AquaEnergy Expo Magazine
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August 2025 Issue 20

The International Exhibition & Conference For Water and Energy in the Middle East and Africa

Aqua Energy Expo MEA 2025

Under the Patronage of

AquaEnergy Expo
Middle East & Africa Egypt

Date
24th - 26th September 2025

Cairo International Convention Center (CICC), Cairo, Egypt

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Meter Empowers Utilities: The BlueEdge Suite for Enhanced Water Management

Dii
MENA's Renewable, Hydrogen and Energy Storage Insights 2030 from Dii Desert Energy

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Innovative Solutions to Achieve Sustainability in Water and Energy

From The Editor

In an era where the intersection of water and energy defines our global trajectory, innovation and collaboration have become essential drivers of progress. This edition of the magazine features two key events that embody this necessity: the Aqua Energy Expo MEA and Cairo Water Week (CWW). Both serve as vital platforms fostering dialogue, innovation, and actionable solutions in the fields of water management and sustainable energy.

The Aqua Energy Expo MEA, taking place from September 24-26, 2025, at the Cairo International Convention Centre, is a major event dedicated to integrated resource management in the Middle East and Africa. Bringing together over 200 companies from more than 20 countries, the Expo will showcase cutting-edge technologies in desalination, wastewater treatment, water purification, renewable energy, and smart systems powered by AI. Strongly supported by various Egyptian ministries and governmental authorities, the event reflects Egypt's ongoing commitment to sustainable development, economic growth, and industrial innovation. It offers a dynamic environment for investment, collaboration, and technological exchange among global and regional stakeholders.

Running shortly after the Expo, Cairo Water Week will be held from October 12-16, 2025, at the Triumph Luxury Hotel in New Cairo. Now in its eighth edition and held under the patronage of President Abdel Fatah El-Sisi, CWW is a prestigious international forum focusing on water sustainability and climate resilience. Themed "Innovative Solutions for Climate Resilience and Water Sustainability," this year's gathering will highlight modern strategies to strengthen water systems in the face of climate change challenges such as drought, flooding, and extreme weather. It will feature smart planning tools, nature-based solutions, and policy discussions, emphasizing the importance of sound infrastructure and governance. Furthermore, the event champions youth involvement and innovation, hosting competitions that encourage the next generation to contribute fresh ideas and solutions.

Together, these events underline a unified vision: transforming urgent water and energy challenges into opportunities through collaboration and innovation. They are more than exhibitions—they are catalysts for change, shaping the future of sustainable development in the region and beyond. As the world grapples with resource constraints and environmental pressures, the insights and partnerships formed at the Aqua Energy Expo MEA and Cairo Water Week offer a blueprint for a resilient, secure, and sustainable global future.

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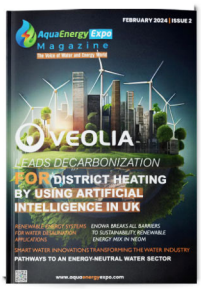

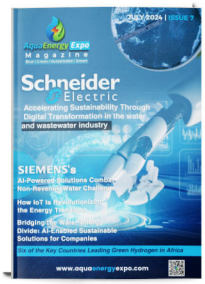

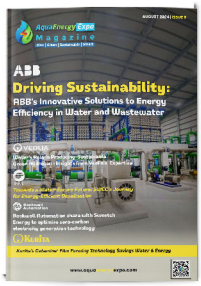

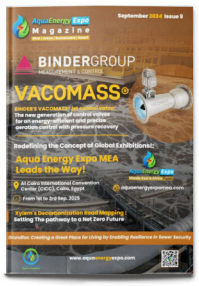

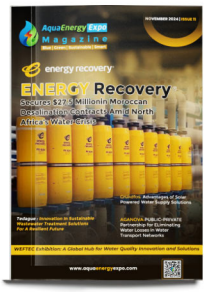

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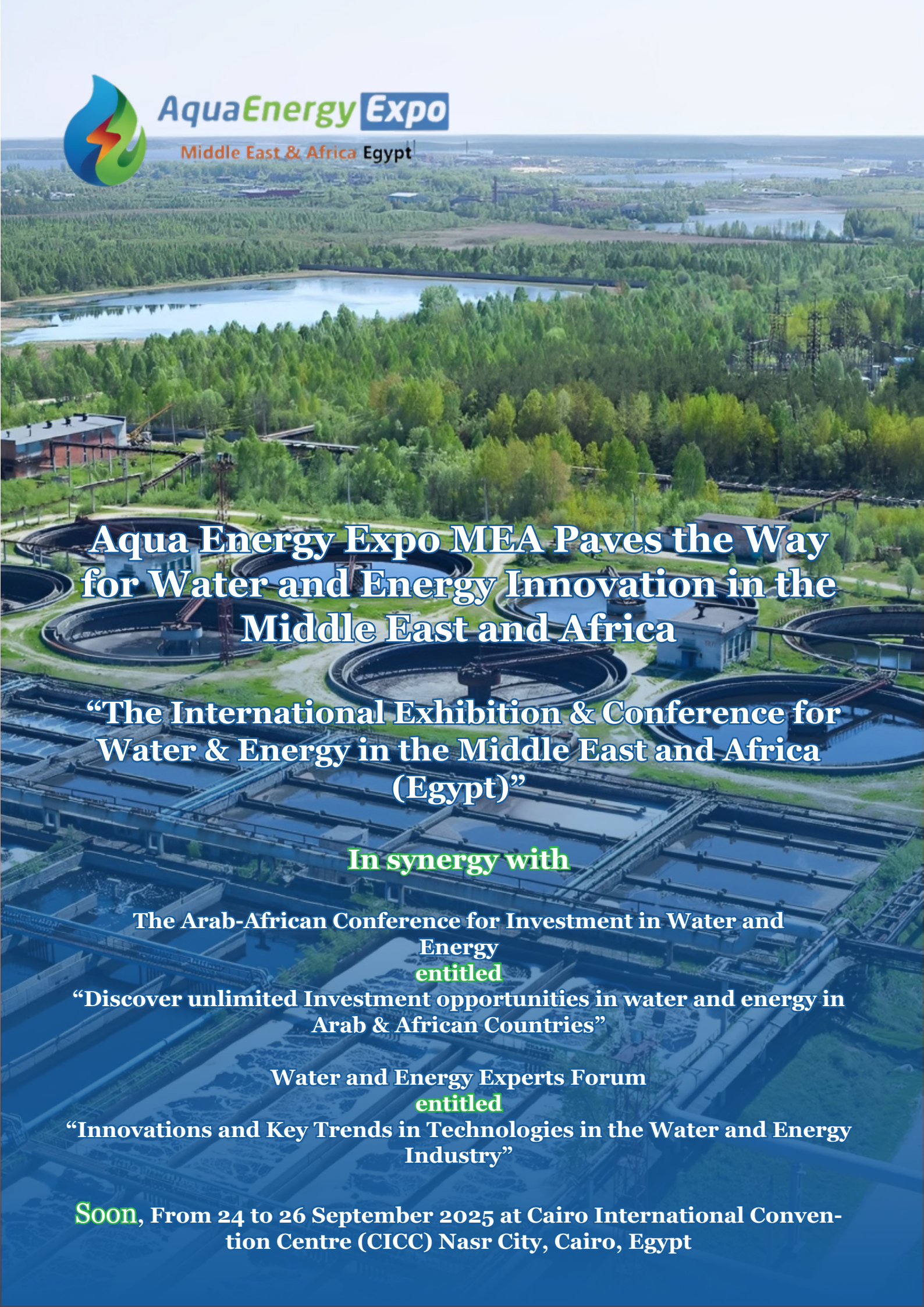


AquaEnergy Expo
Middle East & Africa Egypt

Aqua Energy Expo MEA Paves the Way for Water and Energy Innovation in the Middle East and Africa

"The International Exhibition & Conference for Water & Energy in the Middle East and Africa (Egypt)"

In synergy with

The Arab-African Conference for Investment in Water and Energy
entitled
"Discover unlimited Investment opportunities in water and energy in Arab & African Countries"

Water and Energy Experts Forum
entitled
"Innovations and Key Trends in Technologies in the Water and Energy Industry"

Soon, From 24 to 26 September 2025 at Cairo International Convention Centre (CICC) Nasr City, Cairo, Egypt

As the demand for clean water and renewable energy continues to rise, the Aqua Energy Expo serves as a vital platform for collaboration and inspiration, highlighting the importance of integrated approaches to resource management. The Aqua Energy Expo stands as a pivotal event in the realm of water and energy sustainability, bringing together innovators, industry leaders, and environmental advocates from around the globe. This exhibition promises to showcase groundbreaking technologies and solutions aimed at addressing the pressing challenges of water scarcity and energy efficiency. Attendees will have the opportunity to explore a diverse array of exhibits, participate in insightful discussions, and network with key stakeholders dedicated to fostering a sustainable future.

Collaborative Effort: Aqua Energy Expo Supported by Ministries and Executives

We extend our heartfelt gratitude to the state for its remarkable patronage for The International Exhibition & Conference for Water & Energy in the Middle East and Africa (Egypt), along with the dedicated efforts of the relevant ministries and authorities. Such an initiative is truly unprecedented and serves as a testament to the government's ongoing dedication to fostering economic growth, advancing industrial development, and promoting sustainability.

This level of dedication not only highlights the importance of these sectors but also inspires confidence in the nation's vision for a prosperous and sustainable future.

Under the Patronage of:

With the support of:

- New and Renewable Energy Authority
- Egyptian Electricity Holding Company
- Central Agency for Reconstruction
- The Construction Authority for Potable Water and Wastewater
- General Organization for Physical Planning
- Housing and Building National Research Center
- National Water Research Center
- The International Federation of Arab Businessmen and Investors Abroad
- Egyptian Water Bank

What is Aqua Energy Expo?

The Aqua Energy Expo harnesses the integration of water and energy by focusing on key areas such as water efficiency, energy efficiency, renewable and green energy, sustainability, smart technologies, and innovation. This event aims to stimulate growth and sustainability in the water and energy sectors by bringing together industry leaders, experts, and enthusiasts. By facilitating collaboration and knowledge sharing, the Expo provides a platform for showcasing practical, actionable solutions that can drive businesses forward. Attendees can explore the latest advancements and trends while networking with professionals from various fields.

The Aqua Energy Expo is designed to be a comprehensive resource for all project needs, making it a vital destination for anyone involved in the water and energy industries. Through this gathering, participants can discover new opportunities, enhance their understanding of emerging technologies, and contribute to a more sustainable future.

Join us at Aqua Energy Expo to Explore more!

Exhibition Highlights: Discover the Key Events and Activities Featured in The Exhibition.

• **The exhibition** will feature the participation of more than 200 local and international companies and international brands from over 20 countries, showcasing the latest technologies and best global practices in the drinking water, wastewater treatment, and desalination projects sectors, as well as sustainability applications, renewable energy, digital transformation, and artificial intelligence.

It will also host delegations and representatives of international organizations and trade offices from European and Arab countries, promoting technology localization, tradeexchange, and encouraging exports through the display of various technologies and equipment.

Main Exhibiting Sectors

The Aqua Energy Expo MEA will feature a diverse range of exhibiting sectors, making it a comprehensive showcase of the latest advancements in water and energy technology. Here are some of the main sectors that will be represented:

- Desalination Technologies
- Wastewater Treatment
- Drinking Water Purification
- Pipes & Fittings
- Membranes & Filters
- Pumps
- Valves
- Water Analysis & Testing Equipment
- Smart Water Meters
- Water Treatment Chemicals
- Renewable, Green & Clean Energy
- Irrigation Technologies
- Automation & Instrumentation

• Smart Technologies & AI

• **The Arab-African Conference for Investment in Water and Energy**

entitled

"Discover unlimited Investment opportunities in water and energy in Arab & African Countries" will focus on investment and business opportunities in the water and energy sectors, including financing, manufacturing, supply, export, consulting, engineering services, solutions, technologies, treatment systems, water supply, desalination, and wastewater, as well as industrial plants and networks across various sectors.

• **Water and Energy Experts Forum**

entitled

"Innovations and Key Trends in Technologies in Water and Energy Industry" which includes 7 main themes with more than 40 lecturers and experts from Egypt, Arab and foreign countries.

Connecting with Your Audience: Tailored Solutions for Your Needs

The Expo has a special concern to target visitors of governmental key persons such as:

• The Egyptian prime minister.

• Ministry of Housing, Utilities, and Urban Communities.

• Ministry of Water Resources and Irrigation.

• Ministry of Investment and Foreign Trade.

• Ministry of Industry

• Ministry of Military production

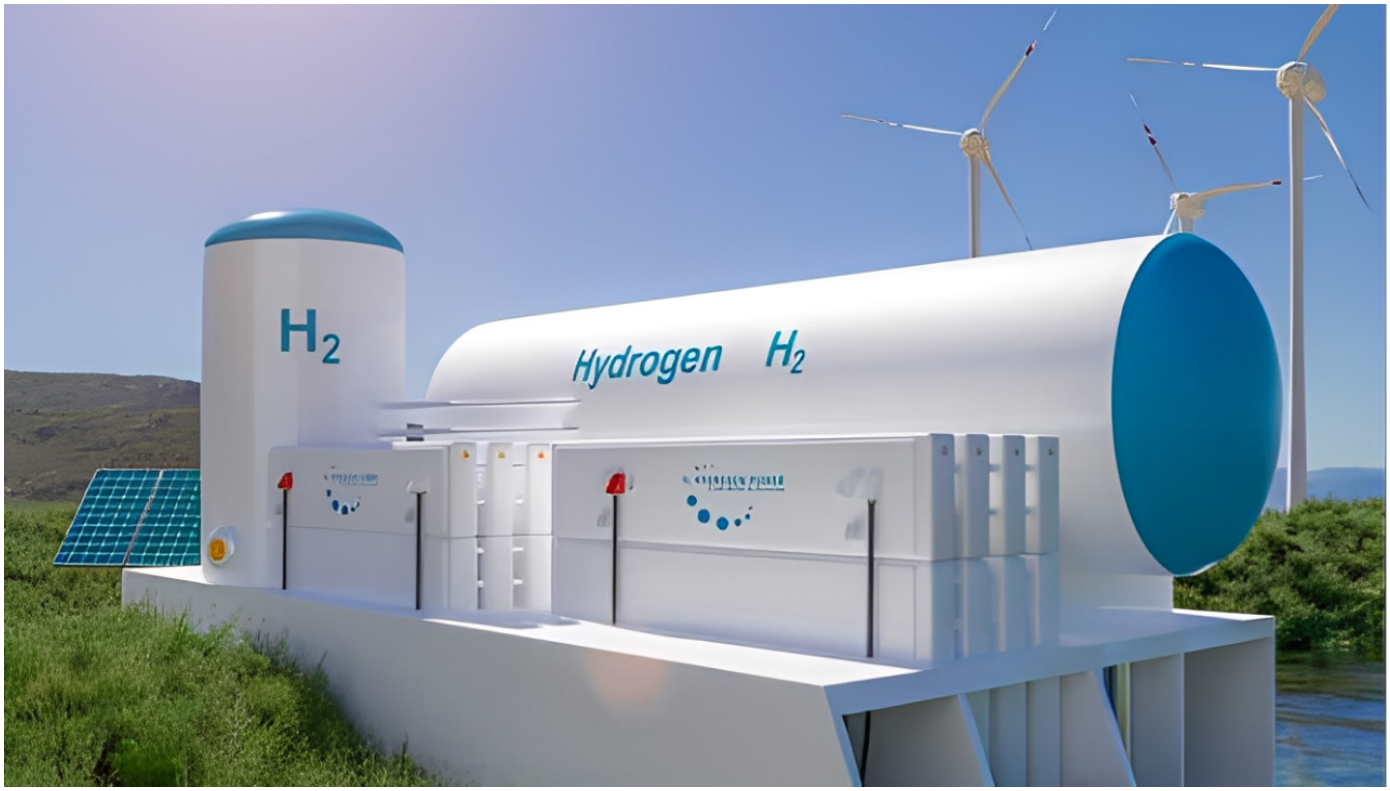
• Ministry of Environment.

• New and Renewable Energy Authority

• Egyptian Electricity Holding Company

• Central Agency for Reconstruction

• The Construction Authority for Potable Water and Wastewater



Sectors of Attendees

- Water/wastewater Contractors
- Water /wastewater Consultancies
- Renewable energy projects contractors
- Consultants
- Distillery / Brewery Units
- Government Agencies/ Bodies
- Ground Water Authorities
- Agencies/ NGOs/ OEMs
- Engineering Organizations
- Environmental Consultants
- Project Finance Companies
- Water Authorities
- Renewable energy authorities
- Water Resources
- Research and Technical Institutes
- Real-estate developers.
- Agriculture/Authorities
- Automobile Manufacturers
- Cement & Glass Industries
- Chemical Plants
- Distillery / Brewery Units
- Educational Establishments
- Fertilizer Manufacturers
- Food & Beverage Industries
- Food Processing Units
- Hospitals/Hotels/ Clubs
- Industrial Estates Authority
- Leather Industries
- Manufacturers of Electrical / Electronics
- Municipal Corporation
- Medical factories
- Paint Industries
- Petrochemical& Pharmaceutical Plants
- Plastic Industries
- Pollution Control Boards
- Power Plants
- Public Utilities
- Public Works Department
- Pulp and Paper
- Refineries
- Rubber Industries
- Oil & gas
- Steel Plants
- Sugar& Textile Industries
- Trade Publications and Research
- Educational and Academic institutes

Why Exhibit at Aqua Energy Expo Middle East and Africa?

Exhibiting at the AquaEnergy Expo MEA offers unparalleled benefits that can significantly elevate your business. Here's why you should consider becoming an exhibitor:

Before the Show

• Unparalleled Year-Round Connectivity

By showcasing your innovative products and services on the dynamic virtual expo platform, you can extend your reach far beyond the event itself. With over 1200 companies and 16,000 products viewed by 6.4 million global viewers, your brand will gain continuous visibility and engagement.

• Powerful Social Media Promotion

Gain visibility through strategic advertisements on AquaEnergy Expo's social media channels, reaching a robust audience of over 300,000 followers on LinkedIn, Facebook, and other platforms. This extensive promotion will elevate your brand's presence even before the show begins.

• Prestigious Magazine Feature

Highlight your company's achievements in the renowned AquaEnergy Expo Magazine.

An article featuring your company, complete with a hyperlinked logo, will connect you directly with potential clients and industry leaders, enhancing your brand's credibility and reach.

• Insightful Webinar Participation

Take advantage of regular webinars held twice a week by global experts in water and energy. Feature your company as a sponsor and hyperlink your profile to engage with an informed and engaged audience. These webinars provide an excellent platform for knowledge exchange and brand promotion.

During the Show

• Valuable Networking Opportunities

Engage with key stakeholders, including representatives from various ministries, government agencies, and the private sector. Build relationships that can drive your business forward and open doors to collaboration and innovation.

• Comprehensive Media and Marketing Campaign

Benefit from a comprehensive media and marketing campaign using key industry publications, street signage, newsletters, and press conferences.

This extensive promotion will maximize your exposure and leave a lasting impression on attendees.

After the Show

• Sustained Visibility

Maintain a strong presence on the virtual expo platform, ensuring ongoing visibility for your products and services. Continue to attract attention and generate leads long after the event concludes.

• Engaging Follow-Up Webinars

Participate in follow-up webinars to further engage with your audience. Present updates, new offerings, and keep the conversation going with potential clients and partners.

• Continued Magazine Features

Enjoy additional articles and features in the Aqua Energy Expo Magazine. Keep your brand in the spotlight and share your latest advancements with a global audience.

Register now and join us! at the Cairo International Convention Center from September 24 to 26, 2025.

Book your space now!

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FILTRALITE®

“Filtralite® Clean Is Redefining Wastewater Filtration Standards”

Around the globe, communities and industries are facing mounting challenges in securing clean, safe water. Rapid urbanization, climate change, aging infrastructure, and rising energy costs are placing unprecedented pressure on water utilities and treatment plants. In response, there is a growing demand for sustainable, high-performance filtration technologies that can not only improve water quality, but also reduce environmental and operational burdens.

In this context, Filtralite®, a filtration media brand developed by Saint-Gobain, has emerged as a game-changer. With a focus on innovation, efficiency, and sustainability, Filtralite® offers a range of filter media products tailored to meet the evolving needs of modern water treatment systems. One of its standout products, Filtralite® Clean, is a leading solution for wastewater treatment applications. Let's have a focus

What is Filtralite® Clean?

Filtralite® Clean is a high-performance filter media produced from expanded clay aggregates, made through a carefully controlled thermal process that transforms natural clay into a highly porous and lightweight material. This unique structure provides a significantly larger surface area than traditional media, allowing for superior retention of suspended particles and contaminants.

Available in various grain sizes, the product is adaptable to a wide range of filtration setups, whether in mono-media or dual-media configurations. It is especially valued for its longer filter runs, enhanced removal efficiency, and lower frequency of backwashing, all contributing to cost savings and operational resilience.

Engineered for Performance

Filtralite® Clean is specifically developed cifically developed for biological treatment and tertiary filtration in wastewater treatment plants. Its unique porous structure offers ideal conditions for biofilm growth and improved water flow through the filter bed. This translates into more contaminants being retained and adsorbed, greater filtration capacity, and significantly reduced operational costs.

In biological reactors, Filtralite® Clean sup-

ports both aerobic (nitrification and organic matter removal) and anoxic (denitrification) processes. Its high surface area and void ratio promote robust biomass development, while its mechanical filtering ability efficiently captures suspended solids. These features contribute to a process that is not only more effective but also more durable, boasting a media lifespan of up to 30 years in biological filters.

For tertiary filtration applications, Filtralite® Clean stands out with its high porosity, enabling:

- Lower initial and slower-building head loss
- Higher particle storage capacity
- Extended intervals between backwashes (by approximately 25%)
- Reduced backwash water use and energy consumption

Existing systems using Filtralite® Clean already achieve filtration rates of 15–20 m/h, a benchmark that showcases the media's superior efficiency.

A Tailored Solution for Every Need

Filtralite® Clean is available in both round and crushed forms, with various grain sizes and densities to suit specific design and performance requirements. These customizable properties make it a versatile solution for a wide range of wastewater treatment settings, from compact urban systems to large-scale municipal installations. Additionally, Filtralite® Clean complements other products in the Filtralite® range, like Filtralite® Pure that's designed for drinking water treatment.

The Sustainable Choice

Filtralite® media is manufactured by heating clay to around 1200°C, followed by controlled crushing and sieving. This process results in a material that combines low density with high durability, impact resistance, and porosity, hallmarks of a long-lasting and environmentally responsible product.

As wastewater treatment facilities evolve to meet the demands of the 21st century, Filtralite® Clean offers a proven, forward-looking solution that supports sustainable water management, operational efficiency, and urban resilience.

Case Study (1): Filtralite® Clean Enhances Wastewater Treatment in Dalian, China

In 2000, the city of Dalian, China, inaugurated a new wastewater treatment plant designed to serve a population of 432,000 people, treating up to 120,000 cubic meters of wastewater per day. To meet the stringent effluent standards

set for the facility, a biological treatment system with fixed-bed technology was implemented powered by Filtralite® Clean filter media.

Treatment Process Overview

The treatment process begins with standard pre-treatment, including screening and grit/grease removal. This is followed by primary sedimentation in four tanks using lamellar sedimentation technology.

The core biological treatment system is composed of two stages:

1.First Stage – Organic Matter Removal

- Consists of BOD, COD and SS removal in 12 biofor filters.
- In these filters round expanded clay aggregates, Filtralite® Clean, are used as carriers for the biofilm.
- Process air blowers aerate the filters.

2.Second Stage – Nitrification

- Another 12 biofor filters, with the same surface area, are dedicated to nitrification.
- These filters use crushed Filtralite® Clean as the filter media.
- Air is supplied by blowers to promote biological activity.

Performance Results

Parameter	Influent (mg/L)	Required Effluent (mg/L)	Achieved Effluent (mg/L)
BOD_5	216	< 10	3
COD	480	< 40	30
SS	350	< 10	8
NH_4-N	–	< 5	1.1

These results demonstrate Filtralite® Clean's effectiveness in consistently surpassing treatment targets, particularly for organic matter and ammonium removal. Approximately 40% of the treated effluent is disinfected with chlorine and reused as industrial water, significantly reducing freshwater demand in the region a strong step toward circular water use and sustainability.

Case Study (2): How Filtralite® Clean is Helping Keep the Mediterranean Sea Clean

Malta, an island nation surrounded by the pristine waters of the Mediterranean, once faced a critical challenge: the majority of its domestic wastewater was discharged untreated into the sea. In 2005, only 6.4% of household wastewater was being treated, leaving the rest to pollute the marine environment.

To meet the standards of the Urban Wastewater Treatment Directive and the European Regulation on water protection, Maltese authorities embarked on an ambitious mission: to build three modern wastewater treatment plants across the island. One of the most significant was the Malta South Sewage Treatment Plant, located in Ta' Barkat, Xgħajra.

A National Milestone: 80% of Malta's Wastewater Treated

Commissioned in January 2011, the Malta South STP was designed to treat 51,000 m³ of sewage daily, covering nearly 80% of Malta's total wastewater output. This project became a turning point in Malta's environmental stewardship, vastly improving seawater quality, reducing pollution-related odors, and enhancing the overall health of coastal ecosystems.

The Role of Filtralite® Clean: Biofiltration at its Best

At the core of the treatment process lies 6,000 m³ of Filtralite® Clean, a highly porous and lightweight ceramic filter media tailored for biological wastewater treatment. In this facility, Filtralite® is integrated into BIOFOR®, a compact fixed-bed process developed and patented by Suez, where it's branded as Biolite®.

This setup includes:

- 12 filters for the removal of organic compounds and nitrogen.
- 8 filters dedicated to denitrification.

Thanks to Filtralite® Clean's high specific surface area, excellent void ratio, and superior abrasion resistance, it enables the robust development of biofilms that degrade contaminants efficiently and reliably.

Beyond Filtration: A Full Treatment Chain

After biological treatment with Filtralite®, the wastewater undergoes:

- Sand filtration for fine particle and bacterial removal
- UV disinfection to eliminate residual microorganisms

Approximately two-thirds of the treated water is safely discharged into the Mediterranean, while the remaining one-third is reused for agricultural irrigation, supporting sustainable water resource management on the island.

This project not only highlights Malta's environmental progress but also illustrates how advanced filter media like Filtralite® Clean can play a crucial role in meeting regulatory standards, promoting water reuse, and protecting natural ecosystems.

By embracing innovative technologies, Malta has transitioned from a nation discharging untreated wastewater to a model of sustainable urban water management and Filtralite® has been central to that transformation.

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FILTRALITE®

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FILTRALITE® CLEAN – SMARTER BIOFILTRATION FOR WASTEWATER TREATMENT

The unique porosity of Filtralite® Cleen facilitates biofilm growth while allowing water to pass easily through the filter, improving contaminant removal. It is an advanced expanded clay media designed for high-performance biological filtration and sustainable wastewater treatment, featuring high efficiency, low environmental footprint, and sustained performance.

As utilities and operators seek greener, more cost-effective filtration,Filtralite® Clean stands out with:

- **Fast & effective biofilm growth**
- **High filtration rates (15–20 m/h)**
- **Fewer backwashes & lower energy use**
- **25+ year media lifespan**

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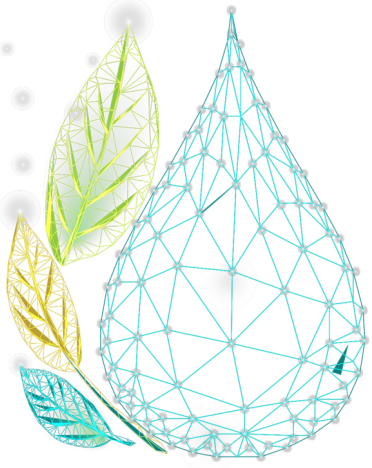
Cairo Water Week 2025

12–16 October 2025
Triumph Luxury Hotel, New Cairo, Egypt

Innovative Solutions for Climate Resilience and Water Sustainability

Key Features

- Ministerial Roundtables and High-Level Sessions
- Scientific and Technical Panels Featuring Global Research
- Exhibition, Workshops, and Side Events
- Youth and Innovation Competitions
- Field Visits and Cultural Experiences



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Venue: Triumph Luxury Hotel, New Cairo

Dates: 12–16 October 2025

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Beyond the Banks of the Nile: Cairo Water Week's Global Ripples

Since its inception in 2018, Cairo Water Week (CWW) has quickly become an important global forum focused on water sustainability and climate resilience challenges. Held under the patronage of H.E. President Abdel Fatah El-Sisi and organized yearly by Egypt's Ministry of Water Resources and Irrigation, CWW brings together scientists, policymakers, innovators, young leaders, and industry professionals. Through lively discussions, new ideas, youth participation, and extensive exhibitions, the event consistently encourages action and promotes international cooperation for a sustainable water future.

Seven Editions of Impact

In seven successful editions, CWW has established itself as a leading international platform for water and climate discussions. The event has attracted over 26,000 participants, hosted 30 competitions focused on innovation, featured 123 exhibitors, and welcomed 554 notable speakers from over 1,800 international organizations. With a vibrant agenda that includes plenary sessions, technical panels, interactive workshops, youth-led initiatives, and a strong scientific conference, CWW continues to drive collaboration, knowledge sharing, and effective solutions on a global scale.

Advancing Water and Climate Solutions Year by Year

The first edition in October 2018 laid a solid foundation, focusing on sustainable development, integrated water resource management, and Egypt's growing role in regional water diplomacy. Building on this, the 2019 edition addressed water scarcity, emphasizing technology, policy changes, and international cooperation. Quickly adapting to global conditions, CWW 2020 adopted a hybrid format to discuss water security in arid regions, highlighting resilience and cross-border collaboration during the pandemic. The 2021 edition expanded discussions about the connections between population growth, environmental challenges, and water sustainability, emphasizing adaptive governance and youth engagement. In 2022, CWW played a crucial role in global climate discussions, aligning with preparations for the UN 2023 Water Conference and COP27, and placing water at the heart of climate action plans. The 2023 event moved from dialogue to practical adaptation strategies, focusing on resilient infrastructure, eco-friendly solutions, and strengthened scientific collaboration. The landmark 2024 edition joined with the Ninth Africa Water Week, boosting Africa's voice and reinforcing Egypt's leadership in water diplomacy and climate resilience through extensive regional collaboration, inclusive policymaking, and effective knowledge exchange.

CWW 2025 – Innovating Together for a Sustainable Water Future

CWW returns for its eighth edition from 12 to 16 October 2025, hosted at the Triumph Luxury Hotel in New Cairo, Egypt. Under the theme "Innovative Solutions for Climate Resilience and Water Sustainability," this year's event will spotlight breakthrough approaches for strengthening the resilience of water systems, managing infrastructure sustainably, and addressing the intensifying risks posed by climate change including droughts, floods, and unpredictable weather extremes.

CWW 2025 will bring together government officials, researchers, innovators, civil society leaders, and private sector stakeholders from across the globe. Through high-level dialogues, technical sessions, and interactive panels, participants will explore smarter planning strategies, data-driven tools, and forward-thinking technologies aimed at increasing the efficiency, reliability, and sustainability of water resources. The program will also highlight the growing importance of nature-based approaches in restoring ecosystems and offering cost-effective, environmentally sound water solutions.

Beyond building new infrastructure, the week will emphasize the importance of maintaining and optimizing existing assets through sound infrastructure management and investment planning. Discussions will tackle integrated policy frameworks that link mitigation with adaptation, along with the development of early warning systems to help reduce vulnerability to climate shocks.

The event offers a dynamic space for connection, exchange, and action. A wide range of activities including plenaries, forums, workshops, round tables, and an international exhibition will create opportunities for meaningful collaboration across disciplines and sectors.

The exhibition will feature cutting-edge technologies and water-related innovations, while the cultural program and field visits will provide additional layers of engagement for participants.

Youth and innovation are central to the spirit of CWW.

A series of competitions will be held throughout the week to encourage bold ideas and practical solutions from emerging talents. These include the Best Graduation Projects Competition for undergraduate students presenting original ideas with real-world impact, and the Three Minute Thesis Competition, which challenges graduate students to present their research clearly and compellingly to a general audience. The Young Water Inventors Competition engages STEM school students who have developed water-related projects, promoting both creativity and scientific thinking. Additionally, the "Save Our Water" Campaign Competition invites media students to create compelling awareness campaigns that promote responsible water use and environmental protection.

Organizations and institutions involved in water and climate are invited to host sessions and activities during the week. Convener registration is now open, offering a variety of halls and support to ensure impactful participation. For more information, **visit www.cairowaterweek.eg.**

CWW 2025 also presents a unique opportunity for sponsorship. By supporting the event, sponsors align themselves with the global agenda for sustainable water management and position their brand at the center of meaningful dialogue and innovation. Sponsorship helps drive progress, support the next generation of thinkers, and contribute to building a more water-secure future for all.

Cairo Water Week 2025 is more than a conference it's a collaborative call to action. It is where ideas meet action, partnerships take shape, and the future of water is reshaped, together.

For more details, visit www.cairowaterweek.eg and stay connected with us on social media via @cairowaterweek.

Maximizing Water Utility Resilience: The Power of Total Productive Maintenance (TPM)

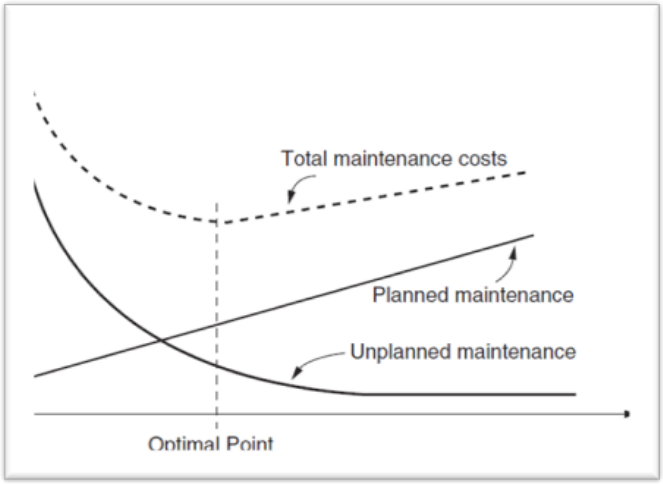
Article Contents

In the critical domain of water utility management, ensuring uninterrupted service, optimal operational efficiency, and sustainable resource utilization is supreme. From complex pumping stations and extensive pipeline networks to sophisticated treatment facilities, the reliability of infrastructure directly impacts public health, economic stability, and environmental stewardship. This is where Total Productive Maintenance (TPM) emerges as a transformative strategy, offering a holistic and proactive approach to asset management that extends far beyond traditional maintenance paradigms. For the professionals and stakeholders engaged with the Aqua Energy Expo, understanding and embracing TPM is not just an advantage; it's a necessity for future-proofing our vital water infrastructure.

Eng. Karim Abosalem

The Genesis and Core Concepts of TPM

Total Productive Maintenance originated in Japan in the 1970s, evolving from a focus on preventive maintenance to a comprehensive system that emphasizes the involvement of all employees in optimizing equipment effectiveness. At its heart, TPM is about achieving "perfect production" – striving for zero breakdowns, zero defects, and zero accidents. This seemingly ambitious goal is underpinned by a philosophy that recognizes that equipment effectiveness is a shared responsibility, not solely confined to the maintenance department.



The "Total" in TPM signifies three key aspects:

1.Total Effectiveness: TPM aims to maximize Overall Equipment Effectiveness (OEE), a critical metric that measures how well a manufacturing or production operation is utilized. OEE considers availability (uptime), performance (speed), and quality (defects). By addressing losses in these areas, TPM seeks to unlock the full potential of equipment.

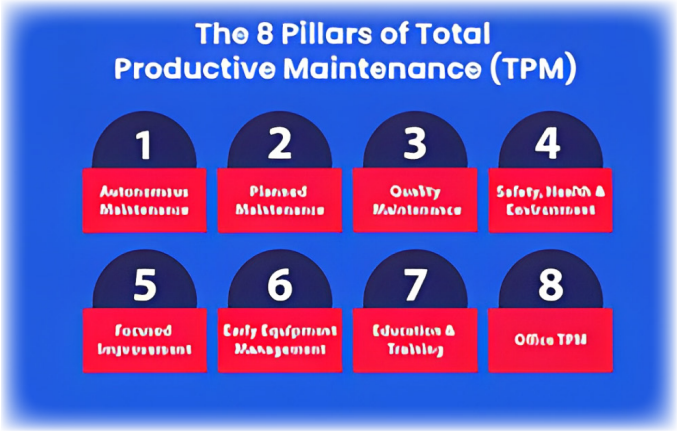
2.Total System: TPM integrates maintenance into the entire organizational structure, from the shop floor to senior management. It breaks down departmental silos, fostering collaboration between production, maintenance, engineering, and administrative functions.

3.Total Participation: A cornerstone of TPM, this principle empowers all employees, particularly equipment operators, to take ownership of their machines. Through training and empowerment, operators become frontline maintainers, performing routine tasks like cleaning, inspection, and lubrication, and identifying potential issues before they escalate.

Defining Total Productive Maintenance

More formally, Total Productive Maintenance can be defined as a systematic, company-wide approach to equipment management that aims to maximize equipment effectiveness throughout its entire lifecycle. It achieves this by involving all departments and employees in a proactive and preventive maintenance strategy, with the ultimate goal of eliminating losses, reducing costs, and improving overall operational performance. In the context of water utilities, this translates to reliable water supply, minimized service disruptions, and efficient resource consumption.

The Pillars of TPM: A Structural Framework



The successful implementation of TPM is typically structured around eight core pillars, each addressing a specific area of improvement and contributing to the overall effectiveness of the system. These pillars provide a roadmap for organizations to systematically address equipment-related losses and cultivate a culture of continuous improvement:

1.Autonomous Maintenance: This includes daily cleaning, inspection, lubrication, and minor adjustments. Autonomous maintenance leads to early detection of abnormalities, reduced minor stoppages, and frees up skilled maintenance technicians for more complex tasks. For water utility operators, this could mean daily checks of pump vibrations, valve functionality, or pressure gauge readings.

2.Planned Maintenance: This pillar encompasses time-based maintenance, condition-based monitoring, and predictive maintenance techniques, ensuring equipment receives attention before failure occurs. In a water utility, this translates to scheduled inspections of filters, predictive analysis of pipe corrosion, or planned overhauls of large pumping units.

3.Quality Maintenance: Focused on achieving zero defects, this pillar aims to prevent quality issues by identifying and addressing the root causes of equipment-related defects. It involves setting up robust quality inspection points, error-proofing processes (Poka-Yoke), and using root cause analysis (RCA) to eliminate recurring problems. For water treatment plants, this means ensuring consistently high-water quality by preventing equipment malfunctions that could lead to contamination or deviations from purity standards.

4.Focused Improvement: This pillar is essentially the application of Kaizen principles to specific equipment-related losses. Cross-functional teams are formed to identify, analyze, and eliminate significant losses. In water utilities, a Kaizen event might focus on reducing energy consumption in a specific pumping station or optimizing the chemical dosing process to minimize waste.

5.Early Equipment Management (Development Management): This pillar focuses on designing new equipment and processes to be inherently

reliable, easy to maintain, and energy efficient. It involves incorporating lessons learned from existing equipment into the design phase of new assets, ensuring that maintainability, operability, and safety are built in from the start. For water utilities considering new infrastructure projects, this means designing treatment plants with modular components for easier maintenance or selecting pumps with extended mean time between failures (MTBF).

6.Training and Education: Training programs cover technical skills, problem-solving methodologies, and the philosophy of TPM. This ensures that everyone has the necessary competencies to contribute to equipment effectiveness. Training could involve advanced troubleshooting for maintenance technicians, OEE interpretation for managers, or basic equipment inspection for operators.

7.Safety, Health, and Environment (SHE): It emphasizes identifying and mitigating potential hazards, preventing accidents, and promoting environmentally friendly practices throughout the equipment lifecycle. For water utilities, this is crucial given the potential for hazardous chemicals, high-pressure systems, and confined spaces. TPM promotes proactive measures to ensure worker safety and prevent environmental incidents like chemical spills or wastewater overflows.

8.Administrative and Office TPM: Extending TPM principles beyond the production floor, this pillar applies the concepts of waste elimination and efficiency improvement to administrative and support functions. This includes optimizing processes in areas like procurement, scheduling, and data management to support overall operational effectiveness. Efficient administrative processes contribute to faster spare parts acquisition, streamlined work order management, and improved overall coordination in a water utility.

Implementing TPM in a Water Utility

Implementing TPM is a journey, not a destination, requiring commitment, patience, and a structured approach. For a water utility, the following steps provide a practical framework:

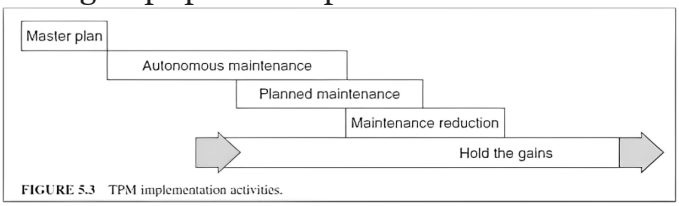


FIGURE 5.3 TPM implementation activities.

1.Master Plan: TPM success starts from senior leadership. They must take the initiative, allocate resources, and communicate the vision and benefits to all employees.

2.Train and Empower Operators (Autonomous Maintenance): Provide comprehensive training to operators on basic equipment functions, cleaning, inspection, and lubrication procedures. Establish clear guidelines for autonomous maintenance tasks and empower operators to perform them.

3.Develop Planned Maintenance Schedules: Based on equipment criticality, failure modes, and OEE data, develop detailed preventive and predictive maintenance schedules. This involves leveraging CMMS (Computerized Maintenance Management Systems) for effective planning and tracking.

4.Maintenance Reduction: By implementing early equipment management principles and reliability considerations into the design and procurement of new water utility equipment.

5.Continuous Training and Skill Development: Invest in ongoing training for all levels of staff

to continuously enhance their technical skills, problem-solving abilities, and understanding of TPM principles.

6.Hold gains – Monitor, Measure, and Sustain: Regularly track OEE, maintenance costs, safety incidents, and other relevant KPIs. Celebrate successes, learn from failures, and continuously refine TPM processes to ensure long-term sustainability. Regular audits and feedback mechanisms are crucial for maintaining momentum.

Benefits of TPM for Water Utilities

The implementation of TPM offers a multitude of tangible and intangible benefits for water utility platforms, contributing significantly to their operational resilience and financial health:

• Increased Equipment Reliability and Uptime: By proactively addressing potential issues and empowering operators, TPM drastically reduces unplanned downtime and equipment breakdowns, ensuring consistent water supply and treatment.

• Reduced Maintenance Costs: Shifting from reactive to proactive maintenance, coupled with autonomous maintenance, minimizes costly emergency repairs, overtime, and extensive component replacements.

• Improved Water Quality: By reducing equipment-related defects and ensuring stable operating conditions, TPM directly contributes to maintaining and enhancing the quality of treated water, meeting stringent regulatory standards.

• Enhanced Safety: A strong emphasis on safety within TPM leads to a reduction in workplace accidents and creates a safer environment for employees working with complex and potentially hazardous equipment.

• Increased Operational Efficiency and Productivity: Optimal equipment performance leads to higher throughput, reduced energy consumption per unit of water treated, and overall improved operational efficiency.

• Extended Asset Lifespan: Proactive maintenance and proper care significantly extend the useful life of expensive water utility assets, delaying capital expenditures for replacements.

• Employee Empowerment and Morale: TPM fosters a sense of ownership and responsibility among employees, leading to increased job satisfaction, improved teamwork, and a more engaged workforce.

• Better Data for Decision-Making: OEE tracking and systematic problem-solving generate valuable data that informs strategic decisions regarding asset investment, maintenance strategies, and operational improvements.

• Environmental Stewardship: Reduced breakdowns and optimized processes can lead to less waste, lower energy consumption, and a smaller environmental footprint for water utility operations.

Barriers to TPM Implementation

Despite its numerous benefits, TPM implementation can face several challenges, particularly within established organizations like water utilities:

• Resistance to Change: Employees accustomed to traditional maintenance practices may resist new roles and responsibilities, especially the concept of autonomous maintenance. This requires strong change management strategies,

clear communication of benefits, and consistent support.

• Lack of Top Management Commitment: Without unwavering support and active involvement from senior leadership, TPM initiatives can lose momentum, suffer from inadequate resources, and fail to gain widespread adoption.

• Insufficient Training and Skill Gaps: A lack of adequate training for operators, technicians, and managers can hinder their ability to effectively perform TPM tasks and understand its underlying principles.

• Siloed Organizational Culture: Overcoming departmental boundaries and fostering cross-functional collaboration can be challenging in organizations where departments have historically operated independently.

• Lack of Defined Metrics and Measurement: Without clear KPIs like OEE and consistent data collection, it's difficult to track progress, demonstrate benefits, and justify continued investment in TPM.

• Short-Term Focus: Organizations may be tempted to prioritize immediate cost savings over the long-term benefits of TPM, leading to a half-hearted implementation that fails to yield significant results.

• Inadequate Resources: Insufficient allocation of time, budget, and personnel for training, pilot projects, and continuous improvement activities can cripple TPM efforts.

• Difficulty in Sustaining Momentum: Initial enthusiasm for TPM can wane over time if the benefits are not consistently reinforced, successes are not celebrated, and continuous improvement mechanisms are not ingrained in the organizational culture.

Conclusion: A Resilient Future with TPM

For water utilities, the adoption of Total Productive Maintenance is more than just a maintenance strategy; it's a strategic imperative for building resilient, efficient, and sustainable operations. By fostering a culture of shared responsibility, empowering frontline workers, and systematically eliminating losses, TPM enables water providers to maximize the effectiveness of their critical assets, ensure uninterrupted service delivery, safeguard water quality, and optimize resource utilization.

As the Aqua Energy Expo continues to highlight advancements in water and energy sectors, it's clear that the future lies in integrated, proactive, and intelligent approaches to asset management. TPM, with its proven framework and profound impact on operational excellence, stands as a powerful tool for water utility engineering platforms to navigate the complexities of modern infrastructure and deliver reliable, high-quality water to communities worldwide. Embracing TPM is not merely about maintaining equipment; it's about cultivating a mindset of continuous improvement that drives superior performance and ensures a sustainable water future.

Badger Meter Empowers Utilities: The BlueEdge Suite for Enhanced Water Management

For over 115 years, Badger Meter (Milwaukee, Wis.) has pioneered solutions that redefine water management. Founded in 1905 with the first frost-proof water meter, the company now serves global municipal, commercial, and industrial clients with end-to-end smart water technologies. Recent acquisitions including s::can, ATi, Syrinix, and Telog have expanded its capabilities beyond metering into water quality monitoring, pressure analytics, and AI-driven software. This evolution culminates in BlueEdge™, a transformative suite integrating hardware, software, and services to tackle the water sector's most pressing challenges: aging infrastructure, non-revenue water loss, and water safety.

Challenges Facing the Water Industry

Despite the advancements in technology, the water industry faces several universal challenges. First, aging infrastructure and leaks pose significant issues, as many utility systems are dealing with facilities that have surpassed their intended lifespan, resulting in considerable water loss. Second, there is the challenge of managing water supplies, which involves both quantity addressing issues like droughts and floods and quality, particularly concerning emerging contaminants such as PFAS, along with the associated funding and remediation efforts. Lastly, the adoption of technology presents a unique hurdle in this traditionally slow-moving and risk-averse sector. Successfully implementing new technologies requires finding the right talent for change management while also considering the long lifespan of existing assets, which is a distinct challenge for the utility industry.

How BlueEdge Addresses Key Challenges

The BlueEdge suite represents a paradigm shift in water management, offering a customizable and scalable approach that meets the unique needs of each utility. Unlike traditional solutions, BlueEdge is not a one-size-fits-all product; rather, it is an umbrella under which various tools and technologies work together to provide actionable data and insights. This flexibility allows utilities to adapt and grow their systems in response to changing demands and challenges.

> Ken Bockhorst, Chairman, President, and CEO of Badger Meter, emphasizes the company's commitment to innovation: We're proud to drive innovation in the water sector with solutions that empower customers to effectively manage water resources now and for generations to come.

key Features of BlueEdge

1. Smart Water Metering: BlueEdge incorporates advanced metering technologies that provide real-time data on water consumption, enabling utilities to monitor their infrastructure down to individual components. This capability is crucial for detecting leaks and reducing non-revenue water.

2. Environmental Monitoring: The suite includes modular measurement tools designed to monitor source water quality. These instruments provide critical data on parameters such as pH, dissolved oxygen, and turbidity, helping utilities respond to potential contamination events swiftly.

3.Network Monitoring: BlueEdge offers a range of monitors and sensors that ensure the integrity of residential and commercial water networks. This proactive monitoring reduces the risk of contamination and enhances public health safety.

4. Analytics Software: The analytics capabilities within BlueEdge empower utilities to make informed decisions based on near real-time insights into water quality, asset performance, and network health. This data-driven approach supports effective resource management and operational efficiency.

5. Customer Engagement Tools: With features like the EyeOnWater® app, BlueEdge fosters better communication between utilities and their customers. This transparency helps customers understand their water usage patterns and encourages conservation efforts.

Transforming Utilities: BlueEdge in Action

Decreasing Non-Revenue Water

A primary goal for water utilities is to reduce non-revenue water (NRW), which refers to treated water that is produced but not billed to customers. Estimates suggest that globally, 10–30% of treated water is lost before it reaches consumers. The BlueEdge suite offers several technologies to address this issue, including smart water metering systems that monitor infrastructure performance in real time.

• Case Study: Highway 71 Water District No. 1

Located in Alma, Arkansas, the Highway

71 Water District No. 1 serves a population of 2,500 and faced significant challenges in detecting leaks due to its large, rural service area. The utility purchased treated water but was losing it before it could be billed to customers. To combat this, they implemented BEACON and ORION Cellular endpoints, which provided flexibility for deployment and compatibility with existing systems.

To further isolate leaks, Highway 71 established a district-metering solution with 10 zones. This strategy revealed numerous leaks throughout the system, leading to a total water loss rate of approximately 125 gallons per minute. With the new solution in place, the utility located and repaired these leaks, saving about $260,000 annually in non-revenue water.

Safeguarding Water Quality

Drinking water treatment facilities are essential for producing a safe and reliable supply of high-quality drinking water. This involves reducing risks associated with waterborne diseases and ensuring that disinfection processes meet regulatory standards. The BlueEdge portfolio includes advanced water quality monitoring technologies that provide visibility from source to tap, helping mitigate risks to public health and the environment.

• Case Study: Columbus Division of Water

The Columbus Division of Water in Ohio operates three drinking water treatment plants, including the Dublin Road Water Plant, which treats surface water from the Scioto River. To monitor nitrate levels, the division installed spectro::lyser probes at three critical locations. These probes continuously monitor parameters such as total organic carbon (TOC), turbidity, and dissolved organic carbon (DOC).

In June 2015, continuous monitoring allowed the city's Water Quality Assurance Lab (WQAL) to detect a nitrate event seven days before contaminated water reached the treatment plant's intake. This early warning enabled the utility to issue a public health advisory and prepare in advance, showcasing the effectiveness of proactive water quality monitoring.

Providing Exceptional Customer Service

Customer satisfaction is crucial for the success of water utilities. The BlueEdge suite enhances customer service by providing utilities with detailed usage data, allowing them to proactively inform customers about their water consumption.

• Case Study: Beaufort-Jasper Water & Sewer Authority (BJWSA)

BJWSA serves a fast-growing area in South Carolina and faced issues with discolored water due to high demand. To address these concerns, BJWSA installed E-Series G2® Ultrasonic meters with ORION Cellular endpoints to gather near real-time insights into water usage patterns. Upon analyzing this data, BJWSA discovered particularly high consumption on Mondays between 4 a.m. and 9 a.m., primarily due to residential irrigation. The utility launched an awareness campaign to educate customers on adjusting their irrigation schedules, which resulted in 13,000 customers signing up for the EyeOnWater app. This initiative reduced water demand on Mondays by 1.1 million gallons (4,163,510 liters) and significantly decreased complaints about discolored water. Additionally, BJWSA improved customer service, enabling staff to quickly resolve billing disputes and proactively alert customers to unusual spikes in consumption.

Maximizing Staff Resources

Utilities often rely on manual processes for tasks such as meter reading and leak detection, which can be time-consuming and costly. The BlueEdge suite streamlines staffing for field services through technologies like cellular AMI, which offers a Network as a Service (NaaS) model. This model allows for continuous monitoring and management of infrastructure, freeing staff to focus on critical tasks.

• Case Study: Ames Public Works

For years, Ames Public Works in Iowa managed water main emergencies by relying on individual team member expertise. Without technologies to support water pressure monitoring, staff struggled to identify the right course of action when problems arose. To enhance efficiency, Ames Public Works installed Telog® units with IoT technology, providing real-time data on water pressure and system performance. This upgrade enabled the City of Ames to respond quickly to fluctuations in water pressure. Shortly after installation, a water main break caused pressure to drop below 20 psi in specific areas. With data from the Telog units, utility staff effectively defined the boil water advisory area, limiting it to three businesses and sparing the rest of the community.

Improving Utility Management

Effective utility management relies on data-driven decision-making. The BlueEdge suite provides utilities with comprehensive data access, helping identify operational improvements. For example, the Punta Gorda Water Treatment Division in Florida optimized its backwash process using FilterSmart technology, resulting in a 42% decrease in backwash water consumption and significant cost savings.

• Case Study: Punta Gorda Water Treatment Division

The Punta Gorda Water Treatment Division

operates the 10 MGD Shell Creek Water Treatment Facility. To optimize efficiency, the utility conducted a field trial of the FilterSmart backwash monitor, which measures media expansion and turbidity. This trial revealed that the filters were lightly loaded, prompting staff to switch from a time-based to a head-loss-based schedule. This adjustment led to a 42% reduction in backwash water consumption, saving approximately $65,000 annually. Additionally, the division installed an EchoSmart sludge blanket monitor to control sludge pumps, eliminating inconsistencies in operation and reducing hydraulic loading. This efficiency allowed the plant to minimize the number of sand-lined drying cells used, further decreasing operational costs.

Strengthening Resilience and Emergency Preparedness

With the increasing frequency of severe weather and potential contamination threats, municipalities must prioritize resilience in their water systems. The BlueEdge portfolio enhances preparedness through smart metering systems that remain operational during emergencies.

• Case Study: Bethpage Water District

The Bethpage Water District (BWD), one of the oldest water districts on Long Island, serves an area of five square miles (12.95 square kilometers). During Hurricane Sandy in 2012, BWD's water system was directly impacted, losing visibility in areas supported by traditional fixed-network gateways. However, the sections served by cellular solutions remained online, allowing for easier management. BWD had an emergency response plan in place before the storm, ensuring an efficient and effective response. After recovering from the storm, the utility replaced its fixed-network AMI systems with cellular solutions for improved resilience in future emergencies.

Aiding Sustainability and Water Conservation Efforts

Global water use is projected to grow at a rate of about 1% annually, with usage rates likely increasing 20–30% by 2050. To meet the urgent demand for accountability and conservation, water utilities need more intelligent data delivered quickly. The BlueEdge suite supports sustainability through smart water solutions like flow measurement dashboards and cloud-based analytics.

• Case Study: City of Columbia

As part of its smart city initiative, the City of Columbia, South Carolina, upgraded to a smart water metering system, one of the largest cellular AMI installations in the U.S. Since upgrading, Columbia Water has achieved impressive benefits, including a 96% reduction in monthly field service calls, a 21% decrease in inactive accounts, and a $750,000 credit for recycling old metering equipment. The city also received a Smart50 Award, recognizing it as one of the 50 most transformative smart projects annually.

CONCLUSION

The challenges of municipal water management are significant, but with innovative solutions like Badger Meter's BlueEdge suite, utilities can enhance their operations, improve customer service, and promote sustainability. By leveraging data-driven insights, water utilities can address critical goals such as reducing non-revenue water, safeguarding water quality, and maximizing staff resources. As municipalities continue to navigate the complexities of water management, Badger Meter remains committed to providing the tools and support needed to succeed in an ever-changing landscape.

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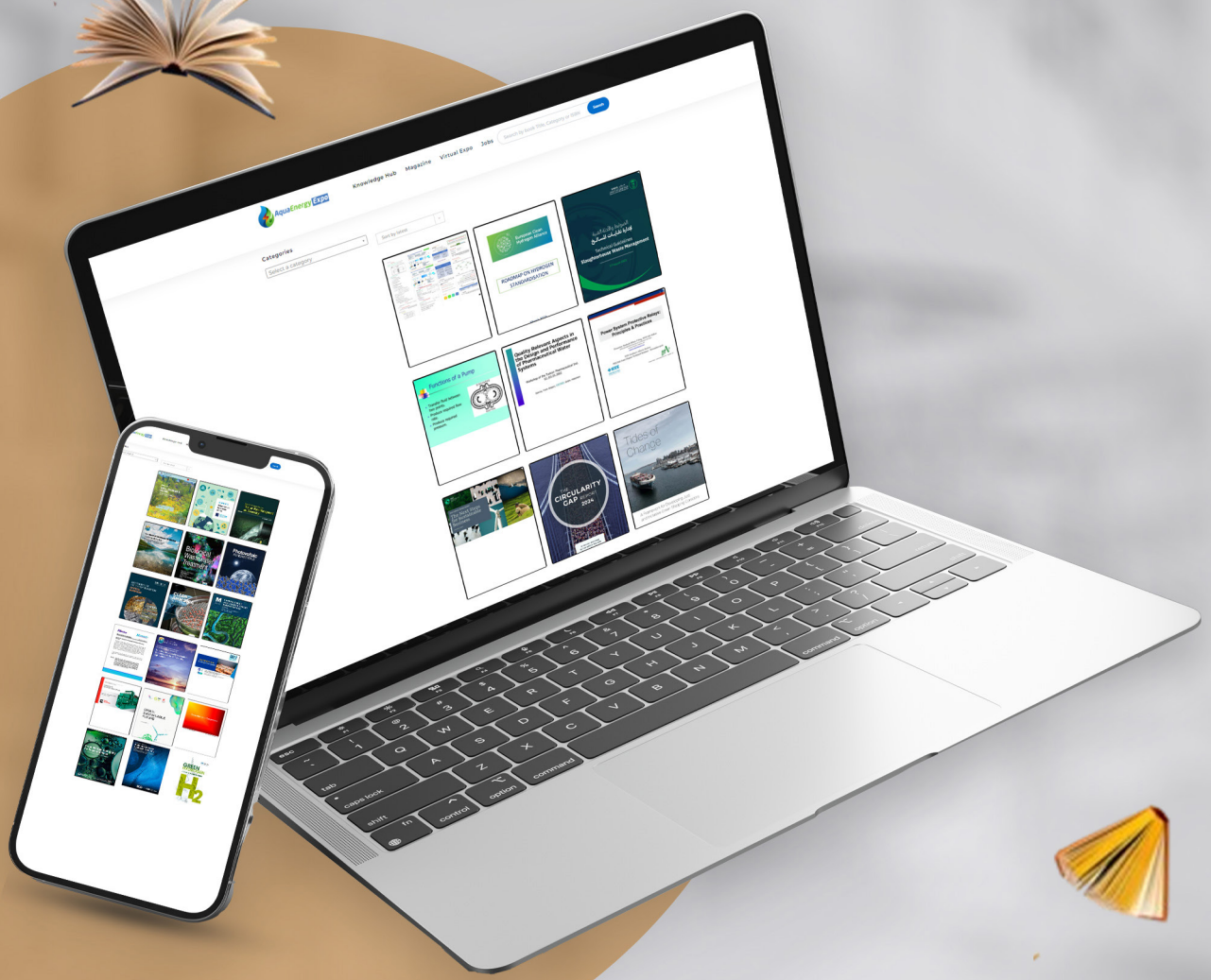

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BIMEX: Pioneering Excellence in Valves and Water Solutions

Founded with a bold vision to shape the future of water management and infrastructure, BIMEX (Al Andalus for Engineering Industries) has emerged as one of Egypt's leading manufacturers of industrial valves, fire protection systems, and compact water and wastewater treatment units. Founded by Eng. Salem Nashwan, BIMEX is proudly celebrating its 30th anniversary — three decades of engineering innovation and customer commitment.

A Strong Foundation in Engineering Expertise

From its inception, BIMEX has built its operations on deep technical expertise and a strong understanding of the local and global demands for infrastructure development. The company manufactures a wide range of products including gate valves, check valves, air valves, fire hydrants, and surge protection systems, serving a multitude of sectors such as water utilities, municipal infrastructure, oil & gas, firefighting, and irrigation.

The hallmark of BIMEX's growth lies in its investment in high-grade materials like GGG50 ductile iron, along with rigorous manufacturing standards, allowing its products to perform reliably under harsh environmental and hydraulic conditions.

Dr. Salem Nashwan

Certified to Lead

BIMEX products are proudly UL Listed and FM Approved, earning global recognition for meeting stringent fire protection standards. Furthermore, the company holds WRAS and NSF certifications, affirming the safety and compatibility of its products with drinking water applications. Most recently, BIMEX received ASME U and R stamps, reinforcing its competency in manufacturing pressure vessels

to the highest international standards. Furthermore, BIMEX is approved in NWC, Modon, and Irrigation Association in KSA and Kuwait Water Utilities.

A Complete Range of Water Management Solutions

In addition to its valve portfolio, BIMEX manufactures compact wastewater treatment units based on MBBR, IFAS, and MBR technologies, serving both domestic and industrial clients. These advanced systems are designed for tertiary-level treatment, enabling the safe reuse of treated water and ensuring compliance with environmental standards.

Another key product category is surge protection systems. BIMEX offers bladder-type, compressor-type, and dip-tube surge vessels that protect pumping stations and transmission mains from damaging pressure fluctuations. The company is a recognized expert in designing these vessels for both water and wastewater applications.

Engineering Custom Solutions

One of BIMEX's strongest competitive advantages is its ability to tailor solutions based on customer requirements. Whether it's modifying dimensions, adapting material specifications, or delivering modular systems, the engineering team works closely with clients to ensure precise alignment with technical and operational needs.

Additionally, BIMEX offers a wide range of accessories including basket screens for lift stations, dismantling joints, steel fittings, and pressure filters. The recent launch of steel multimedia filters and dish heads manufactured by cold forming has expanded its footprint in the industrial water treatment sector.

Robust Quality Control and After-Sales Support

BIMEX maintains a full QA/QC dossier for each project and product, encompassing material traceability, inspection reports, welding qualifications, painting records, pressure testing, and more. All products are thoroughly inspected at each stage of production. A dedicated after-sales service department provides installation support, site testing, spare parts, and customer training.

Strategic Presence and Manufacturing Capacity

With three state-of-the-art production facilities in Egypt and new factories recently launched in Suez, Egypt and Dammam, Saudi Arabia BIMEX enjoys the advantage of scalability and logistical flexibility. This enables the company to respond rapidly to customer needs across the Middle East, Africa, and

beyond. These facilities are equipped with CNC machining centers, automated coating lines, testing rigs, and dedicated assembly zones.

Landmark Projects in Egypt and Saudi Arabia

Over the past three decades, BIMEX has played a key role in numerous infrastructure projects across the region. In Egypt, BIMEX supplied valves and treatment systems for landmark urban developments such as Al Rehab City (since 1996), Madinaty, Noor City, and SouthMed City. In the Kingdom of Saudi Arabia, BIMEX products have been integrated into various citywide infrastructure projects, reinforcing its presence as a trusted engineering partner.

Looking Ahead

With a firm focus on research, digitalization, and sustainability, BIMEX is actively investing in expanding its automation lines, enhancing energy efficiency, and integrating IoT-based monitoring for its smart valves and treatment units. Participation in global exhibitions such as Aqua Energy and Water Expo in Riyadh has positioned BIMEX as a trusted name in the international market.

Conclusion

BIMEX's journey is a testament to Egyptian industrial excellence. By combining innovation with integrity, and engineering with environmental responsibility, BIMEX continues to build a legacy of solutions that protect lives, sustain resources, and power development. For clients and partners across the globe, BIMEX is more than a supplier — it's a strategic ally in shaping a sustainable future.

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HRS Heat Exchangers: Optimizing Evaporation Techniques for Digestate and Sludge Management

Digestates and sludges, due to their thick and viscous nature, present significant challenges in the realm of evaporation. However, the benefits of efficient evaporation in terms of handling, disposal, and treatment are substantial. As industries seek effective solutions for managing these materials, there has been growing interest in mechanical vapor recompression (MVR) evaporation techniques. Despite this interest, the complex characteristics of digestate mean that MVR may not always be the optimal choice. This article delves into the intricacies of evaporation, the various techniques available, and the specific considerations necessary for digestate and sludge treatment, particularly in the context of HRS Heat Exchangers.

The Digestate and Sludge Challenge: Why Evaporation Matters

Digestate and sludges often contain suspended solids that increase their viscosity during evaporation, complicating the process. To effectively use mechanical vapor recompression (MVR) evaporation, pre-treatment is necessary to remove these solids, typically through filtration. This pre-treatment step adds significant capital costs and can reduce potential energy savings. Additionally, digestate usually contains 2,000 to 3,000 ppm of ammonia. Pre-treating the product with acid to neutralize ammonia is essential to prevent it from evaporating and to protect the compressor, but this also introduces extra costs and operational complexity.

However, this process introduces further complexity and cost. Each type of sludge is unique, necessitating thorough testing to determine the best heat exchanger solution and any required pre-treatment.

Evaporation Equipment: Matching Technology to Material

Evaporation is the process in which a liquid transitions to a vapor state. A familiar example is the evaporation of water from the Earth's surface into the atmosphere. During evaporation, dissolved or suspended materials remain in the liquid, making this process beneficial for concentrating solutions or separating materials.

Unlike dehydration or drying, where the end product is a dry solid, evaporation results in a concentrated liquid. The evaporation process can be combined with drying, where initial evaporation removes most of the water, followed by drying to eliminate any remaining moisture. Evaporation can occur in batch or continuous processes and involves two main phases: heating the product to its boiling point and the subsequent evaporation phase. Several types of equipment are employed for these processes, including:

• Jacketed Tank Evaporators (JTE)

Jacketed Tank Evaporators are among the simplest types of evaporators, ideal for small-capacity applications with limited capital expenditure (Capex). In this system, the product is fed into a tank equipped with an external heating jacket through which heating media flows. As the product is heated, it reaches its boiling point, and steam evaporates from the top. To enhance heat transfer and manage potential fouling, an agitator or scraper may be added to increase turbulence. However, JTEs have a lower heat transfer area per unit volume compared to tubular or plate evaporators, making them suitable only for relatively small evaporation tasks. Their design eliminates the need for a recirculation pump, simplifying installation.

• Forced Recirculation Evaporators (FRE)

Forced Recirculation Evaporators are one of the earliest industrially developed systems, refined by HRS using corrugated tube heat exchanger technology. In an FRE system, the product is superheated above its boiling point before entering a flash separation vessel where pressure is reduced. This reduction allows part of the product to flash off, increasing the concentration of the recirculating fluid.

The evaporated steam is then condensed back into water in a condenser, and a vacuum pump can be connected to the condensate tank to control evaporation pressure. This method enables the use of evaporated steam to preheat incoming products, significantly enhancing thermal efficiency.

• Falling Film Evaporators (FFE)

Falling Film Evaporators introduce the product at the top of a vertical tube bundle, where it flows downwards as a thin film against the tube walls. A heating medium, typically steam, raises the product's temperature, facilitating evaporation at the liquid film surface. The vapor generated travels down with the liquid film, aided by steam velocity, which promotes movement along the tube walls. FFEs offer high levels of heat transfer and require lower recirculation flow rates compared to FREs, resulting in reduced pump power consumption. Additionally, since evaporation occurs within the tubes, there is no temperature gradient affecting the recirculating product.

FFEs are particularly suited for applications with service fluid temperatures close to the evaporation temperature, making them ideal for heat-sensitive products.

Energy Optimization: Multi-Effect, TVR, and MVR

To optimize evaporation processes, several methods can be employed to enhance energy use, including reusing the latent heat from evaporated water and utilizing steam compression devices.

• Multiple-Effect Evaporators

Multiple-Effect Evaporators (MEE) utilize a series of evaporation stages where the steam generated in the first stage serves as the thermal energy source for the subsequent stage. This process can be repeated multiple times, allowing the same quantity of steam to evaporate several volumes of water. Each stage operates at progressively lower pressures, which lowers the boiling point of the liquid. For example, in a three-effect evaporator, each stage handles one-third of the total evaporation requirement. The resulting condensate streams at 100°C, 75°C, and 50°C can be combined to preheat incoming raw products before they enter the first effect. A vacuum or pressure control system is essential for adjusting the evaporation pressure in each stage, ensuring optimal performance.

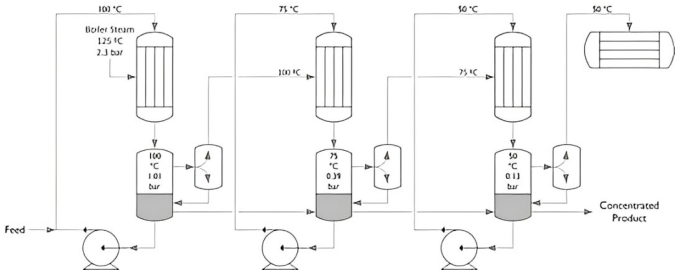
This multi-effect approach significantly enhances
thermal efficiency; moving from one to two stages can halve energy consumption, while adding a third stage can reduce it by two-thirds compared to a single-stage process.

• Thermal Vapour Recompression (TVR)

Thermal Vapour Recompression (TVR) employs a compressor that mixes a portion of the evaporated steam with fresh steam from a boiler. This combined steam is then used as the thermal energy source for the evaporation stage. By reusing evaporated steam, TVR increases the energy efficiency of the plant. For instance, in a one-stage evaporation system with a TVR compressor that reuses 50% of the steam, energy efficiency can double compared to systems without it. TVR can be integrated into multi-effect evaporators for further optimization. However, the mixing of evaporated and boiler steam results in a net steam temperature closer to the boiling point, making this method less suitable for liquids with high boiling point elevations or those with high viscosities and low heat transfer rates.

• Mechanical Vapour Recompression (MVR)

Mechanical Vapour Recompression (MVR) is a cost-effective evaporation technique that utilizes electrical power instead of thermal energy. In MVR systems, a lobe or fan compressor is employed to recompress the steam generated during the evaporation process. By compressing this steam, both its temperature and pressure are increased, allowing it to be reused as thermal energy for the same evaporation stage. This method enables the same kilogram of steam evaporated from the product to serve as the thermal energy source, enhancing overall efficiency.

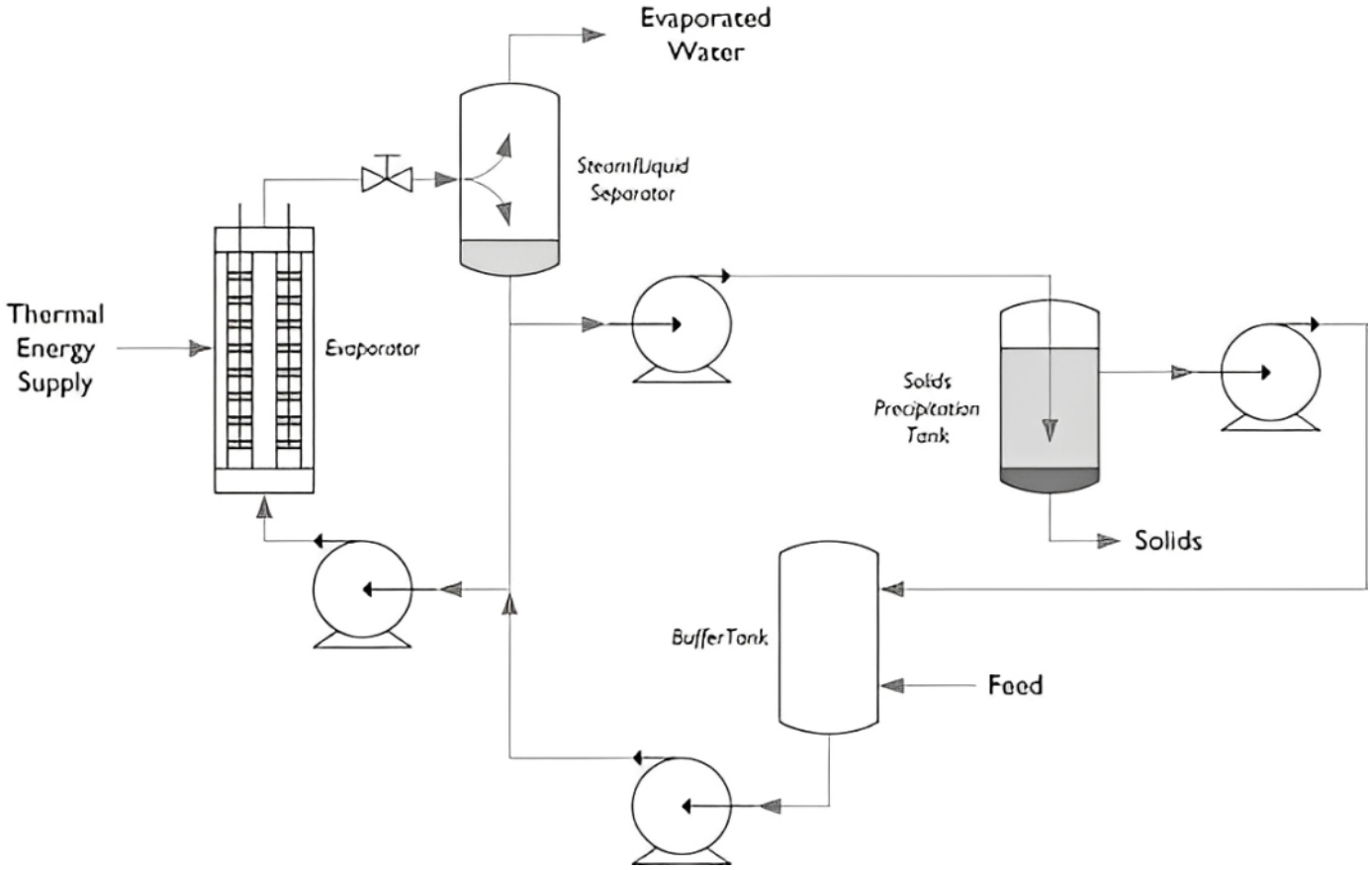


MVR compressors are recognized for their low operational costs per ton of water evaporated, making them one of the most economical choices for evaporation processes. Unlike traditional systems, MVR does not require a final condenser since the evaporated steam is condensed on the service side of the evaporator, eliminating the need for cooling towers and reducing associated water costs. However, MVR systems typically involve higher capital costs due to the larger evaporators needed to accommodate the lower supply temperatures. Similar to TVR, MVR systems are less suitable for products with high boiling point elevations or those with increased viscosi-

Limitations of MVR

Traditional evaporation techniques rely on high-temperature service fluids, such as pressurized steam, to evaporate water from a solution. In contrast, MVR systems leverage electrical energy to compress steam, significantly reducing operational costs. However, the effectiveness of MVR is limited when dealing with thick and viscous products like digestate and sludges.

The primary limitation of MVR lies in the relatively small temperature rise achieved by compressors, typically between 8°C and 15°C. This limited temperature difference between the service fluid and the product's boiling point means that a larger heat exchanger is required to facilitate adequate heat transfer. In contrast, traditional boilers can deliver steam at much higher temperatures, requiring less surface area for effective heat exchange. The thick nature and high fouling potential of digestates and sludges increase the need for larger heat exchangers, leading to higher capital costs. Additionally, larger pumps are required to move the product through these systems, potentially diminishing the operational cost benefits that MVR offers.



Zero Liquid Discharge (ZLD): The Ultimate Goal

One of the most advanced applications of evaporation technology is in Zero Liquid Discharge (ZLD) systems, which integrate evaporation processes with solids precipitation or crystallization to achieve a net-zero liquid output. In these systems, the evaporator concentrates the product as much as possible, usually reaching saturation, before directing it to the crystallization section. Here, solids are suspended and separated from the saturated solution. The resulting supernatant is then recycled back into the evaporator, allowing the process to continue.

For substances with steep solubility curves where concentration is high at elevated temperatures and low at reduced temperatures additional cooling in the precipitation tank can accelerate solid formation and settling. ZLD systems are intricate and tailored to meet specific application needs, often necessitating product trials to determine the optimal process parameters.

Conclusion

Evaporating digestate and sludge demands more than defaulting to MVR. While its energy savings are compelling, high viscosity, solids content, and ammonia levels often tip the scales toward traditional thermal systems or hybrid approaches. HRS Heat Exchangers advocates for holistic assessment factoring in pre-treatment costs, scalability, and ZLD goals to deliver economically viable solutions. As energy markets fluctuate, the “best” technique remains context-dependent, underscoring why rigorous product testing and customized engineering are non-negotiable.

AquaEnergy Expo

Magazine

Blue | Green | Sustainable | Smart

WATER NEWS BRIEF

August| 2025

www.aquaenergyexpo.com

Xylem Comag Helps Yorkshire Water Exceed Phosphorous Targets

Knostrop Wastewater Treatment Works (WwTW) is Yorkshire Water's largest facility, serving 990,000 residents with a capacity of 5,600 liters per second. To address population growth and lower phosphorus levels discharged into the River Aire, Yorkshire Water initiated a £60 million upgrade in 2023, implementing advanced biological treatment processes mandated by the UK Environment Agency. The CoMag® system from Xylem enhances phosphorus removal using magnetite for faster solid settlement, achieving an average total phosphorus level of 0.25 mg/l, surpassing the 0.4 mg/l target. This efficient system reduces space requirements and operational costs while supporting sustainability goals.

Veolia to equip France's largest treated wastewater reuse project in Argelès-sur-Mer

Veolia and the Albères-Côte Vermeille-Illibéris Community of Municipalities (CCACVI) have begun construction on a wastewater reuse project in Argelès-sur-Mer, aiming to recycle 1.3 million cubic meters of treated wastewater annually—equivalent to five months of potable water use. Supported by France's hydraulic fund, the facility will start operations in April 2026, addressing growing water resource issues in the Eastern Pyrenees. Veolia will implement a membrane ultrafiltration system to meet Category A water quality standards, using the treated water for drip irrigation across 700 hectares of agricultural land, primarily fruit orchards.

Temporary Use Ban (hosepipe ban) enforced on Thames Water network in parts of Swindon, Gloucestershire, Oxfordshire, Berkshire and Wiltshire

Thames Water has implemented a Temporary Use Ban (TUB) in specific areas, including postcodes OX, GL, SN, RG4, RG8, and RG9, due to the driest spring in over a century and record heat in June. Announced on July 14, the ban restricts hosepipe use for activities like car washing and watering gardens to conserve water amid a prolonged dry weather classification by the Environment Agency. While businesses like garden centers are exempt, Thames Water urges residents to conserve water through simple actions. The company is also reducing leaks and planning a new reservoir in Oxfordshire to enhance water supply resilience.

ACWA Power Signs Landmark Agreements with Senegal Government for West Africa's Largest Seawater Desalination Project Powered by Renewable Energy

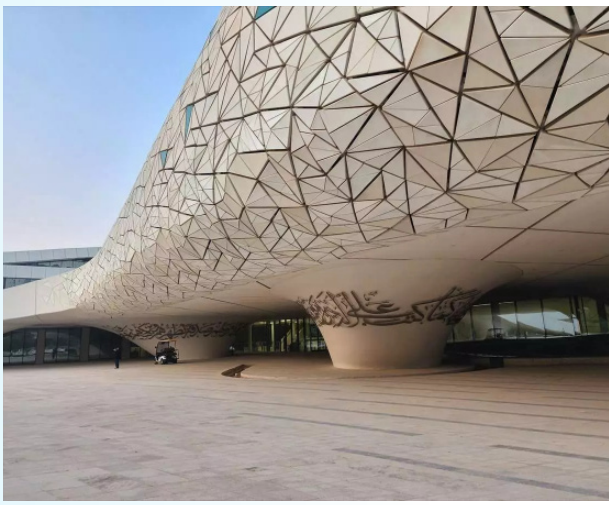
The Grande-Côte seawater desalination project, with a capacity of 400,000 m^3/day powered entirely by green electricity, aims to enhance water security for Dakar and surrounding regions. Implemented in two phases of 200,000 m^3/day each, the project is expected to be fully operational by 2031. ACWA Power has signed key agreements with the Senegalese Government to formalize this $800 million public-private partnership. The project will utilize renewable energy from Senegal's grid and represents West Africa's largest desalination initiative, reinforcing Senegal's commitment to sustainable infrastructure and climate goals.

Veralto Commits €20M to Emerald's New Fund to Accelerate Water Innovation Solutions

Veralto Corporation has committed €20 million to Emerald Technology Ventures' Global Water Fund II, emphasizing its dedication to advancing water innovation and addressing global water challenges. Emerald, a pioneer in sustainable industrial innovation with over €1.2 billion in assets, will provide Veralto access to early-stage water technology companies. This partnership enhances Veralto's ability to identify and scale solutions tailored to customer needs. Emerald's upcoming €150-180 million fund aims to foster innovation in water treatment and monitoring technologies, aligning with both companies' missions to promote sustainability and collaboration in water resource management.

bNovate Technologies Partners with HBKU in Groundbreaking SMART-Distribution Project to Enhance Qatar's Water Security

Novate Technologies has joined the SMART-Distribution initiative to enhance Qatar's water distribution networks amid climate change challenges. This innovative project employs advanced risk assessment and real-time water quality monitoring to bolster the resilience of Qatar's water infrastructure. Led by Hamad Bin Khalifa University's Sustainability Division, in partnership with bNovate and Kahramaa, the initiative aims to create a risk-based monitoring system for drinking water systems. Utilizing cutting-edge technologies, the project will assess water quality fluctuations and ensure reliable water security, aligning with Qatar's National Water Management Plan 2030 and addressing critical water challenges.



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

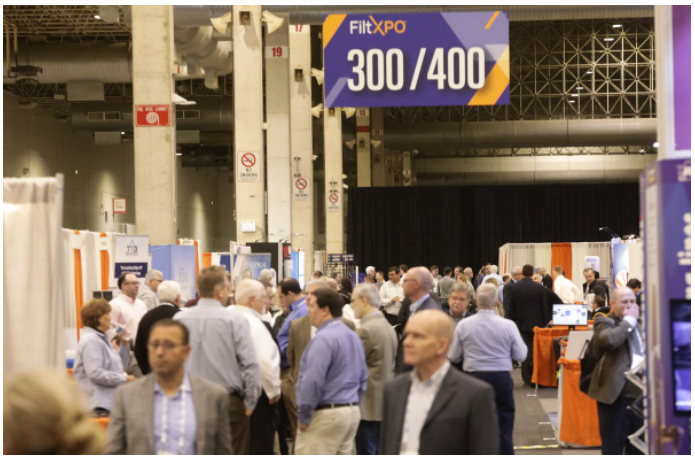
Date: From 15 to 16 April 2025
Location: Hilton London Kensington, London

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

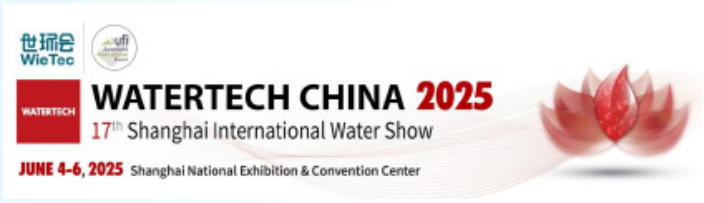
Date: From 4 to 7 March, 2025
Location: West Palm BEeach, Florida

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

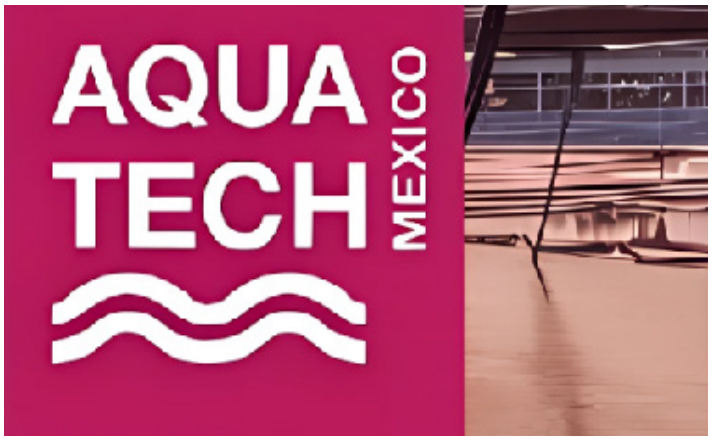
Date: From 24 to 28 August 2025
Location: Stockholm, Sweden

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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From Supplier to Solution Partner: The Al Mousa Approach to Water Systems Integration

In the rapidly evolving infrastructure landscape of Saudi Arabia, delivering water systems is no longer just about supplying pumps and pipes. It's about delivering performance, reliability, and long-term value right from design to post-installation support. This shift in expectations has redefined the role of suppliers, and Al Mousa Trading Co. has embraced this transformation by positioning itself not merely as a product vendor, but as a true solution partner.

Beyond Products: A Modern Vision of Water Infrastructure

Since its founding, Al Mousa Trading Co. has understood that modern projects, whether residential compounds, industrial complexes, hospitals, or mega developments require more than just supply of the components. They demand integrated, engineered systems that meet strict technical, environmental, and performance criteria.

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far beyond procurement. The company offers a full suite of services that includes:

- Technical consultation and design review.
- Energy and flow analysis.
- Site supervision and installation oversight.
- Testing, commissioning, and system validation.
- Post-sales service and maintenance work.

By combining equipment supply with engineering expertise, Al Mousa ensures that every pump, pipe, or valve fits into a bigger, optimized system.

Global Technologies, Local Integration

As an authorized partner of leading global brands such as Grundfos, SPP Pumps, Peerless, Wilo, and Filtralite, Al Mousa Trading brings world-class technology into the Saudi market. But what sets the company apart is how it adapts those technologies to local conditions considering everything to municipal regulations and water resource constraints.

On-the-Ground Experience = Better System Design

Al Mousa's strength lies in its hands-on experience across hundreds of water-related projects. Its team understands how to:

- Select the right pump or filtration system based on local flow patterns and water quality.
- Meet or exceed the Water industry important approvals required in KSA.
- Navigate approvals, testing, and commissioning with local municipalities and authorities.

These insights save clients time, cost, and reduce the risk of redesigns or system failures.

Strong Local Networks and Global Partnerships

Over the years, Al Mousa Trading has developed strong ties with:

- Government and semi-government agencies.
- Local contractors, developers, and consultants.
- Authorized service centers and certified technicians.

This network allows Al Mousa Trading to act as a bridge between international technology and local implementation, ensuring that global innovations are applied successfully on Saudi soil.

Recent Projects: Engineering Excellence in Action

From the SPP fire pump systems installed at Masar Makkah to the acoustic drainage solutions delivered at Dallah Al Arid Hospital, Al Mousa Trading value lies in solving complex challenges through real-world understanding.

Each project showcases how local technical depth, regulatory familiarity, and site-specific experience make a measurable difference in project outcomes.

Core Capabilities: End-to-End Water Systems

Al Mousa Trading success stems from its comprehensive approach in supplying, and supporting water and mechanical systems across residential, commercial, industrial, and municipal sectors. The company's portfolio includes:

- Water supply & pressure boosting systems
- Firefighting pump sets (UL/FM approved)
- HVAC & chilled water circulation
- Submersible & deep well pumping
- Stormwater and sewage management
- Water treatment & filtration technologies
- Thermal & heating solutions
- Specialized piping systems (HDPE, PPR, PEX, Acoustic)

Al-Mousa Trading, we believe that supplying equipment is not enough, we are partners in sustainable water transformation.

As the Kingdom accelerates toward Vision 2030, energy efficiency and long-term operational resilience are no longer optional, they are essential. Our focus goes beyond short-term supply. We engineer optimized water solutions that are designed to minimize electrical consumption, reduce maintenance, and deliver long-lasting performance in harsh operating conditions.

By aligning with national goals for water conservation, renewable integration, and operational efficiency, Al-Mousa Trading is not just supporting today's infrastructure we are building the foundations for the next generation of water systems in Saudi Arabia.

AquaEnergy Expo

"Al-Mousa Trading Wraps Up Masar Makkah Project"

Scope Highlights:

- Delivery of certified SPP fire pumps.
- On-site installation supervision.
- Commissioning in line with international fire protection standards.
- In partnership with SPP Pumps – a global leader in fire systems.
- Raising the bar in safety, reliability, and engineering excellence.
- Supporting Saudi Arabia's Vision 2030 through world-class infrastructure.

الموسى AL MOUSA
AL MOUSA TRADING CO. شركة الموسى للتجارة

Al-Mousa Trading proudly completed the supply and commissioning of 4 certified SPP fire pump sets at the prestigious Masar Makkah car park facility.

info@almousatrade.com https://almousatrade.com/ +966549300388

Jacobi Carbons: Odour Control in Wastewater- Coconut shell-based activated carbon helps utilities go green

Activated carbon stands as one of the most effective technologies for odour control in wastewater treatment facilities. The water industry consumes nearly half of the world's activated carbon production, underscoring its indispensable role. Historically, coal and fossil-fuel-based materials dominated production, but sustainability demands are driving a shift toward greener alternatives. Coconut shell has emerged as a superior raw material due to its renewability, consistent quality, and supply security. Companies like Jacobi Carbons are pioneering this transition, leveraging product engineering to deliver technically advanced solutions. In 2024, the global coconut shell activated carbon market reached $1.5 billion, projected to grow at a 5.5% CAGR a testament to its rising prominence. Jacobi's innovations, such as energy-efficient production methods, further enhance cost-effectiveness and environmental benefits, positioning coconut shell carbon as the future standard for wastewater odour management.

Why Coal-Based Carbon Is Not Our Future

In wastewater treatment, various challenges are visible, such as sludge build-up, mechanical wear, and energy consumption. However, one of the most underestimated yet disruptive issues is odour control. Uncontrolled odours not only

affect air quality but also have broader implications, impacting public perception, regulatory compliance, worker morale, and the overall sustainability of treatment facilities. Foul odours primarily arise from the anaerobic decomposition of organic matter. When organic waste breaks down without oxygen, it produces volatile compounds that escape into the atmosphere. The main culprits include:

• Hydrogen Sulfide (H_2S): This toxic gas has a characteristic rotten egg smell and can be harmful to health and corrosive to infrastructure.

• Amines: These compounds emit fishy or ammonia-like odours and are common in industrial waste.

• Mercaptans: Sulfur-based compounds that produce strong, skunky odors.

• Volatile Organic Compounds (VOCs): Organic molecules that can react with sunlight to form ground-level ozone.

These gases are typically released at various points in the treatment process, including influent pump stations, grit chambers, primary clarifiers, digesters, sludge holding tanks, lagoons, and dewatering facilities. Among these, hydrogen sulfide (H_2S) is particularly concerning, posing health risks to workers and serving as a public nuisance for surrounding communities. Effective air treatment in high-odour areas, such as sludge-handling zones or near open-air treatment basins, is crucial for controlling these emissions. While coal-based activated carbon has been used for decades, its drawbacks are increasingly untenable:

• Non-Renewable and Geopolitically Vulnerable: Coal extraction depletes finite resources and faces supply-chain instability due to price volatility and regional conflicts.

• Inconsistent Quality: Geological variations in coal seams lead to unpredictable mineral content, affecting activation efficiency and final product performance. High ash content and impurities further reduce reliability.

• Environmental and Health Risks: Coal processing emits significant greenhouse gases (GHGs), contributing to climate change. In odour control, coal carbon underperforms its pore structure and surface area are less effective at adsorbing H_2S compared to sustainable alternatives. These flaws highlight an urgent need for alternatives that align with global sustainability goals.

Coconut Shell Activated Carbon: Superiority in Performance

Activated carbon derived from coconut shells offers several distinct advantages over traditional coal-based carbon, particularly in odour control applications. One of the primary benefits is its superior capacity to remove sulfur compounds from the air up to three times more effective than coal-based alternatives. This enhanced performance is attributed to the unique activation process that creates a pore structure optimized for gas-phase adsorption, resulting in a higher surface area, improved

structural integrity, and a catalytic surface that facilitates the removal of hydrogen sulfide.

Additionally, coal-based carbon suffers from variability in quality. Even coal sourced from the same seam can exhibit significant geological differences in mineral content, which can adversely affect the activation process and the final product's quality. Coal's complex chemical composition often leads to higher ash content and unpredictable activation outcomes. In contrast, coconut shell carbon boasts a more consistent chemical composition, moisture profile, and physical structure, along with lower ash content. Since coconuts are farmed rather than mined, the inputs for coconut shell carbon are more controllable, ensuring a reliable and consistent output.

From Waste to Resource: The Circular Economy of Coconut Shells

This consistency is crucial for wastewater treatment facilities, where operators need to predict the performance and longevity of filter media accurately. The renewable nature of coconut shells also sets them apart from coal, which takes millions of years to form. Coconut trees can produce coconuts every six months and continue to do so for up to 100 years, capturing CO_2 from the atmosphere and contributing to climate change mitigation. The shells used for activated carbon are typically a waste product from the food industry, transforming low-value waste into a high-value resource, benefiting both the environment and the economies of coconut-growing communities.

Moreover, the Global Warming Potential (GWP) associated with using coconut shells is significantly lower than that of fossil fuel-based materials. A study conducted by Jacobi Carbons and Maastricht University analyzed the GWP of coconut shell, wood, and coal activated carbon using a "cradle to gate" life cycle assessment (LCA). The results indicated that the GWP of coconut shell activated carbon is less than half that of coal and lower than that of wood, with specific GWP values of 11.8 kg CO_2-equivalents for coal, 7.63 for wood, and 5.46 for coconut shell. Remarkably, reactivated coconut shell carbon can achieve a GWP as low as 0.44 kg CO_2-equivalents. When mixed with a specific ratio of virgin activated carbon for reuse, the GWP increases to only 1.37 kg CO_2-equivalents, representing less than 25% of the GWP of 100% virgin coconut shell activated carbon. This highlights the environmental benefits of utilizing coconut shell-based activated carbon in odour control and wastewater treatment applications.

Pelletized Carbon: Jacobi's Engineering Breakthrough

The geometry of activated carbon significantly influences both cost and sustainability, just as much as its source material. In the water and wastewater treatment sector, activated carbon is available in three primary forms: powdered,

granular, and pelletized. Pelletized carbon is particularly advantageous for air and gas filtration due to its ease of handling and low energy requirements. Reducing dust is a key concern in air filtration, and pelletized carbon minimizes dust production, enhancing both worker safety and equipment protection. With considerably less dust and fines generated, pellets are easier to manage during changeouts compared to granular activated carbon (GAC).

Furthermore, pelletized activated carbon experiences a lower pressure drop, which means that fans and blowers use less energy compared to other media types with varying sizes. Air flows through pellets more efficiently than through powders or granules, eliminating the need for higher energy inputs. The durable structure of pellets contributes to their longevity, resulting in cost savings, decreased labor requirements, and enhanced sustainability. Coupled with the lower global warming potential (GWP) of coconut shell-based carbon, products like Jacobi's AddSorb™ OX meet all essential criteria for the wastewater treatment industry.

AddSorb™ OX: A Leap Toward Carbon-Neutral Odor Control

Jacobi Carbons, Inc. has launched the AddSorb™ OX-Series, an eco-friendly alternative to its coal-based AddSorb Sulfox, as part of its 'GO GREEN initiative. Made from coconut shell , the OX-Series significantly reduces global warming potential (GWP) while delivering high hydrogen sulfide (H_2S) removal efficiency.

The AddSorb OX-Series is available as two variants in extruded form only:

- AddSorb™ OX20 has a minimum H_2S loading capacity of 0.2 grams per cubic centimeter (capacity is 40 percent by weight).
- AddSorb™ OX30 with an enhanced H_2S loading capacity of 0.3 grams per cubic centimeter (capacity is 66 percent by weight).

Jacobi's AddSorb OX-Series products represent a solution for a variety of odor control scenarios where H_2S, organics or the presence of both cause issues in meeting emissions requirements. The product is manufactured using a unique process, which establishes the high adsorption capacity without the use of a chemical impregnation being applied to the activated carbon surface. In its place, a reactive surface functionality is established which can convert H_2S to sulfur compounds which may be physically adsorbed. In addition, the product retains an appreciable capacity for organic contaminants.

> "We are aiming to become the most sustainable supplier of activated carbon and ion exchange resins, replacing fossil-based products within 10 years," said Jacobi Carbons, Inc. Business Development Director of the Americas Rae Marie Harber.

Through product innovation, CleanTech carbonization, production improvement and reactivation, Jacobi can further reduce its already low global warming potential.

From Farm to Filter: Jacobi's End-to-End Decarbonization Model

A key factor enabling Jacobi's coconut shell activated carbon to achieve a low global warming potential (GWP) is the processes involved in converting coconut shells into activated carbon. The initial step involves the burning of coconut shells, often performed by small-scale farmers crucial partners in Jacobi's supply chain using the open-pit method. This method relies on the earth as insulation and does not capture emissions released during pyrolysis. These emissions include harmful greenhouse gases such as methane, carbon dioxide, and carbon monoxide, which pose risks to workers, surrounding communities, and the environment.

To assist these farmers in adopting a more efficient, environmentally friendly, and safer burning method, Jacobi developed the GreenEco Furnace. This compact and highly efficient equipment reaches sufficient temperatures to combust both the coconut shells and the emitted greenhouse gases, thereby eliminating toxic emissions and dark smoke. Future plans include capturing waste heat from the GreenEco Furnace to generate emission-free steam-powered electricity for the towns where the coconut farmers operate. Moreover, activated carbon derived from coconut shells can be reactivated. This process involves removing the adsorbed compounds, allowing the product to be reused, which reduces waste and lowers costs for our customers. The carbon footprint associated with reactivation is estimated to be 80% lower compared to producing virgin activated carbon.

Conclusion

Coconut shell activated carbon transcends its role as an odour-control medium. It embodies a paradigm shift toward circular economies, climate resilience, and social equity. Jacobi Carbons, through innovations like AddSorb™ OX and GreenEco Furnaces, demonstrates how industrial progress can align with planetary boundaries. As wastewater treatment evolves, coconut shell carbon isn't just an alternative it's the inevitable standard. With a market poised to exceed $2 billion by 2030, this technology promises cleaner air, safer communities, and a sustainable blueprint for industries worldwide.

MENA's Renewable, Hydrogen and Energy Storage Insights 2030 from Dii Desert Energy

The Middle East and North Africa (MENA) region, endowed with unparalleled solar irradiation and vast wind resources, stands at the forefront of the global energy transition. As nations pivot from fossil fuels, MENA's renewable energy capacity has surged from less than 1 GW in 2009 to 30.3 GW by the end of 2024, driven by record-low technology costs and ambitious national targets. Dii Desert Energy, an industry alliance founded in 2009, has catalysed this shift through data-driven insights, maintaining comprehensive databases tracking over 700 renewable projects (>5 MW), 117 hydrogen initiatives, and emerging energy storage deployments across the region.

This article synthesizes Dii's landmark MENA Energy Outlook 2025, analyzing three pillars renewables, hydrogen, and storage to project pathways toward 2030. With the region aiming for 236 GW of renewable capacity by 2030, we explore how policy, investment, and innovation will shape a sustainable energy future.

Renewable Energy: Accelerating the Green Revolution

a. Current Landscape

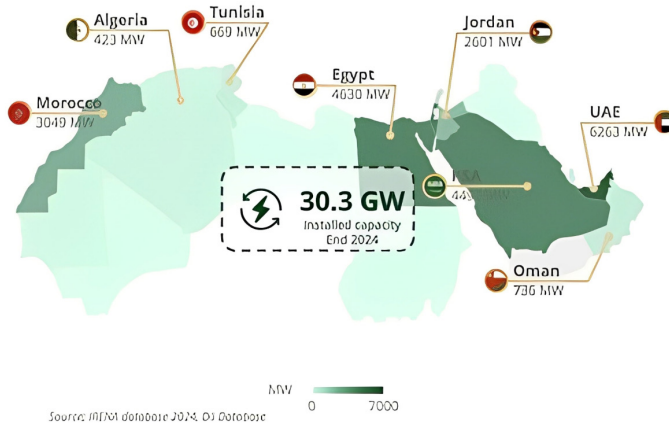
By the end of 2024, the MENA region has achieved a total renewable energy installed

capacity of 30.3 GW, more than doubling from 13.8 GW in 2020. The UAE leads with 6.3 GW, followed by Egypt at 4.6 GW and Saudi Arabia at 4.5 GW. This growth is primarily driven by substantial investments in solar photovoltaic (PV) and wind projects.

• Solar Dominance: Solar PV represents 22.3 GW, accounting for 73% of the region's renewable capacity. The UAE is at the forefront with 5.36 GW, significantly supported by the Mohammed bin Rashid Al Maktoum Solar Park, which aims for a target of 5 GW by 2025.

• Wind Power: Egypt and Morocco are leading in wind energy development, with capacities of 2.14 GW and 2.18 GW, respectively, capitalizing on their excellent wind resources.

By the end of 2024, the Dii RE Database tracked over 700 utility-scale renewable projects across the region, with 467 operational, 47 under construction, and 90 announced.On the construction phase, KSA is leading the way with a series of giga-scale projects, including Al Shuaiba 2, the largest project to date with 2,030 MW. Oman is also set to significantly increase its capacity in 2025 with the Manah 1 and 2 projects, each having a capacity of 500 MW.

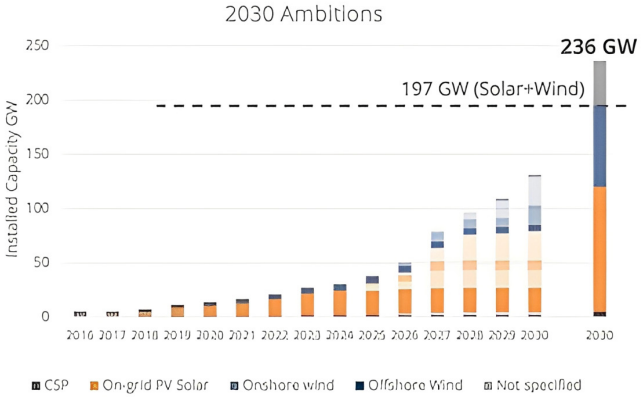


b. 2030 Ambitions and Gaps

Looking ahead to 2030, the MENA region has set ambitious targets for renewable energy deployment, aiming for a total installed capacity of 236 GW. This goal requires :

• 115 GW solar PV (40 GW gap to meet targets).
• 75 GW onshore wind (23 GW gap).
• 5 GW CSP and 2 GW offshore wind (novel for the region).

KSA leads the region in terms of ambitions, accounting for nearly half of the MENA target with an aim to reach 100-130 GW of renewables by 2030 and a share of 45-50% in the energy mix. Jordan has the narrowest gap to fill to meet its 2030 ambition. Oman expects to reach its target of 30% generation capacity ahead of schedule, with 3.8 GW installed by 2028. Egypt aims to install 45 GW of renewable energy, with 28 GW coming from wind by 2030, although this might be reviewed downwards following latest targets announcements.



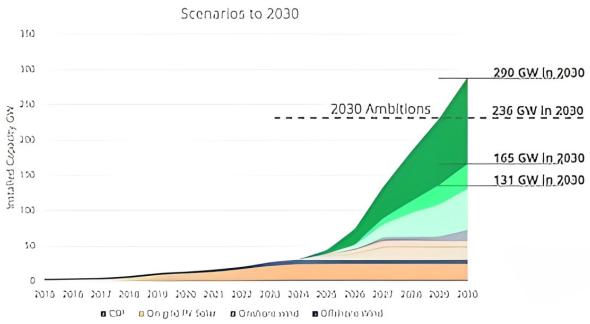
c. Three Pathways to 2030

Three pathways to 2030 outline potential scenarios for renewable energy development in the MENA region.

• Conservative Transition: This scenario assumes that only the projects currently in the pipeline will be realized, including those in pre-development and signed MoUs, totalling an additional 58 GW. It posits that future announcements will offset cancelled projects, resulting in no significant increase in planned capacities. By 2030, this scenario anticipates a total of 131 GW of installed renewable capacity.

• Balanced Transition: In this scenario, new projects are expected to be announced, with some operational by 2026. The additional capacity is projected to reach 60% of current planned capacities by 2030, totalling 92 GW. However, this still falls short of ambitious targets set by countries like Saudi Arabia. By 2030, this scenario forecasts 165 GW of renewable capacity.

• Green Revolution: This optimistic scenario envisions tripling the announced projects (currently 58 GW) to achieve the 236 GW needed to meet ambitions. It predicts that all targets will be met or exceeded, leading to a significant boost in renewable energy deployment, with a total of 290 GW installed by 2030.



Hydrogen: From Promise to Pragmatism

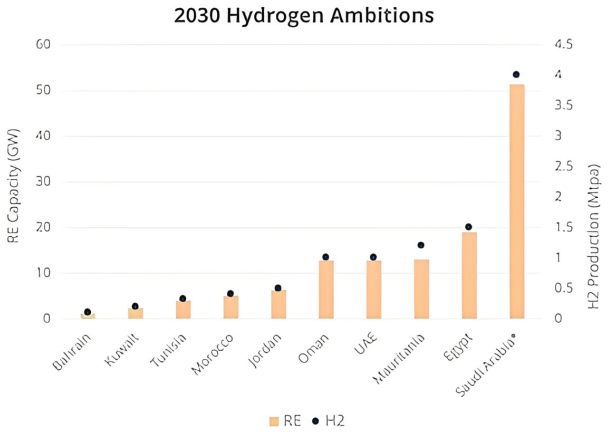
The hydrogen sector in the MENA region is experiencing significant growth, with over 117 projects announced by the end of 2024, primarily focused on green hydrogen produced from the region's renewable resources. However, the transition from announcements to actual projects has been slow, with only a few pilot projects currently operational such as the DEWA Green Hydrogen Pilot 1 in the UAE, which utilizes a 1.25 MW PEM electrolyzer, the Egypt Green (Phase 1) project developed by Fertiglobe and Scatec, and the Masdar-Emirates Steel pilot project in the UAE, which produces green steel using green hydrogen. But only six projects had reached financial closure and are either under construction or set to commence soon:

- DEWA Green Hydrogen Pilot 2 Plant in the UAE, which will use a 2.5 MW alkaline electrolyzer.
- NEOM Green Hydrogen project in Saudi Arabia, which achieved financial closure in December 2022 and is expected to begin operations by late 2026. This project will utilize 4 GW of renewable energy to produce 1.2 million tonnes per annum (mtpa) of green ammonia with 2.2 GW of electrolyzer capacity.
- ENOWA's Hydrogen Innovation and Development Center in KSA, aiming to produce green methanol and gasoline by the end of 2025.
- ACME Green Project in Oman, which reached a final investment decision in 2023, plans to produce 100 kilotonnes per annum (ktpa) of ammonia, expanding to 1.2 mtpa.
- Ammonia-7 in Qatar, developed by QatarEnergy Renewable Solutions and QAFCO, is set to produce 1.2 mtpa of blue ammonia.
- TA'ZIZ Blue Ammonia Plant in the UAE, part of the TA'ZIZ industrial complex, will have a production capacity of 1 mtpa of ammonia.

2030 Production Targets

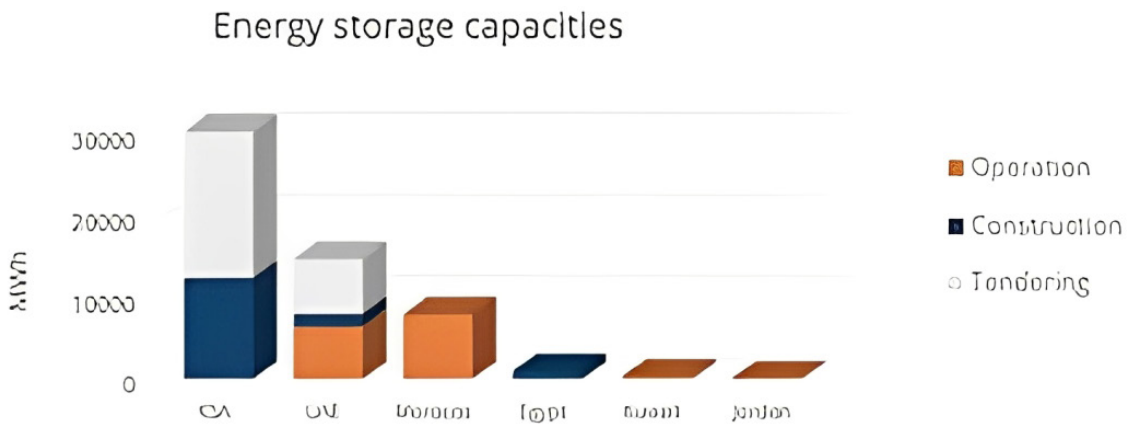
The rapid development of hydrogen projects in the MENA region faces several challenges, including a lack of demand, regulatory uncertainty, and inadequate infrastructure for production and distribution. Despite these hurdles, countries in the region have established ambitious hydrogen production targets, aiming for approximately 10 million tonnes per annum (Mtpa) by 2030.

Achieving this goal will necessitate substantial investments in renewable energy capacity, estimated at around 128 GW. Saudi Arabia (KSA) has set the most ambitious targets, encompassing various types of hydrogen. Addressing the existing challenges will be crucial for realizing these production goals and fostering a robust hydrogen economy in the region.



Energy Storage: Enabling Grid Resilience

Energy storage is becoming increasingly critical for integrating renewable energy into the grid. The variability of solar and wind energy necessitates robust storage solutions to ensure reliability and stability.



In the MENA region, there are currently nine operational energy storage projects with a combined capacity of about 13,000 MWh, primarily consisting of battery energy storage systems (BESS) and two thermal energy storage systems (TESS). The first project, developed by EWEC in the UAE in 2015, has a capacity of 648 MWh. The Noor Energy 1 TESS, part of the Mohammed Bin Rashid Al Maktoum Solar Park, is the world's largest thermal energy storage plant, boasting a capacity of 5,907 MWh.

Additionally, eleven projects were under construction, mainly BESS-based, which would increase storage capacity by 16,750 MWh. Saudi Arabia led in this sector, with significant initiatives like the NEOM project, which featured a 600 MWh BESS to support 4 GW of solar and wind energy. The Bisha BESS project, with a capacity of 500 MW/2,000 MWh, was set to be commissioned in January 2025. Furthermore, over 25,000 MWh of new projects were currently in the tendering process across KSA, UAE, and Morocco, all of which were BESS-based.

Country Spotlights: Diverging Trajectories

• Egypt

Egypt has made significant strides in renewable energy deployment, with a total installed capacity of about 4.6 GW by the end of 2024. The government aims to achieve 58% renewable energy in its electricity mix by 2040. The country is also positioning itself as a leader in green hydrogen production, with several projects announced and a target of 6-7.5 Mtpa by 2030.

• Jordan

Jordan has a total installed renewable capacity of 2.6 GW, with plans to reach 50% of its electricity generation from renewable sources by 2030. The country is exploring hydrogen production as a key component of its economic strategy, with significant potential for green hydrogen exports.

• Saudi Arabia

Saudi Arabia is rapidly advancing its renewable energy targets, aiming for 100-130 GW by 2030. The Kingdom is also investing heavily in hydrogen projects, with NEOM leading the way in innovation and production capabilities. The ambitious goals set by Saudi Arabia reflect its commitment to becoming a leader in the global energy transition.

• UAE

The UAE has established itself as a pioneer in renewable energy, with a target of 30% of its

electricity generation from renewables by 2030. The country is also focusing on developing a hydrogen economy, with a target of 1.4 Mtpa by 2031, supported by various pilot projects and strategic initiatives.

• Morocco

Morocco is a leader in renewable energy development in North Africa, with a total installed capacity of 3 GW. The country has set a target of 52% renewable energy by 2030 and is actively pursuing green hydrogen projects as part of its national strategy.

Conclusion

Dii Desert Energy's data underscores a pivotal decade: if the "Green Revolution" pathway accelerates, MENA could supply 10% of global green hydrogen and become a 290 GW renewable powerhouse by 2030. As global leaders like the EU and China advance climate agendas, MENA's success will resonate far beyond its deserts redefining energy security, economic diversification, and planetary resilience. However, achieving these goals will require concerted efforts to address the challenges of regulatory uncertainty, infrastructure readiness, and market demand. By leveraging its abundant renewable resources and fostering innovation, the MENA region can pave the way for a sustainable energy future.

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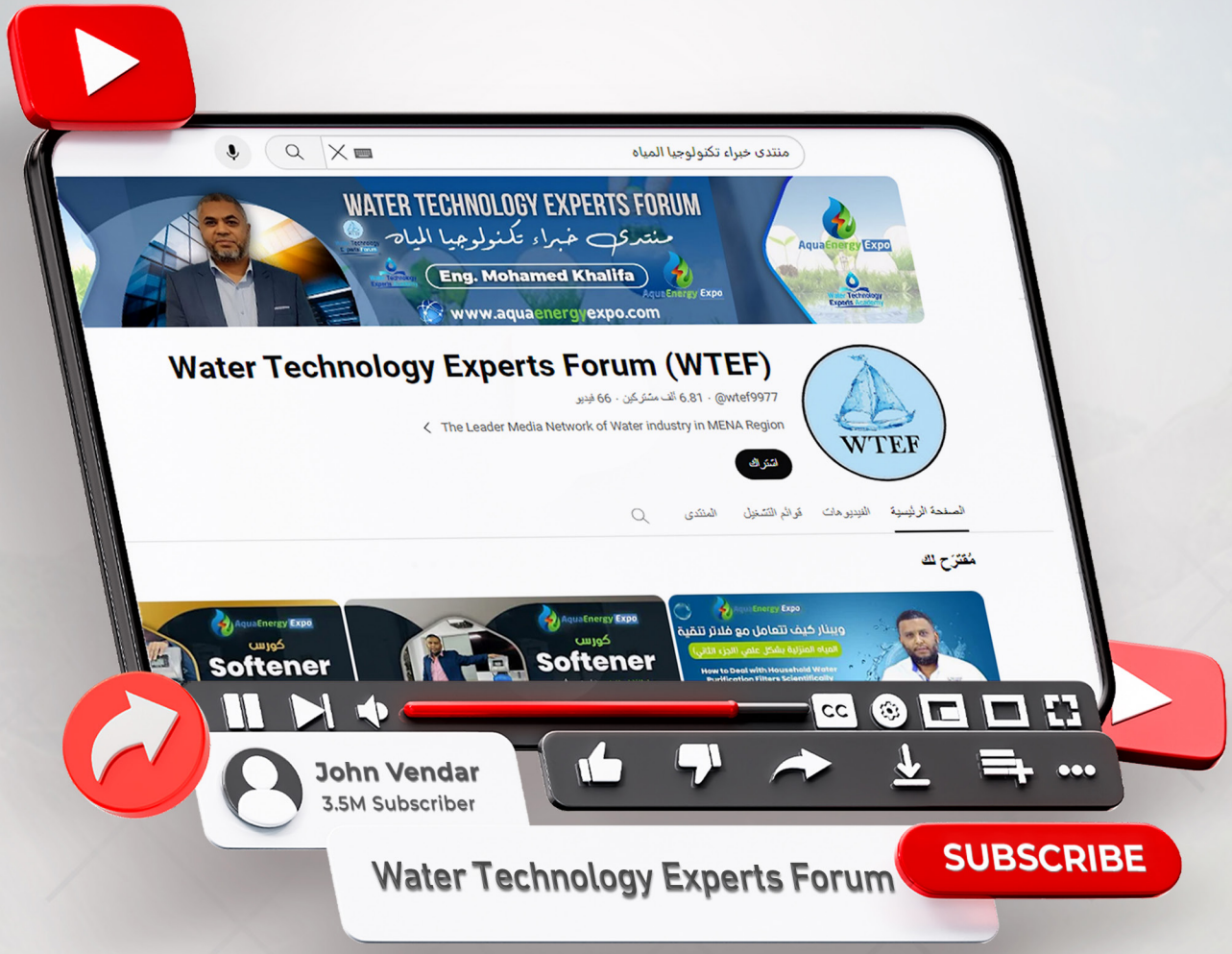

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August | 2025

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إنجازات وزارة الموارد المائية والري

المهندس/ محمد غانم

المتحدث الرسمي بإسم وزارةوالري في مصر

من ٨:٠٠ - ٩:٠٠ مساءاً (بتوقيت القاهرة)

الجمعة, 1 اغسطس 2025

Cooling Towers: Types, Design, Components, Operation, and Chemical Treatment

Senior Chemist / Ragab Gamal Ahmed

08:00 to 10:00 PM (Saudi Arabia Time)

Thursday, August 7th 2025

Environment and Sustainability Manager Skills

Prof. Dr. Abdelfattah Mahmoud Gharieb

7:00 to 9:00 PM (Saudi Arabia Time)

Saturday, August 30th 2025

Corrosion Management

Eng. Salah Ghourab

08:00 to 10:00 PM (Saudi Arabia Time)

Friday, August 15th 2025

From Imbalance to Efficiency: Advanced Microbial Tools for Biomass Control

Dr. Zakaria Morad

Head of Global Scientific Offices at Sternova Solutions

08:00 to 10:00 PM (Saudi Arabia Time)

Saturday, August 29th 2025

Understanding Industrial Water and Boiler Treatment – From Chemistry to Sustainability

Eng. Mohanad Gamal El-Deen

08:00 to 10:00 PM (Saudi Arabia Time)

Friday, August 22nd 2025

The Microbiological Water Pollution and Its Effects on Water Treatment Processes

Dr. Wafaa Mustafa Youssef

Central Chemical Laboratories - Ministry of Electricity.

08:00 to 10:00 PM (Saudi Arabia Time)

Friday, August 22nd 2025

Impact Together

Eng. Essam Tantawy

Co-founder of Midwater co.

08:00 to 10:00 PM (Saudi Arabia Time)

Saturday, August 16th 2025

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Central Agency for Reconstruction

General Eng. Mahmoud Nassar

Head of the Central Agency for
Reconstruction Central Agency for Reconstruction

Eng. Mahmoud Nassar

Central Agency for Reconstruction (CAR) is an important pillar of construction in Egypt. Affiliated with the Ministry of Housing, the agency was established in 1975 and is keen to implement development projects all over Egypt, there are (10) executive agencies subordinated to the Central Agency, in addition to 29 training centres in construction trades and heavy equipment.

Major General Engineer/ Mahmoud Nassar is Head of the Central Agency for Reconstruction. CAR and its subsidiaries are keen to achieve sustainable development goals (SDGs) by planning and implementing projects that contribute to improving quality of life for everyone.

What We Do (Our services)

The projects vary between the implementation of decent housing projects, as well as Road Networks and Bridges, infrastructure works, development of slums, development of remote areas, Renovation Projects in Islamic Cairo, training programs and other service projects:

• Establishing national & Local Road projects and bridges that make transportation smoother, safer, and more efficient.

• Providing adequate Housing projects that suit the Egyptian families and enhance their living standards.

• Implementing Various services and utilities that improve quality of everyone's life (Ex. Desalination plant projects in the Red Sea Governorate – development projects in Sinai and remote areas – youth centers - Lighting Systems and electrical works in Sinai - Social Solidarity Centers - Healthcare Centers ...).

• Providing various Training courses & activities or the youth on construction trades & heavy equipment.

• Reviving the Egyptian heritage and Preserving the Islamic architecture.

The Central Agency for Reconstruction (CAR) is also keen on implementing various developmental flagships for the citizens of Sinai and Canal cities as part of a strategy to develop Sinai.

From 2014 till now, the agency has successfully completed 1820 diverse projects, including roads, housing, utilities, and services, with a total cost of EGP 190.5 Billion

Sustainable Development Goals (SDGs)

When it comes to Sustainable Development Goals (SDGs), the Central Agency for Reconstruction is implementing multiple projects related to Goal No. 11. "Sustainable cities & communities" which aims to:

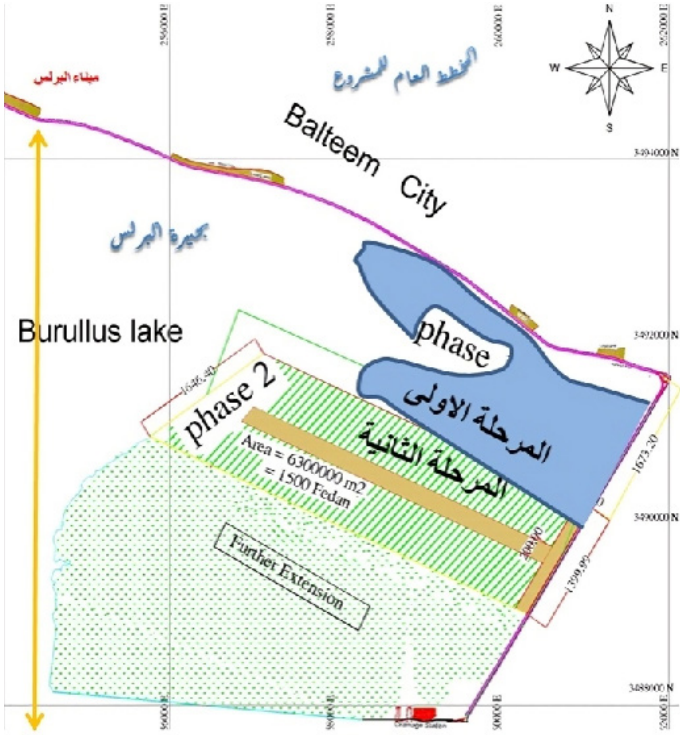
- Ensure access for all to adequate, safe and affordable housing and basic services and slum upgrading (Ex. Slums Elimination Projects, Haya Karima Initiative, ...).

- Strengthen efforts to protect and safeguard the world's cultural and natural heritage (Ex. Renovating: Zeinab Khatoon House, "Qaitbay Agency" in Bab Al-Nasr ...).

- provide universal access to safe, inclusive and accessible, green and public spaces. (Ex. Al Fustat Hills Park Project, ...).

We have also considered the importance of promoting vocational training that is consistent with Goal No. 8 by providing training programs which aim to promote full and productive employment and decent work for all and substantially reduce the proportion of youth not in employment or training.

And we have also considered the importance of protecting and restoring water- related ecosystems including lakes that is consistent with Goal No.6 (Ex. cleaning and deepening the Burullus Lake in Kafr El-Sheikh) that ensures availability and sustainable management of water.



Main Projects

1. Establishing national & Local Road projects and bridges

That make transportation smoother, safer, and more efficient. A total of 585 Road projects with total length 6328 km was constructed from 2014 till now with a total cost of about EGP 92.3 Billion. Examples (Kamal Amer axis, Giza - June 30 axis – Dairout/ Elfarfra axis...)

2. Providing adequate Housing projects:

- Slums Elimination Projects such as:

• Rawdat Al Sayeda project (The project aims to transform a neglected, dangerous slum called "Tal Al Aqareb" with inadequate infrastructure into a modern urban community that provides adequate housing with an architectural design that match the identity of the place).
• Alternative housing projects in The Red Sea: Establishing about 3,780 housing units as an alternative to slums in "Hurghada, Marsa Alam, Ras Ghareb, Halaib and Shalateen".
• Alternative housing projects in Sinai: Establishing about 1,434 housing units as an alterna-

- Adequate Housing projects in needy villages across Egypt:

• Home Rehabilitation of most needy villages: Rehabilitation of 5015 housing units to most vulnerable families in needy villages across Egypt with cooperation of the World Bank
• Bedouin Houses in The Red Sea, Ismailia, and Sinai: Establishing 1603 Bedouin houses in (Sinai- Ismailia). Establishing 3920 Bedouin houses in The Red Sea (Halayeb, Shalateen, Abu Ramad, Marsa Alam).
• The Sutra project: Rehabilitation of 10,000 housing units to vulnerable Egyptian families (restoration and re-roofing). The project is implemented in cooperation with Misr El Kheir Foundation and with funding from the Alwaleed Philanthropies.
• Sakan Karim "Decent Housing" Project: Rehabilitation of 2300 homes (Reinforcing roofs and walls - Installing floor tiles – delivering drinking water and sewage...).

The project is implemented in cooperation with the Ministry of Social Solidarity and with funding from the Ministry of Endowments.

- Development projects in Sinai and Remote areas

• Establishing 32 developmental clusters in Sinai and remote areas: To achieve an appropriate economic and social level for the residents and provide them with job opportunities after training them, the project includes the following activities (Fish Farms - Greenhouses - Planting vegetables, fruit trees, and palm trees - Raising goats and sheep - Milking stations - Seedling nurseries - Digging wells - Bedouin homes - Service buildings (A mosque – a school – an event hall - a healthcare unit - outlets for selling farm products - workshops for training girls and women).
• The new development communities in North and South Sinai: Implementing housing complexes in the new development communities, including the establishment of 22 new housing complexes in North and South Sinai
• Cleaning and deepening the Burullus Lake (Kafr El-Sheikh) with an area of (6000 acres) - cleaning and protecting the sides of the strait - establishing radial channels to improve water quality and flow.

- Desalination plant projects in the Red Sea Governorate:

• Establishing a desalination plant in New Abu Ramad (Capacity 1500 m3/ Day), then expanding and increasing the plant's capacity to (3000 m3/Day).
• Establishing a desalination plant in Halaib (Capacity 1500 m3/Day).
• Expanding and increasing the capacity of the desalination plant in Halaib (from 1500 m3/ Day to 4500 m3/Day).
• Expanding and increasing the capacity of the desalination plant in Shalateen (from 3000 m3/ Day to 9000 m3/ Day).

3. Decent life "Haya Karima" National Initiative (The First Phase)

It's a presidential initiative which was launched in 2019 to raise the standard of living by upgrading basic services in rural communities.

The "Haya Karima" initiative is the largest national project implemented by the state in its history, whose impact extends to cover all global sustainable development goals and dimensions.

The first phase of the initiative is covering about 1488 villages in 52 centers at 20 governorates, with a population of about 18 million people. The Ministry of housing is responsible for 10 governorates including: (Luxor, Aswan, Assiut, Beni Suef, Minya, Fayoum, Qalyubia, Gharbia, Kafr El Sheikh, Damietta) covering about 739 villages in 25 centers. With total projects number (3630 project) and total cost of (LE 58 Billion).

4. Al Fustat Hills Park Project in Historic Cairo

Located in the heart of historical Cairo, Fustat Hills Park is one of the largest parks in the Middle East, covering about 500 feddans. Formerly a waste landfill,

the park is being transformed into a central recreational hub and aims to increase green areas and to be a tourist attraction for regional and international visitors.

The project includes (The Cultural zone, The Qasaba zone, The Heritage Gardens zone, Al-Hafaer zone (The excavations zone), The adventure area, The Market area, Hills zones, The Investment area overlooking Lake Ain Al-Hayah. The project is connected to the Amr ibn Al-Aas Mosque Square, which has undergone comprehensive development, and has been uniquely restored to its former structure.

5. The Great Transfiguration Project in St. Catherine

It's a grand initiative set to transform the captivating mountainous landscapes of St. Catherine city in South Sinai into a haven for spiritual seekers and a hotspot for unique medical and environmental tourism experiences.

The project includes (The visitor center, the Peace Building and Square, the Wadi Al-Deir area, the eco-lodge extension, the Mountain Hotel, the residential neighbourhood of Al-Zaytuna, the Bedouin housing area, the bustling tourist bazaar area, the heritage town center, the new government complex in St. Catherine, and robust infrastructure "efficient road networks and facilities".

6. Renovation Projects in Islamic, and Fatimid Cairo

The aim is to restore, renew, and repurpose the Islamic historical facilities and the Fatimid neighbourhood,6. Renovation Projects in Islamic, and Fatimid Cairo The aim is to restore, renew, and repurpose the Islamic historical facilities and the Fatimid neighbourhood, which are known for their remarkable architectural and artistic qualities (Examples: Amr Ibn Al-Aas Mosque Square, - Zeinab Khatoon House - Qaitbay Agency - Sakakini Pacha Palace...). The primary goal is to preserve the archaeological heritage of these sites and establish them as significant tourist attractions.

7. Training Center on Construction Trades & Heavy Equipment

The Training Center on Construction trades and Heavy Equipment was established in 1975 and is considered one of the agencies affiliated with the Central Agency for Reconstruction. It has 29 Training centers all over Egypt.

It aims to promote training in the construction field and enhance training awareness in accordance with the requirements of labor needs and the demands of development and reconstruction plans in the country.

The Construction Authority for Potable Water and Wastewater: Towards Smart and Sustainable Development of Water and Sanitation

The Construction Authority for Potable Water and Wastewater, one of the entities affiliated with the Ministry of Housing, Utilities, and Urban Communities, is one of the pivotal entities in supporting the infrastructure for providing potable water and sanitation services in the Arab Republic of Egypt. The Authority was established by Decree No. 497 of 1981 issued by the Minister of Reconstruction and State for Housing and Land Reclamation, to undertake a strategic role in planning, executing, and monitoring water and wastewater projects, in line with the state's goals for sustainable development according to Egypt's Vision 2030. The Authority operates according to the highest technical and environmental standards, and its activities expand to serve approximately 34% of the population of the Republic, in the governorates of Cairo, Giza, Qalyubia, Alexandria, in addition to a number of new cities.

A Decade of Major Achievements (2014–2024)

During the last decade, the Authority has achieved a qualitative leap in its projects, where 322 projects were implemented with total investments amounting to 31.2 billion Egyptian pounds. These included the construction of treatment plants with a capacity of 3 million m^3/day for wastewater, and potable water projects with a capacity of 1.6 million m^3/day.

These included the delivery of water and sanitation services to 128 villages and their affiliated hamlets,

Contributing to a significant improvement in the quality of life for citizens in underserved areas. Notably, the sanitation coverage rate for villages in Qalyubia Governorate increased from 16.9% based on 2014 population data to 85% in 2024, while coverage in Giza Governorate rose from 32% to 50% during the same period reflecting the scale of efforts made to enhance infrastructure and public services.

Supervision of the Largest Treatment Plants in the Middle East and Africa

The Authority is responsible for supervising the operation and maintenance of the largest wastewater treatment plants in Egypt, which are among the largest in the Middle East and Africa. Among the most prominent of these:

Al-Gabal Al-Asfar Treatment Plant:

The plant was established to serve the population of Greater Cairo, and is considered one of the largest treatment plants in the world, with a current design capacity of 2.5 million m³/day, distributed over two phases:

- **Phase One:** 1.5 million m³/day
- **Phase Two:** 1 million m³/day
- Work is currently underway to implement the third phase with an additional capacity of 1 million m³/day, bringing the total capacity of the plant to 3.5 million m³/day by 2030.

It is also worth highlighting the key projects executed by the Authority

Abu Rawash Treatment Plant – Giza :

Total capacity of 1.6 million m³/day, distributed over:

- **Phase One:** 1.2 million m³/day
- **Phase Two:** 400 thousand m³/day

East Treatment Plant – Alexandria:

Total capacity of 1.2 million m³/day

Advanced Technologies for Environmental and Economic Sustainability

The Construction Authority for Potable Water and Wastewater pays great attention to adopting the latest technologies in the fields of water and wastewater treatment, out of its belief that true sustainability can only be achieved through the effective integration between operational efficiency and advanced technology. One of the key areas of excellence in this regard is the expansion in sludge treatment systems and the introduction of anaerobic digesters for the first time at the level of treatment projects in Egypt.

The Authority was the first government body to introduce this advanced technology at Al-Gabal Al-Asfar treatment plant, which is one of the largest treatment plants in the Middle East and Africa. This technology relies on the biological treatment of sludge in an oxygen-free environment to produce biogas, which contributesto reducing the volume of final sludge, producing renewable energy that can be used to operate parts of the plant autonomously, reducing the plant's carbon footprint, achieving economic benefit from waste, improving

treatment efficiency, and reducing the burden on transport and subsequent treatment networks.
to reducing the volume of final sludge, producing renewable energy that can be used to operate parts of the plant autonomously, reducing the plant's carbon footprint, achieving economic benefit from waste, improving treatment efficiency, and reducing the burden on transport and subsequent treatment networks.

The application of these technologies is not limited to Al-Gabal Al-Asfar only, but the Authority has begun to expand their use in other projects including the East Treatment Plant as well as projects currently under preparation, such as the Arab Abu Saad Wastewater Treatment Plant in Helwan, the expansions and upgrades of the West Treatment Plant in Alexandria, and the sludge treatment and utilization project at Abu Rawash Treatment Plant in Giza Governorate. These efforts are part of the Authority's plan to develop sludge systems and maximize the utilization of sludge.

In the context of digital transformation, the Authority is working on integrating SCADA systems into new and existing plants, and applying digitization and GIS technologies for monitoring and maintenance, to ensure rapid response, improve performance efficiency, reduce losses, and enhance transparency in operations.

The Authority aims to serve as a model for achieving a balance between technology, social, and environmental sustainability. Its role goes beyond simply disposing of wastewater extending to the maximization of resource recovery from treatment processes through the reuse of treated water and the utilization of sludge, through its use in producing biogas and fertilizers, thereby contributing to the circular economy by focusing on:

• Improving the quality of produced and treated water.

• Reducing losses from the networks through pressure and consumption monitoring.• Supporting the transition to the safe use of treated water in irrigation and manufacturing.

This integrated approach makes the Construction Authority not only an executor of projects, but an innovator in providing solutions and a regional leader in sustainable water infrastructure.

A Central Role in the "Haya Karima" Initiative

The Authority plays an active part in the first phase of the national project to develop the Egyptian countryside ("Decent Life" initiative), where it is implementing 46 projects to serve a total of 39 villages in Giza and Qalyubia governorates, with an estimated cost of 7 billion pounds, including the construction of gravity networks and 25 lifting stations and 3 treatment plants in Giza Governorate, and construction of gravity networks and 24 lifting stations and 3 treatment plants in Qalyubia Governorate.

The Authority also plans to implement projects for the second phase of "Decent Life," including 6 water purification plants and 15 treatment plants with a total capacity of 413 thousand m³/day.

Urban Expansion and Future Projects

Currently, 219 projects are being implemented in the governorates of Cairo, Giza, Qalyubia, and Alexandria, at a cost of about 31 billion pounds, with a total capacity of 1.78 million m^3/day (516 thousand m^3/day for Wastewater and 1.27 million m^3/day for potable water). The plan also includes 16 projects in new cities with a cost of 13.7 billion pounds.

International Partnerships for Development

The Construction Authority is keen collaborate with development partners from major international financing and development institutions, such as the European Investment Bank, the African Development Bank, and the French Development Agency. The Authority continuously seeks to build strategic partnerships through the implementation of innovative projects under the public-private partnership (PPP) model, including the sludge treatment project at Abu Rawash Wastewater Treatment Plant and the expansion of Mostorod Water Plant with a capacity of 150,000 m^3/day. These efforts aim to strengthen the Authority technical and financial capabilities and to deliver projects that support Egypt's sustainable development goals.

Towards a Sustainable Water Future

Through this comprehensive approach that integrates operational efficiency, technical innovation, and digital transformation, the Construction Authority for Potable Water and Wastewater affirms its position as a regional leader in the field of water resource management and sustainable infrastructure. It serves as a model in balancing environmental preservation with the provision of basic services with quality and efficiency, in line with the ambitions of the New Republic and serving the future of coming generations.

Eng. Ahmed Abd El-Kader

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ENERGY NEWS BRIEF

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LONGi Achieves Breakthrough in Perovskite-Silicon Tandem Solar Cell Efficiency

Perovskite-silicon tandem solar cells are at the forefront of photovoltaic research, aiming to exceed the Shockley-Queisser efficiency limit of traditional silicon cells. By integrating wide-bandgap perovskites, these tandem architectures minimize thermalization losses, enhancing solar energy utilization. However, performance has been hindered by interfacial non-radiative recombination. In a groundbreaking study, LONGi's team introduced a bilayer-intertwined passivation strategy, achieving a certified power conversion efficiency of 33.9%, surpassing the single-junction limit. Collaborating with Soochow University, they also developed an innovative asymmetric carbazole-based self-assembled molecule to further improve carrier extraction and reduce recombination at buried interfaces, marking significant advances in solar technology.

RSE and Siemens Collaborate to Accelerate Decarbonisation of Water Treatment

RSE has partnered with Siemens to explore how digitalization can aid in decarbonizing water treatment processes. Their Memorandum of Understanding (MoU) aims to integrate Siemens' digital and AI technologies into RSE's modular systems, enhancing efficiency and scalability. The collaboration will begin with feasibility and pilot projects in 2025, progressing to full-scale implementation in 2026. Emphasizing skills development, the partnership seeks to upskill the water workforce through training programs. This initiative reflects Siemens' commitment to innovation in the water sector, addressing the urgent need for low-carbon infrastructure and advanced water treatment solutions.

TotalEnergies Joins PJM Interconnection, The Largest Power Grid in The United States

TotalEnergies has joined PJM Interconnection, North America's largest wholesale electricity market, allowing its U.S. trading division to participate in physical and financial energy transactions. PJM serves around 65 million users across 13 states in the northeastern and mid-Atlantic regions. This membership provides TotalEnergies' Houston trading hub access to advanced trading systems, aiding in energy portfolio optimization. The company has invested nearly $11 billion in the U.S. over the past three years, focusing on oil, LNG, and low-carbon electricity, and is the leading U.S. LNG exporter. TotalEnergies also has 10 GW of renewable projects in development, supporting its lower-carbon strategy.

Enphase Energy Continues Expanding Product Offering in Europe with IQ8P Microinverter Launch in Italy and Switzerland

Enphase Energy has launched its IQ8P™ Microinverters in Italy and Switzerland, expanding its product offerings in Europe. With a peak AC output of 480 W, the IQ8P Microinverters are designed for high-powered solar modules, accommodating up to 670 W DC and handling a continuous direct current of 14 amperes. This model represents Enphase's most powerful microinverter to date, promising enhanced energy harvesting and performance. All units shipped and activated in these countries come with a 25-year warranty, demonstrating the company's commitment to quality and long-term customer satisfaction.

Waaree Energies Launches Waaree Prime+: Empowering the Lives and Livelihoods of India's Solar Integrators

Waaree Energies Ltd., India's largest solar PV module manufacturer, has launched Waaree Prime+, a next-generation digital loyalty and empowerment platform for solar integrators and EPC companies. This initiative aims to transform solar entrepreneurs into future-ready professionals by providing incentives, tools, training, and support to enhance their careers and businesses. Waaree Prime+ offers powerful business tools, ongoing training, exclusive rewards, real-time invoice tracking, and family engagement activities. The platform not only streamlines operations but also recognizes the contributions of solar integrators, fostering inclusive growth in India's rapidly expanding solar sector. This launch underscores Waaree's commitment to supporting the entire solar economy.

Oklo and Vertiv Announce Collaboration to Advance Power and Cooling Solutions for Hyperscale and Colocation Data Centers in the United States

Oklo has partnered with Vertiv to develop power and thermal management solutions for hyperscale and colocation data centers, utilizing steam and electricity from Oklo's advanced nuclear power plants. This collaboration aims to enhance energy efficiency and support the growing power demands of U.S. data centers. A pilot demonstration is planned for the Oklo Aurora powerhouse. Both companies emphasize delivering clean power and energy-efficient cooling tailored for AI and high-performance computing, while minimizing environmental impact and creating comprehensive designs for data centers powered by Oklo's facilities.

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)

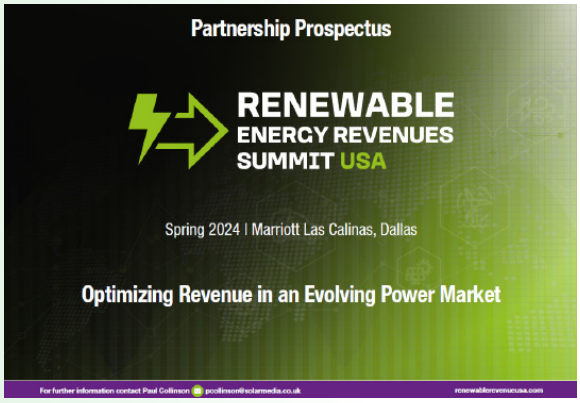
Date: From 10 to 12 April , 2025
Location: Beijine – New China International Exhibition center phase 2

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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