February 2025 Issue 14

AquaEnergy Expo Magazine

Towards a Green | Blue | Smart | Sustainable World

Towards a Sustainable and Smart Future for Egypt:

Future Projects in Egypt in the Field of Water and Green Smart Cities

H.E. Dr Sayed Ismail

Deputy Minister for Infrastructure, Ministry of Housing, Utilities & Urban Communities, Egypt

AquaEnergy Expo Middle East & Africa Egypt

Aqua Energy Expo MEA 2025

At Cairo International Convention Center (CICC), Nasr City Cairo, Egypt

From 24th to 26th Sep. 2025

Under the Patronage of

FILTRALITE's Media reduce the Size and Cost of Water Treatment Plants

WETCO : Pioneering Water Purification for a Sustainable Future

AECOM : Optimize Your Wastewater Treatment with Advanced SCADA

www.aquaenergyexpo.com

AquaEnergy Expo
Magazine
Blue | Green | Sustainable | Smart

Now for Free & for a Limited Time

Show your products in the global virtual expo for water and energy products

Joining the virtual expo will help you to increase your customers network, grow your sales, publish your brand, find new distributors and agents and open new markets

The virtual expo of water and energy products contains more than ***15000*** *products and more than* ***1100*** *companies from more than* ***150*** *countries around the world*

To add your company for free contact us

WhatsApp (+966 505308851)

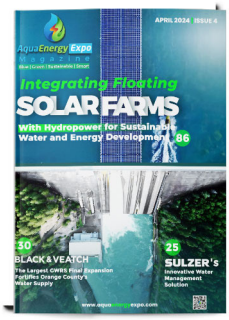
www.aquaenergyexpo.com

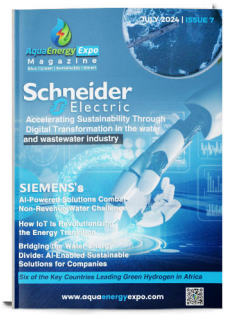
AquaEnergy Expo Magazine

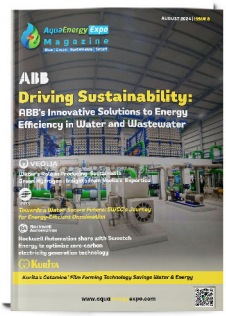
Blue | Green | Sustainable | Smart

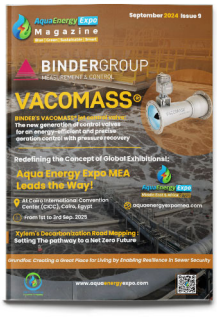
Digital Magazine Advertising

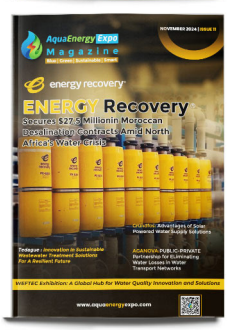
Aqua Energy Expo magazine includes more than 1000 unique articles and news about global Water and Energy fields

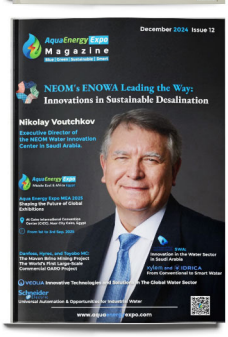












To download the Latest issue Visit our Digital Magazine

www.mg.aquaenergyexpo.com

AquaEnergy Expo

Florida, USA

250K+ Followers

- 60K+ Mailing List
- 10k+ YouTube Subscribers
- 13k+ Telegram Subscribers
- 150k+ Facebook Subscribers
- 10k+ WhatsApp Subscribers
- 36k + LinkedIn Subscribers
- 150+ Countries
- 800+ Jobs Offers
- 16 Employees
- 3.6M+ Products Views
- 1100+ Companies
- 15K+ Virtual Expo Products
- 13K+ References Knowledge Hub
- 200+ Webinars and Courses
- 1K+ Articles and News
- 15k+ Trainee

www.aquaenergyexpo.com

Issue Contents

Issue Contents

Issue Contents

AquaEnergy Expo Magazine

Blue | Green | Sustainable | Smart

AQUA ENERGY EXPO TEAM

Magazine Team

Mohamed Khalifa

Founder and CEO

Team leader: **Heba Sayed**

Design
- Hagar Wali
- Nesma Saeed
- Walaa Mohamed

Content Writers
Water Section: Rana Ayman · Energy Section: Hagar Wali

Jobs platform
- Mona Nady

IT Support
- Aya Mohsen

Webinars Team
- Esraa Hany
- Haidy Walid
- Khloud Khaled
- Mona Nady

Social Media Team
- Mona Nady

Virtual Expo Team
- Heba Taha
- Khloud Khaled
- Mona Nady

Knowledge Hub Team
- Esraa Hany

Marketing Team

- Heba Sayed :heba@aquaenergyexpo.com
- Rofayda Mohamed (China) : rofayda@aquaenergyexpo.com
- Khloud Khaled (China) : Khloud@aquaenegyexpo.com
- Esraa Hany : Esraa@aquaenergyexpo.com
- Haidy Walid :Haidy@aquaenergyexpo.com

Innovative Solutions to Achieve Sustainability in Water and Energy

From The Editor

As the world faces increasing environmental challenges, the pursuit of sustainability and smart solutions has never been more critical. Egypt, with its ambitious vision for green, smart cities and water sustainability, is at the forefront of transformative projects that are reshaping the future. In this edition, we delve into groundbreaking advancements in water management, digital transformation, and clean energy that are driving progress toward a more resilient future.

Our cover story, Towards a Sustainable and Smart Future for Egypt, explores the nation's commitment to sustainable urban development and water resource management. As Egypt continues to invest in smart cities, integrating green infrastructure with advanced water treatment technologies becomes essential to ensuring long-term environmental and economic viability.

Water security remains a global priority, and pioneering companies are stepping up with innovative solutions. WETCO and Ultrafiltration Technologies highlights the company's role in advancing ultrafiltration for water purification, ensuring clean and safe water with sustainable methods. Similarly, AECOM outlines six essential upgrades for wastewater treatment, demonstrating how advanced SCADA systems can optimize operations, enhance efficiency, and reduce environmental impact.

The power of digitalization in water management cannot be overstated. Xylem presents a compelling case for how digital technologies can significantly reduce energy consumption in wastewater treatment plants. Likewise, IDRICA explores how digital tools are revolutionizing river basin management, improving efficiency and sustainability in water resource planning.

Desalination is another key area of focus, particularly for regions facing water scarcity. Aquatech showcases how its Lowatt® technology is achieving consistent low-energy consumption in seawater reverse osmosis (RO) desalination plants. This breakthrough is setting new standards for energy-efficient water production, making desalination a more viable long-term solution.

Renewable energy is also playing a crucial role in the water sector. InPipe Energy presents an inspiring case of how a rural water utility harnesses its distribution system to generate renewable energy. This innovation underscores the potential for integrating clean energy into water infrastructure, reducing costs and environmental impact. Meanwhile, InSolare Energy Visions sheds light on advancements in solar cleaning techniques, ensuring that solar power remains a reliable and efficient energy source for sustainable projects.

These stories highlight a common theme: the intersection of technology, sustainability, and efficiency. Whether through smart city planning, water purification innovations, digital transformation, or clean energy integration, the future of water and urban development is being shaped by cutting-edge advancements.

Mohamed Khalifa

Founder and CEO

COMPANY:
AQUA ENERGY EXPO LLC
ADDRESS:
(ST. PETERSBURG, FLORIDA USA 33702)
(L23000439864), EIN (61-2116509)

EMAIL ADDRESS:
Info@aquaenergyexpo.com
LinkedIn:
www.linkedin.com

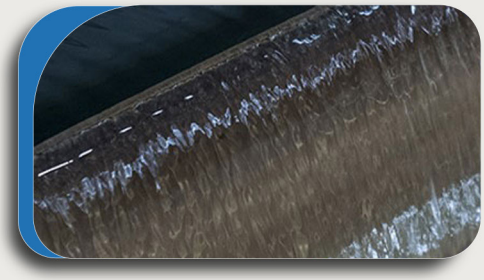
FILTRALITE®

FINLAND & PORTUGAL

Address: Finland and Portugal
Business Type: Manufacturer
Year Established: 1665
Number of Branches all over the world: 85 Countries

Products and Fields of work

Filtralite Pure



Filtralite Clean

Filtralite Air

Filtralite Nature

For more details and contact with Filtralite, please click here or Scan QR Code

AquaEnergy Expo

www.aquaenergyexpo.com

Filtralite's Media reduce the Size and Cost of Water Treatment Plants

As the MENA region's water market embraces innovation, Filtralite® — a high-performance filter media — is gaining momentum. Mohammed Kastawy, Area Sales Manager - MENA region, shares insights on Filtrate's impact, challenges, and growth potential in the Middle East.

Filtralite®, the filter media made of expanded clay, started its journey in Europe, 45 years ago. After strengthening its presence in Europe, such as in France, United Kingdom, Norway and Spain, Filtralite is expanding further in the Middle East. Filtralite has recently made its debut in the MENA market, supported by Saint-Gobain, a company with 360 years of industrial experience. Filtralite is more than just a product; it's a proven solution with a successful track record in over 750 plants worldwide. It is designed to replace traditional materials like sand and anthracite in water treatment facilities, providing numerous benefits for sectors such as desalination, wastewater and drinking water production.

In MENA region, Filtrate's benefits include enhanced filtration efficiency, reduced energy consumption, and better water quality. Its porous structure allows for higher water flow rates and longer filtration cycles while reducing the need for backwashing, which saves up to 75% in energy costs and cuts water loss by 60%. Additionally, Filtralite has a lower carbon footprint compared to traditional methods and can last twice as long as sand, up to 30 years in some cases. Filtralite is well adapted to the MENA market, due to the rapid urbanization which entails a need for more production capacity without building new facilities. Furthermore, when new facilities need to be built, Filtralite allows the size of the plant to be reduced to deliver the same amount of water. Filtralite is well adapted to reduce operation costs and improve production capacity and the efficiency of water treatment plants, all over the globe.

We had the opportunity to interview Mohammed Kastawy, Area Sales Manager - MENA region, whose commitment has been crucial to advancing Filtrate's development in Middle East.

Mohammed Kastawy
Area Sales Manager – MENA Region
Mobile :+966 544 22 9595
Email : mohammed.kastawy@saint-gobain.com
LinkedIn: www.linkedin.com

Mohammed Kastawy, Area Sales Manager for the MENA region, is collaborating with the new team at our distributor, Al-Mousa Trading.2025

Can you describe Your Career, Your Current Role, and Your Level of Involvement within Saint-Gobain?

With over 20 years of experience in sales and development with several International Organizations, I currently serve as the Area Sales Manager for the MENA region at Saint-Gobain. Saint-Gobain is an exceptional company with a global presence, offering excellent opportunities to enhance skills and knowledge in a positive work environment.

I achieve goals through strategic business planning and innovative sales initiatives. I enjoy collaborating with my colleagues and harnessing our collective energy to reach our objectives year after year. The new challenge with Filtralite presents a valuable opportunity for me to expand my expertise in the water sector, particularly in filtration.

How long have you been involved in the Development of Filtralite in Middle East?

My team and I have dedicated years to developing the market for Filtralite, an expanded clay solution used in filtration. Increasingly, various stakeholders are recognizing this innovative solution for its ability to reduce operating costs in drinking water and wastewater treatment plants.

"With such a strong and capable team on board, I'm confident that this partnership will drive significant growth and expand Filtralite's footprint in KSA"

I thrive on challenges, and it's rewarding to be part of the journey with such an outstanding product that meets the needs of the MENA market.

Each year, we have seen a rise in satisfied customers in the Middle East. To build on this success, we are now distributing Filtralite throughout the region in collaboration with Al-Mousa Trading, which brings over twenty years of expertise in providing innovative engineering solutions in water, energy, and infrastructure.

We look forward to driving significant growth and expanding Filtralite's presence in KSA. This is just the beginning of what promises to be a successful and impactful 2025.

"Filtralite, a high-performance filter media, has been optimizing water treatment for over 40 years—delivering efficiency, sustainability, and long-term cost savings"

How would you describe the Water Market in MENA Region?

The MENA water market is growing very fast. Compared to other areas in the world, we do not lack raw water resources, but the need for desalination, wastewater and drinking water is rising alongside the country's increasing urbanization. More people are going to live in cities, and this puts additional pressure on water resources in these areas. This is why we need to rethink and enhance our approach to filtration in urban regions.

As cities expand quickly, the size of water treatment plants becomes small for the growing demand. This is where Filtralite can play a great role, by increasing the water production capacity and thus reducing the need to build new facilities. In addition, with its superior performance, Filtralite allows to reduce the size and thus the cost of new water treatment plants.

What is the Most Common Filter Media?

The most common filter media in MENA region are sand, and sand combined with anthracite. In the past, the priority in MENA was to have enough water treatment plants, both for drinking water and wastewater, but more and more the performance of those plants is also being considered. Again, Filtralite can have a major impact here: compared to sand, we can increase the production capacity and decrease the operation costs, keeping the same output qualities. The same happens with the combination of sand and anthracite; we are outperforming this dual-layer solution, with better production capacity, and fewer backwashes needed; this means a significant decrease in operating costs, but with the same water quality as the output of the filters.

The lifetime of our products is more than double that of Anthracite, and it is 4 to 6 times longer than sand.

How did the MENA Markets React to the Introduction of Filtralite Filter Media?

A common point with the rest of the world is that the water market is conservative. Sand has been used for thousands of years to filter water, dating back to ancient Egypt, so it is a well-known solution, and it can be difficult to change this established mindset. Also, in engineering schools specializing in water treatment, Filtralite is not mentioned, traditional solutions like sand and anthracite are most frequently discussed. We have an outsider position for now. So it is very important for us to educate and reassure customers and to clearly convey how easy it is to implement Filtralite.

"Filtralite outperforms the combination of sand and anthracite solution, with better production capacity, and fewer backwashes needed"

Filtralite has been used for more than 40 years now, and we have a strong reference list of more than 750 references in drinking water and wastewater, and many case studies around the world. For sure, every water plant is different with different characteristics and needs, but the market is reacting very positively to Filtrate's deployment. Of course, we need time to be well known in a big country such as KSA and even more in the whole of Middle East, but the economy is stable in the country and the market has an appetite for innovation and high-performance products. It is a very good moment for Filtralite to be implemented in the whole of Middle East.

We started to have several references in MENA with very positive results, which has increased market interest in Filtralite.

Also, we have presented Filtralite at several exhibitions in the Middle East, and we can feel the public's interest in the product, which motivates us even more.

What Synergies can you find between Al-Mousa Trading and the Filtralite Area?

Al-Mousa Trading is specialized in water distribution and Filtralite focuses on the production side. The great synergy we have is that often we can share our contacts. It was the starting point for combining our strengths to be even better, together. Also, we share the same processes, the same values, and the same goals, aligned with Saint-Gobain policies. This helps us to focus on the most important questions, and to respond to the needs of our customers.

"Filtralite has been used for more than 40 years, with a strong reference list of more than 750 references in desalination, drinking water and wastewater"

As you may know, Saint-Gobain Group is one of the leading companies in building materials. This way, we focus on high-performance materials to offer our customers comfort and security.

With Al-Mousa Trading, which specializes in Water Pumps, Boilers, Media Filter and Piping Systems Solutions, we are following the same preference for high-performance products to bring the best solution to our customers. I am proud to work for a company that delivers good solutions to meet our customers' needs.

Filtralite fits perfectly with our goals. It is a high-performance filter media designed to reduce operating costs during the filtration stage and is made to last.

What are the Main Challenges you are facing when presenting Filtrate's Advantages?

As I mentioned earlier the water market around the world is conservative, especially concerning drinking water, but MENA is keen to experiment with new solutions in water treatment. The high number of case studies we have around the world, and now in MENA, have provided us with extensive results and performance tests.

"We need time to be well known in a big country such as KSA, but the market has an appetite for innovation and high-performance products"

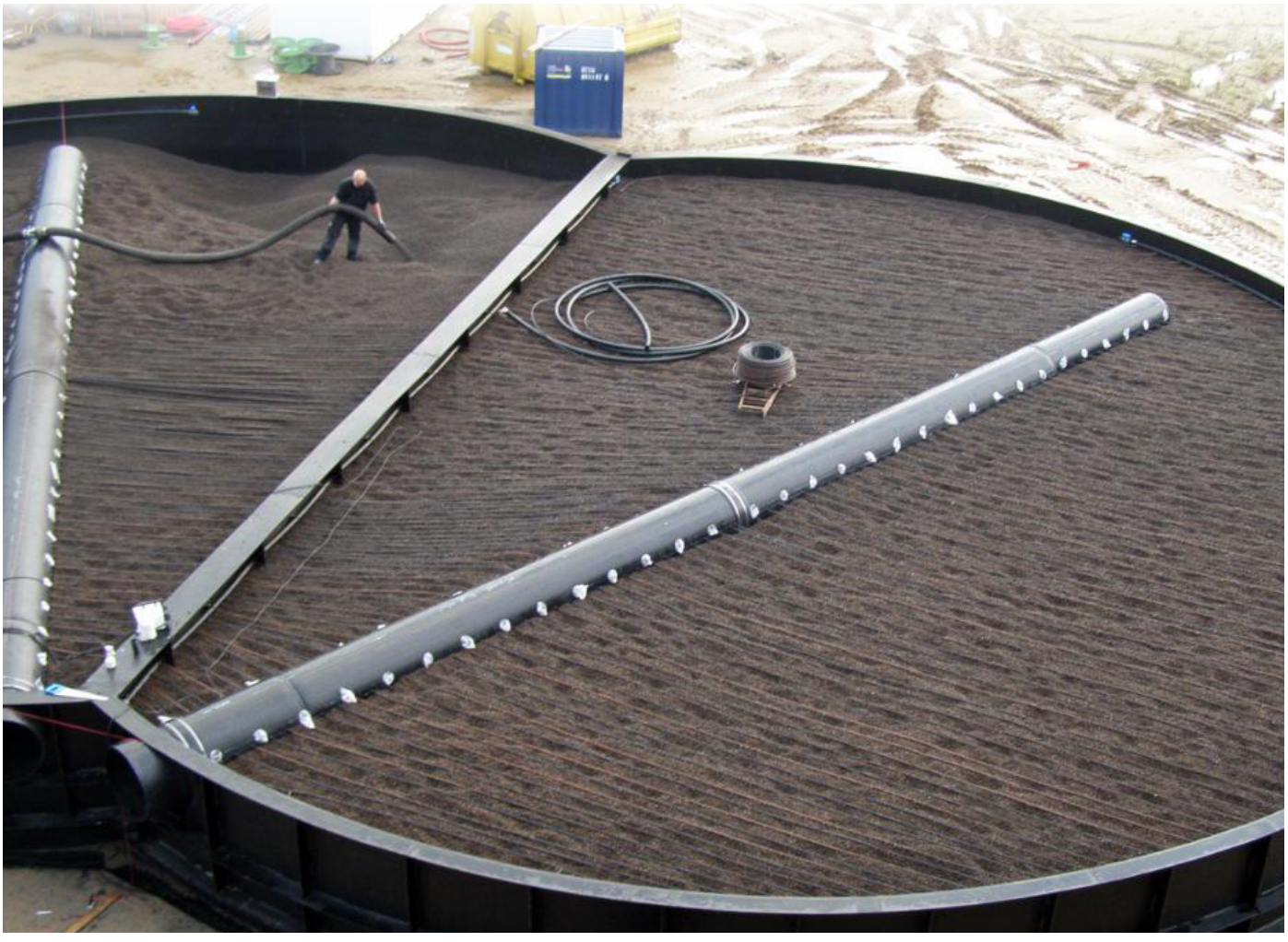
When plant managers, plant designers, and even consultants look at our case studies around the world, they want to conduct a trial – either in a column or directly in one of their filters – to see if this new generation solution can apply to their plant.

When the set-up is correctly established in the pilot, they can replicate in local settings the same results as in our case studies, and want to proceed with a deployment. The stock we have in MENA helps us to answer quickly to customer needs.

How do you see the Future with Filtralite and What are the Next Steps in its Development?

I see a bright future with Filtralite. Sand and anthracite are still the most commonly used products, but Filtralite has significant growth potential in MENA. We still have work ahead to make Filtralite as well-known as our two competitors, but given the performance results we're achieving, we're confident in Filtrate's expansion.

In the next steps of our development, we want all actors in the water market to be aware of Filtralite and mainly about its advantages – the benefits they can gain with Filtralite, and what they miss out on by not using it. We hope our example can support our colleagues in Middle East and all around the world.



Towards a Sustainable and Smart Future for Egypt: Future Projects in the Field of Water and Green Smart Cities

The Middle East and North Africa (MENA) region is grappling with the profound impacts of climate change, characterized by diminishing rainfall and soaring temperatures. Among the nations most affected is Egypt, which relies heavily on the Nile River for approximately 97% of its renewable water resources. This dependency renders Egypt particularly susceptible to fluctuations caused by climate change and upstream activities. Current water availability in Egypt stands at 560 m^3 per capita annually, below the water poverty line of 1,000 m^3, and is projected to fall below 500 m^3 by 2030, risking absolute water scarcity.

In response to these alarming trends, Egypt is implementing a comprehensive national water resources plan that extends to 2037, with an initial allocation of $50 billion for various water projects. Concurrently, the government is advancing its Smart Cities program to meet the needs of its rapidly growing urban population, which exceeds 47 million out of over 105 million inhabitants. This initiative aligns with Sustainable Development Goal (SDG) 11, which aims to create inclusive, safe, resilient, and sustainable urban environments by 2030.

Water Management in Egypt

Egypt is actively working to manage its limited water resources amidst increasing demands from population growth, intensive agriculture, and various challenges.

Approximately 90% of Egypt's water supply relies on the Nile River, with an annual allocation of around 55 billion m^3, unchanged since 1954. The remaining 0.5 billion m^3 comes from non-renewable subterranean sources, resulting in a significant water deficit, as the country requires at least 90 billion m^3 annually to meet national needs. The annual per capita share of water has already declined to 570 m^3, below international standards, rendering Egypt vulnerable to upstream conditions, particularly Ethiopia's plans regarding the Nile.

In light of these challenges, the Egyptian government has made notable progress in improving access to drinking water and sanitation.

Between 2015 and 2019, access to drinking water rose from 90% to 97%, while sanitation access increased from 50% to 70.6%. Moreover, the proportion of treated wastewater has risen from 50% to 68.7% during the same period.

However, the government recognizes the urgent need for action to ensure water security. To address these issues, the government has devised a national plan aimed at rationalizing water use and optimizing available resources through 2037. This plan includes investments in alternative water sources via desalination in coastal areas, the establishment of groundwater extraction stations, and the reuse of treated water. Additionally, the introduction of efficient irrigation systems is crucial, as agriculture consumes the vast majority of Egypt's water supply.

Innovative Projects to Fight Egypt's Water Scarcity

In response to the pressing challenges of water scarcity and sanitation, Egypt has implemented innovative government initiatives aimed at enhancing water management. With substantial investments and ambitious projects, the government of egypt is committed to ensuring sustainable water solutions for its population, fostering both health and agricultural productivity.

• Enabling Access to Drinking Water and Sanitation

Access to drinking water in Egypt is nearly universal. In FY 2020/2021, the Government of Egypt (GoE) allocated 25.9% of public investments in urban development to water and wastewater projects. In 2020, the Ministry of Housing completed 295 drinking water projects at a cost of approximately USD 2.4 billion and provided sanitation services to 703 villages for about USD 350 million. A 10-year plan was initiated to invest ~USD 19 billion in upgrading outdated water pipelines. The proportion of the population benefiting from proper sanitation management, including handwashing facilities, increased from 50% in 2015 to 66.2% in 2018.

• Decreasing Water Loss and Encouraging Water Saving

Improving access to water and sanitation is complemented by efforts to enhance water conservation. The GoE is focusing on wastewater treatment and reducing irrigation water seepage. Key initiatives include:

1. Wastewater Treatment Plants: 52 plants are under construction in Upper Egypt, with a capacity of 418 million m^3 per year. The percentage of treated wastewater rose to 68.7% by 2019. The Bahr al-Baqar water plant, announced in 2020, is the world's largest, with a capacity of 5 million m^3 per day, aimed at irrigating 342,000 acres in the Sinai Peninsula.
2. Irrigation Canals Project: Launched in 2020, this initiative aims to line irrigation canals, saving 5 billion m^3 of water annually over 20,000 km.

• Utilizing New Water Resources

Egypt is expanding the use of new water sources, prioritizing desalination projects to address water scarcity. The urban development plan emphasizes reliance on seawater desalination in coastal cities.

By 2020, Egypt operated 58 desalination plants with a capacity of 440,000 m^3 per day, with an additional 39 plants under construction.

Egypt's Commitment at IFAT 2024

Dr. Sayed Ismail, Egypt's Deputy Minister of Housing, Utilities, and Urban Communities for Infrastructure Affairs, participated in the "IFAT 2024" exhibition in Munich, a leading global event focused on water, sewage, and waste technology, featuring around 3,000 exhibitors from 59 countries. He emphasized the ministry's dedication to fostering partnerships between Egyptian and international private sector companies to adopt advanced technologies for water purification and sewage treatment.

During the exhibition, Dr. Ismail visited Egyptian company pavilions, including Nasr City for Trade and Contracting and its partner Rudolf Umwelttechnik AG, Euro Sweillam, and Flowtech.

Dr. Sayed discussed the importance of developing local industries and addressing obstacles to enhance exports. He highlighted significant investment opportunities in Egypt's utilities sector, such as improved sewage services in rural areas and seawater desalination.

The Smart Cities Program: A Multi-Phase Approach

Egypt has a population of more than 100 million, making it the 14th most populated country in the world. But currently, only 8% of its 1 million square kilometers is inhabited, with most of the population crowded into the Cairo, Alexandria, and Giza governorates. Since the turn of the millennium, Egypt has made commendable strides in urban development.

A significant achievement includes the drastic reduction of urban populations living in slums – from 42.2% in 2000 to a mere 0.9% in 2018.

Despite this progress, challenges like air pollution, traffic congestion, and waste management persist, necessitating innovative solutions.

In a bid to absorb the rapidly growing population, increase housing and job opportunities, and improve the overall quality of life, Egypt is in the process of constructing 22 new fourth-generation cities to accommodate around 30 million people across nearly every part of the country. Once complete, these new cities will grow the inhabited land area to 14%, according to the National Strategic Plan for Urban Development 2052. Launched in 2016, the first phase of Egypt's Smart Cities program, funded with over 39 billion Egyptian pounds (US$1.25 billion), focused on redeveloping 312 unsafe areas. The ongoing second phase, with a budget of 318 billion Egyptian pounds (US$10.25 billion), aims to revitalize informal areas by 2030, combining state funds with contributions from the Informal Settlements Development Fund (ISDF).

Features of Fourth-Generation Cities

Fourth-generation cities in Egypt emphasize expanded green spaces, renewable energy, and accessible, safe, and affordable transportation systems. They adhere to sustainability standards, incorporating waste recycling and green building practices while offering electronic services that create job opportunities for youth and stimulate economic growth. The planning focuses on positioning Egypt on the global investment map, with 37 cities, including New Alamein, selected based on criteria ensuring competitiveness and connectivity to major projects. This initiative promotes integrated urban development through enhanced sustainability and resilience, encouraging healthy living patterns that prioritize walking, cycling, and eco-friendly public transport.

Additionally, these cities feature diverse areas for residential, service, recreational, and industrial purposes, expected to generate thousands of jobs. A comprehensive network of roads, bridges, and public transportation connects these new cities to surrounding areas, facilitating convenient and affordable travel across the country.

Digital transformation is a key initiative undertaken by the government for smart cities and other urban regions. Numerous services are becoming accessible via user-friendly digital applications—available anytime and anywhere—through a comprehensive and secure national digital system.

A significant measure taken by the state was the allocation of 7.8 billion Egyptian pounds in the 2019/2020 budget to enhance the information infrastructure and digital content of Egypt.

The government has also set up several councils dedicated to transitioning to a digital economy and attracting foreign investments, including the Supreme Council for Digital Transformation. Additionally, efforts have been made to transform Port Said into Egypt's first digital city in late 2019. Lastly, a new administrative capital is currently under construction, reflecting the philosophy of moving toward a digital government.

The New Administrative Capital: A Sustainable Digital City

One of the flagship projects of Egypt's smart cities program is the New Administrative Capital (NAC), which is located 45 kilometers east of the bustling Cairo metropolis. The NAC is envisioned to become the sustainability capital of the Middle East as well as the new seat of government and a hub for business and innovation. The NAC will be home to key government ministries and foreign embassies as well as residential neighborhoods, commercial districts, cultural centers, educational institutions, and recreational facilities. The NAC will also showcase Egypt's commitment to renewable energy and green technology. The city will be powered by solar panels and wind turbines and will feature smart grids and smart meters to optimize energy consumption. The city will also implement smart waste management systems that will recycle and reuse waste materials. Moreover, the city will promote green mobility by providing electric buses, trams, monorails, and metro lines.

Chosen as the Arab Digital Capital for 2021, it serves as a pioneering model, showcasing advanced digital capabilities. This recognition was granted during the 24th session of the Arab Ministers Council for Communications and Information, highlighting it as one of the best developmental projects in the Arab world. The capital aims to achieve sustainable development and serves as a benchmark for investment and developmental projects, setting a standard for urban development in the region.

Transitioning to high-efficiency SWRO plants and integrating renewable energy sources will further lower emissions. Many new plants are already utilizing solar and wind energy, especially off-grid installations in remote areas. Projects like the Taweelah plant in Abu Dhabi exemplify this trend, combining grid power with solar energy. Overall, the growing reliance on renewable energy in desalination not only supports decarbonization efforts but also positions SWRO as a sustainable solution for global water challenges.

Beyond the Capital: A Nationwide Initiative

Egypt's smart city plan goes beyond Cairo. New Alamein, New Mansoura, and New Luxor are just a few of the smart cities being developed, aimed at enhancing tourism, industry, and cultural prospects. These cities will create jobs and draw in both local and foreign investments.

- New Alamein City

New Alamein City, Egypt's first million-person city on the North Coast, is a key part of the fourth-generation cities initiative. It shares similarities with the New Administrative Capital, featuring large-scale global projects aimed at making it one of Egypt's premier tourist destinations, complete with international commercial centers and residential towers.

Spanning 48,000 acres and located over 60 km south of the coastal strip, New Alamein City is designed to alleviate population congestion by promoting the North Coast as a year-round residential and tourist destination. The city aims to accommodate over 3 million residents and is developed in multiple phases.

The first phase includes two main sectors, each covering about 8,000 acres and housing around 400,000 residents. This phase features a coastal sector, which includes a global tourist center and an archaeological sector, alongside an urban sector.

New Alamein City is notable for its advanced technological and architectural projects, including:

- The first drinking water production plant using condensation technology, capable of producing 100,000 liters per day.
- The New Alamein Towers project for residential and tourist skyscrapers.
- An 18 km tourist promenade and a coastal road from Sidi Abdel Rahman to Wadi El Natrun.
- A sewage and desalination station by Orascom.
- A wave barrier project with 18 barriers.
- Agricultural initiatives for crops like date palms, olives, and pomegranates.

Accelerating Progress with Collaborations

Egypt is actively pursuing international partnerships to enhance water management technologies. Engineer Sherif El-Shorbiny, the Minister of Housing, Utilities, and Urban Communities, met with Japanese Ambassador Oka Hiroshi to discuss strengthening cooperation in drinking water, wastewater treatment, seawater desalination, and smart cities. The minister emphasized the importance of collaboration between Egyptian and Japanese companies to localize modern technologies and boost the production of essential electromechanical equipment.

El-Shorbiny highlighted ongoing urban development efforts, particularly the New Administrative Capital, and advancements in water projects, including the "Decent Life" initiative aimed at rural development. He also discussed strategies to optimize land use and residential units managed by the New Urban Communities Authority.

Ambassador Hiroshi expressed Japan's commitment to deepening cooperation, recognizing the potential for collaboration at the World Urban Forum. Both parties see this forum as a vital platform for showcasing Egypt's urban development and enhancing joint efforts in various sectors.

Technology and Sustainability: Core Pillars

- Dr. Sayed Ismail, Egypt's Deputy Minister of Housing, convened a meeting with officials from global firms like Siemens and Petrojet to discuss the implementation of smart solutions in new cities, including New Cairo and New Alamein. The meeting focused on establishing executive steps to achieve high-quality service delivery through sustainable systems. Dr. Ismail highlighted the need for modern utilities management to reduce water loss and enhance monitoring capabilities. Discussions included creating model simulations for New Alamein City to effectively integrate smart technologies, improve network efficiency, and train staff for better service delivery.

- A draft capacity-building plan was proposed to equip employees in the new cities' authorities with the latest knowledge in smart systems. The importance of a field visit to assess existing utilities was also emphasized, ensuring compatibility with proposed systems. Dr. Ismail concluded that a successful model should be implemented in New Alamein City, with ongoing performance evaluations to ensure system efficiency.

- In a separate initiative, Dr. Ismail met with a global company specializing in electromechanical equipment for water and sewage treatment. The aim was to discuss localizing production in Egypt, aligning with government directives to promote local manufacturing. Dr. Ismail reaffirmed the ministry's support for private sector companies in meeting the needs of drinking water and sewage projects. The meeting covered plans for future projects, including drinking water purification and sewage treatment. Company representatives shared their experience and production capabilities, emphasizing quality control and customer satisfaction. Dr. Ismail stressed the importance of forming alliances with local factories to transfer manufacturing expertise and assured the ministry's commitment to facilitating these efforts.

CONCLUSION

Egypt stands at a critical juncture as it navigates the challenges posed by climate change and water scarcity. Through innovative water management practices, ambitious smart city initiatives, and strategic partnerships, the country is laying the groundwork for a sustainable and smart future. The commitment to creating green urban spaces, enhancing water access, and implementing advanced technologies positions Egypt as a leader in sustainable development in the MENA region. As these initiatives unfold, they will not only address the pressing needs of the population but also contribute to the broader goals of sustainability and resilience in the face of climate change.


AquaEnergy Expo
WETCO
Water Engineering Technology Co.
PLATINUM
SPONSOR
WETCO: Pioneering Water Purification for a Sustainable Future
www.aquaenergyexpo.com

Water quality is an increasingly critical concern in our rapidly industrializing world. Ultrafiltration (UF) has emerged as a vital water purification method, offering an effective solution to meet the stringent demands for clean, safe water across various sectors. This technology operates under low pressure, making it energy-efficient compared to other filtration methods. Its versatility and effectiveness make ultrafiltration a key component in various industrial applications, contributing to improved quality and sustainability. In this article, we'll delve into the world of UF membranes with Chemist Tarek El-Sherif, GENERAL MANGER at WETCO, exploring the intricacies of ultrafiltration, its mechanisms, applications, advantages, and the market trends shaping its future.

Founding of the Company

WETCO, established in 2002, is a leading water treatment joint-stock company in Egypt, recognized for its exceptional services and high-quality products sourced globally from renowned suppliers. WETCO, established in 2002, is a leading water treatment joint-stock company in Egypt, recognized for its exceptional services and high-quality products sourced globally from renowned suppliers. With over 5,000 clients, WETCO caters to a diverse clientele, including small businesses and large corporations across various sectors such as electricity, petroleum, fertilizers, and pharmaceuticals, extending its reach throughout Cairo and Upper Egypt. "WETCO is an innovative water treatment joint Stock Egyptian Company established in 2002. We are one of the leading players who provide exceptional services and source premium quality products from around the world in collaboration with globally recognized suppliers and manufacturers." Eng. Mohamed Amer, CEO of WETCO, remarked that.

The company's primary focus is on water treatment, dedicating significant resources to providing cutting-edge technologies and competitive products. WETCO continually expands its service offerings to deliver a wide array of solutions and professional support to its customers. It engages in contracting activities, including the design, construction, supply, installation, and operation of water treatment plants. Additionally, WETCO represents international companies by distributing their products and providing installation, operation, and maintenance services.

Eng. Mohamed Amer
CEO of WETCO

Aqua Energy Expo 2025: WETCO's Leadership in Innovation

It is worth mentioning that WETCO Company will be the platinum sponsor and top exhibitor at the Aqua Energy Expo MEA 2025, scheduled for September 1-3, 2025, at the Cairo International Convention Center in Egypt. This prominent event will highlight various sectors within water and energy technology, such as desalination, smart water meters, and renewable energy. WETCO is dedicated to water treatment, offering advanced technologies and competitive products, while engaging in activities like designing and constructing treatment plants and supplying equipment. Participating in the Aqua Energy Expo MEA 2025 presents a unique opportunity for WETCO to showcase its expertise and innovative solutions to a diverse audience from across Africa and the Middle East. The exhibition will attract key stakeholders, including government bodies, industry leaders, and potential clients, providing WETCO with valuable networking opportunities. By engaging with an extensive audience, WETCO can further establish its reputation as a leader in water treatment technology.

WETCO's core business areas include:

- Design and supply of industrial water treatment systems.
- Design and supply of desalination systems, including reverse osmosis (RO).
- Stocking and supplying filtration aids and ion exchange resins.
- Providing a variety of parts and accessories for water applications.
- Offering operational support, troubleshooting, and maintenance services.

WETCO's vision is to be the preferred choice for water management solutions, while its mission emphasizes continuous improvement in service quality, ethical conduct, and strong relationships with customers and partners, ensuring excellence in all operations.

What is Ultrafiltration (UF) & it's Role in Water Treatment?

Ultrafiltration (UF) is a separation method that uses porous membranes, driven by pressure differentials, to filter out suspended solids and high molecular weight solutes. This process operates alongside microfiltration (MF), nanofiltration (NF), and reverse osmosis (RO). UF membranes have perforations typically ranging from 0.1 to 0.01 microns, which effectively block larger molecules from passing through while allowing treated water and low molecular weight elements, such as minerals, to permeate.

Compared to microfiltration, ultrafiltration systems are more advanced due to their smaller membrane perforations, enabling the removal of a greater variety of contaminants, including:

- Proteins
- Endotoxins
- Silt and silica
- Organic matter
- Viruses and bacteria
- Microplastics
- Chlorine-resistant organisms
- High molecular weight solutes

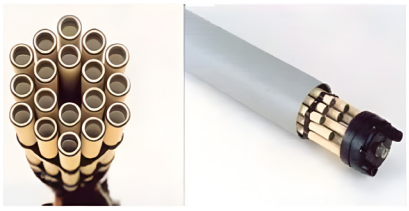
However, ultrafiltration is not effective against low molecular weight pollutants like minerals and dissolved salts. Ultrafiltration (UF) systems showcase versatility in treating various water sources, making them ideal for applications such as brackish water, wastewater, groundwater, and seawater treatment.

These systems are effective as stand-alone solutions and can also complement other plants, particularly in conjunction with reverse osmosis (RO). UF systems are frequently employed for pretreating feed water with high silt density before it enters RO systems.

Types of Ultrafiltration Membranes

Ultrafiltration (UF) membranes come in various configurations, each designed for specific water treatment needs. Choosing the right membrane type is crucial for optimizing the ultrafiltration process. Here are the main types of UF membranes used in water treatment:

- **Hollow Fiber Membranes:** Composed of bundles of hollow fibers with microscopic pores, these membranes allow water to flow either inside-out or outside-in. They offer a high surface area relative to their volume, making them compact and efficient, especially for large municipal facilities. Its advantages: Ideal for high solids content; widely used in municipal water treatment.
- **Spiral Wound Membranes:** This design features flat sheet membranes coiled around a central permeate collection tube. Feed water circulates between the sheets, with filtered water spiralling inward. These modules are compact and energy-efficient, commonly used in industrial and residential applications. Its advantages: Reduced energy consumption; prevalent in the food and beverage sector.
- **Tubular Membranes:** Made of polymer materials, these tube-shaped membranes allow water to flow through porous walls. They are effective for high-solids content and easy to clean, suitable for industrial applications with challenging feed streams. Its advantages: Effective for high-fouling scenarios; frequently used in industrial wastewater treatment.
- **Plate and Frame Membranes:** Featuring flat sheet membranes stacked between supporting plates, these modules can withstand high pressures, making them ideal for specialized industrial uses. Advantages: High pressure resistance; suitable for viscous liquids.



Tubular

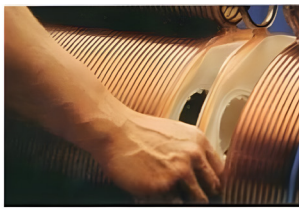


Plate & Frame

Spiral Wound

Hollow Fibers

What are the Benefits of Ultrafiltration?

Ultrafiltration (UF) presents several advantages over traditional pretreatment methods:

- Adaptability: UF membranes effectively act as physical barriers against particles, colloids, bacteria, and viruses, ensuring high water quality despite influent variations.
- Consistent Quality: With fine pores, UF membranes achieve turbidity levels below 0.1 NTU, an SDI of less than 3%/min, and over 6-log removal of pathogens like Cryptosporidium and Giardia.
- Reduced Footprint: UF systems occupy up to 50% less space and weight compared to media filtration, lowering land and construction costs.
- Easy Integrity Testing: Modules can be tested online for leaks with minimal downtime.
- Isolated Maintenance: Individual modules can be repaired or replaced without impacting overall plant performance.
- Simplified Design: UF systems maintain stable water quality without the complexities of multimedia filtration, leading to easier design and more automated control.
- Lower Environmental Impact: UF minimizes chemical usage by employing size exclusion for contaminant removal, reducing environmental concerns related to wastewater.
- Cost Efficiency in RO Stages: UF enhances downstream processes by improving water quality, allowing for higher design flux in reverse osmosis (RO), lower membrane cleaning needs, and reduced replacement rates, while minimizing the use of cartridge filters.

Microfiltration vs Ultrafiltration

Microfiltration, with a filtration precision of 0.1-50 microns, is suitable for coarse filtration tasks such as removing sediment, rust, odor, and color in water. It employs elements like PP, activated carbon, and ceramic filters, commonly applied in whey and skimmed milk production. However, due to its lower accuracy, it falls short in eliminating bacteria and other harmful substances, providing only average results against sediment and rust.

Constituent	Comparative Efficacy
Giardia	UF = MF
Cryptosporidium	UF = MF
Bacterial	UF = MF
Virus	UF >>> MF
TOC	UF > MF
Colloid	UF > MF

In contrast, ultrafiltration boasts a precision range of 0.001-0.1 microns, enabling the removal of rust, sediment, suspended solids, colloids, bacteria, and large organic matter. This process retains essential mineral elements, making it ideal for producing mineral and mountain spring water. With a water recovery rate exceeding 95%, ultrafiltration is efficient, easily maintained through flushing and backwashing, and enjoys a longer service life. Choosing between the two depends on budget constraints and specific water treatment needs. Ultrafiltration, with its higher flow rate, excellent removal efficiency, versatility, and compatibility with other filtration methods, emerges as a more cost-effective solution compared to microfiltration.

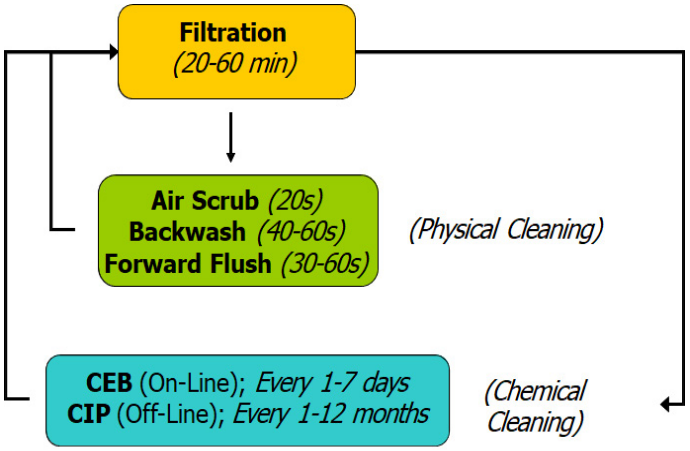
Qualified Feed Water Quality Parameters

The UF modules can withstand temporary fluctuations in feed water quality, as indicated by the maximum allowable limits. If the feed water quality falls outside the specified design range shown below, a pilot study should be conducted to verify performance, or pretreatment options should be considered. Depending on the application, it is advisable to use a safety screen with a mesh size of 150 – 300 microns before the UF system. Various technologies can be employed, including self-cleaning screens, as well as bag, cartridge, or disc filters. Additionally, based on the type of water or the range of feed water parameters, other pretreatment methods such as oxidation, coagulation, sedimentation, and media filtration may also be recommended.

Parameter	Unit	Design Basis	Maximum Allowable
Turbidity	NTU	<50	300
TOC	mg/l	<10	40
Particle Size	micron	<150	300
COD Mn	mg/l	<20	60
Oil /Grease	mg/l	0	< 2
pH continuous	6-9	2-11	
Temperature	C^0	25	40
Cl2 continuous	mg/l	0.5	200
TSS	mg/l	50	100

HOW does it Work ?

The ultrafiltration process typically involves several stages:



• Filtration

Ultrafiltration systems primarily operate in filtration mode, where feed water is pumped through membranes to produce filtrate. This process usually involves dead-end filtration, converting nearly all feed into filtrate, unlike cross-flow filtration, which allows some feed to exit as reject.

Filtration cycles last between 20 to 90 minutes, depending on the quality of the feed water.

These systems maintain a constant flow rate, but as solids accumulate on the membrane surface, transmembrane pressure (TMP) increases, necessitating a backwash sequence for cleaning. Backwashing can be triggered by time, volume of filtrate, or TMP set points, with the latter being ideal for variable feed water quality. The backwash process includes several steps: Air Scour, Gravity Drain, backwashing through both the top and bottom outlets of the module, followed by a final Forward Flush or rinse to ensure effective cleaningkb.

Physical Cleaning

• Air Scour

The Air Scour step is crucial for maintaining ultrafiltration membrane efficiency by loosening particulates that accumulate on the membrane surface. During this phase, oil-free air is injected from the bottom of the module, generating ascending bubbles that agitate the membrane surface. This agitation dislodges materials stuck to the membrane, allowing them to be expelled through the module's top port for disposal. The Air Scour typically lasts between 20 to 30 seconds, after which the module is drained by gravity to remove the dislodged particulates.

• Gravity Drain

Following the Air Scour, the Gravity Drain step is essential for flushing out the loosened materials from the system. The duration of this step varies based on system volume and piping configuration, generally lasting 30 to 60 seconds. If gravity drainage is impractical due to system design or if it takes too long, a forced flush can be employed. This involves using the backwash pump to push water through the bottom outlet of the module, although this method requires more water and energy.

• Backwash Top

Once the gravity drain is completed, the Backwash Top step is initiated. In this phase, filtrate water is pumped backward through the membrane fibers, effectively pushing accumulated materials away from the membrane and directing them to waste via the top module outlet.

The backwash flux during this step ranges from 100 to 120 LMH, with a typical duration of 30 to 45 seconds

Depending on the application, chlorine may be added to the backwash stream to enhance the removal of foulants or to inhibit microbial growth. Combining the Air Scour with the Backwash Top step can improve cleaning efficiency.

• Backwash Bottom

After completing the Backwash Top step, the process moves to the Backwash Bottom step. In this phase, filtrate flows from the inside of the fibers to the outside and is expelled through the module's bottom outlet. The backwash pump remains active to ensure continuous cleaning and protect the membranes.

This step lasts approximately 30 to 45 seconds, and chlorine may be added to aid in removing foulants

The backwash steps can be repeated as needed, depending on the level of fouling, and monitoring the quality of the backwash wastewater can optimize the duration of these cleaning processes.

• Forward Flush

The backwash sequence concludes with the Forward Flush step, which uses feed water to rinse the system and remove any remaining solids or trapped air from previous steps. In this phase, water flows over the outside of the fibers (feed side) while the filtrate valve is closed, exiting through the module's top outlet.

This step generally lasts between 30 to 60 seconds, or long enough to refill the modules and purge any air and water from the outlet

After completing the Forward Flush, the system returns to Filtration mode, and the cleaning cycle begins anew.

Chemical Cleaning

Fouling in the UF process refers to the gradual rise in transmembrane pressure (TMP) while maintaining a constant product flow, or conversely, a decrease in filtrate flow at a steady feed pressure. This phenomenon is typically caused by the deposition or adsorption of contaminants from the feed stream onto the membrane surface or within its inner structure.

to quickly address issues such as leaks or blockages. Deployed

- Cleaning Enhancement Back Wash (CEB)

Chemically Enhanced Backwash (CEB) improves ultrafiltration membrane cleaning by adding chemicals like chlorine or acids to the backwash stream, tailored to specific foulants. Typically performed daily to weekly based on feed water quality, CEB is automated but can be adjusted or triggered by transmembrane pressure (TMP) set points.

The process includes a soak step of 5 to 20 minutes after chemical addition for effective contaminant interaction.

It's recommended to reverse the backwash order, starting with bottom backwash to maintain chemical presence. Following soaking, a routine backwash is completed, including air scour and gravity drain to eliminate particulates and residual chemicals. Initial filtrate may need discarding, and CEB can operate at a reduced flux of about 80 LMH.

- Cleaning In Place (CIP)

A Clean-In-Place (CIP) operation is essential for maintaining fiber cleanliness through backwashing and chemical recycling. The frequency of CIP depends on feed water quality, typically occurring every 1 to 3 months. Initially, routine backwash steps-air scour, draining, and backwashing through both top and bottom drains-are conducted 3 to 8 times to eliminate contaminants that don't require chemicals.

After backwashing, the module is drained to prevent dilution of CIP chemicals, which are then recycled externally for 30 minutes. Heating the CIP solution to 40°C enhances contaminant removal. Following the initial recycle, a soaking period of at least 60 minutes is implemented, with an additional 30-minute chemical recycle afterward.

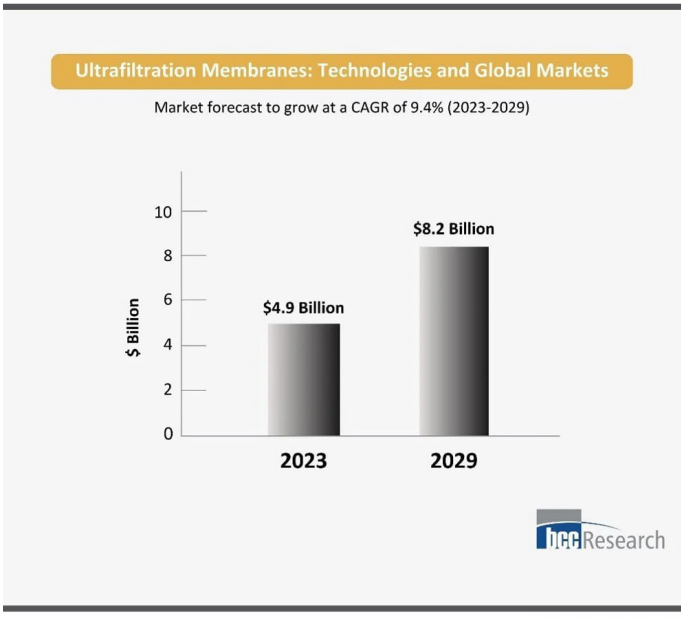
An air scour is performed before draining to eliminate concentrated chemicals. Finally, backwashing and forward flushing are done to clear any remaining contaminants from the fibers. If both acid and alkali cleaning is necessary, the CIP steps are repeated for each chemical solution. This systematic approach ensures optimal membrane performance and longevity.

CEB	CIP
Maintenance cleaning.	Intensive cleaning.
Shorter in duration (but higher frequency).	Longer in duration (but lower frequency).
equire less operator involvement. Automatic.	Manually initiated.
It is done with Ultrafiltrate.	Chemical solution is prepared with Demin/RO water, usually at higher concentrations.
Chemical solution is flushed out from the system.	Chemical solution is recirculated through the system.
Cleaning occurs at ambient temperature.	Heating of the cleaning solution is recommended.

Market Trends

According to BCC Research, the global ultrafiltration membranes market is growing significantly, valued at $4.9 billion in 2023 and expected to reach $8.2 billion by 2029, with a compound annual growth rate (CAGR) of 9.4%.

This growth is fueled by several factors: the rising demand for efficient separation and purification processes in industries aiming to enhance product quality and safety while reducing waste; stringent environmental regulations requiring high-quality membranes for pollutant removal; increasing water scarcity driven by climate change and population growth, necessitating better water management solutions; and advancements in ceramic-based ultrafiltration membranes, known for their durability and effective contaminant removal. Together, these elements are leading to greater adoption of ultrafiltration technologies across various sectors.



AquaEnergy Expo

Blue | Green | Sustainable | Smart

SAUDI ARABIA
DECEMBER 2024

Buyers Guide for Water and Renewable Energy Companies

Aqua Energy Virtual Expo

To add your company for free contact us
WhatsApp (+966 505308851)

www.aquaenergyexpo.com

VEOLIA FILTRALITE xylem Endress+Hauser SIEMENS Schneider Electric ABB LG Chem Danfoss BINDERGROUP MEASUREMENT & CONTROL

AquaEnergy Expo

Blue | Green | Sustainable | Smart

AquaEnergy Expo

Blue | Green | Sustainable | Smart

الجزيرة

رعاية المياه
CARE WATER
TECH & SOLUTIONS

شركة قطر للتجارة

Wabra
Wabra Water Works

AYC

الكوثر
AlKawther

ALMANAMEEN
Since 1975

MEMFITS
SMARTER SOLUTIONS

DL

BMS

SALSABIL

RaissYon

CONFIRMATION LAB
food and beverages testing

EVA TAQA
ايفا طاقة

نقية
NAQIA

SADC

BEST TECH
PARTNER IN MAINTENANCE & SERVICES

كون
KOON

الوطني المهيدب
Al Muhaideb National

نقاء السلسبيل
Naqaa Al-Salsabil

ADECO GROUP
مجموعة الدكتور علي الدهيمان

MINTREAT

Water Flow
Contracting Co. Ltd

AFAQ SOLAR

شركة الميمنة للمقاولات
AlMaymanah Contracting Co.

NWWC
الشركة الوطنية لأعمال المياه
National Water Works Co.

MARJAN
مرجان

منابع الحياة
MANABA'A AL HAYAT

SHAS
SHAS Water Company Ltd.
شركة شاس ووتر المحدودة

ARAB GULF UNITED Co.Ltd

EWSC

HSE
Hesham El-Sewedy Trading Co. Ltd.

CPT

Amaalni
OIL&GAS
شبكة الأمان

ADVANCEDLINE
الخط المتطور للتجارة

ALTAYAR
PLASTIC

شركة مصنع الغماس
Alghammas Factory
SAUDI MADE

SEVEN PLANETS GROUP OF COMPANIES
(Seven Planets Trade Pvt. Limited)
"Service Excellence - A Business Growth Strategy"

SAFIA
Innovative Measurements
SAFIA Measurement for Trading Co.
شركة صفية القياسات للتجارة

ARABIAN CALIBRATION COMPANY
Accuracy Redefined

SPS

GPECO
جيبكو للبيئة

BESCO

شركة الفوزان للتجارة والصناعة
AL FOUZAN CO. FOR INDUSTRY AND TRADING

POWER SUPPLY

OSUS
WATER TREATMENT

energya
INDUSTRIES
elsewedy HELAL

SCC

Douglas Group

Jeddah cables
COMPANY

Maskoub int.
مسكوب
www.maskoub.com

شركة القياس والتطوير للتجارة
Al - Qiyas & Al Tatweer Trading Co.

naizak
نيزك

AL-ANDALUS
BIMEX

EGYPTIAN
ENGINEERING
COMPANY

MIQYASS

IDRICA : The Digital Revolution in River Basin Management

www.aquaenergyexpo.com

River basins are crucial for water, food, and livelihoods, serving millions globally. However, they face significant challenges, including climate change, pollution, land degradation, and biodiversity loss. Effective decision-making is essential for sustainable management, ensuring fair water distribution, conflict resolution, and long-term cooperation in transboundary river basins. Traditional data-gathering methods often fall short in this complex environment. Advances in science and technology have led to systematic hydrological approaches, highlighted by conventional models developed by Darcy, Horton, Clark, and the SCS. These models improved the mathematical understanding of hydrological processes like snowmelt and groundwater infiltration, despite difficulties in measuring their stochastic and variable nature. The limitations of these models stemmed from a lack of accurate data and the complexity of natural systems.

The digital revolution has transformed river basin management, introducing advanced technologies and vast data resources. Hydrometeorological satellites provide real-time data on precipitation, soil moisture, and snow cover changes, significantly enhancing hydrological model accuracy. This wealth of information empowers scientists and water utilities to make better-informed and timely decisions, marking a new era in the management of river basins.

Digitalization in River Basin Management

In modern river basin management, Decision Support Systems (DSS) have become essential tools. These systems integrate data from diverse sources, such as satellites, weather stations, and ground-based sensors, employing advanced mathematical models to generate predictions and recommendations. DSSs are interactive software platforms designed to assist decision-makers in navigating complex issues by leveraging data and information. Their evolution has varied across disciplines; in water resources management, some DSSs have developed independently of mathematical models, while others have enhanced existing models with user-friendly graphical interfaces and post-processing tools. The primary goal of DSSs is to improve usability for water authorities by creating a tailored information technology (IT) framework that aligns with decision-making processes and supports workflow. Typically, a DSS offers more than just modeling capabilities. It includes tools for data management, socioeconomic evaluations, and interactive communication frameworks for sharing information with the public. This holistic approach enables comprehensive decision-making support.

• DSS Modelling Frameworks

A significant feature of modern DSS is the open modeling interface, which allows for the integration of mathematical models from various suppliers. This flexibility is crucial for addressing different management needs, such as general water resources management, flood management, and climate change analysis. To facilitate this integration, adapters are required to enable the DSS to access prepared input data and model parameters while also storing relevant results. The benefits of an open architecture are manifold: it prevents the DSS from being vendor-dependent and allows for the seamless incorporation of new tools in the future. This approach ensures that existing model codes, which have already been validated and utilized by water authorities, can be retained and enhanced rather than replaced.

The incorporation of artificial intelligence (AI) has significantly enhanced DSS capabilities, allowing for the analysis of large datasets and the identification of complex patterns that traditional models often miss. AI plays a pivotal role in DSS by predicting the behavior of continuous variables and analyzing relationships within stochastic processes. This capability is vital for risk assessment and optimizing water management strategies. Furthermore, AI and big data analytics provide unprecedented opportunities to adapt to the impacts of climate change. By analyzing extensive historical and current data, AI can identify trends and patterns indicative of climate shifts, improving the prediction and mitigation of floods and droughts with greater accuracy and foresight.

Major Issues in River Basin Digitalisation

Despite the advancements in technology, several challenges persist in implementing digital solutions for river basin management.

• Low Sensor Density

One of the most significant challenges in river basin management is the markedly lower density of sensors in watersheds compared to urban environments. In cities, a comprehensive network of sensors monitors drinking water and sanitation systems, as well as electromechanical installations like wastewater treatment plants (WWTPs) and drinking water treatment plants (DWTPs). In contrast, river basins often have sensor densities that can be up to a thousand times lower. This disparity hampers real-time data collection, making it difficult to create accurate digital twins-virtual representations of physical systems that require detailed, and real-time data. To address this challenge, substantial investment in sensor installation is necessary to enhance data collection and improve hydrological modeling accuracy.

- Calibration of Rating Curves

Another major obstacle lies in the calibration of rating curves, which are crucial for linking hydrological models to real-world measurements. These curves establish the relationship between water levels and flow rates in rivers, but achieving accurate calibration is complex. It requires extensive data and the ability to adapt models to local conditions, which can vary significantly over time and space. The challenge is compounded by the difficulty of acquiring precise data necessary for calibration, limiting the effectiveness of hydrological models.

- Early Warning Systems

While digital transformation has improved early warning systems for floods and droughts, the successful implementation of these systems relies on robust infrastructure and effective coordination among various agencies and government levels. Utilizing sensor data and hydrological models for predicting extreme events necessitates seamless collaboration, which is often challenging to achieve. Without this coordination, the potential benefits of digital technologies in anticipating and responding to hydrological events may not be fully realized, undermining efforts to manage river basins sustainably.

Riding the wave of data transformation

The Xylem Vue powered by GoAigua platform (XVPGA) exemplifies effective digital water management in river basins. Developed through a partnership between Idrica and Xylem, this platform integrates specialized modules and algorithms for real-time management of extreme events and medium- to long-term hydrological planning, utilizing intuitive dashboards and user-friendly GIS viewers. Xylem Vue operates on a unique three-layer model, known as the Smart Water Engine, which collects, processes, and standardizes data to offer targeted water resource solutions. Central to this is a Business Intelligence (BI) dashboard that visualizes key indicators. The platform's Early Warning System (EWS) enhances extreme event management by processing real-time water and weather data. It integrates various sensors and hydrological models, including reservoir inflow simulations, to provide timely warnings and alerts.

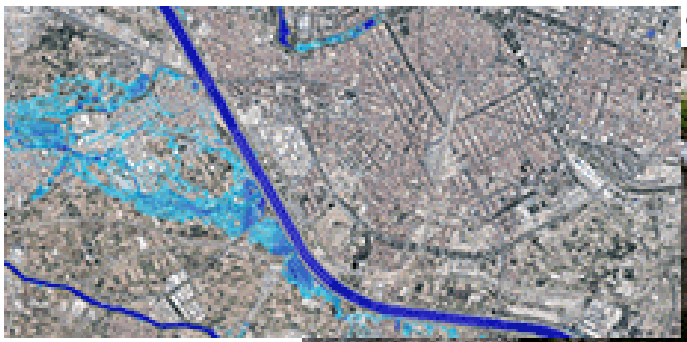
Key features of the XVPGA include:

- Automatic generation of weather observation maps.
- Deterministic and probabilistic weather prediction models.
- Integration of sensor data in GIS format.
- Basin rainfall and river analysis.
- Hydrological and hydraulic simulations, including snowmelt models.
- Simulation of inflows, outflows, and reservoir filling.
- Generation and monitoring of alerts and instant warnings.
- Visualization of flood-prone areas and affected elements
- A comprehensive water and weather data bank for processing.
- A multiplatform solution with user role management.

Optimized for analyzing large datasets and high-resolution hydrometeorological satellite imagery.

Xylem Vue delivers accurate analyses rapidly while ensuring high-quality, traceable results. It enables detailed spatial and temporal assessments across integrated meteorological models, computes IDF (Intensity-Duration-Frequency) curves for intense events, and evaluates flood risks associated with peak flows.

By employing statistical processing and AI with historical data, along with meteorological reanalysis models, it creates water planning models that improve decision-making over the medium and long term. Moreover, XVPGA includes a robust hydrological alert management and reporting module that simplifies the visualization and monitoring of extreme events for emergency management stakeholders. By systematizing and standardizing hydrological analysis, the platform builds a strong database for informed decision-making, empowering basin managers to effectively oversee surface water bodies, groundwater resources, and reservoirs, thereby ensuring hydraulic and water security while addressing watershed challenges comprehensively.



Case Studies

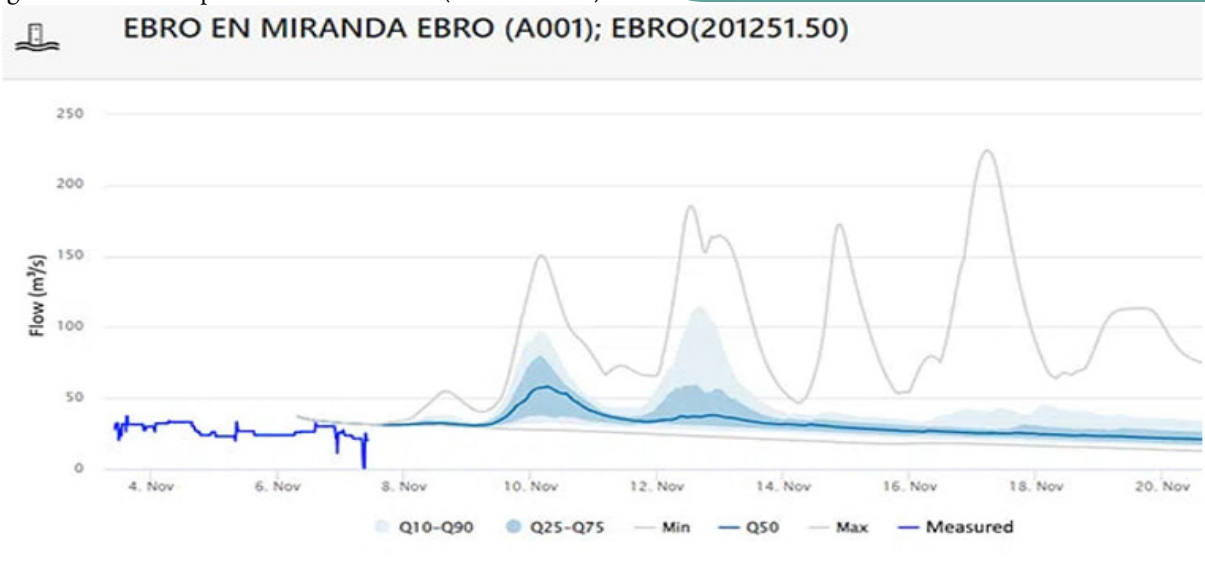
The Ebro River basin is crucial for Spain's water resources, with its main river stretching 930 km through diverse climate zones, including Atlantic and Mediterranean regions. This area experiences various precipitation and transpiration rates, influenced by unique geomorphological and climatological factors, alongside the growing effects of climate change, leading to river, pluvial, and flash floods throughout the year. To mitigate flood damage, a project was initiated to implement an Early Warning System (EWS) as part of the Xylem Vue platform, aimed at assisting civil defense and disaster management stakeholders in the basin.

The EWS application provides timely alerts for different flooding scenarios, enabling the Confederación Hidrográfica del Ebro (CHE) to anticipate events days or hours in advance. This proactive approach allows for earlier activation of disaster management protocols, considering the potential impact on infrastructure.

The system also facilitates the evaluation of management protocols and communication systems after each event, helping optimize future planning and investments. Additionally, the EWS enhances CHE's ability to forecast river flows and levels, improving understanding of the hydrological status of the basin and reducing potential dam damage through better management practices. Named 'VIGILAEbro,' this implementation aligns with the European Floods Directive (2007/60/EC).

CONCLUSION

The journey from traditional observations to advanced technologies and AI in river basin management has significantly enhanced our ability to forecast extreme events, optimize water use, and manage resources sustainably. However, challenges like low sensor density and calibration of rating curves persist. The Xylem Vue platform, developed through a partnership with Idrica, exemplifies how digital solutions can enhance early warning systems and hydrological planning. By improving data accessibility and collaboration, we can better manage river basins, ensuring resilience against extreme weather events and safeguarding vital water resources.



AquaEnergy Expo

AERZEN

Maximize Energy Efficiency in Small Footprint With Aerzen Delta Hybrid Screw Blowers

For 160 years, AERZEN has been a leader in developing high-performance machines, particularly in compressor technology for wastewater treatment.

www.aquaenergyexpo.com

With the growing need for durable technology that ensures low energy consumption and high performance, the rising energy costs and diminishing resources are now more pressing concerns for companies, researchers, and end users than ever before. The increasing scarcity of resources is particularly alarming. Fundamental industrial processes incur some of the highest energy expenses. Processes involving pumps and compressors, regardless of their type, account for the largest share of total energy costs—30%. This also impacts wastewater treatment applications. The energy consumed in aeration tanks can reach an astonishing 60% to 80% of the total energy utilized by a wastewater treatment facility.

Now is the ideal time to build a future centered on technologies that prioritize low energy costs and sustainability. Since its founding in 1864, Aerzen has established itself as a leading provider of reliable, high-performance, and energy-efficient solutions across a wide range of industries, offering a diverse portfolio that includes blowers, compressors, and more. In the water and wastewater treatment sector, the company has further advanced its efforts by addressing environmental protection, resource conservation, and climate change through optimized control technologies and sophisticated digital water management systems.

Aerzen's Solutions: Energy in Focus

For 160 years, AERZEN has been a leader in developing high-performance machines, particularly in compressor technology for wastewater treatment. A significant challenge in aeration technology is providing a demand-driven air supply that can adapt to severe fluctuations in load profiles and varying contamination levels. Many older wastewater treatment plants utilize blower technologies that deliver a constant amount of oxygen, which is often unnecessary and inefficient.

To address this issue, AERZEN offers a comprehensive product portfolio that includes various blower technologies tailored to the specific needs of each wastewater treatment facility. This strategy maximizes efficiency and potential savings. The portfolio features turbo blowers, positive displacement blowers, and rotary lobe compressors, each with distinct advantages. Turbo blowers are known for their impressive energy efficiency, while rotary piston machines provide excellent adjustability and consistent performance in partial load scenarios.

The rotary lobe compressor effectively combines the benefits of both blower and compressor technologies. Depending on the application, AERZEN recommends either a combination of different technologies or selecting the most efficient option for the specific case. Additionally, different sizes of these technologies can be installed to further enhance performance. By integrating these systems with an intelligent global control system, AERZEN enables additional savings and ensures that energy supply aligns closely with actual demand, optimizing operational efficiency in wastewater treatment.

Real-World Successful Stories

• Rheda-Wiedenbrück Wastewater Treatment Plant

In 2013, the Rheda-Wiedenbrück wastewater treatment plant underwent modernization to improve air supply efficiency for biological processes. This involved replacing old ventilation grids and installing them 30 cm deeper in the aeration basins, increasing processing volume but also raising system pressure, which required a redesign of the blower technology. Previously, the plant used excessive oxygen to handle fluctuations from a nearby pig slaughterhouse. The modernization aimed to align aeration with actual wastewater load and oxygen consumption, utilizing needs-based speed control for four AERZEN blower units.

The control system optimizes oxygen levels based on ammonium and nitrate concentrations, using diaphragm regulating valves to adjust pressure dynamically and reduce energy loss. AERZEN introduced a turbo blower (AT 150-0.8S-G5) for base load supply, complemented by two Delta Hybrid units and one Delta Blower for variable air needs.

The AERsmart control system minimizes switching and wear, leading to a 30% energy savings in biological processes, with an additional 5-8% from optimizations

Rheda-Wiedenbrück is the first German plant to test AERsmart under real conditions, emphasizing the value of customer collaboration for future innovations.

• Oberschleißheim Wastewater Treatment Plant

The operation of load changes in wastewater treatment is influenced by factors such as time of day, season, and precipitation, leading to variations in wastewater volume and contamination levels. This variability affects the air requirements in aeration tanks, resulting in excessive energy consumption if not optimally managed. Anton Mayer, Head of the Oberschleißheim WWTP, emphasizes the need for advanced technology to enhance performance and resource savings. The solution lies in the Performance^3 technology mix, which focuses on precise control of load changes to maintain energy-efficient base loads and accurately address supply peaks.

This system utilizes a tailored AERZEN Performance^3 mix, where the turbo blower manages the base load, the Delta Blower operates during low demand, and the Delta Hybrid assists during peak periods. The integrated AERsmart control system optimally distributes required air volumes across the blowers, ensuring they operate near peak efficiency. Continuous monitoring and real-time visualization of operating parameters enable early detection of anomalies, allowing for prompt intervention and minimizing failures. As a result, the aeration tanks now exhibit uniform effluent values with significantly reduced fluctuations.

The electricity consumption for biological treatment has decreased by 60%, translating to annual savings of €60,800, and two of the four aeration tanks have been taken offline, enhancing overall efficiency

The Delta Hybrid: A New Benchmark in Performance

AERZEN's rotary lobe compressors, commonly known as screw blowers, represent the pinnacle of innovation, quality, energy efficiency, and reliability. Used globally in diverse applications, including those requiring oil-free air, the Delta Hybrid series has been further refined to meet future demands. With the innovative further development of the successful series, AERZEN is now taking the next step. The future-oriented design sets new scales regarding energy efficiency, durability, machine footprint, digitalization, low noise levels and maintenance requirements, making the new sizes an absolute high performer in process air generation.

• Efficiency in a New Dimension

The new Delta Hybrids deliver 100% oil-free process air with exceptional efficiency, operating economically with an extended turndown ratio of up to 1:5. Energy savings of up to 37% compared to conventional blowers are achievable, which is unparalleled in the market. This leap in efficiency is driven by a sophisticated technology concept tailored to customer needs, including:

- Innovative compressor stage with highly efficient screw rotor profiles
- Internal flow optimization for better performance
- Direct drive enabling the use of high-efficiency IE4 or IE5 motors
- Integrated variable frequency drive (VFD) for optimal control
- Smart oil system ensuring reliability and minimal maintenance

The synchronous reluctance permanent magnet motors used also maintain high efficiency during partial load operations, further enhancing cost-effectiveness. These features make the Delta Hybrid an excellent choice for applications requiring oil-free compressors and oil-free blowers.

• User-Friendly Plug & Play Solution with the Smallest Footprint

The robust design of the new Delta Hybrid series guarantees unmatched reliability, even in the most challenging environments. These screw blowers are built to operate safely in intake temperatures ranging from -40°C to +50°C, covering a wide range of applications, including those needing reliable blower rental and compressors rental solutions. Additionally, an optional acoustic hood allows for outdoor installation, making the machines resilient to direct weather conditions.

Delta Hybrid packages are delivered ready for immediate use and require minimal floor space, thanks to their compact side-by-side installation design. This space-saving feature ensures that the machines can be easily integrated into existing setups without requiring extensive modifications.

• Quiet Operation & Easy Maintenance

The intelligent AERtronic package control system is already integrated and takes over the efficient control and monitoring of the Delta Hybrid. All data can be transmitted to the master control system and accessed via browser, tablet or mobile phone. The result is maximum machine availability, reliability and efficiency.

The new Delta Hybrid sizes achieve a maximum sound pressure level of 75 dB(A), making them among the quietest on the market in their performance class. Thanks to the flexible modular system, the silencer technology can be selected to comply with customer and application requirements.

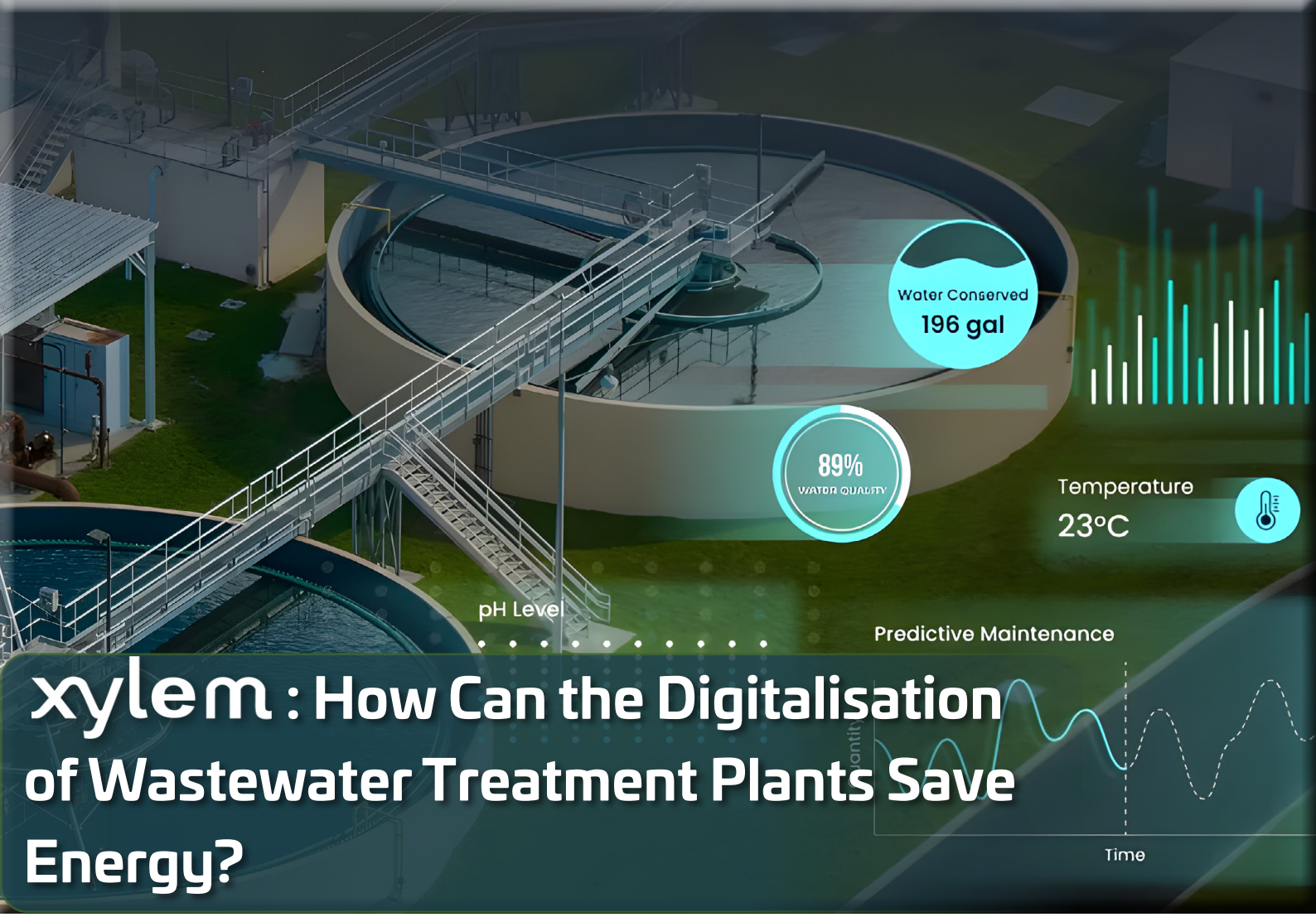
Operation and maintenance are performed exclusively from the front and rear. The exceptionally long oil change and maintenance intervals reduce service costs. The drive components are completely maintenance-free. The machines are already filled with oil on delivery and can be easily transported by pallet truck, forklift truck, or crane.

Efficiency for Rent

The path to decarbonization can be significantly enhanced by Aerzen Rental, launched in Apr 2023, which delivers rental units for immediate deployment in the event of production failure or shortfall, longer term operational leasing, and even rent-to-own. Exemplifying the company's confidence in its portfolio, the programme encompasses all Aerzen products, including water management solutions and advanced aeration pads with membrane technology.

"Our rental services are designed to meet customer needs quickly, offering plug-and-play solutions that allow for rapid access to innovative technologies," Lim managing director for Asia-Pacific at Aerzen, explained.

"Following our current rental model in Europe, we are able to deploy our products within 24 hours in the event of a plant failure or malfunction. We even provide hoses for rent with a range of sizes for the facility. Our aim is to meet our customer's needs as fast as possible." The rental model not only provides flexibility to customers but also helps them manage operational costs more effectively.



xylem : How Can the Digitalisation of Wastewater Treatment Plants Save Energy?

Wastewater treatment is among the most energy-intensive processes in the water sector, especially in light of a 27% average annual increase in electricity prices from 2021 to 2023. As a result, water utilities are prioritizing operational efficiency in wastewater treatment plants (WwTPs). Companies like Xylem are actively assisting these utilities in pinpointing areas for reducing energy consumption and emissions. The urgency of meeting 2030 net zero targets in England is driving innovative approaches, with plans to increase the use of renewable energy sources, including onsite biogas generation, in the upcoming 2025-2030 asset management plans (AMP8).

While these long-term strategies promise substantial benefits, many utilities are also in search of technologies that can deliver immediate results. Upgrading outdated processes and equipment with high-efficiency designs can significantly lower power consumption and energy costs, often yielding a payback period of around two years. Remarkably, up to 40% of a water company's greenhouse gas emissions arise from wastewater management, making optimization a crucial priority for operational teams. However, it is essential to recognize that no single solution can tackle all challenges. Digital technologies will be vital for achieving energy efficiency and climate resilience. This article will explore the advantages WwTPs can gain from incorporating Xylem's digital solutions, their role in ensuring compliance with EU directives, and insights from previous projects, highlighting the importance of innovation in sustainable urban water management.

Go Digital

Xylem is revolutionizing water management through advanced digital tools that enhance energy efficiency and promote climate action. Their solutions focus on three key areas: predictive maintenance, energy management, and water conservation. Xylem offers a comprehensive range of digital solutions, from individual components like pumps and blowers to complete digitalization of water infrastructure, utilizing smart technologies and real-time monitoring.

Key Innovations

- Intelligent Pump Systems: Pumps are vital in the water sector, representing a significant portion of operational costs. Xylem's intelligent systems adapt to changing flow conditions in real-time, reducing maintenance needs and operational expenditures. A notable partnership with Scottish Water showcased the Flygt Concertor system, which achieved a 99.8% reduction in unplanned maintenance and up to 60% energy savings.
- Aeration Upgrades: Aeration can account for up to 75% of energy costs in wastewater treatment. Xylem offers high-speed turbo blowers and intelligent controls that optimize air flow, providing significant energy savings. Upgrading to these systems can save up to 50% in energy compared to traditional mechanical aerators.

Xylem provides digital solutions grounded in data science and extensive expertise in water process engineering. Each project is managed by a wastewater process engineer who not only comprehends the intricacies of biological-chemical processes but also possesses knowledge of online measurement processes.

Empowering Utilities

Xylem's solutions are designed to assist wastewater treatment plants (WWTPs) in complying with EU Directives by continuously monitoring and adjusting to incoming pollution loads. This ensures that water is treated to the required quality, even during peak load periods. The system's continuous monitoring capability allows it to recognize and respond to both standard and non-standard events, thereby alerting the plant to potential compliance issues.

"The system we offer for WWTPs is a plant optimisation system. This means that using our digital solution we try to keep the WWTP running optimally whenever possible. In practice, this means that we primarily check the achievement of the effluent limits from the WWTP because this is the main function of the WWTP. If we know that the limits are safely achievable, we look for a setting through our software that saves operating costs in the form of electricity and chemical consumption. Our current digital systems allow us to recalculate 100s of WWTP settings in relation to effluent limits and cost savings in just one minute, which means enormous overview, support and options for the plant operator." Zuzana Kalinčíková, Xylem Senior Business Development Manager expressed.

It's all about finding the right balance. Digital solutions enable utilities to optimize energy consumption while simultaneously minimizing harmful greenhouse gas emissions. Attention must be divided, as you cannot effectively address one issue without considering the other. On the financial front, accurate calculations lead to substantial savings. These digital systems can achieve a reduction of 10-30% in electricity usage for essential processes such as aeration, promoting energy neutrality and conserving resources.

.

Xylem Vue: Digital Solutions

Water companies are increasingly realising the benefits of digital technologies in making better use of the thousands of datasets they receive each day. Bringing data together on a single, smart platform provides a complete overview of operational performance and enables decision-making based on real-time insights. Without integrated wastewater management software, many utilities find it challenging to gain a comprehensive view of their operational status and network efficiency. Operators and managers are often overwhelmed by numerous separate data streams from various sources, making it hard to accurately reflect the interconnected nature of their network. This fragmentation hinders holistic improvements, quick responses to challenges, scenario testing, and problem prediction.

At its core is the Smart Water Engine, which eliminates data silos and integrates information from all sources. It standardizes this data to create a comprehensive model that, combined with advanced algorithms, allows for a thorough analysis of the utility's entire network. Users can access this single data source through applications within the Xylem Vue platform to solve real-world network issues. By alleviating the complexity of managing multiple independent technologies, the Smart Water Engine provides essential, 360-degree operational decision intelligence to all utility stakeholders.

The Smart Water Engine facilitates several critical functions, including:

- Monitoring operational processes: Ensures all systems are functioning as intended.
- Running real-time what-if scenarios: Allows operators to simulate different conditions and responses.
- Interacting with GIS frameworks: Accurately geolocates all assets for better management.
- Establishing device management and performance alerts: Keeps operators informed of any issues.
- Building digital twin hydraulic models: Creates virtual representations of the physical systems for analysis.
- Designing operational dashboards: Provides visual insights into performance metrics.

What Real Transformation looks like?

• Innichen-Sexten wastewater treatment plant, Italy

ARA Pustertal AG operates the Innichen-Sexten wastewater treatment plant in Tyrol, Italy, serving a population equivalent to 36,000.

The facility employs a conventional activated sludge process with pre-denitrification and biological phosphorus removal. Its wastewater intake comprises 25% municipal, 25% commercial, and 50% tourism-related sources, with commercial wastewater primarily from local dairies, a juice producer, and a meat processing plant.

To optimize operations, the plant implemented Xylem Treatment System Optimization (TSO), which offers real-time analysis of operational parameters and actionable recommendations for improved efficiency and reduced costs. TSO utilizes a decision intelligence approach, continuously refining its recommendations based on updated data.

Xylem developed a digital twin model of the plant's processes, powered by artificial neural networks, to analyze correlations between influent loads, temperatures, aeration profiles, and effluent concentrations. This model enabled the TSO system to propose scenarios that ensure compliance with effluent limits while minimizing energy and chemical usage.

After four months of TSO implementation, the plant achieved a 10% reduction in energy consumption, despite a 33% increase in pollution load, along with reductions of 16% in total nitrogen and 25% in total phosphorus in the effluent.

- EWE Wasser GmbH, Germany

EWE Wasser GmbH, a leading wastewater disposal company in northwest Germany, partnered with Xylem to enhance the efficiency of aeration processes at its Cuxhaven wastewater treatment plant, which serves nearly 400,000 residents. Aeration typically consumes over 50% of the energy in wastewater treatment, prompting EWE to seek optimization strategies to reduce energy and chemical costs while ensuring compliance with effluent regulations.

In early 2017, EWE implemented Xylem Vue, powered by GoAigua's Plant Real-Time Decision Support application. This system utilized neural network models to analyze carbon, nitrogen, and phosphorus elimination processes based on existing SCADA data. The application created a real-time digital twin of the plant, enabling optimal aeration and chemical input adjustments. Due to the absence of online sensors for real-time influent measurements, "virtual sensors" were developed to estimate incoming loads accurately.

By August 2017, the Plant Real-Time Decision Support system was operational, leading to a 30% reduction in aeration energy usage, equivalent to 1.2 million kWh annually-enough to power 321 homes.

Conclusion

Enhancing energy efficiency in wastewater treatment plants (WWTPs) is vital for creating sustainable urban environments and minimizing their environmental impact. Amid increasing electricity costs, these plants are adopting digital solutions to improve operational efficiency and lower energy consumption. Remarkable case studies, like the Innichen-Sexten plant in Italy and EWE Wasser GmbH in Germany, showcase how Xylem's innovative technologies lead to significant energy savings while ensuring compliance with environmental regulations. As utilities strive for net-zero targets by 2030, the integration of advanced digital tools will be essential for optimizing processes, reducing emissions, and promoting sustainable water management practices.

AquaEnergy Expo
Middle East & Africa Egypt

Aqua Energy Expo MEA Leeds the Way to Redefining the Concept of Global Exhibitions

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

When Water Efficiency meets Energy Efficiency, Sustainability Comes True

Connect With Thousands of Visitors from all Over the World

At Cairo International Convention Center (CICC), Cairo, Egypt

From 1st to 3rd Sep. 2025

+20 101770 4973

info@aquaenergyexpomea.com

Organized by

Water Technology Experts Company

https://aquaenergyexpomea.com

Aquatech: Achieving Consistent Low Energy Consumption in Sea Water Ro Based Desalination Plants Using Lowatt® Technology

Water desalination is increasingly essential to satisfy global industrial and drinking water needs. While both thermal desalination methods—such as multi-effect distillation (MED) and multistage flash evaporation (MSF)—and membrane-based seawater reverse osmosis (SWRO) processes are utilized, SWRO has experienced significant growth over the past 15-20 years. This technology has become notably cost-effective and energy-efficient compared to previous years. Most desalination systems now integrate various energy recovery devices to optimize energy use, as energy expenses account for nearly 60% of the operational costs in SWRO plants.

Current designs primarily emphasize hardware solutions, incorporating energy recovery turbines or variable frequency drives (VFDs) to achieve energy savings that justify the initial equipment investments. However, while this approach reduces energy consumption during the design phase, it struggles to maintain these savings over time due to the onset of biofouling. Biofouling, driven by bacterial growth on membranes, diminishes water production and escalates differential pressure and energy usage. Additionally, chlorine treatments often exacerbate the issue by generating oxidized byproducts that nourish remaining bacteria after dechlorination. Therefore, implementing alternative strategies to manage biofouling is crucial for ensuring the long-term effectiveness of desalination facilities.

Biofouling: a global challenge that needs rethinking

Bacterial deactivation poses a significant and recurring challenge in RO plants, as it diminishes water productivity, raises differential pressure, and boosts power consumption. This issue is exacerbated in facilities with open intakes and during summer months when seawater temperatures rise. Chlorine treatments further complicate matters by producing oxidized byproducts that serve as a nutrient source for residual bacteria on membrane surfaces, which are expelled along with the bacteria post-dechlorination. It has become clear that chlorination is not a sustainable method for managing biofouling. The surviving bacteria proliferate rapidly after dechlorination, fed by these potent nutrients.

Additionally, chlorinated organic compounds can lead to the formation of carcinogens, making them undesirable. Thus, alternative methods for controlling, minimizing, or eliminating biofouling are crucial.

Biofouling creates a sticky layer of extracellular polymeric substances (EPS) on membrane surfaces, which is difficult to remove due to its strong shear strength.

Initially, biofouling increases feed pressure, leading to higher energy consumption. As fouling progresses, water production declines, necessitating further increases in feed pressure to maintain design productivity, which in turn raises power usage. This ongoing cycle requires extensive and multi-step chemical cleaning of membranes. Concurrently, differential pressure across membranes rises, complicating the cleaning process and hindering the restoration of original performance. Aggressive cleaning methods may cause irreversible damage, ultimately shortening the lifespan of the membranes.

Aquatech: Developing the Right Solution

Aquatech's LoWatt technology is designed to enhance the efficiency of desalination processes by significantly reducing energy consumption. This is primarily achieved through effective management of biofouling on membranes, coupled with an innovative cleaning methodology that prevents the accumulation of biofilm. By maintaining low differential pressure and minimizing fouling, LoWatt® ensures sustained low energy consumption, which is crucial for the long-term performance of desalination plants. This is made possible by the following innovative process approach:

• Ultrafiltration Pretreatment

The first step in the LoWatt® process involves ultrafiltration (UF) membranes, which are used for pretreatment, achieving over 6 log reductions in bacteria and 1-2 log reductions in viruses.

The UF permeate typically has a Silt Density Index (SDI) of less than 3, often between 1-2, effectively removing most suspended and colloidal particles, as well as some biofoulants.

However, it does not eliminate all organic contaminants that cause fouling. To ensure optimal performance, inlet water turbidity must be below 5 NTU, with upstream treatments tailored to meet this requirement. This maintains UF-treated water turbidity around 0.06-0.08 NTU and protects downstream systems from colloidal loads.

• Bacteria Deactivator Unit

The system includes an ultrafiltration pretreatment alongside a bacteria deactivator unit that utilizes an electrochemical process to deactivate bacteria and coagulate organics such as humic acids, proteins, and carbohydrates, which contribute to biofouling. Coagulated organics are effectively filtered through ultrafiltration. The deactivator interferes with membrane chemical conditioning, preventing biofilm development by stopping negatively charged organics from accumulating on the r

Without the deactivator, ultrafiltration membranes show minimal reduction in Total Organic Carbon (TOC) values. With it, treated water exhibits significantly reduced turbidity and Silt Density Index (SDI), typically below 1.

The process achieves 40-60% TOC reduction while effectively removing contaminants, ensuring reliable operation at reduced Reverse Osmosis (RO) flux.

• Low Flux Design

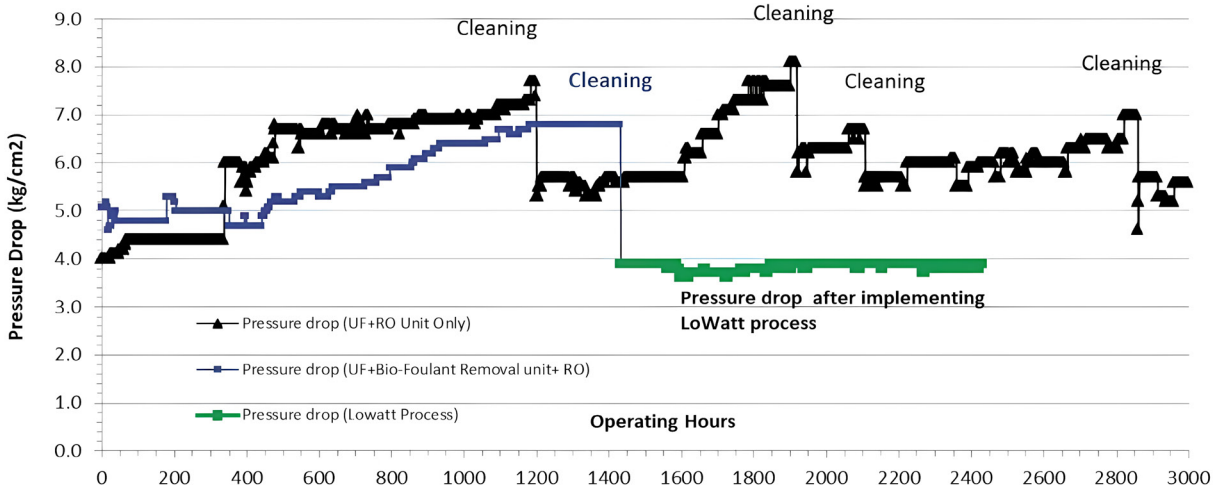
The system operates at a low flux of 6-8 GFD, optimizing energy consumption by 20% compared to higher flux designs.

This low flux Reverse Osmosis (RO) process minimizes energy loss associated with temperature variations and pressure adjustments. For example, at 35,000 PPM TDS, power consumption drops from 2 KWH/M^3 at 9-10 GFD to 1.7 KWH/M^3 at 6 GFD, with reduced feed pressure. The design ensures acceptable permeate TDS levels even at high temperatures, while biofouling is significantly minimized through effective pretreatment. This approach results in minimal differential pressure increase and easier cleaning, maintaining efficient operation and reducing energy costs over time.

• Osmotic Cleaning Methodology

To further combat biofouling, a unique cleaning methodology utilizes the natural osmotic pressure differential between reject and permeate water. When the system halts while maintaining regulated feed flow, permeate flows back to the feed side due to concentration differences. This process, supported by a recirculation system, dislodges biofilm within 10-15 minutes. Operating at lower flux and using ultrafiltration with a bacteria deactivator minimizes biofilm buildup. The cleaning technique maintains clean membrane conditions without chemicals, relying on brine from the SWRO or BWRO plants. Automated systems, potentially using biosensors, trigger cleaning based on differential pressure, allowing continuous water production while isolating specific SWRO banks for maintenance.

RO UNIT PRESSURE DROP: COMPARATIVE GRAPH



Advantages of LoWatt Technology

- Energy-efficient RO technology, particularly for surface water and SWRO applications.
- Optimal flux design minimizes initial energy consumption.
- Initial low energy use followed by sustained low operational energy.
- Energy usage for a SWRO system is between 2.8-3.0 kWh/m^3.
- Reduced biofouling due to lower concentrations of bacteria and nutrients per membrane area, resulting in a decreased membrane replacement rate.
- Natural online cleaning with minimal chemical use.
- Predictive diagnostics and cleaning options based on bio-sensors.
- Addresses the root causes of biofouling, focusing on bacteria and organics.
- Decreased chemical usage.

Project Outline

Nirma, a leading FMCG brand based in Gujarat, India, produces a diverse range of products, including cosmetics, soaps, detergents, and soda ash. As the largest-selling detergent brand in India and a global leader in soda ash production, Nirma faced significant challenges due to water scarcity in the region. To secure a reliable freshwater supply for its manufacturing operations, the company aimed to reduce its dependence on rainwater by exploring seawater treatment solutions. Aquatech was selected to design and implement a 25 MLD Seawater Reverse Osmosis (SWRO) system.

Water Characteristics

Parameter	Unit	Inlet Seawater	SWRO Permeate
pH value at 25°C	-	7.2 - 8.31	6 - 6.5
Temperature	°C	25 - 40	25 - 40
Total Dissolved Solids (TDS)	mg/l	29,535 - 43,858	Max 500
Total Suspended Solids (TSS)	ppm	12 - 200	-
Flow	m^3/hr	3,017	214 * 5 = 1,070

Aquatech assessed Nirma's feed water quality and operational challenges, recommending its LoWatt™ technology, which minimizes energy consumption and prevents biofouling.

The LoWatt™ system uses advanced ultrafiltration (UF) membranes in the pretreatment stage, achieving over 6 log reductions in bacteria and 1-2 log reductions in viruses, with a consistently low Silt Density Index (SDI) below 2. Additional treatment targets organics like humic acids and proteins. The SWRO membranes operate at a lower flux of around 7 GFD, optimizing energy use. A unique cleaning method utilizes natural osmotic pressure differentials to dislodge biofilm. Overall, the installation of Aquatech's LoWatt™ system significantly enhanced Nirma's water treatment facility, ensuring reliability, reducing costs, and providing a consistent water supply for expanded operations.

A Collaborative Vision

Desalination was recognized as a reliable, albeit costly, method for producing fresh water in water-scarce regions. To tackle this issue in 2021, Aquatech International, a frontrunner in desalination, joined forces with Pani Energy, an AI analytics firm, to lower energy usage and costs related to desalination. This collaboration aimed to enhance Aquatech's LoWatt® membrane desalination process by integrating Pani's AI platform, targeting unprecedented energy reductions. LoWatt was designed for low-energy desalination, utilizing robust pretreatment, optimized reverse osmosis, and a proprietary cleaning mechanism, achieving the lowest specific energy consumption in the industry. The integration of Pani's software was expected to establish a new standard of 2.7 kWh per cubic meter, facilitating wider adoption in water-scarce areas.

> "With superior process design combined with advanced machine learning, Aquatech can provide a solution that reliably meets treatment goals while minimizing energy consumption and O&M requirements in real time. Aquatech is proud to welcome Pani as our official digital partner for LoWatt. This partnership enables us to better serve our customers and address the biggest pain points of desalination – energy consumption and biofouling," noted Ravi Chidambaran, Aquatech's Chief Operating Officer.

AECOM: Optimize Your Wastewater Treatment with Advanced SCADA

Many wastewater treatment plants (WWTPs) are exploring advanced supervisory control and data acquisition (SCADA) systems to enhance performance. While most WWTPs currently use some form of SCADA, many systems were installed when the plants were built and now struggle to meet evolving demands, including complex operations and stringent compliance regulations. Operators face two options: upgrade their existing SCADA systems with advanced control strategies to extend their lifespan or replace outdated technology entirely. Additionally, WWTPs confront challenges from an aging workforce. The U.S. EPA reports that nearly one-third of current operators will retire in the next decade, risking a significant loss of institutional knowledge. The complexity of WWTPs, which integrate mechanical, electrical, and biological processes necessitates years of specialized training for certification. As experienced operators leave, the shortage of skilled professionals may hinder effective operations management.

Modernizing SCADA systems is crucial for maintaining public health and ensuring compliance, yet many systems are outdated, posing risks. While the urgency for upgrades is clear, water professionals are understandably wary of the complexities involved in transitioning to new technologies. Ultimately, intuitive tools like advanced SCADA systems could help bridge the skills gap and optimize WWTP operations.

Challenges and the Road Ahead

SCADA modernization is an important consideration for all providers of wastewater services. There are many challenges and benefits involved in the modernization process, acknowledging these obstacles are a crucial step toward addressing them. Here are the three primary challenges water utilities encounter when pursuing SCADA modernization:

- Scale

These extensive systems cannot be replaced overnight; a complete modernization can take anywhere from three to ten years. While new technology requires configuration, the most significant hurdle lies in rewiring and installing the system. Water utilities may have thousands to hundreds of thousands of connection points that need commissioning and testing. The vast scale of the project necessitates careful planning and execution.

- Risk

How can water utilities ensure public and environmental health during the transition? Shutting down an entire city's drinking water and sanitation system to implement a new system is not feasible. It resembles upgrading an aircraft's flight systems while in the air—complex and high-stakes, yet essential for enhanced performance and safety.

- Integration

Many water utility companies operate on various proprietary automation systems. Furthermore, these existing control systems often lack compatibility with modern non-proprietary business systems, making integration challenging. Effective SCADA modernization relies on the seamless integration of new technologies with current infrastructure, demanding innovative solutions and strategic planning.

Accelerating Plant Optimization

Integrating advancements in SCADA with modern sensor and process technologies offers wastewater treatment plants (WWTPs) numerous opportunities for operational optimization. Here's how to ensure your SCADA system is a top-performing asset.

- Solids Retention Time (SRT)

An excessively long SRT wastes energy as the biology in aeration tanks begins aerobic digestion, while a short SRT risks insufficient treatment and potential permit violations. Traditional wastewater testing is manual and infrequent, often only once daily. In contrast, SCADA can implement ammonia-based control, utilizing sensors to continuously monitor residual ammonia, allowing for precise SRT control and improved effectiveness.

- Aeration

Oxygen is diffused through nozzles at the tank's bottom to create an optimal environment for bacteria to break down organic matter and ammonia. Operators set control points to measure dissolved oxygen, but these are rarely optimized, leading to energy waste from over-aeration. SCADA can enhance this process through dynamic control or digital twin models, achieving necessary effluent levels while saving energy.

- Solids Dewatering

This mechanical separation process, assisted by chemicals, reduces the volume of solids for disposal. Traditionally, set points are adjusted manually based on output. With new sensor technologies, SCADA can monitor inputs, outputs, and machine conditions, dynamically adjusting set points to save on chemicals, energy, and hauling costs.

- Chemical Dosing

Disinfection often involves chlorine, with dosing typically based on effluent flow rates, sometimes resulting in over-dosing. New sensors can provide input quality data and feedback from chlorine residual meters, allowing for more precise dosing. This approach reduces chemical use and optimizes treatment.

- Operator Time Efficiency

Nothing hampers efficiency like alarm fatigue. A robust SCADA alarm strategy should include tiered prioritization—distinguishing critical alerts from lower-priority notifications and silencing nuisance alarms in critical situations. Establish priority levels (e.g., low, medium, high) and use "alarm suppression" to ensure critical incidents stay top of mind. Advanced algorithms can prioritize alarms; reducing time spent discerning which require attention.

- Maintenance Schedules

New sensor technologies and SCADA systems enable a shift from scheduled to predictive maintenance. Instead of quarterly pump lubrication, algorithms detect energy inefficiencies, prompting timely maintenance. This proactive strategy minimizes downtime and reduces unnecessary costs by using historical data and real-time metrics to anticipate issues. For instance, Denver Water effectively employs predictive maintenance by monitoring pump vibrations, allowing early detection of problems like bearing wear or misalignment. This early intervention prevents severe failures, reduces unplanned downtime, and enhances system reliability. By strategically planning maintenance based on vibration data, operators ensure optimal pump and motor performance while lowering the risk of unexpected shutdowns.

Seize the Opportunity

The challenges may be sizeable, but the benefits of SCADA modernization can be transformative for water utilities—providing flexibility and boosting operational efficiency. SCADA systems collect vast amounts of data, including flow rates and chemical concentrations. However, excessive data without prioritization can overwhelm operators. To enhance efficiency, it's crucial to identify key metrics, such as pressure and chlorine levels, and display them prominently on SCADA dashboards.

Implementing trend analysis enables operators to recognize patterns and variations over time, helping them identify critical parameters that significantly impact operations. For example, distinguishing seasonal fluctuations from irregular patterns allows operators to focus on metrics that deviate from expected baselines, indicating issues like leaks or equipment wear.

An optimal SCADA system can:

- Safeguard the water system against downtime or cyber events through a more resilient and cyber-safe SCADA system.
- Leverage advanced analytics for precise chemical dosing, decreasing energy use and carbon emissions while improving water quality.
- Rationalize alarms, allowing operators to focus on critical processes.
- Enable independence from original vendors, providing flexibility for upgrades and competition.
- Mitigate risk by using seamless technology, avoiding the weaknesses of legacy systems.
- Build in-house maintenance capabilities to reduce challenges with outdated systems.
- Enhance efficiencies through new technologies, including AI and digital twins.
- Achieve comprehensive situational awareness for proactive management and rapid response to emerging issues.

Where Do You Stand on SCADA Maturity?

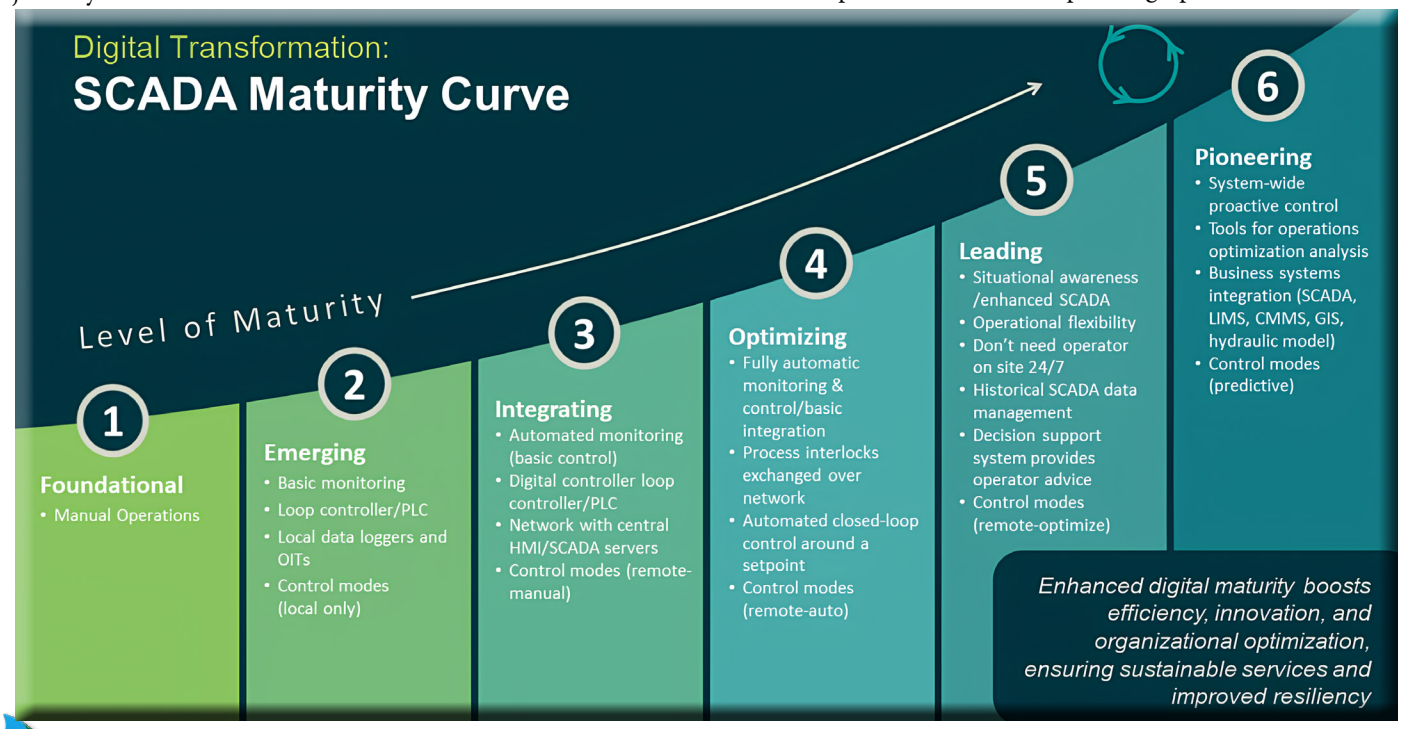
AECOM has developed a SCADA maturity curve to assist wastewater treatment plant (WWTP) operators in evaluating their current status and planning future modernization efforts. This curve helps identify the optimal timing for upgrades, enabling decision-makers to allocate resources and training effectively for this critical transformation. Currently, most water utilities fall between levels 2 and 3 on the curve, indicating that many are at the beginning stages of their modernization journeys.

As utilities advance along the maturity curve, they gain access to more sophisticated data analysis tools, real-time decision-making capabilities, and operational optimization strategies. This progression leads to enhanced efficiency, improved service reliability, and better resource management. More mature SCADA systems allow utilities to respond quickly to changes, providing a strategic advantage in adapting to regulatory shifts, consumer demand fluctuations, or unexpected events. Ultimately, these utilities can leverage predictive technology to mitigate risks and seize new opportunities for technological advancement. Importantly, progressing along the maturity curve does not require a complete system overhaul; many utilities achieve success through a strategic, phased approach that balances immediate operational enhancements with long-term technological goals.

Deephams STW Upgrade

The upgrade of Deephams sewage treatment works exemplifies effective SCADA optimization. As one of London's largest wastewater treatment plants, Deephams serves nearly a million residents, processing 230,000 tons (209,000 tonnes) of waste daily, and over 1.4 million tons (1.3 million tonnes) during heavy rainfall. Originally built in the 1950s and 60s, the plant required significant upgrades to comply with new Environment Agency wastewater standards, modernize its facilities, adapt to increasing environmental pressures, and improve odour control.

The project was executed as a joint venture (JV) between AECOM, Murphy, and Kier, focusing on cost-effective development within the existing footprint while ensuring uninterrupted operations. AECOM designed the civil, structural, tunnelling, and hydraulic components, and is also responsible for maintaining effluent quality during demolition. A key innovation introduced was the Integrated Fixed Activated Sludge (IFAS) technology, which allows Thames Water to enhance its treatment processes without expanding operations.



AquaEnergy Expo Magazine

Blue | Green | Sustainable | Smart

Aqua Energy Expo Jobs platform

Aqua Energy Expo Jobs platform connects immense and diverse talents in the global Water and Energy industry .

www.aquaenergyexpo.com

AquaEnergy Expo

Magazine

Blue | Green | Sustainable | Smart

WATER NEWS BRIEF

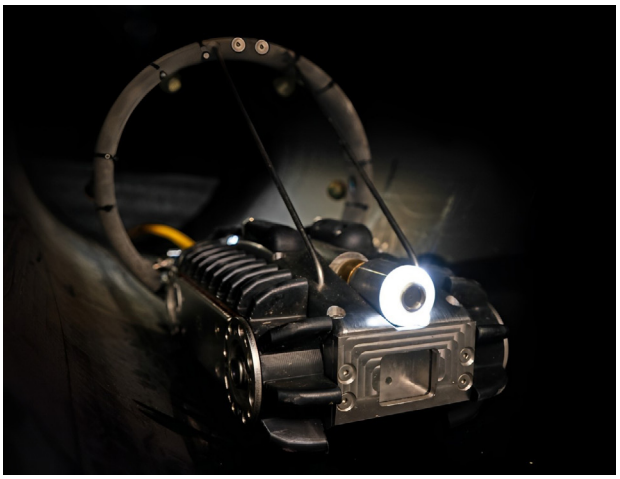
February | 2025

www.aquaenergyexpo.com

ACWA Power Signs 5 Agreements with Italian Entities for Clean Energy and Water Projects

Saudi-listed ACWA Power has signed five agreements with Italian entities to collaborate on clean energy and water projects in Central Asia, Africa, and beyond. Key agreements include two with SACE, totaling $600 million, providing a $100 million credit line for green projects and $500 million in insurance solutions to support Italian exports. A three-year deal with Cassa Depositi e Prestiti (CDP) focuses on projects in ODA-eligible countries. Additionally, ACWA Power will partner with De Nora to enhance water treatment technologies and with NOMAC Holding and Ansaldo Energia to expand gas turbine refurbishment in Africa. These partnerships align with Italy's Mattei Plan for sustainable development.

Ofwat announces details of £400 m fund to spur Water Sector Transformation in Next Five Years



Ofwat has announced a £400 million expansion of its Innovation Fund to transform the water sector over the next five years. Originally established in 2020 with £200 million, the fund supports collaborative projects aimed at addressing challenges like net-zero emissions, storm overflow management, and leak prevention. The initiative is part of a broader £104 billion investment plan for the sector. With 93 projects funded so far, including innovative technologies like leak-detecting robots, the new funding will introduce additional Water Breakthrough Challenges and funding streams to scale successful innovations. This collaborative approach aims to enhance water services while reducing environmental impacts and ensuring customer satisfaction.

World Bank approves $240 million to support Investments in WASH Services in Karachi, Pakistan

KETOS and Siemens have partnered to enhance water quality solutions and improve management for industrial and municipal water operators. Their collaboration aims to provide comprehensive water quality management, supporting Siemens' water reuse initiatives and the Siemens Xcelerator strategy. Utilizing Siemens Water (SIWA) applications, the partnership focuses on optimizing energy efficiency, reducing water loss, and improving predictive maintenance. KETOS automates water testing and monitoring through a robust AI-driven platform, ensuring real-time insights for safety and efficiency. CEO Meena Sankaran emphasized the importance of integrating water usage and quality data for sustainable management, catering to clients focused on ESG reporting and carbon footprint reduction.

GHD chosen to lead Process Design of First Large-scale Desalination Project in South Texas

GHD has been selected to lead the process design of the Corpus Christi Inner Harbor Desalination Treatment Plant, a pivotal project that will provide 30 million gallons of fresh water daily. This facility, developed in collaboration with Kiewit Infrastructure South Co. and Corpus Christi Water, is the first large-scale seawater desalination plant in the region. In an area facing persistent dry conditions and limited water resources, the plant will enhance long-term water sustainability for Texas. GHD will oversee process design, marine construction expertise, and environmental monitoring. Mark Donovan emphasized the project's importance for community health and the environment, showcasing GHD's global expertise tailored to local needs.

Arab Energy Fund consortium finalizes Acquisition of Metito Utilities

The Arab Energy Fund (TAEF), formerly APICORP, has led a consortium to acquire a 100% stake in Metito Utilities, a global leader in sustainable water management solutions. This strategic partnership, involving Zamil Group Investment Company and the Ghandour family, aims to enhance energy security and sustainability by addressing critical water infrastructure needs across the Middle East, Africa, and Asia. Metito, established in 1958, has extensive experience in water and wastewater management, with over 35 successful concessions globally. TAEF's CEO, Khalid Ali Al-Ruwaigh, emphasized the importance of this investment in tackling water scarcity and fostering long-term value creation, while Zamil highlighted the commitment to sustainable development.

GWF-Microsoft AI Collaboration unlocks Millions of Liters of Water Savings

Climate change is worsening global water scarcity, with projections suggesting that by 2050, three-quarters of the world's population may face drought, particularly in the Global South. Challenges are compounded by non-revenue water (NRW) losses, where 30-40% of treated water is wasted due to leaks. In response, GWF and Microsoft announced a collaboration at the World Economic Forum to implement GWF BALANCE, an AI-driven technology aimed at reducing water losses in distribution networks. This solution can decrease pressure-related leaks by approximately 35% without costly infrastructure changes. The initiative supports Microsoft's goal of being water positive by 2030, promoting scalable water conservation strategies in urban areas.

World Bank approves $258 Million financing to improve Water Supply Services in Lebanon

The World Bank has approved a US$257.8 million financing for the Second Greater Beirut Water Supply Project (SGBWSP) to enhance water services in Greater Beirut and Mount Lebanon. This project aims to complete vital water infrastructure, improve water quality, and reduce dependence on costly private sources. Lebanon, despite high precipitation levels, faces significant water shortages due to seasonal rainfall and inadequate storage. Climate change threatens to halve dry-season water availability by 2040. The SGBWSP builds on previous efforts, repairing damaged infrastructure and upgrading the Wardanieh Water Treatment Plant. It aims to increase water supply coverage for 1.8 million residents, significantly lowering reliance on expensive private water tankers.

French-led Group signs $5B Desalination Deal for Jordan's Largest Infrastructure Project

Jordan has signed a groundbreaking agreement with French-led investors to construct a major desalination plant, one of the largest in the world, valued at over $5 billion. This project, led by Meridiam in collaboration with SUEZ, Orascom Construction, and VINCI Construction, marks Jordan's largest infrastructure initiative to date. The plant aims to provide over 300 million cubic meters of drinking water annually to Amman and Aqaba, benefiting more than three million people and increasing the domestic water supply by nearly 60%. The project will include approximately 445 kilometers of pipelines to transport desalinated water from the Red Sea and is expected to be completed in four years.

Southern Water awards £500m Wastewater Contracts to enhance Network Performance

Southern Water has awarded £540 million in wastewater contracts to three companies to improve its wastewater network in the South East. These contracts, part of preparations for the 2025-2030 spending period, encompass four workstreams. Lanes Group will handle maintenance and manhole services, Cappagh Browne will manage sewer rehabilitation, and McAllister Bros will focus on sewer sealing. This collaboration aims to enhance essential sewer services, including emergency response and rehabilitation, while improving environmental performance and customer service. Alex Saunders, Head of Wastewater Networks, expressed confidence in partnering with industry leaders to meet customer expectations and achieve environmental goals. The contracts will commence in April 2025 and cover AMP8 through 2030.

Transition Industries and Veolia Partner to redefine Industrial Water Use at the Pacifico Mexinol Project in Mexico

Transition Industries LLC and Veolia Water Technologies & Solutions have signed an agreement to develop advanced industrial water technology for the Pacifico Mexinol project in Sinaloa, Mexico, set to begin operations in 2028. This facility aims to be the world's largest ultra-low carbon chemical production site, producing 6,145 metric tons of methanol daily. The partnership focuses on a water management strategy that utilizes municipal wastewater, avoiding freshwater use and preserving resources for local needs. Veolia will implement cutting-edge technologies, including ultrafiltration and reverse osmosis, to optimize water treatment. This collaboration underscores a commitment to sustainable practices and environmental responsibility in combating climate change.

Osmoflo and Aqua Membranes Partner to bring 3D printed Spacer Technology Benefits to a Water-scarce World

Australian company Osmoflo Water Management has partnered with US-based Aqua Membranes to integrate Aqua's 3D printed spacer technology into reverse osmosis (RO) membranes. This collaboration aims to enhance water and wastewater treatment solutions for industrial and municipal sectors. Supported by Kanadevia Corporation, Osmoflo is investing in Aqua's Series B funding to expand US manufacturing and global supply capabilities. The exclusive agreement allows Osmoflo to distribute Aqua's advanced RO membranes across Australia, New Zealand, and the Pacific. Aqua's technology offers improved energy efficiency and reduced fouling, helping clients meet sustainability goals while addressing the growing demand for reliable freshwater sources.

Ferrovial and Rubau begin €102 Expansion of Catalonia's Largest Drinking Water Treatment Plant

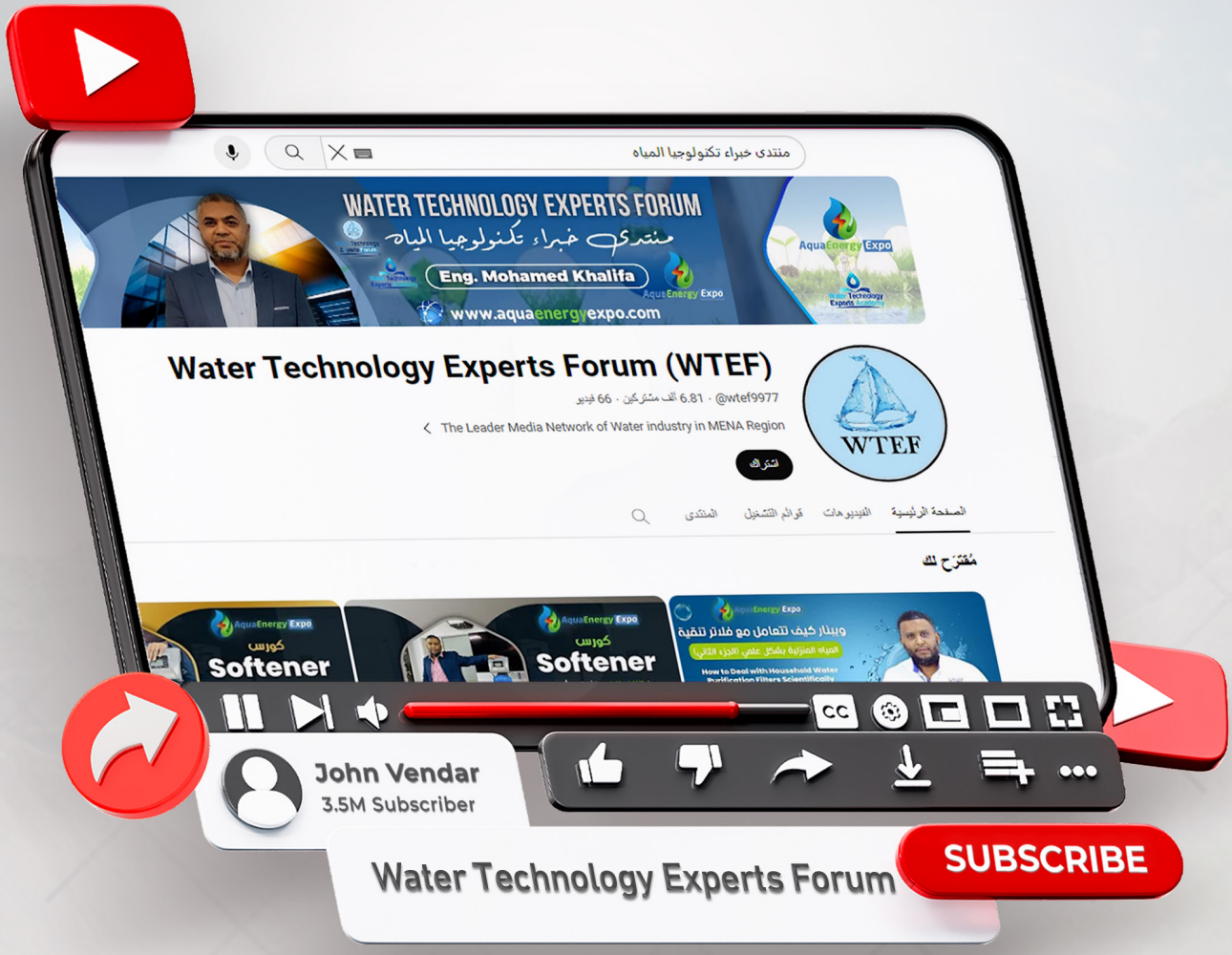
Ferrovial and Construcciones Rubau have begun the €102 million expansion and modernization of the Ter Drinking Water Treatment Plant (DWTP) in Catalonia, the region's largest facility. Commissioned by Ens d'Abastament d'Aigua Ter-Llobregat (ATL), the project will take 48 months and aims to enhance the plant's capabilities by upgrading sand filters, installing new granular activated carbon filters, and adding advanced disinfection facilities. Maintaining uninterrupted operation during the upgrade poses a challenge, but careful management of connections will mitigate disruptions. The Ter DWTP, operational since 1966, currently supplies two-thirds of the Barcelona metropolitan area's water, and the upgrades will ensure compliance with stringent quality standards.

AquaEnergy Expo Magazine

Blue | Green | Sustainable | Smart

Watch more than 150

Online free webinars in the field of "Water and Energy Engineering and Science" on our YouTube channel



www.aquaenergyexpo.com

WEBINARS

Meet our Experts at Aqua Expo Weekly Webinas

Dr. Mohamed A. Haikal

Advances in RO Desalination Technologies

Date: Saturday, Feb 1st
Time: From 6 to 8 PM (Saudi Arabia Time)

Eng. Mohamed Zidan

Rotating Equipment Maintenence Engineer

Date: Friday, Feb 21st
Time: From 8 to 10 PM (Saudi Arabia Time)

Eng. Mostafa Badawy

Renewable Energy Technologies: Concepts, Development and Global Trends

Date: Saturday, Feb 1st
Time: From 8 to 10 PM (Saudi Arabia Time)

Eng. Mokhtar Morsy

Water Hammer and Design of Surge Protection Systems
Lecture#3: Surge Vessels- Air Compressor Type

Date: Saturday, Feb 22nd
Time: From 7 to 9 PM (Saudi Arabia Time)

Dr. Fathy Ghorab

Role of TSC in Sustainability of Water Resources

Date: Friday, Feb 7th
Time: From 9 to 11 PM (Saudi Arabia Time)

Eng. Hatem H. Abd Elhamid

How Maskoub Uses Reverse Engineering as a Tool for Development and Excellence

Date: Saturday, Feb 28th
Time: From 8 to 10 PM (Saudi Arabia Time)

Dr. Ahmed Saad

The Efficacy of Pathogenic Microorganisms on Sustainability of Safe Drinking Water

Date: Friday, 14th
Time: From 9 to 11 PM (Saudi Arabia Time)

www.aquaenergyexpo.com

AquaEnergy Expo Magazine

Blue | Green | Sustainable | Smart

Visit our Knowledge Hub

Read and Download More than 13000 Free and Open Access References in Water and Energy Science and Engineering

www.aquaenergyexpo.com

AquaEnergy Expo

ocean oasis

Wave-Powered Water: The Zero-Emission Future of Desalination

www.aquaenergyexpo.com

Nearly 1.5 billion people, including 450 million children, live in areas with high water vulnerability. By 2050, water scarcity is projected to impact over half the global population due to climate change and population growth. Meeting the demand for fresh water will require extensive desalination, which converts seawater into fresh water. Currently, over 300 million people depend on desalination, a figure expected to triple by 2050. However, desalination is energy-intensive, relying on fossil fuels for over 90% of its energy, leading to significant carbon emissions. Concerns about the environmental effects of brine discharge also persist.

To address these challenges, Ocean Oasis, a Norwegian company, is utilizing wave power to energize offshore desalination buoys. These buoys can operate independently or enhance existing desalination plants. This innovative approach not only adapts to climate change but also mitigates its effects by offering a cleaner alternative to fossil fuel-dependent desalination methods. By reducing the high electricity demand associated with desalination, this solution supports decarbonization efforts, particularly in small or island-based grids. Furthermore, it helps alleviate local environmental issues linked to water intake and brine discharge, promoting a more sustainable approach to water supply in vulnerable regions.

Tapping Into Wave Energy Potential

Currently, just over 1% of the world's freshwater is desalinated, but this industry is expected to double by 2030. Offshore desalination introduces new opportunities for growth by utilizing wave power in deep waters, ensuring clean water intake, and allowing brine discharge away from sensitive coastal areas. This method is flexible and zero-emission, with wave power projected to become cost-competitive with offshore wind by the 2030s, according to a study by LUT University in Finland and Delft University of Technology in the Netherlands.

Their global wave energy resource assessment highlights the potential of wave power in energy systems, incorporating data from advanced wave energy converters.

The study predicts that wave power will achieve a levelized cost of electricity (LCoE) below 70 €/MWh by 2035, with mid-term projections indicating competitiveness with offshore wind at under 100 €/MWh by 2030. By the 2030s, point absorber-based wave power could generate up to 39,700 TWh of electricity at costs below 100 €/MWh, and by 2050, this could drop to under 50 €/MWh, providing 29,000 TWh.

Ongoing research, market-driven learning curves, and economies of scale are expected to reduce wave power costs, making it increasingly attractive to investors and policymakers. This emerging energy source could be vital for coastal regions with high population densities and limited onshore renewable energy potential, reducing reliance on energy imports.

Incorporating Innovative Systems

Ocean Oasis's journey into offshore desalination technology is rooted in the expertise cultivated within Norway's offshore oil and gas sector. For over five decades, this industry has been the backbone of Norway's economy. The company leverages this experience, combining it with the nation's strong shipbuilding capabilities. Their innovation lies in utilizing wave energy to power a conventional reverse osmosis desalination process onboard floating buoys. This approach not only provides a sustainable solution but also enhances the efficiency of water desalination.

Ocean Oasis's system directly utilizes wave energy to pressurize seawater, which is the most energy-intensive phase of the desalination process. By bypassing the conversion of wave energy into electricity, the company minimizes energy losses that typically occur during this transformation. This unique approach not only enhances efficiency but also eliminates the need for extensive land use, as demonstrated by the project's ability to deliver the same amount of water that would require a FIFA-sized field of solar panels for energy production. Their innovative solution captures fluctuating wave energy to maintain a stable flow of pressurized seawater, allowing for freshwater production in deep ocean waters. Freshwater is delivered to shore via seabed pipes, and a fleet of these units could supply an entire city.

Ocean Oasis also offers a Build-Own-Operate (BOO) model, financing, building, operating, and maintaining desalination plants while delivering water to customers under long-term contracts, ensuring a reliable and sustainable water supply.

A Commit to Sustainability

Ocean Oasis's wave-powered desalination technology presents several advantages over fossil fuel-based methods. Firstly, it utilizes renewable wave energy, resulting in zero emissions from energy use. A typical fleet deployment could save over 200,000 metric tons of CO2 equivalents over its lifespan. Secondly, as an off-grid solution, it alleviates pressure on the electricity grid, eliminating the need for costly upgrades to weak grids. Thirdly, by producing desalinated water offshore, it conserves land, avoiding the need for large onshore facilities in urban coastal areas. This technology complements existing and new traditional desalination plants by enhancing capacity and addressing key limitations such as high energy consumption, reliance on strong grid supply, land use constraints, and brine management. For instance, integrating Ocean Oasis's buoys with an onshore desalination plant could improve competitive pricing through energy savings and attract blue and green funding sources by aligning with EU Taxonomy requirements, thus promoting sustainable project development.

One of the significant environmental concerns associated with traditional desalination is the discharge of brine and the impact on marine ecosystems.

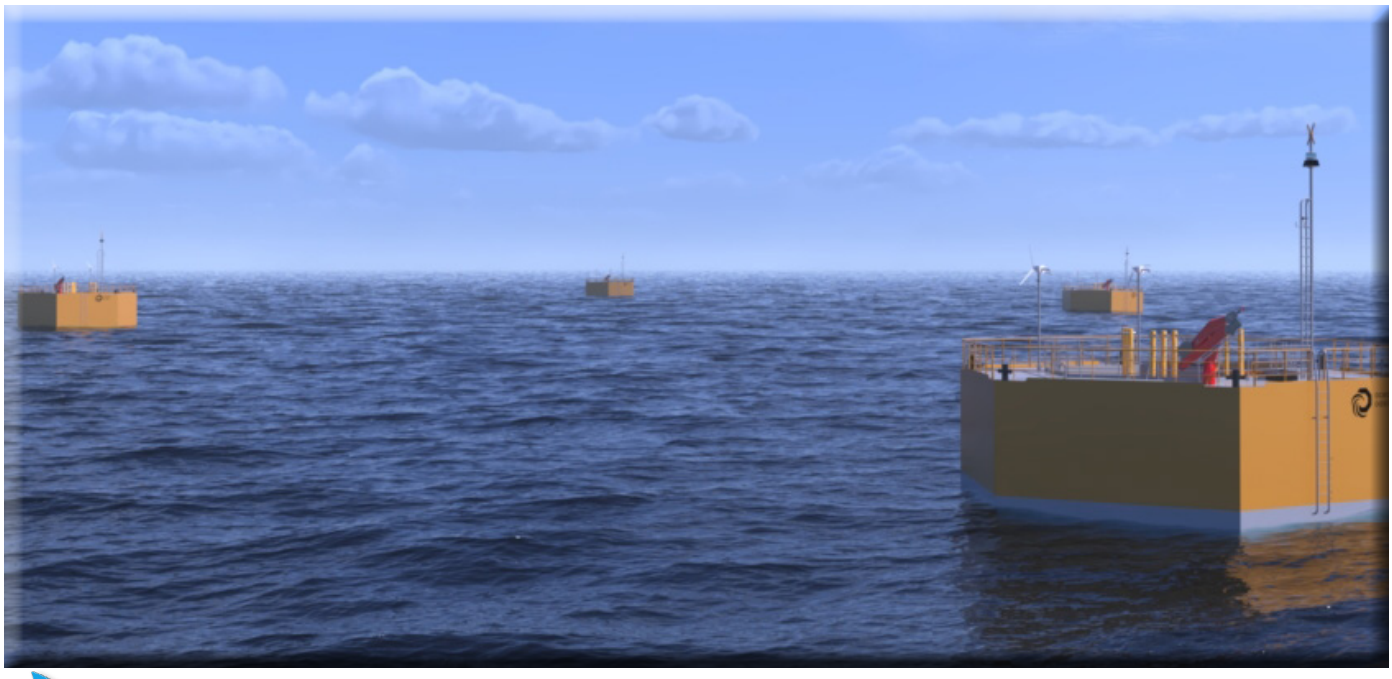
Ocean Oasis's offshore buoys mitigate these challenges by operating away from sensitive nearshore environments, ensuring higher quality intake water. The brine produced is discharged at a higher point in the water column, allowing for better dilution and minimizing the risk of environmental harm. Furthermore, the absence of chemicals onboard contributes to a cleaner operational footprint.

Project to be Operational by 2026

Since the establishment of Europe's first desalination plant in 1964, the Canary Islands have relied heavily on desalinated seawater, sourcing over 70% of their drinking water in this manner.

The region has faced persistent water scarcity, with traditional desalination methods often resulting in high energy costs and environmental concerns, such as brine discharge. Gran Canaria has been selected as the testing ground for Ocean Oasis's wave-powered desalination technology, due to its status as Europe's largest desalination market. Ocean Oasis has secured a €6 million grant from the European Union to develop this innovative technology through the deployment of offshore desalination buoys aimed at combating water scarcity on Gran Canaria.

Kristine Bangstad Fredriksen, CEO and Co-founder of Ocean Oasis, expressed her enthusiasm for the project, stating, "At Ocean Oasis, we believe that renewable energy, particularly wave power, holds the key to a future where clean water is both accessible and abundant. The DESALIFE project represents a significant step forward in demonstrating our technology's potential, not just for the Canary Islands, but for coastal communities worldwide."



The north coast of Gran Canaria was specifically chosen for its wave potential, favorable operating conditions, and proximity to existing onshore desalination facilities. The local population currently relies on three desalination plants for drinking water. One of these, the Arucas-Moya seawater desalination plant, will play a crucial role in the implementation and operation phases of the DESALIFE project by integrating the offshore freshwater produced by the desalination buoys with its own production.

The facility will increase production by 2,000 m^3/day on average, sufficient for the daily consumption of 15,000 people, without requiring expansion of the existing onshore plant or increasing energy consumption, CO2 emissions, or brine discharge.

Additionally, the Consortium comprises key institutional and private partners:

- Canary Islands Institute of Technology (ITC)
- Oceanic Platform of the Canary Islands (PLOCAN)
- Group for the Research on Renewable Energy Systems (GRRES) at the Universidad of Las Palmas de Gran Canaria (ULPGC)
- Elittoral, an environmental consultancy specializing in coastal and oceanographic engineering.

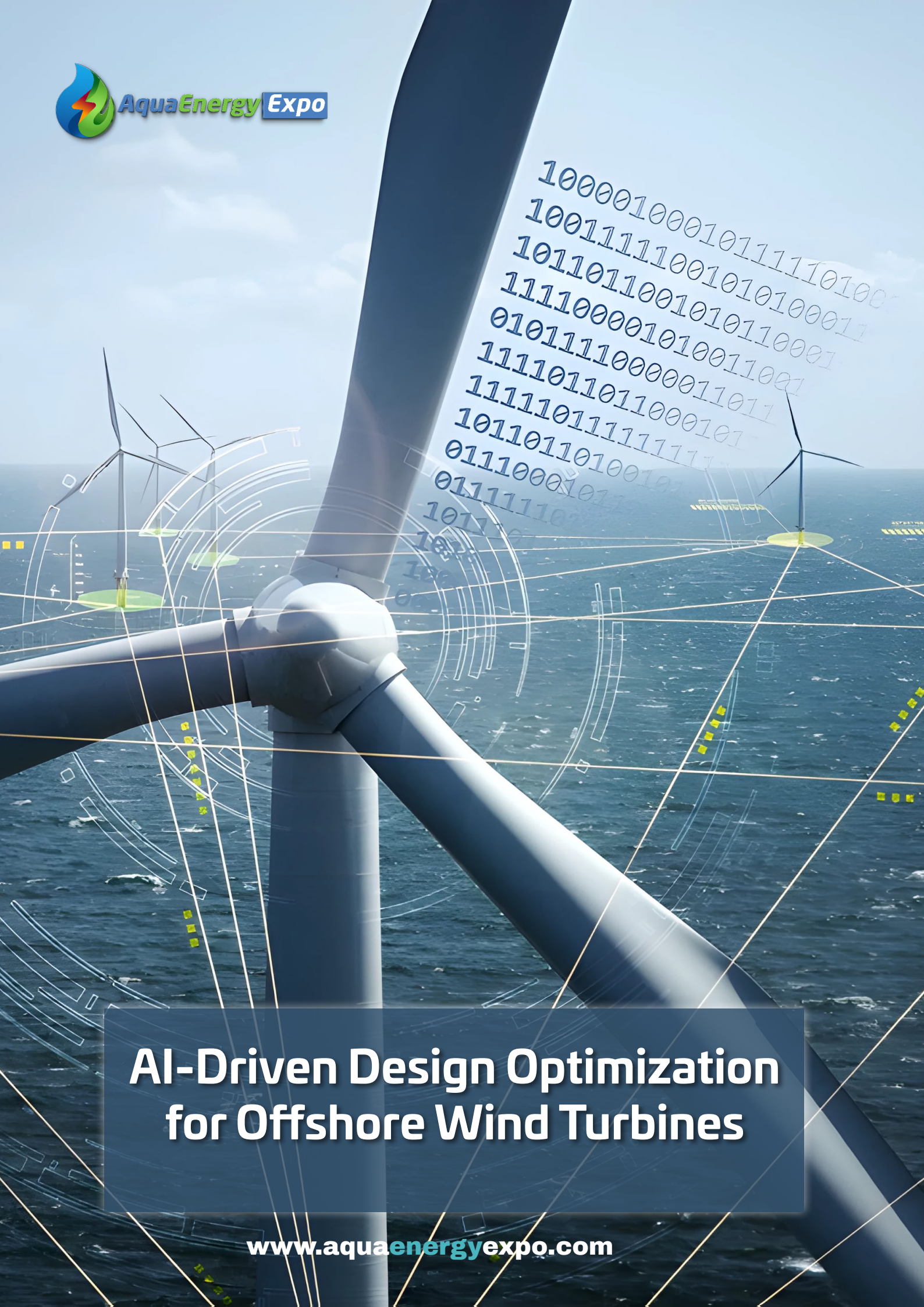
The first pre-commercial buoys are expected to be operational by mid-2026, potentially serving as a model for addressing water scarcity in coastal communities globally while promoting renewable energy use.

The Goal: Providing Freshwater on a Larger Scale

Over the past year, Ocean Oasis successfully completed full-scale offshore testing of its pilot buoy, Gaia, in Las Palmas de Gran Canaria.

This prototype, measuring 7 meters in diameter and 10 meters high, weighs about 100 tons and harnesses wave energy through the relative movement of two bodies to perform desalination via reverse osmosis without needing electrical energy, thus enhancing efficiency. Gaia is anchored at the PLOCAN test site in Punta de la Mareta.

The project was funded by the European Accelerator and received financial support from Innovation Norway, the Norwegian Research Council, and the Gran Canaria Economic Promotion Society, among others. The successful tests demonstrated the viability of producing freshwater solely from wave energy, validating the company's approach and providing insights for future developments. Ocean Oasis aims to address the growing water demands of coastal regions, initially focusing on the Canary Islands and planning to partner with onshore desalination plants. Potential expansion locations include Morocco, Cape Verde, South Africa, and Chile, which face increasing water scarcity due to climate change.



AI-Driven Design Optimization for Offshore Wind Turbines

www.aquaenergyexpo.com

Wind power is a leading renewable energy source, crucial for generating clean electricity and reducing carbon footprints. As the world transitions to sustainable energy, both onshore and offshore wind farms are vital in meeting increasing energy demands. The recent announcement of achieving a 2 terawatt (TW) milestone within seven years marks a significant acceleration in global wind power capacity growth. This target, set for 2023 to 2030, represents a substantial increase over previous projections. According to GWEC Market Intelligence, total wind power capacity additions during this period have been revised upward by 143 gigawatts (GW), reflecting a notable 13% year-over-year adjustment.

Despite the significant growth of the global offshore wind market over the last decade, particularly in Europe, its contribution to power supply remains a small fraction of its potential. Offshore wind farms can capture larger, more reliable winds, but the associated infrastructure is costlier to install, operate, and maintain compared to onshore technologies. To address these challenges, the EU-funded HIPERWIND project aims to develop advanced models for both fixed-bottom and floating offshore wind turbines. These models will enhance resolution and predictive capabilities, ultimately fostering significantly lower lifetime energy generation costs and encouraging greater investment in offshore wind technology.

Offshore Wind Power: Potential and Limitations

Offshore wind farms are gaining traction as technology advances and the need for renewable energy grows. These installations offer unique benefits but also face unique challenges.

• More Expensive

Offshore wind turbines encounter stronger wind speeds and more intense ocean currents compared to onshore turbines, necessitating designs that can endure significantly greater loads. Consequently, these stringent design requirements lead to substantially higher capital expenses, especially in balance-of-plant costs. While offshore wind turbines generally harness higher wind speeds and can produce more energy, the elevated capital costs result in a higher levelized cost of electricity (LCOE). Although the LCOE for offshore wind generation has dropped notably—by 65% from 2017 to 2023—this reduction is primarily attributed to the industry's maturation and the development of larger plants.

• Maintenance Challenges

While higher wind speeds offshore can generate more energy, they also make offshore wind turbines more vulnerable to damage. Additionally, due to their exposure to strong winds, especially during storms, offshore wind farms frequently require maintenance. These repairs are not only costly but also harder to access because of their distance from shore, often resulting in longer repair times, despite companies' efforts to find optimal locations for their wind farms.

• Less Local Involvement

In contrast to onshore farms that can be owned by local businesses, offshore farms require more investment and are typically owned by large corporations. Consequently, while offshore wind farms create job opportunities, they may not necessarily benefit specific local communities. Ultimately, the offshore wind sector does not provide the same economic advantages that onshore projects do.

HIPERWIND Project: Game changer

The HIPERWIND consortium consisted of seven partners from both academia and industry: DTU Wind and Energy Systems, Chair of Risk, Safety and Uncertainty Quantification at ETH Zurich, EDF, IFPEN, EPRI Europe, University of Bergen, and DNV.

Funded by the European Union's Horizon 2020 Research and Innovation Programme, the project ran for 3.5 years and was led by DTU Wind, with a total cost of €4,103,638.75

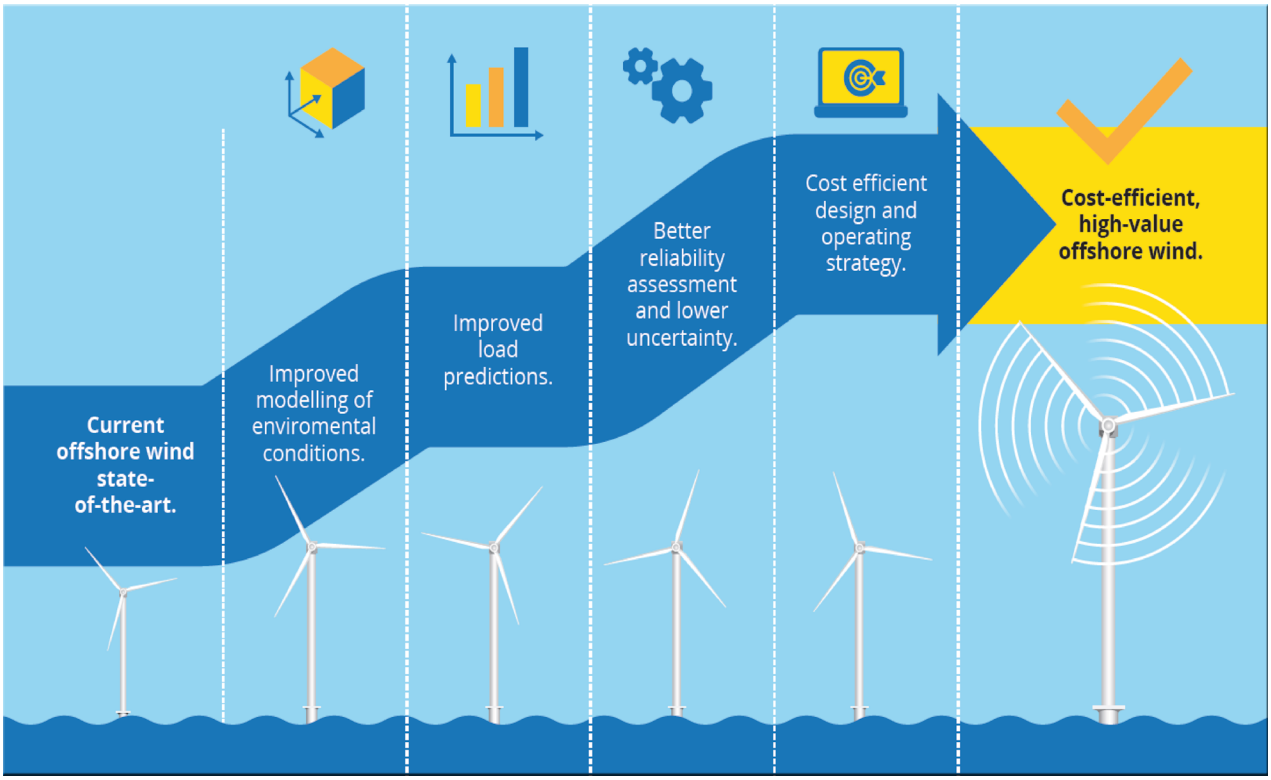
Managing uncertainties is crucial for lowering costs and enhancing the production, reliability, and overall value of offshore wind energy. Uncertainties lead to higher safety margins, necessitating additional materials for components, more frequent maintenance cycles, and increased financing costs for wind farms. The HIPERWIND project aims to achieve a 9% reduction in the Levelized Cost of Energy (LCOE) for offshore wind farms by advancing fundamental wind energy science, ultimately reducing risk and uncertainty.

The result is cost-effective offshore wind through minimized unnecessary material usage, fewer unscheduled maintenance events, and an optimized operational strategy designed to deliver power with high market value.

Project Coordinator Nikolay Dimitrov states, "HIPERWIND set out to significantly lower the LCOE by understanding how to manage uncertainties in the wind turbine design modeling chain."

The project investigated how to quantify and identify various uncertainties, from environmental conditions to loads and wind turbine reliability. This strategy aimed to reduce material consumption by improving model performance and decreasing uncertainty, proving the feasibility of designing more efficient systems. The five specific objectives of the HIPERWIND project are to:

- Improve the accuracy and spatial resolution of met-ocean models.
- Develop innovative load assessment methods suited to large offshore fixed-bottom and floating wind turbines.
- Create an efficient reliability computation framework.



- Develop and validate a modeling framework for component degradation due to loads and environmental factors.
- Prioritize measures achieving at least a 9% reduction in LCOE and a 1% improvement in market value for offshore wind energy.

Our Modelling Approach

The primary challenge tackled in the project is enhancing the entire modelling chain, from basic atmospheric physics to advanced engineering design, to reduce uncertainty and risk for large offshore wind farms. HIPERWIND employs multi-scale atmospheric flow and ocean modelling, creating a seamless connection between models of phenomena on a mesoscale level and those on a wind farm level, with the aim of reducing uncertainty in load predictions, and broadening the range of scenarios for which adequate load predictions are possible. Improved modelling of environmental conditions, improved load predictions, better reliability assessment and lower uncertainty, cost-efficient design and operating strategies, and lower O&M costs will yield a projected 9% decrease in the Levelized Cost of Energy (LCOE) and a 1% increase in the market value of offshore wind by the conclusion of the project.

"HIPERWIND could be a game changer," Clément Jacquet from EPRI Europe says. "We delivered a significant reduction of the LCOE of up to 9% – and even 10% is achievable if we consider the most optimistic case we have. In the least optimistic case, the reduction will still be 5%."

Applications beyond wind energy

Utilizing the collected data alongside advanced physics-based and data-driven models, this approach to managing and reducing uncertainty was implemented throughout the entire offshore wind turbine design modelling process—and beyond. For instance, IFP Energies Nouvelles (IFPEN) is currently utilizing HIPERWIND data to improve chain modeling by accurately characterizing wind turbine fatigue loads. The project has yielded important reliability design procedures that are ready for market application, extending beyond mere research

. "The project has produced some significant reliability design procedures that are feasible in an industrial context and thereby go beyond the research domain," explains Martin Guiton from IFPEN. "

Taking uncertainties into account, we obtain a reduction of 21% of the mass of the wind turbine structure, which is a lot", adds his colleague, Alexis Cousin."

In a similar vein, ETH Zurich is employing these methods to address not only wind-related challenges but also issues related to earthquakes, such as the seismic vulnerability of structures in complex environments and the design of tall buildings exposed to random wind forces.

Senior Scientist Stefano Marelli, Chair of Risk, Safety, and Uncertainty Quantification at ETH Zürich, noted, "The project necessitated the development of a new methodology from the ground up to manage uncertainties in high-dimensional inputs and responses. Our advancements in surrogate modeling techniques, which expedited algorithm development and facilitated collaboration among partners, proved to be effective."

Real-world Case Study

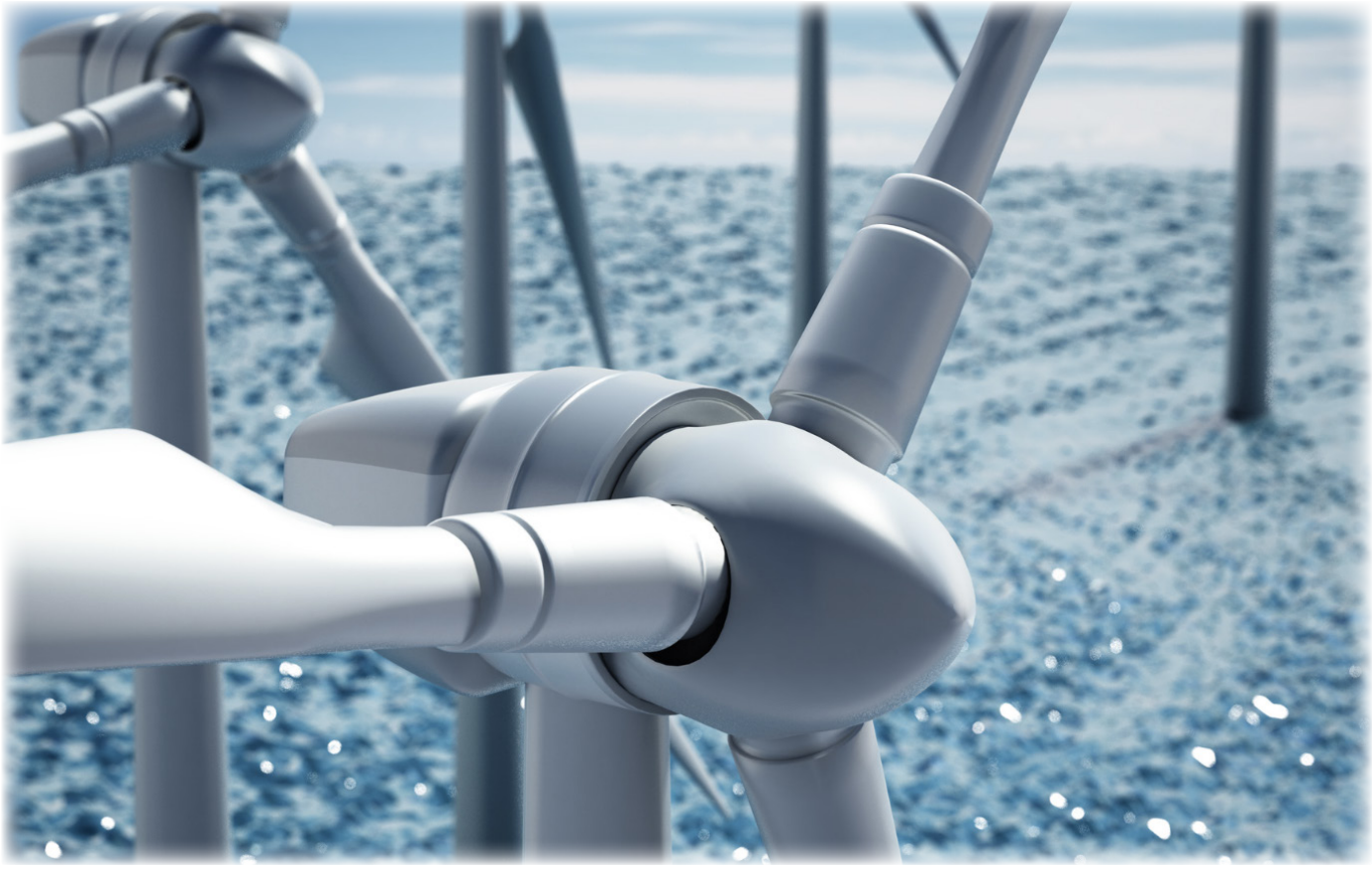
EPRI evaluated the influence of HIPERWIND technology on LCOE, necessitating a thorough approach and an in-depth analysis of offshore wind farm expenses. This initiative led to the development of a new, customizable framework that EPRI plans to utilize in future projects to improve the economic efficiency of both onshore and offshore wind farms. The Teesside offshore wind farm, located off the coast of England and owned by project partner EDF, served as a practical case study for the project. By utilizing wind farm-specific data and models, the team identified and measured uncertainties associated with turbine tower and foundation design. They then assessed how the new findings could lower the costs of reconstructing the wind farm.

HIPERWIND showcased that reducing material usage in turbine construction can decrease initial capital costs, which constitute approximately 30% of the overall electricity cost

Additional savings were realized by timing maintenance during periods of low energy prices, enhancing both cost efficiency and operational performance.

CONCLUSION

Wind power plays a pivotal role in the transition to renewable energy, with offshore wind farms poised for significant growth. The HIPERWIND project exemplifies innovation in this sector, focusing on reducing uncertainties that drive up costs. By enhancing modelling techniques and improving reliability, HIPERWIND aims to achieve a 9% reduction in the Levelized Cost of Energy (LCOE) for offshore wind farms. This initiative not only addresses the challenges of higher capital expenses and maintenance but also promotes greater investment in offshore technology. Ultimately, HIPERWIND's advancements could transform the offshore wind landscape, making it more economically viable and efficient.



AquaEnergy Expo Magazine

Blue | Green | Sustainable | Smart

Are you looking for new customers?

Join Aqua Energy Virtual Expo and increase your sales

Joining our Virtual Expo will help you to increase your customers network,grow your sales, publish your brand,find new distributors, agents and open new markets

COUNTRIES 150+

COMPANIES 1100+

PRODUCTS 15000+

www.aquaenergyexpo.com

InPipe Energy: How a Rural Water Utilities Produce Renewable Energy through Its Distribution System

Rural water utilities often operate with limited finances, aging systems, and vast service areas. One promising solution involves harnessing the otherwise wasted pressure within water pipelines to produce reliable, renewable power. Beyond cutting electricity bills by offsetting grid consumption, this approach also curtails carbon emissions and bolsters infrastructure longevity. By embedding energy generation into their networks, smaller utilities can secure an additional revenue stream, aiding efforts to keep water services both affordable and accessible.

InPipe HydroXS technology functions similarly to a control valve, ensuring precise pressure and flow control while converting surplus pressure into clean energy. InPipe Energy envisions a future where renewable power is as abundant as water itself. Too often overlooked, water has immense potential for delivering consistent energy. In a world still reliant on nuclear and fossil fuels, At InPipe Energy, their favourite question is, “What if existing or newly built pipelines could supply dependable, predictable power without harming the environment?”

The Advantages: The Upside of Turning Water into Power

- Generates efficient, renewable power: Recovers surplus pressure and converts it into a clean energy source.
- Straightforward bypass setup: Attaches to existing pipelines without disrupting water flow.
- Minimizes carbon footprint: Lowers reliance on carbon-based grid power and cuts overall emissions.
- Streamlined, turnkey solution: Offers a standardized, off-the-shelf product that surpasses custom micro-hydro designs or standard control valves.
- Prolong infrastructure life: Employs carefully engineered technology and monitoring to reduce non-revenue water loss.
- Adds a revenue stream: Provides an extra source of income that can offset operational costs.

InPipe HydroXS Energy Recovery System: Turning Wasted Pressure into Renewable Power

Like a control valve, InPipe HydroXS Energy Recovery technology ensures precise pressure and flow control. Rather than burning the differential pressure, it generates renewable energy. This efficiency lowers running costs, saves water, minimizes carbon emissions, and increases the lifespan of your infrastructure. The smart-control technology enables real-time data collection, resulting in considerably better verification.

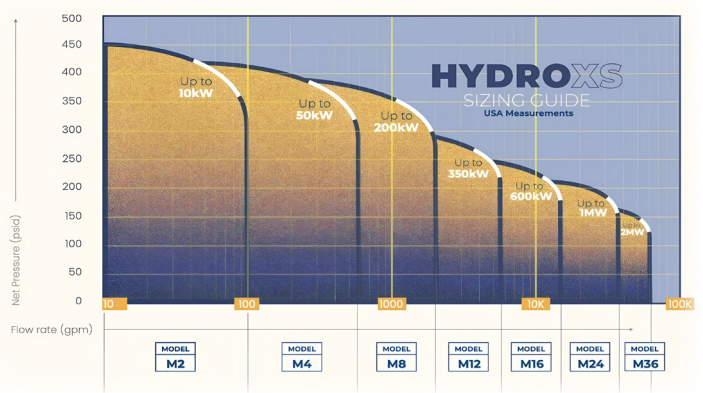
It works by converting wasted pressure into electricity, making water more accessible, dependable, and economical for your business and its consumers. From a single HydroXS unit to a multi-unit, system-wide strategy, the more you install, the greater the impact on lowering energy costs, conserving water, and reaching your sustainability objectives.

Minor changes in chemical, electrical, and labor expenses have a significant influence on small district budgets and long-term planning. Climate change also poses problems for the community's water supplies, and the district's administration is aware of the carbon footprint required to provide drinking water throughout this wide service area.

The Specifications: InPipe HydroXS Energy Recovery System

- Unlike custom-designed micro-hydro solutions, the InPipe
- HydroXS Energy Recovery System is a fully standardized, turnkey product equipped with robust data management capabilities.
- It provides real-time, actionable insights through the Flow and Pressure Management and Energy Recovery Dashboard, delivering 24/7 live hydraulic data to track the impacts of non-revenue water efforts and sustainability initiatives.
- This system applies to any potable water or wastewater setup with a steady flow and differential pressure, including municipal water distribution, wastewater networks, industrial manufacturing, and water reuse facilities.
- Typical installations address pressure-reducing valves in district metering areas, filling reservoirs, tanks, wells, or aquifers, running pump stations, managing raw water inflows at treatment plants, desalination (RO) plants, and wastewater effluent flows.

Key features and specifications include availability in seven pipe sizes from 2 to 110 inches (51 mm to 2.4 m), NSF/ANSI 61 certification for safe drinking water, pre-assembled and tested components, real-time performance data with an interactive dashboard, SCADA compatibility, and a 480 V, 3-phase output voltage.



Turning Pressure into Energy: Skagit PUD's Quest for a Greener Future

Skagit Public Utility District (PUD), located in Washington's expansive Skagit County, has consciously responded to the intensifying threat of climate change while meeting local water demands. Minor variations in chemical, electrical, or labor expenses have an amplified effect on smaller districts like Skagit, especially because transporting water over extensive distances increases their carbon footprint. As eco-minded communities nationwide pressure utilities to curb greenhouse gas outputs, Skagit PUD realized it was moving astray when confronted with rising demand for treated water and escalating energy bills. Searching for an effective remedy, the district embraced micro-hydroelectric technology, namely a power-generating pressure reduction valve (PRV) that converts wasted pressure into carbon-neutral power. This system complements standard control valves, ensuring precise and reliable pressure oversight.

In just three years, Skagit PUD's first installation yielded up to 104,000 kilowatt-hours annually—equivalent to offsetting 3.5 million pounds of carbon dioxide. Spurred by these results, the district introduced a second hydroelectric venture expected to produce more than 290,000 kilowatt-hours and avert around 9.3 million pounds of CO2.

Such innovative measures, enabled by federal, state, and local grants, show that even modest actions can substantially influence operating costs, water tariffs, and environmental stewardship. InPipe Energy's HydroXS patented energy recovery system underpins these efforts, facilitating safe net metering on-site or to the electric grid, akin to a photovoltaic (PV) arrangement. Meeting NSF 61 standards and electric utility sector criteria for secure grid interconnection, this project lowers operational expenses while also advancing climate change mitigation by providing clean, secure water to EBMUD's 1.4 million consumers in Alameda and Contra Costa counties. Ultimately, Skagit PUD's achievements illustrate that adopting inventive strategies can bolster resilience, shrink carbon footprints, and sustain reliable water service for future generations.

Case Study 1: East Bay Municipal Utility District's Conduit Hydropower Facility

The East Bay Municipal Utility District (EBMUD) in California has effectively introduced a conduit hydropower installation to capitalize on the pressure variances within its water distribution network. This pioneering initiative, finalized in 2023, employs InPipe Energy's HydroXS patented energy recovery solution. The HydroXS arrangement parallels the function of a traditional Pressure Reducing Valve (PRV), yet delivers the added advantage of producing renewable power. Implemented in the Piedmont Pressure Zone, the HydroXS module operates concurrently with EBMUD's existing Piedmont Regulator, securing continuous service even during upkeep intervals. The system processes average flows near 2.5 cubic feet each second, accompanied by an approximate 55 psi pressure differential.

With a 30 kW rated capacity, the HydroXS installation is projected to yield 150,000 kWh of green electricity annually. This renewable generation aids EBMUD in its notable aspiration of reaching carbon neutrality by 2030

InPipe Energy retains complete ownership, operates, and fully manages the HydroXS unit on behalf of EBMUD, ensuring continuous, reliable net metering of power either on-premises or into the electric grid, akin to a PV system. The HydroXS solution satisfies NSF 61 standards and electric utility sector guidelines for safe grid interconnections. This venture lowers operational costs while simultaneously advancing the fight against climate change by delivering clean, dependable water to EBMUD's 1.4 million consumers in Alameda and Contra Costa counties. EBMUD Board Member Marguerite Young voiced enthusiasm for the undertaking, emphasizing its role in generating renewable power while achieving the utility's core mission.

The project's success sets an example for comparable undertakings across its broad service region and the nation, highlighting the promise of conduit hydropower in meeting sustainability objectives.

Case Study 2: The HydroXS Brings EBMUD Closer to Its 2030 Carbon Neutral Ambition

The East Bay Municipal Utility District (EBMUD) supplies 1.4 million individuals in California's San Francisco Bay region through an extensive water distribution network spanning 4,200 miles of pipelines and over 400 facilities. Dedicated to becoming carbon neutral by 2030, EBMUD has already halved its greenhouse gas emissions since 2000 by integrating hydropower, solar, and biogas strategies. Its newest endeavor within this portfolio is the HydroXS energy recovery system, a micro-hydro turbine paired with a control valve that captures excess pressure—normally released as friction-and converts it into clean, renewable power.

Replacing a traditional pressure-reducing valve, the HydroXS installation enables EBMUD to more efficiently manage upstream and downstream pressures while generating electricity. This real-time data is monitored around the clock, helping operators track key performance metrics such as pressure levels and power output. Beyond cutting operational costs and keeping rates low, this initiative also bolsters the triple bottom line. It reduces greenhouse gas emissions in the service area and beyond, while providing a quieter, more community-friendly alternative to older infrastructure.

EBMUD's collaboration with InPipe Energy has resulted in the first installation of this technology in California. Early input from the utility shaped product development to meet both EBMUD's needs and those of the global water sector. For InPipe Energy, this partnership illustrates how water technologies can drive innovation: leveraging pressurized pipelines to create predictable, reliable, and low-cost hydroelectricity without harming the environment.

InSolare Energy Visions: The Advancing in Solar Cleaning Techniques

The significance of solar operations and maintenance (O&M) goes beyond merely boosting project capacity. Proper cleaning of modules removes dust and boosts power generation. Though the solar sector once relied on standard cleaning methods, it now sees growing adoption of semi-automatic and automatic approaches. "Semi-automatic" merges automated rotary brush systems with manual labor, whereas "automatic" relies on minimal human interaction. This shift has been shaped by decades of global solar power experience. InSolare Energy exemplifies these advancements with a team of over 200 experts, led by Dr. Dipakkumar Patel, who holds around 50 patents. Such expertise underscores the company's leadership in solar innovation. As the industry moves forward, investing in modern cleaning technologies will be crucial for maximizing system efficiency, cutting maintenance costs, and enabling long-term performance gains across diverse installation sites worldwide.

The Main Three Methods of Cleaning in Solar Plants

Dipakkumar Patel, the director at InSolare Energy, offers a comprehensive evaluation of the three cleaning methods, considering various factors. However, the conclusions drawn are preliminary and may vary depending on specific project needs, regional conditions, and technical challenges.

- Traditional Wet Cleaning Method

A water-based cleaning system, featuring pipe networks and strategically placed nozzles, allows operators to spray modules and then wipe them down with brushes or towels. Though this approach delivers thorough cleaning, it is time-consuming, cost-intensive, and demands substantial water—often a challenge in remote areas. Water spray systems using sprinklers or other delivery mechanisms have grown in popularity, yet they are mostly utilized where access is limited, such as commercial rooftops, parking lots, or residential settings.

- Semi-automatic Method

By blending automatic rotary brushes with conventional water piping systems, this strategy effectively cuts labor expenses while reducing water consumption.

- Automatic Method

This approach relies on a collection of robotic devices and attachments, requiring only limited human involvement. If equipped with an adequate battery setup, the robotic system can be powered either by an auxiliary source or by solar energy generated on-site.

From our observations, implementing this approach calls for thoughtful planning to account for terrain specifics as well as routine execution and integration considerations. Over the full operational span of a plant, automated systems deliver substantial benefits by maximizing output through the efficient use of installed equipment.

InSolare's Vision: Which Method is Better?

Dipakkumar Patel's analysis reveals that traditional cleaning methods have the longest cleaning cycle, while automation techniques are the most efficient.

Automatic systems experience the least amount of soiling loss, with a rate of approximately 1%, compared to 2% for traditional methods and 1.5% for semi-automatic systems.

On the cost side, automatic methods have high one-time capital expenses but low running costs. Meanwhile, traditional methods are the most cost-effective at first, but they require a lot of power and water throughout the project's life and are inefficient. Aside from the expensive expense, traditional methods have a substantial environmental impact due to their effect on groundwater, whereas automated methods have relatively little impact.

Traditional and semi-automatic methods can be utilized on rooftop, ground, and floating installations, whereas automatic methods are limited to ground installations. This is due to the latter's inherent complexity. Automatic methods confront greater problems in terms of ground contour, plot shape, and commissioning, necessitating additional structural design consideration and compatibility with robotic original equipment manufacturers. Automatic systems have recently gained popularity and have been used in a variety of applications. Semi-automatic and automated technologies are still in the early phases of evaluation in terms of life cycle benefits. More novel approaches are required to reach a point where such systems are technically and financially acceptable in all applications.

Advanced Cleaning Methods: What is Coming?

Aside from these previous methods, several other advanced methods are being explored or tested at the pilot level. These include many techniques such as electrostatic cleaning, hydrophobic and self-cleaning coatings, ultrasonic cleaning, deionized water using water-fed pole systems, nanotechnology-based treatments, ionized air blowers, and drone-based cleaning.

• Electrostatic Cleaning

Electrostatic cleaning involves using electrostatic forces to remove dust and debris from the surface of solar panels. It is a contactless technology, which helps to prevent scratches on the panels. Dust particles are removed from the surface by creating an electric charge. The main advantage of this procedure is that it does not require water, which is preferable in arid climates, and it also prevents damage to the panel surface.

Researchers at the Massachusetts Institute of Technology have created a cleaning method that removes dust particles by electrostatic repulsion. An electrode charges the particles, and then a transparent film with the opposite charge is put on the panel. This clear layer repels and eliminates dust particles from the panel's surface.

Experts at the University of Jordan advocate using an electrostatic ionizer to remove dust from solar panels. This electrostatic cleaning method minimizes the attraction between dust particles by spraying an electrostatically charged mist to neutralize static energy.

• Ionized Air Blowers

Another upcoming dry and contactless option is to utilize ionized air blowers to clear dust-off solar panels. This approach is intended for higher adoption in dry environments with water scarcity.

• Hydrophobic Coatings

Meanwhile, hydrophobic coatings require the usage of water. In this procedure, specific coatings are put on solar panels to make them water-repellent. Titanium oxide is a commonly utilized material for such coatings. When water is poured into the panel, it flows down, carrying dust and particles with it. This method frequently involves the use of dust repellents, which reduce the quantity of debris that adheres to the surface, requiring less water for dust cleaning.

• Nanotechnology-based Coatings

Another coating-based solution employs nanotechnology. These self-cleaning nanocoatings form ultra-thin layers on the panels, preventing dust from clinging to the surface. These coatings also offer self-cleaning properties, which clean the panel when exposed to sunlight or rain. This technique helps to reduce long-term maintenance needs while also increasing the efficiency and durability of the panels.

- Self-cleaning Coatings

Solar panels with self-cleaning panes are a more sophisticated approach in this sector. These glasses are coated with a substance that reacts with sunlight to break down biological grime, and then rain washes away the residue. It, like any other automatic cleaning system, lowers the need for frequent manual cleaning as well as water.

- Ultrasonic Cleaning

Another intriguing technique is ultrasonic cleaning, which uses high-frequency sound waves to remove contaminants from the surface of solar panels. This can be used with a water spray or with only dry vibrations. Because it is contactless, it prevents physical harm to panels.

- Drone-based Cleaning

Drones are commonly employed for solar plant operations and maintenance, but they are also rapidly being used for cleaning. Specialized drones are available, outfitted with brushes, sprayers, or air-blowing devices to clean solar panels in difficult locations. Drones are increasingly being employed in remote places for cleaning, in addition to their primary function of diagnosing damage in specific panels. The usage of drones is also deemed safe in such areas because it reduces the need for manual effort.

The Cleaning Systems: The Eco Effect

Unlike wet cleaning systems, dry cleaning systems may necessitate additional research on their soiling factor, as most dry cleaning equipment sprays dust particles into the air. These airborne particles may accumulate on neighboring modules, reducing the benefits of regular cleaning.

As a result, the soiling factor could increase, reducing commercial viability even further. These investigations should evaluate area, wind speed, wind direction, cleaning speed, seasonal effects, morning dew, and other relevant parameters.

Currently, most project owners and asset management teams prefer autonomous solutions. This is especially noteworthy when comparing battery disposal and charging energy to the amount of water and people needed for typical cleaning. InSolare Energy is developing analytical models to identify appropriate solutions to difficulties on a case-by-case basis.

Conclusion

Various solar panel cleaning solutions, from conventional wet methods to robotic technologies and advanced approaches like electrostatic, ultrasonic, and coating-based treatments, highlight the industry's ongoing drive toward greater efficiency and sustainability. Automatic systems can save on water usage and offer rapid, thorough cleaning, albeit at a higher cost. Meanwhile, manual methods remain common despite their greater labor and water demands. As solar power proliferates worldwide, further innovation will aim to maximize efficiency, cost-effectiveness, and environmental care, especially concerning water conservation and panel lifespan. Ultimately, each project's context, evolving solar technologies, and local requirements will shape the most suitable cleaning solution overall.

AquaEnergyExpo

Blue|Green|Sustainable|Smart

CHINA

Buyers Guide for Water and Renewable Energy Companies

Aqua Energy Virtual Expo

December 2024

To add your company for free contact us WhatsApp (+966 50 530 8851)

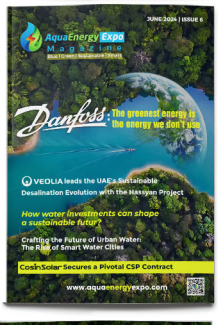
www.aquaenergyexpo.com

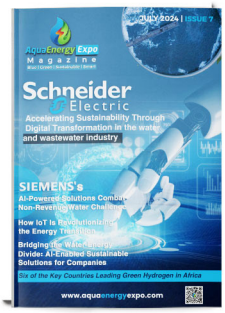
AquaEnergy Expo Magazine

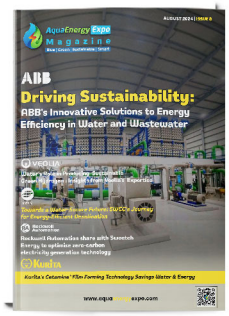
Blue | Green | Sustainable | Smart

Digital Magazine Advertising

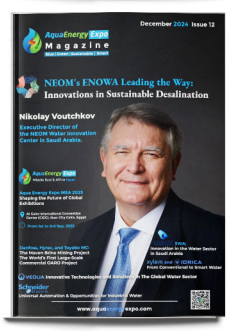
Aqua Energy Expo magazine includes more than 1000 unique articles and news about global Water and Energy fields







To download the Latest issue Visit our Digital Magazine



AquaEnergy Expo Magazine

Blue | Green | Sustainable | Smart

ENERGY NEWS BRIEF

February | 2025

www.aquaenergyexpo.com

TotalEnergies and STMicroelectronics sign 15-year Renewable Energy Deal

TotalEnergies has finalized a 15-year power purchase agreement (PPA) to supply 1.5 terawatt hours (TWh) of renewable electricity to STMicroelectronics in France, beginning January 2025. The agreement involves energy from two new wind and solar farms, totalling 75 MW capacity, with guarantees of origin to confirm its renewable nature. TotalEnergies will also provide services to ensure a consistent supply of green electricity from these intermittent sources. Sophie Chevalier, TotalEnergies' senior vice president, expressed pride in the partnership, emphasizing their commitment to supporting tech companies in decarbonization. Geoff West from STMicroelectronics highlighted that this PPA is a crucial step toward achieving carbon neutrality by 2027, including sourcing 100% renewable energy for their operations.

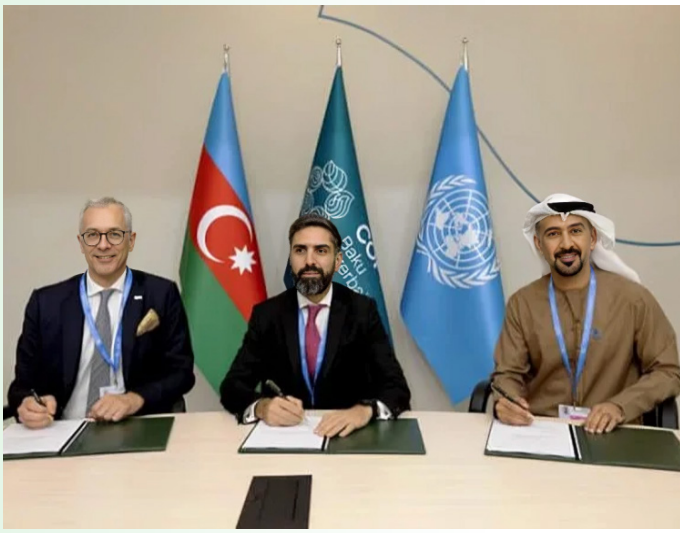
esVolta secures $243m for Battery Storage Projects in Texas

esVolta has secured a preferred equity transaction worth $243 million, facilitated by energy investment firm Captona, to develop three utility-scale battery energy storage projects in Texas: Anole, Desert Willow, and Burksol. These projects will collectively provide approximately 1 gigawatt hour (GWh) of capacity and are expected to become operational in the first half of 2025. CEO Randolph Mann praised the partnership with Captona, highlighting esVolta's expertise in delivering reliable energy storage solutions. In 2024, the company raised nearly $900 million for its operations across the U.S. With over 30 projects in its pipeline totaling nearly 25 GWh, esVolta aims to enhance power quality and support the transition from fossil fuels.

Vestas secures Turbine Supply Deal for Ukrainian Wind Project

Vestas has secured an order to supply 64 turbines for the second phase of the Tyligulska wind energy project in Ukraine, the country's largest renewable energy initiative. Following the successful commissioning of the first phase in spring 2023, this order will add 384 MW, bringing the total capacity for both phases to 498 MW. Vestas will deliver 83 V162-6.2 MW turbines, each generating 6 MW. CEO Henrik Andersen emphasized the importance of this partnership with DTEK for enhancing Ukraine's energy security, supported by international backing from Danish and EU authorities. DTEK CEO Maxim Timchenko highlighted the project's role in building a resilient energy infrastructure amidst ongoing challenges. Delivery is set to start in Q1 2025, with completion expected by Q4 2026.

Masdar, SOCAR, and ACWA Power to develop Offshore Wind in Azerbaijan



Masdar, SOCAR Green, and ACWA Power have signed a memorandum of understanding (MoU) to develop 3.5GW of offshore wind projects in Azerbaijan's Caspian Sea, marking the country's first offshore wind farms. This collaboration is part of Azerbaijan's strategy to enhance its renewable energy and green hydrogen initiatives. The MoU was formalized by key executives from the three companies, who will follow a roadmap for crucial development milestones in the offshore wind sector. Masdar CEO Mohamed Jameel Al Ramahi emphasized Azerbaijan's strategic importance, while SOCAR President Rovshan Najaf highlighted the agreement's role in achieving sustainable energy goals. The projects aim to bolster energy security, create jobs, and support Azerbaijan's net-zero emissions target by 2050.

JA Solar delivers 1 GW PV Modules for China's Ulan Buh Desert Project

JA Solar has delivered 1GW of n-type photovoltaic (PV) modules for a pilot project within the 12 GW Ulan Buh Desert Northeast New Energy Base in China. This pilot is a crucial milestone, highlighting the region's renewable energy potential. Initial shipments began in early 2024, with delivery completed in 180 days, achieving peak monthly deliveries of over 400 MW. JA Solar's executive president, Aiqing Yang, emphasized the company's commitment to sustainable development and its role in global carbon neutrality efforts. Additionally, JA Solar has secured a 1.25 GW module procurement agreement with the China Energy Engineering Corporation for Africa's largest PV storage project in Egypt, reinforcing its position as a key player in renewable energy infrastructure.

Envision Energy secures 1GW Wind Turbine Order from Juniper

Envision Energy India has secured an order from Juniper Green Energy for 200 EN 182 5MW wind turbine generators (WTGs) and its first 320 MWh battery energy storage systems (BESS). The WTGs will be used in various state and central auction projects, while the BESS will support the Firm Dispatchable Renewable Energy project. The 5 MW turbine features a 182 m rotor diameter and a 140 m hub height, offering over 40% more annual energy output compared to the existing 3.3 MW model. Envision's MD, RPV Prasad, highlighted the importance of this partnership in advancing industrial decarbonization. Juniper Green Energy aims to establish 10 GW of renewable energy capacity by 2030, enhancing its leadership in India's green energy sector.

LONGi Supplies 33 MW of Photovoltaic Modules to EMMI in Guatemala

LONGi Green Energy Technology Co. Ltd. has signed an agreement to supply 33 MW of Hi-MO 7 photovoltaic modules to EMMI for the Magdalena Solar Phase II Park in Guatemala. This partnership enhances LONGi's presence in the region, where it has previously supplied over 500 MW for sustainable projects. The first module deliveries started in late 2024, with the project expected to be operational by Q4 2025, marking a significant advancement in the region's energy transition. Antonio Morales from LONGi praised Guatemala's commitment to renewable energy, while EMMI's General Director, Ángel Nicolás, emphasized the urgency of driving the energy transition. This initiative supports Guatemala's goal of a cleaner, sustainable energy future and economic growth.

US DOE Grants $1.66bn to Plug Power to develop Hydrogen Facilities

The US Department of Energy (DOE) has announced a $1.66 billion loan guarantee for Plug Power's subsidiary to build up to six clean hydrogen facilities. This initiative supports the Biden-Harris administration's clean energy goals and the Investing in America agenda, aiming to maintain US leadership in the global energy sector. The loan, from the DOE's Loan Programs Office, will enable the production of clean hydrogen using Plug Power's electrolyser technology. The project will create 100 to 200 construction jobs and at least 50 permanent positions at each site. Utilizing advanced proton exchange membrane technology, the facilities aim to reduce greenhouse gas emissions by 84% compared to traditional methods, contributing to the US's net zero objectives and enhancing industrial competitiveness.

LONGi and Solarpro Cooperate on Largest Romanian PV Plant to Date

LONGi has partnered with Solarpro to supply over 285,000 solar modules for a 174MW photovoltaic plant in Romania, set to launch in mid-2025. This project is the largest solar initiative in Romania and will provide electricity for 115,000 households. Solarpro CEO Krasen Mateev praised LONGi for its reliable technology, essential for sustainable energy solutions in Europe. The Hi-MO 7 module, designed for utility-scale applications, boasts an efficiency of up to 22.6% and a high bifacial ratio. Located in Oltenia, the plant will leverage the region's high solar irradiation, contributing to Romania's climate goals and reducing greenhouse gas emissions by approximately 95,000 tonnes annually.

Arctech secures 1.5GW solar project deal in UAE

Solar equipment manufacturer Arctech has secured a deal to supply 1.5GW of its SkyLine II single-axis solar tracking system to PowerChina for the Al Ajban solar photovoltaic (PV) independent power project in the UAE. This marks Arctech's entry into the Middle East market and aligns with the UAE Energy Strategy 2050 for zero-emission clean energy. The Al Ajban project, located in Abu Dhabi, will be one of the largest single-site solar plants globally, generating enough electricity for 160,000 households and reducing carbon emissions by 2.4 million tonnes annually. Arctech has been expanding in the region since 2017, with plans for a new manufacturing base in Jeddah by 2025, enhancing its local delivery capacity to 15GW.

Q ENERGY Finalizes Deal to Transfer 105 MWp Solar Capacity to Dos Grados in Spain

Q ENERGY concluded 2024 by selling two solar projects in Spain to Dos Grados, focusing on sustainable real estate. Located near Tordesillas in the Castilla y León region, each photovoltaic (PV) power plant has a capacity of 52.4 MWp. Although the sale is finalized, Q ENERGY will manage the EPC (Engineering, Procurement, and Construction) and oversee operations for the first two years post-commissioning. Construction has already commenced on the nearly 220-hectare site, featuring over 170,000 solar panels. By summer 2026, the combined 105 MWp capacity is expected to supply clean energy to around 59,000 homes, reducing CO2 emissions by over 790,000 tons. The deal's total value is approximately €80 million, supported by Uría Menendez and KPMG.

Qualitas Energy purchases 250MW Wind Power Portfolio in Germany

Qualitas Energy has acquired a 250 MW wind energy portfolio in Germany, consisting of four advanced-stage wind farm projects with 37 planned turbines. This portfolio is expected to supply green electricity to 166,000 households. The acquisition aligns with Qualitas Energy's strategy to expand its presence in Germany, following previous purchases, including a 32-turbine wind farm and seven repowering projects totaling 173 MW. This is Qualitas Energy's largest transaction since acquiring DunoAir's 1.4 GW onshore wind business in 2023. Backed by the €2.4 billion Qualitas Energy Fund V, the company is committed to decarbonization and operates across six strategic German locations. Co-CEO Johannes Overbeck emphasized the importance of wind power in their investment strategy for sustainable energy transition.

AquaEnergy Expo

Florida, USA

250K+ Followers

- 60K+ Mailing List
- 10k+ YouTube Subscribers
- 13k+ Telegram Subscribers
- 150k+ Facebook Subscribers
- 10k+ WhatsApp Subscribers
- 36k + LinkedIn Subscribers
- 150+ Countries
- 800+ Jobs Offers
- 16 Employees
- 3.6M+ Products Views
- 1100+ Companies
- 15K+ Virtual Expo Products
- 13K+ References Knowledge Hub
- 200+ Webinars and Courses
- 1K+ Articles and News
- 15k+ Trainee

www.aquaenergyexpo.com

AquaEnergy Expo
Magazine
Blue | Green | Sustainable | Smart

Now for Free & for a Limited Time

Show your products in the global virtual expo for water and energy products

Joining the virtual expo will help you to increase your customers network, grow your sales, publish your brand, find new distributors and agents and open new markets

The virtual expo of water and energy products contains more than ***15000*** *products and more than* ***1100*** *companies from more than* ***150*** *countries around the world*

To add your company for free contact us

WhatsApp (+966 505308851)

www.aquaenergyexpo.com