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FUTURE TRENDS IN SEAWATER DESALINATION: PIONEERING INNOVATIONS FOR GLOBAL WATER SECURITY

Dear Readers,

Welcome to the October edition of EverythingAboutWater Magazine, where we dive into the critical and ever-evolving field of seawater desalination. As freshwater scarcity intensifies and global populations continue to grow, desalination is emerging as a key solution to addressing the world's water challenges. In this issue, we focus on the future trends that are poised to redefine the desalination industry.

We explore cutting-edge advancements that are making desalination more energy-efficient, cost-effective, and environmentally sustainable. From novel membrane technologies and energy recovery systems to solar-powered desalination plants and advancements in reverse osmosis, this edition provides insight into the innovations driving desalination forward. We also examine how artificial intelligence and machine learning are enhancing process optimization, reducing operational costs, and increasing the lifespan of desalination infrastructure.

Through in-depth articles and case studies, we delve into the broader applications of these technologies in ensuring water security for arid regions, coastal cities, and industries reliant on desalinated water. Additionally, we assess the environmental considerations and potential solutions to mitigate the ecological impact of desalination, such as brine management and the integration of renewable energy sources.

This issue is a valuable resource for policymakers, engineers, water utility managers, and all stakeholders committed to securing a sustainable water future. As we explore these forward-looking trends, we envision a world where seawater desalination is no longer a last resort but a mainstream, sustainable method of ensuring access to clean water for all.

Thank you for joining us as we chart the future of desalination and its pivotal role in addressing global water scarcity. We hope the insights and expertise shared in this issue inspire innovative solutions and a renewed commitment to safeguarding our planet's water resources.

Thanks & Regards,
Simran Arora
Associate Editor
EverythingAboutWater Magazine

NATIONAL W ATER NEWS

DROPLETS

EU paves the way for investments in Timor-Leste's water, waste, and forestry sectors, boosting the country's sustainable development

The European Union Delegation to Timor-Leste and the European Investment Bank (EIB Global) have worked closely with the Government of Timor-Leste to prepare investment projects aimed at improving the country's infrastructure and fostering sustainable development. The three proposals resulting from this collaboration focus on water supply, solid waste management, and forestry, and are now ready to be transformed into tangible investments.

The three projects include a commercial forestry initiative in the municipalities of Covalima and Bobonaro, a national solid waste management project including a health waste management component, and a water supply project for selected municipalities. The forestry project aims to transform underutilised state lands, generating essential resources like firewood and timber, while creating thousands of jobs for local communities. The national waste management project introduces solutions for the safe and efficient management of waste thus reducing significantly the pollution discharged into the environment. The water supply project focuses on improving access to clean water in key municipalities, addressing both urban and rural needs for better sanitation and reliable water sources. Together these initiatives require a total investment of about €260 million.

The preparation of the three investment projects was made possible through the Project Preparation and Implementation Programme (PPIP), which concluded today with the final Steering Committee meeting where these projects were presented. Managed by EIB Global, the PPIP was supported by a €5 million budget, including €4.75 million in technical assistance from the EU and €250,000 from the Cotonou Partnership Agreement.

The final Steering Committee meeting was chaired by H.E. the Minister for Planning and Strategic Investments, Gastão Francisco de Sousa, and attended by representatives from the Government of Timor-Leste, EIB Global, the EU Delegation to Timor-Leste, and other stakeholders.

Citizens Can Track Water Contamination, Sewer Overflow Complaints: HMWSSB

Complaints to HMWS&SB will be mapped using Google Maps and GPS coordinates.

Hyderabad: A dashboard has been established at the main office of the Hyderabad Metropolitan Water Supply and Sewerage Board (HMWSSB) for the general public to track complaints regarding sewer overflow, contaminated water and silt on roads. Complaints will be mapped using Google Maps and GPS coordinates. HMWSSB Managing Director Ashok Reddy directed officials to update information on manholes and desilting activities online daily and to ensure that waste is transported to dumping yards.

During a review of the board's 90-day special drive, he discussed ongoing surveys of dry bore wells and emphasised the need for better coordination among officials. Further, Ashok Reddy mentioned that the general public will be informed about the establishment of additional pits at their homes, with notices issued for non-compliance.

Chennai Metrowater Initiates Steps to Improve Production Capacity in Minjur Desalination Plant

Production in the facility had declined steadily over the past one year owing to internal issues of the company operating it. Options, including serving notice to the company on the drop in water supply and initiating a study to assess factors affecting the operation of the plant, are under scrutiny to rectify the flaws and augment daily water distribution, say officials.

In a bid to address the dwindling water supply from Minjur desalination plant, Chennai Metrowater has initiated measures to improve production capacity in the facility and boost supply to north Chennai. The plant, which has a capacity to treat 100 Million Litres a Day, is now producing only 25 MLD as on Saturday. Officials said the water agency was now mulling over the possibility of taking over operation of the plant and boosting production to its original capacity. Among the city's three desalination plants, the first one in Minjur was built on design, build, own, operate and transfer basis in 2010. The facility caters to nearly 12 lakh residents of north Chennai areas falling under Madhavaram, Manali and Tiruvottiyur zones.

It may be recalled that the water agency had entered into a bulk water purchase agreement with Chennai Water Desalination Limited, a consortium company of IVRCL Infrastructures Limited and Befesa, Spain. Officials noted that production in the facility had steadily declined over the past one year owing to internal issues of the company, operating the facility. Options, including serving notice to the company on the drop in water supply and initiating a study to assess the factors affecting the operation of the plant, are under scrutiny to rectify the flaws and augment the daily water distribution.

To bridge the gap in supply to north Chennai, the water agency now diverts 15 MLD of water from Red Hills reservoir to the existing distribution network. The three zones in north Chennai have a water demand of 40 MLD. Metrowater will soon call for bids to lay a dedicated six-km pipeline from Red Hills reservoir to Madhavaram booster station where treated water would be stored and sent to various localities in north Chennai. This pipeline would have a carrying capacity of 23 MLD and the 40-crore project would begin in January.

Similarly, another pipeline would be laid to link raw water between the reservoirs in Thervoy Kandigai- Kannan Kottai and Red Hills at a cost of 31 crore to augment water supply. A pipeline for a length of six km would be laid and interconnected with the existing network. Priority would be given for north Chennai areas, officials added.

How Thirukazhukundram is Setting an Example in Reviving Waterbodies

Chennai: Once a parched town relying on tractors to fetch water, Thirukazhukundram is now in revival mode.

DROPLETS

LANXESS India wins the 'DigiTech Front Runner of the year' FICCI Chemicals & Petrochemicals Award 2024

LANXESS India has won the FICCI Chemicals & Petrochemicals Award 2024 for 'DigiTech Front Runner of the year' category in chemical sector. Smt. Anupriya Patel, Minister of State for Health & Family Welfare and Chemicals & Fertilizers, Government of India presented the award to LANXESS in the presence of Smt. Nivedita Shukla Verma, Secretary, Department of Chemicals and Petrochemicals, Ministry of Chemicals and Fertilizers, Government of India and other stakeholders of the sector.

Namitesh Roy Choudhury, Vice Chairman and Managing Director, LANXESS India along with Balaram Khot, Wholetime Director & Head of PTSE received the Digitech Front Runner of the year award on behalf of the organization at an event held in Mumbai on 17th October 2024.The award recognizes the organization's commitment to digitalization, emphasizing on our capabilities and tools that enhance process improvement, asset reliability, safety, sustainability, and cost savings. Through the strategic implementation of digital solutions across our value chain, we continue to drive operational excellence and sustainable growth.

Federation of Indian Chambers of Commerce and Industry (FICCI) organizes Chemical & Petrochemical Awards ceremony as a part of the India Chem series of events to felicitate companies for their contribution in the development of chemical and petrochemical industry.

Commenting on the success, Namitesh Roy Choudhury, Vice Chairman and Managing Director, LANXESS India said, "We are truly honored to receive this esteemed award. By leveraging new technologies and adopting a digital mindset, we streamline our processes and drive improvements in productivity, connectivity, and overall organizational performance to deliver enhanced value to our customers, employees and other stakeholders."

The panchayat leveraged multiple govt. schemes to restore 16 long-neglected ponds and boost groundwater levels in nearby villages, investing 4.17 crore. Located in Chengalpet district, Thirukazhukundram Special Grade Municipality spans 11.20 sq. km. and encompasses 18 wards with 8,300 households spread across Mangalam, Rudrankoil, M. N.Kuppam and Thirukazhukundram panchayats. Daily water consumption is 24 lakh litres, mainly sourced from Palar River and Keerapakkam Lake.

The 16 ponds in the area were essential groundwater sources, but years of neglect led to a drop in groundwater levels by 2015. Worse, the Palar which once supplied 50% of the municipality's drinking water, dried up due to inadequate rainfalland the municipality brought water by tractors, limiting each household to 2-4 pots. Fortunately, rainfall in subsequent years helped things, prompting residents to call for measures to strengthen groundwater levels. G. D. Yuvaraj, the panchayat chairman, said that upon taking office, he secured funds from the 15th Finance Commission to create a model pond. "We revived Sunambu Kulam in Mangalam by deepening it and raising the bund height, allowing it to hold up to 30 ft. water. After the rains, water storage increased, and nearby wells saw improved water quality," he said.

In 2023, Vannam Kulam in Thirukazhukundram town was selected for restoration under Kalaignar Urban Development Scheme (KNMT). "Previously, water would dry up by April or May. After desilting, it now lasts over a year," Yuvaraj said. "We have also undertaken revival of ThondanarTheertham, Indira Theertham, Andu Arasan Kulam, and Valai Kulam under Amrut 2.0 and KNMT. Soon, these ponds will be full, with desilting, strengthened banks, walkways, and new lighting to beautify the area." C. S.Seenuvasan, a resident, says only a few ponds were desilted 15 years ago, and only one was successfully revived. "Our well water is also salty," he noted, emphasising the long-standing demand for pond restoration.

"It's essential that these ponds are well-maintained in the years ahead, with regular desilting." Aravindan Sampath Kumar, a long-time resident, said the restoration has also enhanced safety.

"A walking track has been added at Vannam Kulam, behind Thirukazhukundram Boys School. Lights have been installed to deter anti-social activities, and now yoga and self-defence classes are held here. Just three years ago, the area was in a pathetic state," he said.

Secretary (Water Resources) reviews preparedness of Special Campaign 4.0; 400 sites identified for Intensive Cleaning Efforts

Secretary, Department of Water Resources, River Development & Ganga Rejuvenation (WR, RD, GR), Ministry of Jal Shakti, Ms. Debashree Mukherjee, chaired a comprehensive review meeting for preparedness of the Special Campaign 4.0, on 27.09.2024. The campaign is part of the government's broader initiative to reduce pendency, ensure cleanliness and sanitation, in Government buildings and public places. About 400 sites have been identified for cleaning activities under the Department and its organisations across the country. A detailed action plan for each of the identified sites has been developed, with tasks including waste segregation, disposal of hazardous materials, and long-term monitoring to ensure the cleanliness is maintained.

During the review, Ms Mukherjee expressed satisfaction with the progress made and emphasized the need for accelerated efforts at these locations. All the identified sites, which include public spaces, industrial areas and water bodies should undergo cleaning operations at a war footing, ensuring swift and thorough removal of waste, debris, and pollutants. Special focus may be given in carrying out cleanliness campaigns in areas where the footfall is high like River Ghats, Dam sites, residential complexes, etc. Adequate media publicity of activities undertaken during the campaign including on social media handles will be given during the campaign period by all the organisations.

Organizations wise targets were examined in the meeting. Secretary also instructed that 'Swatchhata Mitras', who may be third party officials from Department and its organisations, may be appointed to randomly check the cleanliness campaign carried out in other organisations of the Department. The identified sites were flagged based on their environmental impact, level of pollution, and their importance to local communities.

Ms. Mukherhee reiterated the Department's commitment to transforming these locations into clean, hygienic areas that reflect the national goal of maintaining a clean and sustainable environment. Similarly, emphasis was given in the meeting for reducing the pendency under various categories.

CM Hails Surat Industrialists for Resolve to Set Up 80,000 Rainwater Harvesting Units

Speaking on the occasion, CM Patel said,"Industrialists who have made Surat their karmabhumi have resolved to contribute to set up 80,000 rain water harvesting structures in Gujarat. "Chief Minister Bhupendra Patel on Sunday hailed the resolve of industrialists, who have settled in Surat, to contribute to set up 80,000 rainwater harvesting units in Gujarat and congratulated them.

The Chief Minister was addressing an event organised by the Union Water Resources Ministry in Surat under the 'Jalsanchay, Jan Bhagidari' initiative. Gujarat has set a target of setting up more than 2 lakh such rainwater harvesting units in the state. At the function called 'Karmabhumithi Janmabumi' held at Indoor Stadium in Surat, apart from Gujarat CM, Rajasthan CM Bhajanlal Sharma, Madhya Pradesh CM Mohan Yadav and Deputy Chief Minister of Bihar Samrat Chaudhary brainstormed on intensifying water conservation programmes in their states, said an official release.

Speaking on the occasion, CM Patel said,"Industrialists who have made Surat their karmabhumi have resolved to contribute to set up 80,000 rain water harvesting structures in Gujarat. And there is a target of setting up 2 lakh structures. I congratulate them." CM Patel hailed Prime Minister Narendra Modi for his initiatives like 'Nal Se Jal' and 'Catch the Rain',while saying that these are examples of the PM's vision to address challenges before its arrival.

Quoting Paatil, the official release stated that Gujarat's model of 'Jal Sanchay, Jan Bhagidari' will set an example for the entire country. The event was also attended by various Gujarat ministers, and industrialists from Gujarat, Rajasthan, and Madhya Pradesh among others.

PM Lauds Jhansi Women's Contribution to Water Conservation in 'Mann Ki Baat' Program

In his monthly radio address 'Mann Ki Baat' on Sunday, Prime Minister Narendra Modi once again highlightedUttar Pradesh with a specific mention of the remarkable waterconservation efforts in the Jhansi district. He praised the women of Jhansi for breathing new life into the Ghurari River by preventing wastage of water and showcasing their commitment to addressing the country's water crisis.

Chief Minister Yogi Adityanath thanked PM Modi for recognising the efforts of the women from Self Help Groups (SHGs) in Jhansi, particularly in the water-scarce Bundelkhand region. Modi acknowledged the extraordinary accomplishment of these SHG women, who, as 'Jal Sahelis', led a campaign to revive the dying Ghurari River. He marvelled at their initiative to construct a dam using sand-filled sacks to stop rainwater from being wasted and replenish the river. The initiative successfully alleviated the region's water crisis bringing joy to the community.He emphasised that where 'Nari Shakti' (women's power) enhances 'Jal Shakti' (water power), 'Jal Shakti' in turn strengthens 'Nari Shakti'.

The noteworthy efforts of these Jal Sahelis took place in Simrawari village, Babina development block, Jhansi. They worked tirelessly over six days of voluntary labour to construct the dam that revived the Ghurari River. Their initiative not only revived the river but also sent a powerful message to society. The water retained in the river now provides essential resources for local people, serving their bathing needs and providing drinking water for animals. The Yogi government has undertaken water conservation efforts across Bundelkhand with unprecedented determination, overcoming numerous challenges. As a result, most households in Vindhya and Bundelkhand have now water connections. Under the Har Ghar Nal Se Jal Yojana, the government ensured tapped water supply for 95% of the households.

Additionally, initiatives such as the reconstruction of village ponds, rainwater harvesting systems, and cleaning reservoirs have been implemented. The Yogi government is also actively promoting women-led SHGs across the state.

In recognition to their contribution to water conservation, the 'Jal Sahelis' have been honoured by the state and Central governments. These women continue to support government efforts in water conservation across Bundelkhand and play a vital role in raising awareness about the importance of preserving water resources. Chief Minister Yogi Adityanath expressed his gratitude to Prime Minister Narendra Modi and congratulated the women who have become a source of inspiration for water conservation.

On his X handle, he wrote: "Prime Minister Narendra Modi's mention of the efforts made by the self-help group women of Jhansi, who became 'Jal Sahelis' to revive the dying Ghurari River, in his Mann Ki Baat program is a moment of pride for all of Uttar Pradesh. This recognition will undoubtedly infuse new energy into ongoing water conservation efforts. These 'Jal Sahelis', who have become a remarkable symbol of women's empowerment by constructing hundreds of water bodies, have set an exemplary standard for water conservation despite facing many obstacles. Heartfelt congratulations to these women who have become an inspiration for water conservation, and sincere thanks to the Prime Minister for his acknowledgment!"

G-STIC 2024: Pathways for Sustainable Solutions and Water Reuse

October 23: The 7th G-STIC Conference successfully concluded today after 2 days of rigorous sessions, enthralling presentations, rewarding networking, practical insights, on-ground case studies and data, and above all, an inspiring showcase of the global passion for sustainability and innovation. With a focus on harmonising technology, policy, and business pathways for a sustainable future, the conference featured impactful discussions on climate action, water sustainability, and innovation.

The G-STIC Platform and Conference

G-STIC (Global Sustainable Technology & Innovation Community) is a community of more than 10,000 stakeholders consisting of innovators, entrepreneurs, researchers, captains of industry and policymakers from around the globe. The annual, rotating G-STIC Conference ranks among the largest global conferences dedicated to technological innovation and sustainable development. The G-STIC community, innovators, investors and social and economic actors gather at the conference to discuss market-ready technological innovations and solutions that have the potential to substantially impact the Sustainable Development Goals.

Together, they delve into new approaches and strategies to scale up and accelerate the deployment of these solutions. The conference also serves to build knowledge bases and global expert networks in support of the technological transitions needed for the implementation of the Agenda 2030 and the Paris Agreement.

G-STIC 2024

G-STIC 2024 was held in Delhi, India with a plethora of sessions focused on water, health, energy, climate, education and the interconnections among them all. G-STIC 2024 offered a holistic platform to explore cross-cutting solutions that address the world's most pressing sustainability challenges.

The conference began with a high-level Inaugural Session, featuring welcome and opening remarks by Dr. Jitendra Vir Sharma, Senior Director, TERI, followed by a G-STIC overview presented by Mr. Dietrich Van der Weken, General Manager of G-STIC: Global Sustainable Technology & Innovation Community, Vlaamse Instelling voor Technologisch Onderzoek (VITO), Belgium. This was followed by a Welcome Address by Mr. Nitin Desai, Chairman, Governing Council, TERI, along with video messages from Dr. Vibha Dhawan, Director General, TERI, and Ms. Inge Neven, CEO of VITO, Belgium and a Special Address by Dr. Paulo Gadelha, Former President of Fiocruz, Brazil, Coordinator of the Fiocruz Strategy for 2030 Agenda. Wrapping up the inaugural session was a Vote of Thanks delivered by Mr. Anshuman, Director, Water Resources Division, TERI.

Ministerial Inaugural Address by Chief Guest, Shri Hardeep Singh Puri, Hon'ble Minister of Petroleum and Natural Gas, Government of India. In his highly anticipated inaugural address, Minister Puri underscored India's commitment to addressing the interconnected challenges of

energy demands, and climate change. He delivered a powerful speech addressing India's energy needs, its commitment to sustainability, and the trilemma of affordability, sustainability, and availability in energy. Minister Puri emphasised India's proactive approach towards green energy solutions such as ethanol blending, green hydrogen, and LPG distribution. He urged industries, policymakers, and technologists to foster partnerships that bring scalable solutions to the forefront of sustainability.

H.E. Mr. Didier Anna L. Vanderhasselt, Ambassador of Belgium to India, presented the keynote address at the session, highlighting India's growing influence on global sustainability and innovation. He praised India's leadership in tackling climate change and advancing socio-economic development. The Ambassador noted Belgium's strong presence in India through projects led by VITO and Belgian businesses in sectors like renewable energy, semiconductors, space, life sciences, and defence. He emphasised the importance of collaboration between research institutions and private sectors, aligning this with the G-STIC mission and Belgium's economic policies.

Day 1 Sessions

The inaugural session was followed by 2 plenary sessions for first half of the day 1. Plenary 1was on Health and Climate with a focus on The Paris Agreement, 2030 Agenda and Health followed by Plenary 2 on Water with the theme: Water as a Driver of Multi sectoral Sustainability and Economic Development. The second half of the day saw multiple Deep Dive and Plenary sessions, some of them running in parallel. The plenary sessions included discussions on 'Green Hydrogen Market Creation Mechanisms for Ensuring and Derisking Offtake' and 'AI in or Versus Education: Future Strategies on Innovation Policy for Education'. The Deep Dive session themes included 'Health, Equity and Climate Change', 'Implementation of Climate Action Through the Lens of Different Stakeholders – Part I', 'AI in or Versus Education: Future Strategies on Innovation Policy for Education'. It also included a Special Session on 'Water Sustainability – Leapfrogging Water Reuse and Improved Efficiencies'.

Special Address by Ms. Debashree Mukherjee, Secretary (DoWR, RD&GR), Ministry of Jal Shakti, Government of India

In her address at the Special Session on water, Ms. Debashree Mukherjee provided a stark reminder of the water challenges India faces in light of climatechange. She highlighted the increasing frequency of extreme weather events such as heavy precipitation and floods, noting that climate change is already disrupting India's water cycle and exacerbating the country's water management challenges. Ms. Mukherjee also stressed the need for better management of water resources, both surface and groundwater, through storage solutions such as dams and reservoirs, and emphasised the critical role of public participation in achieving these goals.

In addressing the agricultural sector, which consumes 83% of India's water, she called for a radical shift towards improving water use efficiency. She noted the success of initiatives like micro-irrigation and piped distribution networks to minimise losses. She also emphasised the importance of wastewater reuse, citing the Namami Gange program as a pivotal initiative. "We have a national framework for wastewater reuse, and industries such as thermal power plants are now mandated to use treated water within a 25-kilometer radius of STPs. This is a critical step in moving towards a more sustainable water management model."

Day 2 Sessions

The second day of G-STIC 2024 built on the momentum with dynamic discussions on technological innovations, policy frameworks, and sustainable business practices. Panels explored how cutting-edge technologies can address critical global issues such as wastewater treatment, renewable energy, and climate resilience, diving straight into the issues, with concurrent plenary, deep dive and special sessions. The plenary session focused on 'The Role of Energy Mix Planning and Power Grids to Achieving Net Zero', while the Special Sessions deliberated on 'Digital Technologies to Achieve the SDGs', and 'Uniting for nature: Multi stakeholder Solutions for Biodiversity'. The Deep Dive sessions had exhaustive discussions on 'Education Technology and Innovation: Challenges for Quality and for Teachers', 'Agriculture and Food Sustainability', 'Green Hydrogen Common Infrastructure Readiness and Global Supply Chain Integration', 'WEFE Nexus – Towards Common Grounds to Strengthen Water Security', and 'Implementation of Climate Action through the Lens of Different Stakeholders – Part II'.

Keynote Address by Ms.Archana Varma, Mission Director, National Water Mission (NWM), Ministry of Jal Shakti, Government of India

In her keynote address for the deep dive session on water, Ms. Varma highlighted the profound interdependence between water, energy, food, and ecosystems (WEFE).

Through relatable examples, Ms. Varma underscored how decisions in one sector impact policies across others. This interconnectedness necessitates a holistic approach to ensure sustainable growth and equity across sectors. She stressed that India, with 18% of the world's population but only 4% of its water resources, faces significant challenges in water management, exacerbated by rapid urbanisation and industrialisation.

Ms. Varma also pointed to the need for sustainable energy and water conservation measures to avert a looming water crisis by 2050, when water availability may fall below critical thresholds. She emphasised the National Water Mission's focus on conservation, reducing wastage, and ensuring equitable water distribution across states. She stated that community involvement is central to these efforts, particularly through initiatives like the Jal Shakti Abhiyan, which engages women and rural communities in water conservation. Ms. Varma concluded with a call for a "whole-of-society" approach to water management to improve water use efficiency and secure India's water future.

Closing Session and Conclusion

Key figures from across the globe, including industry leaders, policy makers, and researchers, shared their experiences and insights into tackling sustainability challenges, making G-STIC 2024 a resounding success. Participants explored collaboration opportunities between governments, businesses, and research institutions to accelerate progress toward the Sustainable Development Goals (SDGs).

G-STIC 2024 concluded with insightful reflections and a strong call to action at the closing session. Mr. Anshuman, Director of the Water Resources Division, TERI, India, delivered the closing remarks and vote of thanks, emphasising the collaborative spirit and innovative solutions that emerged throughout the event. Mr. Dietrich Van der Weken, General Manager, G-STIC at VITO, Belgium, summarised the key takeaways, highlighting the urgent need to harmonise technology, policy, and business pathways for a sustainable future.

A powerful keynote address by Mr. Nitin Desai, Chairman of the Governing Council at TERI, India, underscored the critical importance of sustainable innovation in addressing global challenges like water, climate, and energy. The closing session reinforced the conference's goal of fostering cross-sectoral collaboration for a sustainable future. G-STIC 2024emphasised the urgency of leveraging technology for a sustainable future. In looking ahead, the conference set a clear task: to accelerate the deployment of market-ready technologies, foster deeper partnerships, and ensure that collective efforts are both scalable and sustainable. G-STIC has once again demonstrated that technological advancement, when paired with policy support and economic incentives, can drive the transformations we need.

G-STIC 2024 Hosts

G-STIC was jointly hosted by VITO (the prime research and technology organisation on cleantech and sustainable development in Belgium) and 9 other not-for-profit independent technology research institutes: CSIR (The Council for Scientific and Industrial Research, South Africa), FIOCRUZ (Fundação Oswaldo Cruz, Brazil), GIEC (Guangzhou Institute of Energy Conversion, China), JITRI (Jiangsu Industrial Technology Research Institute, China), MASEN (Moroccan Agency for Sustainable Energy), NACETEM (National Centre for Technology Management, Nigeria), STEPI (Science and Technology Policy Institute, South Korea), TERI (The Energy and Resources Institute, India) and TII (Technology Innovation Institute, United Arab Emirates).

MEIL Signs MoU with Maharashtra Government for Development of 4000 MW Pumped Storage Hydro Projects

Mumbai: The Hyderabad-based Megha Engineering & Infrastructures Limited (MEIL) has signed a Memorandum of Understanding (MoU) with the Department of Water Resources, Government of Maharashtra, to develop two prominent Pumped Storage Projects with a total capacity of 4000 MW, the Kamod Pumped Storage Project in Nandurbar and the Ghosla Pumped Storage Project in Chhatrapati Sambhaji Nagar.

It is noteworthy that MEIL is executing its first pumped storage hydro projects under the Build-Operate-Maintain (BOM) method. These two projects will involve an estimated investment of Rs. 21,100 crore and are expected to generate employment for approximately 2,500 people. MEIL plans to complete the Ghosla Pumped Storage Project within three and a half years, while the Kamod Pumped Storage Project is expected to be completed in five years.

The two Pumped Storage Projects are off-stream in nature and the projects are planned to provide a minimum of 6 hours of energy storage on a daily basis. A powerhouse equipped with reversible pump turbines, generators, and other ancillary systems will be installed between the two reservoirs, interconnected through a water conductor system. The reversible turbines will pump water during non-peak hours and generate power during peak demand. Water for the projects will be drawn from existing reservoirs or dams for initial filling and replenished annually to compensate for losses due to evaporation and seepage.

Pumped Storage Projects are recognised for their cost-effective energy storage, grid management, frequency regulation, and integration with renewable energy sources. The MoU signing event was attended by Maharashtra Deputy Chief Minister Devendra Fadnavis, who is also the Power Minister and Deepak Kapoor, Additional Chief Secretary of the Water Resources Department and MEIL was represented by company President R.V.R. Kishore, along with Girish, Ravi Kiran, and Sameer Jha.

"These projects will not only address Maharashtra's energy needs but also drive the state's development. We are proud to contribute to national progress by supplying power through the grid across India," said Kishore.

Modi Dedicates Sewage Treatment Plant to State

SHILLONG, Oct 2: Health Minister Ampareen Lyngdoh, on behalf of Prime Minister Narendra Modi, inaugurated the Faecal Sludge and Septage Treatment Plant in Shillong. The PM virtually presided over the inaugural programme held on Wednesday, in which Lyngdoh took part in the symbolic ribbon cutting on behalf of the Prime Minister.

The programme was a parallel function in the state for Swachh Bharat Diwas (Clean India Day) during which Prime Minister Modi dedicated a number of projects to the nation, amongst which the Faecal Sludge and Septage Management Plant at Shillong is one. The plant was set up under the Atal Mission for Rejuvenation and Urban Transformation (AMRUT).

Speaking at the programme, Health Minister Lyngdoh said, "Shillong city generates about 32.37 million litres of sewage per day which include both black water that is going into the septic tanks and grey water that is discharged from the kitchen and bathrooms into the open storm water drains. Most of the city's wastewater is collected and partially treated in septic tanks. When the septic tank is full, the septage and the sludge is collected by SMB's cesspool and treated at the septage plant at Marten which has a capacity to treat 115 kiloliters of septage per day." In this regard, she said that the government has taken a series of actions to rejuvenate these rivers in the spirit of the Swachh Bharat Mission which was launched on October 2, 2014, by the Prime Minister. The birth anniversary of Mahatma Gandhi is being celebrated all over the country as "Swachh Bharat Divas" or "Clean India Day" as a tribute to the Father of the Nation who inspired the virtue of cleanliness and sanitation in all Indians.

"The Faecal Sludge and Septage Treatment Plant in Shillong was taken up under the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) at a cost of Rs 52.08 crore (inclusive of four onsite STP for the outfalls of Wahumkhrah and Umshyrpi). The plant is designed to treat faecal sludge and septage, which includes untreated and partially treated sewage, solid, liquid, and sludge from on-site sanitation systems. This plant will cover 1 lakh households' waste in the city," Lyngdoh said.

She also informed that the government is also in the process of setting up decentralised Sewage Treatment Plants at locations which are inaccessible by cesspool. Around 24 cesspool tankers have also been procured under this project for timely collection of septage to ensure that the septic tanks shall not overflow.

The minister also appreciated the efforts of communities and traditional institutions in taking the lead in waste management and stressed that it is only collective efforts that yield proper results. She highlighted the need for cesspool vehicles of different sizes and proper connections to be able to access all households. On the other hand, Director of Urban Affairs department, Isawanda Laloo, highlighted a major milestone being celebrated by the government in the journey towards a cleaner, healthier, and more sustainable city. "Together, we can achieve a Swachh Bharat, a clean India, where every citizen has access to sanitation and hygiene.

We are proud to have made significant strides in waste management, with 171 metric tons of solid waste handled daily," she said. The sewage treatment plant will serve the Shillong Urban Agglomeration areas and has a designed capacity to treat 350 kilolitres of septage/wastewater per day. The treated water can be discharged into the environment or it may be recycled within the plant.

During this occasion, 18 Safai Mitras or workers of the Shillong Municipal Board were felicitated by the National Insurance Company Ltd. (a Government of India undertaking) through a Janata Personal Accident Policy worth about Rs. 2 lakh each. Others who were present at the event include Chief Executive Officer of SMB, and Secretary of Meghalaya Urban Development Authority, PK Boro, Joint Director, Urban Affairs department, Biangmon Lato, besides officials of the Urban Affairs department and Shillong Municipal Board and the RangbahShnong of Laitumkhrah.

T.N. Rains: Water Resources Dept. Nominates 38 Nodal Officers to Monitor Monsoon Preparedness

Besides coordinating with the field engineers in the districts, the nodal officers — one for each district — would also team up with other departments for efficient management of monsoon-related workThe Tamil Nadu Water Resources Department has nominated 38 nodal officers for each district in the state to monitor the preparedness for the Northeast monsoon, which is likely to set in around October 16-17.

In a government directive issued on Monday (October 14, 2024), the WRD said that officials in the rank of executive engineers would coordinate to meet for emergencies during the monsoon season. Besides coordinating with the field engineers in the districts, the nodal officers would also team up with other departments for efficient management of monsoon-related work. The department has deployed engineers for the first time for monsoon-related work in various districts. A team of 31 engineers, headed by officials of the State Water Resources Management Agency, were already nominated to monitor monsoon preparedness work, particularly in Chennai, Tiruvallur, and Kancheepuram. They were assigned to check the progress of various projects being implemented.

A senior official said that the possibility for fluvial flooding, which is caused by rivers that carry more than their capacity, is less now. The 90 reservoirs in the State have only 57.47% of their storage capacity of 224.2 thousand million cubic feet as of Monday. Similarly, of the 14,139 irrigation tanks in the state, only 706 tanks have reached their full storage capacity as of Monday.

Another 1,584 tanks have storage above 75% of their capacity. "We have enough buffer space in waterbodies in the state to store floodwater. In Chennai, the five major reservoirs have a storage of only 33.2% of their total capacity," the official said. Many of the tanks in Chennai and surrounding districts too have only 25% of water storage and await monsoon rain spell to fill them.

Hon'ble Union Minister of Jal Shakti Announces 5thNational Water Awards

Hon'ble Union minister of Jal Shakti Shri C. R. Patil announced the list of winners of the 5th National Water Awards today, at Shram Shakti Bhawan, New Delhi.

The Department of Water Resources, River Development, and Ganga Rejuvenation (DoWR, RD &GR), under the Ministry of Jal Shakti announced the 38 winners, including joint winners, for the 5th National Water Awards, 2023, in 9 categories viz. Best State, Best District, Best Village Panchayat, Best Urban Local Body, Best School or College, Best Industry, Best Water User Association, Best Institution (other than school or college), and Best Civil Society.

In the category of Best State, the first prize has been conferred upon Odisha, with Uttar Pradesh securing the second position, and Gujarat and Puducherry jointly securing the third position. Each award winner will be conferred with a citation and a trophy as well as cash prizes in certain categories. The Department of Water Resources, River Development, and Ganga Rejuvenation (DoWR, RD &GR), announced that award distribution ceremony for the 5th National Water Awards, 2023 is going to be held on 22nd October, 2024 at 11.00 am at Plenary Hall, Vigyan Bhawan, New Delhi. Hon'ble President of India, Smt. Droupadi Murmu will be the Chief Guest at the event. Hon'ble Ministers of State for the Ministry of Jal Shakti Shri Raj Bhushan Chaudhary and Shri V.Somanna, Secretary Department of Drinking Water and Sanitation Smt. Vini Mahajan, Secretary

Department of Water Resources, River Development, and Ganga Rejuvenation (DoWR, RD &GR), Smt. Debashree Mukherjee, OSD to Department of Drinking Water and Sanitation Shri Ashok K.K. Meena and other senior officials of the Ministry of Jal Shakti joined the Cabinet Minister in announcing the National Water Awards.

Department of Water Resources, River Development, and Ganga Rejuvenation (DoWR, RD &GR), Smt. Debashree Mukherjee, OSD to Department of Drinking Water and Sanitation Shri Ashok K.K. Meena and other senior officials of the Ministry of Jal Shakti joined the Cabinet Minister in announcing the National Water Awards.

The Ministry of Jal Shakti serves as the central ministry entrusted with the responsibility of establishing policy frameworks and implementing programs for the development, preservation, and efficient management of water as a national asset. Under the guidance of Hon'ble Prime Minister, the Ministry of Jal Shakti has been undertaking a comprehensive campaign to spread awareness about water management and water conservation on a national level. From this standpoint and to create awareness among the people about the importance of water and to help motivate people to adopt the best water usage practices, the 1st National Water Awards were launched in 2018 by the DoWR, RD & GR. The 2nd, 3rd, and 4th National Water Awards were given for the years 2019, 2020 and 2022. The awards were not given in the year 2021 due to COVID pandemic.

For the year 2023, 5th National Water Awards were launched on 13th October, 2023 on the Rashtriya Puraskar Portal of the Ministry of Home Affairs (MHA). A total of 686 applications were received. The applications were scrutinised and evaluated by a Jury Committee. The ground truthing of the shortlisted applications was carried out by the Central Water Commission (CWC) and Central Ground Water Board (CGWB). Based on the ground truthing reports, a total of 38 winners, including joint winners, covering 9 different categories have been selected for the 5th NWA, 2023.

The National Water Awards (NWAs) focus on the good work and efforts made by individuals and organisations across the country in attaining the government's vision of a 'Jal Samridh Bharat'. The awards are for creating awareness among the people about the importance of water and motivating them to adopt best water usage practices. The event provides an occasion for all people and organisations to further cement a strong partnership and people engagement in water resources conservation and management activities.

Sewage Treatment Plant Issue Finally Resolved

Pune: The state biodiversity board, along with the forest department, spent nearly one-and-a-half years on the proposal for final approval of land for a Sewage Treatment Plant (STP) in the botanical garden of the college of agriculture. Finally, a proposal to allot 30 gunthas of land for the purpose was approved at a meeting of The Mahatma Phule Agricultural University, Rahuri. It was also recommended that the state government should approve it. This has finally paved the way for the project.

The central government is setting up the project with the financial support of JICA (Japan International Cooperation Agency) to treat sewage in the city. Under this, sewage treatment plants (STPs) are being set up at 11 places in the city. Work on 10 centres started by the Pune Municipal Corporation (PMC) is in progress. Work on the centre at the Agricultural College, however, was stalled. Sakal had followed up on the question of other departments creating hurdles for the eco-friendly project.

The current state of work

The municipal pumping station is located on the site of the botanical garden.

The land was reserved by the BMC in the development plan for a sewage treatment plant and a connecting road. However, the BMC was facing technical difficulties as the forest department had declared the site as a biodiversity heritage area. A central government team had last year reviewed the project and directed the state government to address the problem. In December last year, a meeting was held at the office of the Principal Secretary of the Forest Department in Mumbai with senior officials including principal chief conservator of forests, secretary of state biodiversity board, regional chief conservator of forests, municipal commissioner, chief engineer, deputy conservator of forests and associate research director of national agricultural research project.

It also discussed sending a revised proposal to exclude the site from the Biodiversity Heritage Area. Accordingly, the revised proposal was submitted to the State Biodiversity Board in Nagpur. The board gave a positive order that there was no objection to the allotment of the land. However, the forest department said it would follow up as the order was not clear. Civic officials were also upset with the toll-sharing between the two organizations.

Finally, the Mahatma Phule Agricultural University of Rahuri discussed the proposal for final approval of the BMC. The Maharashtra Council of Agricultural Education and Research will make a recommendation for the approval of the state government. Jagdish Khanore, Project Coordinator, JICA, Pune Municipal Corporation said, "A proposal to allot land for a sewage treatment plant in botanical gardens has been approved at a meeting of The Mahatma Phule Agricultural University, Rahuri. Now, after getting the approval of the state government, the work of this center can be completed."

ADB Commits $200 Mn to Upgrade Water Supply, Other Services in UTTARAKHAND

It will also build the capacity of state agencies in project management, climate and disaster-resilient planning, own-source revenue generation, and gender mainstreaming. The Government of India and the Asian Development Bank on Wednesday signed a $200 million (about Rs. 1,680 crore) loan to help upgrade water supply, sanitation, mobility, and other urban services in Uttarakhand.

The signatories to the loan agreement for the Uttarakhand Livability Improvement Project were Juhi Mukherjee, Joint Secretary, Department of Economic Affairs, Ministry of Finance and Mio Oka, Country Director of India Resident Mission, for ADB, a joint statement said.

Mukherjee said the project aligns with Government of India's urban development agenda as well as the Uttarakhand government's initiatives to enhance urban services, aiming to boost livability and sustainability in cities. "The project aims to create urban infrastructure that is resilient to climate and environmental risks such as floods and landslides, ensuring the safety and health of Uttarakhand's population," said Mio.

It will also build the capacity of the state agencies in project management, climate and disaster-resilient planning, own-source revenue generation, and gender mainstreaming, she said.

The project will enhance transportation, urban mobility, drainage, flood management, and overall public services in Haldwani, the economic hub of the state. Additionally, it will improve water supply delivery in four cities – Champawat, Kichha, Kotdwar, and Vikasnagar – by developing efficient and climate-resilient water supply systems. The project will also introduce initiatives for women, such as livelihood skills training on driving buses, bus ticketing, and the operation of electric charging stations.

Given women's role in monitoring water supply systems, it said, the project will build the capacity of women, including those from vulnerable households, in operating and managing water supply and sanitation services. The European Investment Bank is co-financing the project with $191 million on a parallel basis.

Union Minister Shri C.R. Paatil chairs 12th Meeting of Empowered Task Force on Ganga Rejuvenation

The 12th meeting of the Empowered Task Force (ETF) on Ganga Rejuvenation was chaired by Minister of Jal Shakti Sh. C. R. Paatil, in the presence of MoS, Dr. Raj Bhushan Choudhary.

Senior officials, including Sh. Ashok K. Meena OSD, Department of Drinking Water and Sanitation, Sh. Rakesh Kumar Verma (AS), Sh. Rajeev Kumar Mital (DG), Executive Directors, and representatives from Ministry of Power, Ministry of Tourism, Ministry of Housing and Urban Affairs and Ministry of Environment Forest and Climate Change.

The meeting was also attended by Sh. Anurag Srivastava, Principal Secretary State Government of Uttar Pradesh;Sh. Sunil Kumar Yadav Additional Secretary State Government of Bihar, Sh. Shailesh Bagauli Secretary, State Government of Uttarakhand Sh. Sunil Kumar, Principal Secretary State Government ofJharkhand and Ms. Nandini Ghosh Project Director SPMG West Bengal. Director General NMCG, Sh. Rajeev Kumar Mital gave a detailed presentation on various issues and briefed the Minister about the progress made since the last meeting.

During the session, a comprehensive action plan for the rejuvenation of River Ganga was discussed. Key topics included progress under the Namami Gange program, with a special focus on the reuse of treated water, biodiversity conservation, remediation of polluted river stretches, and the implementation of the River Action Plan and natural farming. The Minister called for a unified approach among stakeholders to closely monitor and evaluate the progress of Ganga-related projects, stressing the need to preserve the sanctity of the sacred river through dedicated conservation efforts. Rural and urban sanitation efforts have a big role in river cleaning and are directed to complete the targets for creation of infrastructure in a time bound manner.

The Minister for Jal Shakti directed state Governments to assist NMCG in completing the pollution abatement efforts as under to take river cleaning effort to next level:

Shri Paatil emphasised the spiritual connect of the river Ganga in the country and directed that tourism potential along the banks of this sacred river should be harnessed. This will develop the economy of the region and also give a boost to infrastructure. Shri Paatil also emphasized that Urban River Management Plans provide a comprehensive approach to river rejuvenation efforts at the city level and these should be mainstreamed to improve the health of urban rivers. He emphasized that the River City Alliance (RCA) should focus on ensuring co-learning amongst the river cities and should act as a platform for resolution of river related issues. He appreciated the concept of Smart Lab for Clean Rivers which is being developed with Danish collaboration and IIT (BHU) and would help in small river rejuvenation efforts in the country. The Minister stressed upon the need for adopting natural farming practices along the Ganga basin as it would help in river rejuvenation. The Ministry of Agriculture mentioned that they would support this initiative of NMCG and will actively collaborate to take this initiative forward. An action plan would be prepared to upscale the activities under Natural Farming with a focused approach.

As an institutional development initiative, it was decided to have a clean Ganga workshop jointly by the Department of Drinking Water and Sanitation and NMCG to sensitise the DGCs about the initiatives. The Minister emphasized the collaborative efforts by all the stakeholders in furthering the cause of river rejuvenation and mentioned that ETF provides a platform for focused deliberation on the river related issues. He mentioned that all the stakeholders would work together to achieve the targets and goals set by Hon'ble Prime Minister for taking the Ganga river rejuvenation efforts to next level and make it a model to look up to.

Union Jal Shakti Minister Shri C.R. Patil Champions Swachhata Efforts in Chhattisgarh, During Ongoing Swachhata Hi Seva 2024 Campaign

As part of the ongoing Swachhata Hi Seva (SHS) 2024 campaign, Union Minister for Jal Shakti, Shri C.R. Patil visited the Rajnandgaon district of Chhattisgarh today. His visit was aimed at observing the significant progress and implementation of various sanitation and water conservation initiatives under the Swachh Bharat Mission Grameen (SBM-G), reinforcing the importance of sustaining cleanliness efforts in rural India. The ongoing Swachhata Hi Seva (SHS) 2024 campaign, with its theme of 'Swabhaav Swachhata, Sanskaar Swachhata', is being held from 17th September to 1st October. The campaign will be culminating with Gandhi Jayanti on 2nd October, which is also the 10th anniversary of the Swachh Bharat Mission.

The SHS campaign focuses on behavioural change and community participation to maintain cleanliness and sanitation across India.

In his opening address, Shri Patil highlighted, "Under the inspiring leadership of Prime Minister, Shri Narendra Modi, we are entering a new chapter in the Swachhata journey. As we approach 2nd October, a day marking 10 years of the Swachh Bharat Mission, we should all do our bit by participating in Shramdaan in our villages and towns. Our collective efforts over the past decade have transformed the sanitation landscape of India. Chhattisgarh, like the rest of the country, has played a pivotal role in this transformation, and today I urge everyone to continue their dedication as we move forward with renewed commitment and energy."

Key SHS 2024 Activities in Chhattisgarh:

- 5,631 Cleanliness Target Units (CTUs) planned, with 2,071 transformed CTUs involving 1.3 lakh volunteers.
- 29,951 Swachhata Mein Bhagidari events, with over 10.48 lakh participants, fostering community ownership of local sanitation systems.
- Over 32,000 sanitation workers benefited from health camps, and 26,000 sanitation workers were provided with PPE kits through 2,332 SafaiMitra Suraksha Shivirs.

Chhattisgarh's Sanitation Progress:

- 67% villages declared ODF Plus Model.
- 73% villages have arrangements for Solid Waste Management.
- 94% villages have Liquid Waste Management systems in place.
- Chhattisgarh has achieved ODF Plus Model status for 13,033 villages, with a goal to declare all villages ODF Plus by December, 2024.

During the visit, Shri Patil witnessed firsthand the innovative waste-to-art installations created by the local community, the transformative impact of Cleanliness Target Units (CTUs), and the successful 'Ek Ped Maa ke Naam' tree plantation initiative.

The 'Mission Jal Raksha' programme, aimed at water conservation, was highlighted with the Minister inspecting the percolation tank site in Barga village, showcasing local efforts to preserve and replenish water resources. A notable highlight was the declaration of Rajnandgaon and Dongargaon blocks as ODF Plus Model blocks, underscoring the district's commitment to Sampoorna Swachhata and waste management.

The Union Minister also inaugurated the Faecal Sludge Treatment Plant (FSTP) in Baghara, which was a significant step towards sustainable waste management. He also visited the Plastic Waste Management Unit (PWMU) in Amlidih village, where he interacted with Swachhata Didis, sanitation workers leading local cleanliness efforts.

This visit by the Union Minister demonstrates the government's ongoing resolve to make the vision of a Sampoorna Swachh Bharat a permanent reality. The Swachhata Hi Seva 2024 campaign continues to unite communities in their mission towards a cleaner and more sustainable India.

DID YOU KNOW?

The hydroinformatics combines information technology, computer science, and water engineering principles to model, analyse, and manage water resources?

This interdisciplinary approach is becoming essential in modern water management.

GLOBAL W ATER NEWS

DROPLETS

Renewable Carbon Feedstocks: Building a Net-Zero Chemical Industry in 2050

Experts from nova-Institute, on behalf of the Renewable Carbon Initiative (RCI), prepared a groundbreaking report titled "Evaluation of Recent Reports on the Future of a Net-Zero Chemical Industry in 2050". This study, which builds on RCI's pioneering work in introducing the concepts of renewable carbon and defossilisation, provides a critical assessment of net-zero visions for the chemical and plastics industries.The now released report evaluates available studies with net-zero 2050 visions and scenarios for chemicals or plastics, with a focus on overall growth and renewable carbon shares. After rigorous quality checks of available reports, 15 studies with a total of 24 scenarios were evaluated in regards to the relative contributions of non-fossil feedstocks and pathways projected for 2050.

Key Findings

Industry Growth Projections
The majority of global scenarios anticipate continued growth in the production of the chemical industry. The average annual growth rate of the global feedstock demand for the chemical or plastics industry is projected at 2.9% (range 2%-4%). This indicates a slight deceleration compared to 3-4% compound annual growth rate (CAGR) observed in recent decades. Studies differ on the extent to which this growth will be offset by efficiency gains along the value chain. Overall, this translates into an approximate 2.4-fold increase in global feedstock demand from the chemical industry by 2050 compared to 2020 levels.

Notably, growth patterns show significant geographical differences:

- Most of the growth is expected to take place outside of Europe.
- Feedstock volumes in Europe are predicted to remain stable through 2050.

Renewable Carbon Shares
The analysis reveals a clear trend toward defossilisation. All scenarios include biomass and recycling as possible alternatives to replace fossil carbon, while two thirds also include carbon capture and storage (CCU). A complete defossilisation is considered in 10 of the 24 scenarios. The remaining studies expect a residual share of fossil carbon feedstocks, and in those cases combine these processes with Carbon Capture and Storage (CCS).

Vendor News

Emerson and Nozomi Networks extend relationship to help secure critical power and water processes worldwide

Global software and technology leader Emerson and Nozomi Networks, a leader in OT (operational technology) and IoT (Internet of Things) security, have announced they have extended their agreement to more effectively address the growing demand for OT cybersecurity services and solutions in the power and water industries. Emerson now offers Nozomi Networks' advanced solutions for industrial control system cyber resiliency and real-time operational visibility to Emerson's Ovation Automation Platform customers worldwide. The expanded agreement combines Nozomi Networks' OT & IoT expertise with Emerson's industry expertise and Power and Water Cybersecurity suite of solutions and services to help customers strengthen their cybersecurity posture and reduce the risk of downtime due to cyberattacks or process anomalies. "Emerson is enhancing our power and water customers' immediate access to OT network visibility, security and asset intelligence with Nozomi Networks' advanced software that integrates seamlessly with our industry-leading Ovation Automation Platform and purpose-built Power and Water Cybersecurity suite of solutions," said Emily Thomas, Director of Cybersecurity and Shared Services for Emerson's power and water business. "Together, we will deliver the deepest possible industrial process expertise, superior solutions and a proven track record serving our customers."

Operating in thousands of power, renewable and water plants worldwide, Emerson's Ovation software and technologies form a reliable and innovative automation platform embodying the company's five decades of industry expertise. Designed to evolve easily with rapidly changing technology, the Ovation Automation Platform helps to increase plant performance and reliability. The platform's intelligent control is easy to operate and maintain and is adaptable to meet customer requirements and objectives, scaling easily without adding complexity. Nozomi Networks' OT & IoT threat and anomaly detection and actionable intelligence complement the Ovation platform by helping customers quickly see and respond to cyber threats before they impact process controls.

In addition, vulnerability assessment capabilities help customers identify OT devices that can be exploited in cyberattacks. Nozomi Networks' asset discovery capabilities combine active and passive techniques to safely identify OT and IoT assets. "We've extended our relationship with Emerson from the DeltaV Automation Platform for process industries to the Ovation Automation Platform, addressing the cybersecurity concerns that are an everyday reality for modern automation processes," said Chet Namboodri, Nozomi Networks Senior Vice President of Global Business Development. "Power, renewable and water customers rely on Emerson for its innovative technologies and solutions. This new agreement strengthens our joint commitment to help protect critical infrastructure around the world." Nozomi Networks' full suite of OT and IoT cybersecurity solutions is now available globally through Emerson.

Smart metering: transforming water management

Smart metering has revolutionized the water sector, providing advanced tools for efficient, sustainable water resource management. Smart metering has been a mainstay in digitally transforming the entire water cycle since it was introduced and continues to be a fundamental tool. Smart metering technology was created in response to the need to manage water resources more efficiently and sustainably, driven by advances in digital communication and the development of digital sensors. It is a technology that uses smart meters to collect detailed data on water consumption. However, these advanced devices go beyond simple metering, as they enable real-time monitoring, leak detection, and two-way communication between the meter and the utility.

According to Carlos Tejedor, a Smart Metering & Instrumentation Specialist at Idrica:

"Water utilities have been investing in the digital transformation of micro-metering for some years now, not as an end in itself, but as a way to extract value from data and turn information into business intelligence". Tejedor also stated that "developments in meters are one of the most important advances of the last 50 years in the water sector".

DROPLETS

Orbis Signs US Distribution Partnership with Core & Main

Orbis Intelligent Systems, a leader in water technology, is announcing a national distribution partnership with Core & Main, a trusted name in water infrastructure solutions. This collaboration combines Orbis' innovative SmartCap technology with Core & Main's extensive industry leadership and expertise, marking a significant milestone in the water industry.

Orbis and Core & Main are partnering to enhance water network performance and efficiency through the SmartCap technology. This acoustic fixed-base pipe monitoring system, housed in a fire hydrant cap, uses real-time data to detect leaks and reduce non-revenue water loss, providing a crucial role in modern water management.

Orbis, with its focus on cutting-edge infrastructure monitoring technologies, stands out as a key partner for water utilities and municipalities. Now, Orbis' SmartCap solution will be accessible nationwide through Core & Main's expansive distribution network.

To explore how Orbis' SmartCap technology can benefit your water operations, visit Orbis Intelligent Systems, or contact your local Core & Main CORE+ product specialist.

Benefits of smart metering in the water sector

In this sense, smart metering has become an ally, not only in the digital transformation of the water cycle, but in actually managing the resource. In line with this idea, the World Bank stated that "Information systems are needed for resource monitoring, decision-making under uncertainty, systems analyses, and hydro-meteorological forecast and warning".

Management efficiency
According to the World Bank, the world will face a 40% shortfall between forecast demand and the available supply of water by 2030, calling for urgent measures to be taken to improve water resource management. In this sense, smart metering provides utilities and users with precise knowledge of water consumption. This real-time information facilitates informed decision-making to improve efficiency in water resource management.

Rapid leak detection
The ability to constantly monitor water flows helps identify and locate leaks quickly. This not only reduces water losses, but also minimizes the environmental impact and the costs associated with repairing damage.

- **Accurate, transparent billing**

Smart metering removes the need for billing estimates and enables accurate pricing based on actual consumption. This leads to a more transparent relationship between utilities and users, raising awareness about responsible water use.

- **Changes in consumer behavior**

When users have access to detailed consumption data, they are able to adjust their habits to reduce waste and save water. Environmental awareness increases as consumers become conscious of their individual impact.

Automation and optimization
Smart metering technology brings automation to processes such as meter reading and data management. This reduces operational burdens, optimizing resources and improving service efficiency.

Innovative smart metering applications

Integration with emerging technologies

- Combining smart metering with technologies such as the Internet of Things (IoT) and artificial intelligence further extends its capabilities. Devices can learn consumption patterns and anticipate needs, improving operational

Real-time alerts and notifications
Smart meters can send immediate alerts about potential leaks and anomalous consumption. This enables a fast and effective response, minimizing damage and reducing associated costs.

Data management platforms
Developing centralized platforms that integrate smart meter data gives policymakers and utilities a holistic view of the water system, facilitating strategic decision-making.

Smart metering plays a crucial role in the water management revolution, providing the perfect stepping stone to boost sustainability and efficiency. This innovative technology is a milestone in moving the water sector towards a smarter, more sustainable future, with benefits ranging from water conservation to operational optimization. One of the best examples in the market is Global Omnium, one of the largest water utilities in Spain, which operates mainly in the cities on the country's east coast. Two decades ago, the company had around one million meters, although the inefficiencies and costs of this system led it to progressively upgrade its network to the current smart grid it now runs. This is an example of digital transformation built on smart metering.

Mozambique, Malawi and Tanzania sign MoU for the Joint Management of the Ruvuma/Rovuma River Basin

The Rovuma River Basin countries – Malawi, Mozambique and Tanzania – on 31 July signed a Memorandum of Understanding in Dar es Salaam in pursuit of stronger cooperation in water management. The MoU will be the reference point for further discussions on basin management cooperation efforts in general, the crafting of a basin treaty and the establishment of River Basin Organisation in particular. The riparian states are receiving support from the SADC, working with the GIZ-TWM, IUCN, GWPSA and WaterNet.

The governments of Mozambique, Malawi and Tanzania intend to maximise their contributions to the mutual management of the resources of the Rovuma River Basin. The memorandum, signed on Wednesday in Dares Salaam, foresees the strengthening of cooperation in matters of use, development, protection, conservation and sustainable management of the Rovuma River Basin, a press release issued by the Mozambican Ministry of Public Works, Housing and Water Resources reads.

Shared by the three countries, the Rovuma River Basin extends for 760 km, 650 km of which serves as the border between Mozambique and Tanzania. It is rich in aquatic and terrestrial biodiversity, in particular the 42,400 square kilometre Niassa National Reserve, which covers parts of the provinces of Cabo Delgado and Niassa, whose development is likely to be boosted by the implementation of the Integrated Transboundary Water Resources Management.

The agreement was signed during the meeting of the Council of Ministers for the Rovuma Basin by Carlos Mesquita, Minister of Public Works, Housing and Water Resources; Jumaa Hamido Aweso, Minister of Water of Tanzania; and Abida Sidik Mia, Minister of Water and Sanitation of Malawi. The agreement serves as a platform for cooperation partners, the Southern African Development Community (SADC) and member states to assess the progress of the basin roadmap and discuss the implementation of the subsequent project, financed by the Global Environment Facility (GEF).

At the ceremony, the Mozambican government was represented by the Minister of Public Works, Housing and Water Resources, Carlos Mesquita, who said that the agreement would bring numerous advantages to the three countries, namely the openness of member states to the development of regional projects, as well as the possibility of mobilising financing for their implementation, resulting in economic and social benefits for the communities living along the Rovuma Basin. Minister Mesquita further highlighted that the Rovuma River basin was almost unparalleled in the SADC region as being among the few shared basins that are still in their natural conditions, that is, without storage infrastructure (dams). "This river basin is rich in aquatic and terrestrial biodiversity, and a large part of it is still intact, especially in Mozambique, where the Rovuma flows through the provinces of Niassa and Cabo Delgado," Minister Mesquita said.

"In this sense, Mozambique considers that there are many challenges for its management, with emphasis on the sustainable use and guarantee of water supply to the main water-using sectors, the vulnerability associated with water (floods and droughts), water quality and health of the aquatic ecosystem, as well as good water governance and implementation of Integrated Water Resources Management, from the perspective of transboundary water management," he added.

These challenges "increase the need to adopt structural and non-structural measures, which require cooperative actions between the riparian states. In the current context of climate change, in which our region was hit by El Niño, we hope that the ongoing initiative will help to create and promote integrated and sustainable resource management through the implementation of measures to guarantee water safety in the Rovuma river basin, in order to mitigate the occurrence of water-borne diseases, such as COVID-19 and diarrhoeal diseases, and mitigate the impacts resulting from water scarcity".

Cooperation between the three countries also extends to the Zambezi River basin, with the creation of the Zambezi Watercourse Commission (ZAMCOM) in 2024. Malawi has however not yet ratified the agreement establishing the commission.

Sewer sealing work underway to protect West Sussex village from flooding

Southern Water is continuing its major programme of works to protect homes from flooding and protect their network from the impacts of groundwater entering sewers. Funtington, west of Chichester, will take center stage for works to seal sewers to help keep out groundwater. This will also help reduce storm overflows in the area helping protect Chichester Harbour. It comes as Southern Water is close to completing its work to seal sewers in East Dean, with more than a kilometer worth of sewers being sealed since July.

Both East Dean and Funtington are impacted by groundwater levels. Over the last two years, this issue has become even more acute as the impacts of the wettest 18 months since records began has led to more groundwater getting into sewers. The work at Funtington forms part of the Bosham storm overflow reduction project, which was launched earlier this year to drive down storm overflow releases in this area. It is hoped that through extensive sealing of sewers in this area that the area will be better prepared during periods of rising groundwaters and it means there could be less reliance on tankers and other measures.

This technique has been trialed elsewhere and proven successful, for instance in the pan parish area of Hampshire near Andover, sealing private and public pipes reduced the number of tankers being used by more than 85 per cent.

Spain Intends to Replicate Morocco's Successful Drought-Fighting Strategies

Morocco's innovative approach to combating water scarcity is gaining global recognition, with plans underway to build Africa's largest desalination plant in El Jadida province. Doha – Spain is looking to its southern neighbor, Morocco, for inspiration in combating the severe water scarcity that has plagued parts of the country, particularly Catalonia and Andalusia.

According to the Spanish newspaper El Periódico de Catalunya, the Catalan government plans to implement a desalination plant strategy similar to Morocco's in an effort to alleviate the drought crisis. Morocco has been grappling with water shortages for years, further exacerbated by the lack of rainfall over the past six years. The country's reservoirs currently stand at a mere 29% of their capacity.

In response, the Moroccan government has implemented various measures to ensure a stable water supply, including cloud seeding and the construction of mobile desalination plants primarily used for agricultural purposes. In June, Morocco's Crown Prince Moulay El Hassan launched the construction of Africa's largest desalination plant in the commune of Lamharzi Essahel, El Jadida province. With a projected annual production capacity of 300 million cubic meters, the plant is expected to serve an estimated 7.5 million inhabitants.

The $653 million project is part of Morocco's comprehensive strategy to address water scarcity, aligning with the 2020-2027 National Program for Drinking Water Supply and Irrigation. In September, the Wall Street Journal commended Morocco's innovative approach to mitigating water scarcity by harnessing renewable energy to power advanced desalination plants. The country aims to source 52% of its electricity from renewables by 2030. The Agadir desalination plant, for instance, procures 275,000 cubic meters of water daily, with 150,000 cubic meters allocated for drinking water, sufficient to cover the basic daily needs of one million people. The Safi seawater desalination plant, managed by the OCP Group, is also set to play a crucial role in alleviating the region's water crisis. Inaugurated in 2022, the plant boasts an annual production capacity of 40 million cubic meters, with plans to increase its output to 30 million cubic meters annually for Safi and an additional 20 million cubic meters for industrial use in the broader Marrakech-Safi region by 2026.

Furthermore, the JorfLasfar seawater desalination plant, operated by OCP Group, is scaling up its production to combat water scarcity in El Jadida and nearby areas. The plant expanded its output to 45 million cubic meters annually by 2022 and is on track to reach a production capacity of 300 million cubic meters by 2026. Despite these efforts, Morocco's agriculture sector remains vulnerable to water scarcity, with approximately 80% of the cultivated area reliant on rain-fed agriculture as of 2022.

Inspired by Morocco's holistic water management approach, French President Emmanuel Macron expressed his admiration during a meeting organised by the OCP Group in October, as part of his three-day state visit to the country. Macron stated that France should take inspiration from Morocco's strategy, which includes water highways and urban desalination projects. As Spain looks to emulate Morocco's success in tackling water scarcity, Catalonia plans to have the Tordera II desalination plant in Blanes operational by 2029, with an investment of €290 million.

This expansion is expected to increase the production capacity from 20 to 80 cubic hectometers of water. By 2030, Catalonia aims to have an additional 280 cubic hectometers of water available through its desalination plant strategy.

Singapore's NEWater journey

Singapore, 27 September 2024 – PUB, Singapore's National Water Agency commemorated the closure of NEWater Visitor Centre (NVC) and Bedok NEWater Factory (BNF) with a closing ceremony today. The event graced by Guest-of-Honour Ms Grace Fu, Minister for Sustainability and the Environment and Minister-in-charge of Trade Relations, was attended by more than 100 guests.

- In her opening remarks, Minister Grace Fu paid tribute to the dedication and significant contributions of the pioneers, whose indomitable spirit has been integral in implementing the technology behind Some of these pioneers include PUB's Senior Consultant Harry Seah, then-Project Manager of the NEWater study team who oversaw the research and development phase of NEWater before it was launched in 2002, and Mr Tan Thai Pin, the study team's Deputy Project Manager. Mr Tan played a crucial role in garnering support from industrial partners and convinced them to adopt NEWater in their operations. Professor Ong Choon Nam, a prominent local expert on water quality, contributed valuable technical knowledge as Chairman of the International Expert Panel on NEWater alongside his fellow panel members.

Continuing NEWater public education

- Although the NVC has officially closed on 31 July, visitors can still head to the Sustainable Singapore Gallery (SSG) at the Marina Barrage to learn more about the Singapore Water Story, which features NEWater as one of the key components of our water management strategy. PUB is committed to continue NEWater education and promote water sustainability and is working on developing a new exhibit on NEWater at SSG and at a learning gallery located at the upcoming Tuas Nexus.

Bolstering NEWater supply

- With Singapore's water demand projected to nearly double by 2065, NEWater's role as a dependable and weather-resilient National Tap remains vital. To meet projected increase in water demand from industries, PUB is building a third NEWater Factory in Changi, located within the existing Changi Water Reclamation Plant (WRP). The upcoming Tuas NEWater Factory (TNF), which will be integrated within the Tuas Water Reclamation Plant currently under construction, will have a production capacity of 75 million gallons per day (mgd) – the equivalent of 136 Olympic-sized swimming A construction tender for the expansion of TNF from its initial capacity of 25 mgd to 75 mgd will be launched later this year.

- As we progress towards a three-node* used water management system by 2035, PUB will continue to expand our expansion to further increase its used water treatment capacity.

The three-node system, with the Deep Tunnel Sewerage System at its core, consists of Changi WRP in eastern Singapore, Kranji WRP in the north and Tuas WRP in the west.

Pursuing research and innovation in NEWater

- PUB continues to innovate for greater efficiency of the NEWater production Since 2006, we have incorporated membrane bioreactor (MBR) technology in our used water treatment process. This 3-in-1 solution combines conventional bioreactors, secondary sedimentation tanks and microfiltration and ultrafiltration in one single step. The benefits include increased energy efficiency of used water treatment, reduced land footprint of our water reclamation plants and higher quality effluent for NEWater production.
- The development of ceramic-based MBR also further enhanced our used water PUB conducted successful demonstration trials to validate the use of ceramic MBR systems as part of the used water treatment process, which proved to be more resilient to chemical damage and able to effectively treat industrial used water. The upcoming Tuas WRP will be retrofitted with ceramic MBRs for industrial water treatment and will house the world's largest MBR system.
- There is also a continuous effort to enhance energy efficiency in NEWater PUB has been collaborating over the last few years with local and overseas partners to develop and scale biomimetic membranes for municipal applications. The technology uses nature-based protein water channels within a filtration membrane, which facilitates high water flow while minimizing energy consumption. Demonstration plant trials at KNF with Aquaporin Asia which commenced last year are showing promising results, achieving 20 percent reduction in energy consumption.
- To improve NEWater recovery rates, PUB explored the incorporation of water technology company ROTEC's proprietary Flow-Reversal technology in the reverse osmosis membranes used during the NEWater production process. Initial trials have successfully demonstrated an improvement in recovery rates from 85 percent to as high as 90 percent, enabling PUB to produce more NEWater from each drop of treated used water The Flow-Reversal technology will be incorporated into the design of our future NEWater plants.

About PUB, Singapore's National Water Agency

PUB is a statutory board under the Ministry of Sustainability and the Environment (MSE). It is the national water agency, which manages Singapore's water supply, water catchment, and used water in an integrated way. From April 2020, PUB also took on the responsibility of protecting Singapore's coastline from sea-level rise as the national coastal protection agency. PUB has ensured a diversified and sustainable supply of water for Singapore with the Four National Taps (local catchment water, imported water, NEWater, desalinated water). PUB leads and coordinates whole-of-government efforts to protect Singapore from the threat of rising seas and the holistic management of inland and coastal flood risks.

PUB calls on everyone to play a part in conserving water, in keeping our waterways clean, and in caring for Singapore's precious water resources. If we all do our little bit, there will be enough water for all our needs – for commerce and industry, for living, for life.

University of Arizona Hosts International Researchers Tackling Water and Climate Challenges with Computational Innovation

The University of Arizona hosted the 2024 Computational Methods in Water Resources Conference at the Student Union Memorial Center from September 30 to October 3, 2024. Established in 1976 at Princeton University, this year's event marked the 25th edition of the biennial conference that alternates between North America and Europe. The conference welcomed 230 attendees from 26 countries, with participants from 40 U.S. institutions across 18 states. The program included technical sessions and keynote talks covering a wide range of topics, including applications of artificial intelligence, high-performance computing, and the assessment of human-nature interactions to address water challenges. "Computing is critical for understanding and predicting water behavior at global and local scales," said Bo Guo, conference chair and associate professor of Hydrology and Atmospheric Sciences.

"Our ability to simulate complex hydrological systems using mathematical models allows us to address issues such as drought and flood resilience, clean-up of contaminated waters and the mitigation of natural disasters."

As climate anomalies become more frequent, computational models offer powerful tools for forecasting and protecting communities. For example, flood modeling advancements presented at CMWR could improve early warning systems in vulnerable areas such as Florida, while in water-scarce regions like the U.S. Southwest, these models can guide optimal water use decisions.

Hosting CMWR 2024 further boosted U of A's profile in water resources research, a key area of historical strength for the university, said Guo. "The conference planted seeds for high-profile collaborations," he said, "and contributed to career-transforming networks for our community, especially graduate students and postdoctoral researchers."

Guo added, "The quality of science and enthusiasm were excellent, reminding us that together, we can tackle even our biggest challenges through scientific discovery and engineering innovation."

Work on £1.9m upgrades at East Sussex wastewater treatment works set to start

Construction is almost underway on improving Halland Wastewater Treatment Works in East Sussex – as part of ongoing efforts to drive down storm overflow activity across the region. The works at the site – located near East Hoathly – will increase its capacity and mean the site can treat more flows, especially during and after stormy weather, enabling greater volumes to be treated. Overall the project will mean the site can increase the amount of flows it treats by more than 100%. This in turn will reduce the need to use storm overflows, which are activated when the network becomes overloaded with additional surface and groundwater, to avoid flooding homes and communities.

One part of the project is building a new storm tank (dimensions 4.37m by 4.23m) which will store 36,000 litres of storm water. The work carried out by construction partner Ward and Burke, is expected to end next summer.

Director of Wastewater Operations at Southern Water, John Penicud, said:

"Storm tanks are one of a variety of important engineering solutions in our commitment to cut storm overflows. They provide extra storage capacity on site which fills during storm conditions, before later being released for treatment. This helps us keep these flows on site, rather than it being released into the environment.

"We're delighted to get this scheme underway, as we continue to invest in our network for the benefit of our communities and our environment. "Southern Water is spending £3bn between 2020 and 2025 on improving its environmental performance, and last year launched its £1.5bn Clean Rivers and Seas Plan to reduce storm overflows.

Innovative alternative to septic tanks is a European first for United Utilities

United Utilities has become the first water company in Europe to introduce an innovative low carbon, chemical-free wastewater treatment process for use at small sites. The FujiClean system was developed in Japan to provide an alternative to septic tanks and is widely applied there as well as in the US and Australia. It is typically used for domestic properties and facilities such as camp sites that aren't connected to a sewer network. Earlier this year United Utilities became the first water company in Europe to collaborate with Fujiclean and quickly deployed their CEN unit at a site in Shropshire. Fujiclean also offered an even more innovative option with a solution for chemical free phosphorus removal inside, the CRX model. The United Utilities team moved quickly to get this on test and de-risk the technology. Now, after a successful trial an initial batch of 11 FujiClean CRX units are set to be installed at small sites across the North West where septic tanks have previously been used.

It is understood to be the first time the system has been used on municipal wastewater in Europe.

Lisa Mansell, Chief Engineer, Innovation and Carbon at United Utilities explained:

"We are always looking for ways both to enhance the wastewater treatment process and reduce the use of chemicals – FujiClean does both.

"We have a large number of small sites where septic tanks are used. The septic tank process hasn't significantly evolved for many years but now the FujiClean system offers a much more enhanced wastewater treatment option that provides phosphorus removal without the use of chemicals. "The final effluent is much better quality and we can now remove phosphorus in the same system. An added benefit of the design is that it doesn't need emptying as much, this combined with not needing chemical deliveries means fewer vehicle movements to our small sites – a win for the environment and rural communities."

After discovering the CRX system, the Engineering Innovation team at United Utilities spent almost a year working with both FujiClean in Japan and UK distributors Haigh evaluating the system at Glazebury Waste Water Treatment Works in Cheshire.

Luke Shepherd, Director at Haigh said:

"The passion we have seen from the United Utilities teams over the entire course of the FujiClean CEN deployment and CRX trial has been incredible. While the team here at Haigh have had confidence in the FujiClean systems, the United Utilities approach to getting the initial project delivered, properly and promptly means there is now an incredible amount of data around the technology with effluent treatment performance results even surprising the system manufacturers."

The first two FujiClean CRX units to be used in a live environment have now been installed by United Utilities' engineering and capital delivery teams at a site in Whitegate in Cheshire, with further units due for delivery and deployment at sites across the region.

Company prosecuted for failing to complete reservoir safety works

The Environment Agency has prosecuted a Midlands company which failed to safely maintain Ward's Reservoir in Lancashire, putting residents in nearby Belmont at risk. At Kidderminster Magistrates' Court on 8 October 2024, Blue Lagoon Heritage Limited, of Old Marlbrook Quarry, Lydiate Ash, Bromsgrove, admitted failing to comply with an enforcement notice. This was issued under the Reservoirs Act 1975. This required the company to complete essential maintenance and construction works in the interests of public safety. The company was ordered to pay fines and costs of £5,445.

Safety checks

The court heard that a notice was served on the company by the Environment Agency's National Reservoir Safety Team in May 2021. This was to carry out safety measures under the supervision of a qualified civil engineer. However, the company by October 2021 had failed to carry out the work and weekly safety checks by Environment Agency officers.

In June 2022, the Environment Agency intervened to protect public safety, commissioning contractors to inspect and free the outlet valve. This allowed levels in the reservoir to be managed and maintained at 5.25 metres below the maximum top water level, significantly reducing its risk of failure. In the continued absence of adequate management by the company the Environment Agency has since been conducting site visits and engineer safety checks.

Karl Hunter, Enforcement Advisor for the Environment Agency's National Reservoir Safety Team, said:

"The director and owners of Blue Lagoon Heritage Limited failed to respond to advice and enforcement notices to improve the unacceptable and unsafe condition.

"This failure to comply came despite repeated site inspections and warnings from Environment Agency officers and independent expert engineers. "This caused unacceptable risks to local residents and businesses in the village of Belmont and surrounding areas downstream of the reservoir. "The owners of all Large Raised Reservoirs are regulated under the Reservoirs Act 1975 by the Environment Agency.

"The Act requires owners to maintain their reservoirs in full compliance with safety recommendations, set periodically by independent reservoir engineers. "Blue Lagoon Heritage Limited took ownership of Ward's Reservoir in 2019 and has consistently failed in its legal duty. "We will continue to work to tackle inadequate maintenance of reservoirs which puts lives at risk. We are committed to ensuring that reservoir safety standards are adhered to.

The charge:

That Blue Lagoon Heritage Limited, (Company number 07390323) by 29 July 2021 as undertaker of Wards (Blue Lagoon) Reservoir, had failed to comply with the requirements of a Notice. This was made on 20 May 2021 under Section 10(7)(b) of the Reservoirs Act 1975. This required safety measures to be put into effect at Wards (Blue Lagoon) Reservoir under the supervision of a qualified civil engineer by 28 July 2021. Contrary to Section 22(1)(b) of the Reservoirs Act 1975. Reservoirs in England and Wales capable of holding more than 25,000 cubic meters of water must be registered with the Environment Agency.

The owners ('Undertakers') must comply fully with the requirements of the Reservoirs Act 1975. The Act is designed to provide a regulatory framework for maintaining reservoir safety to prevent an uncontrolled release of water and risk to life.

Natural Resources Wales (NRW) has announced plans to change its structure so it can either stop or scale back certain services.

Natural Resources Wales (NRW) has announced plans to change its structure so it can either stop or scale back certain services. Following extensive consultation with the Trade Unions and their members, alongside engagement with staff, NRW has made the decision to streamline its activities and concentrate its resources on delivering essential services that only it can provide. NRW said the changes, which have now been approved by NRW's Board, will ensure that the organization is better equipped to deliver its corporate plan objectives to support nature's recovery, tackling climate change, and minimizing pollution.

Following Trade Union consultation, several proposals have been adjusted, reducing the number of roles to be removed from the organizational structure. 120 staff members are directly impacted by this change and where possible, they will be redeployed within the organization. Following Board approval some services will be reduced or delivered differently, including areas such as provision of recreation on the land in its care and interpretation services.

Additionally, certain activities that fall outside of NRW's statutory responsibilities or have a lower impact on key environmental priorities will be discontinued. This includes no longer having a physical library service. The catering and retail operations at Visitor Centres will also end.

Clean up half-hearted approach to PFAS regulation to protect public health and our environment

As MP Munira Wilson reads her Private Members Bill on PFAS, we can now confidently say that health concerns surrounding these so-called 'forever chemicals' are no longer a niche scientific topic, but a genuine issue of concern for the UK public. In early 2025 the Royal Society of Chemistry will release the results of a YouGov survey they commissioned, the results of which explore nationally representative public attitudes to PFAS.

Initial analysis of the data tells us that more than three quarters (77%) of people in the UK believe that some, most or all PFAS present a significant risk to human health. Over three quarters (88%) say that the use of PFAS known to be toxic should be stopped immediately or subject to more effective controls. And the most popular PFAS control measure the UK public would accept is increased regulation on industries using PFAS, requiring them to reduce and reverse contamination caused by their processes, with 84% saying they would support this.

However, there is a lack of coordination across government to dealing with the many issues surrounding the use of PFAS, from drinking water to environmental and consumer product-related issues.

One good example of the current fragmented approach is piece of good news that quietly snuck out in August, unnoticed by anyone outside of the water industry. The news itself was a change in technical guidance provided to water companies that essentially means every resident of England and Wales should now be better protected from harmful PFAS in their drinking water. After a year of campaigning for tighter restrictions on PFAS in UK drinking water in my role at the Royal Society of Chemistry, this update from the Drinking Water Inspectorate (DWI) felt like a massive win.

The guidance to water companies makes it clear they will be expected to monitor for and enforce a limit of 100 nanograms per litre (ng/L) for a new cumulative sum of 48 PFAS as part of their legal duty to deliver 'wholesome' drinking water to households.

Currently, water companies measure whether drinking water samples exceed 100 ng/L for each of the 48 individual types of PFAS, which means the total amount of PFAS could accumulate far beyond the high-risk threshold. The updated limits, which take effect from January 2025, mark a significant new safeguard for public health that surpasses drinking water limits in both the European Union and Scotland, where the same 100 ng/L is enforced for a much smaller group of 20 PFAS.

So why is this good news a little bittersweet?

A lot of it is due to the terminology around our drinking water protections. 'Guidance', 'wholesome' and 'expected to' don't exactly provide the comfort and certainty we may expect when it comes to what we and our families drink every day. While we laud the DWI's new PFAS guidelines for laying out a more comprehensive limit than even the EU, in comparison our laws still lack clarity. The existing regulation itself is vague, with water companies being required to provide water the DWI considers 'wholesome' – the parameters of which are defined by guidance such as the recent PFAS expectations. The positive side of this approach is that the DWI can act decisively in line with the latest scientific understanding – put simply, water companies must now follow the new guidelines or risk enforcement action via the wholesomeness rules. It is an immediate, positive step to protect public health.

But we shouldn't stop there. No-one chooses the water that comes out of their tap, so we want to see statutory PFAS limits for UK drinking water that are clearly and transparently defined and legally enforceable. We need to translate this new guidance into legislation that gives the regulator Ofwat defined criteria – and the power – to hold water companies to account.

It's not just our YouGov survey that shows this issue matters to the general public. Since we at the Royal Society of Chemistry launched our 'Clean up UK drinking water' campaign last year, which highlighted the prevalence of PFAS in our water courses, over 10,000 people have seen our campaign map showing PFAS in their local area and close to a thousand wrote to their MP highlighting the issue.

It seems this public pressure is starting to make waves. For instance, while debating the Product Regulation and Metrology Bill, Baroness Bennett of Manor Castle noted: "Public awareness of PFAS and 'forever chemicals' is growing fast; the Government are going to find themselves coming under considerable pressure in these areas very soon." In the meantime, chemicals continue to accumulate in our rivers, aquifers and environment. We don't actually know how many PFAS are being produced, and where they end up – so we also urge government and industry to build upon this change by creating a national inventory of PFAS and enforcing stricter limits on industrial discharges.

Ultimately, at the RSC, we want the government to establish a national chemicals regulator that can provide better strategic coordination, monitoring, and regulation of all chemicals, including PFAS. With a harmonised and comprehensive approach, we ensure everyone connected to the chemical sciences is doing everything they can to protect our health and our environment.

2 in 5 households say they will find it difficult to afford water bill increases

Two in five households across England and Wales say they will find it difficult to afford the increases to water bills being proposed by the regulator Ofwat. The Consumer Council for Water (CCW) has published the findings of an in-depth study of 9,500 households.

It gauged bill payers' views on the regulator's draft decisions to allow water companies to increase bills by an average of 21%, before inflation is added, over the next five years to help fund £88 billion of investment in improving services and the environment. These proposed bill rises would begin to take effect from April 2025.

A representative sample of household customers served by each water company in England and Wales were asked how easy or difficult they would find the proposed bill rises for their supplier. They were also asked how acceptable they found the five-year investment plans for their area, based on Ofwat's draft determinations in response to companies' business plans.

Overall, 40% of customers said they would find the proposed changes to their water bill difficult to afford – more than double the 18% who say they have difficulty paying their current bill. In Wales, these concerns were even more acute with nearly half (48%) of customers saying they would find the planned rises difficult to afford. Customers were broadly supportive of the way their money would be spent to tackle issues like curbing leakage and reducing pollution into rivers, lakes and seas, with 75% of those surveyed finding the overall investment package for their company acceptable.

The consumer watchdog CCW says the findings show that while the majority of people back the need for investment in water and sewerage services, the price tag would be too much to bear for millions of households. CCW has already voiced concerns that some water companies' proposals to expand financial support for struggling customers do not go far enough. There remains an urgent need for a single social tariff for England and Wales to end the current postcode lottery of assistance.

Mike Keil, Chief Executive of the Consumer Council for Water, said:

"These bill increases would put an intolerable strain on the finances of millions of households and only a single social tariff can provide the safety net that is needed to ensure water is affordable for everyone. "People support the need for investment but there is a strong undercurrent of mistrust over whether water companies can deliver on their commitments. Customers need to see evidence their money is being well spent, otherwise fractured trust in the water sector will never be repaired."

CCW conducted the research in collaboration with Ofwat to help ensure participants were presented with a clear and understandable picture of the proposed changes to their water bill – including the impact of forecast inflation – and how their company would be expected to invest in services. The survey set the scene by looking at how people were currently managing financially and found that many billpayers were walking a tightrope. More than 2 in 5 customers (42%) said they had struggled to pay at least one household bill in the past year.

Among those that said they would find the proposed water bills for 2025-30 difficult to afford, over half (54%) said they would cut back on non-essentials to pay for it – while 43% said they would use less water and 38% would cut back on food shopping and other essentials. Although three-quarters of customers found companies' investment plans acceptable, there was considerable variation among the companies – with 81% of Severn Trent Water billpayers endorsing its draft determination, compared to 65% of Southern Water households at the other end of the spectrum.

Overall acceptability of the investment plans shrank to 58% when customers were reminded of the proposed bill rises later in the survey. The findings support many of the recommendations CCW made to Ofwat when it submitted its formal response to the draft determinations in late August. In particular, some water companies need to show vastly more ambition in their support for customers who will not be able to afford these proposed bill rises.

A failure to listen to customers' concerns over the affordability of their bills risks further exposing the limitations of existing financial assistance.

Microplastics and PFAS – combined risk and greater environmental harm

The combined impact of so-called 'forever chemicals' is more harmful to the environment than single chemicals in isolation, a new study shows.

Researchers at the University of Birmingham investigated the environmental effects of microplastics and PFAS and showed that, combined, they can be very harmful to aquatic life. Microplastics are tiny plastic particles that come from plastic bottles, packaging, and clothing fibres. PFAS (Per- and Polyfluoroalkyl Substances) are a group of chemicals used in everyday items like non-stick cookware, water-resistant clothing, firefighting foams, and numerous industrial products. PFAS and microplastic are known as "forever chemicals" because they don't break down easily and can build up in the environment, leading to potential risks for both wildlife and humans.

Both PFAS and microplastics can be transported through water systems on long distances, all the way to the Arctic. They are often released together from consumer products. Yet, their combined effects, and also the ways in which they interact with other polluting compounds in the environment, remain poorly understood. To better understand the combined impact of these pollutants, researchers used Daphnia, commonly known as water fleas. These tiny creatures are often used to monitor pollution levels because they are highly sensitive to chemicals, making them ideal for determining safe chemical limits in the environment.

In this study, published in Environmental Pollution, the team compared two groups of water fleas: one that had never been exposed to chemicals and another that had experienced chemical pollution in the past. This unique approach was possible thanks to Daphnia's ability to remain dormant for long periods, allowing researchers to "resurrect" older populations with different pollution histories.

Both groups of Daphnia were exposed for their entire life cycle to a mixture of microplastics of irregular shapes – reflecting natural conditions- together with two PFAS chemicals at levels typically found in lakes. The team showed that PFAS and microplastics together caused more severe toxic effects than each chemical alone. The most worrying result was developmental failures, observed together with delayed sexual maturity and stunted growth.

When combined, the chemicals caused Daphnia to abort their eggs and to produce fewer offspring. These effects were more severe in Daphnia historically exposed to pollutants, making them less tolerant to the tested forever chemicals. Importantly, the study found that the two chemicals lead to greater harm when combined – 59% additive and 41% synergistic interactions were observed across critical fitness traits, such as survival, reproduction and growth.

Lead researcher Professor Luisa Orsini emphasized the importance of the findings:

"Understanding the chronic, long-term effects of chemical mixtures is crucial, especially when considering that previous exposures to other chemicals and environmental threats may weaken organisms' ability to tolerate novel chemical pollution. "Our research paves the way for future studies on how PFAS chemicals affect gene function, providing crucial insights into their long-term biological impacts. These findings will be relevant not only to aquatic species but also to humans, highlighting the urgent need for regulatory frameworks that address the unintended combinations of pollutants in the environment. Regulating chemical mixtures is a critical challenge for protecting our water systems.

Dr Mohamed Abdallah, co-leading the research, said:
Current regulatory frameworks focus on testing the toxicity of individual chemicals, mostly using acute (short) exposure approaches. It is imperative that we investigate the combined impacts of pollutants on wildlife throughout their lifecycle to get better understanding of the risk posed by these pollutants under real-life conditions. This is crucial to drive conservation efforts and inform policy on facing the growing threat of emerging contaminants such as forever chemicals.

"Novel tools in chemical and biological screening with advances in artificial intelligence mean that we can understand the complex interactions among chemicals in the environment. Revising current methods for assessing environmental toxicity is therefore not only possible but imperative."

Norwegian clean-tech group Ocean Oasis will turn seawater into freshwater using renewable wave power to address water scarcity issues on the Canary Islands. Situated off the west coast of Africa, the islands in the archipelago face serious water shortage problems, putting pressure on already depleted water resources. As such, businesses and communities on the island have become much more dependent on sea water desalination for freshwater. The consortium's DESALIFE (Desalination for Environmental

Sustainability And LIFE) project will test and validate Ocean Oasis' wave-powered solution providing desalinated water from floating buoys in deep water off the coast of Gran Canaria.

Floating desalination buoys will increase the volume of affordable and sustainable freshwater available to the local population and farmers in the north region of the island. A pilot buoy, Gaia, has been employed already to validate the technology at a site offshore the Port of Las Palmas, made possible by co-funding from the European Innovation Council Accelerator, Innovation Norway and other funders.

Creating accessible and abundant water

DESALIFE's consortium aims to have the first pre-commercial buoys producing fresh water by mid-2026.

Kristine Bangstad Fredriksen, CEO and Co-Founder of Ocean Oasis, said: "At Ocean Oasis we believe that by harnessing the power of renewable energy, such as wave power, we have the potential to create a future where clean water is accessible and abundant, not scarce. We are honoured to lead the DESALIFE project consortium to deliver renewable powered desalinated water, with zero emissions, to Gran Canaria. This first-of a-kind project will demonstrate our solution for the Canary Islands, and the potential to deliver freshwater to other coastal areas and island nations facing water scarcity."

Ocean Oasis' technology addresses the challenges associated with access to affordable and clean freshwater. More than 300 million people rely on desalination of seawater for their water supply, a number that is expected to double by 2030 due to climate change, droughts, increasing populations and urbanization.

Incorporating innovative systems

The north coast of Gran Canaria was chosen for its wave potential, operating conditions and proximity to existing onshore desalination facilities. The local population currently relies on three desalination plants for drinking water. One of those, the Arucas-Moya seawater desalination plant will contribute to the implementation and operation phases of the DESALIFE project by integrating the offshore freshwater produced by the desalination buoys with its own production. As a result, the facility will increase production by 2,000 m3/day on average, the equivalent of the daily consumption of 15,000 people. This will be achieved without the need to expand the existing on shore plant, or increase its energy consumption, CO2 emissions or its brine discharge from shore. The Councilor of Territorial Policy, Territorial Cohesion and Water of the Government of the Canary Islands, Manuel Miranda, highlighted the values of the project, which he said, "combines solutions to address the increasing water production demand in the Islands with an environmentally friendly alternative".

Miranda added that the proposal is "aligned with the collaboration between diverse institutions to incorporate innovative systems to the water cycle in the Archipelago, already a pioneer when searching for formulas for obtaining fresh water". "The Government of the Canary Islands will continue to focus on evaluating how systems can be incorporated to not only provide greater production efficiency but also allow further deepening on measures contributing to mitigate climate change," said Councilor Miranda.

Norwegian offshore industry experience

Ocean Oasis'buoys produce freshwater using membrane-based desalination technology powered directly by wave induced motion, with no need for grid power, any emissions to the atmosphere and without chemicals on board. The technology has been developed for sustainable use of the oceans drawing on 50 years of experience and knowledge development in the Norwegian offshore industry. Dr. Thomas B. Johannessen, CTO, co-founder and inventor of the technology commented: "We are grateful and feel privileged to be given this opportunity to take the Ocean Oasis technology to the next commercial level. Wave power is abundant, and a concentrated energy form compared with solar and wind power. Whereas the power of the waves must be treated with respect in engineering and design of offshore structures, the pilot testing carried out to date suggests that direct desalination is a very good way to utilise wave energy bypassing many of the challenges associated with electricity production by wave power."

The DESALIFE consortium received nearly €6 million in funding from the European Executive Agency on Climate, Infrastructure and Environment (CINEA) under its framework of Circular Economy and Quality of Life Programme. The project will be led by Ocean Oasis Canarias, a subsidiary of Ocean Oasis, which is based in Gran Canaria. The Consortium include key institutional and private partners: The Canary Islands Institute of Technology (ITC), The Oceanic Platform of the Canary Islands (Plataforma Oceánica de Canarias, PLOCAN), The Group for the Research on Renewable Energy Systems (GRRES) of the Universidad of Las Palmas de Gran Canaria (ULPGC) and elittoral, an environmental consultancy specialized in coastal and oceanographic engineering.

A commitment to renewable energy

Miguel Hidalgo, vice president of the Gran Canaria Island Water Council, stated: "The participation of the Gran Canaria Island Water Council in the DESALIFE project, within the scope of insular hydrological planning, represents a strong commitment to promoting and developing reference projects aimed at harnessing renewable energy resources, such as wave energy."

It is also a central objective in the project to investigate the scalability of the technology to provide fresh water to other islands in the archipelago, which are also experiencing water scarcity issues. Once operational, the buoys will facilitate the transition toward a sustainable, energy-efficient and climate-resilient economy in the archipelago. They will also demonstrate that the solution has potential for use in other coastal communities, to provide emission-free, cost-effective sources of fresh water.

NX FILTRATION SUPPLIES MEMBRANE MODULES TOKINDASA WATER SERVICES CO WATER TREATMENTPLANT IN SAUDI ARABIA

NX Filtration received new orders to supply its HYDRAcap ultrafiltration modules to KWS' largest water treatment plant, located in Jeddah, Saudi Arabia. Upon delivery in December 2024, all of the existing modules in this plant will have been replaced by NX Filtration's technology, representing more than 800 modules and boosting capacity to 65 million liters per day (MLD). This is further strengthening KWS' ability to provide clean and sustainable water solutions in the region.

This collaboration underlines NX Filtration's commitment to addressing the challenges of water scarcity and promoting sustainable water management. Our innovative membrane filtration technology will play a key role in improving water quality in one of the world's most arid regions.

"Collaborating with NX Filtration on this important project will significantly boost our ability to provide sustainable water solutions," said Ashraf Alsheikh Khalil –Operation Director at Kindasa Water Services Co. "Initial deliveries last year boosted our confidence and enthusiasm about NX Filtration's products, and we are happy our operations will soon fully run on their modules."

"We are excited to work with Kindasa Water Services Co to help advance their water treatment capacity," said Rick te Lintelo, Sales Director at NX Filtration."This project reflects our shared vision of delivering high-quality and safe drinking water to communities in need."

About Kindasa Water Services Co

Kindasa Water Services Co is a water treatment and distribution company based in Jeddah, Saudi Arabia, specializing in the desalination and distribution of potable water.

As the first private water supply company in the region, KWS continues to lead the way in providing sustainable water solutions.

About NX Filtration

NX Filtration is a provider of direct nanofiltration membrane technology for producing pure and affordable water to improve quality of life. Its direct nanofiltration technology removes micropollutants (including pharmaceuticals, medicines, PFAS and insecticides), colour and selective salts, but also bacteria, viruses and nanoplastics, from water whilst offering strong sustainability benefits.

For further information on NX Filtration please visit www.nxfiltration.com.

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BENTLEY SYSTEMS ANNOUNCES WINNERS OF THE 2024 GOING DIGITAL AWARDS

VANCOUVER (Bentley Systems' Year in Infrastructure 2024), October 10, 2024 – Bentley Systems, Incorporated (Nasdaq: BSY), the infrastructure engineering software company, today announced the winners of the 2024 Going Digital Awards. The annual awards honor the extraordinary work of infrastructure professionals and their innovative use of Bentley software to improve the way infrastructure is designed, built, and operated.

This year, 250 projects were nominated by organizations in 36 countries. Winners were selected from among 36 finalists in 12 categories by a panel of independent judges during Bentley's Year in Infrastructure event, held October 8 and 9 in Vancouver, Canada.

"This year, we received an impressive variety of submissions for the Going Digital Awards from users across the globe, showcasing groundbreaking projects that exemplify the future of infrastructure," said Kristin Fallon, chief marketing officer at Bentley Systems. "Today, we celebrate the extraordinary achievements of our finalists and winners. These visionary teams demonstrate the power of going digital across the infrastructure lifecycle to improve project delivery and asset performance."

2024 GOING DIGITAL AWARDS WINNERS

Bridges and Tunnels
- JMT – Digital Experience for I-95 Rappahannock River Crossing Construction Project.

Construction
- Proicere Ltd. – SPRS Retreatment (SRP) Sellafield.

Enterprise Engineering
- Mott MacDonald and HDR – Ontario Line.

Facilities, Campuses, and Cities
- China ENFI Engineering Co., Ltd. – Digital Construction Project of Comprehensive Waste Management Facilities in Xiong'an New Area.

Process and Power Generation
- PowerChina Zhongnan Engineering Corporation Limited – Shandong Energy Group Bozhong Offshore Wind Farm Site A Project.

Rail and Transit
- SPL Powerlines UK – Midland Main Line Electrification.

Roads and Highways
- Department of Public Works and Highways (DPWH) – Digital Twin Implementation for NLEX-SLEX Connector Road Project.

Structural Engineering
- Hyundai Engineering – New Physical Modeling Method for Plant Steel Structures Using STAAD API.

Surveying and Monitoring
- Water Supplies Department – Digital Twin of the Ex-Sham Shui Po Service Reservoir.

Subsurface Modeling and Analysis
- Spark and WSP – North East Link Central Package.

Transmission and Distribution
- Southwest Electric Power Design Institute Co., Ltd. of China Power Engineering Consulting Group – Butuo ±800-kV Converter Station.

Water and Wastewater
- Companhia de Saneamento Básico do Estado de São Paulo – Sabesp – Integra 4.0

Founders' Honors
During the event, Bentley also recognized 16 projects with Founders' Honors. Chosen individually by Bentley Systems' founders, Founders' Honors are presented to a small number of exemplary projects, individuals, and organizations that reflect the company's mission of advancing the world's infrastructure for better quality of life.

The 2024 Founders' Honors recipients are:

- Qk4, Inc. – Going Digital Survey with Bridging Kentucky
- Tecne Systra-Sws Advanced Tunneling Srl – Digital Implementation in Tunnel Assessment and Rehabilitation
- Guangdong Airport Authority – Digital Innovation Application of Guangzhou Baiyun International Airport Phase III Expansion Project
- MCC Capital Engineering & Research Incorporation Limited – Integrated Application of BIM Technology in the Design, Construction, Operation and Maintenance of the World's First Hydrogen Metallurgy Engineering Demonstration Project
- Monir Precision Monitoring – 31 Parliament Street Urban Infrastructure and Excavation Shoring Monitoring
- Greenman-Pedersen Inc. – Brooklyn Bridge - Montgomery Coastal Resilience
- Arcadis – Cambridge South Infrastructure Enhancements
- Communaute d'Agglomeration Pau Bearn Pyrenees (CAPBP) – The Multipurpose Urban Digital Twin of Communaute d'Agglomeration de Pau Bearn Pyrenees
- PT Wijaya Karya – Nusantara Road and Highway Connectivity, New Capital City of Indonesia
- PT SMG Consultants Indonesia – Transformative Innovations in Southeast Sulawesi Nickel-Cobalt Exploration
- University of Canterbury – Incorporating Visible Geology and Leapfrog into undergraduate university courses
- Macquarie Geotechnical – Subsurface reality modelling for enhanced insight
- Exo Inc. – Evergy Power Transmission Structure Stabilization
- PUB, Singapore's National Water Agency – High Fidelity Digital Twin-Enabled Anomaly Detection and Localization in Singapore
- Maynilad Water Services Inc. – Network Design using OpenFlows WaterGEMS for Distribution of Direct Potable Reused Water at Parañaque City, Philippines
- Dublin Fire Brigade – Digital Twins for Emergency Response (DTER)

More information about Bentley's 2024 Year in Infrastructure and Going Digital Awards, visit our website.

Detailed descriptions of all nominated projects will be included in Bentley's 2024 Infrastructure Yearbook, which will be published in early 2025. Past yearbook editions, visit our website.

About Bentley Systems

Bentley Systems (Nasdaq: BSY) is the infrastructure engineering software company. We provide innovative software to advance the world's infrastructure – sustaining both the global economy and environment. Our industry-leading software solutions are used by professionals, and organizations of every size, for the design, construction, and operations of roads and bridges, rail and transit, water and wastewater, public works and utilities, buildings and campuses, mining, and industrial facilities. Our offerings, powered by the iTwin Platform for infrastructure digital twins, include MicroStation and Bentley Open applications for modeling and simulation, Seequent's software for geoprofessionals, and Bentley Infrastructure Cloud encompassing ProjectWise for project delivery, SYNCHRO for construction management, and AssetWise for asset operations. Bentley Systems' 5,200 colleagues generate annual revenues of more than $1 billion in 194 countries.

For more information, contact:
Bentley Press: Chris Phillips, PR@news.bentley.com
Bentley Investors: Eric Boyer, ir@bentley.com

ROTORK ENHANCES DATA COLLECTION WITH INDUSTRIAL ETHERNET

Rotork is excited to introduce its fully integrated ethernet actuator, which is compatible with EtherNet/IP Modbus TCP and PROFINET protocols.This innovative technology marks a significant leap forward in industrial automation, offering unprecedented data connectivity, speed, and operational efficiency.

With the introduction of Rotork's integrated Ethernet solution, a data gateway is no longer required, enabling a direct, streamlined connection to Rotork's intelligent IQ3 Pro actuator. This reduces complexity and increases the volume and speed of data extraction, with transfer rates up to 100 Mbps.

The solution is also housed within a robust weatherproof or explosionproof enclosure and supports RJ45 and M12 connection standards. Compatibility extends to industry-standard protocols, with PI certification, GSDML files for PROFINET, and ODVA certification with supporting EDS files for EtherNet/IP.

Data is key to operational excellence in the era of Industry 4.0. The new Ethernet solution from Rotork accelerates data transfer and enhances the capability for in-depth data analysis. By leveraging the Rotork Intelligent Asset Management (iAM) cloud-based system, operators can unlock powerful insights from their operational data. This enables predictive maintenance, optimised performance, and informed decision-making, driving productivity and reducing downtime.

Darren Silverthorn, Rotork& #39;s Product Manager for electric actuators, commented, "We understand the critical role that data plays in today's industrial landscape. Our new Ethernet solution not only simplifies connectivity but also enhances the capacity for real-time data analysis, empowering our customers to operate with greater precision and efficiency."

This feature underscores Rotork's commitment to delivering reliable, durable products that perform under the most demanding conditions.

About Rotork

Rotork is a market-leading global provider of mission-critical flow control and instrumentation solutions for oil and gas, water and wastewater, power, chemical process and industrial applications. We help customers around the world to improve efficiency, reduce emissions, minimise their environmental impact and assure safety.

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BNOVATE UNVEIL NEW BACTOSENSE PRODUCT PORTFOLIO FOR ADVANCED WATER QUALITY MONITORING

bNovate Technologies SA has launched its new BactoSense product portfolio, featuring three innovative models: BactoSense CORE, BactoSense SMART and BactoSense PURE, as well as the new Active Cells - UV cartridge.

The new versions of its automated analysers for online microbiological monitoring of water represent a significant advancement in water quality management, offering tailored solutions to meet the unique challenges of numerous industries.

The BactoSense portfolio is built on proven flow cytometry technology, enabling precise and online counting of bacteria in water in just 20 minutes. Fully automated and capable of continuous analysis, BactoSense units provide near real-time monitoring of microbiological changes in water, alerting users in the event of anomalies. This ensures proactive water quality management, enhancing safety and efficiency across different sectors.

BactoSense CORE, known as the Watchdog, allows drinking water and utility companies to ensure water safety and optimise treatment processes. With its automatic restart, multiple connectivity options and threshold alarm capabilities, BactoSense CORE offers an early warning system to detect abnormalities, enabling data-driven decisions and proactive interventions.

For industries focused on advanced data analysis and process optimisation, such as Food and Beverage (F&B) and industrial water applications, the BactoSense SMART, aka the Explorer, offers unique features such as forward scatter, audit trail and user management functionalities. This model is designed to improve process efficiency, reduce downtime and provide faster results through advanced automation.

BactoSense PURE, the Protector, is designed to meet the stringent requirements of the pharmaceutical, cosmetics, medical and semiconductor industries. It provides unmatched security for pure water generation, storage, distribution and disinfection systems with its compliance to 21 CFR FDA Part 11 and primary validation as per Ph. Eur. 5.1.6. It serves as a risk management and compliance tool, maximising savings and enhancing brand trust.

At the heart of BactoSense technology lies an innovative cartridge system designed for safety, convenience and sustainability. The cartridges contain all reagents and liquids necessary to count bacteria in water. They require no manipulation or contact with chemicals and their waste. Integrated with flow cytometry technology, they offer unparalleled ease of use and reliability. In addition to the already available Total Cells and Intact Cells cartridges, the new Active Cells - UV cartridge is an industry breakthrough allowing validation of UV disinfection. This new cartridge measures bacteria with metabolic activity. The Active Cells - UV cartridge offers great durability and long autonomy, lasting up to 700 measurements. Beyond innovative technology, bNovate Technologies offers comprehensive support to accompany its BactoSense solutions. Experienced and knowledgeable technicians provide global support through local partners, including remote technical support, software updates, breakdown repairs, installation support, end-user training and more.

About bNovate Technologies
bNovate Technologies SA, a multi-award-winning company, is a game-changing leader in water monitoring and analysis. It propels industrial microbiology into the digital age with rapid, automated solutions for the global water, F&B, pharmaceutical, cosmetics and semiconductor industries. Its solutions are powered by proprietary technology and deliver high-value microbial water quality data for efficient, sustainable water management. Trusted by water professionals across Europe, bNovate is rapidly expanding worldwide.

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TOWARDS SUSTAINABLE DESALINATION

Dr Mayur J. Kapadia
Former AGM, Quality Control Dept, GNFC Ltd, Bharuch, Gujarat – TC Member & Resource Person, BIS-Trainer, Technical Writer, Book Editor.

As the world's population grows, the number of people facing water scarcity is on rise. Some estimates indicate that the number of people experiencing water shortages could be almost 60 percent within 2-3 years' time. While 97 percent of the world's water lies in oceans, seawater desalination has been gaining importance and domination in efforts to alleviate water stress across the globe. Countries like Maldives, Malta and the Bahamas meet all their water needs through the desalination process. Saudi Arabia gets about 50 per cent of its drinking water from desalination. More than 21,000 desalination plants are operating in more than 175 countries. The process of desalination is, however, expensive, time consuming and complex. At most desalination plants, electrical energy accounts for about 35 to 40 percent of total operating costs, which is why sustainable, energy-efficient desalination is at the forefront of discussion and research for developing clean water technologies.

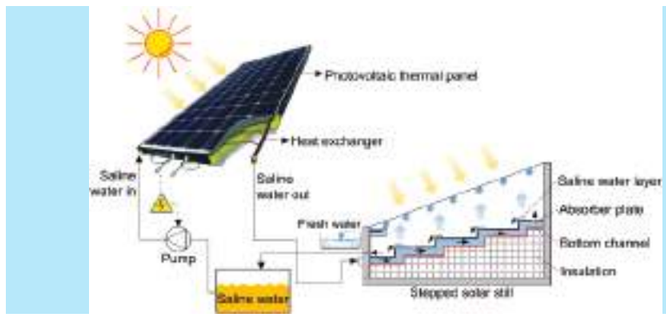
It is also important to understand and monitor the impact of the rapidly growing number of desalination plants on the environment as the toxic brine, generated as a by-product of desalination process, can degrade coastal and marine ecosystems unless treated. As a general rule, every litre of potable water produced by way of desalination process leads to generation of 1.5 litres of brine, which harbours significant amounts of chlorine and copper, which are employed during pretreatment of the sea water prior to desalination. When pumped back into the ocean untreated, the toxic brine depletes oxygen and impacts organisms along the food chain. This can harm organisms living on or in the bottom of a water body and translate into observable effects throughout the food chain.

CHALLENGES AND OPPORTUNITIES

Brine production and high-energy consumption are key downsides of desalination. Disposal of toxic brine is both costly and associated with negative environmental impacts. On a more positive note, many desalination plants are in areas with plenty of sunshine where solar power can provide a more sustainable energy solution. Another positive point is that there are several economic opportunities associated with brine, such as recovery of commercial salt, metals, use of brine in fish production systems, etc.

SUSTAINABLE DESALINATION TECHNOLOGIES

Desalination technologies are classified according to the energy source employed in the process, specifically through thermal, mechanical, electrical, membrane-based or hybrid means. The consumption of huge amount of energy underscores the importance of developing a clean-energy driven desalination protocol across the globe. It is imperative to focus on advancing the utilization of low-grade energy sources to make the desalination process a sustainable one. It is also necessary to leverage the integration of renewable energy with desalination methods. Given the fast growth of global desalination capacity, development of clean-energy driven, energy-efficient freshwater generation, particularly seawater desalination, is more urgent than ever nowadays.



Photovoltaic – Membrane Desalination system : To generate both energy and water using a renewable energy process, a system is developed that captures heat shed by solar panels to generate clean drinking water. In this Photovoltaic – Membrane Distillation system, the Membrane Distillation component is attached directly onto the backside of commercial Photovoltaic panels and the heat produced by the Photovoltaic panels flows into the Membrane Distillation component naturally.

Solar power generation by photovoltaics occupies the

change. Photovoltaic panels are generally over-heated during daytime, especially in arid and semi-arid regions where solar irradiation is high.

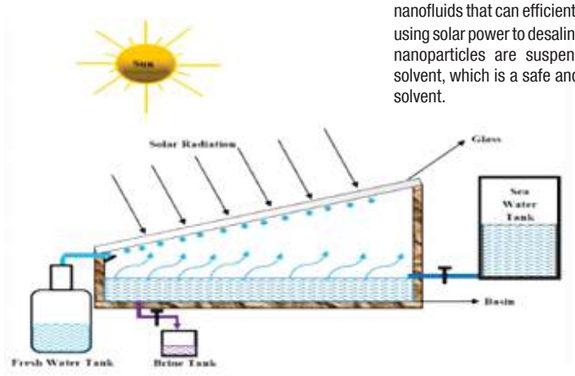
Therefore, there is a huge amount of heat produced and wasted on Photovoltaic panels daily. The extra heat generated from Photovoltaics panels is turned into a power source to drive a multistage membrane distillation process to produce fresh water from seawater. While the heat flows through the multistage Membrane Distillation, the latent heat from vapor condensation is collected and reused to drive multiple cycles of water evaporation, leading to a high freshwater production rate.

The beauty of this system is that the water desalination process is undertaken on the backside of the Photovoltaic panel, hence the membrane distillation does not affect regular electricity generation by Photovoltaic panels, thus achieving simultaneous and efficient generation of electricity and fresh water on the same panel. Both the processes — electricity generation and water desalination — are solely driven by solar energy.

Use of battery materials : While solar energy can bring desalination processes forward in their quest to obtain sustainability, use of battery materials could also help alleviate some of the energy-efficiency issues in the desalination process. Devices developed for this purpose involve deionization devices, which can reversibly store and release cations using intercalation materials-a class of materials commonly used for rechargeable batteries.

This type of system uses battery-type materials to absorb and release ions from water in the desalination process at a much faster rate. The rate of salt removal in this type of development is higher by manyfold in comparison to conventional cation intercalation desalination. The use of such materials has the potential to reduce the environmental burden of desalination by leveraging the very high ion concentrations that are achievable inside of these solid materials. In principle, this high degree of ion storage can be used to get high water recovery in desalination, thus producing minimal brine that requires disposal or further treatment.

Use of solar energy : Desalination plants have a high carbon footprint that releases approximately 7 tonnes of carbon dioxide for the desalination of 1,000 cubic metres of seawater. In an effort to mitigate this impact, solar energy is increasingly being utilised for treating seawater. Solar-powered distillation systems are developed to reduce the salinity of the groundwater. This system utilises a solar panel to heat water through a solar panel, distills it, removes the salts and condenses the vapours to form purer water.



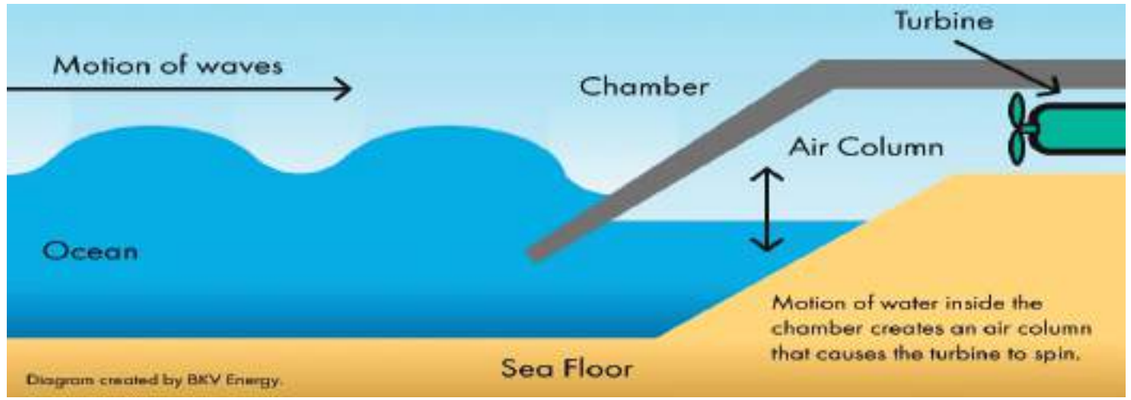
Another development involves novel heat transfer nanofluids that can efficiently transfer heat generated using solar power to desalination systems. In this, the nanoparticles are suspended in a deep eutectic solvent, which is a safe and environmentally friendly solvent.

Better management of brine disposal : In order to curtail adverse effects of brine disposal onto aquatic life of sea, brine outfall system is equipped with diffusers to reduce brine release and disperse the high salt concentration to a larger area.

Low temperature thermal distillation technology is another approach to reduce brine release.

Zero liquid discharge (ZLD) : ZLD is gaining traction in the sector of sustainable desalination. It effectively closes the water loop with no eventual discharge of brine. It is gaining traction in several industries such as textiles, pharmaceuticals, food and beverages, chemicals and petrochemicals, and paper and pulp.

Ocean wave energy: Use of ocean wave energy to power desalination plants is expected to aid to sustainable desalination. An ocean wave is energy in motion through water. This energy, in the form of kinetic or potential energy, can be harvested using wave energy converters, or WECs. Wave Energy Converters (WECs) convert wave power into electricity, which can be employed for operating desalination plants.



CONCLUSION

Advances continue to be made in desalination technology, especially incorporating “smart” applications. Smarter systems designed to detect, anticipate, and manage desalination issues before they become significant problems, as well as improvements in process control, monitoring, and response, have the potential to enhance day-to-day operations.

The integration of renewable energy sources, such as solar and wind, into desalination processes can significantly reduce the carbon footprint, making these systems more environmentally friendly and economically viable. Furthermore, advancements in materials science and engineering are paving the way for more efficient membranes and processes, which can lower energy consumption and operational costs. Embracing sustainable water desalination not only addresses immediate water needs but also promotes resilience against future water challenges. By prioritizing sustainability, we can secure a brighter, water-abundant future for generations to come.

ABOUT THE AUTHOR

Dr Mayur J Kapadia, MSc, PhD, former Add General Manager & Laboratory Head of GNFC Ltd, Bharuch, possesses professional industrial experience of 4 decades in the fields of Quality Control, New Laboratory Set up, Cooling Water Management, ISI certification, Technical Education, Research, Waste Water Treatment, Supplier development, Cost Reduction and Administration. His technical articles on ‘Water Sector’ have been regularly getting published in magazines. He also has co-edited a book published by Elsevier’. He is an active member as well as a ‘Resource Person’ of Bureau of Indian Standards (BIS). He has been rendering technical services to various organizations for quality improvement, new product development, process trouble-shooting, analytical aspects, publications and training purposes. He has also been providing full day formal classroom training to industry professionals in the fields of Quality Improvement, Water / Air analysis, Instrumental methods of analysis, NABL, BIS certification, Cooling Water Treatment, Boiler Water treatment and other areas.

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3 THINGS TO KNOW ABOUT DEIONIZED WATER

Veolia Water Technologies

In precision-driven industries where quality is non-negotiable, deionized water plays a vital role. Unlike readily available tap water, it undergoes a rigorous purification process, removing dissolved minerals and salts to achieve exceptional purity. This meticulously treated water supports diverse industries, enabling manufacturers to produce cutting-edge technologies and safeguard product integrity.

Here are three interesting insights on the unique properties of deionized water:

1. Demystifying the Transformation

Deionized water is water that has been stripped of its conductive constituents, rendering it electrically neutral and chemically inert. This is achieved by running water through ion exchange resins which act as microscopic magnets, selectively attracting and capturing dissolved minerals and salts in the water.

Why deionize? Though inconsequential for everyday uses, the presence of dissolved ions in tap water can pose significant challenges in industrial applications. They can disrupt sensitive chemical reactions, corrode vital equipment, and compromise product quality. Stripped of disruptive mineral interferences, deionized water forms a predictable and dependable base for a variety of high-precision applications.

2. Purity with Nuance

While both deionized and distilled water strive for the crown of purity, their paths diverge. Distillation relies on the age-old art of boiling, capturing the pristine steam that condenses into pure water, leaving behind a concentrated broth of minerals. Deionization, on the other hand, employs the finesse of ion-hungry resins, directly extracting the offending ions.

Production methods: Distillation demands significant energy expenditures, while deionization often boasts a gentler footprint.

However, deionized water possesses a thirst for atmospheric carbon dioxide, leading to slight acidity over time. Distilled water, on the other hand, maintains its neutral stance.

Technology's guiding hand: Both processes have thrived under the watchful eye of technological advancements. Modern deionization systems utilize sophisticated mixed-bed resins for enhanced ion removal, while real-time monitoring ensures consistent water purity.

3. Purity Reigns Supreme

Deionized water is essential in many industries outside of sterile laboratories, powering progress and safeguarding quality. Some examples include:

- Semiconductor fabrication: In the intricate world of chip manufacturing, deionized water is used extensively for cleaning and rinsing electronic components, circuit boards, and other sensitive parts, washing away contaminants, oils, and particles that would threaten the performance and reliability of the electronic devices.
- Food & beverage production: Deionized water is used as an ingredient water to ensure consistent water quality as this can alter the taste, texture, and appearance of the final products.
- Power generation: The use of deionized water in cooling towers and heat exchangers prevents scale formation and corrosion, ensuring boilers and turbines hum efficiently.
- Textile processing: From fabric rinsing to dyeing, deionized water plays a crucial role in removing impurities and residual chemicals to ensure the quality and durability of textiles.
- Chemicals & petrochemicals manufacturing: High-purity deionized water is used in production and formulation as impurities can lead to unwanted chemical reactions or interactions.

EMBRACING THE POWER OF PURITY

Deionized water is more than just pure; it's a critical element in ensuring accuracy, quality, and safety across various industries. Its multifaceted applications, from powering scientific research to ensuring the efficacy of life-saving medicines, showcase its undeniable significance.

Veolia Water Technologies, a leader in water treatment solutions, recognizes the vital role deionization plays in various sectors. The company's Service Deionization offering provides customized solutions tailored to specific purity requirements and operational needs. With expertise in resin selection, system design, and ongoing maintenance, Veolia ensures a reliable and cost-effective supply of deionized water for clients across China, Malaysia, Singapore, and Thailand.

To find out more about Veolia's Service Deionization solutions, please visit:
www.veoliawatertechnologies.com/asia/en/solutions/services/service-deionization
or email: marcom.apac@veolia.com.

ABOUT VEOLIA WATER TECHNOLOGIES

Veolia Water Technologies provides the complete range of services required to design, deliver, maintain, and upgrade water and wastewater treatment facilities and systems for industrial clients and public authorities. The company's extensive portfolio of technologies features everything from online diagnostic solutions to evaporation and crystallization, energy-producing sludge treatment, state-of-the-art desalination, laboratory-grade water and mobile water services. By optimizing both processes and monitoring, Veolia Water Technologies helps clients reduce their water footprint while generating considerable savings in energy and chemical consumption.

www.veoliawatertechnologies.com

RETHINKING WATER: GREY WATER AS A SUSTAINABLE SOLUTION FOR A PARCHED PLANET

Dr Kunal Trivedi, Mr Amit Kumar, Mr Chandrashekhar Kubal and Dr Hiten Mehta
Grasim Industries Limited

INTRODUCTION:

In a world grappling with climate change and the pressures of an ever-growing population, our approach to water demands a complete transformation. The days of a wasteful, "use-once-and-discard" mindset must end as global water scarcity intensifies. Our future relies on innovative strategies to maximize every drop of water. Amid this need, grey water emerges as a beacon of hope—an opportunity to conserve fresh water through resourceful reuse. Grey water, consisting of the gently used water from showers, sinks, and washing machines, is often funneled down the drain, disregarded as waste. However, treating and reusing grey water offers a sustainable oasis amid increasing water scarcity.

Adopting grey water reuse for applications such as irrigation, toilet flushing, and more goes beyond practicality; it signifies a shift in our relationship with water. It's about closing the loop and transforming our homes and buildings into miniature ecosystems of conservation and resourcefulness. Effective treatment of grey water, involving a combination of physical and chemical processes, enables us to redefine water's journey and purpose in our lives.

Grey water treatment typically involves techniques like screening, sedimentation, chemical processes (coagulation and flocculation), Moving Bed Biofilm Reactor (MBBR) technology, Sequencing Batch Reactor (SBR) processes, followed by settling, filtration, and ultrafiltration. Among these, coagulation-flocculation stands out as a critical step for sewage and grey water treatment, removing impurities and preparing water for further stages of purification.

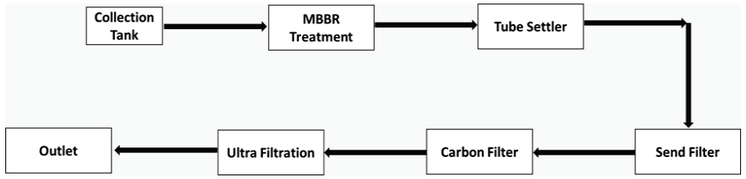

Figure 1: Current treatment scheme in STP.

VYTAL: GRASIM INDUSTRIES' INNOVATIVE APPROACH TO GREY WATER TREATMENT

Grasim Industries is emerging as a leading supplier of water treatment chemicals under its "VYTAL" brand, dedicated to providing effective solutions to various industries. In this case study, we explore the efficacy of Vytal 710 and 610, specially formulated composite coagulants designed for grey water treatment.

In a real-world application, approximately 135 cubic meters of grey water is treated daily at the sewage treatment plant of Raheja Vivarea, Tower E, in Mahalaxmi, Mumbai. The treatment process involves multiple stages, as shown in Figure 1, including disinfection with sodium hypochlorite prior to ultrafiltration. The resulting treated water is repurposed for plantation irrigation, car washing, and other non-potable uses, demonstrating a practical solution to urban water management.

PROBLEM STATEMENT:

The current treatment scheme is proving ineffective due to contaminants such as paint derivatives, cement, plaster of Paris (PoP), and asbestos, which hinder the performance of the MBBR and downstream systems. These impurities result in discoloration of the treated water, rendering it unsuitable for further applications.

OBJECTIVE:

To reduce color, cement, PoP and asbestosis impurities before MBBR treatment. Chara cterization of sewage water collected from sewage reatment plant and tested for different parameters as shown in below Table 1.

Sr. No.	Parmameters	Remark
1.	pH	7.90
2.	Turbidity, NTU	179
3.	Total Organic Carbon (TOC), ppm	62
4.	Total dissolved solids, ppm	276
5.	Chemical oxygen demand, COD, ppm	200
6.	Color, APHA	312

Table 1: Characterization of sewage water.

MATERIAL AND METHOD:

Vytal 710 and 610 is designed based on hypothesis. The product is used for chemical treatment i.e. coagulation and flocculation. It gives synergistic impact when used with secondary and tertiary treatment and helps to reduce overall operating cost of treatment of effluent as compared to secondary and tertiary treatment. This product can be used as such or diluted. Jar test was conducted on site for selection and optimization of right product. Jar test condition were taken as per Table 2. Based on the different trials, specialty solution Vytal 710, 610 (as coagulant) followed by Vytal 971 (as flocculent) developed for effective removal of suspended solids, separation of paint and other impurities.

RESULTS AND DISCUSSION:

Dosage of Vytal 710 and Vytal 610 optimized using jar test to get the best result in terms of reduction in turbidity, color, COD and TOC as shown in Table 3 and Figure 2

Stage	Process	Speed(rpm)	Minutes
1	Rapid mixing	200	2
2	Slow mixing (Flocculation)	40	4
3	Sedimentation	0	20

Table 2: Jar Test Condition

Figure 2: Photo of treated and untreated water.

Sample	Dosage ppm	Vytal A-971	Turbidity	pH	COD (ppm)	TDS (ppm)	TOC (ppm)
Inlet	-	-	179 NTU	7.90	200	276	61.86
Vytal 610	150	1ppm	5.0 NTU	7.30	56	298	24.59
Vytal 710	100	1ppm	7.0 NTU	7.40	56	267	23.49

Table 3: Jar Test Results

CONCLUSION:

The Grasim dual-chemical system, utilizing Vytal 710, Vytal 610, and A 971, proved highly effective in treating grey water effluent. Key achievements included over 95% reduction in turbidity and more than 70% reduction in COD, with minimal impact on pH levels. The system also demonstrated operational ease and enhanced performance of downstream processes, including MBBR, pressure sand filtration, carbon filtration, and ultrafiltration, making it a robust and efficient solution for grey water treatment.

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Mr Chandrashekhar Kubal

Mr Chandrashekhar Kubal is a veteran in the filed of water treatment with many accolades and 4 decades of filed experience.

RECENT TECHNOLOGIES FOR DESALINATION OF WATER

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Water is often taken for granted, yet for many around the globe, it is a precious and increasingly scarce resource. As populations grow and climate change disrupts traditional water cycles, the availability of fresh water is becoming a critical concern. The World Health Organization reports that over 2 billion people live in countries experiencing high water stress. In response, the world is turning to the ocean, which covers over 70% of our planet, as a vast and largely untapped source of fresh water through the process of desalination. Desalination, the process of removing salt and impurities from seawater to produce fresh drinking water, has emerged as a vital solution in regions where freshwater is scarce. Countries like Saudi Arabia and Israel have long relied on desalination to meet a significant portion of their water needs, with Israel deriving about 55% of its domestic water from desalinated sources. Globally, the desalination market has grown rapidly, with over 20,000 desalination plants now in operation, producing nearly 100 million cubic meters of desalinated water each day. However, despite its promise, traditional desalination methods are not without challenges. The energy-intensive nature of the process, coupled with environmental concerns such as the disposal of brine—a byproduct of desalination—limits its broader adoption. As a result, there is a growing need for innovative technologies that can make desalination more efficient, sustainable, and accessible.

In this article, exploration of the latest breakthroughs in desalination technology, examining how new methods are addressing the limitations of traditional approaches. From harnessing solar energy to creating electricity-free systems, these innovations promise to unlock new possibilities for securing the world's freshwater future.

CHALLENGES IN TRADITIONAL DESALINATION METHODS

Traditional desalination methods, such as reverse osmosis and thermal distillation, have been the backbone of seawater conversion for decades. However, these methods come with substantial challenges that hinder their widespread adoption and sustainability. One of the most pressing issues is the high energy demand. Reverse osmosis, the most common desalination technique, requires enormous amounts of electricity to push seawater through membranes that filter out salt. This process not only drives up operational costs but also raises environmental concerns, particularly in regions where energy is sourced from fossil fuels. Moreover, the issue of membrane fouling—where contaminants build up on the membranes, reducing efficiency and increasing maintenance costs—further complicates the operation.In addition to energy consumption and fouling, the disposal of brine, the highly concentrated saltwater left over after desalination, poses a significant environmental risk. Discharging brine back into the ocean can harm marine ecosystems, leading to long-term ecological damage. These challenges highlight the need for innovative solutions that can make desalination more efficient, environmentally friendly, and economically viable.

MEMBRANE FOULING

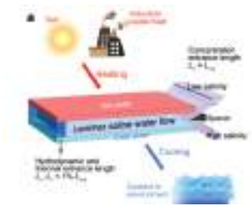
Membrane fouling is one of the most persistent and challenging issues in the operation of reverse osmosis (RO) desalination systems. Fouling occurs when particles, microorganisms, or other contaminants accumulate on the surface of the desalination membranes, leading to a significant decline in system performance. Over time, these deposits can clog the membranes, reducing water flow, increasing the energy required to push water through the system, and ultimately leading to a reduction in the overall efficiency of the desalination process. The impact of membrane fouling extends far beyond just a decrease in performance. Fouling necessitates frequent maintenance, including chemical cleaning and, in severe cases, membrane replacement. This maintenance not only incurs substantial costs but also results in downtime, during which the plant cannot produce fresh water. For instance, the cost of membrane replacement alone can be a significant financial burden, particularly for large-scale desalination plants, which may contain thousands of individual membrane modules.

INNOVATIVE DESALINATION TECHNOLOGIES

As traditional desalination methods grapple with challenges such as high energy consumption and membrane fouling, the search for innovative solutions has become more urgent. New technologies are emerging that promise to overcome these obstacles, offering more efficient, sustainable, and cost-effective ways to turn seawater into fresh, drinkable water. These innovations are not merely incremental improvements but represent a fundamental shift in how desalination can be approached, potentially transforming the landscape of water security. From electricity-free methods that harness natural temperature gradients to advanced solar-powered systems, these technologies are paving the way for a future where desalination is more accessible to all, particularly in regions most vulnerable to water scarcity. As we explore these cutting-edge developments, it becomes clear that innovation is not just a luxury but a necessity in the quest to meet the world's growing water needs.

- **Thermodiffusive Desalination**

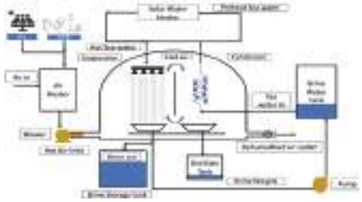
Thermodiffusive desalination represents a groundbreaking advancement in the quest for more efficient and sustainable methods of converting seawater into fresh water. Developed by researchers at the Australian National University, this innovative technique stands out for its simplicity and effectiveness. Unlike traditional desalination processes that rely on complex machinery and energy-intensive operations, thermodiffusive desalination leverages low-temperature heat from the environment, operating entirely in the liquid phase without the need for phase changes or membranes. The core mechanism of thermodiffusive desalination involves passing seawater through a narrow channel that is heated on one side and cooled on the other. This temperature difference causes a separation of water based on salinity, with less saline water migrating toward the warmer side and more saline water toward the cooler side. Through repeated cycles, the salinity of the water is gradually reduced, producing fresh water that meets the needs of agriculture and other critical uses. The absence of a membrane in this process is particularly noteworthy, as it eliminates the common problem of membrane fouling—a significant operational challenge in traditional reverse osmosis systems. This technology's potential extends far beyond just operational efficiency. Its simplicity and reliance on naturally available temperature gradients make it especially well-suited for deployment in regions suffering from severe drought or those with limited access to electricity. For instance, the researchers are already testing the system on the Pacific island of Tonga, where it is powered by a small solar panel. This adaptability and low environmental impact make thermodiffusive desalination a promising solution for providing water security in some of the world's most vulnerable areas. The development of thermodiffusive desalination underscores the importance of rethinking our approach to water purification. By harnessing natural forces in innovative ways, this technology offers a path forward that is not only sustainable but also accessible, addressing both the technical and humanitarian challenges of ensuring a reliable supply of fresh water in an increasingly water-scarce world



- **Solar-Powered Multistage Desalinatio**

One of the most promising innovations in desalination technology comes from researchers at MIT, who have developed a solar-powered multistage desalinati system. This cutting-edge method offers a sustainable solution by utilizing solar energy to drive the desalination process, which could drastically reduce the cost of prod'ucing freshwater, making it even cheaper than tap water. The mechanism behind this technology is inspired by the natural process of thermohaline convection, a phenomenon that occurs in the world's oceans where variations in temperature and salinity drive water circulation. The MIT system replicates this on a smaller scale, using a multistage process that combines evaporation and condensation to separate salt from seawater. The system consists of several stages, each designed to enhance the circulation of water and salt, mimicking the natural convection currents found in the ocean. As seawater flows through these stages, it is heated by solar energy, causing the water to evaporate, leaving the salt behind. The water vapor is then condensed into fresh, drinkable water. This multistage approach not only increases the efficiency of the desalination process but also extends the operational life of the system. By preventing the buildup of salt within the system, which is a common problem in traditional desalination methods, this technology can operate for years without significant maintenance, further reducing costs. The researchers have demonstrated that this system can produce up to 5 liters of freshwater per hour per square meter of solar collection area, making it a viable option for regions with high solar irradiance. The cost-effectiveness of this solar-powered system is particularly noteworthy. Because it relies on solar energy, it eliminates the need for expensive and environmentally damaging fossil fuels. The operational costs are so low that, for the first time, desalinated water could be produced at a cost lower than that of tap water in the United States. This breakthrough has profound implications, especially for regions where access to fresh water is limited by both geographic and economic factors. The system's long lifespan and minimal maintenance requirements make it an attractive option for both developed and developing regions, offering a sustainable solution to the global challenge of water scarcity. By tapping into the abundant energy of the sun, this solar-powered desalination technology represents a significant step forward in the quest for sustainable, affordable, and accessible freshwater. It highlights the potential of innovative approaches to not only address the technical challenges of desalination but also to make it economically viable on a global scale.

- **Electricity-Free Desalination**



In the relentless pursuit of sustainable water solutions, a groundbreaking method developed in collaboration with Shanghai Jiao Tong University has emerged: electricity-free desalination. This innovative approach offers a viable alternative for regions where access to electricity is either limited or prohibitively expensive, addressing one of the most significant barriers to the widespread adoption of traditional desalination technologies. The electricity-free desalination system operates using natural convection processes, a fundamental physical phenomenon where fluid motion is driven by temperature differences. In this system, seawater is heated naturally—often through solar energy—causing it to rise as it becomes less dense. The warmer, less salty water moves to the upper layers, while the cooler, saltier water sinks. This separation of water based on temperature and salinity allows for the gradual reduction of salt content as the water cycles through the system. This natural convection process is not only energy-efficient but also eliminates the need for complex machinery or electrical inputs, making the system highly adaptable to various environmental conditions. The modular design of this electricity-free desalination system is another key advantage. Its simplicity allows for easy scalability, from small, household-sized units to larger systems capable of supplying fresh water to entire communities. This flexibility is particularly important in remote or rural areas where infrastructure is limited, and the need for a reliable, low-maintenance water source is critical. The system's ability to function without electricity also makes it an ideal solution for disaster-stricken areas, where access to power may be disrupted. Moreover, the environmental benefits of this technology are significant. By eliminating the need for electricity, the system reduces carbon emissions and lowers the overall environmental footprint of desalination operations. This makes it a more sustainable option for long-term water management, particularly in regions that are already vulnerable to the impacts of climate change. The potential of electricity-free desalination extends far beyond individual applications. As the global demand for fresh water continues to rise, particularly in developing countries, this technology offers a promising path forward. Its scalability, low environmental impact, and ability to operate independently of the electrical grid make it a critical innovation in the ongoing effort to provide clean, accessible water to al. By reimagining the fundamentals of water purification, the electricity-free desalination method stands as a testament to the

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power of innovation in addressing some of the most pressing challenges of our time. It offers a new horizon in the field of desalination, one that is both inclusive and sustainable, paving the way for a future where fresh water is within reach for everyone, regardless of their location or economic status.

- **Economic Feasibility and Cost Considerations**

When considering the large-scale deployment of innovative desalination technologies, cost remains a critical factor. Traditional desalination methods, such as reverse osmosis (RO), have long been associated with high operational costs, driven primarily by energy consumption and maintenance requirements. The financial burden of these systems often makes them less accessible, particularly in developing regions where budget constraints are a significant concern. In contrast, newer technologies are demonstrating potential for significant cost savings, both in terms of operational expenses and initial investment. Additionally, the absence of membranes in this system reduces maintenance costs, as there is no need for frequent replacements or chemical cleaning. Similarly, the solar-powered multistage desalination system from MIT is designed with cost-effectiveness in mind. By utilizing solar energy, the system eliminates the need for electricity, which is a major cost driver in traditional desalination. The long operational life of this system, coupled with its minimal maintenance needs, further enhances its economic appeal. Researchers estimate that this technology can produce freshwater at a cost lower than that of tap water in the United States, positioning it as a viable solution for both developed and developing markets. The electricity-free desalination method developed in collaboration with Shanghai Jiao Tong University also offers promising economic advantages. This system's ability to operate without electricity not only reduces energy costs but also makes it particularly suitable for deployment in remote or off-grid areas where access to electricity is limited. The modular design of this system allows for scalable deployment, meaning it can be tailored to meet the specific needs and budget constraints of different communities, from small households to large-scale operations. However, the initial capital costs associated with these innovative technologies remain a consideration. While the long-term savings in operational and maintenance costs are significant, the upfront investment required for infrastructure, especially in scaling up production and distribution, can be a barrier. This is where government subsidies, international aid, and private investment become crucial. Programs aimed at promoting sustainable technologies, such as the European Union's Green Deal, can provide the financial support needed to offset initial costs and accelerate the adoption of these advanced desalination methods.

- **Potential Applications and Impact**

As innovative desalination technologies continue to evolve, their potential applications and impact on global water security become increasingly clear. These advancements are not confined to theoretical improvements; they offer practical solutions to some of the world's most pressing challenges. From providing reliable water sources in drought-prone regions to supporting agriculture in arid climates, the applications of these technologies are vast and varied. Moreover, their impact extends beyond mere water production, influencing economic development, public health, and environmental sustainability. In this section, we will explore how these cutting-edge desalination methods can be deployed in various contexts, examining their potential to transform lives, economies, and ecosystems across the globe

- **Securing the Future: Global Water Security**

The promise of innovative desalination technologies extends far beyond the developed world, holding particular significance for developing countries grappling with severe water scarcity. In many of these regions, access to clean, potable water remains a daily struggle, exacerbated by climate change, population growth, and limited infrastructure. For nations facing such challenges, the ability to harness the ocean's vast resources through sustainable desalination could be transformative. These technologies offer a lifeline to communities where traditional water sources are unreliable or entirely absent. For example, in sub-Saharan Africa, where millions of people rely on seasonal rivers or groundwater that is often contaminated, deploying solar-powered or electricity-free desalination systems could provide a consistent and safe water supply. The adaptability of these technologies is crucial; systems like those developed by MIT or in collaboration with Shanghai Jiao Tong University can be scaled to fit the needs of small villages or entire cities, making them versatile tools in the fight against water scarcity. Moreover, the reduced operational costs and minimal maintenance requirements of these advanced systems make them economically feasible for regions with limited financial resources. Traditional desalination methods often require significant investment in both capital and ongoing energy costs, making them less accessible for poorer nations. In contrast, the energy efficiency and sustainability of newer technologies mean that even areas with limited infrastructure can benefit from clean water at a lower cost, without the heavy reliance on external power sources. This is particularly important in regions where electricity is scarce or prohibitively expensive.

- **Nurturing Growth: Agriculture and Industry**

The role of water in agriculture cannot be overstated, particularly in regions where water scarcity directly threatens food security and economic stability. As climate change exacerbates drought conditions and depletes traditional water sources, the need for reliable and sustainable irrigation solutions becomes increasingly urgent. Innovative desalination technologies offer a promising solution to these challenges, providing a steady supply of fresh water that can support agricultural production even in the most arid environments. The potential impact on industry is equally significant. In sectors such as mining, manufacturing, and energy production, where water is a critical input, the availability of desalinated water could ensure continuity of operations even during periods of severe drought. Industries that are currently limited by water availability could expand, leading to job creation and economic growth. Moreover, the ability to use desalinated water for industrial processes could reduce the pressure on freshwater resources, preserving them for human consumption and environmental sustainability. The economic benefits of integrating desalination into agriculture and industry extend beyond mere water supply. The cost savings associated with using efficient desalination technologies, such as those powered by solar energy, can lower the overall expenses of water-intensive operations. This not only makes desalinated water a viable alternative but also an economically attractive one. Furthermore, as these technologies continue to advance and become more affordable, their adoption could drive a broader transformation in how water is sourced and used across various sectors. In summary, the application of innovative desalination technologies in agriculture and industry holds the potential to reshape water use practices in regions facing severe water scarcity. By ensuring a reliable and cost-effective supply of fresh water, these technologies could safeguard food security, support industrial growth, and contribute to economic resilience in some of the world's most vulnerable areas. The broader adoption of these technologies could thus play a crucial role in addressing both current and future water challenges, helping to secure a sustainable and prosperous future for communities worldwide.

CONCLUSION

In conclusion, the potential applications of innovative desalination technologies in disaster relief and emergency use are profound. These systems offer a practical and effective solution to one of the most pressing challenges in disaster management-ensuring that affected populations have access to clean, safe water when they need it most. By integrating these technologies into disaster preparedness and response strategies, governments and aid organizations can significantly enhance their ability to respond to crises, ultimately saving lives and supporting faster recovery.

ABOUT THE AUTHOR

Dr. Pooja is a Microbiologist in Punjab Agricultural University since 2018. She was an INSPIRE National fellowship holder from DST, New Delhi during her PhD and also qualified the ASRB-NET. She was awarded with two Gold medals for her excellence in academics during PhD and M Sc degree. She is currently working on Postharvest management of Horticultural crops along with quality analysis of water, waste water and all types of fresh and processed food products. She is handling researches on Fresh cut fruits and vegetables shelf life extension by the use of disinfection treatments, edible coatings and Modified atmosphere packaging techniques. She is also involved in the use of horticultural wastes for the production of valuable products by fermentation processes. She has published more than 40 publications including research papers, book chapters, review articles and popular articles on various aspects of fermentation, fresh cuts and value added products development.

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DIGITAL TRANSFORMATION IN WATER UTILITY

Ran Kedem,
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BACKGROUND:

Many water utilities around the world have been suffering for years from underinvestment, alongside significant deterioration of the water system due to aging infrastructure and inadequate maintenance.
Today, water utilities face additional challenges, such as increased water consumption coupled with a decrease in water sources due to extreme climatic events, pollution, and inefficient management of existing systems. Additionally, there is a need to enhance control and monitoring of all water systems to ensure a continuous supply of safe drinking water to the entire population. This challenge is even greater in rural and remote areas, where there are additional issues such as resource scarcity, lack of skilled manpower, rising operational costs, and limited budgets.
To address these challenges, it is necessary to focus on two levels: the operational level and the data management level.
At the operational level, we can define five main challenges:

- Intermittent water supply
- Limited maintenance and service levels
- Lack of automation, remote monitoring, and control, resulting in a lack of real-time data
- Delayed response to critical events, causing significant damage and expenses
- Limited or non-existent corporate governance, both at the utility and state/national levels

In terms of data challenges, there was a time when the primary issue was the insufficient data available about the operation within the water network. However, today, the capacity to gather real-time data from the field is virtually limitless. This abundance of information introduces new challenges related to managing this data and utilizing it in real-time to address the operational challenges previously

Draw 1 – Water utilities challenges

mentioned.
The first step in improving the operation of water systems lies in the real-time collection and management of relevant and accurate data from remote facilities. Considering this, the characteristics required of data management systems in water corporations include the following parameters:

- Real-time data collection from all critical sites
- Real-time monitoring and remote control
- Real-time data aggregation
- Real-time data integration
- Real-time data processing
- Real-time data sharing

Additionally, we must address the cyber security challenge due to global threats to strategic facilities, including water systems.

THE DIGITAL TRANSFORMATION CHALLENGE:

Digital transformation is the integration of the physical-operational layer with the digital-informational layer. It involves incorporating Internet of Things (IoT) and cloud computing technologies into an organization to enhance control, safety, efficiency, productivity, and ultimately improve the organization's operations and business outcomes.

Draw 2 – "Must have" requirements from modern information technology system

Without a doubt, digital transformation represents the most significant revolution in the water market since the introduction of control and automation technologies.

In 2016, GWI magazine published a report highlighting that the water and wastewater industry is transitioning to a digital revolution. Digital transformation is a game changer for water utilities, adding value by connecting real-time data, people, and processes.

Draw 3 - Value Creation Connecting in Real-Time Data + People + Processing

However, a recent publication by the SWAN forum stated, "The United States represents the epicentre of the global digital economy, at least in terms of technology development and go-to-market strategies. The U.S. municipal water sector, however, has lagged its peers in other advanced economies" (Smart Water Report, SWAN).

This phenomenon characterizes not only the water companies in the USA but is typical of a considerable part of the water companies around the world. Various studies point to a variety of reasons for this, but all agree on three main factors contributing to the slow adoption of the digital transformation process:

- Cost (construction and maintenance)
- Technological complexity (installation, maintenance, and use) due to a lack of skilled teams
- Information security (especially cyber protection)

To address these challenges and simplify the digital transformation process while ensuring it remains secure and affordable for all, a fifth market segment has been introduced in recent years. This segment offers comprehensive cloud software and IoT hardware solutions that span from the infrastructure level, including communication, up to the ICT and SCADA systems level, and extend to cybersecurity and data analytics. This market segment is developing at a fast pace and is led by RealiteQ". (Frost & Sullivan)

Draw 4 – Holistic platform for water utilities

in this article we will present a case study of implementation of digital transformation in large water utility with decentralized system, using most advanced holistic platform.

CASE STUDY: DIGITAL TRANSFORMATION IMPLEMENTATION IN WATER UTILITY

Background:

The Water Commission of the State of Mexico – CAEM, is a decentralized public entity known as the "State Commission for Water and Sanitation," with its own legal status and assets. Its general purpose is to build, maintain, operate, and manage potable water and sewer systems for the benefit of urban and rural communities in the State of Mexico. Essentially, it is responsible for the distribution of potable water in the State of Mexico and its municipalities, and thus operates specialized facilities for the storage, distribution, and exploitation of potable water wells.

In the second half of 2019, there was an overflow in one of the most important water storage tanks in the eastern area of the State of Mexico. This situation presented the first opportunity to demonstrate the effectiveness of process automation in water management facilities through real-time remote control and monitoring via the IIoT platform from RealiteQ. This initiative started with the Cerro Gordo tank located in the municipality of Ecatepec, which has now become possibly the largest project in Mexico in terms of the number of installations controlled remotely and in real time.

The organization's management was aware of the technology offered by RealiteQ through prior work with our local solutions integrator, who immediately proposed a plan to eliminate the operational risk of continued tank overflows due to operational errors, primarily caused by the lack of personnel or the handling of valves and pumping equipment at specific times.
Within a week, our local integrator implemented the improvement plan, which involved automating the tank's operational processes. Manual measurements were replaced with a complete set of digital sensors to obtain tank levels, start and stop pumping equipment, gather data from various flow meters installed in the network, and automated valves to control flow based on operational directives defined by CAEM management according to water distribution needs. Since then, the Cerro Gordo tank has been remotely controlled in real-time and operates autonomously according to operational guidelines, minimizing personnel intervention. As a result, there have been no tank overflows since it began operating automatically through the RealiteQ platform.

ABOUT REALITEQ SCADA 4.0 HOLISTIC PLATFORM

RealiteQ Scada 4.0 - Bundle of IOT & cloud programs & tools from the infrastructure level through the ICT, SCADA level and up to the Cybersecurity & data analytics level for real time, remote-control operation & Data management

RealiteQ is a Holistic solution for digital transformation - single-source solution of IIoT hardware and Cloud software from the infrastructure level through the ICT & SCADA level and up to the Cybersecurity & data analytics level, providing a comprehensive solution for real-time, Secured, remote-control operation & Data management from "A" to "Z" (Data acquisition, telemetry, real-time & historian data management, Alert & Notification, data analytics & BI, cybersecurity, remote control & visualization) of devices, sites, facilities, and the entire networks.

Draw 5 – RealiteQ Scada 4.0 – the fifth segment

RealiteQ allowing real-time interfacing between all the different devices from different manufacturers on site and connecting all sites in the network together, allowing data sharing and improve the transparency within the utility to provide the highest quality information to the operational level and decision-makers.

The technology consists of four system components:

- ICEX (Integrated Cellular and Ethernet Explorer) – Smart gateway installed in remote sites.
- COMP (Central Online Management Portal) – Mediates communication, data, security & users.
- UI – Browser-based graphical user interface (HMI/SCADA)
- VPN – for remote secured accesses to PLC on remote sites

RealiteQ is on the one hand, the most advanced solution existing today but on the other hand, it is simple to install, use and maintain, it is highly secured, and most importantly it is affordable to any organization from the smallest to the largest.

SCOP OF WORK:

With the evidence of efficiency in managing such installations, CAEM decided to extend the pilot project to its entire network and for that they have been engaged with APRA - a Mexican company dedicated to offering end-to-end comprehensive solutions. The collaboration model designed for CAEM is an integral service that develops the process automation plan, transitioning from manual/analog to digital operation, and is responsible for the equipment, maintenance, and replacement of all necessary components for the operation of the automation system. This ensures that each component functions adequately and that those that fail are replaced as quickly as possible, ensuring uninterrupted operation once a facility is automated.
Additionally, APRA handles all the design work of automated processes and their programming, as well as the initial configuration of the platform and the multiple control dashboards.
The service is complemented by ongoing training for users authorized by CAEM management.

THE PROJECT INCLUDES

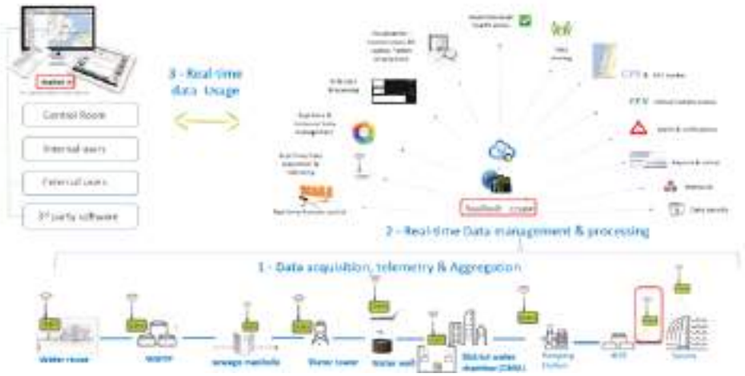
- Installation of electrical and communication network engineering to comply with the project specifications at each site.
- Automation configuration: networking, device programming, provision of various measuring instruments and sensors.
- 24/7 permanent maintenance of the automation system: maintenance and replacement of any device required in the operation of the tanks.
- Remote monitoring and control of site operation 24/7 from any place.
- All sites are connected to one centralized remote monitoring and control system.

Draw 6 – Project scope of work, the 5 stages

THE PROJECT OBJECTIVES:

- Remote monitoring and control of site operation 24/7 from any place.
- The facility can be operated under the guidelines authorized by Operations DG remotely and in real time, without restriction of schedules or the distance it is.
- Values of all measured and controlled parameters are presented in real time in an intuitive, easy to follow manner. Historical data of important measured parameters enables optimizing of different parts and the whole process.

Over the past four years, the original scope of process automation for potable water management has



Draw 7 – Solution architecture

expanded to various types of installations in more than 120 facilities.

Currently, CAEM controls via the RealiteQ wide range of facilities including:

- Water storage tanks with capacities up to 50,000 cubic meters
- Water conveyance lines with diameters up to 60 inches over dozens of kilometers
- Pumping plants
- Monitoring of pressure in conveyance lines at critical points
- Automated valves controlled by target flow or specific volume across different communities or urban areas
- Deep potable water wells where the production of each installation and the status of their assets, such as pump motors, are monitored
- Water Treatment Plant
- Weather stations for monitoring climatological variables, mainly rainfall

Draw 8 – RealiteQ dashboard of BI & Trends

As part of the solution CAEM have all the tools they need to improve the operational efficiency of the connected facilities using RealiteQ UI which includes, operational dashboards, trends, tables, smart alert and notification system, BI dashboards.

Draw 9 – The connected facilities

RESULTS & OUTCOME:

Using RealiteQ not only allow to have real-time monitoring and remote control (SCADA) of the remote facilities, but it also provides:

IT/OT convergence (real-time data integration)- Real-time processing & integrates information technology (IT) with operational technology (OT) used to monitor events, processes, and devices, adjusts in networks sites, machines, enterprise and industrial operations and offers significant benefits in cost, quality, speed and reliability.

Data management - RealiteQ platform is much more than just a remote-control platform, it is a real-time data management system from A to Z, from the data acquisition to Big data analytics. By using RealiteQ you are not only operating and controlling the system in real-time, but you also can use the data to increase efficiency.

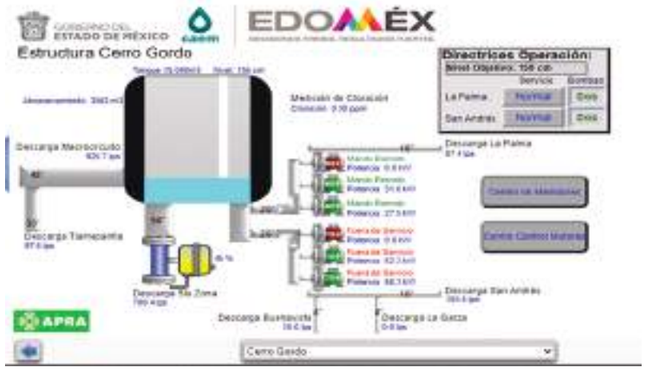
Draw 10 – Some of the facilities

Data Aggregation - Real time Data aggregation and data analysis to improve the utility operational efficiency is one of the biggest challenges water utilities are facing today, RealiteQ makes it available, accessible, and affordable to any utility by providing real-time secured IT/OT convergence.

Real time display of assets health - RealiteQ provides for real time graphic display (on a Google map and more) of the status of each of the devices (assets) connected using a dashboard display.

Smart alerts system – highly advanced mechanism for managing faults. Each fault may be defined as a fault that requires a confirmation action, deliberate faults may be silenced for an extended time, there is no limit to the number of faults or the number of fault recipients, a “nagging” mechanism may be used for recurrent alerts until the problem is resolved, and there is an alert escalation mechanism, ensuring that it is transferred to a number of parties based on the priority for remedial action and responsibility.

Secure hierarchical system – the Comprehensive Cloud based SCADA system allows for connection of local systems to a secure hierarchical central system at the country (and even global) level. The system allows for access by an unlimited number of users (according to personal authorizations) while building a clear hierarchy from the worker on the ground to the facility level, network operator, regional manager to the entire country and world.



Draw 11 – RealiteQ SCADA dashboard for remote control

The project was very successful and the main CAEM has achievements from the project were:

- Increase in safety in the operating guidelines
- Reduce operational costs
- Reduce water loss
- Save energy
- Service without interruption.
- Stability in different basic parameters, such as:
- 1. Storage levels.
- 2. Exact water consumption for each circuit
- Eliminating the overflow of storage tank
- Reducing emergency response times
- Operating water distribution circuits remotely
- Having information on operational trends of different installations
- Sharing critical potable water availability information with municipalities.

Costumer testimony (CAEM - Ing. Salvador Ibarra. Director of Facilities Maintenance):

- The communication between different CAEM's areas improved given a better, quicker and accurate information flow about several performance operative variables produced at facilities level.
- Better control and efficiency in water distribution. Now we can determine target flows at specific times and areas of the city based on hard and accurate data in real time using the ReliteQ's Central Management Online Portal.
- Improved relationship with community leaders. We can share with the community and its representatives accurate and reliable information about the flows that are delivered in certain periods of time at different seasons of the year and demonstrate that we comply with the agreed commitments.
- With RealiteQ the time to attend municipal authorities' requirements for the distribution of drinking water has improved significantly because now from the central online management portal we can change the flows in different conduction lines simultaneously and in real time, having the ability to respond immediately to the demands of the community.
- Reduction of maintenance costs. We have reduced total stop hours at facilities due to the failure of pumping equipment. With the RealiteQ platform it is possible to permanently monitor the main performance variables of the pumping equipment and determine in advance when any equipment requires repair.
- We achieved the elimination of the risk of flooding of facilities due to sudden excess inflow that are greater than storage tank capacity, it resulted in the total loss of expensive water pumps and electrical installations.
- The use of the RealiteQ Platform allows us to operate our facilities in a safer environment for our collaborators. Before RealiteQ, it was normal to send personnel to facilities far from the city to manipulate valves or pumps at night and in high-risk areas in security terms. Now all facilities inflows and outflows are monitored at any time by the responsible personnel.

CONCLUSION

I believe that the solution presented in this article and the successful case study is very relevant for the water market in India (cities as well as remote rural villages) as well as many other areas in the world who suffered from all of some of the challenges described in this article.

This corresponds very closely with the priorities set by the Government of India and the initiatives that the Government of India has been leading in recent years. The government of India's focus on improving water management and conservation, as well as increasing access to clean water for all citizens. The government is encouraging and investing in digital transformation initiatives in the water utilities sector.

One of the main initiatives for digital transformation in the water utilities sector in India is the "Smart Cities Mission" focuses on the use of digital technologies to improve the quality of life and service delivery in the cities.

Another initiative is the "AMRUT" (Atal Mission for Rejuvenation and Urban Transformation) and "AMRUT 2.0 scheme, which aims to provide basic infrastructure in 500 cities and towns across India. The scheme also focuses on the use of digital technologies to improve water management and distribution.

Note: I would like to thank Mr. Pedro Carrillo from APRA company for the great work he and his company are doing with CAEM, and for the information he provided me with regarding the project at CAEM that helped me a lot in to write this article.

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Partner at Reali Technologies Ltd, a breakthrough company in IoT & Cloud computing for real-time remote control and data management. The developer of RealiteQ – Scada 4.0

Ran has 30 years of executive management experience in Global Business development in the field of advanced environmental technologies with emphasis on water & agriculture. Ran holds two academic degrees B.Sc. in Water and soil sciences and MBA.

Prior to Reali technology Ran was part of the founding team and served as EVP at Miya, (a global company specialized in large scale NRW & water efficiency projects), leading some of the world largest and most successful NRW redaction projects.

Recently (August 2024) Ran was an expert guest lecturer in a four-day course on achieving 24/7 drinking water supply in Urban Centers was successfully organized by Atal Mission for Rejuvenation and Urban Transformation (AMRUT), and Indian Institute of Technology, Madras.

Ran also was a panel member at the CII-Triveni Water Institute. The panel was about Disruptive Technologies, Digital IoT for Water and Wastewater Management" was an intriguing session at the recently concluded CII Water-Tech Summit 2024.

Ran was a member of the Steering Committee "International Standards for smart Water management" (ISO/TC).

ACHIEVING CONSISTENT LOW ENERGY CONSUMPTION IN SEA WATER RO BASED DESALINATION PLANTS USING LOWATT® TECHNOLOGY

Narendra Singh Bisht, General Manager,
Research and Development centre, Aquatech Systems Asia Pvt Ltd in Pune, India

Abstract

Biofouling remains the single most important factor that increases energy consumption as time progresses in the operation of the Reverse Osmosis membrane system. One of the challenges with plant operation is that once a plant has been designed for certain energy consumption, it does not remain steady over a period. This is mainly due to biofouling and the inability to clean the membrane efficiently.

In an effort to maintain healthy operational efficiency in terms of water production and energy consumption, differential pressure across the membranes should remain constant and close to the start-up conditions for multiple years. To achieve sustainable lower energy consumption, it is important to keep the membranes clean and then adopt an effective cleaning at the very initial phase of biofouling formation before it becomes a permanent problem. This paper describes the combination of ultrafiltration and bio-foulant removers, at a low flux operation, reduces the severity of the biofouling and results in lower energy consumption.

The LoWatt® process offers several advantages by reducing the severity of biofouling and sustained plant operation is possible at lower energy consumption with high plant availability.

INTRODUCTION

Water desalination is growing to meet industrial and drinking water demands worldwide. Although both thermal desalination (multi effect distillation – MED, and multistage flash evaporation – MSF) and membranes-based seawater reverse osmosis (SWRO) processes are used in these plants, SWRO has grown predominantly over the last 15-20 years. SWRO has become very cost effective and efficient in terms of energy consumption compared to where the technology was a few years ago [1]. Most desalination systems incorporate one or the other type of energy recovery devices with a view to optimizing the energy consumption, as energy cost constitutes close to 60% of the operating costs in a SWRO plant [2]. Most designs focus on hardware approaches – with incorporation of energy recovery turbines or VFDs on certain drives – wherein the energy cost savings are calculated to offset the investment in equipment and provide a significant saving over a period.

Though this approach does limit the energy consumption at the design stage, it does little to sustain the energy savings over a period of time, as biofouling starts to build up.

Bacterial deactivator is a serious and recurrent problem in RO plants as it reduces productivity of water, increases the differential pressure, and increases power consumption. This problem is compounded in plants where there are open intakes and where seawater temperature increases during the summer [3]. Chlorine treatment makes this worse due to formation of oxidized products, which provide potent feed for the residual bacteria on the membrane surface where they are rejected along with the bacteria after the de-chlorination process. It has been recognized that chlorination cannot be considered as a sustainable process option to control biofouling. The balance bacteria left after chlorination multiply much faster after de-chlorination with the potent nutrients as their food [4]. Moreover, chlorinated organic products may be undesirable due to the formation of carcinogens. Therefore, alternative techniques to control, minimize or eliminate biofouling are essential.

Biofouling results in a sticky EPS (Extracellular Polymeric Substances) layer on the surface of membrane. It has good shear strength, hence hard to remove. The onset of biofouling first increases the feed pressure, which results in increase of the energy consumption. As the fouling continues, it reduces the water production. To maintain design productivity, the feed pressure must increase, which again increases the power consumption. As this process continues the membranes must be taken for a long and multi-step chemical cleaning process. Simultaneously, the differential pressure across the membranes increases and it becomes difficult to clean the membranes and regain the original performance. Aggressive cleaning of the membrane may result in damage, which may become irreversible with time and ultimately shorten the membrane life.

Figure 1 represents a typical behavior of such a system, where a continuous creep of feed pressure is experienced. It may be noted that this can persist even at lower silt density Index (SDI) range <3 as required by the membrane manufactures.

Figure 1

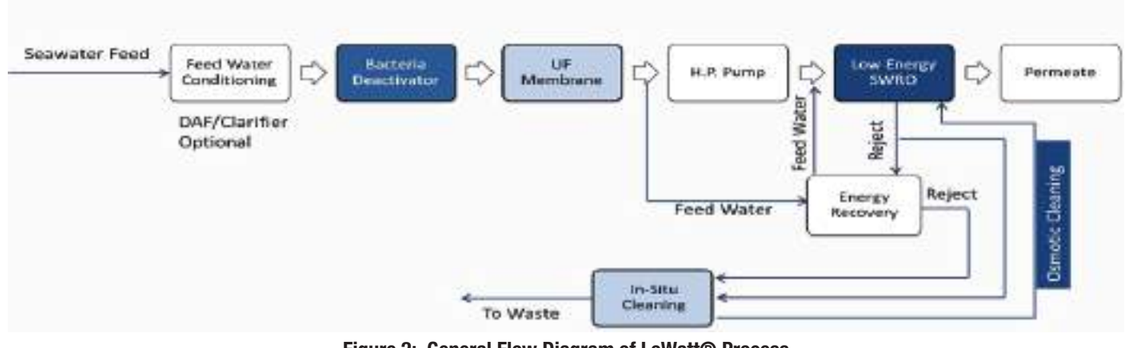


Figure 2: General Flow Diagram of LoWatt® Process

LOW ENERGY RO (LoWatt®)

We present an energy efficient RO desalination, which focuses on achieving Low energy consumption by reducing the biofouling in the membrane integrated with a cleaning methodology. This prevents build-up of any residual bio film on the membrane surface. To achieve sustainable lower energy consumption, it is important to ensure the membranes do not foul, and the differential pressure does not increase. Also, a cleaning methodology is available to clean membranes at the very initial phase of biofouling formation before it impacts differential pressure and before any fouling becomes permanent and starts impacting plant performance in terms of water production, power consumption and product quality. This is made possible by the following innovative process approach:

1.0 The pretreatment is done with the ultrafiltration membranes, which gives more than 6 log reduction of bacteria and 1-2 log reduction of virus. The Permeate of ultrafiltration provides an SDI of less than 3 and very often between 1-2. The UF is able to remove the majority of suspended particles including those which are colloidal in nature, and it also removes some bio-foulants. But it is not able to eliminate all the organic contaminants, which participate in fouling on membranes. To calibrate the performance of the UF it is important that inlet water has a turbidity of less than 5 NTU even during upset conditions and any treatment on the upstream of UF is designed to achieve these parameters based on water analysis and site conditions. This ensures UF treated water quality remains around 0.06-0.08 NTU turbidity and SDI values of less than 3. This also ensures the downstream system is protected from any loads of colloidal particles.

2.0 Along with ultrafiltration pretreatment, bacteria deactivator unit is also provided that deactivate the bacteria with the help of electrochemical process and coagulates the majority of organics like humic acids, polysaccharides, proteins, amino acids, carbohydrates, bacteria and other potential contaminants which aid biofouling. Coagulated organics can be then easily filtered through ultrafiltration.

The bacteria deactivator device interferes with the chemical conditioning process of the membrane in controlling biofilm development. When a clean membrane surface is exposed to seawater or natural water, polymeric natural organic compounds are adsorbed. This chemical conditioning imparts a negative charge to the fouled substrate. The conditioned surface can now concentrate lower molecular weight substances used as a food supply for bacteria. The bacteria deactivator system does not allow the carryover of the negatively charged organics and therefore disrupting the process of bio film formation.

Ultrafiltration membranes without bacteria deactivator device does not give much reduction in TOC value in treated water. Whereas with bacteria deactivator, ultrafiltration membrane delivers large quantities of treated water with much more reduced turbidities and SDI while removing a majority of potential contaminants that can cause fouling. The typical SDI value at the outlet of ultrafiltration is less than 1 and typically close to 0.6-0.8. The process highlights the importance of presence of bio-foulants along with UF, which is critical for eliminating or minimizing bio film formation at reduced flux of RO. There are multiple options of bio-foulant removal, which operate under a wide range of Total dissolved solids (TDS) and provide Total organic carbon (TOC) reduction of at least 40-60% on an overall basis and remove the majority of the negatively charged TOC. The bacteria deactivator can include ion exchange materials, positively charged media or electro-chemical or electrode-based methods.

3.0 The system Design and plant operation is done at a lower flux of around 6-8 GFD based on feed water quality, permeate quality requirement and temperature range. This is achieved through a low flux Reverse osmosis (RO) process.

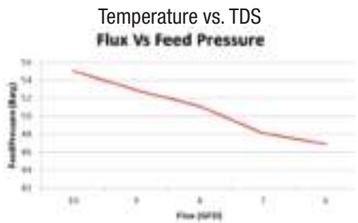


Figure 3

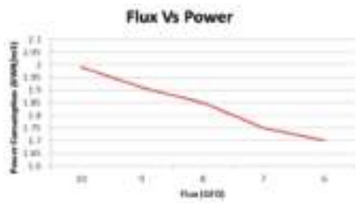


Figure 4

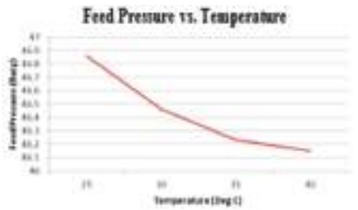


Figure 5

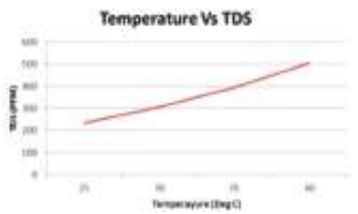


Figure 6

The flux can be marginally increased for lower (TDS) or low fouling waters. This flux is optimum for energy consumption as there is not much improvement in energy consumption if the flux is further reduced. Any further reduction in flux will cause deterioration in permeate quality. This flux reduces the concentration of bacteria and nutrients over the membrane surface and reduces the differential pressure to a minimum. Moreover, at this reduced flux, operating pressures reduce significantly by a minimum of 10-20%. Also, there is minimum variation in the difference in operating pressure with variation of feed water temperatures. When the design flux is higher as per the conventional process, there is significant variation of operating pressures at minimum and maximum temperature. This requires sophisticated controls to adjust the pressures, but these still result in loss of energy when the actual temperatures are higher than design. Alternatively, speed control devices have to be installed to adjust pump speed for changes in water temperatures, which still result in some loss of energy and make the system complex and expensive. Operation at low flux design avoids this complication and reduces energy consumption by 20%. For example, for 35000 PPM TDS, if the system is designed at 9-10 GFD the power consumption is around 2 KWH/M3 for the RO pump and energy recovery system. But if the same system is designed at 6 GFD the power consumption reduces to 1.7 KWH/M3 (reference Figure 4) and reduces feed pressure from 55kg/cm2 to 46 kg/cm2 (reference Figure 3). At this level variation in pressure due to feed water temperature within a wide range of 25- 40 degrees C is only 0.5-0.7 kg/cm2 (reference Figure 5) for different types of membranes. This also provides product TDS within acceptable limits even at the highest possible temperature (reference Figure 6).

The energy consumption has been calculated based on 85-86% efficiency of pumps and more than 96% efficiency of motors. This data is more or less consistent for different membrane models available from different membrane manufacturers in the market and their difference, if any, is very small. It is evident from these studies that at these levels of flux the energy consumption is most optimum and can handle a wide range of temperature with minimum variation in power and also provides acceptable range of permeate TDS. At this level of flux, the bio film formation is reduced to insignificant levels especially when it is pretreated with UF and the bio-foulants removal unit as mentioned above. This ensures that the energy consumption design is low to start with and remains low on a sustained basis due to reduced or insignificant biofouling. Over a period of a day's operation, the increase of differential pressure is less than 0.1Kg/cm2, and more often less than any detection limits. Also due to reduced driving pressure across the membrane, whatever fouling happens is not firmly attached to membrane surface and therefore can be easily removed under mild cleaning conditions. With certain precautions taken in the pretreatment as described, the residual foulants are not able to adhere to the membrane surface. Some of these concepts are similar for surface water RO plants, including some low TDS waters, where severe fouling happens on reverse osmosis and energy consumption increases and water production eventually drops. It has been seen that biofouling alone can increase the differential pressures across RO stages to more than 4-5 kg/cm2, which results in the loss of energy. This may happen even if the pretreatment includes a UF system. This can be easily mitigated by optimizing flux, calibrating and regulating pretreatment as described in points 1 and 2 above and stopping the buildup of biofouling as mentioned below in point 4.

4.0 To further augment the process described above and to overcome any biofouling right before it initiates, a unique methodology of cleaning is devised based on natural osmotic pressure differential between the reject and permeate water. When the system or part of the system is stopped with a continued regulated flow in the feed side, which allows the reject water to remain in the feed side, there is a steady flow of water from the permeate side to the feed side. The permeate flow continues to the feed side due to concentration differential. The concentration differential is maintained by makeup reject water flow through a recirculation system. If this process is allowed to continue for 10-15 minutes, any bio film is dislodged from the membrane surface. As the plant has been designed at lower flux and also the feed water has been filtered through UF with bacteria deactivator unit, the buildup of any bio film and pressure drop is reduced and can be controlled through the osmotic cleaning. This process should be controlled through regulated flows and concentration on both feed and permeate side using plant produced reject and permeate water. The permeate back flow under these conditions is purely a function of concentration gradient and pressure drop built in the membranes due to fouling. The feed side flow is adjusted by circulation of brine to overcome dilution due to permeate entry and also maintain dynamic conditions in the feed side. It is possible to maintain clean membrane pressure drop conditions by using this cleaning technique and prevent any increase in feed pressure or membrane differential pressure. The loose debris can be then flushed out with pretreated seawater rinsing at a higher velocity. This cleaning methodology is based on a concept that bio film formation should be removed as fast as it is formed or prevented from building up. It can be achieved by shorter cleaning cycles of 10-15 minutes done frequently or based on predetermined differential pressure increase over start up conditions. Normally the differential pressure builds up from 0.1 kg/cm2 per day to 0.3kg/cm2 a day over 24 hours of operation depending on site conditions and plant design. This process will typically not allow any buildup of differential pressure, and the membrane will operate at clean membrane conditions. This process does not use any cleaning chemicals on a daily basis but uses the brine generated in the reject of SWRO or BWRO plants. The option of adjusting brine concentration can be exercised to control the effectiveness of the cleaning process. The cleaning processes will be carried out with osmotic cleaning as a feature for LoWatt® technology. The osmotic cleaning of SWRO train is carried out without affecting the production. The same is done by an automated system, which may include a biosensor. The input based on differential pressure, or a biosensor shall trigger the cleaning procedure of individual banks with a set of SWRO tubes, which will get isolated from the train [5]. The rest of the SWRO train will continue the water production.

PERFORMANCE TRIALS ON A REVERSE OSMOSIS SYSTEM WITH BIOLOGICALLY ACTIVE WATER.

Performance Trials 1: With UF as a pretreatment step alone.

To benchmark the base performance, a Reverse Osmosis (RO) unit operates for 17 months on surface water having TOC level of 5 – 10 ppm without any bio-foulant removal unit at the upstream of the RO unit.

Figure 7

This source of water was selected due to its previous history of biofouling for several years. Based on the original plant design, the surface water was passed through an Ultrafiltration (UF) unit before feeding into an RO unit and the silt density index (SDI) was maintained below 5 and most of the time below 3. The RO unit pressure drop was monitored, and its results are as shown in Figure 8.

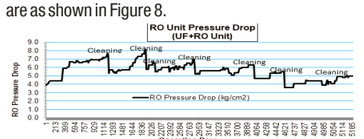


Figure 8: RO Unit performance graph when operated with UF only

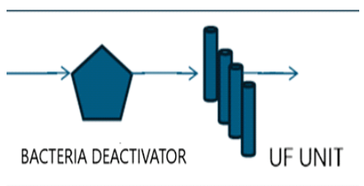
During the 17 months of operation, the RO unit was cleaned seven times to keep the pressure drop constant. The RO unit's average service cycle time was approximately 700 hours, and chemical cleaning was necessary to maintain pressure drop, product quality, and energy usage. Table 1 shows the running hours of this RO unit throughout several servicing cycles. The running hours were gradually altered such that, after each chemical cleaning, the original starting pressure drop circumstances could be restored. During this operation, it was very clear that even with the UF pre-treatment process, pressure drop increase was evident within days and sometimes within hours during the rainy seasons and after a very elaborate cleaning process the initial pressure was not restored.

RO Unit Service Cycles	RO Unit Operating Hours	Initial Pressure Drop of RO Unit (kg/cm2)	Final Pressure Drop of RO Unit (kg/cm2)
1st Service Cycle length	1201	3.9	7.4
2 nd Service Cycle length	717	5.3	8.1
3 rd Service Cycle length	296	5.5	6.5
4th Service Cycle length	650	5.5	7.0
5th Service Cycle length	859	5.2	6.3
6th Service Cycle length	687	4.7	5.5
7th Service Cycle length	462	3.6	5.0
Average Service Cycle	696 hours length		

Table 1: RO Unit Operating Hours vs. Service Cycle

PERFORMANCE TRIALS 2: ON A BIO-FOULANT REMOVAL UNIT

In this experiment, a bio-foulant removal unit (bacteria deactivator) was installed with UF. The TOC and turbidity values across the system with and without bacteria deactivator unit were monitored and compared. The results of TOC and Turbidity are shown in Table 2.



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Outlet TOC without Bacteria Deactivator unit (ppm)	Outlet TOC with Bacteria deactivator unit (ppm)	Outlet Turbidity without bacteria deactivator unit (NTU)	Outlet Turbidity with bacteria deactivator unit (NTU)
5.13	3.83	0.069	0.054
5.17	3.92	0.065	0.059
5.16	3.88	0.067	0.064
5.20	2.84	0.069	0.061
5.68	3.98	0.068	0.065
4.38	1.08	0.068	0.06
5.16	3.98	0.066	0.06
5.16	3.27	0.071	0.059
5.28	3.31	0.073	0.063
5.48	3.38	0.066	0.058
5.13	3.05	0.069	0.065
5.26	3.59	0.065	0.058
5.06	3.81	0.067	0.06
4.98	3.02	0.064	0.060
5.13	3.68	0.065	0.061
5.36	3.82	0.066	0.059
5.86	3.02	0.066	0.060
5.02	3.12	0.068	0.060
4.82	3.30	0.070	0.060
5.68	3.82	0.068	0.055
4.58	1.62	0.069	0.059
5.03	2.91	0.068	0.063
4.28	2.03	0.069	0.056
5.21	2.91	0.066	0.059
4.28	2.06	0.065	0.057
4.32	2.12	0.065	0.057

Data above in Table 2 clearly indicates that the bacteria deactivator unit improves the TOC removal efficiency of UF by around 40 – 60% and outlet turbidity of water was always around 0.060 NTU. This directly helps in maintaining the SDI level below 3 in the RO unit and mostly in between 1–2, minimizing the biofouling in the RO unit.

PERFORMANCE TRIALS 3: COMBINED PRE-TREATMENT OF UF FOLLOWED BY BIO-FOULANT REMOVAL UNIT

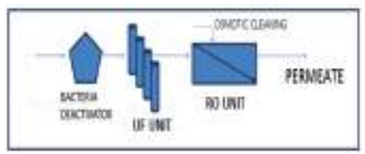

Figure 10-A: Condition-1

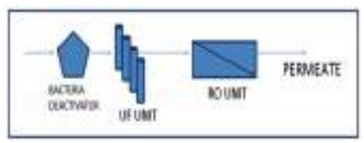

Figure 10-B: Condition-2

In another set of experiments, the same RO unit was operated in two conditions as shown in Figure 10-A and 10-B with the inclusion of the bacteria deactivator unit at the upstream of the UF/RO unit. Performance of the RO Unit in these two conditions is summarized in Figure 11.

In Condition-1, the RO Unit was operated for nine months (Approx. 1400 hours) and its effect was clearly observed with respect to longer service cycle length as compared to the service cycle lengths of trial-1. During this operation it was observed that for more than 3 months there was a very insignificant increase in differential pressure but once it started increasing, gradually subsequent fouling rate started accelerating and progressively started increasing. Even though the bacteria deactivator unit minimized the pressure drop rise and bio-fouling in the RO unit, still the pressure drop gradually increased over a period of six months and the main reason for this is the gradual deposition of fine bio film on the RO membrane surface day by day. The intensity of biofouling was very low as indicated by longer service length.

In Condition-2, after the normal chemical cleaning of the RO unit and bringing back its pressure drop to a normal level (3.8 kg/cm2), a natural osmotic cleaning process was implemented and every day one natural

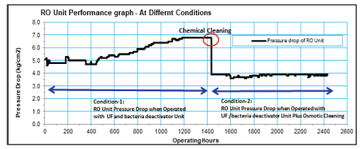

Figure 11: RO Unit performance graph when operated with UF + Bacteria Deactivator unit

osmotic cleaning cycle was performed on the RO unit by RO Reject water for 10 – 15 minutes. The impact of natural osmotic cleaning was clearly observed, and the pressure drop was unchanged at 3.8 kg/cm2 for next 1000 hours of operation. Due to the unchanged pressure drop of the RO Unit, its energy consumption remained the same, no increase was observed. During this time, no increase of differential pressure was seen. It became clear at this stage that with proper feed conditions of UF and bacteria deactivator unit and proactive Osmotic cleaning, virtually clean membrane conditions can be maintained, which means no biofouling and no increase in energy.

PERFORMANCE TRIALS 4: WITH LOWATT® PROCESS

In this study, the RO plant was operated with a new set of membranes with LoWatt® Process that includes a UF system with bacteria deactivator unit at the upstream of RO unit and a periodic osmotic cleaning system. It was operated for 20 months (approximately 5000 hours) with the same water source used in trial-1 and the expected results were observed without any increase of differential pressure at sustained levels of power consumption.

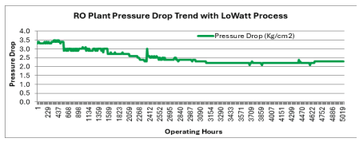

Figure 12: RO Unit performance graph when operated as per LoWatt® Process

The Observations

- The differential pressure drop across the membrane did not increase (see Figure12) and remained constant.
- The RO system with LoWatt® process was not
- once cleaned and clearly differentiates its advantages over conventional RO where the plant was cleaned seven times during same duration and similar conditions. (see Figure 13)

No changes or increase in power consumption were experienced with LoWatt® process. It remained mostly constant throughout the period.

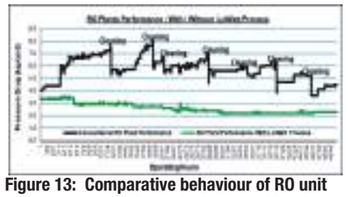

Figure 13: Comparative behaviour of RO unit pressure drop with and without LoWatt® Process

3.5 Advantages of LoWatt® Technology

1. Lower energy RO technology, especially for surface water and SWRO applications
2. Optimum flux design for lowest initial energy consumptions
3. Initial and then sustained low energy operation
4. Energy consumptions for a SWRO system ranging from 2.8-3.0 kwh/m3
5. Lower biofouling due to lower concentration of bacteria and food per unit area of membrane, lower membrane replacement rate
6. Online natural cleaning and minimum chemicals
7. Predictive diagnostics and cleaning option- based on Bio senor [5]
8. Focus on the root cause of biofouling, i.e. bacteria and organics
9. Reduced chemical consumption

CONCLUSION:

The above studies clearly demonstrate that LoWatt® presents itself as a significant development in lowering the cost of desalinated water by as much as 25% than would be possible with best known energy recovery approaches available today.

In addition to the lower initial power consumption, the system is also able to sustain the design power consumption without compromising on product quality, thereby providing a predictable life cycle cost for a desalination system. From a plant manager's perspective, this means more system availability and reliable operations without expensive and time-consuming chemical cleaning regimes.

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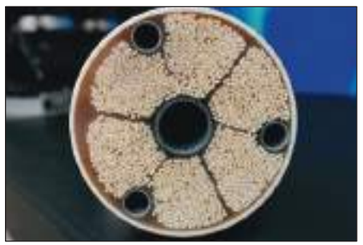
HOW INNOVATIVE MICROBIAL FORMULATIONS CAN ENHANCE ULTRAFILTRATION MEMBRANE LONGEVITY

Sanjay Bahl
CEO – SUPERWELD ECOSOLUTIONS

From the past few years, the significance of ultrafiltration membrane technology in wastewater treatment has grown a lot. It is universal and is able to produce high-quality treated water, making it a key component in modern wastewater treatment processes. However, due to various factors there are concerns that must be taken into consideration before incorporating it into the wastewater treatment.



In this article, we will explore the importance of UF membrane technology, address the cost concerns, and introduce innovative solutions to enhance the longevity of this membrane technology.

Let's first dive deeper into the technology!

Benefits of Ultrafiltration Membrane Technology in Wastewater Treatment

EFFICIENT REMOVAL OF IMPURITIES:

UF membrane technology is a game-changer in wastewater treatment due to its ability to efficiently filter out suspended solids, bacteria, and even some viruses.

- **Compact Design:** UF membrane systems are known for their compact design, making them suitable for both large-scale treatment plants and smaller installations. Their small footprint reduces the space required for treatment facilities.
- **Flexibility:** UF technology is versatile and can be applied in various wastewater treatment scenarios, including the removal of contaminants from sewage, industrial effluents, and stormwater. It can also be used in water reuse and desalination processes.
- **Environmentally Friendly:** The use of UF membranes contributes to a sustainable environment by reducing the discharge of pollutants into natural water bodies. It helps protect aquatic ecosystems and supports the conservation of freshwater resources.

These were some of the few importance or benefits of the Ultrafiltration Membrane Technology in Wastewater Treatment. Let's now understand the cost structure and see how we can make the right decisions.

IMPLEMENTATION OF ULTRAFILTRATION MEMBRANE TECHNOLOGY CAN BE QUITE EXPENSIVE.

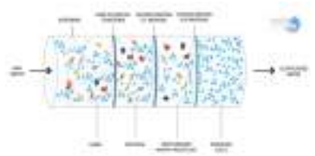
While UF membrane technology offers a lot of benefits as we have discussed before, the high initial cost of these membranes sometimes becomes a barrier in adopting the technology by a lot of outlets. For example, a 10,000 litres per day (10KLD) Sewage Treatment Plant (STP) would require a UF membrane plant worth Rs 2,00,000. However, it is essential to consider the long-term advantages and other good adaptations that will boost the wastewater treatment for your plant.

One of the major reasons for its highest costs is membrane fouling which is a common issue in UF systems, which requires additional investments in anti-fouling measures, cleaning, and replacement. Fouling should be prevented properly to avoid extra money on replacements for UF membranes.

MEMBRANE FOULING AND CLOGGING LEADS TO THE DAMAGE OF UF MEMBRANES!

Let's imagine a water filter in your home. The filter is like a super-thin sheet with tiny holes. It cleans water by letting water pass through these holes and blocking out dirt and impurities.

Now, think of this filter getting dirty because of all the stuff it has caught from the water. This dirt and slime stick to the filter and make it harder for water to go through. This is what we call "fouling."



Similarly, membrane fouling happens when dissolved particles in the feed water collect on the surface of the UF membrane. These particles can include organic matter, bacteria, algae, minerals, and other contaminants present in the wastewater. When these substances come into contact with the membrane, they stick to its surface.

Here are some of the common reasons why membrane fouling can happen in your plant:

- **Increased Operating Pressure:** To maintain the desired flow rate and water quality, the UF system must compensate for the reduced permeability caused by fouling. This often necessitates an increase in the operating pressure, which places additional stress on the UF membrane and the entire system.
- **Reduced Permeability:** The presence of biofilms and trapped particles in the membrane can reduce the effective pore size and permeability of the UF membrane. This reduction in permeability can lead to decreased filtration efficiency and an increase in the membrane pressure needed to get the wanted flow rate.
- **Microbial Growth:** Nitrogen and phosphorus are essential nutrients for microorganisms, including bacteria and algae. When these nutrients are present in sufficient quantities in water sources, they can promote the growth of these microorganisms. As microorganisms begin to increase, they can form biofilms on the surface of UF membranes.

This biofilm acts like a blockage on the filter. It can slow down the water from passing through, like a traffic jam on a road. That's why it's a problem when too much food (nitrogen and phosphorus) is in the water because it makes these slimy biofilms, which can clog up the filter.

HIGH-PERFORMANCE MICROBIAL FORMULATIONS TO THE RESCUE!

Here's how high-performance microbial formulations can address these challenges and avoid the membrane fouling to maintain the clarity of water and its desired flow:

1.Enhancing Biodegradation These formulations promote the growth and activity of aerobic bacteria, which are more efficient at breaking down organic pollutants.

- Enhanced biodegradation of organic matter leads to a reduction in BOD and COD levels and TSS, making the water cleaner and less prone to fouling UF membranes.

2.Nutrient Removal These formulations include compounds that facilitate the removal of nutrients like nitrogen and phosphorus. They can encourage the formation of insoluble compounds with these nutrients, making them easier to remove from the water.

- For example, they might help convert ammonia (a form of nitrogen) into solid particles or facilitate the precipitation of phosphorus compounds. Removing these nutrients before the water reaches the UF membranes reduces the chances of membrane fouling caused by nutrient accumulation and biofilm formation.

By improving biodegradation, removing nutrients, and eliminating odors, these formulations can help maintain a more efficient and trouble-free wastewater treatment process. This, in turn, reduces the risk of membrane fouling in systems like ETPs, STPs, and other treatment processes.

Consequently, this can lead to reduced TSS in the effluent, which can significantly extend the lifespan of UF membranes, making your water treatment system more efficient and cost-effective.

REAL-WORLD EXAMPLE: REVIVING A TEXTILE MILL'S UF MEMBRANE

A textile mill's wastewater treatment plant was initially commissioned using traditional methods, relying on cow dung, urea, and DAP (Diammonium Phosphate) for bioculture development. However, this approach resulted in a weak biological floc in the aeration tank. This underperforming system was susceptible to frequent shock loads that disrupted the outlet water quality. As a consequence, the UF membrane had to handle the entire load of high TSS and BOD.

While the UF membrane was able to produce clear water within acceptable parameters, it was filtering well beyond its designed capacity. This resulted in the membrane becoming clogged within a year of operation.

THE CHALLENGES:

The textile mill's wastewater treatment process faced several key challenges:

- Ineffective Traditional Approach: The use of cow dung, urea, and DAP did not create a strong biological environment, leading to inconsistent treatment and frequent shock loads.
- UF Membrane Overload: The UF membrane was pushed beyond its design capacity due to high TSS and BOD levels, resulting in clogging.
- Quality Control: The mill struggled to maintain consistent water quality, making it difficult to meet regulatory and environmental standards.

THE SOLUTION:

Our team introduced a comprehensive solution that included high-performance microbial formulations.

- These formulations were designed to enhance the biological treatment process and improve water quality.
- By utilizing these formulations, the UF membrane could be bypassed, allowing the microbes to break down pollutants, remove nutrients, and eliminate odors.
- Additionally, the team provided operational guidance to the treatment plant operators.

THE OUTCOME:

Our expertise led to the following positive outcomes:

- Enhanced Wastewater Treatment: The textile mill's treatment plant achieved a more robust and effective biological treatment process.
- Lowered Membrane Load: The UF membrane was no longer overloaded, extending its lifespan and reducing the need for frequent replacements.
- Consistent Water Quality: The mill consistently produced high-quality treated water that met regulatory and environmental standards.
- Management Appreciation: The textile mill's management acknowledged the effectiveness of the high-performance microbial formulations and the value they brought to the wastewater treatment process.

This case study highlights the significant impact that modern microbial solutions can have on industrial wastewater treatment. By adopting these technologies, we can solve environmental issues and ensure sustainable industrial operations.

Leverage our expertise and save the environment and your plant before it's too late!

Contact us at: 981858848

ABOUT THE AUTHOR

Sanjay helps businesses and their leaders by providing Eco-logical solutions for pollution control and waste management problems. At Superweld Eco-Solutions, they create innovative products to treat wastewater, Malodors, Solid waste, Algae Treatment, Lake and Pond remediation. Sanjay has helped clients like Paper Mills, Pharma Companies, Hospitality Industry, Food and Beverage Industries to meet stringent wastewater discharge parameters. A Post Graduate from Symbiosis College, Sanjay and his team act as technical advisors and trouble shooters to 900+ clients. They help companies Like CETPS, Dairy, STPs and ETPs improve their biological wastewater treatment. He strongly believes Indian biotechnology is among the best in the world. Along with his passion for transforming the wastewater treatment industry; he likes to read about the latest technologies and does social work in his free time.

Sanjay Bahl
CEO – Superweld Ecosolutions

ENHANCING WATER SECURITY IN RURAL INDIA

Ms Ellora Mubashir, PhD

THE WATER SCENARIO IN RURAL INDIA

India's development and self-reliance is dependent upon water security. At present, India ranks 2nd in water consumption[1] and 132 in water availability per capita[2]. Although rural India comprises 66 percent of the country's population, it accounts for approximately 80 percent[1] of the nation's total water usage, for agricultural purposes.

The water availability in any region is dependent on natural factors like rainfall, river systems, hydro-meteorological and geological conditions, however, water availability per person is dependent on the population of a country. The per capita water availability in India is reducing due to the ever-growing population, salinization of groundwater, water pollution, unsustainable water uses and impact of climate change. Climate change leads to extreme weather events, disrupting water cycles. For long term water security reducing greenhouse gas emissions is crucial. This formidable climate change crisis as essentially a water crisis, as is also recognized by the UN. Besides, the economy of an agrarian country like India, is directly affected by water due to its impact on agricultural productivity and its long term viability. Currently, the utilization of India's 142 million hectares arable land[3], which is the largest in the world, is getting limited due to the lack of water.

One of the greatest national challenges is to provide adequate water particularly for the 117 million small and marginal farm holders, who account for 80% of the farming population.

The water insufficiency for them also includes the reduced availability of domestic water. Rainfed agriculture occupies about 51% of country's net sown area and accounts for nearly 40% of the total food production[4].

According to the Central Ground Water Board (CGWB), about 60% of the rural domestic water supply and 90% of the rural irrigation water supply are met by groundwater. However, groundwater levels are declining in many parts of the country, due to overuse and low recharge.

The 2011 census of India informs that the average availability of water per person per day in rural areas is 40 liters, which is already below the minimum standard of 55 liters recommended by the World Health Organization.

The worst hit by the water crisis are the women and girls, as they bear the physical burden of making multiple trips in a day carrying heavy loads of water for their families, which is detrimental to their health and well being. As per the Global Gender Gap Index 2020 by World Economic Forum, India slipped from 110 in 2006 to 145 in 2020 in female participation in the workforce[5]. The International Development Enterprises (IDE) estimated that Indian women spend 150 million workdays every year fetching water, equivalent to a national loss of income of ₹10 billion[5]. Therefore, the impact is not just on the rural women but also on the rural and national economy.

GOVERNMENT AGENCIES AND OTHER STAKEHOLDERS: *Dedicated for directly or indirectly empowering villages, on water security*

There is national agreement that community-led and community based water management at village level is to be promoted, for successful water management. However rural water management is often fragmented and uncoordinated, involving multiple actors and institutions.

The decentralization of Government agencies – the primary funder

According to the Seventh Schedule of the Constitution the primary responsibility of water management lies with the State Governments. This provides an opportunity for the State Governments to innovate and experiment with different approaches and models of water governance, which can suit their specific needs and contexts. The role of the Central Government on the topic of 'Water' in villages of India is to provide partial funding and guidance to the State Governments, while respecting their autonomy and diversity. Besides, the Central Government plays a vital role in setting the national vision and goals for water security and sustainability, and aligning them with the global commitments and frameworks, such as the Sustainable Development Goals and the Paris Agreement.

A balance between the autonomy and cooperation of the different levels of government is required. The network of government agencies, all whose aim is addressing the last mile availability of water to the individual in a village, are the following (i) central Government's Ministry of Jal Shakti coordinates with other ministries such as the Ministry of Environment, Forest and Climate Change, the Ministry of Agriculture and Farmers Welfare, the Ministry of Rural Development, and the Ministry of Health and Family Welfare, on issues related to water management (ii) the State Governments have departments and agencies for rural water management, such as the Public Health Engineering Department (PHED), the Water Resources Department, the Irrigation Department, the Groundwater Department, and the State Water Resources Agency, Rural Water Supply and Sanitation Department and Jal Nigams (iii) the district and block administrations have their own officials and staff for rural water management, such as of the District Water and Sanitation Mission, the District Collector, the District Development Officer, the Block Development Officer, and the Junior Engineers. (iv) the Panchayati Raj Institutions (PRIs) also have their own committees and functionaries for rural water management, such as the Gram Panchayat, the Gram Sabha, the Pani Samiti, the Sarpanch, and the Panchayat Secretary.

Other stakeholders

The other stakeholders assisting the village communities directly or indirectly are (i) civil Society organizations (CSOs) who may implement water related activities in rural areas using Corporate Social Responsibility (CSR) funds or funds from international development organizations. CSR is a legal obligation for certain companies under the Companies Act, 2013. Section 135 of the Act has made it mandatory for companies having specified criteria to contribute at least 2% of their average net profit for development initiatives. Also, businesses who are major consumers and or polluters of water resources, may implement projects on water management in villages (ii) international donor agencies supplement the efforts of the government and other stakeholders by bringing financial and technical assistance, supporting capacity building of local institutions and communities, facilitating coordination and collaboration between related agencies, promoting good governance and accountability, as well as may act as advocates for policy changes in the water sector (iii) philanthropies contribute significantly to rural water management in India by funding projects, building capacity, supporting research, raising awareness, and fostering collaborations to ensure sustainable water access for rural communities (iv) the academic and research institutions, such as universities, think tanks, and laboratories, who generate and disseminate scientific and evidence-based knowledge and information on water resources and issues, and provide policy advice and solutions for water management and governance. They can also train and educate the water professionals and leaders of the future (v) the media and communication platforms, such as newspapers, television, radio, and social media, who can raise awareness and educate the public about the importance and challenges on water resources, as well as highlight the best practices and success stories of water management and governance. They can also facilitate dialogue and debate among the various stakeholders and amplify the voices and perspectives of the marginalized and vulnerable groups.

STAKEHOLDER COLLABORATION UNLEASHES SYNERGIES

The themes covered under water management are – enhancing the water availability, quality, and equitable accessibility, reducing wastage, demand, consumption, and pollution. To address these topics, there is a need for convergence and synergies between the different stakeholders involved. This refers to the alignment of goals, strategies, policies, and actions of different actors to achieve common outcomes and maximize the benefits of their interventions.

However, the different stakeholders often have different mandates, interests, and capacities. This leads to inefficiencies, duplications, wastage, and conflicts. Thus, there is an urgent need for integrated, holistic, and participatory approaches to rural water management that can address its inter related challenges. In addition, the various stakeholders contribute to innovation and scaling up the technologies, practices, and models on water security and improvement of livelihoods of the rural communities. Convergence also ensures better delivery of services, accountability, transparency, and responsiveness of the water services.

WHY LOCAL WATER MANAGEMENT IS A NECESSITY

Many villages in India are not provided with water from rivers or other surface sources. These habitations depend on groundwater, which may be contaminated or scarce, or the women must fetch water from distant places. In the case of villages that are provided with water from rivers, also, water harvesting, and conservation is needed as this water may not be sufficient to meet the growing water demand of the village, especially during the dry season or droughts, when the river flow may decrease or stop completely.

Therefore, it is imperative for most of the villages to manage their water, locally.

For this, most of the villages depend on rainfall of only about 100 days on average for providing them with water throughout the year, for all their domestic and agriculture purposes.

WATER BUDGETING: *Water Security begins with Water Responsibility*

Prior to implementing water management initiatives, it is recommended that a water budgeting exercise is conducted in a village for informed decision making, which integrates the technical, social, economic, environmental, and institutional aspects of water management. An outcome of water budgeting is the community driving a positive water balance to ensure sustenance in the long run. This crucial planning process by the whole community, aims to (i) balance the competing demands of different water users and sectors, while ensuring the long term sustainability and resilience of water resources (ii) prioritize interventions and allocate resources for them (iii) equitable distribution of water for all sections of the society including landless families (iv) garner agreement on the monitoring methodology (v) resolve challenges including those arising from the vested interests of dominant members of society (vi) utilize government programs.

The themes which are typically covered during water budgeting are on – the community's vision of a progressive village, water conservation, rainwater harvesting, groundwater recharge, choice of crops to be grown, climate resilience which includes factoring in the irregular rainfall, sustainable use of water resources preventing overexploitation, reserving separate water sources for drinking, irrigation and other uses, and creating water stewardship and responsibility among the water users.

Water budgeting requires simple, reliable, and transparent methods to estimate, analyse, monitor and communicate data. Therefore, best results may accrue when this process is initially facilitated by experts like CSOs or other mentors, this is so also because sometimes it is seen that community members do not respect each other's views initially and are more receptive to external agencies, indicating the truism of the proverb – 'familiarity breeds contempt'. CSO's can play roles in (i) community mobilization to generate motivation for water budgeting in the village (ii) use Participatory Rural Appraisal (PRA) tools to assist in this process and its outcomes. PRA includes mapping, transect walks, ranking, scoring, or matrix analysis, which can enable the people to share their knowledge, opinions, and preferences about the water situation and the possible solutions. PRA tools can also help in building trust, rapport, and consensus among the

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community members and with the external facilitators (iii) provide information on the various possibilities of accessing government facilities (iv) ensure the participation of women and marginalized sections (v) address affordability and water related risks (vi) provide information about the potential of different technical interventions which can be adopted by the people (vii) build capacities. Even though the principles upon which water budgeting stands are widely accepted in the country which are – 'Jal Swaraj' or 'Water Self Governance', 'Water as a common property resource', 'Water as a human right', 'Every Drop Counts', 'Every Source Matters', 'Water is an asset and not a liability', 'Participatory Water Governance', 'Try to, Catch every drop, where it falls'. Still there are inadequacies in (i) supportive policies and regulations to enable and enforce its actions and outcomes (ii) sustained funding, and (iii) capacity building for this.

Enhancing the community's understanding on Aquifers

Aquifers are underground layers of permeable rock or soil that store water as well as allow it to flow through. There are two types of aquifers, surface and deep. Surface aquifers are shallow and typically less than 30 meters below the ground surface. They can be quickly replenished by the monsoon rains through structures like check dams or percolation tanks. These aquifers can be tapped by hand pumps or dug wells.

Deep aquifers are usually more than 100 meters below the ground surface and have been created by ancient or distant sources of water. The quality of water in deep aquifers depends on various factors, such as the geology and hydrology in the area. In some cases, deep aquifers may have good quality water that is free from toxic chemicals. However, in other cases, deep aquifers may have water that is contaminated by high levels of natural anthropogenic pollutants. Deep aquifers are accessed by bore wells which have an average depth of 150 meters (50-300 meters). A bore well sucks out the water from deep aquifers at one go, which had taken a long time to accumulate, and as per a World Bank report it is typically abandoned in a period of about 6 years. Additionally, borewells create inequalities in society since only the well off and powerful people can afford to construct and maintain them, and through which only they can access most of the water from this limited and precious source.

Thus, it is important for the community at large to put a stop to the indiscriminate construction of borewells in their village for their overall benefit since those deep aquifers which have good quality water need to be protected both for themselves and for future generations. This water needs to be thought of as sustainable storage buffers of water to be used by the village only during critical situations, and not for routine requirements in regular times. It is only the shallow aquifers which need to be most efficiently filled during monsoons so that they can be the source of water throughout the year.

A joint community decision needs to be taken regarding which supply points of the shallow groundwater sources would be used by the whole community in specific months and seasons.

WATER CONSERVATION STRUCTURES

The effort needs to consider the entire village as single water management unit, for multi faceted action. Developing naturally occurring hydrological units or watersheds is the ideal strategy. This is a holistic approach of enhancing the lives of the villagers around water and includes creating water security, reducing soil erosion, improving soil moisture, supporting crop production and livelihood diversification. Water follows no political boundary and flows from higher to lower levels of any given area/terrain. A drainage basin is an area of land where all flowing surface water converges to a single point, such as a river mouth, or flows into another body of water, such as a lake or ocean. However, establishing a watershed may sometimes be challenging as it may involve a cluster of villages, who may not cooperate with each other. In this case, regarding a single village as a mini watershed is an option.

Considering the entire village as a water management unit can be successful, but it also has its hurdles. In general, there is a natural incentive for collective action in water conservation as the villagers often share common sources of water, like wells or ponds, and have strong social ties. However, the existence of internal diversity within the community also needs to be recognized, which may lead to conflicts and unequal outcomes of water related initiatives.

There are several classifications pertaining to water management, a current one which is also recognized is by the United Nations, constitutes of dividing water into three groups, which are (i) blue water that is available in aquifers, tanks, reservoirs and rivers (ii) green water which is present in soil and is used by plants or evaporates (iii) grey water is the wastewater generated by domestic and other human activities.
The above classification can also be further separated into categories of water management structures – *in situ, ex situ*, or both. In situ structures are those which increase the water availability within the natural drainage system of the land, *ex situ* structures are those that are built outside it.

A diverse range of structures and techniques exist for water harvesting in rural India, which depend on the geographical and climatic variations in the country. These methods include ones that have traditionally developed over time, and are best suited to various local environments, provided they have remained relevant amidst regional changes.

The structures depend on considerations like, whether (i) the soil is permeable or not permeable (ii) the bedrock is permeable, impermeable, or partially permeable, and (iii) the extent of slope in the topography. While many of the structures augment water for the entire community, some need to be implemented by individual farmers and households.
In general, the two simple but reliable methods to decide the kind of water conservation structures to be built are through (i) determining the slope of the landscape using just the auto level, and leveling staff/rod and a few more simple accessories (ii) discussion with the villagers on their observations regarding the direction of the flow of rainwater run offs.

Since many regions have unique scenarios, they require customized approaches. Two extreme geological situations and the strategies to be adopted in their cases are discussed below. However, it should be noted that most areas have a mix of such possibilities, and so require a hybrid approach.

Where the soil and bedrock are permeable, and there is a terrain

Where the soil and bedrock are permeable many rainwater harvesting structures can be constructed to recharge the shallow aquifers, such as – check dams, percolation tanks, concrete nallah bunds, earthen bunds, ponds, recharge trenches, contour trenches and bunds, and loose stone gabion structures. These structures are constructed across slopes to slow down the flow of runoff water from rainfall, allowing it to percolate into the soil. In addition, planting trees around the water harvesting structures further helps in not only percolating the water but also minimizing the soil erosion and strengthening of earthen structures as its roots hold the soil together.

Recharge wells should be built on drainage line where the rainwater collects and in runoff drains near open wells or borewells, as they directly recharge the aquifers.

Where the bedrock and soil are impermeable and there is no terrain

No land is totally flat, and there are always undulations. When the soil and underground rocks are mostly impermeable, the primary water harvesting option is surface storage in many tanks and ponds. These can be constructed in natural depressions or by making them and surrounding these by earthen embankments. This water may be used directly by people for domestic purposes, livestock, and irrigation with the help of water channels. For drinking, the households in such villages where no alternative sources of water are available, relying on rooftop rainwater harvesting and tankers would be the only alternative.

Ponds, an integral part of village ecosystem

Ponds contribute to various aspects of village life like (i) they provide good quality water in salinity affected areas (ii) supplement irrigation to the standing crops during the critical growth stage (iii) domestic use (iv) groundwater recharge, and (v) for animal husbandry, which is an important source of income in rural areas and fosters sustainable development (vi) maintaining local ecology supporting flora and fauna. Thus, water bodies like ponds, lakes and tanks should either be constructed or rejuvenated through cleaning and desilting as well as be upgraded. Ideal ponds should have the following features – (i) suitable catchment area contributing sufficient runoff (ii) sufficient water storage volume to cater to the local people's requirements (iii) a filtering chamber (or planting perennial grasses) to remove silt before the rainwater runoff enters the pond. A pre filter chamber removes plastic, insoluble items, and other solid waste material. From here, the water enters the filtration tank system, where the finer silt gets collected and the clear water enters the pond. This filtration system needs to be cleaned regularly (iv) outlets for overflow of excess water (v) cattle ramps for animals (vi) tree guards to stabilize the embankments (vii) steps on side slope to reach the water (viii) platform to wash clothes with a tin shed for shade.

Household structures

Rooftop rainwater harvesting is an *ex situ*, blue water collecting system, which holds significant potential for improving water security in Indian villages and promotes water conservation in the community. This is because even a small roof of 100 square meters can yield about 80,000 litres of water, with an average rainfall of 800 mm. This technology is particularly useful as it reduces the dependence of families on external sources for water and this stored rainwater is of better quality and available round the clock. Both flat and sloped roofs are suitable for rooftop rainwater harvesting and the water collected can be stored in tanks, barrels, or underground sumps, and can be used for domestic purposes over a long time. Though it is a simple and relatively inexpensive technology with easily available materials, the rooftop rainwater harvesting setup needs seasonal cleaning and maintenance to ensure water quality. Thus, a training is required to be imparted to households, for its implementation and maintenance.

Since each roof type has its pros and cons, a combination approach is usually the most suitable approach. Rooftop rainwater harvesting in village schools is a highly successful initiative as the stored water provides water for drinking and use in the toilet blocks, for the entire academic year of 10 months together, instead of individual households.

GREY WATER MANAGEMENT

According to the last Census of India 2011, about 74.8% of rural households in India do not have a drainage facility for domestic wastewater or they rely on open drains. 10.3% have a closed drainage system. 14.9% use other methods for disposing of wastewater, such as soak pits, septic tanks, or community facilities.

Thus, it is common for this exposed, stagnant grey water to be a nuisance on the roads, create a stench and be a breeding ground for disease-carrying organisms like mosquitoes and flies. To address this, context-specific solutions need to be promoted, which may be decentralized greywater management methods and small scale community treatment systems.

Soak pits are effective for domestic waste water management, in Indian villages. They are simple to construct and low cost. Soak pits are underground chambers that allow wastewater to slowly percolate into the ground. However, certain precautions need to be taken so that they do not contaminate groundwater sources. Also, they are not suitable in areas with clayey soil or rocky strata which have low permeability and water holding capacity or high–water table conditions. According to Indian Council of Agricultural Research (ICAR), about 49% of the total geographical area in India is covered by clayey or rocky soils. For these areas, options other than soak pits need to be used. Soak wells work on the same principle as the soak pit, but cater to several neighboring households together, instead of individual households.

The key to the sustainability of these structures, in terms of preventing clogging and overflow, is the regular cleaning of the silt trap/filtering chamber, located at the wastewater inlet of soak pit or soak well. Filtering chamber filters out solid particles and organic matter from the grey water.

WATER IN AGRICULTURE

The biggest utilization of water is in agriculture, where the conservation of green water *in situ* involves (i) efficient use of water, and (ii) improving soil health, which enhances water retention capacity that reduces irrigation needs. Soil health is improved by reducing soil erosion, increasing its nutrient content including micronutrients and organic carbon, stopping the use of excessive non judicious amounts of agricultural chemicals which necessitates more irrigation, which can be a concern in water scarce regions, particularly when considered cumulatively, minimizing tillage and through practicing crop rotation and intercropping.

The techniques for water management in agriculture include (i) micro irrigation through sprinklers and drip. Need based irrigation scheduling can save 35–40% of freshwater and 20 –25 percent reduction in fertilizer use[6] (ii) mulching (iii) farm bunding (iv) farm ponds. Often farmers do not want to lose their agricultural land by making farm ponds and they need to be enrolled for this, as it can provide them with protective irrigation in kharif and sometimes additional irrigation in rabi as well. Even though several types of farm ponds are in use based on the local factors, however typically in the case of small farmers in water stressed regions 15x15x3 meters or 12x12x3 meters farm ponds are constructed based on the farmer's land holding and choice, where tarpaulin of 350+GSM is used. In the case of clayey soil, there is no requirement of a lining. (v) laser leveling (vi) furrow based irrigation that delivers water directly to the plant roots minimizing wastage (vii) reducing the cultivation of water guzzling crops (viii) utilize renewable energy sources, such as solar power, for micro-irrigation and water pumps to reduce the water footprint (ix) crop diversification, which refers to the practice of growing a variety of crops instead of just one or two. This practice improves the soil structure enhancing water retention, due to which less irrigation is required as well as there is a reduced need for water intensive pesticide applications.

The most effective approach involves a combination of the above-mentioned techniques.

Two challenges need to be addressed for water conservation in agriculture (i) particularly small holding farmers, may have financial constraints to adopt some of the techniques which necessitates government support, micro–loans, or community based solutions where farmers pool resources or share equipment (ii) lack of technical knowledge requires capacity building and training programs to be conducted for farmers to help them to adopt and effectively utilize new technologies.

DRINKING WATER

The main sources of drinking water in India are surface water and groundwater. Surface water includes rivers, lakes, reservoirs, ponds, and canals. Groundwater is extracted from aquifers through wells, tube wells, bore wells, or hand pumps. According to the Ministry of Jal Shakti, about 85% of the rural population depends on groundwater for their domestic needs.

The Jal Jeevan Mission is in the process of providing potable water to all the rural households and as of December 2023, the number of rural households with tap water supply in their homes was around 13.69 crore (71%)[7].

6. Press Information Bureau. 5 September 2019
https://pib.gov.in/Pressreleaseshare.aspx?PRID=1584254

7. Press Information Bureau. 4 December, 2023.
https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1982294#:~:text=2023%2C%20around%2010.46%20Crore%20additional,water%20supply%20in%20their%20homes

The rest of the people use water from unprotected wells or springs, or surface water sources like rivers or lakes. While definitive data is not available, some evidence suggests that approximately 60–70 percent of India's water sources are contaminated by pollutants including – fluoride, arsenic, iron, nitrates, heavy metals, excess salinity, Per- and Polyfluoroalkyl Substances (PFAS), and biological contaminants. They originate from both natural processes and human activities. Some substances leach into water sources from underground rock and minerals. Human activities include industrial discharge, untreated sewage, and agricultural runoff having fertilizers, pesticides, and manure.

These contaminants cause serious effects on health and even death, especially among children. Some of the acute or chronic diseases caused by the pollutants include – fluorosis, arsenicosis, hemochromatosis, methemoglobinemia, cancer, diarrhea, cholera, typhoid, hepatitis, Giardiasis, roundworm infection of the intestines, and others. The limited availability of healthcare facilities in rural India coupled with the financial burden of treatment and lost wages due to illness, make this a major concern for the villagers. To address this critical issue, prioritizing clean drinking water initiatives in rural India is crucial.

Household filtration units and community based reverse osmosis (RO) are examples of two water purification methods, among others. Both have advantages and disadvantages. Region specific conditions drive the decision on which purification method to use.

The advantage of RO is that it removes all the harmful contaminants completely from the drinking water. However, it also results in stripping off the beneficial minerals from the water which are necessary for health, and there is a waste of about 60% of water. Newer RO technologies that address the disadvantages at reasonable costs are becoming available. In many districts of India there is no option but to use RO due to the prevalence of high levels of toxic substances in the water, and the alternative method of purifying water through filtration not being effective. In general, community managed RO systems in rural India have been successful in providing safe water to the villagers and have high community participation and ownership.

Two water filters that are prevalent are the bio sand filter and ceramic filter. The bio-sand filter uses layers of sand and gravel, and a biological layer of microorganisms that develop on the surface of the sand, while the ceramic filter uses porous ceramic material to filter. These filters can remove bacteria, protozoan parasites, cysts, worms, and turbidity from the water. However, by and large they are not suitable for the removal of pollutants like arsenic, fluoride and iron, nitrates, and salinity from the water, even though specifically designed ones can remove some of these contaminants to different extents.

For the long term improvement of the quality of underground water in villages i.e. aquifer remediation, the steps to be taken include (i) increasing the amount of water infiltration into the aquifer to dilute the pollutants (ii) sustainable use of fertilizers, pesticides, and other chemicals (iii) regulating groundwater extraction to prevent saltwater intrusion into freshwater aquifers.

Overall, more research and innovation are required to improve water purifying technologies for rural India.

VILLAGE LEVEL INSTITUTION: *Water Focused Community Based Organizations (CBO) & Panchayats*

India's development hinges on a decentralized system, with the elected Gram Panchayats representing village-level governance. Gram Panchayats are the recipients of budget allocation from the various State and Central Government schemes and sources and are intended to serve the interests of the Gram Sabha, which comprises the entire population of the village who are eligible voters. While the Constitution mandates the Gram Panchayat as the driver of village development, the need for Community Based Organizations (CBOs) extends beyond this formal structure. CBOs are a strategic bridge between the Gram Sabha and the Gram Panchayat.

CBOs are voluntary groups comprising of dynamic and motivated villagers who work for the collective benefit of the community. Panchayat members are also invited to be part of these groups. In the context of rural water related issues, they facilitate the management and conservation of water and promote its sustainable and equitable use. Water focused CBOs can comprise users' groups, committees, sangha and samitis.

Characteristics of Water Focused CBOs

CBOs The characteristics of the CBOs which are important to note are (i) they are not parallel structures to substitute the roles and responsibilities of the Gram Panchayat but are the vital missing link between the grassroots and official channels. Synergies between the CBOs and Gram Panchayat together bring about efficient development in the village (ii) gram Panchayats have finite tenures of 5 years, while CBOs have the advantage of being permanent structures, due to which they are better able to ensure sustainability of development initiatives. However, CBO members can also be changed under various circumstances if felt so by the local community or majority of the committee members (iii) CBOs enhance social cohesion, trust, and solidarity among rural people, and foster a sense of ownership and responsibility in them to take charge of their own development (iv) CBOs ensure that the required issues get into the Gram Panchayat Development Plan (GPDP) which is submitted to the Government, and that they are followed through till their outcomes.

(v) they act as platforms, representing the community, with whom the various stakeholders can interact (vi) CBOs play a vital role in mobilizing and educating the local communities, ensuring the smooth operation and maintenance of infrastructure, and resolve conflicts and disputes (vii) finally, when needed, they demand transparency, responsiveness and accountability from the elected representatives and officials.

Training of village level institutions

Training Panchayats in India is a multifaceted approach, in which various organizations are involved. This is mainly the responsibility of the government even though Civil Society Organizations (CSOs) as well conduct trainings. The government organizations include — State Institutes of Rural Development (SIRDs), National Institute of Rural Development & Panchayati Raj (NIRD&PR) and other government departments who conduct trainings related to their specific schemes and programs.

Mostly it is the CSOs which facilitate the formation and capacity building of the CBOs. The usual model followed is the formation of an overall village development CBO committee, which has thematic sub committees like for water. The training involves topics such as – enhancing self confidence and public speaking, assessment of the integrated development needs, gender mainstreaming, micro – planning and actions for executing them, technical understanding of initiatives, maintenance of water systems, participatory assessment of development initiatives, convergence with Gram Panchayat and government departments. The power of collective action is soon realized by the CBO members as they begin their activities, practically.

For fostering their better management of water resources. The water CBO members are also trained to (i) read piezometers which show the impact of the water conservation structures (ii) test the water quality through the field test kits (FTK), to assess and monitor the water sources.

Most essentially though, the CBOs are trained to facilitate independence of the village by stimulating the community towards innovation and adaptation of local solutions to local problems and encourage experimentation and learning from failures and successes.

Some themes promoted by water - CBOs

Advocacy of WASH (Water Sanitation and Hygiene). It is seen that behavior change in the community by using even the simplest WASH practices has a significant impact on improving the health of the rural people, due to which their livelihoods, education and social well being is positively impacted. These WASH practices include – the safe storage of drinking water, frequent handwashing with soap, waste disposal mechanisms, personal hygiene, hygienic handling of food, keeping the surroundings clean, and managing animal waste responsibly through composting or in designated disposal sites.

Social initiatives by water–CBOs in rural communities can foster a water related culture in them. This includes awareness campaigns through water literacy and celebrations around water. School and university students, as well as Youth Clubs in villages, have proven to be good assistants to water–CBOs, for this.

DISCUSSION AND CONCLUSION: *Communication is Crux*

In many villages of India, the lack of adequate and clean water, perpetuates and worsens the 'poverty trap', through adversely affecting the health and livelihood of people. Breaking free of this requires united efforts by all the stakeholders and entails a comprehensive approach of community-led and government backed initiatives, built around the limitation of the available water supply.In addition to the government, other stakeholders like Community Based Organizations (CBO), Panchayats, Civil Society Organizations (CSOs), Corporate Social Responsibly (CSR) entities, international donor institutions, academia, think tanks and media all play a vital role in organizing the village's human resources, building civil structures, training and capacity building of the community.

While India tackles water emergencies like droughts and floods, there also needs to be policy and greater promotion around the specific theme of 'consistent water availability'. New vocabulary needs to start being used in the country like – 'Water-based Livelihoods', 'Participatory Water Governance', 'Sustainable Water Security', 'Water is an asset and not a liability', 'Every Drop Counts, Every Source Matters', and others. Capacity building in villages needs to begin with a paradigm shift in the mindset of the people so that they see water as a fixed resource that needs careful management to ensure net availability in the positive per annum.

Mitigation of the symptoms is not the solution, and it must be tackled from the underlying source of the problem. The following six–pronged prototype needs to be adopted for creating impactful models, in India. However, there is no 'one size fits all' approach. Solutions must be tailored to the specific geographic, hydrological and social contexts of each area.

- Water literacy
- Engaging women and youth
- Setting up Community Based Organizations
- Water budgeting and accountability. Among others, source sustainability, water quality and future projections need to be included in this exercise.
- An ecosystem or watershed approach that integrates all aspects of water instead of fragmented, siloed initiatives. Water challenges overlap with other issues like food and economic security, health, well being, sanitation, education and gender equality. Addressing these interconnected issues through integrated programs will lead to more sustainable and lasting solutions.

To truly address water security, the development initiatives must actively include women in the villages, as most of their lives are spent around water, and 'health' is the domain of women. They are managing even in scarcity and can play a vital role collectively. The men in the community must be enrolled about women participation and the women must be provided with subject matter skills and access to all water resources like pumps, irrigation systems, and water storage facilities. Besides, women should be part of water committees and decision making processes, where their voices are heard. Empowered women can manage overall water governance including – water supply, undertake water quality surveillance, protect water sources, and promote sanitation. Furthermore, it is seen that some women emerge as water champions, advocating with the public system for water security, engaging in the various government schemes and ensuring equitable access of water for all community members. Many of the traditional water structures and mechanisms, even based on local folklore, are best suited to the region and so need to be revived, because the community strongly identifies with them which leads to long term sustainability. However, there is a need to validate their utility prior to simply reviving these structures, as the ecosystem and even the catchment areas may have changed, since the time they had been constructed and were useful. For optimal outcomes an integration of time tested techniques and contemporary advancements is required.

Some of the best practices to achieve water security in rural areas include the following (i) solutions should be adapted to the conditions and resources present in the village. They should be environmentally and financially sustainable and ensure benefits for future generations (ii) technology alone is not enough, and long-term water security requires behavior change, community ownership, and institutional support (iii) the government extension systems must be gender responsive (iv) the most powerful tool available to the village is the Gram Panchayat Development Plan (GPDP), which needs to be harnessed by the community and CBOs (v) there is a under utilization of the available government programs by the villagers, and there is a need to bridge this information gap (vi) water pipelines need to be upgraded and installed underground, which has the potential to substantially increase conveyance efficiency, and improve water conservation and sanitation in villages across India. (vii) increased access is required to government subsidies, microfinance and loans for communities and individuals to invest in water infrastructure and technologies like – efficient irrigation equipment, rainwater harvesting tanks, water purification systems and others (viii) transparent and fair water metering needs to be introduced for charging the water users based on the volume of water that they use, both for household and farm purposes. This encourages water conservation, more efficient use, detecting leaks and losses, monitoring the water use patterns, while ensuring affordability for vulnerable groups.

The most important facet around the theme of water is the communities themselves becoming the drivers of their own change and become independent of externalities and contingencies. For this to materialize, the game changers are – (i) awareness in every community member including school children, so that all realize that 'water' is the individual's responsibility (ii) identification and nurturing of altruistic people in the community, to carry the initiatives forward (iii) the community together 'reflecting' on water issues, to find local solutions. Thus, effective communication, and the use of excellent and simple IEC tools is an essential feature. Consistent with this, the government may like to enhance its initiatives and budget for awareness and capacity building, as this is the rudder for transformational change.

Change is a slow process, and sustainability of development projects is not an easy task, as projects mostly do not automatically become self reliant and continue operating on their own, unless special efforts are made. Mostly, this entails the setting up of trained and empowered Community Based Organizations, the CBOs, who work in tandem with the Panchayat.

On an optimistic note, the power of the community lies in collective action and a shared sense of responsibility through which it is possible to create sustainable solutions to water challenges.

ABOUT THE AUTHOR

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Q: HOW CAN SUSTAINABLE WATER MANAGEMENT ADDRESS THE CHALLENGES OF CLIMATE CHANGE, POPULATION GROWTH, AND POLLUTION TO ENSURE FUTURE WATER AVAILABILITY?

A: Global warming, driven by climate change, along with a rapidly growing population and rising pollution levels in oceans, lakes, and rivers, is making access to clean water increasingly critical. The availability of safe, potable water is under serious threat as these challenges will continue to intensify.

Sustainable water management has become crucial for present and future generations. To secure future water availability, we must implement comprehensive strategies that address these interconnected threats. Diversifying water sources through integrated systems that combine surface water, groundwater, and recycled water will create reliability. Modernizing aging infrastructure can eliminate the significant water loss water utilities experience through old supply networks. Digital technology, smart metering and real-time monitoring will help identify waste and optimize distribution. These technical solutions must be paired with conservation programs that encourage efficient water use by all users.

Strong regulations on industrial and agricultural runoff, combined with protection of water sources can prevent contamination before it occurs.

Advance treatment technologies and nature-based solutions can clean contaminated water sources, while proper wastewater management prevents new pollution. The future of water management lies in integration and innovation. While the challenges are significant, we have the knowledge and tools to ensure water security for future generations.

Q: WATER LOSS IS A SIGNIFICANT CHALLENGE FOR WATER UTILITIES ACROSS THE COUNTRY. HOW CAN IT BE EFFECTIVELY ADDRESSED?

A: In the face of aging infrastructure, manual management, water scarcity, population growth and growing regulatory pressures, water loss is a worldwide concern confronting water utilities across continents. The distinguishing factor is that in India, this issue accounts for nearly half of the total water production. The alarming reality is that despite having a significant population and water consumption reaching trillions of litres of fresh water, nearly half of treated, pumped water is lost in the distribution system. The leaks and breaks in the water pipeline that allows water to escape are also dangerous to public health as it becomes the major source of contamination with impurities entering the distribution system impairing the quality of water.

Ensuring reliable and sustainable operations is a major challenge that affects customers and businesses, and water utilities everywhere are taking steps to modernize their operations.

> To secure future water availability, we must implement comprehensive strategies that address current and emerging challenges.

Underscoring the need for a shift towards smarter, more sustainable water operations, water utilities should prioritize implementing smart water solutions, including:

- Accurate demand forecasting and management-Meet consumer demand with precision.
- Strategies for water loss reduction - Protect water supply, enhance pipeline integrity, and reduce inefficiencies.
- Infrastructure modernization - Upgrade for future-readiness and data reliability
- Real-time monitoring and leak detection - Monitor distribution network, repair leaks and minimize losses.
- Awareness and stakeholders' engagement - Collective approach to water conservation and reduce wastage.

By adopting these strategies, water utilities can transition towards more resilient, sustainable, and efficient operations, ensuring a reliable water supply.

Q: COULD YOU SHARE INSIGHTS INTO SPML'S EXPERIENCE WITH EXECUTING A WATER LOSS MANAGEMENT PROJECT?

A: SPML Infra Limited successfully executed a water loss management project in selected areas of Bengaluru. Utilizing advanced leak detection technologies, we traced underground leaks and addressed issues by removing and rehabilitating old, deteriorated pipelines. This targeted project yielded impressive outcomes, reducing water loss from an initial 53% to 19%, leading to a remarkable conservation of almost 52 million litres of potable water on a daily basis.

Water utilities in India must ensure that the water they deliver is safe and compliant with drinking water regulations while at the same time they have to ensure that minimum water is lost during the transmission and distribution. By addressing leaks, optimizing infrastructure, and implementing efficient monitoring systems, utilities can achieve a more sustainable supply while maximizing resource efficiency and maintaining financial stability. Reducing water loss not only conserves valuable resources but also strengthens the reliability of the water network and supports long-term resilience in the face of increasing demand and scarcity.

Q: THE UNTREATED DISCHARGE OF WASTEWATER INTO WATER BODIES RESULTS IN EXTENSIVE WATER POLLUTION. WHAT IS YOUR VIEW ON WASTEWATER TREATMENT IN INDIA?

A: The issue of untreated wastewater being released into water bodies and causing water pollution is a significant concern. Approximately 80 billion liters of municipal wastewater is generated daily in urban India. From this substantial amount, only around one-third undergoes treatment before being released. The remaining almost two-third is discharged into water bodies without any form of treatment resulting in polluted rivers, lakes and ponds.

India generates nearly 14 billion litres of industrial wastewater as well, which requires proper treatment before being discharged so that it meets environmental norms.

Roughly just over half of this wastewater undergoes treatment, leaving the remaining portion untreated before being released into the land and water bodies. This strongly underscores the urgent need for enhanced wastewater management in the country.

The traditional concept of wastewater treatment plants is now becoming obsolete and a real desire for change can be felt throughout the sector. Wastewater treatment plants must transition into a circular economy model, emphasizing the repurposing of resources and energy. It is imperative to take proactive steps to ensure the safeguarding and preserving water resources.

New technologies for treatment and management are quite effective to meet industry and irrigation water needs and comply with existing regulations. Several examples from different countries are available where they are using treated wastewater for useful purposes even some of them is meeting their potable water needs through the reclaimed water.

The most effective strategy moving forward would involve the establishment of decentralized wastewater treatment facilities, flexible enough to accommodate a wide range of operational requirement. These facilities could be deployed in settings such as small townships, urban and rural clusters, gated colonies, factories, and industrial parks. The advantage of such solutions lies in their on-site installation, enabling direct treatment of wastewater at its origin for various purposes. Reuse of treated wastewater is an issue that has not received much attention as yet in government policies. The Central Public Health and Environmental Engineering Organization reports that the treated wastewater can be used for irrigation, cleaning operations (roads, vehicles, trains), fire-fighting, industrial refrigeration, toilet flushing, and horticulture.

The effective treatment and reuse of wastewater, aiming to repurpose it for beneficial utilization across various activities are progressively gaining attention as an attractive and practical solution. This approach not only tackles water scarcity challenges but also effectively addresses concerns related to pollution.

Q: HOW SPML INFRA POSITIONING ITSELF TO LEVERAGE EMERGING OPPORTUNITIES IN INDIA'S EVOLVING WATER SECTOR?

A: The Indian water sector has experienced significant growth in recent years. In the third term of the government, the sector is poised for unprecedented expansion, driven by several ambitious initiatives like Jal Jeevan Mission, AMRUT (Atal Mission for Rejuvenation and Urban Transformation), Namami Gange, Pradhan Mantri Krishi Sinchayee Yojana, National River Linking Project, Atal Bhujal Yojana, Dam Rehabilitation and Improvement, and National Hydrology Programme. These initiatives have created a landscape rich with opportunities for SPML Infra and other companies in the water infrastructure sector.

SPML Infra, a leading player in the industry, is strategically positioned to capitalize on these opportunities. With over four decades of experience, we have established ourselves as a trusted partner for executing complex water infrastructure projects. The company's proven track record and extensive experience qualify it to bid for water projects worth up to Rs. 1,500 crore. This capability allows SPML Infra to pursue large, prestigious water supply projects, further cementing its position as a key player in India's water sector.

> By improving water infrastructure, the government can enhance water security, mitigate the impacts of climate change and create sustainable opportunities for economic expansion, thereby fostering long-term prosperity for the nation.

As the industry evolves to meet the challenges of climate change and urbanization, SPML Infra's technical prowess and execution capabilities make it well-equipped to drive transformative change. The company's ability to adapt to new technologies and implement innovative solutions positions it as a frontrunner in India's water infrastructure revolution.

By leveraging its expertise, market presence, and qualification for high-value projects, SPML Infra is poised to play a crucial role in shaping the future of India's water sector. As the country strives to achieve its water management goals, SPML Infra will be instrumental in turning ambitious plans into reality, contributing to India's sustainable development and water security.

INTERVIEW WITH
THEOGENE RUSATIRA
WASH EXPERT,
MOVIMENTO LOTTA FAME NEL MONDO (MLFM)

Q: What do you see as the key trends shaping the future of seawater desalination technology? How is the industry addressing challenges related to energy consumption and environmental impact?

A: The future of seawater desalination technology is being shaped by several exciting trends aimed at enhancing efficiency, sustainability, and cost-effectiveness.

Industries are actively addressing challenges related to energy consumption and environmental impact through several innovative strategies:

1. Adoption of Clean Energy: Many industries are transitioning to renewable energy sources like solar, wind, and hydro power. These sources significantly reduce carbon emissions compared to fossil fuels.
2. Energy Efficiency: Implementing high-efficiency electric motors and other energy-saving technologies can reduce energy consumption in industrial processes by up to 90%. Additionally, practices like heat recovery and reuse are becoming more common.
3. Circular Economy: Industries are adopting circular economy principles to minimize waste and maximize resource efficiency. This involves recycling materials, reusing products, and designing for longevity.
4.Technological Innovations: Advances in technology, such as machine learning and artificial intelligence, are being used to optimize energy use and reduce environmental impacts. For example, AI can help monitor and manage energy consumption more effectively.
5. Behavioral Changes: Training staff to reduce waste and energy use is also a key strategy. Encouraging sustainable practices within the workforce can lead to significant reductions in energy consumption.

Q: With the increasing global demand for freshwater, how do you envision the role of desalination evolving over the next decade? What technological advancements will play a critical role in scaling up desalination efforts?

A: Desalination is poised to play a crucial role in addressing the global freshwater shortage over the next decade. Desalination is set to become a more integral part of the global water supply strategy, helping to meet the growing demand for freshwater in a sustainable and economically viable manner.

Several technological advancements are poised to significantly enhance desalination efforts, making the process more efficient, cost-effective, and sustainable. Here are some key innovations:

1. Advanced Membrane Technologies: Improvements in reverse osmosis (RO) membranes, such as higher efficiency and nano structured membranes, are reducing energy consumption and costs. Forward osmosis (FO) and membrane distillation (MD) are also emerging as promising alternatives.
2. Energy Recovery Systems: Advanced pressure-exchanger based energy recovery systems are helping to lower the energy requirements of desalination process.
3. Solar Desalination: Innovations in solar-powered desalination systems are making it possible to produce freshwater using renewable energy. For instance, MIT researchers have developed a solar desalination device that avoids salt-clogging issues and can produce water at a rate and price cheaper than tap water.
4. Portable Desalination Units: Portable units that use ion concentration polarization (ICP) and electrodialysis (ED) processes are being developed. These units are lightweight, require minimal power, and do not need replacement filters, making them ideal for remote and resource-limited areas.
5. Electrochemical Processes: Capacitive deionization (CDI) and other electrochemical methods are being explored for their potential to efficiently remove salts from water.

Q: Energy efficiency has always been a major concern in desalination. Can you talk about some of the emerging solutions that aim to reduce the energy footprint of desalination processes?

A: Absolutely! Reducing the energy footprint of desalination is crucial for making it a more sustainable solution for addressing water scarcity. Here are some emerging solutions that aim to improve energy efficiency in desalination processes:

1. Renewable Energy Integration: Utilizing renewable energy sources like solar, wind, and geothermal power to drive desalination processes can significantly reduce reliance on fossil fuels and lower greenhouse gas emissions. For example, photovoltaic-powered reverse osmosis (RO) systems are becoming more economically viable.
.2. Advanced Membrane Technologies: Innovations in membrane technology, such as forward osmosis (FO) and membrane distillation (MD), are helping to reduce energy consumption. These technologies often operate at lower pressures and temperatures compared to traditional methods, which can lead to substantial energy savings.
3. Hybrid Systems: Combining different desalination technologies and renewable energy sources can enhance overall efficiency. For instance, hybrid systems that integrate solar thermal energy with membrane-based desalination can optimize energy use and improve scalability.
4. Energy Recovery Devices: Implementing energy recovery devices (ERDs) in desalination plants can capture and reuse energy that would otherwise be wasted. This can significantly reduce the overall energy consumption of the desalination process.
5. Low-Energy Desalination Processes: Emerging processes like adsorption desalination (AD) and gas hydrate-based desalination are being developed to lower energy consumption. These methods can potentially reduce energy use to below 2 kWh/m³, making them highly efficient.

Q: How are renewable energy sources like solar or wind power being integrated into desalination plants to make the process more sustainable? Do you foresee large-scale adoption of these technologies?

A: Integrating renewable energy sources like solar and wind power into desalination plants is a promising approach to making the desalination process more sustainable.

Yes, large-scale adoption of solar and wind power technologies is highly likely over the next decade, The combination of economic viability, supportive policies, technological progress, and environmental necessity is setting the stage for widespread adoption of solar and wind power technologies.

Q: Brine disposal and its environmental impacts remain a significant challenge for the desalination industry. What innovations are currently being developed to manage or mitigate these issues?

A: Indeed, brine disposal is a significant challenge for the desalination industry, but several innovative approaches are being developed to manage and mitigate these issues:

1. Brine Valorization: Researchers are exploring ways to convert brine into useful chemicals. For example, a process developed at MIT can turn concentrated brine into valuable chemicals like sodium hydroxide and hydrochloric acid. This not only reduces the environmental impact but also makes the desalination process more efficient and economically viable.
2. Membrane-Based Brine Concentration: New membrane technologies, such as the All-Membrane Brine Concentrator (AMBC), are being developed to concentrate brine more efficiently. These systems use less energy compared to traditional thermal evaporation methods, making them more sustainable and cost-effective.
3. Zero Liquid Discharge (ZLD) Systems: Some desalination projects are aiming for zero liquid discharge, meaning no brine is released into the environment. These systems often involve advanced treatment processes that recover almost all the water and convert the remaining brine into solid waste, which can be safely disposed of or used in other applications.
4. Renewable Energy Integration: Integrating renewable energy sources like solar and wind power into desalination processes can help reduce the environmental footprint. Some innovative projects are focusing on using renewable electricity to power desalination plants and minimize the impact of brine disposal.
5. Electrodialysis and Forward Osmosis: Emerging membrane processes like electrodialysis and forward osmosis are being explored for their potential to treat and manage brine more effectively. These technologies can help reduce the volume of brine and recover valuable resources from it.

Q: What role do you see for digital technologies, such as artificial intelligence (AI) and machine learning, in optimizing the operation and maintenance of desalination plants?

A: Digital technologies, particularly artificial intelligence (AI) and machine learning (ML), are set to revolutionize the operation and maintenance of desalination plants. Here are some key roles they will play:

1. Predictive Maintenance: AI can analyze data from various sensors to predict equipment failures before they occur. This helps in scheduling maintenance activities proactively, reducing downtime and extending the lifespan of equipment.
2. Energy Optimization: Desalination is energy-intensive, but AI can optimize energy usage by adjusting operational parameters in real-time. Machine learning algorithms can identify patterns and suggest the most energy-efficient operating conditions.
3. Water Quality Management: AI can continuously monitor water quality and make real-time adjustments to ensure the output meets required standards. This includes adjusting chemical dosing and filtration processes based on predictive models.
4. Process Optimization: Machine learning can analyze historical and real-time data to optimize the overall desalination process. This includes improving the efficiency of reverse osmosis membranes and reducing the amount of brine produced.
5. Integration with Renewable Energy: AI can help integrate renewable energy sources like solar and wind with desalination plants. By forecasting energy availability and optimizing its use, AI can make renewable-powered desalination more reliable and cost-effective.
6. Operational Efficiency: AI-driven automation can streamline operations, reducing the need for manual intervention and minimizing human error. This leads to more consistent and efficient plant performance.

Q: How are governments and private companies collaborating to expand desalination infrastructure in regions most affected by water scarcity? Are there any promising partnerships or projects you'd like to highlight?

A: Governments and private companies are increasingly collaborating to expand desalination infrastructure, especially in regions facing severe water scarcity in:

1. Public-Private Partnerships (PPPs): These partnerships leverage the strengths of both sectors. Governments provide regulatory support and funding, while private companies bring in technical expertise

and efficiency. For example, countries like Israel, Australia, and the United States have successfully implemented PPPs to build and operate desalination plants.
2. Innovative Financing Models: Governments are adopting innovative financing tools to attract private investment. This includes offering tax incentives, subsidies, and grants to reduce the financial burden on private companies.
3. Joint Research and Development: Collaborative R&D efforts are crucial for advancing desalination technologies. Governments and private companies are investing in research to develop more efficient and sustainable desalination methods. For instance, projects focusing on renewable energy-powered desalination are gaining traction.
4. Capacity Building and Training: Both sectors are working together to build local capacity and expertise. This involves training programs and knowledge transfer initiatives to ensure that local communities can manage and maintain desalination infrastructure effectively

These collaborative efforts are essential for scaling up desalination infrastructure and ensuring a reliable supply of freshwater in water-scarce regions.

Certainly! Here are a few promising partnerships and projects in the desalination sector that are making significant strides:

1. National Alliance for Water Innovation (NAWI): The U.S. Department of Energy (DOE) and NAWI have selected 12 projects aimed at improving the energy efficiency of desalination and water reuse technologies. These projects focus on innovative technologies to treat, use, and recycle water, contributing to a circular economy and providing climate-resilient, cost-effective water supplies.
2. Israel's Sorek Desalination Plant: This plant is one of the largest and most advanced in the world. It operates under a public-private partnership model, combining government support with private sector efficiency. The plant uses advanced reverse osmosis technology to produce high-quality drinking water at a competitive cost.
3. Australia's Victorian Desalination Project: This project is another example of a successful public-private partnership. It provides a reliable water supply to Melbourne and surrounding areas, especially during drought periods. The plant is designed to be environmentally sustainable, with measures in place to minimize its ecological footprint.
4. Saudi Arabia's NEOM Project: As part of its Vision 2030 initiative, Saudi Arabia is investing in large-scale desalination projects powered by renewable energy. The NEOM project aims to create a sustainable city with a significant portion of its water supply coming from solar-powered desalination plants.

Q: Cost has been a barrier to widespread desalination in certain regions. What advancements are being made to reduce the cost of desalinated water, making it more accessible to developing nations?

A: Several advancements are being made to reduce the cost of desalinated water, making it more accessible to developing nations:

1. Improved Membrane Technology: Innovations in reverse osmosis (RO) membranes, such as nanostructured and higher efficiency membranes, are significantly reducing energy consumption and operational costs. These advancements allow for more water to be processed with less energy.
2. Energy Recovery Systems: Advanced pressure-exchanger based energy recovery systems are being implemented to capture and reuse energy within the desalination process. This can reduce energy costs by up to 60%, making desalination more affordable.
3. Solar-Powered Desalination: Integrating solar power with desalination plants is a promising approach, especially for regions with abundant sunlight. Solar desalination systems can lower operational costs by using renewable energy, which is often cheaper and more sustainable.
4. Modular and Mobile Desalination Units: Developing smaller, modular desalination units that can be easily transported and deployed in remote or developing areas is another cost-effective solution. These units can be scaled up or down based on demand, reducing initial investment and operational costs.
5. Government and Private Sector Collaboration: Public-private partnerships and innovative financing models are crucial in reducing costs. Governments can provide subsidies, tax incentives, and regulatory support, while private companies bring in technological expertise and efficiency.

Q: Seawater desalination requires significant up front investment. Where do you see the best opportunities for investment in this space, and what areas are likely to experience the most growth in the coming years?

A: Investing in seawater desalination is becoming increasingly attractive due to the growing global demand for fresh water. Here are some of the best opportunities for investment and the areas likely to experience the most growth:

Best Opportunities for Investment.
1. Publicly Traded Companies: Investing in established companies involved in desalination can be a solid choice. Some leading companies include:
- **Veolia Environment S.A.:** A global leader in water management solutions.
- **Consolidated Water Co. Ltd:** Operates desalination plants primarily in the Caribbean.
- **Doosan Heavy Industries & Construction Co., Ltd. :** A major player in the desalination market.

2. Technological Innovations: Companies that are developing new and more efficient desalination technologies, such as advanced reverse osmosis and solar desalination, are promising investment targets. operational costs are particularly valuable.
3. Infrastructure Projects: Investing in large-scale desalination plants, especially in regions facing severe water shortages, can offer substantial returns. For example, the Carlsbad Desalination Plant in California is a significant project addressing local water scarcity.

Areas Likely to Experience the Most Growth

1. Asia-Pacific: This region is expected to be the fastest-growing market for desalination, driven by rising water shortages, population growth, and industrialization. Countries like China, India, and Australia are leading the way.
2. Middle East and North Africa (MENA): Countries in this region, such as Saudi Arabia and the UAE, have been heavily investing in desalination due to their arid climates and lack of freshwater resources.
3. United States: Particularly in the Western states like California, where prolonged droughts have made desalination a critical solution for water supply.
4. Sub-Saharan Africa: With a projected 163% increase in water demand by mid-century, this region is also expected to see significant growth in desalination projects.

Q: Can you share any notable examples of recent large-scale desalination projects and the technologies they are using to push the boundaries of current capabilities?

A: Certainly! Here are some notable recent large-scale desalination projects and the innovative technologies they are using:

1. Ras Al-Khair, Saudi Arabia
- **Capacity:** 1,036,000 m³/dayo
- **Technology:** This project is a hybrid that uses both thermal multistage flash (MSF) and reverse osmosis (RO) technologies. It also includes a substantial power generation component with a capacity of 2,400 MW.

2. Taweelah, UAE
- **Capacity:** 909,200 m³/day (upon completion)
- **Technology:** This project will significantly increase the UAE's desalinated water production using advanced RO technology. The project is still in its early stages but is expected to be one of the largest once completed.

3. Rabigh 3, Saudi Arabia
- **Capacity:** 600,000 m³/dayo
- **Technology:** This project uses state-of-the-art RO technology and is one of the largest awarded RO desalination plants.

4.Oneka Wave-Powered Desalination

- **Technology:** This innovative project uses wave power to drive a pump that forces seawater through filters and RO membranes. Floating buoys tethered to the ocean floor harness wave energy, making it a sustainable and energy-efficient solution.

5. Solar-Powered Desalination
- **Technology:** Recent advancements include the use of sophisticated solar concentrators and solar stills (SS) to enhance efficiency. Photovoltaic (PV)-powered RO systems use solar panels to produce electricity for operating RO systems, reducing reliance on traditional energy sources.

Q: What role can public policy and regulation play in accelerating the adoption of desalination technologies? Are there any current policy changes that you think will significantly impact the industry?

A: Public policy and regulation play a crucial role in accelerating the adoption of desalination technologies by:

1. Funding and Incentives: Governments can provide financial support through grants, subsidies, and tax incentives to lower the initial costs of desalination projects. This can make it more attractive for private companies to invest in and develop these technologies.
2. Research and Development: Public funding for R&D can drive innovation in desalination technologies, making them more efficient and cost-effective. Policies that support collaborative research between public institutions and private companies can also accelerate technological advancements.
3. Regulatory Frameworks: Establishing clear and supportive regulatory frameworks can streamline the approval and implementation of desalination projects. This includes setting standards for water quality, environmental impact assessments, and waste management.
4. Environmental Regulations: Policies that address the environmental impacts of desalination, such as brine disposal and energy consumption, can ensure that these technologies are sustainable. Regulations that promote the use of renewable energy in desalination processes can also reduce the carbon footprint of these projects.

Current Policy Changes Impacting the Industry

Several recent policy changes and trends are likely to significantly impact the desalination industry:

- **Climate Change Policies:** As climate change exacerbates water scarcity, many governments are incorporating desalination into their climate adaptation strategies. This includes funding or new desalination plants and research into more sustainable desalination methods.
- **Environmental Impact Regulations:** There is growing scrutiny on the environmental impacts of desalination, particularly regarding marine ecosystems and energy use. New regulations are being introduced to mitigate these impacts, such as stricter guidelines on brine disposal and incentives for using renewable energy sources.
- **Global Clean Water Desalination Alliance:** International interest groups are promoting the use of clean energy for desalination, setting global targets to reduce reliance on fossil fuels in water treatment processes. This initiative aims to make desalination more sustainable and environmentally friendly.

Q: What are some of the biggest misconceptions about desalination that you think need to be addressed as the technology becomes more widespread?

A: There are several misconceptions about desalination that often come up. Addressing these can help people better understand the potential and limitations of this technology:

1. Desalination is Too Expensive: While desalination was once considered prohibitively costly, advancements in technology have significantly reduced the expenses associated with the process. Modern desalination plants are more efficient and cost-effective, making the technology increasingly accessible.
2. Desalination Harms the Environment: Properly managed desalination plants can minimize their environmental impact. Advanced filtration and membrane technologies ensure that brine discharge is safely returned to the ocean without harming marine life. Additionally, using renewable energy sources can further reduce the carbon footprint of desalination plants.
3. Desalination Produces Low-Quality Water: This is a common myth. Desalination processes, such as reverse osmosis, produce high-quality freshwater that meets or exceeds drinking water standards. The water is meticulously filtered and purified, removing impurities, minerals, and salts.
4. **Desalination is Only Suitable for Coastal Regions:** While coastal areas are ideal due to easy access to seawater, advancements in technology have made it possible to implement desalination systems inland as well. This flexibility allows communities far from the coast to benefit from desalinated water, addressing water scarcity in regions with limited freshwater resources.
5. Desalination is a Silver Bullet for Water Scarcity: Although desalination can significantly alleviate water scarcity, it is not a standalone solution. It should be part of a broader water management strategy that includes conservation, recycling, and sustainable usage practices.

Q: Looking ahead, what would you identify as the top three priorities for the desalination industry in the next 5-10 years?

A: Looking ahead, the desalination industry has several key priorities to focus on in the next 5-10 years:

1. Energy Efficiency and Sustainability: One of the biggest challenges for desalination is its high 1 energy consumption. The industry needs to prioritize the development and implementation of more energy-efficient technologies. This includes integrating renewable energy sources, such as solar and wind, to power desalination plants, thereby reducing their carbon footprint.
2. Environmental Impact Mitigation: Addressing the environmental concerns associated with desalination, particularly the disposal of brine and its effects on marine ecosystems, is crucial. Innovations in brine management and the development of environmentally friendly disposal methods will be essential. Additionally, improving intake systems to minimize harm to marine life is a priority.
3. Cost Reduction and Accessibility: Making desalination more affordable and accessible is vital for its widespread adoption. This involves not only reducing the operational costs through technological advancements but also creating financial models and policies that support the deployment of desalination in regions facing severe water scarcity

Q: How do you see the future of hybrid desalination systems, which combine different desalination processes (such as reverse osmosis and forward osmosis)? Do you believe they could become the industry standard?

A: Hybrid desalination systems, which combine processes like reverse osmosis (RO) and forward osmosis (FO), hold significant promise for the future of water treatment. Here are a few reasons why they could become more prevalent and potentially the industry standard:

1. Enhanced Efficiency: Hybrid systems can leverage the strengths of both RO and FO. For instance, FO can pre-treat seawater, reducing the energy required for subsequent RO treatment. This combination can lead to lower overall energy consumption and higher water recovery rates.
2. Cost-Effectiveness: By improving efficiency, hybrid systems can reduce operational costs. The integration of FO and RO can also mitigate some of the limitations of each individual process, such as the high energy demand of RO and the lower water flux of FO2. This makes the overall process more economically viable.
3. Environmental Benefits: Hybrid systems can help address environmental concerns associated with desalination. For example, FO can dilute seawater with treated wastewater, reducing the salinity and thus the energy required for RO. this can also lead to less brine discharge, which is a major environmental

issue.

4. Technological Advancements: Ongoing research and development are continuously l improving the membranes and processes used in hybrid systems. Innovations such as pressure-assisted osmosis (PAO) are enhancing the performance and feasibility of these systems.

Q: Finally, what advice would you give to innovators and entrepreneurs looking to enter the desalination industry? What areas of innovation hold the most promise for the future?

A: Advice for innovators and entrepreneurs:

1. Focus on Sustainability: Prioritize developing technologies that reduce the environmental impact of desalination. This includes minimizing energy consumption, using renewable energy sources, and addressing brine disposal issues.

2. Leverage Public-Private Partnerships: Collaborate with government agencies and other stakeholders to secure funding, navigate regulatory landscapes, and gain access to necessary infrastructure.

3. Invest in Research and Development: Continuous innovation is crucial. Invest in R&D to improve the efficiency and cost-effectiveness of desalination technologies. Stay updated with the latest advancements and be open to adopting new methods.

4. Understand the Market Needs: Tailor your solutions to the specific needs of different regions. For example, coastal areas might benefit more from seawater desalination, while inland areas might need solutions for brackish water or wastewater treatment.

5. Build a Strong Team: Assemble a team with diverse expertise, including engineering, environmental science, business development, and regulatory affairs. A multidisciplinary approach can help address the complex challenges of desalination.

Promising Areas of Innovation:

1. Renewable Energy Integration: Combining desalination with renewable energy sources like solar, wind, and wave energy can significantly reduce operational costs and environmental impact. Innovations in this area are crucial for making desalination more sustainable.

2. Advanced Membrane Technologies: Developing more efficient and durable membranes can enhance the performance of desalination processes. Innovations such as nanostructured membranes and improved reverse osmosis (RO) membranes are particularly promising.

3. Hybrid Desalination Systems: Combining different desalination processes, such as reverse osmosis and forward osmosis, can improve efficiency and reduce costs. These hybrid systems can leverage the strengths of each method to create more effective solutions.

4. Digital and Smart Technologies: Implementing digital technologies, such as Artificial Intelligence (AI) and Internet of Things (IoT), can optimize desalination operations, improve monitoring and maintenance, and reduce downtime. Smart systems can also enhance the overall efficiency and reliability of desalination plants.

Q: What do you see as the key trends shaping the future of seawater desalination technology? How is the industry addressing challenges related to energy consumption and environmental impact?

A: One of the UN's Sustainable Development Goals, the sixth goal, is to ensure the availability and sustainable management of water and sanitation for all. Unfortunately, safe drinking water, sanitation, and hygiene are still out of reach for many. In 2022, 2.2 billion people could not access safely managed drinking water. That is more than a quarter of the global population.

While water may be abundant in some places, it is often not in the right quality or quantity to meet our water needs. Different technologies have emerged to address this issue. The increasing use of desalination, removing salt from seawater, has been critical for water scarce areas, such as the Middle East and parts of Europe. Australia, Singapore, and Israel have a significant portion of demand met through desalination, while India and China are investing heavily to meet their growing needs. Desalination can also be used in the oil and gas sector, as well as with industrial applications.

Coupled with digital tools to design, build, and maintain these types of projects, the industry is seeing more desalination plants come online each year.

There are approximately 21,000 desalination plants in operation around the world, with the largest one, the Ras Al-Khair Power and Desalination Plant in Saudi Arabia, processing 1.4 million cubic meters each day.

While desalination is more energy-intensive than other types of water treatment (about three kilowatt-hours per cubic meter, compared to freshwater supplies that use 0.2 kilowatt-hours per cubic meter or less, according to the Electrical Power Research Institute), its benefits outweigh the costs in water stressed areas.

Q: With the increasing global demand for freshwater, how do you envision the role of desalination evolving over the next decade? What technological advancements will play a critical role in scaling up desalination efforts?

A: One of the biggest challenges in water security is the demand for freshwater sources. As freshwater sources are limited, we're finding new ways to reuse the water we already have, such as with desalination of brackish water (either from oil and gas activities or seawater) or the reclamation of wastewater.

For work in water plants, including desalination plants, we're seeing users implement a digital twin to plan and design their work.

They utilize that same data to optimize operations, run emergency scenario simulations, and make better decisions for future projects with an evergreen model.

On the treatment side of the industry, we've seen project engineering data be used to reduce time and cost of construction. This same data can then be used during operations to train new operators or provide a single view of engineering data for all stakeholders, such as operations personnel, engineers, and consultants. Due to Bentley's industry-leading levels of openness and interoperability, our users are able to apply their own AI technology on top of the foundation of a Bentley iTwin.

Q: Energy efficiency has always been a major concern in desalination. Can you talk about some of the emerging solutions that aim to reduce the energy footprint of desalination processes?

A: At Bentley, we host the annual Year in Infrastructure and Going Digital Awards event to recognize outstanding projects using our software. In the water and wastewater category, one of this year's finalists—Beijing Shougang International Engineering Technology Co., Ltd.—delivered a desalination project to develop 90 million tons per year of freshwater sources. In this project, Beijing Shougang applied integrated digital solution work flows to improve the design efficiency by 70% and save 10% of the materials to reduce engineering waste. Those savings not only minimized errors and costs, but also helped reduce the carbon footprint.

This project in particular used Bentley software to complete the digital design at the plant to reduce the capital and operating costs and effectively lower carbon emissions.

Renewable energy sources like solar or wind power are being integrated into many desalination plants to make the process more sustainable. For example, for this project, Beijing Shougang designed 8,000 square meters of solar panels to use as green power, estimated at generating 50,000 megawatt-hours of electricity for the plant. These savings will amount to a carbon dioxide emissions reduction of 30,000 tons every year. This improves our users' sustainability objectives and makes a lasting difference for our planet.

Q: What role do you see for digital technologies, such as AI and machine learning, in optimizing the operation and maintenance of desalination plants?

A: AI holds significant potential to improve the way everyone works. We're already seeing AI being used to help optimize the operation and maintenance of water assets. AI, machine learning in particular, is technology that can assist engineers and operators by running predictions on top of the data collected. Bentley's Water Network Monitoring and Water Treatment Plant Engineering solutions give our users exactly those capabilities, enabling more effective management of existing assets and significantly reducing time to design through the direct application of AI. These capabilities extend to carbon impact calculations with our Carbon Analysis tool, as well as advanced AI-driven visualisation, reporting, and analysis.

One of the coolest uses that I've seen for plants is taking a static piping and instrumentation diagram drawing of an existing plant and using AI to transform it into a digital representation. This helps to save time in the development of a digital model and can help designers to more accurately reference existing assets.

Q: How are governments and private companies collaborating to expand desalination infrastructure in regions most affected by water scarcity? Are there any promising partnerships or projects you'd like to highlight?

A: Governments and private companies often collaborate on projects through water utilities. Governments provide funding, subsidies, and utility-friendly legislations, while private companies provide the technology and human expertise to expand desalination infrastructure. They are also aligned on sustainability initiatives. There is an opportunity for governments and private companies to collaborate further through direct partnerships.

Q: Can you share any notable examples of recent large-scale desalination projects and the technologies they are using to push the boundaries of current capabilities?

A: Wanhua Chemical (Penglai) Co., Ltd., recently initiated a 300,000 tons/day seawater desalination project in Yantai, China. The project will support an environmentally friendly, low-carbon chemical park and alleviate freshwater resource constraints, providing Penglai with 90 million tons per year of freshwater resources. Located on the seashore, the project presented poor geological conditions, compounded by complex desalination processes and equipment, along with data integration and exchange challenges. Therefore, the project team wanted to pilot BIM workflows to deliver the seawater desalination plant.

To perform the project, Beijing Shougang International Engineering Technology Co., Ltd. leveraged ProjectWise, OpenPlant, and OpenFlows. They established a collaborative BIM environment, modeled the plant and equipment, and simulated and analyzed water hammer and pipeline stress to ensure the safety and reliability of the system.

Bentley's integrated digital solution streamlined workflows to improve design efficiency by 70% and shorten the design cycle by more than 50%. Working in a connected digital platform, they identified and resolved 247 design conflicts, saving 10% of materials to reduce engineering waste and shorten the construction period. The 3D models provide the foundation for intelligent digital seawater desalination operations.

This project utilized BIM collaborative design for the entire plant, which spanned 10 disciplines. One of the benefits of selecting this sort of implementation was that they were able to construct the project on the seashore with poor geological conditions, around many existing outdoor buried and overhead pipelines, cable bridges, and other works.

Then, they designed for a new process at the plant with 35 process systems supporting process equipment, much of which was non-standard. By adopting the Bentley platform to carry out BIM design, they were able to efficiently produce high quality work, quickly and with different technical scenarios. This allowed teams to complete the design of the whole plant in just four months.

Q: What are some of the biggest misconceptions about desalination that you think need to be addressed as the technology becomes more widespread?

A: The two major misconceptions that we believe are now being addressed, specifically through the development of new innovative digital solutions, is that desalination only works on a massive scale, as well as that it is so energy intensive that it is rarely a cost-effective option.

In the past, we've heard a lot about the large desalination projects, such as the one mentioned in Saudi Arabia, but we're starting to see that this technology is also feasible at smaller scales. No matter the size of the plant, whether it is being used for industrial purposes or city water supply, for these projects to be successful, it takes large multidiscipline teams to come together and utilize modern digital workflows.

Full end-to-end software solutions, such as those provided by Bentley, will be key to delivery, as they enable teams to design, construct, and operate water assets within a consistent and connected toolset, geared toward delivery of a digital twin and grounded in the basis of reality capture, from the outset of the project.

By enabling engineers with a digital twin within the design and analysis phase of a project, we know that project teams can achieve massive benefits from the use of the same digital twin during construction and monitoring of water projects; this is due to the more interconnected nature of the work that the overall team can carry out, and the critical ability to design, analyze, and construct a physical asset with the full context of its digital counterpart. We've also seen examples where energy savings can be prominent in the design of water treatment plants. This trend is likely to continue with the continued pressure on carbon management and sustainability.

For example, in the case of the EchoWater project, which won the Going Digital Award in 2023 for the

Water and Wastewater category, Project Controls Cubed LLC was able to use Bentley's digital twin solutions to anticipate and mitigate obstacles and shutdowns during construction ahead of time, provide optimal and timely situation awareness of cost and schedule performance during construction, and use a digital visual element to collaborate with various stakeholders. Ultimately, the project was completed USD 400 million under budget, and those funds were routed to another water project to provide recycled clean water, further alleviating the strain on our world's freshwater sources.

Q: Looking ahead, what would you identify as the top three priorities for the desalination industry in the next 5-10 years?

A: This is an interesting question because of the number of challenges and opportunities faced by the desalination sector. We should focus on scaling through cost savings and awareness. More people should become aware of the increased use of renewable energy and cost reduction because of improved energy efficiency. The desalination sector should also focus on improving infrastructure resilience and operational efficiency by leveraging the power of artificial intelligence and other technical work flows. Lastly, it should actively promote collaboration between government, private, research, and academic institutions to drive innovation and future growth.

Q: Finally, what advice would you give to innovators and entrepreneurs looking to enter the desalination industry? What areas of innovation hold the most promise for the future?

A: Water treatment issues are as complex in their relationships and policies as they are with technologies. By leveraging digital solutions, we can better communicate and collaborate to meet tomorrow's water needs.

Desalination holds so much potential, and I'm excited to see what the future holds.

WATER REUSE IN POULTRY FARMS

Reuse of process water is of major issue today in India. There are many industries that use tremendous quantities of water, and discharge the effluent with contamination of chemicals, etc Today industries like paper and pulp industry, power plant are all in the process of reducing the contamination of the discharge water , trying simultaneously to reuse at least some portion of the process water as a consideration of depleting water resource in the country. While lots of discussion take place with respect to paper and pulp and power generation industry very little is talked about one industry that uses lot of water in its process in comparison of its size. This is the poultry industry, normally concentrated outside city limits and drawing most of its water from the ground water

The poultry processing industry is a high volume, low margin industry. It is very important to maintain the conversion of feed to body weight ratio. Even minute difference can be the difference between profit and loss. Poultry farms use lots of water. Earlier many farms have been utilizing ground water in the villages , but water being scarce now , it no longer comes cheap to the poultry industry .In poultry processing operations there is a great challenge to optimize the use of water. Water is used extensively for cleaning in the poultry processing industry. Water is used in the picking and scalding, evisceration, and chiller areas, as well as plant sanitation.

Amount of water usage per bird can be as much as 30 liters per bird. The water usage will also increase with the fecal tolerance limits fixed by authorities . As cost for potable water increases more and more interest have cropped for the reuse of water in poultry farms As early as in 1980 in the USA poultry processing facilities initiated water conservation measures and began to decrease the amount of water used per bird. However, the need to increase the use of water to meet new government regulations on visible fecal material on the carcasses has interfered with conservation efforts. The decreased use of water eventually leads to several problems.

Major problem associated with decreased water usage was the increased incidence of food borne pathogens. There continues to be a fine line between water conservation and effective bacteria removal in the poultry processing industry. Poultry processing facilities are now competing with residential communities as well as other hard and soft industries, for a dwindling water supply and wastewater handling facilities. Reusing water would be the only solution in time to come.

Water from poultry processing is collected and sent to primary screening process. Traditional secondary or tertiary treatment follows. This may consists of processes such as DAF, anaerobic and aerobic process and subsequent clarification. Most important is to remove the organic load of the suspended solids, The water can be ozonated to remove the dissolved organic chemicals. Ozone also disinfects the water and removes pathogenic organisms to require zero level. The ozonated water is than slightly chlorinated to prevent re growth of the pathogens .Ozone's half live is short and we cannot maintain residual in water. Hence chlorine is used for effective residual disinfectant property .Chlorine by itself is insufficient to remove organic chemicals. Chlorine is not a strong oxidation agent when compared to ozone. For chemical oxidation ozone appears to be the choice since only small doses are required for effective oxidation of chemical residues in water and the oxidation is total.

The key to the reuse of this poultry waste water is the use of ozone as removal of the chemicals presence in the water. In the US many poultry farms have adopted this technology to reuse water. Many patented technologies are today available for treating poultry waste water, most of them using ozone for chemical oxidation and as a disinfectant

Ozone is also a preferred disinfectant for poultry feed water. Often we find that birds are affected with infections by salmonella / pseudomonas bacteria (very resistant to chlorine). Using ozone as a disinfectant in feed water would provide pure water for the birds, eliminating this risk. Entire bird population can be effected in short time causing losses to farm owners. Ozone is a sure way of insurance to prevent water related problems.

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DEVIL KETTLE: VANISHING WATERS

Hidden within the dense forests of Minnesota's Judge C. R. Magney State Park, Devil's Kettle stands as one of North America's most intriguing and perplexing natural mysteries. This unique waterfall, set along the Brule River, captivates visitors not only for its beauty but for its confounding enigma—a river split in two, with one side vanishing into an unknown abyss.

Devil's Kettle is no ordinary waterfall. As the Brule River flows through the park, it encounters an ancient rock formation that divides it into two streams. One half cascades down a typical path, joining the rest of the river as it continues its journey. But the other half plunges into a massive pothole in the bedrock—"the Kettle"—and, to this day, no one can confirm where the water reemerges. Scientists and explorers have attempted to trace its path using dye, ping-pong balls, and other methods, but these items have simply disappeared without a trace.

Theories abound as to where the water from Devil's Kettle might go. Some speculate it flows into an underground river system, perhaps joining another waterway below the surface. Others believe it could connect to Lake Superior or emerge from unknown springs farther afield. However, the geology of the area lacks extensive limestone formations or cavern networks that could easily explain such an underground route. Instead, the Kettle remains a geological riddle, as baffling to experts as it is to casual hikers.

First documented in the 1960s, Devil's Kettle has sparked scientific interest and inspired local lore. Some locals suggest that the Kettle is a "gateway" to another realm or a portal through which the water simply vanishes. In truth, the Kettle's isolated location and the Brule River's remote course have preserved its mystery over the decades, leaving much about this phenomenon to the imagination.

Today, Devil's Kettle draws those with an adventurous spirit, people hoping to catch a glimpse of one of nature's few remaining unsolved puzzles. Visitors who hike the rugged trails through Judge C. R. Magney State Park often describe the Kettle as an eerie yet beautiful marvel—a place where science meets the unexplained, and a reminder that, even in our modern world, some mysteries remain unsolved.

As the Devil's Kettle continues its quiet, eternal flow, it stands as a testament to nature's ability to defy explanation and ignite curiosity, offering a touch of wonder to all who seek its vanishing waters.

TENDER

Running Operation and Comprehensive Maintenance of 900 Kld Sewage Water Treatment Plant Installed at DDA Housing Pocket- 1 B in sector a 1 to a 4, N			
Category	AMC, Repair, Maintenance, Installation tenders		
Location	Delhi		
Bid Open Date	**20 November 2024**	**Tender Value**	**37.75 Lac**
Doc Collection Date	**19 November 2024**	**FTID**	241109413110
Reverse Osmosis-Based Point of Use Water Treatment System for Drinking Purposes (V2) as Per is 16240			
Category	Agro, Marine, Food Products tenders		
Location	Himachal Pradesh, Shimla		
Bid Open Date	**18 November 2024**	**Tender Value**	**65 thousand**
Doc Collection Date	**18 November 2024**	**FTID**	2411084177870
Providing Compound Wall Chain Link Fencing and Paver Block to the Existing Sewage Treatment Plant in Sendamangalam Road at Namakkal City Municipal Corporation.			
Category	Construction, Infrastructure, Civil Work tenders		
Location	Tamil Nadu, Namakkal		
Bid Open Date	**14 November 2024**	**Tender Value**	**11.94 Lac**
Doc Collection Date	**14 November 2024**	**FTID**	241109420010
Repair to Bldg Wks in Mes Installation Including Power House, Water Filtration Plant, Sewage Treatment Plants, Furniture Yard etc in the Aor of Age B/R-I under Ge Suratgarh at Suratgarh Mil Stn.			
Category	Furniture, Sports, Home Equipments tenders		
Location	Rajasthan, Suratgarh		
Bid Open Date	**25 November 2024**	**Tender Value**	**45.00 Lac**
Doc Collection Date	**23 November 2024**	**FTID**	2411094132800
Preparing Detail Project Report for Survey, Design, Cost Estimation of Drainage Network, Augmentation of Waste Water Accumulation Ponds and Waste Water Treatment Plant for Municipal Board Nohar			
Category	Sewer, Sewerage, Sanitation, Environmental Services tenders		
Location	Rajasthan, Nohar		
Bid Open Date	**18 November 2024**	**Tender Value**	**15.00 Lac**
Doc Collection Date	**15 November 2024**	**FTID**	2411084237470
Manning and Operation of 02x 2.5 Mld Water Treatment Plant Incl Connected Accessories at Aob Rambilli			
Category	Agro, Marine, Food Products tenders		
Location	Andhra Pradesh, Anakapalle		
Bid Open Date	**03 December 2024**	**Tender Value**	**38.00 Lac**
Doc Collection Date	**29 November 2024**	**FTID**	24110945390

TENDER

Work for Interception and Diversion Work for Tapping Nallah and Setup Sewage Treatment Plant for Used Water Management for Alampur Town			
Category	Construction, Infrastructure, Civil Work tenders		
Location	Madhya Pradesh, Lahar		
Bid Open Date	**07 December 2024**	**Tender Value**	**2.75 Crore**
Doc Collection Date	**6 December 2024**	**FTID**	241107450000
Construction of Sewage Treatment Plant of 0.5 Mld Capacity (Sbr Technology) and using the Treated Waste Water (as per norms of Cpcb) for Creating Water Body Including Operation and Maintenance for 5 y			
Category	Sewer, Sewerage, Sanitation, Environmental Services tenders		
Location	Haryana, Ballabgarh		
Bid Open Date	**28 November 2024**	**Tender Value**	**2.77 Crore**
Doc Collection Date	**27 November 2024**	**FTID**	2411064289420

EVENT CALENDAR

October 2024

Aqua Ukraine
15-17 Oct 2024
Ukraine, Kyiv I International Exhibition Centre
www.iec-expo.com.ua/en/aquaen-2024

WWEM - Water, Wastewater and Environmental Monitoring Conference
09-10 Oct 2024
NEC, Birmingham, UK
www.ilmexhibitions.com/wwem/

WETEX 2024
01-03 Oct 2024
Dubai World Trade Centre (DWTC)
www.wetex.ae

IFAT India
16-18 Oct 2024
Bombay Exhibition Centre, NESCO, Mumbai
www.ifat-india.com

Cairo Water Week 2024
13 - 17 Oct 2024
The Nile Ritz-Carlton Cairo, Cairo, Egypt
www.cairowaterweek.eg

November 2024

Produced Water Management, Treatment & Reinjection 2024
28 Oct - 01 Nov 2024
Dubai, UAE
10times.com/e1x5-z5p1-f9sp

Deepwater Operations Conference & Exhibition 2024
05 - 07 Nov 2024
Moody Gardens Hotel Spa and Convention Center, Galveston, USA
www.offshore-event.com/2024home/home

Vietwater 2024
06 - 08 Nov 2024
Saigon Exhibition and Convention Center, Ho Chi Minh, Vietnam
vietwater.com

SADC Groundwater Conference 2024
13 - 15 Nov 2024
Maseru, Lesotho
www.sadc.int

Annual WMAO Conference 2024
19 - 20 Nov 2024
Crowne Plaza Columbus North - Worthington, Columbus, USA
wmao.org

Clean India Show 2024
21 - 23 Nov 2024
Bombay Exhibition Centre (BEC), Mumbai, India
ctwindia.com/clean-india-show/

Floodex 2024
27 - 28 Nov 2024
ExCeL London, London, UK
floodex.co.uk

National Drainage Show 2024
27 - 28 Nov 2024
ExCeL London, London, UK
drainageshow.com

December 2024

GeoSmart India (GSI)
02 – 05 December 2024
Hyderabad, India
geosmartindia.net/2024/

Pak Water & Energy Expo 2024
03 - 05 Dec 2024
Karachi Expo Center, Karachi, Pakistan
www.pakwaterexpo.com

Exhibition on Water / Water Forum
04 - 06 December 2024
Belgrade Fair – Hall 3 / Belgrade / Serbia
www.sajamvoda.rs

Aquatech China 2024
11 - 13 Dec 2024
Shanghai New International Expo Centre (SNIEC), Shanghai, China
www.aquatechtrade.com/shanghai

January 2025

Water Exhibition & Conference
14 - 16 Jan 2025
ADNEC Centre Abu Dhabi, Abu Dhabi, UAE
www.worldfutureenergysummit.com

NEWEA Annual Technical Exhibition & Conference
26 - 29 Jan 2025
Boston Marriott Copley Place, Boston, USA
annualconference.newea.org

InterAqua
29 - 31 Jan 2025
Tokyo Big Sight, Koto, Japan
en.www.interaqua.jp

Michigan Onsite Wastewater Conference
07 – 08 Jan 2025
Kellogg Hotel and Conference Center, Lansing, USA
events.anr.msu.edu/event

February 2025

Indomach
06 - 08 Feb 2025
Adityapur Auto Cluster, Jamshedpur, India
indomach.in

World Ag Expo
11 - 13 Feb 2025
International Agri-Center, Tulare County, USA
www.worldagexpo.com

Mountain States Ground Water Expo
13 - 14 Feb 2025
Aquarius Casino Resort, Laughlin, USA
mountainstatesgroundwater.com

Water and Waste Expo
20 - 22 Feb 2025Pragati Maidan, New Delhi, Indiawatersolidwaste.in

World Water Tech Innovation Summit
25 - 26 Feb 2025
Park Plaza London Riverbank, London, UK
worldwatertechinnovation.com

Membrane Technology Conference & Exposition
24 - 27 Feb 2025
Long Beach, USA
www.amtaorg.com/awwaamta-membrane-technology-conference-exposition

Water Today's Water Expo
26 - 28 Feb 2025
Chennai Trade Centre, Chennai, India
www.waterexpo.biz

March 2025

International Conference on Advances in Water Treatment and Management
1 - 2 March 2025
Gandhinagar, Gujarat, India www.pdeu-h2o.com

Sioux Empire Water Festival
4 - 5 March 2025
Sioux Falls, USA
sewf.org

Hot Water & Hot Air
4 - 6 March 2025
Portland, USA
www.aceee.org/2025-hot-water-hot-air-forums

International Conference on Water Management Modeling
5 - 7 March 2025
Toronto, Canada
www.icwmm.org

Oman Sustainability Week
11 - 15 May 2025
Muscat, Oman
www.omansustainabilityweek.com

ISH - World's leading trade fair HVAC + Water
17 - 21 March 2025
Frankfurt, Germany
ish.messefrankfurt.com/frankfurt/en.html

Aqua Netherlands
18 - 20 March 2025
Evenementenhal Gorinchem, Netherlands
www.aquanederland.nl/en

Water & Clean Tech India Expo
19 - 21 March 2025
Pragati Maidan, New Delhi
www.smartcitiesindia.com

EVENT CALENDAR

Water Phillipines Expo & Conference
19 - 21 March 2025
SMX Convention Center, Manila, Philippines
www.waterphilippinesexpo.com

April 2025

China Clean Expo Shanghai
31 Mar - 03 Apr 2025
Shanghai New International Expo Centre(SNIEC), Shanghai, China
www.chinacleanexpo.com/en

American Worlds Water Association Annual Conference
07 - 10 Apr 2025
Anaheim, USA
www.inawwa.org/event/2025-annual-conference-april-21-25th/

Baku Water Week
08 - 10 Apr 2025
Baku Expo Center
bakuwaterweek.az/en/

Water Environment Association of Ontario Annual Conference
13 - 15 Apr 2025
London Convention Centre, London, Canada
weao.org/about/

Smart Water Systems
14 - 15 April 2025
London, United Kingdom
www.smgconferences.com

MiningWorld Russia
23 - 25 Apr 2025
Crocus Expo International Exhibition Center, Krasnogorsk, Russia
miningworld.ru/en/

Our Ocean Conference KOREA
28 - 30 Apr 2025
Centum City Industrial Complex, Busan, South Korea
ourocean2025.kr

2025 Water for Food Global Conference
28 Apr - 02 May 2025University of Nebraska
waterforfood.nebraska.edu

May 2025

Water Management Show (WaterEx)
01 - 03 May 2025
ICCB, Dhaka, Banglade
shsavor-watermanagement.com

International Water Summit 2025
05 - 06 May 2025
Midreshet Ben-Gurion, Israelwww.watersummitziwr.com

Power of Water Canada Technical Conference & Trade Show 2025
07 - 09 May 2025
Niagara-on-the-Lake, Canada
powc25.vfairs.com/en/

Stormwater and Wastewater Conference Saudi Arabia 2025
11 - 12 May 2025
Jeddah Hilton, Jeddah, Saudi
Arabiastormwaterandwastewaterksa.com

Commonwealth Chemistry Congress (CCC)
11 - 14 May 2025
Stellenbosch, South
Africacommonwealthchemistry.org

Industrial Water Management - Effective Process Water Treatment 2025
15 - 16 May 2025
ibis Styles Berlin Treptow, Berlin, Germany

Enlit Africa
20 - 22 May 2025
Cape Town, South Africa
www.enlit.world/events/enlit-africa-2024/

CWRA Annual Conference 2025
25 - 29 May 2025
Penticton,
Canadaconference.cwra.org/upcomingconferences/

June 2025

World Environment Expo 2025
04 - 06 Jun 2025
Greater Noida,
Indiaworldenvironment.in

Green Tech 2025
03 - 05 Jun 2025
Berlin,Germany
greentechfestival.com

AWWA Annual Conference & Expo 2025
08 - 11 Jun 2025
The Colorado Convention Center, Denver, USAhttps://ace.awwa.org/

Water & Long-Term Value 202510 June 2025
Skytop Studio, Rome, USA

Infrastructure Africa 2025
11 - 12 Jun 2025
Johannesburg, South Africawww.infrastructure-africa.com

Future of Utilities Summit 2025
11 - 12 Jun 2025
QEII Centre, London, UK
futureofutilities.com/events/summit/

Groundwater Quality 2025
10 - 13 Jun 2025
Bordeaux INP, Talence, France
groundwaterquality2025.fr

DrinkTechAsia 2025
12 - 15 Jun 2025
Bangkok,Thailand
www.propakasia.com

China (Guangzhou) International High-end Drinking Water Industry Expo 2025
12 - 14 Jun 2025
Guangzhou, China
waterexpocn.com/en/

Michigan Water Environment Association Annual Conference 2025
15 - 18 Jun 2025
Boyne Mountain Resort, Boyne Falls, US
Awww.mi-wea.org

IFAT Brasil 2025
25 - 27 Jun 2025
Sao Paulo Expo, São Paulo, Brazil
ifat.de/en/brasil/

July 2025

Thai Water Expo 2025
02 - 04 Jul 2025
Queen Sirikit National Convention Center, Bangkok, Thailand
www.thai-water.com

Qingdao International Water Conference 2025
02 - 04 Jul 2025
Hilton Qingdao Golden Beach, Qingdao, China
www.cda-apdwr2009.com/english/

Indo Fisheries Expo & Forum 2025
02 - 04 Jul 2025
Grand City Mall & Convex Surabaya, Surabaya, Indonesia
indofisheries.id

Frontiers in Water Biophysics 2025
12 - 16 Jul 2025
Centro Di Cultura Scientifica Ettore Majorana, Erice, Italy
www.waterbiophysics.eu/

Louisiana Rural Water Association Conference 2025
13 - 17 Jul 2025
Lake Charles Civic Center, Lake Charles, USA
lrwa.org/annual-conference/

International Forum on Water 2025
14 - 17 Jul 2025
Athens Institute For Education and Research (ATINER), Athens, Greece
www.atiner.gr/waterBuild

4Asia 202515 - 17 Jul 2025
AsiaWorld-Expo,
Hong Kong
www.build4asia.com

The biennial Water Loss Asia (WLA) 2024, returns on the 19-21 November 2024 in Kuala Lumpur, focuses on the theme "Asian Perspectives on Water Loss Management and Carbon Reduction." This event brings together experts, policymakers, and industry leaders to address the critical challenges of water loss and carbon emissions in Asia.

This year's theme emphasizes the interconnected nature of water management and carbon reduction, highlighting how efficient water use and improved infrastructure can lead to significant energy savings and lower carbon footprints. By focusing on regional perspectives, we aim to showcase the unique challenges and opportunities that Asian countries face, as well as the groundbreaking technologies and strategies being developed to overcome them.

Date: 19-21 November 2024
Venue: Royale Chulan
Hotel – Kaula Lumpur
Website: www.waterlossasia.com

KoINDEX is a platform designed to target the dynamic Indian market, recognized as a pivotal growth engine of the global economy. It also serves as a springboard for emerging businesses aiming to expand beyond South Asia into regions such as the Middle East and Africa. By fostering international trade and collaboration, KoINDEX bridges opportunities for businesses across borders while focusing on India's vast and diverse consumer base.

Our mission is to provide a robust platform for domestic companies aspiring to scale globally and for international players exploring opportunities in the Indian market. An exhibition is not merely a show or festival but a meticulously crafted business platform created through sustained effort and innovation. It connects companies' products with the most suitable buyers. For exhibitors, the goal is to introduce high-quality buyers, while for attendees, it promises an enriching experience of discovering the best brands and products in the industry.

Date: 21-23 November 2024
Venue: Yashobhoomi, Dwarka, New Delhi, IN
Website: koindex.kr

The 20th EverythingAboutWater Expo 2025 stands as a remarkable and all-encompassing annual event in India, spotlighting cutting-edge technologies and solutions within the water sector. This event serves as an exceptional gateway for stakeholders worldwide to immerse themselves in the expansive and dynamic realm of the Indian Water management Industry, facilitating the exchange of business opportunities, networking, and the exploration of innovative Water solutions.

India is currently on a trajectory towards severe water stress, with projections indicating a critical situation by 2030. The rapid pace of Industrialization and the burgeoning population have significantly widened the gap between water supply and demand, a matter of deep concern for both the Central and State Governments. Within the framework of the 20th EverythingAboutWater Expo 2025 unparalleled business prospects will emerge for both domestic and international players in the Water Industry. Attendees will have the opportunity to gain valuable insights, discover future trends, and navigate the evolving landscape of the Indian Water market.

Date: 28-30 August 2025
Venue: Bharat Mandpum, Pragati Maidan, New Delhi
Website: www.eawaterexpo.com

Clean India Show was founded in 2005 with the vision to promote the right methods of cleaning across India by bringing together professionals and end-users in the Cleaning & Hygiene industry.

Today, Clean India Show has become the only and single largest platform of the Indian Cleaning Industry, showcasing the latest products and processes for cleanliness and hygiene. Our exhibition serves as a sourcing point for the latest products, systems, and solutions available in India and around the world, making it the go-to place for anyone looking to stay ahead in the cleaning industry.

At Clean India Show, we strive to provide a platform that fosters innovation, knowledge-sharing, and networking opportunities for our exhibitors and visitors. Our goal is to help them stay ahead of the curve in the rapidly evolving cleaning industry.

Over the years, we have grown into a renowned exhibition that attracts exhibitors and visitors from across India and around the globe. We take great pride in being a part of the Cleaning & Hygiene industry, and our team provides our visitors and exhibitors with an exceptional experience.

Date: 21-23 November 2024
Venue: Bombay Exhibition Center, Mumbai, India
Website: cleanindiashow.com

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113	Axis Solutions Pvt. Ltd.	01	+91 79229 00860	info@axisindia.in	www.axisindia.in
114	CII Water & Waste Expo 2025	19	91 98183 91920	amit.sharma@cii.in	www.watersolidwaste.in
115	Customized Webinar by EAW	39, 95	+91 85889 11033	enquiry@eawater.com	www.eawater.com
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117	Depth Filtration Technologies Pvt. Ltd.	11	+91 97317 36572	corp@depthfiltertech.com	www.daftechindia.com
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