superior performance. In the water sector, where space and efficiency are critical, the AX80 presents an innovative solution, allowing for tandem assembly and improved operational efficiency.

• W23 Sync+Ultra IE6 Motor

The W23 Sync+Ultra IE6 Motor is WEG's latest ultra-premium efficiency solution, designed to meet the most stringent energy efficiency standards. Offering the highest efficiency classification available, this motor reduces operational costs while enhancing thermal performance, ensuring a longer lifespan.

Its advanced materials and optimized rotor-stator design contribute to minimal energy losses. Additionally, the W23 Sync+Ultra IE6 motor seamlessly integrates with digital monitoring solutions, enabling predictive maintenance and real-time performance optimization.

In applications such as pumping stations, desalination plants, and wastewater facilities, this motor provides unparalleled energy savings and reliability.

Widespread Impact

WEG's high-efficiency motors have been successfully implemented in several major desalination and water treatment projects worldwide for many years.

In Chile, WEG motors have played a key role in multiple desalination projects, including the Atacama Desalination Plant, which supplies 103,000 m³/d of water. For this project, WEG supplied 12 units of LV motors from the W50 line (355kW to 500kW, 4 poles) to KSB, along with 3 MV Soft Starters from the SSW7000 line (6.6kV) and a Step-Down Oil filled transformer (23kV//6.6kV - 13MVA) to GS Inima.

Additionally, at the Copiapó Desalination Plant (Puerto Punta Totoralillo), a 34,560 m³/d facility developed by Acciona for CAP S.A., WEG supplied MV motors from the MGF line, further demonstrating its commitment to providing energy-efficient and reliable solutions for large-scale desalination projects.

In Saudi Arabia, the Rabigh 3 Independent Water Plant (IWP), one of the largest reverse osmosis desalination facilities in the world, relies on WEG motors to ensure efficient and sustainable operation.

The plant, producing 600,000 cubic meters of potable water per day, benefits from advanced automation and variable speed drive technology to minimize energy consumption. As a result of its success in Rabigh 3, WEG has been awarded a contract for the Rabigh 4 IWP project. This reinforces the company's reputation as a reliable provider of innovative motor solutions for large-scale desalination projects, contributing to Saudi Arabia's Vision 2030 goals for sustainable water infrastructure.

Working Together

WEG not only supplies high-efficiency motors but also collaborates closely with engineers and EPC contractors from the early design phases of water infrastructure projects. By providing expert guidance in selecting the most suitable motors and equipment, WEG helps optimize energy consumption and ensures seamless integration into each specific application. This proactive involvement brings significant advantages, such as enhanced system performance, reduced operational costs, and increased reliability in the long term.

Through a combination of high-efficiency motors, automation systems, and digital monitoring solutions, WEG aids water facilities in achieving their sustainability and efficiency goals. The company's extensive experience in desalination, wastewater treatment, and water supply systems positions it as a key partner in the sector's transition toward greener and more cost-effective operations.

Empowering Sustainable Transportation

To confirm energy savings and process optimization, WEG offers the WEGSEE+ tool, designed to evaluate and improve the energy efficiency of motors and equipment installed in water treatment and desalination plants. This innovative software enables precise simulations to identify improvement areas and quantify energy efficiency impacts on operational expenses (OPEX) and sustainability.

WEGSEE+ revolutionizes energy management by providing advanced simulation and analysis capabilities, allowing users to measure potential energy savings, calculate return on investment, and assess greenhouse gas emissions reduction. It serves as a comprehensive solution for optimizing resources and driving sustainability across various industries.

With its user-friendly interface and extensive features, WEGSEE+ simplifies energy efficiency project analysis, guiding strategic decision-making. Beyond this tool, WEG is committed to sustainability through initiatives like the Carbon Neutral Program, targeting a 52% reduction in operational emissions by 2030 and achieving carbon neutrality by 2050. By innovating in product and process design, WEG not only enhances energy efficiency but also significantly reduces water usage, helping companies reach their sustainability goals effectively.

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SWCC: Smart Desalination with AI to Combat Water Scarcity

Water has always been essential to humanity, yet it is increasingly scarce due to shortages, access issues, and rising consumption. Desalination presents a viable solution for achieving water security, particularly in water-stressed regions. As we enter the Fourth Industrial Revolution, technologies like Artificial Intelligence (AI) and the Internet of Things (IoT) are transforming industries, including desalination, by enhancing productivity and lowering energy costs.

The journey towards smart desalination relies on unlocking data's value, enabling AI systems to analyze, predict, and improve operations. This article examines how the Saline Water Conversion Corporation (SWCC) is leveraging AI to enhance its desalination processes.

The Role of Desalination in Water-Scarce World

Water is crucial for nearly all human activities and is fundamental to various industries. The increasing demand for freshwater, driven by continuous population growth, presents a significant challenge as the world grapples with a water scarcity crisis, particularly in regions like the Middle East, which is at the forefront of this issue. As a result, many countries have recognized water desalination as a critical source of freshwater.

In Saudi Arabia, desalinated seawater is the primary water source, with the country producing over 7.6 million cubic meters (MCM) of desalinated water daily, accounting for 22% of the world's total desalinated water, meeting an urban demand of 9.6 MCM/day, while the remainder is sourced from groundwater.

The global desalination market was valued at $14.5 billion in 2021 and is expected to grow to $35.5 billion by 2031.This growth reflects the increasing reliance on desalination as a solution to water scarcity.

Facing the Facts

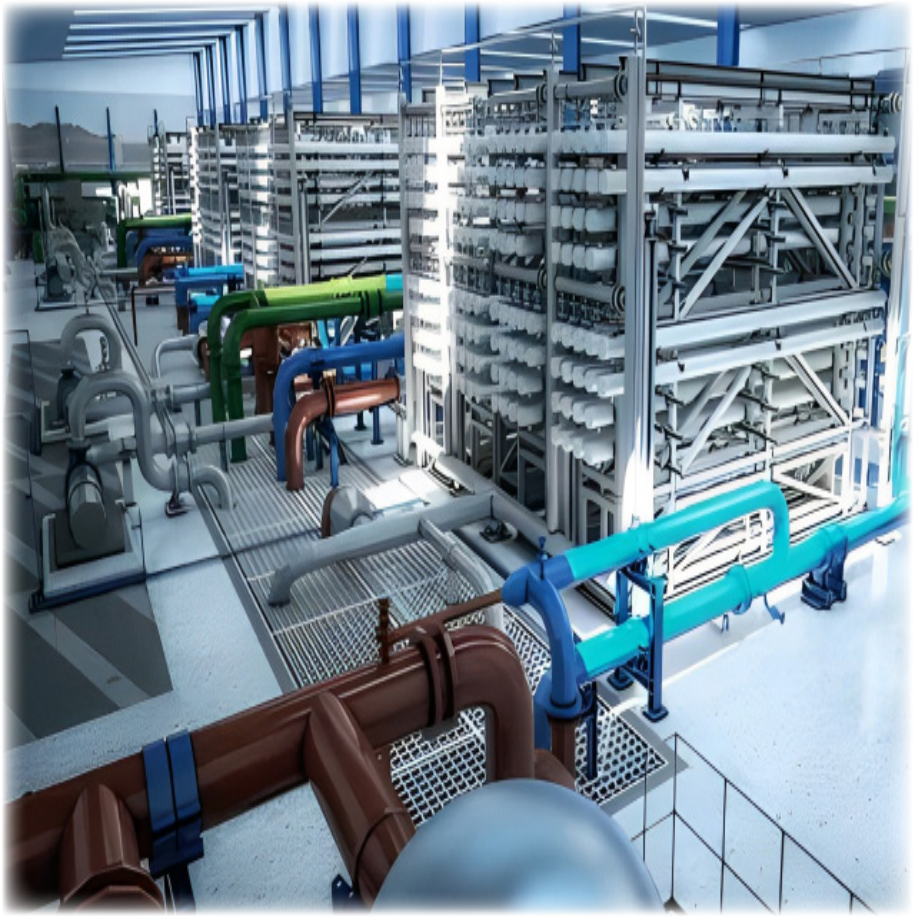
Despite its importance, the desalination industry faces several challenges:

• High Energy Consumption

Desalination is an energy-intensive process, accounting for approximately 0.4% of global electricity consumption. Technologies like Reverse Osmosis (RO) and Thermal Distillation require significant energy inputs, leading to high operational costs and carbon emissions. The energy required for desalination can be substantial, especially during peak demand periods, making it essential to find ways to optimize energy usage.

• Operational Inefficiencies

Many desalination plants operate on outdated systems that lack real-time monitoring and predictive maintenance capabilities.



This can lead to unplanned downtime and decreased productivity. Inefficient operations can result in increased energy consumption, higher maintenance costs, and reduced output quality.

• Environmental Impact

Increased CO2 emissions pose a major challenge; studies indicate the US water production sector contributes 5% of total carbon emissions.

The carbon footprint of RO desalination ranges from 0.4 to 6.7 kg CO2 equivalent per cubic meter.

This means that desalinating 1,000 cubic meters of seawater could potentially release up to 6.7 tons of CO2, highlighting the environmental impact of this process.

• Workforce Challenges

Human error in routine tasks can lead to data entry mistakes and safety risks. Moreover, training for employees working with hazardous materials is often insufficient. Ensuring that the workforce is adequately trained and equipped to handle sophisticated technologies is vital for operational success.

Bridging the Gap with AI

To address these challenges, SWCC is implementing AI solutions to transform traditional desalination processes into smart desalination systems. The integration of AI and the Internet of Things (IoT) enables real-time data analysis, predictive maintenance, and enhanced operational efficiency.

Early Warning Jellyfish Bloom Detector

One of the innovative applications of AI in desalination is the Early Warning Jellyfish Bloom Detector. Jellyfish blooms can block water intakes, forcing desalination plants to shut down.

By utilizing drones equipped with computer vision technology, SWCC can detect and track jellyfish blooms in real-time.

This early warning system allows plant managers to take proactive measures to mitigate potential disruptions. The system uses UAVs (Unmanned Aerial Vehicles) to gather multispectral data from the ocean, identifying areas with a high likelihood of jellyfish blooms.

This data is processed using machine learning algorithms to predict the drift direction of these blooms, enabling timely interventions.

AI-Powered Predictive Maintenance

Condition-Based Maintenance relies on real-time data to perform maintenance only when indicators suggest equipment failure or performance decline, making it proactive yet not fully diagnostic. Predictive Maintenance seeks to anticipate issues before they escalate into critical incidents, reducing risks for employees. Maintenance Optimization uses a system to determine the best maintenance schedule based on various maintenance activities, which is sent to mobile devices. Digital Twin-Based Asset Maintenance employs digital replicas of real-world assets, integrating operational data with engineering aspects to provide insights into performance and potential issues.

This approach optimizes desalination plant performance, reducing downtime and maintenance costs by up to 8%.

Energy and Chemical Management

The Chemicals Management System requires analyzers for water quality, IoT sensors, and energy devices, utilizing technologies like Machine Learning and Trend Analysis. Key chemicals include chlorine, lime, CO2, ferric chloride, sulfuric acid, sodium bisulfite, antiscalant, and caustic soda.

This system optimizes chemical usage, reducing consumption-related costs by up to 7% and promoting eco-friendliness by minimizing energy waste.

By continuously monitoring water quality and historical chemical usage, the system advises operators on optimal chemical dosages. Additionally, energy IoT sensors collect data to enhance energy management and predict inefficiencies, providing real-time insights for better resource utilization and inventory management.

Enhanced Safety and Security

Employee safety is paramount in desalination plants, where workers face potential hazards from chemicals and machinery.

AI-driven solutions can improve safety through real-time monitoring and alerts. For instance, AI can analyze video feeds from surveillance cameras to ensure that employees are wearing appropriate personal protective equipment (PPE). Geofencing technology can also be used to monitor employee locations and ensure they remain within safe zones.

Moreover, AI can facilitate training through virtual simulations, allowing employees to practice emergency procedures and equipment handling in a safe, controlled environment.

Smart Plant Water Grid Systems

To enhance energy efficiency in desalination, a smart grid solution is implemented with energy meters on main and sub-devices, along with a consumption profile in reservoirs. Technologies like AI, machine learning, and IoT are utilized to optimize operations, particularly for high-pressure pumps and chemical dosage systems.

This approach aims to lower production and energy costs, improve sustainability, and extend pump.

lifespan, potentially achieving up to a 3.5% reduction in energy consumption. By monitoring daily consumption profiles, the smart grid system manages component activation to meet production targets while providing operators with actionable recommendations for further savings.

Drone-Based Visual AI for Asset Inspection

Drones are increasingly utilized in desalination plants for various inspection and surveillance tasks.They can inspect water transmission lines for defects or leaks, conduct detailed visual and thermal inspections of produced water tanks to identify corrosion or abnormalities, and monitor for intruders or vandals around the plant and pipelines.

By collecting visual data, drones enhance safety by reducing the need for inspectors to enter hazardous environments.

Required technologies include drones equipped with cameras and integration with mobile operator software, utilizing computer vision and image recognition. This approach boosts reliability, operational performance, and security while potentially decreasing labor inspection costs by up to 30%.

Virtual Simulation for Training

To enhance employee training, SWCC has implemented virtual simulation technologies.

These simulations provide a safe environment for employees to learn about equipment operation and emergency procedures.By immersing employees in realistic scenarios, the training becomes more effective, reducing the likelihood of errors in real-world situations. Virtual simulations can replicate various operational processes, allowing employees to practice their responses to emergencies without disrupting actual plant operations. This approach not only improves employee confidence but also enhances overall safety.

Warehouse & Inventory Automation

Spare part logging using barcodes and QR codes enables real-time inventory management in desalination plant warehouses, allowing managers to track stock efficiently.

Additionally, warehouse automation robots and VR systems facilitate immersive on-the-job training without disrupting production, while simulating dangerous situations to enhance worker safety. The implementation requires ERP software and QR scanners, utilizing technologies like computer vision and robotics.

This approach reduces costs and waste, improves storage tracking, and shortens the time from item request to delivery.

Overall, it can lead to up to a 2% decrease in warehouse-related costs and a 2% increase in supply chain efficiency.

The SWCC AI Roadmap

To successfully implement AI in desalination processes, SWCC has developed a comprehensive AI roadmap aligned with Saudi Vision 2030. This roadmap outlines strategic initiatives aimed at transforming SWCC into a smart organization that leverages AI-driven solutions for operational excellence.

Key Initiatives in the AI Roadmap

- **Data Management and Strategy**: Establishing a robust data management framework to ensure that data collected from various sources is accurate, secure, and easily accessible for analysis.
- **AI Use Case Development**: Identifying and prioritizing AI use cases that align with SWCC's business objectives. These use cases include predictive maintenance, energy optimization, and enhanced safety protocols.
- **Employee Engagement and Training**:

Implementing training programs that equip employees with the skills needed to work alongside AI technologies. This includes immersive training through virtual reality simulations.

- **Collaboration and Partnerships**: Collaborating with technology providers, research institutions, and other stakeholders to foster innovation and share best practices in AI implementation.

Conclusion

The integration of AI in desalination processes represents a transformative shift in how water is produced and managed. SWCC is at the forefront of this revolution, leveraging advanced technologies to enhance operational efficiency, reduce costs, and improve employee safety. As the

global demand for freshwater continues to rise, smart desalination powered by AI will play a crucial role in ensuring water security for future generations. By embracing digital innovation and AI, SWCC is not only addressing the challenges of today but is also paving the way for a sustainable and resilient water future.

Energy Recovery: How can technology that reshaped SWRO advance water reuse and low-pressure desalination?

As the world confronts the harsh realities of climate change and escalating water scarcity, the urgency to utilize unconventional water resources has never been more pressing. Desalination and water reuse can collectively meet our water needs, yet their high energy demands render them expensive solutions. Energy recovery devices (ERDs) present a viable solution, having already revolutionized seawater reverse osmosis (SWRO) by drastically reducing operational costs.

Historically, ERDs have been predominantly used in high-pressure SWRO systems (700–1200 psi), where their impact on energy savings has been profound over 35,000 Pressure Exchanger (PX) ERDs installed globally have collectively saved more than $6 billion in energy costs. However, their application in low-pressure reverse osmosis (LPRO) and wastewater reuse systems (80–700 psi) has been limited, despite the significant energy savings potential. This article explores how advancements in ERD technology, combined with low-pressure membranes and innovative system designs, can transform water reuse and low-pressure desalination into more sustainable and economically viable solutions.

The Importance of Energy Recovery in Desalination

Desalination, particularly through reverse osmosis (RO), has become a vital technology for providing fresh water from saline sources. SWRO typically operates at pressures between 700 and 1200 psi (48–83 bar), while low-pressure RO functions between 80 and 700 psi (5.5–48 bar).

The energy consumption associated with these processes can account for a significant portion of operational expenses (OpEx). Energy recovery devices (ERDs) have revolutionized the desalination landscape by capturing and reusing energy that would otherwise be wasted.

In large seawater desalination plants, the integration of ERDs has become standard practice, leading to substantial reductions in energy costs—over $6 billion saved globally through the use of Pressure Exchanger (PX) ERDs alone.

Delivering Change

ERDs are designed to recover energy from high-pressure brine streams, transferring this energy back into the system to reduce overall power consumption. This technology not only enhances the efficiency of SWRO systems but also presents opportunities for low-pressure RO and wastewater reuse applications, areas that have historically lagged in energy recovery implementation. The integration of ERDs into water treatment systems offers numerous benefits:

• Cost Savings

Implementing ERDs in low-pressure RO systems can lead to substantial cost savings. By recovering waste energy from the brine stream, energy consumption can be reduced by up to 60%. This reduction not only lowers operational costs but also enhances the overall efficiency of the water treatment process.

• Environmental Benefits

The integration of ERDs contributes to a significant decrease in carbon emissions associated with water treatment. By optimizing energy use, these devices help mitigate the environmental impact of desalination and water reuse, aligning with global sustainability goals.

Bringing value to low-pressure RO

The use of low-pressure ERDs, such as the low-pressure pressure exchanger (LP PX), can provide substantial energy savings in these lower-pressure RO applications:

• In municipal applications (70-85% recovery), LP PX can achieve energy savings of 14-28%, with a return on investment (ROI) as little as 2-3 years.

• In industrial applications (70-90% recovery), LP PX can achieve energy savings of 9-28%, with an ROI of 2-4 years.

Synergies with Low-ΔP RO Membranes

Further synergies can be achieved by combining LP PX with new low-pressure (low-ΔP) RO membranes. These membranes allow for maximum energy retention throughout the RO system, enabling more energy to be recovered from the final brine stream.

The benefits of low-ΔP membranes include:

• Improved RO membrane flux distribution and reduced membrane fouling

• Reduced overall ΔP across the RO system, maximizing the available brine energy for recovery using the ERD

• Significantly reduced energy consumption of the RO system, with an attractive ROI .

The combination of low-pressure ERDs and low-ΔP membranes can reduce energy consumption in low-pressure RO applications by up to 43%. This makes these RO systems more sustainable and economically viable, particularly for municipal and industrial water reuse applications where energy costs are a significant operational expense.

Case Studies in Energy Recovery

1. Industrial RO Plant

A notable example of energy recovery in action is a 1.7 MGD (6,435 m^3/d) industrial plant that treats a mix of brackish waters. By retrofitting the facility with low-pressure PX devices and low-ΔP membranes, energy consumption was reduced by nearly a third, resulting in annual savings exceeding $22,000 with a return on investment (RoI) of just two years.

Key Metrics:

- Energy Reduction: 27.1%
- Annual CO2 Savings: 89.6 tons
- Annual Energy Cost Savings: $22,856

2. Municipal Groundwater Treatment Plant

Another compelling case is a 2.0 MGD (7,571 m^3/d) municipal plant treating high TDS groundwater from seawater intrusion.

By employing a standard low-pressure PX and low-ΔP membrane configuration, the facility achieved a 34% reduction in energy consumption, translating to over $180,000 in annual savings.

Optimizing the system further by installing a booster pump pushed energy savings to nearly 45%, with an RoI of less than eight months.

Key Metrics

- Energy Reduction: 43.5%
- Annual CO2 Savings: 906.4 tons
- Annual Energy Cost Savings: $231,247

The Reuse Opportunity

Water reuse is increasingly recognized as an effective solution to combat water scarcity. The demand for high-quality water treatment is on the rise, especially in North America, East Asia, and the Middle East and North Africa (MENA). Utilities and industries are striving to mitigate shortages of high-quality water by treating available effluent to levels that exceed those necessary for discharge or agricultural irrigation.

For both potable and high-value industrial applications, reverse osmosis (RO) is the only technology that can effectively meet most treatment standards.

This results in substantial volumes of pressurized brine, creating a significant opportunity for the advantages of energy recovery devices (ERDs) to be utilized. The integration of ERDs in these contexts can improve the economic viability of RO-based wastewater reuse.

> As Erik Desormeaux from Energy Recovery noted, There is no single larger opportunity to save energy in a water reuse flow sheet than to include an ERD.

• Potable Reuse Growth Growth

The potable reuse market is expected to expand significantly, with forecasts indicating a 716% increase in capacity from 2015 to 2034. North America alone expects to grow from 2.87M m^3/d (2025) to 4.35M m^3/d (2030).This growth underscores the critical role that ERDs can play in making water reuse economically viable. For example, a reduction in water production costs by approximately 6% could yield an RoI in as little as six months, assuming a 30% energy saving.

Flexibility and Efficiency

Isobaric Energy Recovery Devices (ERDs) provide a versatile solution adaptable to various technologies and feedwater conditions. They are designed to enhance efficiency and reduce costs while accommodating a wide range of plant designs and operational parameters without sacrificing flexibility.

• Handling Inconsistent Feedwater Conditions

One significant advantage of isobaric ERDs is their ability to manage inconsistent feedwater conditions.

These devices can effectively handle fluctuations in feedwater quality, flow, and pressure, ensuring cost savings even under challenging circumstances.

Unlike pumps and turbines, which suffer efficiency losses with changing flow and pressure, isobaric ERDs automatically adjust to varying system conditions. They boast uptimes of up to 99.8% with minimal maintenance due to having only one moving part. This reliability is particularly crucial in industries like food and beverage, chemicals, pulp and paper, and textiles, where wastewater characteristics can vary significantly due to batch processing or fluctuating production rates.

• Compatibility with Innovative RO Configurations

Isobaric ERDs, such as the PX model, are also compatible with innovative reverse osmosis (RO) configurations, including semi-batch systems like closed-circuit RO (CCRO) and flow-reversal RO (FRRO). These unconventional setups can yield greater recovery rates at higher pressures, making the economic benefits of ERDs even more pronounced compared to traditional systems.

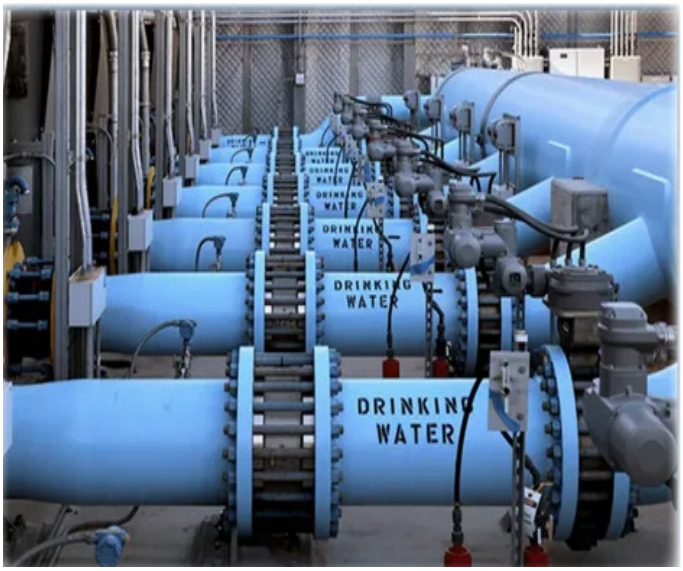
By integrating ERDs with these advanced RO configurations, facilities can optimize energy recovery and enhance overall efficiency.

This compatibility underscores the flexibility and adaptability of isobaric ERDs across diverse water treatment applications, ensuring that users can realize the advantages of energy recovery regardless of their specific requirements.

Global Sustainability Benefits of ERD Adoption

The implementation of energy recovery devices (ERDs) in reverse osmosis (RO) water treatment systems can have substantial sustainability benefits at the global level. Due to the energy-intensive nature of RO, even in lower pressure applications, the widespread adoption of ERDs could lead to significant electricity and carbon savings.

Some regions, such as California, already offer incentives for energy use reductions and carbon credits for larger projects that incorporate ERDs.



By 2030, if ERDs are installed at every RO reuse plant, the annual electricity savings could be equivalent to powering more than 450,000 electric vehicles driving 15,000 km per year or meeting the total electricity demand of the Bahamas.

The CO2 emissions savings would be equivalent to removing 600,000 modern gas-powered cars from the roads or offsetting the emissions of a 125 MW coal-fired power plant. These global benefits underscore the crucial role that ERDs can play in making RO-based water treatment, including desalination and water reuse, more sustainable and economically viable. Widespread adoption of this technology can contribute significantly to addressing the challenges of climate change and water scarcity worldwide.

Conclusion

The integration of energy recovery devices in low-pressure reverse osmosis systems presents a transformative opportunity for enhancing water reuse and desalination processes. By reducing energy consumption, lowering operational costs, and minimizing environmental impact, ERDs can play a pivotal role in addressing the global water crisis. As demand for sustainable water solutions continues to grow, leveraging innovative technologies like ERDs will be essential for creating a more resilient and efficient water management landscape.

Revolutionizing Stormwater Management: The Role of Digital Tools in Green Infrastructure

Urbanization has profoundly impacted watersheds, necessitating a reevaluation of stormwater management strategies.

Historically, approaches centered on the "design storm" methodology led to the construction of numerous stormwater control measures (SCMs), such as detention and retention ponds.

While these measures aimed to mitigate flood risks and enhance water quality, they often fell short due to regulatory constraints and inadequate master planning. This article explores how digital tools are revolutionizing green infrastructure, focusing on innovative planning, design insights, and transformative applications that address contemporary challenges.

Evolving Challenges and the Need for Innovation

The concept of green infrastructure emerged to address the limitations of traditional stormwater control measures (SCMs). By utilizing techniques such as infiltration, filtration, and vegetation, bioretention and other SCMs have significantly transformed stormwater management practices. However, regulatory constraints often hindered the development of larger regional ponds, and site-specific SCMs implemented without comprehensive master plans frequently failed to enhance water quality or mitigate flood risks. Moreover, some implementations led to the degradation of downstream streams.

As a result, bioretention and similar SCMs are collectively referred to as "green infrastructure." Over time, the variety of SCMs has expanded, with detailed specifications provided for practices such as permeable pavement, constructed wetlands, and stream restoration. In the last 10 to 15 years, the demand for innovative SCM planning has increased due to challenges like climate change, extreme weather events, and rising pollution levels in waterways.

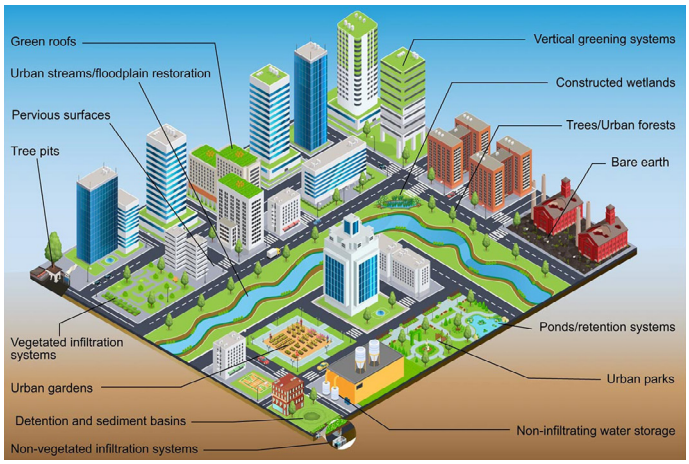
Green infrastructure has gained recognition as a vital tool for reducing pollution, protecting waterways, managing combined sewer systems (CSSs), and enhancing resilience against flooding. Well-planned SCMs can adapt to shifting precipitation patterns caused by climate change while also promoting economic development in urban areas. As we move into an era dominated by Artificial Intelligence (AI), digital tools are revolutionizing the planning and implementation of green infrastructure, presenting transformative applications that can significantly improve stormwater management.

Transforming Green Infrastructure Planning

Traditional green infrastructure (GI) planning relied heavily on GIS desktop analysis and field screening to identify suitable sites for implementation. However, advancements in technology and digital tools have significantly transformed this approach, making it more efficient and cost-effective. These modern tools not only streamline the identification of feasible sites but also enhance user involvement in the planning process.

The integration of digital tools into green infrastructure planning offers several key benefits:

- **Enhanced Efficiency and Collaboration:** Streamlined project planning improves accuracy and fosters stronger collaboration among teams.
- **Climate Resilience Integration:** Digital tools facilitate the incorporation of climate resilience considerations into GI strategies.
- **Strengthened Stakeholder Engagement:** Improved communication with agencies and stakeholders builds stronger partnerships.
- **Real-Time Monitoring and Adaptation:** Digital platforms enable continuous monitoring and adaptive management of GI projects.
- **Dynamic Master Planning:** Creating a living Master Plan allows for ongoing updates to meet changing needs and priorities.



Case Study: RVAH$_2$O Green Infrastructure Master Plan

A notable example of this evolution is the RVAH$_2$O Green Infrastructure Master Plan developed by the city of Richmond, in partnership with the Alliance for the Chesapeake Bay and supported by Arcadis. This initiative aims to expand and accelerate the goals of the RVAH$_2$O program, which focuses on improving the Chesapeake Bay watershed's lands and waters.

Richmond has become a pioneer in Virginia by integrating wastewater, stormwater, and combined sewer systems into a single watershed management program through its first Virginia Pollutant Discharge Elimination System (VPDES) permit.

This integrated approach is designed to maximize pollutant reduction in compliance with the Chesapeake Bay total maximum daily load (TMDL). The Department of Public Utilities (DPU) initiated RVAH$_2$O in 2014 to tackle stormwater quantity and quality issues, promoting GI as part of its outreach and partnership efforts.

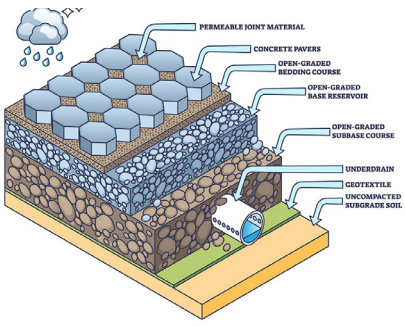
The primary goal of the RVAH$_2$O Green Infrastructure Master Plan is to identify opportunities for incorporating GI in public spaces and right-of-way areas to manage stormwater effectively.

Master Plan Approach

To achieve its objectives, Richmond developed a digital Green Infrastructure Ranking Tool (GI Ranking Tool) to prioritize public parcels with the highest potential for GI implementation. The focus was on three heavily polluted watersheds: Cannon's Branch/Shockoe Creek, Gillies Creek, and Manchester Canal/Goose Creek. These areas, comprising 537 public parcels, are particularly vulnerable to flooding due to outdated collection systems and their proximity to the James River.

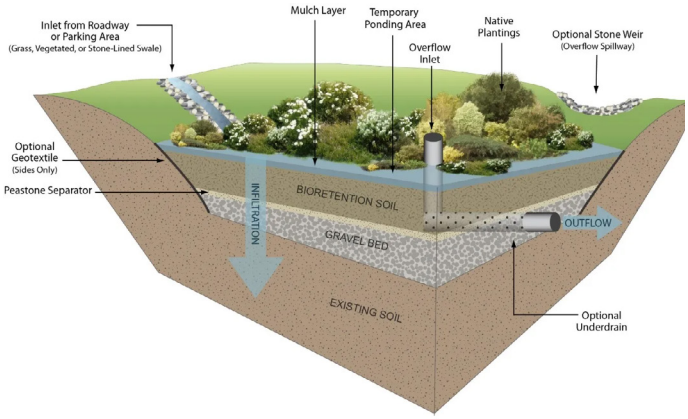
Types of Green Infrastructure

The plan emphasizes the integration of GI with traditional gray infrastructure to enhance stormwater management. The two primary GI types favored by city staff are permeable pavement systems and bioretention.



- **Permeable Pavement Systems:** These include permeable asphalt, concrete, and pavers, chosen for their maintenance compatibility with the city's existing equipment and staff.
- **Bioretention:** This practice provides both vegetation and effective water quality treatment benefits, making it a preferred choice for the plan.

Additional GI practices promoted by DPU include reforestation and tree planting, which contribute to increasing tree canopy and mitigating the urban heat island effect. Rainwater harvesting devices, such as cisterns and rain barrels, are also encouraged for their small footprint, making them suitable for urban settings.



Green Infrastructure Ranking Tool

Despite the mainstream adoption of GI, retrofitting it in developed areas presents challenges due to existing utilities, unsuitable soils, and various surface and subsurface constraints. To address this, the RVAH$_2$O plan employed a five-step GIS site screening approach:

- **Flow Availability:**
  Screening parcels based on tributary volume.
- **Site Availability:**
  Assessing adequate space for different GI types.
- **Site Suitability:**
  Eliminating locations with conflicts from existing structures and utilities.
- **Score GI Performance:**
  Identifying sites based on estimated benefits.
- **Select Target GI:**
  Choosing sites for conceptual design development.

Performance Criteria and Results

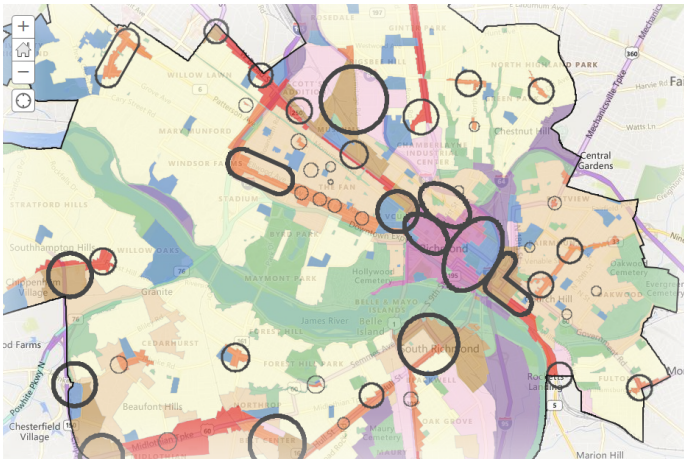
The GI Ranking Tool utilized eleven performance metrics to evaluate potential sites, categorizing them into four tiers based on their importance. The results indicated that bioretention areas in open public parcels and spaces between curbs and sidewalks had the highest number of qualified sites. In contrast, bioretention in parking lots and green alleys yielded fewer suitable locations.

Maps generated by the GI Ranking Tool provided visual representations of site rankings for each GI type, allowing city departments to evaluate optimal locations.

Two primary tools were developed for this purpose:

• ARCGIS Maps:

These maps enable users to explore individual parcels, view site features, and assess potential constraints. Users can toggle layers, such as utility conflicts, for clarity.



• Power BI Interface:

This interactive tool complements the ARCGIS maps, allowing users to access and modify scoring and weighting information for parcels and GI types.

These tools facilitate collaboration with stakeholders outside the city, enabling them to gather and evaluate GI ranking information effectively.

Washington, D.C. Green Infrastructure Project

A similar approach was employed in Washington, D.C., where the Department of Transportation (DDOT) initiated a green infrastructure project.

This initiative involved the planning and design of green infrastructure across 2,000 acres within four sub-watersheds. The Arcadis team, in collaboration with DDOT, created a GIS tool to assess, evaluate, and identify locations for managing runoff from 10 acres of impervious surfaces using GI practices such as bioretention, rain gardens, porous pavement, pavement removal, tree pits, and green alleys.

They utilized GIS data layers along with defined screening and scoring criteria to rank or eliminate potential GI sites along the DDOT right-of-way. Through the GIS site screening and scoring process, the team effectively narrowed down GI locations over a large area, significantly reducing the time and effort required for field inspections.

Transformative applications

Green Infrastructure (GI) is rapidly evolving, recognized for its crucial role in tackling complex environmental challenges. To create sustainable and impactful solutions, it is essential to strategically integrate green and gray infrastructure, fostering a balanced and resilient approach that ensures long-term program success. Here are some innovative applications demonstrating this synergy:

Regenerative Stormwater Conveyances (RSCs)

RSCs represent a hybrid solution that combines natural systems with engineering techniques to treat and convey stormwater. These systems utilize materials like sand, wood chips, native vegetation, and features such as riffles and shallow pools to manage water flow while minimizing erosion. Successful case studies of RSCs have been implemented in states like Maryland, Virginia, and Georgia. Notably, Virginia has incorporated RSCs into its new Stormwater Management Handbook developed by the Department of Environmental Quality in 2024.

Nature-Based Solutions

Nature-based solutions (NbS) involve actions that protect, sustainably manage, or restore ecosystems to address societal challenges, including natural hazard risks and air quality improvement. A report by the Institute for Defense Analyses, titled "Nature-Based Solutions: Evidence for Hazard Risk Reduction and Ecosystem Services," highlights the increasing risks posed by climate change, urban development in hazard-prone areas, and the degradation of natural services. This initiative, supported by the White House Office of Science and Technology Policy, emphasizes the need to understand the performance of both engineering systems and nature-based solutions. The report evaluates 23 NbS to address seven hazards and provide four ecosystem services, showcasing the importance of continued innovation in this field.

Emerging Innovations

Numerous emerging innovations are transforming stormwater management and the application of GI:

• Smart GI Systems:

These systems integrate Internet of Things (IoT) technology and sensors for real-time monitoring and adaptive management of stormwater systems.

• Decision Support Platforms and Digital Twins:

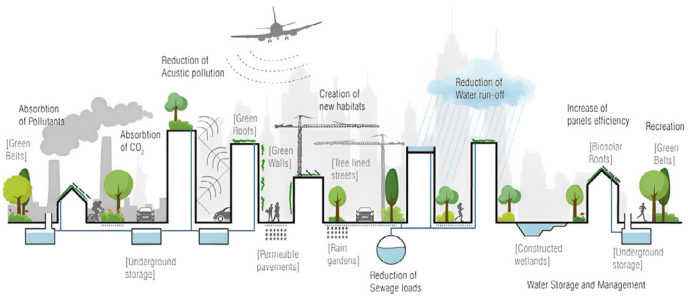
These platforms facilitate learning about the performance of stormwater systems, including GI. They can be linked to stormwater asset management systems to enhance operations and maintenance while reducing costs.

• Resilient GI Designs:

Innovations in GI design are tailored for specific challenges such as flood mitigation and urban heat island reduction, ensuring that green infrastructure is effective in diverse urban environments.

Conclusion

The evolution of green infrastructure planning, exemplified by initiatives like the RVAH2O Green Infrastructure Master Plan and the DDOT project, demonstrates the power of digital tools in enhancing stormwater management. These advancements not only improve site selection efficiency but also foster collaboration among stakeholders, ultimately contributing to more sustainable urban environments. As cities continue to face challenges related to stormwater management, the integration of innovative technologies will be crucial for developing effective and resilient green infrastructure solutions.



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Acwa Power Signs $500 Million MoUs with US Firms to Boost Energy Innovation and Sustainability

Acwa Power has signed Memorandums of Understanding (MoUs) worth $500 million with several leading US companies during the Saudi-US Investment Forum in Riyadh, strengthening the Saudi-US strategic alliance. These agreements focus on collaboration in solar energy, green hydrogen, and seawater desalination, aiming to reduce energy costs and boost local production in Saudi Arabia. Notable partnerships include GE Vernova for innovations in gas turbine projects, Baker Hughes for advancements in green hydrogen production, and KBR for ammonia technology deployment. Acwa Power's Vice Chairman, Raad Al-Saady, highlighted these partnerships as investments in Saudi Arabia's future, aligning with Vision 2030's goals for renewable energy and economic diversification.

Synera Renewable gains controlling stake in Formosa 2 offshore wind farm

Synera Renewable Energy Group (SRE) has increased its stake in the Formosa 2 offshore wind farm by 26%, securing a majority controlling interest of 51%. Formosa 2 is notable for being the first project to achieve commercial operations in Taiwan's second phase of offshore wind development. This strategic decision reflects SRE's long-term investment focus on stability and growth, ensuring that the asset's pricing aligns with fair market value, which promotes a stable offshore wind industry in Taiwan. SRE chairperson Lucas Lin emphasized that this acquisition enhances the wind farm's performance and governance, ensuring a reliable supply of clean energy for Taiwan's export-oriented industries.

Masdar-EDF JV Emerge and Turbotim Launch 1.52MWp Solar + 5MWh Battery Storage Project to Replace Diesel Power at Ras Al Khaimah Facility

Emerge, a joint venture between Masdar and the EDF Group, has partnered with UAE-based Turbotim to develop a hybrid solar and battery energy storage project at Turbotim's Ras Al Khaimah facilities. The agreement, signed at the Make it in the Emirates Forum, involves installing two rooftop solar photovoltaic (PV) systems with a total capacity of 1.52 MWp, alongside a 2.5 MWh battery energy storage system. This transition from diesel generators is expected to significantly reduce Turbotim's carbon footprint and energy costs, preventing over 2.1 million tons of CO_2 emissions annually. The project supports the UAE's sustainability goals and promotes industrial decarbonization and renewable energy integration.

Veolia and Star Energy to advance geothermal energy projects in UK

Veolia has signed a memorandum of understanding (MoU) with Star Energy to promote geothermal energy in the UK, supporting the country's net-zero targets. The partnership aims to replace fossil fuels in district heating systems, commercial properties, hospitals, and educational facilities with renewable geothermal energy. The collaboration will involve advanced modeling, seismic studies, and directional drilling techniques to develop sustainable heating solutions that integrate with existing infrastructures. Veolia will leverage its expertise in managing over 120 community heating schemes in the UK and around 600 worldwide. Star Energy's CEO emphasized the importance of geothermal energy in the UK's transition to sustainable heat provision and achieving net-zero by 2050.

Sungrow Launches Arctic-Edge 60MWh Battery Project to Boost Finnish Grid Stability

Sungrow has successfully deployed a 60MWh Battery Energy Storage System (BESS) in Simo, Finland, marking a significant milestone in enhancing the country's renewable energy infrastructure. Located less than 100 kilometers south of the Arctic Circle, this facility is among the northernmost battery storage projects globally. The project, part of the FRV AmpTank joint venture, features 26 PowerTitan battery containers, providing 30MW of power output and 60MWh of storage capacity to improve grid stability as Finland integrates more renewable energy sources. Sungrow's technology was chosen for its reliability and competitive maintenance support. This modular system, designed for harsh environments, demonstrates Sungrow's commitment to facilitating the global transition to clean energy and supporting Finland's sustainable power goals.

LONGi's High-Efficiency BC Modules Gain Momentum in Europe With 10GW Deployed & 20GW In Progress

At Intersolar Europe 2025, LONGi announced it has surpassed 10 gigawatts (GW) of back contact (BC) solar modules deployed in Europe, underscoring the region's leadership in high-efficiency solar technology. The Hi-MO 9 module, featuring 24.8% efficiency and up to 670 watts output, has significantly contributed to this achievement, enhancing energy yields across diverse climates. In 2024, LONGi shipped a total of 17 GW of BC modules worldwide, supported by a strong order pipeline. The Hi-MO 9's advanced design minimizes land use while integrating seamlessly with modern energy systems. LONGi continues to scale up production to meet rising demand across Europe, ensuring timely delivery for various projects.

Arab Energy Fund & Stonepeak Join Forces in $1 Billion Deal to Build Energy Infrastructure across Middle East

The Arab Energy Fund has formed a strategic partnership with Stonepeak, the largest independent infrastructure firm, to invest in energy infrastructure projects across the MENA region. Khalid Ali Al-Ruwaigh, CEO of The Arab Energy Fund, emphasized that this collaboration aims to mobilize global capital to enhance the region's energy landscape, focusing on resilient and future-ready energy platforms to boost economic growth and energy security. The partnership will leverage the Arab Energy Fund's regional expertise and Stonepeak's global investment experience to support energy sector companies and expand critical infrastructure. Stonepeak's leadership highlighted the Middle East's energy diversification goals as a key focus for this initiative.his project marks the first EIB-Iberdrola collaboration backed by SACE.

Equinor, Polenergia reach €6bn financial close for Bałtyk offshore wind

Equinor and Polenergia have achieved financial close for the Bałtyk 2 and Bałtyk 3 offshore wind projects, valued at over €6 billion ($6.8 billion), marking the largest project finance transaction in Poland's energy sector. Each project has secured finance packages exceeding €3 billion, involving around 30 Polish and international financial institutions including the European Investment Bank and Bank Gospodarstwa Krajowego. The projects will consist of 100 fixed-bottom turbines with a total capacity of 1.4 GW, with construction set to begin soon. Full commercial power production is anticipated by 2028, providing energy to over two million Polish households and enhancing the country's energy security.

GE Vernova to Deliver Norway's First SF6-Free 420 kV Substations in Major Grid Modernization Effort

GE Vernova Inc. is set to deploy two high-voltage 420 kV gas-insulated substations (GIS) free of sulfur hexafluoride (SF6) for Norway's Statnett and Equinor. Awarded in Q4 2024, the project includes the design, supply, and installation of substations at Skaidi and Hyggevatn, supporting Norway's energy transition and carbon reduction goals. The Skaidi substation will upgrade an existing facility, while Hyggevatn will be newly constructed. Both will utilize GE Vernova's g^3 technology, significantly reducing global warming potential compared to SF6. This initiative aims to modernize the national grid, boost transmission capacity, and facilitate electrification, marking a significant milestone in the decarbonization efforts within the energy sector.

Iberdrola and Schneider Electric Celebrate Net-Zero Factory

Iberdrola España and Schneider Electric celebrated the inauguration of a Net-Zero CO_2 factory in Molins de Rei, Barcelona, alongside a new microgrid project. The event highlighted the microgrid's role in enhancing competitiveness and sustainability through self-consumption, battery storage, and energy management. Key representatives emphasized the economic benefits of electrification, showcasing how it can lead to more resilient facilities. Josu Ugarte of Schneider Electric noted the project's replicable and scalable nature, demonstrating the potential for combining electrification and digitization to transform industry. This initiative reinforces both companies' commitment to sustainability, showcasing innovative solutions that contribute to decarbonization and the broader energy transition.

Siemens Energy expects up to 15% revenue growth for FY25

Siemens Energy expects a revenue growth of 13–15% for fiscal year 2025, driven by strong order momentum, as reported in its Q2 earnings. The company achieved a 20.7% revenue increase to €10 billion in Q2, with orders rising 52.3% to €14.4 billion. Growth was noted across all segments, particularly in Grid Technologies and Gas Services, which saw record quarterly orders. Profit before special items surged to €906 million, resulting in a 9.1% profit margin. Net income increased to €501 million, with basic earnings per share at €0.50. Siemens anticipates a profit margin of 4%–6% for FY25 and revised free cash flow expectations to €4 billion.

Siemens Energy expects a revenue growth of 13–15% for fiscal year 2025, driven by strong order momentum, as reported in its Q2 earn-

TotalEnergies has inaugurated its largest solar power plant cluster in Europe, located near Sevilla, Spain, featuring five interconnected projects with a total capacity of 263 megawatts. This facility is expected to generate around 515 gigawatt-hours of renewable electricity annually, enough to power over 150,000 households, while reducing carbon emissions by approximately 245,000 tons each year. A significant portion of the electricity will be sold through long-term power purchase agreements (PPAs). The project has created around 800 jobs and utilized 400,000 bifacial solar panels. Olivier Jouny emphasized the project's contribution to Spain's renewable energy goals, as TotalEnergies aims for 35 gigawatts of renewable capacity by 2025 and over 100 terawatt-hours of net electricity by 2030.

Global Energy Events

Energy Storage Summit USA

Date: From 26 to 27 March, 2025
Location: Renaissance Dallas Addison Hotel, Dallas Texas

2025 is set to unleash a new wave of opportunity with a strong demand momentum of 62 GW of projected storage additions deployed by 2024 and a record number of projects coming online. California has now well-surpassed 13GW of grid-scale energy storage installations, ERCOT continues to go from strength to strength and notable markets in the Midwest and the Southeast are opening up to new deployment opportunities.

Website: storageusa.solarenergyevents.com

The 13th Energy Storage International Conference and Expo 2025 (ESIE 2025)

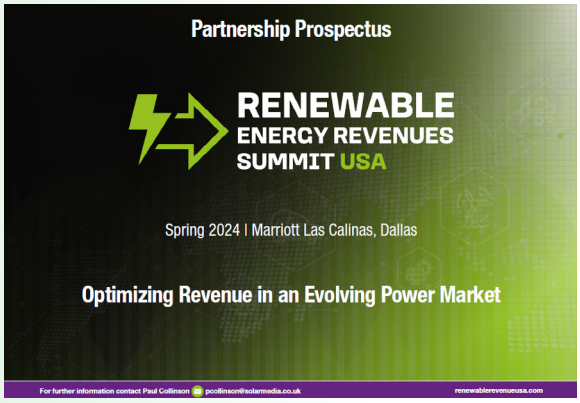
Date: From 10 to 12 April , 2025
Location: Beijine – New China International Exhibition center phase 2

Developed in 2012 by the nation's leading energy storage industry organization, the China Energy Storage Alliance (CNESA), the 13th ESIE in 2025 is the largest, most professional, and international energy storage event in China, acclaimed as the barometer and indicator for the development of the industry.

Website: my.esexpo.org

Renewable Energy Revenues Summit USA 2025

Date: From 23 to 24 April, 2025
Location: Dallas, Texas, USA



To bring buyers and sellers of power together, the Renewable Energy Revenues Summit USA will cover strategies to optimize renewable energy trading, procurement, and offtake structures across U.S. markets.

Website: renewablerevenueusa.com

Large Scale Solar USA 2025

Date: From 29 to 30 April, 2025
Location: Marriott Dallas Las Colinas, Dallas, Texas, USA

Nestled in Dallas, Texas, Large Scale Solar USA Summit is the nexus for project developers, capital providers, utilities, asset managers, and policymakers. Dive deep into the solar industry's transformative growth, learn from the best, and discover strategies to boost utility-scale solar deployment nationwide.

Website: lssusa.solarenergyevents.com

Intersolar Europe 2025

Date: From 7 to 9 May, 2025
Location: ICM München, Munich, Germany

As the world's leading exhibition for the solar industry, Intersolar Europe demonstrates the enormous vitality of the solar market. For more than 30 years, it has been providing a networking opportunity for the key players – from manufacturers, suppliers and distributors to installers, service providers, project developers, planners and start-ups – all under the motto "Connecting Solar Business". It focuses on the latest trends, developments and business models.

Website: www.intersolar.de

Renewables Procurement and Revenue Summit

Date: From 21 to 22 May, 2025
Location: Hilton London Tower Bridge, UK

Revenues Summit serves as the European platform for connecting renewable energy suppliers to the future of energy demand. This includes bringing together a community of European off-takers, renewable generators, utilities, asset owners, and financiers.

Website: renewablerevenue.co.uk

The Battery Show Europe 2025

Date: From 3 to 5 June, 2025
Location: Messe Stuttgart Stuttgart, Germany

Meet battery manufacturers, suppliers, engineers, thought leaders and decision-makers for a conference and battery tech expo focused on the latest developments in the advanced battery and automotive industries.

Website: www.thebatteryshow.eu

PV ModuleTech USA 2025

Date: From 17 to 18 June, 2025
Location: Napa, USA

The event will gather the key stakeholders from solar developers, solar asset owners and investors, PV manufacturing, policy-making and and all interested downstream channels and third-party entities. The goal is simple: to map out the PV module supply channels to the U.S. out to 2026 and beyond.

Website: www.pvtechconferences.com/pv-moduletech-usa

UK Solar Summit 2025

Date: From 1 to 2 July, 2025
Location: Leonardo Royal Hotel London Tower Bridge, London

UK Solar Summit 2025 will look at the role solar currently plays in the energy mix, how this will change over the coming years and how this aligns with net-zero and other government targets.

Website: uss.solarenergyevents.com

Large Scale Solar Southern Europe

Date: From 16 to 17 September, 2025
Location: Athens, Greece

The Southern European solar market has entered a transformative phase, with Greece leading ambitious expansion through its 2030 target of 15GW solar capacity, while Turkey has emerged as a manufacturing powerhouse for solar components.

Website: lssse.solarenergyevents.com

Green Hydrogen Summit USA 2025

Date: From 30 September to 1 October, 2025
Location: The Westin Hotel, Seattle, USA

The hydrogen industry is at a pivotal moment in its evolution. The groundbreaking policy advancements of 2023, including the introduction of 45V tax credits under the Inflation Reduction Act (IRA) and the allocation of $7 billion for regional clean hydrogen hubs through the Bipartisan Infrastructure Law, have set new benchmarks for the sector.

Website: greenhydrogenusa.solarenergyevents.com

Future Energy Asia

Date: From 2 to 3 December, 2025
Location: Rome, Italy

Our 2025 edition will focus on three core themes: Revenue & Trading, the Lifecycle of the Battery, and Optimization Tools for Success. 2025 will see markets such as the Nordics, Iberia, Italy, Germany, UK & Ireland, and the Benelux region, all with market deep dives, helping you to understand how you can position yourself as the front runner with all things Battery Asset Management.

Website: batteryeurope.solarenergyevents.com

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