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REVOLUTIONIZING WATER MANAGEMENT: MEMBRANE TECHNOLOGY'S PROMISE

Dear Readers,

Water, the lifeblood of our planet, weaves its influence through every facet of our existence. It nurtures, shields, and fuels our societies. Yet, as the world evolves, so too must our understanding and guardianship of this invaluable resource. Embarking on a journey into the heart of "Modern Trends in Membrane Technology," a subject of profound relevance for our environment and the legacy we leave behind, is the focal point of this edition of EverythingAboutWater Magazine.

Membrane technology stands as a beacon of hope, offering innovative solutions to our ever-growing water management challenges. It holds the promise of cleaner, more sustainable water sources, and paves the way for a future where scarcity is met with abundance. This issue endeavours to unveil the latest breakthroughs, methodologies, and strategies employed to measure, analyse, and safeguard our water reservoirs.

In the following pages, you will discover a wealth of knowledge on the latest trends in membrane technology. Membrane-based processes are revolutionising the way we purify water, from desalination to wastewater treatment. These advancements are not only efficient but also environmentally friendly, making a substantial impact on water conservation. As the impacts of climate change ripple across the globe, the role of membrane technology becomes even more crucial. It helps us adapt to the changing water landscape, ensuring that we can provide clean water even in the face of increasing water scarcity and pollution challenges.

The challenges we face are evolving rapidly alongside the rest of the world. Factors like population growth, urbanisation, industrialization, and the unpredictable forces of climate change are placing immense pressure on our water supplies. It is our sincere hope that the information presented in this issue will inspire individuals, communities, and governments to take proactive steps in promoting responsible water management.

In closing, I invite you to immerse yourself in the realm of "Modern Trends in Membrane Technology." Let the knowledge held within these pages empower you to make a positive impact in your own sphere of influence. Together, we can ensure that this life-sustaining resource continues to flow for generations to come.

*thanks & regards,
Simran Arora
Editorial Incharge
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NATIONAL W

Droplets

Aker Horizons and Statkraft join forces to develop large-scale green ammonia project in Narvik

Statkraft, Europe's largest producer of renewable energy, has joined Aker Horizons as a partner on the large-scale green hydrogen and ammonia project in Narvik, Norway. The plant under development at Kvandal in Narvik has a planned capacity of up to 600 MW and will be one of the first large-scale plants for green ammonia in Europe, with an expected production of 1,000 - 1,500 tonnes per day. The project aims to reach a final investment decision in 2025 and plans to start commercial operations in 2028.

The project team from Statkraft and Aker Horizons will develop and mature the project together, with the aim of establishing a jointly owned company, Narvik Green Ammonia DA. Aker Horizons has so far signed letters of intent with several major European energy, industrial and chemical companies. Narvik Green Ammonia will also look for opportunities for collaboration with possible off-takers in Norway, for example within the maritime industry. The project entered into a long-term power agreement with Statkraft before the summer and will work actively to secure a cost-effective concept for the plant and the entire value chain, ahead of the next decision point in the middle of next year.

Securing long-term sales agreements, and further reducing costs and risks in the project will be important prerequisites in the next project phase to make the project competitive in the market that is being established for green ammonia and hydrogen in Europe.

Demand for hydrogen and hydrogen derivatives such as ammonia is expected to grow significantly in the coming decade, notably as fuel for heavy duty transport and shipping, and to decarbonize industry that currently uses fossil fuels or hydrogen produced from fossil fuels. By replacing such hydrogen with hydrogen produced from renewable electricity through electrolysis, i.e. green hydrogen, greenhouse gas emissions can be significantly reduced. The EU has set a target to produce 10 million tonnes and import 10 million tonnes of green hydrogen by 2030. Germany is introducing support schemes that will increase end-users' willingness to pay the premium for green hydrogen, which is currently more expensive than hydrogen produced from fossil fuels.



Cabinet Committee on Economic Affairs approves inclusion of Jamrani Dam Multipurpose Project of Uttarakhand

Cabinet Committee on Economic Affairs approves inclusion of Jamrani Dam Multipurpose Project of Uttarakhand under Pradhan Mantri Krishi Sinchayee Yojana-Accelerated Irrigation Benefit Programme (PMKSY-AIBP)

Central assistance in the proportion 90 (centre): 10 (state) for the balance works components of the project under PMKSY-AIBP

Estimated cost of Project is Rs.2,584.10crore, including Rs.1,557.18crore central assistance to Uttarakhand. Scheduled Completion of the Project is March, 2028.

Additional irrigation of 57 thousand hectare in Nainital & Udham Singh Nagar districts of Uttarakhand, Rampur & Bareilly districts in Uttar Pradesh. In addition, 42.70 million cubic metre (MCM) of drinking water to Haldwani and nearby areas benefitting more than 10.65 lakh population.

The Cabinet Committee on Economic Affairs (CCEA) chaired by the Prime Minister Shri Narendra Modi, has approved inclusion of Jamrani Dam Multipurpose Project of Uttarakhand under Pradhan Mantri Krishi Sinchayee Yojana-Accelerated Irrigation Benefit Programme (PMKSY-AIBP) of Department of Water Resources, River Development and Ganga Rejuvenation.

The CCEA has approved central support of Rs.1,557.18 crore to Uttarakhand for completion of the project with estimated cost of Rs.2,584.10 crore by March, 2028.

The project envisages construction of a dam near Jamrani village across river Gola, a tributary of river Ram Ganga, in Nainital district of Uttarakhand. The dam would feed the existing Gola barrage, through its 40.5 km length of canal system and 244 km long canal system, which was completed in 1981.

The project envisages additional irrigation of 57,065 ha (9,458 ha in Uttarakhand and 47,607 ha in Uttar Pradesh) in Nainital & Udham Singh Nagar districts of Uttarakhand, and Rampur & Bareilly districts in Uttar Pradesh. Apart from construction of two new feeder canals, 207 km of existing canals are to be renovated and 278 km pucca field channels are also to be taken up under the project. In addition, the project also envisages hydro power generation of 14 MW, as well as provision of 42.70 million cubic metre (MCM) of drinking water to Haldwani and nearby areas benefitting more than 10.65 lakh population.

A substantial part of irrigation benefits of the project would flow to the neighbouring state of Uttar Pradesh, and cost/ benefit sharing between the two States is to be done as per an MoU signed in 2017. However, drinking water and power benefits shall be available entirely to Uttarakhand.

ATER NEWS

Delhi's Biggest STP at Okhla to Begin Trial Run for Clean Yamuna

After a long wait and missed deadlines, Delhi's largest sewage plant is set to begin trial runs in November. The plant constructed in Okhla will pump out 564 million litres of treated water daily into the Yamuna River.

According to G Asok Kumar, Director General (DG), National Mission for Clean Ganga (NMCG), the work is completed and the water inflow into the plant will begin by November 15. "By next month, many drains which discharge dirty water into Yamuna will get blocked, as the water will be diverted to the Sewage Treatment Plant (STP). So, we expect sufficient improvement in the quality of the river water by December," he said.

With a capacity of 564 MLD, the Okhla STP is not only India's largest, but one of the biggest sewage treatment plants in Asia. It was initially expected to be completed by December 2023, but the deadline was later extended to July this year. According to officials, the pending financial issues with the Delhi government, which held the project, have been resolved. Although the STP will start releasing treated water into Yamuna by November, it will take at least a few weeks for it to stabilise. The treatment of sludge and biogas generation would take another few months, and could begin by March next year.

A large amount of sewage and industrial effluents is dumped into Yamuna daily through multiple drains (nullahs) turning it into one of the most polluted tributaries of Ganga. This is most evident during the festive season in November, when a layer of toxic foam floats across the river while devotees take a dip.

According to the NMCG Chief, all the new STPs, along with upgradation of the existing ones, could significantly improve the water quality in Yamuna flowing in Delhi over the next two years. Two more STPs — Rithala (182 MLD) and Kundli (204 MLD) — have already begun trial runs, and the 318 MLD Coronation Pillar Sewage Treatment Plant was completed last year.

"Yamuna and its tributaries are now our priority. We are taking steps to clean the Hindon river. We have sanctioned around five-six STPs, which should be ready in another 1.5 years, and will improve the water quality significantly. Two of them are about to get completed, while the others are in different stages. The one at Saharanpur and Meerut have high capacity. Hopefully by 2025, the entire Ganga system should be fairly cleaned up," Kumar said.

As many as 12 projects have been taken up under Namami Gange for the treatment of over 1,200 MLD sewage in Delhi to abate the pollution in Yamuna. Its major tributary — Hindon river — has also been identified as Priority I polluted river stretch. Under PRAYAG, an online dashboard launched this year, the NMCG now tracks the inflow and outflow of water for over 100 STPs in Yamuna and Ganga in real-time, and whether they are working up to the standard for which they were designed.

Droplets

PM Modi inaugurates India's first water metro in Kochi

Indian Prime Minister Narendra Modi inaugurated the Kochi Water Metro's first phase on 17th October. The water metro, which is India's first-of-its-kind public boat service integrated with a metro rail network, will be integrating Kochi's water transport system. Before inaugurating the services, PM Modi said that Kochi Water Metro would be a "significant enhancement" to the port city's infrastructure. The water metro service will provide electrically propelled hybrid ferries which will connect the mainland to the islands in Kochi, benefitting more than a lakh residents.

During the inauguration, PM Modi said, "Today, Kerala got its first Vande Bharata Train while Kochi got its water metro. Various connectivity and development projects were inaugurated as well." "Kerala is a state of aware and educated people. Hard work and humility of people here are part of their identity," said the prime minister.

"Kochi Water Metro is a Made in India project. It's unique, I would like to congratulate Cochin Shipyard for making the ships. This project would create Inter Water Connectivity between the Jetty, Bus Terminals and Metro Network. It would also boost Backwater Tourism," he added.



Of the total 39 STPs, as many as 25 do not meet the revised water quality standards as of September 2023. However, according to the NMCG, at least 35 of them (except for two under trial run), meet the design standards (for water quality) under which they were initially built. The National Green Tribunal (NGT) had revised the water quality standards in 2019 and directed all STPs in the country to abide by the new norms. As per the new standards, the Biochemical Oxygen Demand (BOD) and Total Suspended Solids (TSS) should be below 10 mg/L.

“We are now in the process of insisting the Delhi Jal Board to upgrade the existing STPs. There are about 39 such STPs, which were built as per previous standards. It may take time, since the new standards are yet to be notified. Meanwhile, all the new STPs being approved in the stretch from Okhla Barrage to Agra are being sanctioned with far higher standards of BOD:TSS at less than 5 mg/L,” he added.



Uttar Pradesh's Raksail faces acute water shortage, MLA asks hapless villagers to 'wait for rain'

Raksail village in Sidharthnagar district of Uttar Pradesh, is facing such acute water shortage that their only source of water is the amount of water they manage to load on a tractor trolley from a neighbouring village.

Bordering Nepal in Birdpur Block development area, the village has sixty water taps installed which have run dry due to depleting groundwater level. Moreover, water from even handpumps has stopped coming.

Earlier, the villagers were supplied water through tankers under Kapilvastu Jal Shodh Yojana but it has been years since the villagers last saw the tankers as the Yojana was discontinued. The villagers are complaining that no one is lending an ear to their problems. They say that they have not received any reply to the letters addressed to their local leaders and also the District Magistrate.



Chennai Metrowater to Install Water Meters in Commercial & High-Rise Buildings

Chennai Metrowater will soon call for bids to install nearly 2.5 lakh water meters in commercial and high-rise buildings in both core and added areas. The project will be executed under the Chennai City Partnership programme in two phases. Officials of the water agency noted that documents for the detailed project report were being prepared through the consultant, Steady Taps, for the World Bank-funded programme. Tenders will be called for the work in two months. A total of one lakh meters will be fixed in merged areas where comprehensive water supply schemes have been completed.

Initially, commercial, partially commercial, institutional and high-rise residential buildings will be covered under the water metering programme. Buildings that have high water consumption have been identified to be fitted with water meters.

Similarly, nearly 1.5 lakh water meters will be fixed in core areas. However, individual consumers will be covered in later phases. Though the project has been divided into two phases, work on both will be carried out simultaneously.

In a bid to ensure judicious use of water and reduce non-revenue water through leaks or theft, smart electromagnetic meters with IoT sensors will be installed. As of now, the water agency has fixed 24,095 meters of which 12,708 devices have automated meter reading (AMR). Commercial and water-intensive consumers have been covered with meters.

On average, a demand of Rs 5-Rs 5.5 crore towards water consumption charges is raised every month through AMR meters. Metrowater provides drinking water to the city through 7.7 lakh service connections. Consumers with unmetered connections in core areas remit Rs 84 as monthly water charges, officials said.

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The water agency plans to cover 90% of the commercial and high-rise buildings under water metering policy by 2025-26.

Sekar Raghavan, director, Rain Centre, a voluntary organisation working towards awareness on rainwater harvesting, said water metering was essential to popularise RWH and judicious use of resources. People who get ample municipal water supply don't tap groundwater and it floods the city during monsoon. Water meters are an incentive to alternate between municipal supply and groundwater and sustain resources through harvesting.

Smart meters with AMI (advanced metering infrastructure) interface will be web-based and mobile-based and enable real-time information of water usage. Consumers too, will be able to monitor their consumption, monthly billing cycle and reduce use. They may also register complaints through an online redressal mechanism, an official said. The work to install meters will start in 2024 and is expected to be completed in two years.



Srinagar's Dal, Nigeen Lakes to Have Floating Sewage Treatment Plants Soon

The Dal and Nigeen lakes will soon have floating sewage systems that connect the houseboats to treatment plants, protecting the lakes from pollution in the process.

The Lake Conservation and Management Authority (LCMA), which manages and conserves the water bodies and waterways of Jammu and Kashmir, said the project will collect sewage from the houseboats and keep the lakes clean. Both lakes have over the years, suffered a great deal of pollution. It also said the project will totally arrest the sewerage from the houseboats and render the lakes clean. LCMA vice chairman Bashir Ahmad Bhat said that the refuse from houseboats currently goes directly into the two lakes. Since the problem of sewage

seeping into the lake has persisted, the government has decided to connect the houseboats through a proper sewage system.

Last year, the LCMA started a programme under which they planned to connect all the houseboats in the Dal and Nigeen lakes to the sewerage line, Bhat said.

"The western shore houseboats of Nigeen Lake were connected last year. Then the Dal Lake project got started and currently, we have completed 60- 70% of the work. We are hopeful that by the end of October, all the houseboats of both lakes will be connected to the sewerage line," he said.

The houseboats in the lakes are being connected with a sewage treatment plant through a floating sewage system. "Basically, it is to arrest all the refuse that gets into the lake so as to improve the water quality. The goal (of LCMA) is to restore Dal Lake to its pristine glory,"

Bhat said, adding that it was a challenging project as many experiments on collecting sewage have failed in the past. He added that there are 950 houseboats in both the lakes.

According to Tanveer Ahmad, Assistant Executive Engineer, LCMA, the project was designed to scientifically dispose of sewage from houseboats.

For the Dal Lake part of the project, the water body has been divided into 11 clusters. Each cluster has about 70 houseboats. The work on the project is taken cluster after cluster, he said

"These clusters will have an individual sump in which the sewage is collected. After the collection, it will be pumped out and will be carried to the shores where it will get treated in a nearby sewage treatment plant," Ahmad said.

He also added while the project deadline is November 15, the LCMA is trying to complete it before time. He said houseboat owners would benefit from the project as the lakes would be cleaner which would lead to an increase in tourism. "We have the support of houseboat owners and houseboat associations.

They want this network to develop so that the lake remains clean," he added. Houseboat owners have welcomed the move and have thanked the authorities for it. "We want the sewerage system to be constructed as we live around water, and for many years now, it has been polluted," said Zahoor Ahmad, a houseboat owner.

He added that if the project is implemented properly "after three to four years, the water of the lakes will be fit for drinking."

"Due to this sewerage system, our own health and the environment will get better which will be beneficial to everyone," he said.

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Weed Eats up Madambakkam Lake as Raw Sewage Flows in

The Madambakkam Lake, located in the southern suburbs of Chennai, has been a primary source of water for residents in both Madambakkam and Chitlapakkam for decades. However, the deterioration of the lake's water quality over the past few years has become a cause for concern.

The lake has been marred by the unchecked growth of water hyacinths, which now covers large portions of its surface, making it difficult to access the water beneath. Sewage from nearby residential areas and illegal dumping has found its way to the lake. The sewage has encircled the wells within the lake.

Chitlapakkam resident Rajesh Kumar said, "We are dependent on the lake for several years. The water quality has turned from bad to worse. We are scared to use the water after seeing the condition of the lake." Resident-activist Sunil Jayaraman said the water in his sump is dirty due to the pollution of the lake. "It is disheartening to see the sorry state of our lakes. This southern suburb has several water bodies but we cannot rely on them," said Vinayakan J, a Madambakkam resident.

The state government has sanctioned the rejuvenation of five water bodies which includes the Noothancheri pond in Madambakkam. But it does not include the lake. Executive engineer Selvakumar from the water resource department said they are discussing with the Chennai Metropolitan Development Authority (CMDA) regarding the restoration of Madambakkam Lake. "Once we come up with a plan with CMDA, we will start desilting the lake," Selvakumar said.

Meanwhile, Tambaram corporation is seeking corporate social responsibility funds of 4.5 crore to rejuvenate suburban lakes. A corporation official said when the corporation's health department visited the lake last week, the filters inside the well were intact. However, residents fear if the lake is not restored, the quality of water may worsen.



Heavy rainfall in Kerala's Idukki district prompts release of water from dams

Heavy rainfall in the high-range Idukki district of Kerala prompted authorities on October 25 to release water from a couple of minor dams where water had reached close to the red level.

The Idukki district administration said that permission was granted to release 500 cumex of water from the Pambla dam and raise two shutters of the Kallar dam by 10 cm each.

The administration said the permission was granted in view of heavy rainfall in the catchment area of the two dams and rise in their water storage levels.

It advised people living along the Periyar, Kallar and Chinnar rivers to be cautious and follow the safety directions issued by authorities.

The India Meteorological Department (IMD) on October 24 had issued a yellow alert in Idukki and three other districts of Kerala.

There were also reports of landslips in some parts of Kerala following heavy rain. While more than an acre of agricultural land was lost in the landslips, no one was hurt and no houses were damaged, local authorities had said.





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Water released from Sathanur dam, flood alert in 36 villages in Tiruvannamalai

Flood alert has been issued in 36 villages along the banks of the Thenpennai by the Water Resources Department (WRD) as 850 cusecs of water was released from the Sathanur dam in Tiruvannamalai on Friday, after the water-level reached 116.55 feet as against the dam's maximum level of 119 feet. Officials said the inflow into the dam was 1,250 cusecs as the shutters of the Krishnagiri dam had been opened because of rain. The sluice gates located 8 km away from the reservoir downstream were opened. Water has been released into the river since Thursday evening, and distributed to the left and right bank canals from the pick-up dam. Of the storage capacity of 7.32 tmcft of water, the dam had storage of 7.22 tmcft on Friday. "Water from Sathanur dam will be released into the river until the water from the upstream (Krishnagiri dam) is stopped," B. Rajesh, Assistant Engineer (AE), WRD (Sathanur Dam), told The Hindu.

In his order, Tiruvannamalai District Collector B. Murugesh has asked the residents in the villages along the banks to move to safe places. Local panchayat and revenue officials and the police were directed to take steps to move residents from low-lying areas to safety. Residents were warned against crossing the river as the water flow had been on the rise since Friday.

Restoration project

The Public Works Department (PWD) officials said this was the first time after many years that the water level in the dam, which was built in 1958, had reached the full level of 119 ft. This was made possible after the old sluice gates were replaced after the restoration project of the dam in June 2022. Earlier, water could be stored only up to the level of 99 ft, considering the safety of the structure, especially its rusted sluice gates.

Every year, 4 tmc of water is stored in the dam for irrigation. The dam feeds 88 tanks along the route in these districts. While water from the dam's Left Bank Canal feeds 30 tanks in Tiruvannamalai and 10 in Villupuram, the Right Bank Canal is connected to 48 tanks in Villupuram. The dam provides at least 2 tmcft. of water for domestic consumption of residents in at least 150 villages and major towns such as Chengam and Tiruvannamalai, without reducing its deck storage level of 56 ft.





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Droplets

FEDCO-TSG collaboration delivers high-recovery desalination project to support Mexico's tourism industry

FEDCO announced the successful completion of a 1.4 million gallon per day (5,400 m³/d) BiTurbo™ installation in Cabo San Lucas, Mexico. The project was carried out in partnership with TSG. Water Resources and H2O Innovation and marks the largest BiTurbo™ high-recovery SWRO system commissioned to date in the Western Hemisphere. The facility will provide water for the area's tourism industry without impacting local freshwater resources.

TSG Water Resources selected the BiTurbo™ high-recovery seawater reverse osmosis (SWRO) technology in order to expand the production capacity of the site without requiring additional construction works or pretreatment equipment. The two-train system operates at 55-57% recovery with low energy consumption and optimal membrane performance, meeting the client's requirements both for water production and carbon emission reduction.

The small footprint of the BiTurbo™ technology also allows the client unparalleled flexibility by leaving space free for future expansions. With space at a premium in coastal resorts, providing desalination technology is compact, as well as efficient and reliable, is crucial for the tourism sector.

Eli Oklejas, the CEO of FEDCO, shared his excitement about the project, saying, "Bringing the BiTurbo concept to life has been quite a journey. Our close collaboration with TSG has been a crucial element in turning the technical concept into a fully realized solution for high-recovery SWRO. The success of this project can be attributed to the strong synergy among our three companies, and highlights our collective dedication to innovation and sustainability in the realm of desalination."

The facility was installed by TSG Water Resources, a specialist in designing, constructing and operating water and wastewater treatment facilities for the hospitality industry. Engineering support on the project was provided by H2O Innovation, a water solutions provider based in Canada with expertise across the full spectrum of water and wastewater treatment.

Leveraging the BiTurbo™ technology supports TSG's strong commitment to sustainability and environmental stewardship. The company's COO, Jason Erickson, expressed his enthusiasm about the project, "We are thrilled to announce the installation of the high-recovery BiTurbo™ SWRO system in Cabo San Lucas. This system will significantly enhance our water production capacity and showcase our dedication to delivering sustainable water solutions for the Baja California Sur region."

We are excited about our partnership with FEDCO and H2O Innovation, whose expertise strengthens our ability to provide cutting-edge solutions for the region's water needs."

A Severe Drought Pushes an Imperilled Amazon to the Brink

The planet's biggest freshwater tank is in trouble. The Amazon rainforest, where a fifth of the world's freshwater flows, is reeling from a powerful drought that shows no sign of abating.

Likely made worse by global warming and deforestation, the drought has fueled large wildfires that have made the air hazardous for millions of people, including Indigenous communities, while also drying out major rivers at a record pace.

One major river reached its lowest level ever documented on Monday, while others are nearing records, suffocating endangered pink dolphins, shutting down a major hydropower plant and isolating tens of thousands living in remote communities who can only travel by boat.

"There's just dirt now where the river used to be," said Ruth Martins, 50, a leader of Boca do Mamirauá, a tiny riverside community in the Amazon. "We've never lived through a drought like this."

The drier conditions are accelerating the destruction of the world's largest and most biodiverse rainforest where parts have started to transform from humid ecosystems that store huge amounts of heat-trapping gases into drier ones that are releasing the gases into the atmosphere. The result is a double blow to the global struggle to fight climate change and biodiversity loss.

"This is a catastrophe of lasting consequences," said Luciana Vanni Gatti, a scientist at Brazil's National Institute of Space Research who has been documenting changes in the Amazon. "The more forest loss we have, the less resilience it has."

Recent studies have shown that climate change, deforestation and fires have made it harder for the Amazon to recover from severe droughts. And, Ms. Gatti warned, the worst may be yet to come. The rainy season is expected to start in the next weeks and if the drought, which started in June, persists it would mark the first time such extreme conditions took hold in the Amazon's driest period and continued into its wettest.

In Tefé, a rural municipality in the northwestern Amazon, residents are crossing muddy stretches of lake bed on motorcycles and paddling canoes down narrow streams that were once rivers. Some 158 riverside villages in the same region have been left stranded as waterways linking them to bigger towns have dried up, said Edivilson Braga, coordinator of the local civil defense service.

"They're completely cut off," he said, adding that so far authorities have delivered thousands of basic food baskets, many by helicopter, to thousands of families.

The Amazon has experienced droughts in the past, but it's now facing "simultaneous

ATER NEWS

disasters,” said Ayan Santos Fleischmann, a hydrologist at the Mamirauá Institute, a research organization based in Tefé. Scarce rainfall, scorching heat and scalding water temperatures are battering the region all at once. “This is a crisis — a humanitarian, environmental and health crisis,” said Dr. Fleischmann. “And what scares us most is what lies ahead.”

In Boca do Mamirauá, about two hours by speedboat from Tefé, drying waterways have caused stocks of basic food items and medications to dwindle and prevented children from making the river journey to school since Sept. 20, said Ms. Martins, the community leader. Across the Amazon, wells and streams have dried up, leaving communities without clean drinking water. “The water turned to mud here,” said Tuniel Gomes Figueiredo, who lives in Murutinga, an Indigenous village of about 3,000 people.

With no alternative, some residents are drinking, cooking and bathing with contaminated water. “This water is making children sick, it’s making elderly people sick,” Mr. Braga said. Health authorities also worry that stagnant pools of overheated water could breed mosquitoes carrying malaria and dengue.

The drought has stressed countless animal species in a region known for abundant wildlife. In Lake Tefé, water temperatures remain high and the carcasses of more pink river dolphins have surfaced over the last week, bringing the death toll to 153 since the first carcasses were recovered on Sept. 23, Dr. Fleischmann said.

A toxic algae bloom, likely linked to the drought and extreme heat, has also proliferated in the lake, creating a red stain in the water, although scientists are unsure if it could harm humans or animals. “We’re using nets to try to steer the dolphins out of this area,” Dr. Fleischmann said.

While low humidity and high heat alone can kill some plants and animals, much of the destruction is caused by the drier forest’s increased vulnerability to fires typically started by farmers and others who clear the land. Wildfires have consumed more than 18,000 square miles of the Amazon since the start of the year, an area twice the size of Vermont.

Smoke from wildfires turned the air so hazardous in Manaus, a city of two million in the heart of the Amazon, that it recently became one of the most polluted cities on the planet, according to the World Air Quality Index project. Checking air quality data each morning has become an anxious habit in the city, as children and older people have ended up in hospitals struggling to breathe, according to doctors in Manaus.

Camila Justa, a veterinarian in Manaus, said she has never seen such heavy smoke blanket the sky and suffered an asthma attack for the first time in 20 years, while her 4-year-old son has had pneumonia twice since September.

“It’s really hard to fill your lungs with air,” she said. “And, when you do, it burns.”

Droplets

Stantec enters design phase for US\$100 million Tampa Bay Water potable water supply project

Stantec, a global leader in sustainable design and engineering, has begun the final design phase of Segment B for the South Hillsborough Pipeline with longtime client Tampa Bay Water. Tampa Bay Water awarded the firm a contract amendment to include final design engineering and construction management at risk support services (CMAR), bringing Stantec’s total fees to US\$14 million. With a construction cost of approximately US\$100 million, Segment B will help meet the growing demand for potable water in Hillsborough County’s South-Central service area.

During the initial phase of the project, Stantec conducted a route study to determine the most feasible path for the pipeline and prepared preliminary designs. Following final design completion, the firm will provide CMAR and construction support services throughout construction.

Unprecedented population growth is driving this project as Hillsborough County, the fourth largest county in Florida, experienced a 24 percent growth rate since 2010 and a 1.5 percent increase in 2023, according to the U.S. Census data. The Tampa Bay Economic Development Council estimates the county will grow by a further approximate 8% by 2026. To meet the rapid increase in water service demands of new residents, the South Hillsborough Pipeline project will deliver potable water to a new connection point with Hillsborough County and supply water to the growing area.

The South Hillsborough Pipeline will connect Tampa Bay Water’s Regional Surface Water Treatment Plant to a new point of connection in South Hillsborough County, increasing the conveyance to the area. The Stantec-designed Segment B will account for eight out of 26 total miles of pipeline with a design life of more than 50 years. Segment B will connect to Segment A near Fishhawk Boulevard and terminate at the County’s new point of connection. The up to 72-inch diameter pipes will pass through urban and rural corridors, crossing a river, railroad, state and county freeways, and road intersections. Stantec is designing special tunneling sections as part of the project to mitigate effects on the local, rural environment and the public.

“These expanded pipelines will transmit the water needed to serve this growing community. Our team has collaborated with Tampa Bay Water and Hillsborough County to minimise area disruptions while maximising system improvement benefits,” said Jarrah Parke, senior project manager at Stantec. “Stantec and Tampa Bay Water are united in our mutual goal of enhanced water delivery and building a lasting, effective system for years to come.”

Stantec has a long history of providing engineering services for Tampa Bay Water and Hillsborough County. In 2009, the firm served as the engineer of record for the Tampa Bay Water System Configuration 2 Pumping Station Expansions Project, which included the expansion of four major pumping facilities in the Tampa Bay Water Enhanced Surface Water System. Stantec ecologists and engineers currently support Hillsborough County on the Northwest Regional Water Reclamation Facility Expansion Wetland Mitigation. The team was charged with supporting the environmental assessment, planning, permitting for the project and implementing a wetland mitigation program.

The drought has parched countries across the Amazon region. In Bolivia, dozens of municipalities have dwindling water supplies, crops have shriveled and lagoons have dried up, “with great consequences to biodiversity,” said Marlene Quintanilla, a research director at the Friends of Nature Foundation, a nonprofit group.

The lack of rain in the Amazon is largely the result of two climate patterns, experts said.

From the west, El Niño, which warms waters in the Pacific near the Equator, is gaining strength. From the southwest, high temperatures in North Atlantic waters have accelerated the air flow toward the Amazon, preventing rain clouds from forming above the forest.

While the link between human-caused global warming and the drought is still unclear, climate models suggest that “over the next decades, with the increase in temperatures caused by climate change, these events will become more frequent,” said Gilvan Sampaio, a scientist monitoring climate patterns at Brazil’s National Institute of Space Research.

The effects of a changing climate are intensified by high deforestation levels in the Amazon, as farmers clear land for soy and cattle farms whose products are exported to countries around the world. Cutting down trees, like global warming, makes rain scarcer and temperatures higher because the Amazon’s trees release moisture, cooling temperatures and forming rain clouds.



UK government investing in water sector AI

An overview of artificial intelligence (AI) and its emergence in the water and wastewater sector was the focus of British Water webinar, featuring speakers from Ofwat, Thames Water, and across the supply chain, including consultancies Jacobs and ExploreAI.

The recent briefing, AI Explained, on 3 Oct 2023, explored the emergence and adoption of AI in the water and wastewater industry. The session was designed for those new to AI to understand data landscape, companies looking to implement AI, or those hoping to gain knowledge about this topic.

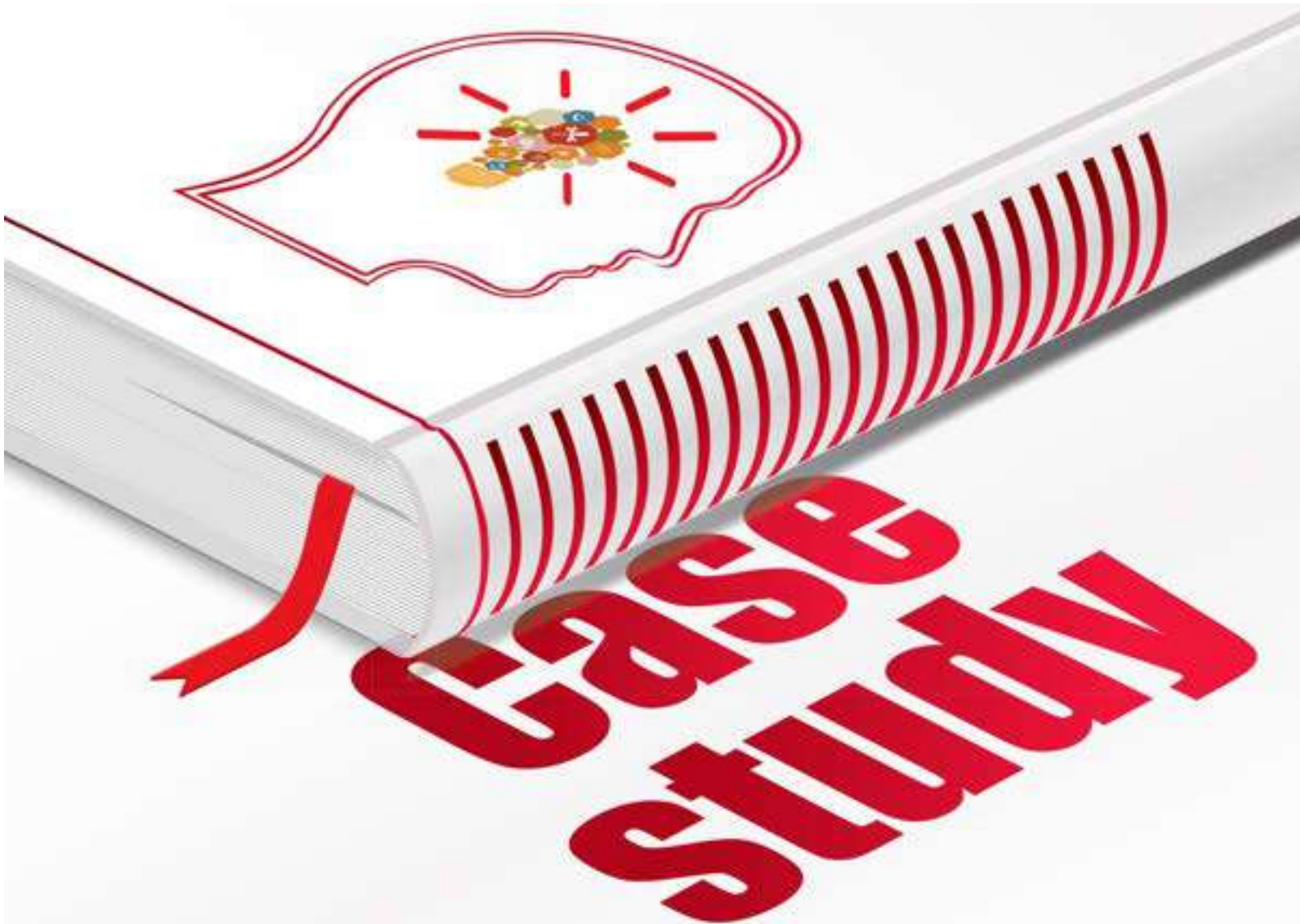
Speakers included Caroline Gregory, director of IT, digital and estates at Ofwat, who discussed AI and the open data strategy; Jethro Yates from Thames Water, George Schley from engineering consultancy Jacobs and Tania Flasck, Byron Helmbold from ExploreAI, which builds AI-driven software and digital twins for global companies.

“With big data, cloud computing and other advancements, AI has become more accessible. The potential for AI to help drive and support economies is already recognised across government and industry,” said Gregory. “There is a widespread commitment from the government to support and invest in the water sector’s use of AI.” According to a report by Frost & Sullivan, the global AI market for the water sector is expected to reach \$2.6bn by 2027.

Ofwat £200m innovation fund supports solutions that address these water sector challenges. An AI project backed by this fund is Safe Smart Systems (SSS) which is led by Anglian Water in partnership with Jacobs, Skanska, Imperial College, Microsoft, the University of Sheffield, and South West Water, Portsmouth Water and Affinity Water.

Schley spoke about the £7.5m SSS project, which is developing an AI-powered system to improve the long-term operational resilience of water systems in climate change and population growth. The system will identify, predict, and manage vulnerabilities to reduce leakage, interruptions, and pressure issues across the water cycle. The project is said to be a step towards autonomous control of water systems in the UK.





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Red weather warning lifted but more flooding possible in Scotland

There could be more flooding in parts of Scotland on Saturday evening although a red weather warning meaning a danger to life has now been lifted. Parts of the Scottish Highlands remain on amber alert until 10pm on Saturday, meaning homes and businesses in the region are still considered at risk of flooding.

A yellow weather warning also remains in place for much of Perth and Kinross, Dundee, Angus and Aberdeenshire until midnight as localised flooding continues to cause problems for drivers. The revisions come after the Scottish Government's Resilience Room met to discuss the "exceptional" levels of rain that had fallen in parts of Scotland during the weekend. The meeting, chaired by Justice Secretary Angela Constance, heard parts of Scotland are still in the midst of dealing with the severe flooding caused by Storm Babet while some rivers remain at hazardous levels.

There remain 16 flood warnings covering places such as Kintore, Kemnay and Inverurie in Aberdeenshire and Innerpefferay to Bridge of Earn in Perth and Kinross. The storm has claimed two lives in Scotland and searches continue for a man reported missing to police on Friday who is said to have been trapped in a vehicle in floodwater in Marykirk, Aberdeenshire.

A 57-year-old woman died on Thursday after being swept into the Water of Lee, Glen Esk, and a 56-year-old man was killed the same day after a falling tree hit a van near Forfar in Angus. Rest centres were set up in Angus with more than 50 people opting to stay in one in Brechin after they were evacuated from their homes as the River South Esk breached the town's flood defences early Friday morning.

Residents of nearby Bridge of Dun had to be airlifted by helicopter, while in other areas people stranded by flood water were rescued by boats, including canoes. Ms Constance said: "Storm Babet's exceptional level of rain has severely impacted parts of Scotland. Tragically, the storm has led to lives being lost and I send my sincere condolences to the families affected. While the red warning has now passed, rain does continue to fall and I urge people in areas with amber and yellow weather warnings to continue to follow advice from emergency services and local authorities. Our priority remains to keep the public safe and I want to thank all those who have worked tirelessly, in very challenging conditions, to respond to this exceptional weather event.

The storm has caused significant damage and while flooding is still

occurring, it is not expected to be as serious as over the last 24 hours. The impact, however, will be felt in communities for some time to come. While many local authorities are still responding to the immediate impacts of the storm, thoughts are now turning to recovery.

Assistant Chief Constable of Police Scotland Stuart Houston said: We are seeing an improving weather picture, but conditions remain extremely challenging, particularly in the worst affected areas in Tayside. A number of roads remain closed due to flooding, while driving conditions on others are extremely hazardous due to surface water.



Ofwat welcomes £4.6 bn of investment to the water sector

The water sector has attracted £4.6 bn (about \$5.6 bn) in additional money from shareholders since 2020, helping to improve the financial resilience of water companies and help fund increased investment for the 2024 price review, according to Ofwat.

This comes after Ofwat has made clear its requirement for water companies to take action to secure their long-term resilience.

Today's report on the Monitoring Financial Resilience (MFR) of water companies shows £1.4 bn of that equity has come in the previous year, with Thames securing £500 m, Yorkshire Water £400 m, Southern Water £375 m, Portsmouth Water £120 m and SES Water £7 m. This is additional money that has been put into the business from shareholders, not customers. This trend has continued a Severn Trent has recently announced a further £1 billion to finance its investment programme.

The MFR report sets out Ofwat's ongoing approach to company financial monitoring and engagement. It places water companies into three distinct categories: standard, elevated concern or action required.

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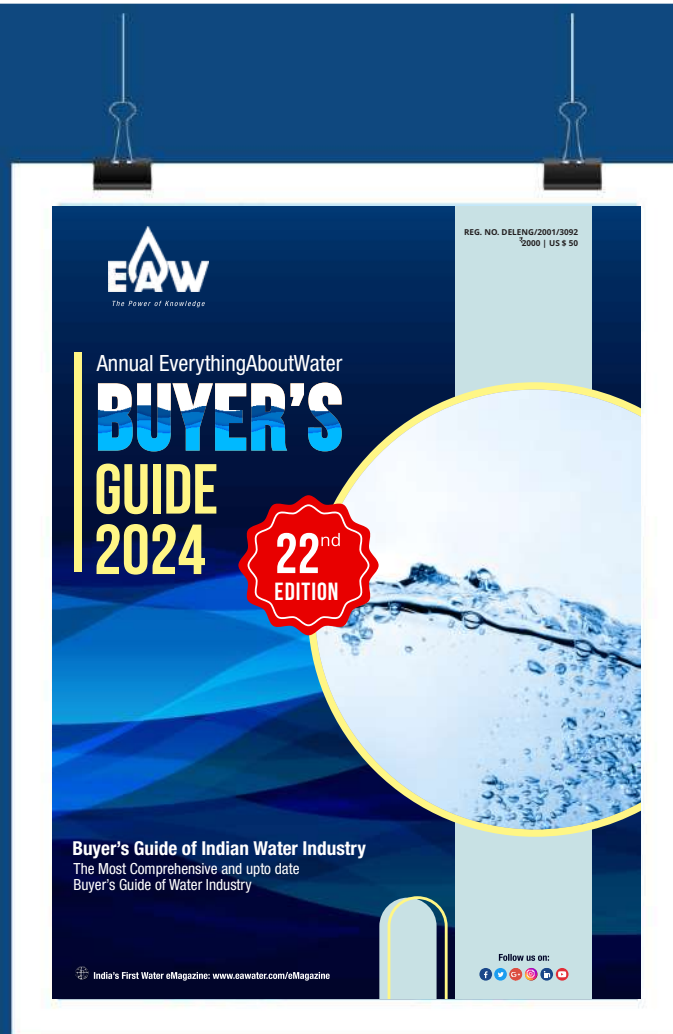
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This year's report, which covers the financial year of 2022-23, sees eight companies categorised as standard, four marked as elevated concern and four companies as requiring action. Where companies find themselves in a category of higher concern, Ofwat expects companies to take action to address their financial resilience. Companies in this category are subject to a range of regulatory actions, which include increased regulatory challenge, scrutiny and monitoring and an expectation that actions are put in place to improve financial resilience. In some instances, this requires companies to action a turnaround plan.

David Black, Chief Executive of Ofwat said: "We expect companies to maintain a level of financial headroom so they can manage periods of volatility and meet their obligations to customers and the environment. We've been calling for the water sector to be strengthened by further investment that is why we welcome the £4.6 bn of additional equity.

"Where we have seen cause for concern, we have also seen some companies responding to the challenge and we expect them to continue to work on improving their financial resilience. This is particularly notable in the cases of Yorkshire Water and Portsmouth Water who last year we had categorised as requiring action. They have taken clear actions and this year, have been moved out of our bottom category. We expect to see more companies following this trend and will continue to closely monitor their progress."

This year's MFR report covers the year ending 31 March 2023 prior to new licence conditions being introduced. New powers were introduced in May 2023 that will see Ofwat able to take enforcement action if the payment of dividends doesn't take account of water company performance or financial resilience over the long term.

IDB pilots innovative data-sharing platform for Caribbean water utilities

The Inter-American Development Bank (IDB) has launched a pilot version of an innovative data-sharing platform within a virtual community for Caribbean water utilities. Through the platform, utilities can exchange real-time data on parts and materials, expediting mutual aid and ultimately cutting costs.

Through Source of Innovation, the IDB has partnered with H2bid, Inc. to provide a one-year pilot version of this groundbreaking platform, which is powered by AURSI. The H2bid/AURSI platform is a unique virtual community with a network effect that connects utilities across various sectors, including water, wastewater, gas, and electricity. It

aims to help Caribbean water utilities by:

Providing access to replacement parts. Encouraging discovery of new technologies. Helping share technical information, such as specifications. Promoting an exchange of best practices, policies, and procedures. Reducing waste by making surplus items available to other Caribbean utilities.

This innovative pilot platform will streamline collaboration among Caribbean water utilities, enabling them to recover from climate-related disasters caused by increasingly frequent and severe storms. Additionally, it addresses current supply chain challenges by expediting mutual aid during emergencies to restore service quickly.

Seven utilities are participating in the data-sharing platform: Water & Sewerage Corporation (WSC), The Bahamas Barbados Water Authority (BWA), Barbados Belize Water Services Limited (BWSL), Belize Guyana Water Inc. (GWI), Guyana National Water Commission (NWC), Jamaica N.V. Surinaamsche Waterleiding Maatschappij (SWM), Suriname Water and Sewerage Authority (WASA), Trinidad and Tobago.

Users at utilities will have the opportunity to connect with their peers from other participating utilities through the virtual community. During the pilot phase, the IDB and participating utilities will explore the feasibility of expanding the pilot version to include a pooled procurement program, a proven method for saving costs through bulk purchases.

The effects of climate change make it imperative to strengthen the resilience, and efficiency of public utilities" said Sergio Campos chief of the IDB's Water and Sanitation Division. "In order to enhance public utilities to implement fast and effective responses to the effects of climate change the Bank has supported the creation of a platform for resources sharing. By launching this pilot platform, we are creating a network ecosystem where utilities work together to improve climate resilience, save money, and make smarter decisions.



The H2bid/AURSI team is excited to partner with IDB to introduce this new concept of a virtual, data-sharing community to water utilities in the Caribbean region,” said Glenn Oliver, CEO, H2bid. “We are already seeing interest from more organizations and water utilities in the Caribbean region, which is great because the virtual community has a network effect—meaning the benefits for participating utilities will only increase as more utilities join.

Representatives from the Caribbean Water and Wastewater Association, the Caribbean Water & Sewerage Association, and the Caribbean Development Bank actively participated in the pilot platform launch event and expressed their organizations’ support for the virtual community and their strong desire to see it expand to include more Caribbean water utilities

Stantec completes report on pumped storage hydropower potential for WaterPower Canada



Stantec, a global leader in sustainable design and engineering, recently completed the Technical and Economic Potential Assessment of Pumped Storage Hydropower in Canada, a report commissioned by WaterPower Canada with funding support from Natural Resources Canada. The report was prepared by an alliance led by Stantec, in cooperation with the Australian National University, the Centre for Energy Advancement through Technological Innovation, and Power Advisory.

The aim of the report is to better understand the potential for, and strategic value of, pumped storage hydropower facilities in Canada as the country presses forward with the energy transition. Initiated in June 2022, the report identifies tremendous potential for pumped storage hydropower in Canada, with over 8,000 gigawatts of potential at almost 1,200 site locations. Most potential locations are in British Columbia, Québec, and Newfoundland and Labrador, with some opportunities in Alberta and Ontario. WaterPower Canada believes the results of the report will demonstrate the importance of pumped storage projects to facilitate large-scale energy storage in Canada.

The report was prompted in response to the Government of Canada’s commitment to achieve a net zero emissions electricity supply by 2035 and a net zero economy by 2050. This led WaterPower Canada, a national trade association that advocates for the Canadian hydropower industry, to commission research projects and explore opportunities to support the increase of installed hydropower capacity in Canada. The Technical and Economic Potential Assessment of Pumped Storage Hydropower in Canada was a key result of these thoughtful actions.

This report shows that the potential for pumped storage hydropower, although not uniformly distributed across our country, is for all practical purposes inexhaustible,” said Michael Morgenroth, Stantec’s principal investigator on the project and business leader for hydropower and dams in Canada. “It is now a matter of identifying the need for pumped storage hydropower and selecting the most appropriate sites for development.

Pumped storage hydropower accounts for over 90 percent of global electricity storage and provides large-scale, high-capacity storage. It also affords grid operators with a mechanism for frequency regulation, load following, inertia, reactive power, and black start capabilities. These features are becoming more critical with the integration of variable renewables in our electricity system—allowing for a more reliable, sustainable grid.

Canada has a tremendous pumped storage hydropower resource, and we are pleased to work with Stantec and its team to highlight this,” said Gilbert Bennett, president, WaterPower Canada. “While Canada is the fourth largest hydropower producer in the world, pumped storage hydropower provides additional opportunities to integrate variable renewables reliably into the Canadian electricity system.

A global leader in pumped storage, Stantec provides a full range of engineering and environmental services, including concept planning, implementation, and rehabilitation services over the entire life cycle of a project. Stantec has developed a global footprint in pumped storage from over 60 years of experience working with our international clients and has one of the largest teams of pumped storage specialists in the international consulting industry.

U.S. EPA announces \$76 million WIFIA loan to Monterey One Water to expand water reuse

At an event near Marina, California, U.S. Environmental Protection Agency (EPA) Assistant Administrator for Water Radhika Fox joined City of Monterey Mayor Tyller Williamson and other local officials to

announce a Water Infrastructure Finance and Innovation Act (WIFIA) loan to Monterey One Water. This \$76 million loan will expand existing water reuse capacity from 5 million gallons per day to 7.6 million gallons per day while ensuring residents and businesses in the surrounding areas have a climate resilient water supply.

Since its creation, EPA's WIFIA program has announced \$19 billion in financing to support 113 projects that are strengthening drinking water, wastewater, and stormwater infrastructure and creating tens of thousands of jobs.



Congratulations to Monterey One Water for securing this \$76 million WIFIA loan to expand water reuse. This project will provide vital drinking water and strengthen nearby water resources — including the Carmel River and the Seaside Groundwater Basin — while creating family-supporting jobs,” said EPA Assistant Administrator for Water Radhika Fox. “With EPA’s WIFIA loan, additional funding from President Biden’s historic Bipartisan Infrastructure Law, and investments by the State of California, this project exemplifies how federal, state, and local partnership can benefit communities.” EPA’s WIFIA loan will save Monterey One Water approximately \$15 million while construction and operation are estimated to create 650 jobs. Additionally, Monterey One Water and Monterey Peninsula Water Management District have secured a combined \$42 million in state and federal grants, including over \$10 million from the Bipartisan Infrastructure Law, which they estimate represents all construction-related costs for this project.

Following years of historic drought, it is imperative that treatment plants like Monterey One Water have the resources they need to provide clean water and protect the public health of thousands of California residents and businesses,” said Senator Alex Padilla (D-Calif). “I applaud today’s significant EPA loan to Monterey One Water, which will allow the plant to safely reuse and reintroduce 50 percent more water in order to bolster the region’s climate resilient water supply.

Congratulations to Monterey One Water for the impressive accomplishment of providing half of its drinking water supply from recycled water to benefit the community and to help restore steelhead in the Carmel River,” said Senator Laphonza Butler (D-Calif). “I also appreciate EPA’s approval of a low-interest loan which makes funding this project possible.

Our water sources across our 19th Congressional District are very vulnerable to the impacts of climate change and droughts,” said Rep. Jimmy Panetta (CA-19). “Through this sizable federal loan to Monterey One Water, we are ensuring that the federal government plays its part by investing in our local infrastructure to bolster our water supply and enhance our sustainability efforts. The Bipartisan Infrastructure Investment and Jobs Act provided historic investments in our nation’s water resiliency, and I will continue to fight for the funding that our community deserves to ensure a diversity of sustainable water sources.” “Monterey One Water is proud to be the first potable reuse producer in northern California and to be optimizing local resources to create sustainable and cooperative water solutions,” said Paul Sciuto, General Manager of Monterey One Water. “Purified recycled water will represent more than 50% of a local water supply and will help create a more climate resilient community.

We are immensely grateful for the federal government’s support for California’s water resilience through the WIFIA program and the Bipartisan Infrastructure Law to help fund innovative projects that strengthen our water supplies, like Monterey One Water’s expansion of its water recycling program,” said E. Joaquin Esquivel, chair of the State Water Resources Control Board. “The board is complementing the WIFIA loan with a \$15 million water recycling infrastructure grant for this project, illustrating how our combined efforts are keeping up the momentum we’ve built in the state to achieve our statewide recycling goals by 2030. With this funding, Monterey One Water will increase production capacity at its Advanced Water Purification Facility and groundwater injection well site with additional treatment technology and infrastructure. Together, these upgrades will ensure a drought-proof supply of potable water and help protect the local aquifer from saltwater intrusion.

Canada and British Columbia invest in the final phase of wastewater infrastructure upgrades

The final phase of wastewater infrastructure upgrades is set to get underway thanks to an investment of more than \$10.1 million from the governments of Canada and British Columbia, as well as Lake Cowichan.



Announced by Minister Sean Fraser, Minister Anne Kang, and Mayor Tim McGonigle, this project will enhance the wastewater system, safeguarding the Cowichan River.

The funding will support the expansion of the wastewater treatment facility, enhancements in lagoon aeration, and the implementation of phosphorus removal and disinfection processes. All of these upgrades are essential for ensuring strict compliance with water quality standards in order to protect our environment and the well-being of the community.

By investing in infrastructure, the Government of Canada is growing our country's economy, building resilient communities, and improving the lives of Canadians.

Tetra Tech wins \$450 million EPA environmental restoration contract

Tetra Tech, a leading provider of high-end consulting and engineering services, announced that the U.S. Environmental Protection Agency (EPA) has awarded the Company a \$450 million, multiple-award contract to accelerate environmental clean-up of contaminated sediment sites in the Great Lakes region to reduce risk to human health and the environment.



Under this five-year contract, Tetra Tech will provide technical support services to EPA Region 5 and the Great Lakes National Program Office to assess the extent of contamination and support the development, evaluation, and selection remedial and habitat restoration strategies. The engineers and scientists will use our Leading with Science approach to develop site assessments and feasibility studies, collect and analyse data, and design innovative solutions to promote sustainable ecosystems at a watershed scale.

Tetra Tech has supported EPA's environmental programs in the Great Lakes for more than 40 years," said Dan Batrack, Tetra Tech Chairman and CEO. "Our work applying innovative technologies to remediate contaminated sites and restore coastal areas throughout the Great Lakes Basin is part of our commitment to improve 1 billion lives through our projects by 2030.

Health crisis looms in Gaza due to inadequate water and sanitation

Lack of access to water is one of the biggest challenges in the humanitarian emergency in Gaza right now, and children face the greatest health risks. Action Against Hunger staff warn that overcrowded displacement shelters are close to the breaking point, as thousands of people accessing the shelters also face inadequate water and sanitation infrastructure. One such shelter is currently supporting more than 24,000 people – with 60 percent of children there affected by diarrhoea. People are also resorting to open defecation. This is a health crisis on the brink of explosion.



The United Nations estimates that there is less than one gallon of water per person each day for the 2.3 million people living in Gaza, half of whom are children, who are most at risk from water shortages and diarrheal infections – a leading cause of child mortality globally. This limited amount of water is likely to decrease by the day as supplies and fuel used to make water drinkable in desalination plants become even more scarce.

“Faced with this impossible situation, many Gazan families are resorting to non-drinking water sources, such as agricultural wells. This puts them at imminent risk of dehydration and even an outbreak of infectious diseases such as cholera,” said Chiara Saccardi, Action Against Hunger’s Officer in the Middle East. “Such an epidemic, if it happens, would make this serious crisis an even bigger problem.”

Gaza is still facing a blackout and has been without electricity for more than a week, affecting basic services such as water, sanitation, and access to food. Action Against Hunger is prepared to distribute basic short-term supplies such as water, food, hygiene products, diapers, blankets, and mattresses, but in the absence of a ceasefire and the continuing blockade, this is proving challenging. “We are urgently calling for a ceasefire and the establishment of a humanitarian corridor to ensure that aid gets to where it is needed the most,” said Saccardi.

Action Against Hunger has been working in the Occupied Palestinian Territories since 2002 and began operating in Gaza in 2005. Our work includes activities to improve the clean water supply throughout Gaza, especially in health centers; to increase food production by supporting farmers in cultivation techniques and greenhouse construction; and to provide employment training to young people and women to help them find jobs and start businesses.

Anglian Water invests £12.5 million to protect local watercourses in Corby

Anglian Water has recently finished work building additional storm water storage and upgrading phosphorous technology at its water recycling centre (WRC) in Corby, in line with new Environment Agency regulations.

The scheme marks an investment portfolio of almost £12.5 million at the company’s WRC off Weldon Road, as part of Anglian Water’s Water Industry National Environment Programme (WINEP), a programme of environmental investment which is taking place between 2020–2025.

Anglian’s WINEP totals over £800 million of work which is specifically targeted at protecting the environment and improving river water quality. It is the largest WINEP plan of any water company, with double the number of commitments made and delivered in the previous five-year period.

The water company installed a new storm tank at Corby, to provide resilience to extreme weather caused by climate change and protect

the local environment from flooding and pollution. The new storm tank at Corby can now hold an additional 2.5 million litres of water during heavy rainfall, until it can be fully treated and safely returned to the environment. This builds resilience to extreme weather caused by climate change and protects the environment by helping to reduce the use of storm overflows, providing additional protection for rivers, many of which in the East of England are unique chalk stream habitats.

Engineers have also installed new equipment which will remove phosphorous from wastewater, improving river water quality nearby. Phosphorous is widely used in soaps and cleaning products but can be harmful to wildlife when it reaches rivers and other watercourses. The investment at Corby WRC includes new equipment to strengthen the current water recycling process and remove even more phosphorous from wastewater. This equipment will help remove harmful algae growth and improve water quality in local watercourses, including the nearby River Nene.

Regan Harris, spokesperson for Anglian Water, said: “We know how important rivers and the wider environment are to our customers and local communities. We’re really pleased that this scheme will help to protect nearby rivers and increase our resilience to climate change, by helping us make sure the wastewater is treated to an even higher standard than usual before it’s returned to the natural environment. “As a result of climate change, we’re seeing more bouts of extreme weather, sudden downpours and rising sea levels, so it’s really important that our sites are prepared to process higher volumes of stormwater and protect the environment. That’s why we’ve committed through our Get River Positive programme that our water recycling processes will not harm rivers, with schemes like this one in Corby.

Get River Positive was launched by Anglian Water and Severn Trent last year. The plan includes five pledges to transform river water quality across their regions and demonstrates a clear and actionable response to calls for a revival of rivers in England. Central to the pledges is a commitment that work carried out by the two water companies will ensure storm overflows and sewage treatment works do not harm rivers.



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THE DAWN OF CERAMIC MEMBRANES AS THE GLOBAL FILTRATION STANDARD

By- Julius Gloeckner, Chief Commercial Officer, CERAFILTEC



Introduction

For years, polymeric membranes were the darlings of the membrane technology world. They had a reputation for effectiveness across various applications and a knack for superior water quality compared to traditional sand filters. Yet, these membranes come with limitations—fiber breakages, operating restrictions, feed water constraints, limited lifespans, and environmental concerns related to PFAS and plastic waste. Enter ceramic membranes: a technological marvel that is fast overcoming initial cost reservations to emerge as a more advantageous and logical choice for global filtration.

Ceramic Membranes – The Logical Choice as The Global Filtration Standard

It is no secret that, technically speaking, ceramic membranes are the industry's crown jewel. Their chemical resistance offers significant operating flexibility and recoverability. High tolerance to temperature, oil, and total suspended solids (TSS) positions ceramics as the go-to solution for harsh environments. Plus, a longer life span translates to superior total cost of ownership economics.

The challenge in the past has been the higher capital expenditure (CAPEX) associated with ceramic membranes. Many people do not know that this has changed. In fact, the unit economics for submerged ceramic membrane technology have improved 15-fold over the last 15 years. Today, in many cases, the CAPEX for a ceramic membrane system is more competitive than that of polymeric membranes—all while delivering a superior value proposition and operating benefits.

The Universal Law of Technological Evolution

It is an inescapable fact of technological progress that new innovations inevitably supplant existing ones. This is not merely an incremental change; it is a paradigm shift, a total replacement of the old by the new. History is full of examples of such sweeping transitions that reset industry standards. From the phasing out of tube TVs in favor of flat screens, to the aviation industry's shift from propeller engines to jet turbines, to the current transformation in the automotive world where electric vehicles are beginning to overshadow combustion engines, the cycle is consistent and relentless.

Within the membrane technology industry, we stand at such a pivotal juncture. While polymeric membranes have largely reached technology maturity, having been optimized for cost and performance over the last decades, ceramic membranes are just hitting their stride. We at CERAFILTEC are convinced that ceramic membranes are on track to outperform polymeric membranes in terms of membrane-to-membrane capital expenditure (CAPEX) across all water and waste applications. This is not a distant reality but a near



future shift that will redefine the global filtration standard.

As demand for ceramic membranes continues to rise, the domino effects proliferate: New market participants enter the space, driving costs further down. Scale effects are harnessed as manufacturing capacities expand and the degree manufacturing automation increases. The innovation landscape becomes richer and more competitive. Different manufacturers and suppliers contest to further advance the technology, each contributing to an accelerated pace of product and performance improvements. As a result, end users benefit from much greater value and continuously improving economics, establishing a new global technology standard in the industry.

In our estimation, it will not be long before submerged ceramic membranes offer a more cost-effective total project CAPEX than even conventional gravity sand filter plants. This will mainly be driven by vastly more compact plant designs utilizing submerged ceramic membranes, where just 20-30% of the required footprint can yield significant savings on civil work and other direct and indirect costs.

In summary, just as flat screens, jet engines, and electric vehicles became the norm after reaching their own tipping points, ceramic membranes are poised to follow a similar trajectory, effectively rewriting the rules of the game in favor of a more efficient, sustainable, and effective solution. This technology evolution is both unavoidable and imminent. Integrators and EPCs who embrace and gain experience with the next technology trend stand to reap significant benefits.

Driving Factors and Benefits

One of the standout features of submerged ceramic membranes is their capability for direct replacement of existing submerged polymeric ultrafiltration membranes.

This solves prevalent issues such as fiber breakages and operating limitations, offering a hassle-free transition for water and wastewater facilities. But the advantages do not stop at mere replacement. Submerged ceramic membranes can rehabilitate conventional systems, such as gravity sand filters. By utilizing the existing infrastructure and footprint, these membranes can increase water capacity by approximately three times while simultaneously improving the quality of the filtered water.

Submerged ceramic membranes also present a compelling case for upgrades of Membrane Bioreactors (MBRs). Ceramic membranes deliver numerous benefits. These advantages include a much longer lifespan, increased operating flexibility, almost no limitations for cleaning, resistance to oil, etc. All of these factors are very useful in situations that require reliable and robust membrane performance.

Moreover, in the realm of seawater pretreatment, ceramic membranes have shown a unique ability to handle fluctuating feed conditions and peak events. Whether it's a sudden algae bloom or an increase in total suspended solids, ceramic membranes prove to be remarkably resilient.

But the versatility of ceramic membranes extends beyond typical water treatment scenarios. They excel in treating harsh feed water characterized by high pH levels, elevated temperatures, or significant amounts of total suspended solids and O&G. Because of their robustness and reliability, they are extraordinarily well suited for industrial applications while also reducing the need for extensive pretreatment which polymeric UF membranes would require.

Perhaps one of the most commendable attributes of ceramic membranes is their sustainability profile. Unlike polymeric membranes that contribute to plastic waste, ceramic membranes are recyclable and reusable. They are our allies in the global push for sustainability and responsible resource management.



By offering a holistic range of benefits that go beyond mere cost-effectiveness, ceramic membranes are proving to be the future of the filtration industry. Their technical superiority, adaptability, and environmental friendliness make them an increasingly appealing choice for operators, end users, and system integrators alike.

Project Overview

In Surat, Gujarat, a groundbreaking project is under construction, one that underscores the future of ceramic membrane technology in water filtration. The venture focuses on the rehabilitation of a 160,000 cubic meter per day (m3/d) conventional gravity sand filter plant. Spearheaded by the EPC, Enviro Control Private Limited (<https://envirowater.in/>), the project aims to meet various filtration challenges, such as a feed design with 300 NTU, PFAS, and color. The plant is set to commence operations in the first quarter of 2024.

Key Benefits

The benefits of implementing ceramic flat membrane technology in this project are manifold:

Triple Capacity Increase: The rehabilitation replaces conventional gravity sand filters with cutting-edge ceramic flat membrane technology, thereby tripling the existing plant's capacity without expanding its footprint. Specifically, each Gravity Media Filtration (GMF) twin basin's capacity will grow from 10 MLD (million liters per day) to 32 MLD. Consequently, the plant's rehabilitated capacity will increase from 50 MLD to 160 MLD.

Significant Cost Savings: This strategy significantly reduces capital expenditure (CAPEX) compared to building a new facility to supply the additional 110,000 m3/d capacity.

Enhanced Water Quality: The plant is designed to handle challenges that are especially prevalent during the monsoon season, like high turbidity and PFAS contamination. The on demand/optional use of Cerafiltec's Active Cake Layer Filtration (ACLF) process ensures that even these dissolved contaminants are removed.

Sustainability Impact

The sustainability advantages of this initiative are equally compelling:

Asset Reuse: Cerafiltec's capacity enhancement of the existing plant eliminates the need for new civil work, thereby reducing carbon dioxide emissions, material usage, and environmental impact.

Improved Public Health: The system achieves 99.9999% (LRV 6) bacteria removal, substantially lowering the risk of waterborne diseases.

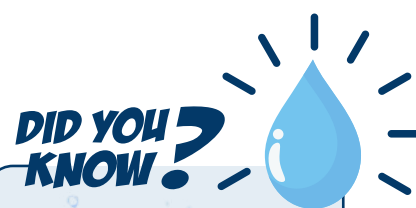
Toxic Substance Removal: The plant removes 99.99% of PFAS, effectively addressing elevated toxic levels during monsoon seasons.

The Role of Cerafiltec

As the technology partner to Enviro Control Private Limited, Cerafiltec is supplying the ceramic flat membrane equipment and providing comprehensive design support, both in plant and process design. The project is executed in close collaboration on-site to ensure successful project delivery.

Conclusion

The Surat case study encapsulates the revolutionary changes ceramic membrane technology can bring to the water treatment landscape. It serves as a precedent not just for India but for the global industry, signifying a shift toward more efficient, sustainable, and effective filtration systems.



The water we have on Earth is older than our solar system. It formed from interstellar clouds that existed before the Sun and the planets were born, carrying with it traces of ancient cosmic history.



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SMART WASTEWATER SOLUTIONS: TACKLING INDIA'S WATER SCARCITY WITH IOT, AI, AND DIGITAL TRANSFORMATION

By- Dhruv Krishna, Assistant Vice President, CIMCON Software (I) PVT. LTD

In today's water industry, the energy and enthusiasm are palpable, with industry veterans and domain experts providing solutions on an unprecedented scale. The key challenge is to maintain execution quality because water is a critical utility that demands round-the-clock attention.

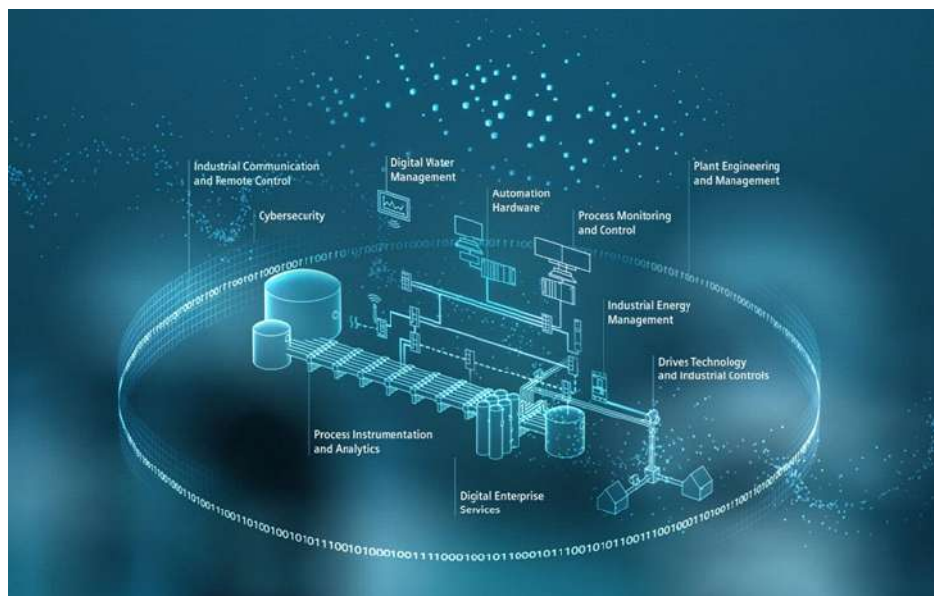
India's water industry is on an exponential growth path, with vast opportunities in untapped areas to manage this dwindling resource for its vast population. As 4G/5G networks continue to expand across the country, alongside improved accessibility through the development of road networks, the implementation of IoT and SCADA solutions becomes more feasible.

Government policies are aligning with the need to meet the water requirements of this immense population.

One significant development is the execution of large-scale turnkey projects, both greenfield and brownfield, across India's water sector. The government is pursuing a two-pronged strategy: refurbishing old infrastructure and establishing new Water Treatment Plants (WTPs) and Sewage Treatment Plants (STPs) in areas previously lacking access to piped water, such as the Jal Jeevan Mission

(JJM). A positive trend is the widespread adoption of technology, including IoT, Remote Monitoring Systems (RMS), and SCADA, to manage these extensive and remote utilities. The company has been a leader in

SCADA and IoT solutions for the last 35 years. With extensive experience in water management, we've harnessed our knowledge to develop customized solutions and logic for remote asset management.



Our hardware and software aim to enhance efficiency by preventing pumps from operating under abnormal conditions and averting water reservoir overflow. This is accomplished through smart logic and combinations of our level sensors and RTUs. We've also implemented vibration sensor-based anomaly detection and fault management for pump motors using machine learning and artificial intelligence. This provides clients with periodic updates on health and potential faults, ensuring preventive maintenance, reducing downtime, and improving efficiency. By preventing water wastage and enabling pumps to run at optimal levels through IoT and SCADA monitoring and control, we contribute to averting water scarcity and promoting sustainable water management.

The key technologies transforming the water industry and enhancing efficiency and sustainability are as follows:

1. IoT and SCADA technology for remote monitoring and control of assets.
2. Using AI and ML to improve pump efficiency, prevent breakdowns, and ensure continuous operation.
3. Preventing pump motors from running in abnormal electrical conditions through protection relays and smart logic.
4. Avoiding water wastage through overflow by using flowmeters, level sensors, and smart logic to shut down pumps based on water level and flow.
5. Utilizing various instruments and methods, including membrane and check valves in STPs and WTPs to ensure healthy water for drinking and irrigation purposes.

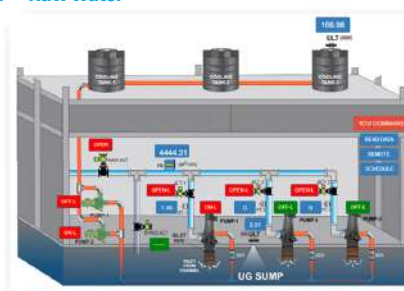
Ensuring water quality is vital, and this is achieved through smart logic and sensors such as depth sensors, turbidity/chlorine sensors, and chlorine dosing pumps, providing clean and healthy water to end consumers.

To meet the water needs of India's vast population, all potential sources of water, including groundwater and surface water, need to be tapped. Groundwater availability is decreasing as the population grows, necessitating the development of more surface water schemes. These schemes involve lifting and pumping water from natural sources like rivers, lakes, and ponds to large available land areas. The water is then treated at WTPs and used for drinking or irrigation. CIMCON Software India Pvt. Ltd has been a pioneering force in the implementation of SCADA and IoT technology for the automatic management of wastewater treatment plants with remote monitoring. Our extensive experience extends to multiple installations across India, where we efficiently manage nearly 540 million liters of treated water daily, catering to a population of approximately 12 million individuals.

Some of the notable cities where our services have made a substantial impact include Chandigarh, Ambala, Haryana, Pundri, Kullu, Manali, Palampur, Nagrota, Dharamshala, Sarkaghat, Chauntra, Thunag, Gandhinagar, Firozabad, and Lucknow, among others. These successful projects underscore our commitment to delivering smart wastewater solutions that address the critical water scarcity challenges facing India.

A typical Water Treatment Plant comprises the following parts and steps. To fully manage the plant, all stages need to be automated with Remote Terminal Units (RTU), sensors, and linked with SCADA software to enable seamless automatic operation with remote monitoring.

1. Raw Water



Details of Installations: Automation panel with RTU, ULT, 3 Phase actuators, and Flow meter.

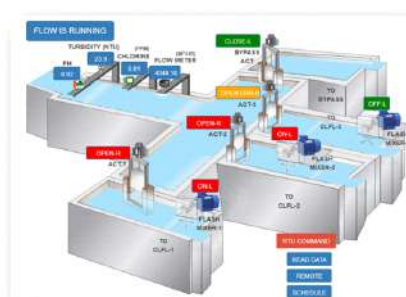
- Raw Water from PST is collected in the Raw water sump.
- The system contains 3 pumps, 4 actuators, 3 pressure transmitters, and 2 level transmitters.
- Out of the three pumps, one is working while the others remain on standby.
- The measured Level in meters is compared with a predefined configured set value.
- During a predefined configured set time period for distribution, if the measured Level is within the limit set by the predefined configured value, the RTU will automatically command the automation panel to open the correlated actuated outlet valve and switch 'On' the correlated Motor pump.
- After the predefined configured set time period or if the measured Level falls below the limit, the RTU will command the automation panel to close the correlated actuated outlet valve and switch 'Off' the correlated Motor pump.
- All pumps and actuated valves can also be controlled from the web-based SCADA.
- Line Pressure and Energy consumption are continuously monitored in real-time using Pressure Transmitters and Energy Meters, respectively.
- The flow meter at the outlet of the pump house measures instantaneous flow in M3/Hour and cumulative flow in terms of M3.

Details of Parameters Monitored on Real-time

Basis: Actuated valves status (Open/Close), Pump Status (On/Off), Pump Run Hours, Level (M), Line Pressure, and Electrical Energy parameters.

Outcome: Real-time monitoring and control lead to more efficient pumping processes and extended machinery lifespan due to optimized operation.

2. FLASH MIXTURE WTP



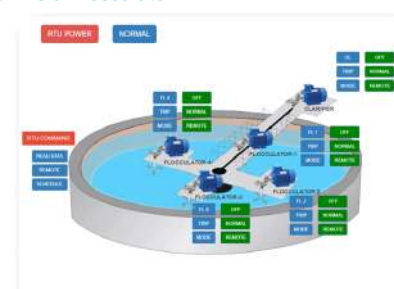
Details of Installations: Automation panel, flow meter, pH, turbidity, chlorine, and 3 Phase actuators.

- During a predefined configured set time period for distribution, the RTU will automatically command the automation panel to open the correlated actuated outlet valve and switch 'On' the correlated Flash Mixer.
- After the predefined configured set time period, the RTU will command the automation panel to close the correlated actuated outlet valve and switch 'Off' the correlated Flash Mixer.
- All Flash Mixers and actuated valves can also be controlled from the web-based SCADA.
- pH, Turbidity, and Chlorine are continuously measured in real-time using appropriate transmitters.
- The flow meter measures instantaneous flow in M3/Hour and cumulative flow in terms of M3.

Details of Parameters Monitored on Real-time

Basis: Actuated inlet valve status (Open/Close), Flow (M3/Hour), Cumulative flow (MLD), Status & Run Hour of Flash Mixture, Flash Mixture (On/Off), pH, Turbidity (NTU), and Chlorine (ppm).

3. Clariflocculator

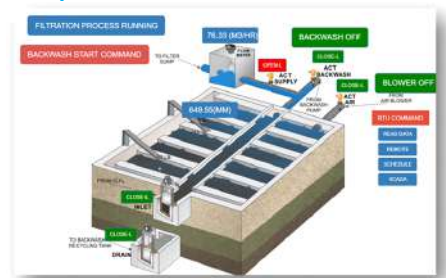


Details of Installations: Automation panel with RTU.

- During a predefined configured set time period for distribution, the RTU will command the automation panel to switch 'On' the flocculator.
- After the predefined configured set time period or if the measured Level falls below the limit, the RTU will command the panel to switch 'Off' the correlated flocculator.
- All flocculators can also be controlled from the web-based SCADA.
- Energy parameters are continuously measured and monitored using Energy Meters.

Details of Parameters Monitored on Real-time Basis: Run Hour of flocculator, flocculator (On/Off), Energy Parameter.

4. Filter Bed (total 12)/ Depends on the capacity of the plant



Details of Installations: Automation panel with RTU.

- After flocculation, water is fed to twelve filter beds.
- The level of respective filter beds is continuously monitored using ULT.
- The monitored Level is compared with a predefined configured set value.
- If the Level is within the limit, the RTU allows the actuated inlet valve and actuated supply valve to remain open, continuing normal filtration operation.
- If the measured Level exceeds the predefined configured set value, the RTU initiates the Backwash Process.

Backwash Process Sequence:

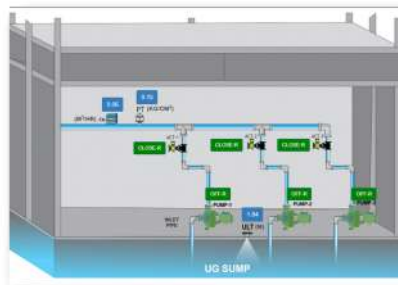
- Inlet valve and supply valve are kept open until head loss indication interrupts the process.
- Head loss is measured with the help of a level switch.
- Backwash is initiated, and inlet and supply valves are closed.
- Drain valve and air valve are opened, and the blower is started for a configured duration (e.g., 3-5 minutes).

- Air valves are closed automatically after the configured duration.
- Backwash valve is opened to feed clear water from the Backwash tank to the filter bed for a configured duration.
- The drain valve is closed, and inlet and supply valves are opened.
- Normal filter bed operation continues 24/7.

Blower System:

- Two blowers, one working and one on standby, are used for purging air to filter beds during backwash.
- Air pressure generated by blowers is monitored using pressure transmitters.
- Blowers are automatically turned on if a status signal is received from the RTU, and the air control valve is opened.
- Blowers operate sequentially.
- Blowers are automatically switched off if no status signal is received from the beds.
- Run hours of the blowers are maintained.

5. Backwash Pump

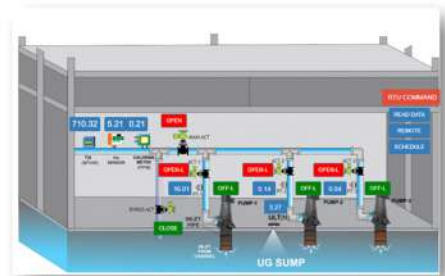


Details of Installations: Automation panel with RTU, Flow meter, Pressure transmitters, and Ultrasonic level transmitter.

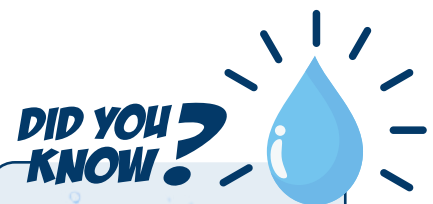
- The system contains 3 pumps, 3 actuators, 1 Ultrasonic Level Transmitter, 1 flow meter, and 1 pressure transmitter.
- At a time, only 1 pump can run, selected by the RTU based on the last run pump.
- Ultrasonic Level Transmitter senses the tank level.
- Line Pressure and Energy consumption are continuously monitored in real-time using Pressure Transmitters and Energy Meters.
- The flow meter at the outlet of the pump house measures instantaneous flow in M3/Hour and cumulative flow in terms of M.

6. Clear Water Pump House

Details of Installations: Automation panel with RTU, ULT, 3 Phase actuators, Flow meter, pH meter, and chlorine meter.



- Clear Water from filter beds is collected in the Clear water sump.
- The system contains 3 pumps, 4 actuators, 3 pressure transmitters, 1 level transmitter, 1 Flow Meter, 1 pH meter, 3 Energy meters, and 1 chlorine meter.
- Out of the three pumps, one is working while the others remain on standby.
- The measured Level is compared with a predefined configured set value.
- During a predefined configured set time period for distribution, if the measured Level is within the limit, the RTU commands the automation panel to open the correlated actuated outlet valve and switch 'On' the correlated Motor pump.
- After the predefined configured set time period or if the measured Level is below the limit, the RTU commands the automation panel to close the correlated actuated outlet valve and switch 'Off' the correlated Motor pump.
- All pumps, the line Pressure, and Energy consumption are continuously monitored in real-time.
- The flow meter at the outlet of the pump house measures instantaneous flow in M3/Hour and cumulative flow in terms of M3.
- pH and chlorine are continuously measured in real-time using appropriate transmitters.



The water we have on Earth is older than our solar system. It formed from interstellar clouds that existed before the Sun and the planets were born, carrying with it traces of ancient cosmic history.

In Conclusion:

The implementation of digitalization and data-driven technologies like SCADA/IOT is crucial for efficient water treatment plant operation and management. These technologies provide real-time data on site conditions and parameters, water supply, quality, and equipment performance. This data is essential for justifying investments, ensuring sustainable water supply, and improving the health and lives of the people in India.

ABOUT THE AUTHOR



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HARNESSING THE POWER OF OZONE: TRANSFORMING WATER TREATMENT

Abdul Rahman Mohammed, CEO, Sahara Industry

Water, a critical natural resource is an indispensable and fundamental need for humans' health and nations' economy. In the current era marked by global warming and frequent climate change events, ensuring water security is of paramount importance for nations to achieve their long-term development objectives. This includes safeguarding vulnerable water resources, catering to population demands, protecting vital infrastructure assets, and sustaining agricultural, energy, and industrial production with adequate availability of clean water.

The water resources face significant strain, and the delivery of water services falls short due to insufficient investment in the sector. Addressing this investment shortfall necessitates a blend of public, concessional, and private sources of financing, all channelled towards the attainment of key objectives of making clean water available with an emphasis on optimizing the contributions of both the public and private sectors.

Emerging Challenges

Water is the planet's lifeblood, facing current and emerging challenges. There are multiple water crises manifesting globally, somewhere there is too much of water, elsewhere it is too little, and too polluted water everywhere. The biodiversity and the environment, food and energy production, business and industry, and entire ecosystem are facing the impact of disappearing resource.

As current trends persist, the world will have to confront a 40 percent deficit between water demand and supply by the year 2030. Already, 10 percent of

the global population resides in countries grappling with significant or acute water scarcity. There are over 2.3 billion people who lack the privilege of accessing clean and safe drinking water, while 3.6 billion people lack access to proper sanitation facilities. These circumstances have profound implications for public health, education, and the development of human capital.

There is a deep connection between water and climate change, as climate change serves to intensify risks associated with water and disrupt the hydrological cycle. Remarkably, nine out of every ten natural disasters are intricately tied to water. The projections indicate that by 2050, floods and droughts could result in a staggering \$5.6 trillion in cumulative losses for the global economy. Moreover, climate



change poses a direct threat to both lives and livelihoods, intensifying international tensions over increasingly scarce resources and chances of facing the 'war on water'.

The climate change events like floods and droughts could result in staggering \$5.6 trillion losses for the global economy by the year 2050.

Clean and safe drinking water is essential for human and nation. Despite technological innovations and economic progress, several regions around the world still struggle with water pollution and contamination issues. As the global population continues to grow, meeting the demand for clean water is becoming increasingly challenging. Ozone technology is emerging as a powerful and sustainable solution for cleaning water and ensuring its safety for consumption and various industrial applications.

Ozone water treatment, a method used to reduce contaminants in water by harnessing the oxidative power of ozone. In the quest for innovative solutions, ozone technology has emerged as a powerful tool in purifying water, offering a sustainable and effective alternative to traditional water treatment methods. Ozone, being an oxidizing agent, readily reacts with other substances, accepting their electrons in the process. The process of ozone water treatment commences with the generation of ozone in an ozone generator. Subsequently, this ozone is introduced into the water, where it promptly initiates the oxidation process. Ozone can also be produced by electrolytic and chemical reactions, but UV and electrical ozone generators are the most common for water treatment.

Water has no boundaries; it is an issue that demands attention and resources at every level, from the local and national to the regional and global.

Ozone is a naturally occurring, triatomic form of oxygen, a highly reactive molecule. It is formed when oxygen molecules are exposed to energy in the form of ultraviolet light, electrical discharge, or chemical reactions. Ozone's reactivity is harnessed for water treatment purposes. When dissolved in water, ozone

reacts with organic and inorganic contaminants, effectively breaking them down into harmless byproducts. This process, known as oxidation, is a powerful disinfectant that effectively eliminates a wide range of pathogens, including bacteria, viruses, algae, hydrogen sulphide, metals, turbidity, and bad tastes and odors.

Ozone Technology in Water Cleaning

This environment-friendly method does not leave harmful residues and is widely used for disinfection and improving water quality. Ozone water treatment is a sustainable and efficient way to ensure safe and clean water for various applications, including drinking water, wastewater treatment, and swimming pool sanitation.

Some notable applications of ozone technology in water treatment:

Disinfection and Sterilization: Ozone is up to 50 times more effective than chlorine as a disinfectant. Ozone's strong oxidative properties make it highly effective in disinfecting water. It rapidly deactivates and destroys bacteria, viruses, and other pathogens without leaving harmful residuals or producing harmful byproducts. This capability is particularly valuable in providing safe drinking water, reducing the risk of waterborne diseases, and ensuring public health.

Taste and Odor Control: One of the common issues faced by water utilities across the globe is the presence of undesirable tastes and odors in water sources, mainly due to presence of organic compounds, such as algae or decaying vegetation. Ozone effectively breaks down these compounds, enhancing the taste and odor of treated water.

Removal of Organic Compounds: Ozone technology excels at removing organic pollutants such as pesticides, pharmaceuticals, and industrial chemicals from water. It can break down and transform chemicals, industrial solvents, and heavy metals into less harmful byproducts. This makes ozone technology a versatile choice for treating water from various sources, including industrial wastewater.

Color and Turbidity Reduction: Some water sources have the color and turbidity issues from the presence of natural organic matter or mixing of industrial effluents in it. Ozone aids in effective removal of color-causing compounds and particulate matter, resulting in crystal-clear water that also meets regulatory standards.

Reducing Chemical Usage: By harnessing ozone's oxidizing power, water treatment plants can reduce their reliance on traditional chemical disinfectants like chlorine. This not only lowers chemical costs but also

minimizes the formation of harmful disinfection byproducts, promoting cleaner and safer water.

Cryptosporidium and Giardia Inactivation: Ozone has been proven effective in eradicating waterborne parasites like Cryptosporidium and Giardia, which are notoriously resistant to conventional disinfection methods.

Micro-Pollutant Removal: Ozone technology can effectively break down a wide range of micro-pollutants, including pharmaceutical residues, endocrine-disrupting compounds, and personal care products, which pose significant challenges to traditional water treatment processes.

Enhanced Water Quality in Pools and Spas: Ozone is a popular choice for maintaining water quality in swimming pools and spas. It reduces the need for traditional chlorine or bromine disinfection, leading to improved water clarity reducing the production of potentially harmful disinfection byproducts.

Environmental Sustainability: Ozone is an environment friendly water treatment option that reduces the use of chemicals and does not leave harmful residues or byproducts. Its use promotes sustainable water management, contributing to the preservation of aquatic ecosystems and reducing the ecological impact of water treatment processes.

Sahara Industry: Contributing with Sustainable Water Treatment

Sahara Industry has established itself as a prominent player in the field of water treatment, particularly in the development and application of advanced filtration system using membrane technology. With a relentless commitment to innovation and a focus on addressing the pressing water challenges, Sahara Industry is revolutionizing the way we purify and manage this precious resource.





Sahara Industry's achievements over the past two decades can be attributed to its unwavering commitment to pioneering water treatment technology and systems. The utilization of advanced membrane technologies such as MBBR, RO, and UV filtration has proven instrumental in separating impurities from untreated water, providing an exceptionally efficient and sustainable water purification solution. It is also effectively used in industrial effluent treatment and producing ultra-pure water for the production.

Sahara Industry is committed to eco-friendly water treatment solutions. The advanced membrane and ozone technology aligns with sustainable practices by minimizing the need for chemical additives and reducing the generation of waste products. This approach contributes to a greener and more environmentally responsible water treatment process.

With its dedication to excellence and commitment to improving water quality, Sahara Industry contributes to addressing water scarcity and pollution issues in India and beyond.

With commitment to address water contamination challenges and catering to the increasing demand for clean water, it puts strong emphasis on research and development to continuously improve and expand their offerings. The commitment to innovation ensures that their solutions remain at the forefront and as a leader in water treatment solution; Sahara Industry has the ability to address a wide range of treatment

challenges that makes it a driving force in the ongoing quest for clean and safe water.

Future Prospects

In a world where the demand for sustainable water treatment solutions continues to rise, access to clean water is a fundamental human right and environmental preservation is a growing concern. As the demand for clean and safe water continues to grow, the role of ozone technology will undoubtedly become even more prominent in our quest for a healthier, more sustainable future.



The water we have on Earth is older than our solar system. It formed from interstellar clouds that existed before the Sun and the planets were born, carrying with it traces of ancient cosmic history.

ABOUT THE AUTHOR



Abdul Rahman Mohammed
CEO, Sahara Industry

With a background in marketing and finance, the young entrepreneur has deftly steered his company towards becoming a leading manufacturer and provider of cutting-edge, top-notch water and wastewater treatment solutions in India. Employing a blend of contemporary business strategies, technological advancements, and visionary leadership, he has driven his group companies to achieve extraordinary growth, surpassing a turnover of INR 1200 million.

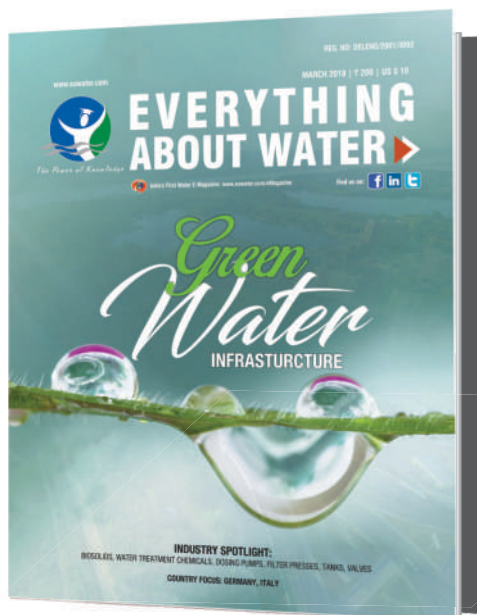
His Visionary approach and expertise have been instrumental in establishing the company as a leader in the industry, delivering efficient and effective solutions to meet the evolving needs to the market.

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SHAPING THE FUTURE OF WATER MANAGEMENT WITH THE LATEST TECHNOLOGY IN MEMBRANE TECHNOLOGY

By- Mr Mandar Vaijanapurkar - Head of Drives Sales, Marketing & Services, Danfoss India Region

In our ever-evolving quest for progress and development, the conservation of our most precious resource, water, is paramount. Technology has emerged as a pivotal tool in ensuring that this invaluable resource is not only conserved but also used efficiently, promoting a sustainable future for generations to come. The era of advanced water management has ushered, courtesy of innovative membrane technologies. With climate change in the picture, the rise in global population, and subsequent freshwater scarcity, the focus on advanced and sustainable water management systems has never been more paramount. This exigency led to breakthroughs in membrane technology, facilitating immaculate water filtration, treatment, and conservation. Membrane technology is at the forefront of this paradigm shift, offering innovative solutions for the meticulous management of water resources, safeguarding the environment, and posterity.

Breaking Ground with the Latest Membrane Technology Innovations

In the world of membrane technology, innovation is the watchword. Breakthroughs have been aplenty,

spanning materials, designs, and applications that are revolutionizing water filtration. The beauty of these novel advancements is that they not only enhance water quality but also present an opportunity for sustainable water management. Researchers have been exploring the utilization of advanced materials that not only improve filtration efficiency but also minimize environmental impacts.

Different types of membrane technology offer a myriad of solutions. Reverse Osmosis (RO) membranes, chiefly used for desalination, aid in converting seawater into freshwater. Ultrafiltration (UF) membranes target micropollutants, preserving water quality, while Nanofiltration (NF) membranes concentrate ions, necessary in pharmaceutical industries. Membrane Bioreactors (MBR) marry membranes with biological processes for wastewater treatment, marking a novel approach in water resource management.

The novel trends in membrane technology exhibit promising materials, designs and applications that cater to enhanced water filtration. Mixed Matrix Membranes (MMMs), endorsing both polymeric and inorganic substances, are on the rise due to their distinct advantages over single matrix membranes.

The shift towards circular economy approaches reusing membranes, and waste brine reduces emissions, limits input resources and curbs wastes effectively.

Internet of Things (IoT): Empowering Real-Time Monitoring

The integration of the Internet of Things (IoT) with membrane technology has ushered in a new era of water management. Real-time monitoring and predictive maintenance of membrane filtration systems have become possible, ensuring optimal performance and resource utilization. This amalgamation of digital innovation and membrane technology has immense potential for precision water management. IoT is seamlessly integrating with membrane technology, transforming water management by enabling real-time monitoring and predictive maintenance of membrane filtration systems. IoT-enabled sensors offer insights into membrane performance, forecast potential faults or failures, hence ensuring timely rectification, reducing bottlenecks and fostering overall system efficiency. When embedded into a membrane system, IoT devices gather comprehensive data in real-time. This



data includes parameters such as temperature, pH, membrane permeability, and digital imaging of fouling formation. By providing an uninterrupted, continuous flow of data, these devices make room for proactive decisions, reducing unplanned downtime for maintenance while improving system longevity and operational efficiency.

A Path to Sustainable Freshwater Production with Desalination

Access to freshwater resources is a global challenge, and membrane technology is playing a pivotal role in addressing this issue. Membrane technology is delivering cutting-edge developments in desalination. Advanced membrane-based desalination techniques are not only more energy-efficient but also environmentally friendly. The key to these innovations lies in the development of high-performance membranes that exhibit remarkable salt rejection while allowing for the passage of fresh water. These membranes can effectively filter out salt and impurities, delivering a sustainable and economically viable freshwater supply.

Various pilot projects worldwide strive to lessen the energy-intensity of desalination, reducing the overall carbon footprint in the process. For instance, the revolutionising use of renewable energy systems such as solar and wind power in membrane-based desalination is a noteworthy innovation. Moreover, the practice of reusing waste heat and brine from desalination enhances the efficiency of the process, pointing towards a sustainable freshwater production future.

Diverse Applications of Membrane Technology beyond the Ordinary

Membrane technology is governed by a robust regulatory landscape that shapes its adoption. These regulations stipulate the quality of drinking water produced, wastewater discharged, and more, ensuring the safety and health of the consumers. The regulatory landscape also influences the research and development landscape of membrane technologies, prompting innovations that align with the societal need for more sustainable options. Outside conventional water treatment, membrane technology stands at the forefront in sectors such as Healthcare sector, pharmaceuticals, food and beverage industries, Chemical and Petrochemical Sector and

more. Membranes are used to concentrate active pharmaceutical ingredients, isolate proteins, fine-tune flavours, and more, underscoring their versatility.

- **Healthcare Sector:**

In healthcare, membranes are integral components in various diagnostic and research applications. Additionally, membranes are utilized for blood oxygenation in heart-lung machines during surgeries. In laboratories, they are employed in protein purification and DNA sequencing, advancing medical research and diagnostics.

- **Pharma Sector:**

In the pharmaceutical sector, where stringent regulations and product purity are paramount, membrane technology plays an indispensable role. Membranes are employed in processes like ultrafiltration and microfiltration to separate and purify biopharmaceutical products and active pharmaceutical ingredients.

- **Food and Beverages Industry:**

In the food and beverage industry, membrane technology is widely utilized for processes such as milk and juice clarification, the concentration of fruit juices, and the production of whey protein isolates. The removal of unwanted components, such as impurities and microorganisms, helps enhance product quality, extend shelf life, and maintain the sensory attributes of the final product.

- **Chemical and Petrochemical Sector:**

The chemical and petrochemical industries utilize membranes for separation and purification processes, contributing to the production of specialty chemicals, petrochemicals, and fuels. Membrane-based technologies offer energy-efficient alternatives for separating chemical components, promoting sustainable practices, and reducing environmental impacts.

- **Wastewater Treatment and Environmental Remediation:**

Membranes have found applications in wastewater treatment and environmental remediation. They aid in



the removal of contaminants and pollutants from industrial wastewater, municipal sewage, and landfill leachates.

This diversification in applications underscores the significance of membrane technology in modern industrial and scientific processes, driving progress and ensuring the wellbeing of the environment and future generations.

Danfoss has enhanced water quality and water resource management by incorporating membrane technology into their systems. Their membrane technology solutions are used in various applications, including supplying clean water to hotels, resorts, ships, and offshore facilities. They provide both small, containerized units and large trains of parallel-coupled pumps, ERDs (Energy Recovery Devices), and drives to meet different water purification needs.

As materials, designs, and applications continue to evolve, membrane technology will play an even more significant role in the conservation and efficient use of water resources. IoT integration, desalination advancements, and diverse applications will pave the way for a sustainable and water-secure future.

The continuous evolution of Membrane Technology and its adaptation to various industries make it a potent tool for preserving our most precious resource. This technology, in synergy with policies, will contribute significantly to shaping the future of water management for the betterment of our environment and the prosperity of generations to come. Collaborative efforts with a focus on reducing the carbon footprint and enhancing resource efficiency would ensure this technology benefits the environment and future generations to a great extent.

ABOUT THE AUTHOR



Mr. Mandar Vajjanapurkar
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Mr. Mandar Vajjanapurkar is an experienced business manager in the mechanical and industrial engineering industry. With a strong background in product management, business strategy, key account management, and business development, he has proven himself as a skilled sales professional.

Mr. Mandar has been an integral part of Danfoss India close to two decades, specializing in the sales and marketing division for Danfoss Drives. With his expertise and dedication, he has played a crucial role in driving the success of the company in the India region.

THE FUTURE OF TRENCHLESS TECHNOLOGY FOR INSPECTIONS

By- Riley Kooh, Content Manager at Pipe Trekker

Across any industry, staying on top of asset conditions is vital for safety, efficacy, and budget forecasting. Stormwater systems are no exception. Visual inspections of material storage and outdoor processing areas, as well as discharge areas and their surrounding environments are essential to a well functioning stormwater system. Over time, asset integrity begins to dwindle, and having consistent condition intel is the only way to minimize risks of contamination, flooding, blockages, and collapsed pipes.

What is Examined in a Stormwater Inspection?

Depending on the size of the site location, stormwater systems can be immense. With the potential to affect millions of citizens or contaminate massive plots of land in the event of a system failure, detailed inspections are vital. When inspecting a stormwater system, there are a variety of potential issues that can be cause for concern.

- Cracks
- Leaks
- Offsets/Disjoints

- Ovality
- Blockages in Pipes/Sediment Build-up
- Foreign Debris
- Corrosion
- Collapses
- Status of previous repairs

Why is a Stormwater Inspection Important?

It is crucial to manage stormwater for several key reasons. With the proper tools, inspections are a non-invasive, low-risk preventative measure against issues, from the health of local waters and aquatic life to flood risk mitigation.

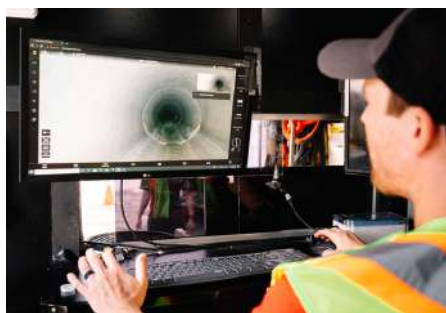
• Maintain the Hydrologic Cycle

Improperly managed stormwater can reduce moisture replenishment in the soil and minimize groundwater recharge. Soil moisture is essential for vegetation, while loss of groundwater recharge can severely reduce stream baseflow, necessary for aquatic life. By managing stormwater correctly, the hydrologic cycle can be maintained to ensure healthy plant and aquatic life.

• Prevent Flooding

Without adequate stormwater maintenance, the risk of flooding, especially in urban areas, is greatly increased. As water cannot be absorbed into the concrete that covers large swaths of towns and cities, the excess water from rain and thunderstorms must be managed to prevent loss of life and property damage by flooding.





- **Prevent Stream Erosion**

While erosion is a normal part of stream behavior, excess stormwater can greatly increase the amount of erosion as abnormal amounts of water enter streams during storms. This extra water increases both the volume and rate at which water - and the sediment in the water - is delivered to streams. This extra water can increase erosion on stream banks and beds, damaging the natural form of these streams. The degradation of these streams can lead to a massive decline in plant and animal diversity. Proper stormwater management can effectively mitigate these risks.

- **Forecasting for Maintenance Budget Optimization**

While no future outcome is 100% predictable, inspection report data is a beneficial tool for educated predictions of budget allocation. By following a dedicated asset health grading system, facilities should be able to narrow down to the year when maintenance will be required. Having this information on hand lowers the risk for costly surprise repairs or large-scale collapses.

How is a Stormwater Inspection Conducted?

In order to conduct a proper inspection, a full visual inside the length of the pipeline is required. Depending on the pipe dimensions and water levels, this can either be done by manned entry or remotely using ROVs or Pipe Crawlers. Generally, in order for a pipe to be entered safely, the diameter must measure a minimum of 48" (122cm). In modern practice, portable robotic solutions streamline visual inspections for safety, access a wider variety of pipes, and instantaneously run reports.



The Tools Used

Pipe Crawler

Pipe Crawlers are an extremely effective way to inspect dry or partially submerged stormwater pipes. Stormwater pipes are often corrugated steel, HDPE, or concrete. Opting for pneumatic tires, tracks, or rubber wheels are ideal for traction on these materials, being adept at traveling through mud, sand, or for getting over debris.

ROV

For fully submerged large diameter pipes, ROVs are the most effective tool for visual inspections, offering intuitive controls and tilt cameras to make it incredibly easy to get crisp visuals of the entire pipeline. One of the drawbacks of a ROV inspection is that the entire pipe must be filled with water for a full survey.



Floats

For partially submerged, large diameter (900mm/36"+) pipes, floats can be a viable option. Floats can provide multi sensor capability and can travel long distances, but generally need significant

flow to operate. For extremely large tunnels that are dry, manned entry is still a reasonable option. However, deploying a crawler is the safest alternative.

Reporting Software

Visual inspections provide integral information to municipalities or organizations about the status of their storm and sewer infrastructure. Using tested and validated reporting programs ensure that teams are provided a convenient import and export using the NASSCO file.

There are several NASSCO certified software options that are used to document PACP inspections. Pipe Trekker offers straightforward WinCan and POSM software compatibility, and integration with GraniteNet, ITPipes, and CTSpec, among others.

How Pipe Trekker can Make a Difference in Storm Water System CCTV Inspection

Implementing a Pipe Trekker crawler or Deep Trekker ROV for stormwater inspections empowers operators to conduct inspections safer and easier than ever before. From 2011 - 2018, 61 fatalities were reported on the job inside a manhole, sewer system, or storm drain. With the use of remote inspection vehicles, operators never have to enter a confined space.

Town of Renfrew - Case Study

The town of Renfrew is a small municipality, with a storm and sanitary system including 89 km (55 miles) of pipe. In 2005, Renfrew hired a CCTV service company to inspect 75% of their system, totaling \$400,000 to complete. The town used to call on a contractor 10 - 12 times a year to provide CCTV services.



Mission Objective

Renfrew understood that CCTV camera inspections of storm water pipes ensure the integrity of the system, and minimize risks of contamination, flooding, blockages and collapsed pipes, although the high cost of inspections limited their abilities to do so. Their mission was to reinvent this process in order to minimize these sunk costs for continuous inspections while maintaining employee safety.

Equipment Used

A Pipe Crawler was a perfect solution for Renfrew's high inspection costs. At the time, this system cost USD\$13,000 to purchase, and gave their internal staff the ability to effectively inspect pipelines 8 - 36" in diameter.



Internal, on-board batteries mean that no generators or topside power sources are required. Traditionally, CCTV inspection systems require a dedicated truck for all of the components including a tether, winch, and power source. The crawler packs down into two carrying cases and can be set up and deployed in less than a minute.

Results

Nearly immediately upon purchase, everyone on the municipality's team was able to operate the handheld controller, maneuver the CCTV camera and view the

live video feed on the unit's super-bright integrated screen. The first day of ownership, Renfrew successfully used the crawler to inspect a 10" storm pipe that would have previously been contracted out. "Another reason we opted to purchase the equipment was to deploy the camera on our schedule rather than waiting on a contractor." - Lane Cleroux, Town of Renfrew.

Toronto Water - Case Study

• Mission Objective

The goal of this particular mission was to evaluate the condition of a combined sewer and storm water tunnel for Toronto Water. PipeTek needed to provide a report of the tunnel and associated pump and intake structures to determine the best next steps for managing the structure.

• Equipment Used

Since this was a 530m long, fully submerged tunnel, the REVOLUTION ROV was chosen for the task. Longer tunnels with sediment in the bottom proved to be more difficult for pipe crawlers, robots that PipeTek had significantly more experience with at the time.

The problem with pipe crawlers is that their wheels or tracks stir the sediment, obstructing the view of the tunnel. They also have a shorter range of view, because their cameras can only raise so far from the bottom of the tunnel. Human entry in this long of a tunnel would be far too dangerous. By utilizing a free swimming ROV with an imaging sonar, PipeTek was able to capture a thorough report of these tunnels and structures.

• Results

Results Overall, this was a complete success despite having zero visibility for the camera. Using the imaging sonar combined with the flexibility of the rotating camera head on the REVOLUTION, PipeTek was able to identify several points of interest for

Toronto Water to evaluate and plan to reinspect, such as protruding laterals, pits, cracks, and sediment levels. Not only were these points of interest located and photographed, they also were able to measure these with the sonar tools available.

Sustainable Solutions for Effluent Treatments

Whether the concern is to maintain water quality or supply consistent intel on asset conditions, key challenges can be identified easier by robotic CCTV inspections. The integrated sondes of the Pipe Trekker A-Series greatly improve efficiency. Offering a visual inspection alongside location identification, workers can pinpoint exact locations of concern for targeted section maintenance.



The water we have on Earth is older than our solar system. It formed from interstellar clouds that existed before the Sun and the planets were born, carrying with it traces of ancient cosmic history.

ABOUT THE AUTHOR



Riley Kooh
Content Manager at Pipe Trekker

Riley has been the Content Manager at Pipe Trekker since late 2020. His experiences in the field working with dedicated customers in sewer, stormwater, general infrastructure, and other industries have shaped his work with various case studies and editorials about the use of robotics for pipe inspections. As a goal to limit the need for dangerous confined entry for workers around the world, Riley's work highlighting the benefits of remote inspections can be seen published in Trenchless Technology Magazine, The Journal of Ocean Technology, International Water Power and Dam Construction Magazine, Subtel Forum, and more.



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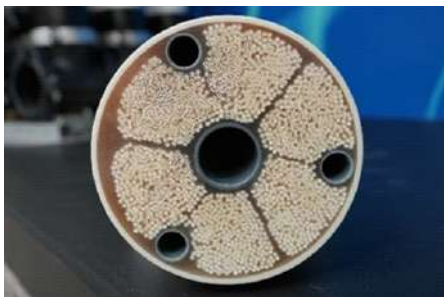
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THE POWER OF MICROBES: HOW SUPER24 & OXYSUPER CAN ENHANCE ULTRAFILTRATION MEMBRANE LONGEVITY

By- Sanjay Bahl, 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, such as Super24 and Oxysuper by Superweld Ecosolutions, 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.

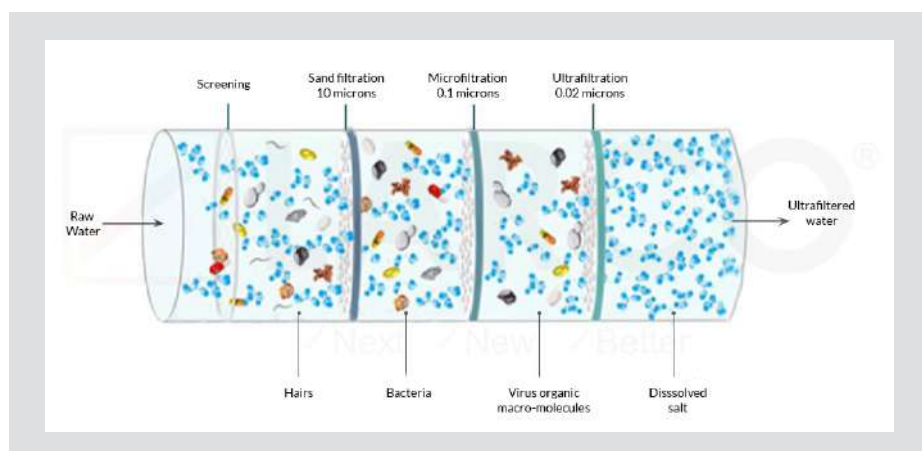
- **Environmentally Friendly:**

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.

Super24 and Oxysuper to the rescue!

Here's how Super24 and Oxysuper by Supeweld Ecosolutions can address these challenges and avoid the membrane fouling to maintain the clarity of water and its desired flow:

- **Enhancing the biodegradation process:**

Super24 is a high performance bioculture that can degrade pollutants and oxysuper is a formulation for enhancing dissolved oxygen in wastewater treatment systems.

By enhancing the metabolic activity of microbes, these formulations promote the growth and activity of aerobic bacteria, which are capable of breaking down organic pollutants more efficiently. 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.

- **Nutrient Removal:**

Super24 and Oxysuper include compounds that facilitate the removal of nutrients like nitrogen and phosphorus. These formulations 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 the biodegradation of pollutants, removing nutrients, and eliminating odours, Super24 and Oxysuper 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.

This can lead to reduced TSS in the outlet that can insanely extend the lifespan of UF membranes, making your water treatment system more efficient and cost-effective.

Let's consider a real-world scenario where Supeweld Ecosolutions effectively addressed a problem and quickly made a significant impact.

Reviving Textile Mill's UF Membrane: A Case Study on Bioculture-Based ETP Restoration

In a textile mill, a wastewater treatment plant was commissioned with traditional methods, utilising cow dung, Urea, and DAP (Diammonium Phosphate) as a bioculture development alternative. However, this approach led to growth of a weaker biological floc in the aeration tank, which was underperforming and was prone to frequent shock loads that disrupted the outlet water quality. The ultrafiltration membrane took all the load of the high TSS and high BOD.

Well, the UF membrane was able to permeate clear water with all parameters under control. But it was filtering much more than the designed capacity. As a result, the membrane got choked with one year of commissioning.

The Challenge:

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, and this led to a challenge to meet regulatory and environmental standards.

So, how exactly did Superweld come to the rescue? You already know! Let's discuss in detail:

Our team introduced and incorporated a comprehensive solution:

Super 24 and Oxysuper:

Superweld introduced Super 24 and Oxysuper, high-performance microbial formulations designed to enhance the biological treatment process and improve water quality.

As discussed above its importance, the membrane was bypassed via our magic products to break down the pollutants, remove nutrients, and eliminate odours.

Operational Guidance:

The Superweld team provided operational guidance to the textile mill's wastewater treatment plant operators.

What did we achieve?

The Superweld Ecosolutions expertise led to the following outcomes:

- **Enhanced Wastewater Treatment:**

The textile mill's treatment plant achieved a more strong and effective biological treatment process.

- **Lowered Membrane Load:**

The UF membrane no longer faced overload, prolonging its lifespan and reducing the need for frequent replacement.

- **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 high-performance microbes and the value they brought to the wastewater treatment process.

This case study highlights the significant impact of modern microbial solutions in industrial wastewater treatment. We are consistently on a mission to solve similar and bigger problems that deal with environmental issues. It's crucial to remain mindful of the technologies we use and their impact on both the environment and your industrial operations. Leverage our expertise and save the environment and YOUR PLANT before it's too late!



ABOUT THE AUTHOR



Sanjay Bahl
Superweld Ecosolutions

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, companies improve their biological wastewater treatment, he strongly believes Indian biotechnology is among the best in the world. Along with his passion for transforming the course of companies, he likes to read about the latest technologies and does social work in his free time.



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EXPANSION TO AN ADVANCED WASTEWATER TREATMENT PLANT WITH A REALITY MODEL.

By - Sandra DiMatteo, Bentley Systems

Gwinnett County, northeast of Atlanta, has a population of 950,000. The Gwinnett County Department of Water Resources (GCDWR) provides wastewater treatment services to these residents via the F. Wayne Hill Water Resources Center. Originally constructed in 2000, it utilizes advanced ozone, granular activated carbon, and membrane treatment processes to return high-quality effluent to the Chattahoochee River and Lake Lanier while going beyond regular water quality requirements. Since it began operations, the facility has received a number of awards from water associations, including the Platinum 18 Peak Performance Award from the National Association of Clean Water, and has never received a water quality violation.

Despite the relatively young age of the treatment plant, Gwinnett County has experienced the second-fastest population growth in Georgia at 19.18% from 2010 to 2022. Even with a maximum flow of 60 million gallons per day, the plant frequently experienced flow issues that would need to be addressed to keep the effluent flow constant for the increasing number of residents. In addition to fixing existing flow issues, GCDWR wanted to improve the capacity of the

membrane treatment process. The organization tasked Jacobs Engineering with designing a renovation to the plant that would address both needs. "This project will allow for the continued delivery of superior wastewater effluent to one of the most important lakes in the state of Georgia," said Nathan Meade, design manager at Jacobs.

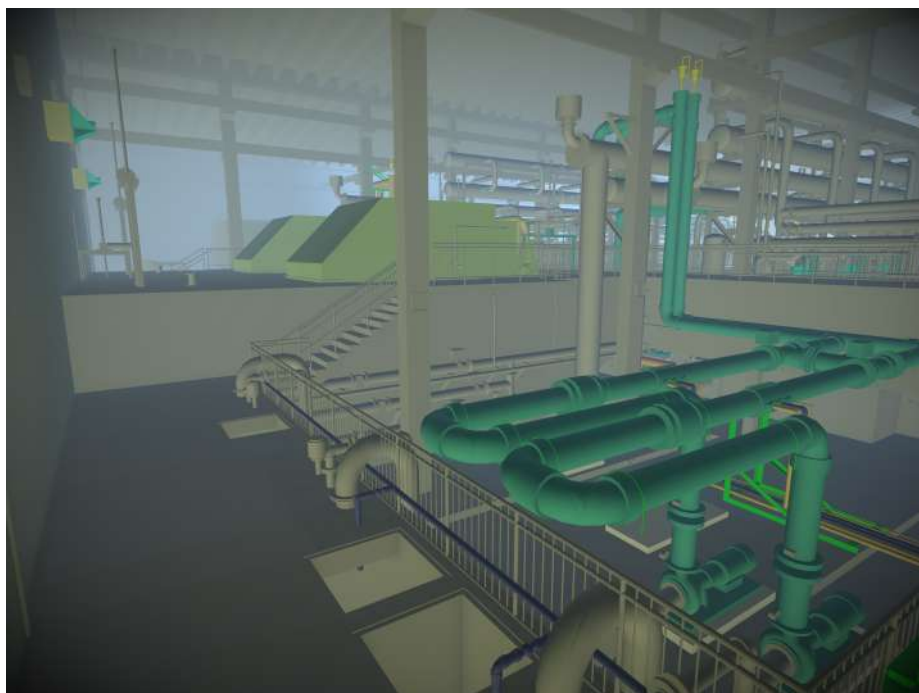
Squeezing New Equipment into Tight Spaces

The scope of the project includes various improvements at the Membrane Building and East Chemical Building. For the Membrane Building, Jacobs is designing and building additional membrane cassettes, permeate, and back pulse pumps and piping, high-capacity drum screens, HVAC equipment, and electrical and variable frequency drive equipment. The East Chemical Building improvements include chemical tanks, chemical pumps and piping, and an architectural canopy over a fill station. Both buildings would also receive various architectural and structural improvements. The project posed numerous challenges to Jacobs. Since the new design and equipment would be

incorporated into an older building, the design team needed to carefully build the new elements alongside existing features that could not be moved. "Since this was a retrofit project, it was essential for the design team to have a thorough understanding of existing space and equipment placement, particularly in the Membrane Building where space is limited," Meade said. They had to tie into the building's original piping, avoid or incorporate existing structural elements, and create complex spatial arrangements that would push the design accuracy to the limits. The team could not easily import older, limited 3D models created for the plant, and they could not visit the site due to the COVID-19 pandemic, preventing them from collecting specific information on building conditions. Jacobs needed an alternative method for the team to view and interact with as-built conditions of the site.

Visualizing the Impact of Design Work in a 3D Model

The design team determined that they could overcome the project's challenges by using Bentley applications to create a federated digital model that



included accurate data for both the existing conditions and the new equipment. First, they undertook a laser scan of the project areas and imported the point cloud data into Context Capture, creating a reality model of the current site. Next, they used Project Wise to establish a connected data environment for both the reality model and models of the new components. By providing current conditions and all project data to the design team and stakeholders, they could undertake modeling and design review in a central location without having to visit the job sites.

Within the reality mesh, the team visualized the combination of the legacy plant data, as-built conditions, and proposed improvements. Because the applications were open and interoperable, they were also able to incorporate older 3D models that had been created with Auto PLANT and update them with the current operational conditions of the facility. In the process, they updated the models to correct errors and build out architectural elements that were missing, ensuring they worked with a complete, accurate digital replica of the work site. Using Open Buildings, Open Plant, Open Roads Designer, and other Bentley applications, they modeled new elements for the renovation. Since the federated model helped them immediately see how each aspect of the design would impact the piping, equipment, and structure of the existing facility, they could make adjustments to correct clashes.

Working Remotely to Improve Collaboration

By establishing both a connected data environment

and a federated model, all project stakeholders were able to greatly improve communication and collaboration.

The design team and stakeholders reviewed the model's development during weekly calls, facilitating discussion of any project concerns and improving decision-making. "These team calls and screen sharing proved invaluable to the success of the project, and utilization of the new reality mesh produced real value-adding design decisions," Meade said. In total, working in the federated model facilitated at least 20 major design decisions that would have required an additional 300 hours of modeling to resolve using older design methods.



Going digital during design also produced strong environmental benefits.

As the reality mesh provided a detailed representation of every area and angle of the project, the team had little need to travel back to the work site, preventing carbon emissions from transportation. Additionally, adjustments to the design will improve the capacity to discharge reclaimed water to Lake Lanier, which will boost water levels at one of Georgia's most popular recreational lakes. Due to the success of designing within the federated model and incorporating all asset information, Jacobs and the project owner now plan to use them to improve construction and operations.

Project Summary

Organization

Jacobs Engineering

Solution

Water and Wastewater Treatment Plants

Location

Buford, Georgia, United States

Project Objectives

- To improve the flow of reclaimed water at an advanced wastewater treatment plant
- To incorporate new elements around existing assets within a tight space.

Products Used: AutoPLANT, ContextCapture, MicroStation, OpenBuildings, OpenPlant, OpenRoads Designer, Pointools, ProjectWise 365



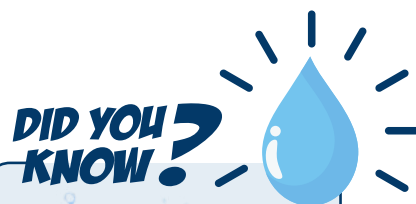
Fast Facts

- The F. Wayne Hill Water Resources Center utilizes advanced ozone, granular activated carbon, and membrane treatment processes to go beyond regular water quality requirements associated with returning high quality effluent to Lake Lanier.
- Jacobs Engineering was tasked with designing a renovation to the plant that would improve flow and accommodate a growing population.
- The new elements had to tie into the building's original piping, avoid or incorporate existing structural elements, and fit within a tight work footprint.

ROI

- Using Bentley applications to create both a connected data environment and a federated model greatly improved communication and collaboration among all stakeholders.
- The reality mesh provided a detailed representation of every area and angle of the project, eliminating the need to travel to the worksite.
- Working in the federated model facilitated at least 20 major design decisions that would have required an additional 300 hours of modeling to resolve using older design methods.

Callout Quote: "The collaboration between the design team and Bentley to drive the use of a high-quality reality mesh resulted in many design decision improvements through the life of the project. Continuous positive feedback from the client further validated the ambitious decision to capture the original laser scan of the highly complex facility." Nathan Meade, Design Manager, Jacobs Engineering



The water we have on Earth is older than our solar system. It formed from interstellar clouds that existed before the Sun and the planets were born, carrying with it traces of ancient cosmic history.

ABOUT THE AUTHOR



Sandra DiMatteo
Bentley Systems

Sandra DiMatteo is the Industry Marketing Director, Water Infrastructure at Bentley Systems. She has more than 25 years of experience in reliability and asset performance management software, asset lifecycle information management, and is an expert in digital twin cloud solutions in the water and wastewater, energy and process industries. Sandra holds an honors degree in accounting and is a Certified Reliability Leader. She sits on the Reliability Leadership Institute Board of Advisors and founded the Ontario Chapter of the Society of Maintenance and Reliability Professionals.

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HIGH-STRENGTH WASTEWATER CHALLENGE FOR NORTHERN MICHIGAN TOWNSHIP - NEW PACKAGE FACILITY

By- Christopher French, POD Public Relations & Marketing Limited

When your small but vital Wastewater Treatment Plant (WWTP) has BOD (Biochemical Oxygen Demand) in excess of 700 milligrams per liter (mg/L) and had phosphorus levels as high as 20 mg/L, it pays to have a firm advocate of good clean effluent at the helm.

With its small population (358) but a fast-rising number of food and retail outlets serving the nearby City of Cadillac, this WWTP in the Northern Michigan Township of Haring was perhaps always destined for interesting times. Before the Haring Township WWTP was built in 2014/15, all Township wastewater was handled by the City of Cadillac (population circa 10,000), but when this agreement reached what turned out to be a landmark conclusion, professional consulting engineers Gosling Czubak Engineering Sciences, Inc. of Traverse City were called in to design a new, dedicated facility to serve the Township.

With its unusual blend of cities, villages, townships and counties, boundary agreements can sometimes get a little complicated in the State of Michigan. After prolonged, heated debates about whose responsibility it is to treat Haring Township's wastewater, a new state law was created to ensure that this type of dispute will never happen again.



Gosling Czubak pushed hard to find funding for the new, 135,000 gallons per day oxidation ditch treatment facility, helping the Township obtain loans from USDA Rural Development, plus \$900,000 in grant funds and \$1M from private business.

The challenge of high-strength waste

As well as securing the funding, we faced the challenge of high-strength waste and high-anticipated sewer bills due to the very small user base", said Mark Hurley, Director of Engineering at Gosling Czubak Engineering Sciences, Inc.



Following the decision that Cadillac would no longer take in Haring's wastewater, we had to get this thing built. We carried out a full study, asking bidders to hold their price for a year. Finally, when we had the finances in place, we went with Lakeside Equipment Corporation. Their ditches are tried and true; very dependable, and at a competitive price.

There at the plant in the very early stages, working closely with the original construction crews, has been Infrastructure Alternatives Inc. (IAI), who provide contract operations, maintenance and management services for numerous treatment facilities across the State of Michigan.

We always knew that we'd be battling against very high BOD and Phosphorus," said Nathan Filley, IAI's Lead Operator at the Haring WWTP.



So, the choice of Lakeside's E.A. Aerotor Plant, which is particularly suitable for small communities, has proved a wise one. It has all the components of a system of a much larger scale, with extended aeration and mixing, combined with final clarification. Despite the ongoing challenges we face, it works very well for the flow and organic loading.

He added: At most of the municipal treatment plants that we manage, BOD levels are around a standard 150-200 mg/L, so the average here at Haring of 700 mg/L is more concentrated due to the small number of homes. And with such a large amount of retail (including Walmart, Home Depot) and multiple fast-food outlets, our wastewater intake is pretty unique.

The Covid lockdown created new problems for all of us, with the vast majority of wastewater treatment plants seeing an increase in flow due to so many people having to stay at home. But at Haring Township, flows were more than cut in half. Even when the local fast-food outlets were allowed to reopen, restrictions meant take-away only, so with such little flow coming through the plant, nowhere near enough mixed liquor was going into the clarifier, meaning no blanket at the bottom, upsetting the balance.

Furthermore, the very low flow also meant that even when the plant's rotors ramped down to their minimum speed, the Dissolved Oxygen (DO) was well above its normal level of around 2.0 mg/L.

Protecting the local environment

Cloudy discharge water was something I definitely did not want to see," added Nathan Filley, for whom typical of IAI's philosophy, being the last line of defense in protecting the local environment was a

primary driving factor in him wanting to work in the industry. Michigan is no stranger of course to great lakes, and Haring's treated wastewater is discharged into the popular, trout-rich Clam River.

He continued: "The small population means we don't receive much wastewater from the use of showers or washing machines, so to help with the high strength intake at the plant, Lakeside designed rotors with the capability of providing high oxygen transfer. And with the help of Gosling Czubak, we've also learned to manage the seasonal differences in levels that are brought on by the big changes in temperature during the year."

He added: "Although the fast-food outlets are required to use grease traps, a fair amount of fats, oils and greases (FOG) still comes into our flow of 75,000 gallons per day. We usually keep one rotor on 24/7 and bring in the second rotor as a lag when the DO gets to around 0.25 mg/L below the setpoint – and shuts off at 0.25 mg/L above the setpoint.

Lakeside's E.A. Aerotor Plant is constructed in a concentric, common wall design, with the outer loop utilizing the Closed Loop Reactor (CLR) process for extended aeration. Meanwhile, the inner area incorporates the proven Spiraflo Clarifier for final settling.

I like to call it the 'Bullseye design', continued Mark Hurley from Gosling Czubak. "It's circular, with the ditches on the outside and the clarifiers in the centre. It's a winner. The plant can be run in series, or with one ditch and both clarifiers, so the Lakeside set-up gives us lots of flexibility". Nathan Filley continued: "Ahead of what the Township hopes will see future investment in Haring, we have two reactors (each 220,000 gallons), with just one needed at the moment. Nobody could have really predicted the impact of the



pandemic on our plant, so when the phosphorus rose to unprecedented levels, we tried turning the rotors down. I thought about how turning the rotors off at certain intervals might help the situation, so consulted leading wastewater equipment manufacturer representative, DuBois-Cooper in Plymouth, Michigan.

Speaking for DuBois-Cooper, Jay Vermilye, commented: "Infrastructure Alternatives, Gosling Czubak and Lakeside Equipment all have a wealth of experience in this field. It was great working with them, and as a team we came up with a plan to modify the operation of the Plant that addressed the issues that Haring faced due to COVID".

Tom Larsen from Lakeside added: "Mixing is important in an oxidation ditch but mixing 100% of the time is not imperative. Sometimes, it is more important to take advantage of denitrification and alkalinity recovery, especially when both nitrification and chemical addition for phosphorus removal creates lower alkalinity. In a lightly loaded system, you

can even get conditions required for phosphorus released for luxury phosphorus uptake (the storage of phosphorus within the biomass in the form of polyphosphate), further reducing the amount of chemical required."

Eventually settling on cycles of seven hours on/one hour off, IAI called in local engineers, West Michigan Instrumentation Systems to adjust control settings and add a timer. The change provided enough denitrification to stabilize pH levels at around 7.1 to 7.3 for most of the year.

Good for the Haring Township

Nathan Filley continued: "Rusty Sietsema and his team did a very professional job. We work closely with many skilled, specialist engineering companies in Michigan to help keep our treatment plants in top shape. We're now also saving on some energy costs, which is good for the Haring Township, and we no longer have to add soda ash, so that saves money and

time, too.

Phosphorus levels remain the most challenging. When Gosling Czubak was designing the new plant, the Michigan Department of Environment, Great Lakes and Energy (EGLE) came out and set very stringent discharge levels to the Clam River. Overall, the change in the rotor timings has worked out better than any of us first thought. "The Lakeside equipment is quality design; very robust. It is easy to operate, maintain and get parts for.

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ABOUT THE AUTHOR

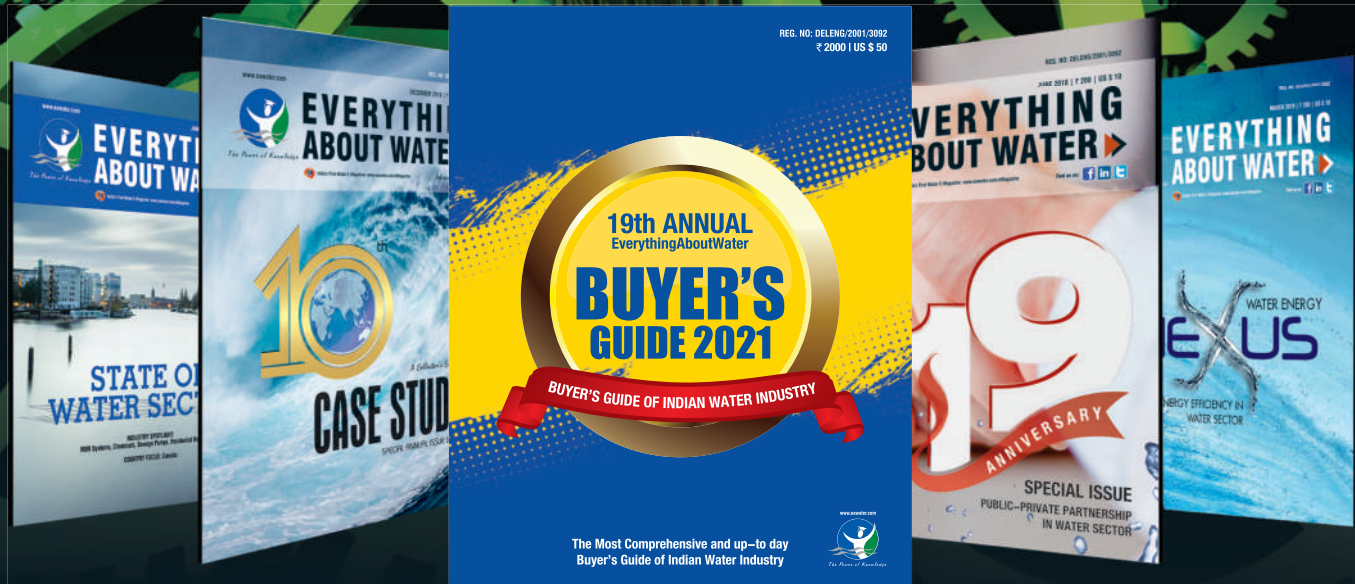


Christopher French
POD Public Relations & Marketing Limited

Christopher French is an independent, UK-based freelance writer on water, wastewater and biogas, who founded POD Public Relations & Marketing Limited in 1996. Formerly at The Daily Telegraph, French regularly visits treatment/recycling sites in the United Kingdom, the Republic of Ireland, Europe and North America, interviewing plant managers, site operators, senior management and owners, as well as recording videos and capturing images. He is currently working with companies in the USA, England, Germany, Denmark and Australia – all of whom have customers worldwide.



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REVOLUTIONIZING WASTEWATER TREATMENT WITH INNOVATIVE MEMBRANE DISTILLATION TECHNOLOGY

By- Ajanta Sarkar, Aquatech

Governments on all continents are increasing pressure on industries to comply with environmental regulations as ecological conservation and environmental preservation become worldwide buzzwords. Additionally, in India, it is becoming more and more difficult for businesses to dispose of environmentally dangerous trash that comes from their facilities. Regulations governing the disposal of industrial wastewater are also getting stricter. To lessen the environmental impact of wastewater management, zero-discharge technologies (ZLD) are being researched more and more. ZLD can be achieved in various ways. There is no “one size fits all” solution, as the optimal system design is site specific. The wastewater composition, various streams to be treated, site specific operating costs, footprint availability and other factors are determining factors for an optimal design.

Because of high installation and maintenance costs, conventional thermal evaporation technologies now find it difficult to provide clients with low cost solutions particularly for lower capacity requirements. Advanced Vacuum Membrane Distillation, or AVMD, is

a breakthrough technology Aquatech developed after years of research to overcome these problems and successfully meet the requirements of small-scale thermal evaporation.

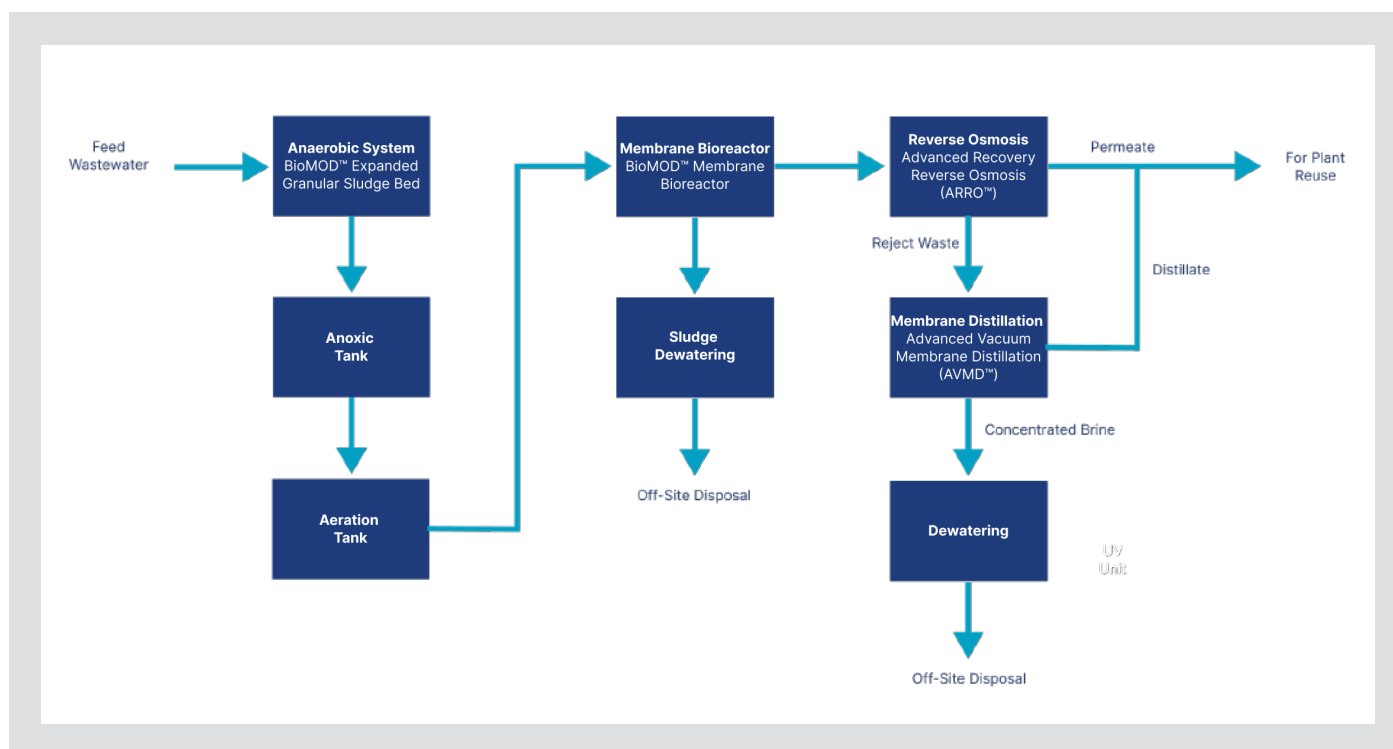
Aquatech collaborated with ACG World to set up their Zero liquid discharge plant, based on AVMD technology in Dahanu, India. ACG is the world's largest integrated supplier of pharmaceutical empty capsules, granulation, tablet coating, capsule filling, and packing films globally.

ACG's new greenfield formulation facilities in India generate complex waste streams with high organic content from multiple processes, which must be treated in compliance with strict zero liquid discharge (ZLD) regulations.

The ZLD project at ACG's Dahanu plant recycles and recovers an impressive 90% of starting water for reuse, helping to meet regulations and alleviate local water stress. Breaking away from the norm of high energy thermal distillation, ACG is making strides to achieve its sustainability goals. As well as choosing

membranes as a lower energy distillation alternative, the overall system generates 400kWh/d through biomethane production to be used within the plant. Furthermore, the project contributes towards ACG's goal to reduce water consumption by 50% in the next 4-5 years.

Aquatech's innovative solution combines biological wastewater treatment with high recovery Reverse Osmosis (RO) and advanced membrane distillation to operate at 350 m3/day zero liquid discharge plant. The advanced combination of Expanded Granular Sludge Bed (EGSB) treatment, anoxic treatment for denitrification, membrane bioreactor, and high-recovery RO were deployed. This was alongside Advanced Vacuum Membrane Distillation (AVMD) technology, which combines the advantages of thermal distillation and membranes to achieve high water quality at lower energy consumption. It is the first full-scale plant integrating advanced vacuum membrane distillation for membrane evaporation and an agitated thin film dryer for dewatering.



Combining an innovative biological wastewater treatment and membrane distillation process to achieve water sustainability goals. It saves power and generates 400 Kwh/d green energy through biomethane production. Additionally it also recycles and recovers over 95% water for reuse with minimal energy footprint.

The Results: Saving Power, Generating Green Energy & Achieving ZLD:

Combining an innovative biological wastewater treatment and membrane distillation process to achieve water sustainability goals enables ACG to:

- Save power and generate 400 Kwh/d of green energy through biomethane production
- Recycle and recover over 95% water for reuse
- Achieve ZLD with minimal energy footprint

The plant has a near-perfect on-site reuse efficiency of 99%, acting as a blueprint to reduce freshwater consumption and expand circularity projects to over 1,000 PepsiCo sites globally. Overall, this makes a substantial contribution to PepsiCo's goal to become net water positive by 2030.

The ZLD project at ACG's Dahanu plant recycles and recovers an impressive 90% of starting water for reuse, helping to meet regulations and alleviate local water stress. This project has set the stage for similar developments across other ACG locations, as water stress rises in India.

Our cooperation with ACG World on the development of a zero liquid discharge plant in Dahanu, India, has

been recognized by the prestigious Brave Blue World Foundation. At BlueTech Forum 2023, we were honoured to receive the esteemed Lighthouse Award, recognizing the role our technology played in helping ACG reduce its water footprint. This project also nominated for Global Water Intelligence in the category of "Industrial Project of the Year" in the field of industrial water and wastewater. This noteworthy contributions to the water sector and commitment to sustainable practices are truly commendable!

Aquatech is awarded 2023 IGCW Green Innovation Award in Mid sized company category by Industrial Green Chemistry World (IGCW).

About Aquatech: At Aquatech, we prioritize the vital role of water in climate impact, making it a core focus

of our mission. We tackle the challenges of water scarcity and complexity by leveraging technology, expertise, and financing to deliver comprehensive solutions that reduce carbon and recycled water footprint. As a leading global water technology and services provider, we help the world's most recognized companies in achieving their sustainability and operational goals through the implementation of innovative approaches for water reuse, desalination, and minimal & zero liquid discharge (ZLD). Our work supporting industries such as hydrogen, biofuels, carbon capture & storage, and critical minerals for EV battery production serves as a catalyst for the industry's transition toward a more sustainable future and showcases our commitment to addressing water's role in climate adaptation.

Learn more at www.aquatech.com/

ABOUT THE AUTHOR



Ajanta Sarkar
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Heading Applications for Process Design and Budget Estimations since 25 years, Ajanta Sarkar has pursued a B.tech in chemical field from Nagpur University. Masters in management science from Pune university.

VERTICAL ATMOSPHERIC PROFILING VIA SOUNDING ROCKET: MICROMETEOROLOGICAL INSIGHTS AND AGROMETEOROLOGICAL IMPLICATIONS.

By- Riddhish Soni, Jainul Abedin, Pranchal Gupta, Nirvik Choudhary, Dr. Adarsh Aggarwal,
Dr. Neeraj Kumar, Karan Behar, Dr. Faruk Kazi, Nirmal Chittora

Abstract

Sounding rockets, traditionally used for high-altitude studies, are emerging as pivotal tools in micrometeorology and agrometeorology. Their unique capability for vertical atmospheric probing unveils intricate microscale phenomena pivotal for both domains. Highlighting the MSR-Spaceshot launch from Sapaha, Uttar Pradesh, this research examines the multiple factors affecting a sounding rocket's altitude achievement. Factors considered include propulsion systems, aerodynamic design, onboard instrumentation, and atmospheric conditions. Their synergy enables the collection of detailed atmospheric data, offering deeper insights into microscale meteorological processes and significant

implications for agriculture. This study emphasizes the transformative role of sounding rockets in enhancing research in both fields.

Introduction

Exploring the Earth's atmosphere, notably its vertical stretches, has perennially been a daunting task due to the complex and dynamic patterns of atmospheric events. Originally designed for pursuits in space, defence, and astronomy, sounding rockets have evolved into essential tools, granting a unique perspective into the intricate stratifications of our atmosphere. The increasing adoption of sounding rockets in micrometeorological research underscores their crucial contribution in revealing previously

uncharted dimensions of atmospheric verticality.

In a notable stride within this realm, the MSR-Spaceshot rocket was recently dispatched from Sapaha, Uttar Pradesh. Serving as a shining beacon of India's progression in atmospheric research, this next-gen rocket is a flagship of the Abyom Space Program [1]. While customary tools like satellites and terrestrial setups present broad atmospheric snapshots, the Abyom fleet of sounding rockets delve deeper, presenting fine-tuned insights, and effectively filling the observational gaps left by their bulkier peers. A testament to the program's commendable journey, past rockets have recorded stellar heights: Vyom at 1885m, Arya scaling 1270m, Rayquaza reaching 3534m, and Lapwing at 320m.

Image 1: Abyom & thrustMIT Rocket Series

Rocket	Vyom	Arya	Rayquaza	Lapwing
Altitude	1885m	1270m	353m	320m
Model				

As time has marched on, technological innovations have refined sounding rockets, tailoring them specifically for atmospheric research. These refinements span upgraded telemetry setups, cutting-edge sensors boasting finer clarity, and agile flight protocols, all of which empower these rockets to delve further and more accurately into atmospheric depths.

The pivot from deploying sounding rockets mainly for extraterrestrial pursuits to harnessing them for detailed atmospheric probes, epitomized by Meteorological Sounding Rockets, signals a pivotal shift in approach. Moreover, with escalating global climate concerns and a heightened urgency for precise atmospheric intel, the significance of these rockets in guiding future investigative directions is monumental. While this study spotlights the Meteorological Sounding Rocket, its overarching aim is to weave it into the larger tale, decoding the intricate layers of vertical atmospheric studies and the bright horizons they beckon.

Sounding Rockets

The SSR-Spaceshot, as a part of its mission, was not just an engineering marvel in rocketry but also a pivotal tool for agrometeorology's progression. Designed for comprehensive vertical ascensions through Earth's atmosphere, the SSR-Spaceshot was equipped with advanced payloads to capture diverse atmospheric data throughout its trajectory. Its unparalleled ability provided a continuous and layered atmospheric analysis, from the Earth's surface to the edge of space. In the realm of agrometeorology, the SSR-Spaceshot's mission objectives had been:

precision data collection and microclimate monitoring [2].

Image 2: Abyom SSR Spaceshot Rocket



While ground instruments offered localized insights and satellites a broader perspective, they often lacked the comprehensive vertical atmospheric profile that the SSR-Spaceshot provided. Through its mission, the SSR-Spaceshot revolutionized agrometeorology, delivering a holistic understanding of the atmosphere, and aiding farmers and researchers in past decisions to optimize productivity and protect crops.

Mission planning

Ahead of the pivotal SSR-Spaceshot launch on 17th May 2021 at 12.30 pm from Sapaha, Uttar Pradesh, a series of exhaustive preparatory measures were executed.

The mission began with static motor tests on a specifically engineered test bed, setting the stage for the manufacturing and subsequent validation of solid rocket motors in BITS Pilani, Hyderabad Campus. Lessons from these tests influenced the development and flight testing of small-scale, single-stage rocket and their individual subsystems.

Image 3: Establishment of a mobile rocket test facility in Hyderabad by Abyom



The mission began with static motor tests on a specifically engineered test bed, setting the stage for the manufacturing and subsequent validation of solid rocket motors in BITS Pilani, Hyderabad Campus. Lessons from these tests influenced the development and flight testing of small-scale, single-stage rocket and their individual subsystems.

Image 4: Rocket thrust assessment with thrustMIT via solid motor test.



These trials ultimately paved the way for the creation and optimization of full-scale rocket systems. This thorough preparation dovetailed with climatic considerations for the launch day. Sapaha's 32-degree Celsius temperature fell within optimal bounds, preserving the rocket's components, while the moderate wind velocity of 5.5 kmph ensured a smooth lift-off and trajectory [3]. The clear skies and 48% relative humidity struck a balance, avoiding potential system complications and ensuring precise tracking. The midday timing was strategically chosen for optimal visual tracking, sidestepping intense solar interference, further emphasizing Sapaha's suitability and climatic reliability for the mission.

Results

The MSR-Spaceshot rocket launch, conducted from the launchpad in Sapaha, Uttar Pradesh, stood as a beacon of advanced rocket engineering and design. Soaring to an impressive altitude of 97m, the rocket's journey was meticulously charted. It was at this apex of its flight that the parachute was deployed, ensuring the rocket's safe and controlled descent back to Earth.

Image 5(a): MSR-Spaceshot Launch



Image 5(b): Payload Detachment Image



Image 5(c): Payload Landing



Underpinning the success of this flight was the Solid Propellant, an intricate blend of Polysulfide Ammonium Nitrate, which fuelled its ascent. Despite the mission's succinct duration of 20 seconds, every moment was optimized for data collection. Key among its payloads was a microwave sounder, specifically tasked with capturing temperature readings. Complementing this, a barometer diligently recorded atmospheric pressure, while a hygrometer measured the ambient humidity levels.

Image 6: Variation of Altitude vs Time

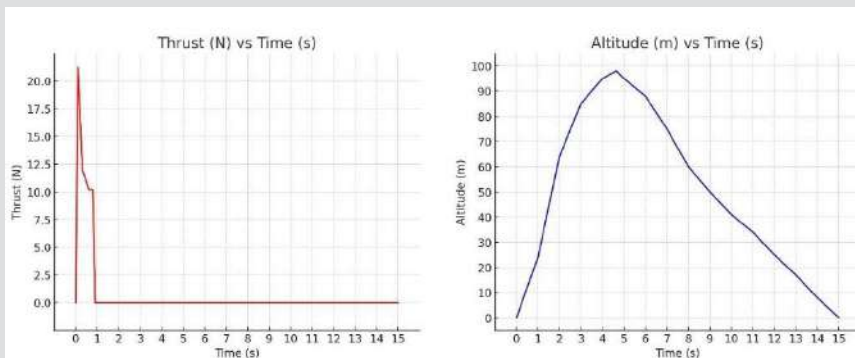


Image 7(a): Humidity Measurement

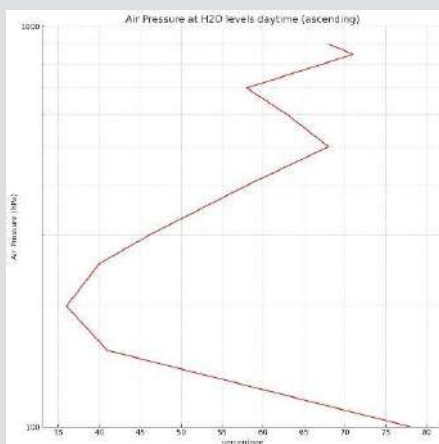
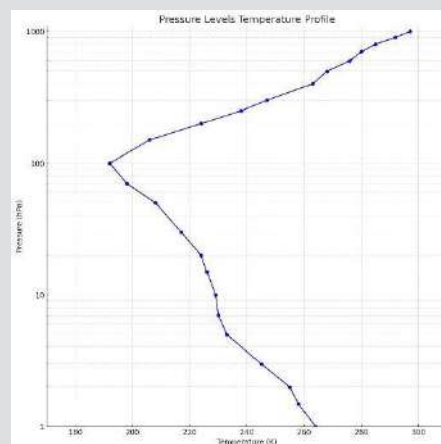


Image 7(b): Pressure-Temperature Profiling



These instruments worked synergistically, providing a comprehensive snapshot [4] of the atmospheric conditions during the rocket's flight. The information gathered is invaluable, paving the way for further refinements in rocket design and offering deeper insights into atmospheric studies.

Conclusion

The SSR-Spaceshot initiative showcased the remarkable capabilities of sounding rockets in delving deep into atmospheric dynamics. Armed with advanced tools like the microwave sounder, barometer, and hygrometer, it gathered precise data on temperature, pressure, and humidity. Such comprehensive data holds transformative potential for agrometeorology, setting the stage for enhanced weather prediction crucial for agriculture—from sowing and watering to combating pests and timely harvesting. The triumph of the SSR-Spaceshot not only highlights the convergence of meteorological innovation and agrarian practices but also paints a vision of a future where such technological strides

bolster sustainable farming [6], reflecting the harmonious blend of advanced rocket science and the quest for agricultural resilience.

**DID YOU
KNOW?**



The water we have on Earth is older than our solar system. It formed from interstellar clouds that existed before the Sun and the planets were born, carrying with it traces of ancient cosmic history.

References:

1. A. Kumar, "Sounding Rockets in Atmospheric Research," Journal of Atmospheric Studies, vol. 12, no. 3, pp. 45-58, 2022.
2. B. Singh and R. Patel, "Agrometeorology and Rocketry: A New Paradigm," AgriRocket Journal, vol. 5, no. 7, pp. 102-110, 2023.
3. C. Mehta, "The Engineering Behind SSR-Spaceshot," Rocket Science Journal, vol. 8, no. 2, pp. 30-40, 2023.
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CELEBRATING WORLD RIVER DAY: NURTURING THE LIFELINES OF OUR PLANET



By- Simran Arora, Editorial Incharge, Earth Water Foundation

Rivers are the lifeblood of our planet, weaving their way through landscapes, sustaining ecosystems, and providing vital resources to countless communities. Each year, on September 24th, we come together to celebrate World River Day, a day dedicated to raising awareness about the importance of rivers and the need for their conservation. In this article, we'll explore the significance of rivers, the challenges that rivers face, and the actions we can take to protect these invaluable natural resources.

THE IMPORTANCE OF RIVERS

Rivers are the lifelines of our planet. They play a central role in the Earth's ecosystem, influencing climate, supporting biodiversity, and providing essential resources for human societies. Here are some key reasons why rivers are of utmost importance:

Water Supply: Rivers are fundamental sources of freshwater, providing a lifeline for human societies. They are crucial for drinking water, irrigation of crops, and industrial processes. As the global population continues to grow, access to clean and reliable

freshwater from rivers is essential for sustaining agriculture, ensuring access to safe drinking water, and supporting economic activities.

Biodiversity Hotspots:

Rivers and the surrounding ecosystems are biodiversity hotspots. They offer a wide range of

habitats, from fast-flowing streams to slow-moving, meandering rivers. These diverse environments host a myriad of species, from fish and amphibians to insects, birds, and mammals. Rivers are breeding grounds and nurseries for many aquatic species, contributing to the overall biodiversity of our planet.



Transportation:

Throughout history, rivers have played a pivotal role in trade and transportation. Even in the modern age, rivers continue to serve as vital transportation routes. They enable the efficient movement of goods and resources, reducing the need for land-based transportation, which can be more energy-intensive and environmentally taxing.

**Cultural Significance:**

Rivers have long been central to the development of human civilizations. Many of the world's most prominent historical cultures, such as the Egyptians along the Nile, the Mesopotamians along the Tigris and Euphrates, and the Chinese along the Yangtze, thrived along the banks of rivers. Rivers have played roles in the development of languages, traditions, and religions.

CHALLENGES FACED BY THE WATER BODIES

While rivers are undeniably essential to life on Earth, they are under severe threat. The following are some of the major challenges that rivers face:

Pollution

Pollution is a pervasive problem affecting rivers worldwide. Industrial and agricultural activities release various pollutants into rivers. Chemical fertilisers and pesticides from farms, along with effluents from factories, often contain harmful substances. These pollutants degrade water quality and pose serious threats to aquatic life.

**Over-Extraction**

Excessive extraction of water from rivers for various purposes, particularly for agricultural irrigation, can lead to lowered water levels and decreased flow in rivers. This can have a cascading impact on

ecosystems. Reduced flow can alter the natural habitat for aquatic organisms and even increase the risk of saltwater intrusion in estuaries, which can harm ecosystems that rely on the river's resources.

Climate Change

Climate change poses a multifaceted threat to rivers. Rising temperatures can impact the thermal conditions of rivers, affecting the survival and distribution of aquatic species. Altered precipitation patterns can lead to more severe droughts or floods, causing significant disruption to river ecosystems and the communities that depend on them.

TAKING ACTION TO PROTECT OUR RIVERS

Individual contributions to river conservation are essential in protecting these vital natural resources. Here is an elaboration on how individuals can make a significant impact:

- **Reduce Water Consumption:**

Every drop counts. Conserving water in your daily life can directly benefit rivers. This can be achieved by fixing leaks, using water-saving appliances, and being mindful of water use.

- **Proper Waste Disposal:**

The disposal of waste and pollutants into rivers is a significant problem. Individuals can make a difference by responsibly disposing of their trash, recycling, and hazardous materials.

- **Support Local Conservation Efforts:**

Get involved with local environmental organisations and conservation groups. They often work on projects aimed at protecting and restoring rivers in your community.

- **Spread Awareness:**

Use your voice to raise awareness about river conservation. Social media platforms, blogs, and personal networks are powerful tools for educating others about the importance of rivers, the threats they face, and the solutions available.

- **Participate in Local Events:**

Join or organise events related to river conservation in your area. These events might include clean-up days, educational workshops, or fundraising activities.

CONCLUSION

World Rivers Day stands as a powerful reminder of the profound impact that rivers have on our lives and the need to protect them for current and future generations. By recognizing the intrinsic value of these waterways and taking collective action, we can work towards ensuring that our rivers continue to thrive and provide for both nature and humanity. Through concerted efforts, we can secure a sustainable and harmonious future for these invaluable resources.



WHY IS OZONE CONSIDERED A BETTER DISINFECTANT THAN UV

Water treatment technologies such as Chlorine & UV have been used for years together. Each of this technology has its advantages and disadvantages. Most of the time they are also combined together. Ozone technology has been present for more than decades now. Ozone technology is now close to becoming a priority in water treatment. Quite often ozone is also used in conjunction with other technologies.

UV VS OZONE

Pathogens of concern in any water treatment system consist of Bacteria, Virus & Protozoans. According to available literature, UV irradiation's effectiveness depends on the UV dosage applied.

Bacteria

UV is most effective against bacteria followed by protozoan and least effective against virus. The normal UV dosage suggested for water treatment is between 20 and 40 mJ/cm². At this dose, most bacteria show a 2-4 log inactivation.

Disadvantage of UV : The potential for reactivation

Because UV irradiation does not immediately result in cell lysis, there is some opportunity for a UV-inactivated cell to regain viability through a repair mechanism. One such mechanism is called photo-reactivation. Following UV inactivation, exposure to wavelengths in the range of 350-450 nm (Present in sunlight) triggers an enzyme that can repair UV-inflicted damage to the DNA of the bacteria. Not all bacteria have this ability to reactivate and it has been found that reactivation decreases with increase in dose from 20 mJ/cm² – 140 mJ/cm².

As most UV generators are designed at the lower range, the potential for reactivation is a reality!

Virus

Viruses are extremely resistant to UV irradiation. California 22 standards require a minimum of 140 mJ/cm² dose for inactivation of poliovirus, while rotavirus needs a minimum of 50 mJ/cm² dose for effective inactivation and adenovirus needs a minimum of 120 mJ/cm² dosage. This is clearly lower than the dose recommended by most UV manufacturers.

Protozoan

UV is not considered a viable technology for inactivation of protozoan pathogens. Cryptosporidium and Giardia require large dosages for 3-4 log inactivation, thus making UV economically unviable for protozoan inactivation.

Water quality

Water quality such as pH, dissolved ions, and turbidity affect UV effectiveness.

- With higher pH, the possibilities of precipitation of carbonates in the water along with scaling of precipitates can foul UV lamps enough to reduce the effectiveness of UV inactivation.
- High hardness affects UV lamps adversely as any scaling of these precipitates can foul the UV systems.
- Any turbidity in the water reduces UV irradiation effectiveness.

The role of Ozone and advantages over UV

Unlike UV, Ozone has a high germicidal effectiveness against a wide range of pathogenic organisms including bacteria, protozoa, and viruses, and requires

much less contact time than UV. Because of its high germicidal efficiency, ozone can be used to meet the high inactivation required by water treatment systems with or without filters. Unlike UV, there is no potential for reactivation as Ozone results in complete inactivation/destruction of pathogens.

Apart from microorganisms, Ozone also has the following benefits:

- Removes Odour
- Removes Colour
- No toxic-by products, and makes chlorine use safe, unlike UV which has no effect on Organics at very low doses.

This is precisely the main reason that in Europe and in America it is very common to use both ozone and UV in conjunction. The process called AOP is becoming more popular nowadays. If UV is to be used alone, then the dose should be above 140 mJ, when reactivations cease.

ISSUED IN PUBLIC INTEREST BY:

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UNVEILING THE ENIGMA OF THE UNDERWATER WATERFALL IN MAURITIUS

Mauritius, known for its pristine beaches and azure waters, has long been a favourite destination for travellers seeking an idyllic paradise. Yet, there's a lesser-known natural wonder that lies beneath the surface – the enigmatic underwater waterfall. This phenomenon has baffled scientists, captivated adventurers, and inspired legends for generations. In this article, we embark on a journey to uncover the mysteries of this underwater spectacle and explore the thrilling activities that await those who dare to dive into its depths.

The Illusion of an Underwater Waterfall

Off the southwestern coast of Mauritius, the underwater waterfall creates an optical illusion that confounds all who encounter it. This remarkable phenomenon occurs at the tip of the Le Morne Peninsula, where the Indian Ocean meets the Mozambique Channel. The illusion is a result of the complex interplay of underwater currents, geological formations, and the brilliant blue hues of the water. Picture a surreal world where the sea appears to cascade into an abyss, much like a terrestrial waterfall. This illusion is created by powerful underwater currents, which carry sand and silt into deep underwater chasms, making it seem as though the water is plummeting over a submerged precipice. The visual effect is both captivating and mysterious, leaving visitors in awe of nature's mesmerising power.

Local Legends and Lore

The underwater waterfall has long held a place in the folklore and stories of Mauritius. Local legends speak of mermaids who are said to reside in the underwater caves, beckoning those who dare to explore the depths. These mythical beings are rumoured to be protectors of the underwater world, watching over the marine life and guiding lost souls to safety. Another story tells of the underwater waterfall being a portal to an ancient, hidden city, lost to the depths of the ocean. Treasure hunters and history enthusiasts have speculated about the existence of this underwater city for years, fueling the imaginations of those who visit. Intriguingly, there are reports of mysterious, unexplained phenomena in the vicinity of the underwater waterfall. Divers have reported hearing eerie, echoing sounds, likened to ghostly whispers, deep within the underwater canyons. These underwater echoes have remained a mystery, adding to the mystique of this underwater wonder.

The Mysterious Origins

The underwater waterfall's origins remain the subject of scientific inquiry and local folklore. Geological experts posit that this phenomenon is a product of the region's unique underwater topography. The Mozambique Channel, which separates Madagascar from the African continent, funnels a colossal volume of water into this area. As these two ocean currents meet, the water's turbulence increases, causing sediments to flow downwards, resulting in the illusion of a waterfall.

Yet, the mysteries continue to mount as scientists puzzle over the depths of the underwater canyon and its uncharted territories. These mysteries provide a sense of adventure, as daring explorers venture below the surface to unravel the secrets concealed beneath.

The Thrill of Exploration

While the underwater waterfall's appearance is undoubtedly intriguing, it is the world beneath the waves that truly invites the adventurous spirit. Here, we dive into the thrilling activities that can be experienced in this unique aquatic realm.

- **Scuba Diving:** One of the most exhilarating ways to explore the underwater waterfall is by scuba diving. Descending into the abyss, divers are treated to a world of marine biodiversity unlike any other. The underwater canyon provides a habitat for a dazzling array of fish, coral, and other marine life. As you venture deeper, you'll discover cave systems, swim-throughs, and overhangs that create an eerie, otherworldly atmosphere.
- **Snorkelling:** For those who prefer staying close to the surface, snorkelling offers an opportunity to witness the illusion of the underwater waterfall from a unique vantage point. The clear, warm waters of Mauritius make snorkelling accessible to people of all skill levels. Vibrantly coloured fish, sea turtles, and intricate coral formations provide endless visual delights.
- **Deep-Sea Fishing:** The underwater waterfall region is renowned for its prolific fishing opportunities. Anglers can test their skills in capturing marlin, tuna, and other game fish that inhabit these waters. The thrill of a deep-sea fishing excursion is enhanced by the backdrop of the underwater waterfall's mesmerising illusion.
- **Underwater Photography:** Professional and amateur photographers alike are drawn to the

unique beauty of this underwater landscape. Capturing the illusionary waterfall and the diverse marine life in one frame is a challenge that results in stunning photographs that can be cherished forever.

- **Submarine Tours:** Not all adventurers are comfortable with the idea of plunging into the deep blue. For them, submarine tours offer a fascinating alternative. These submersibles provide a window to the underwater world without getting wet. Passengers can witness the underwater waterfall and its surrounding aquatic wonders in the comfort of a pressurised cabin.

Preserving the Underwater Ecosystem

As more adventurers flock to Mauritius to experience the underwater waterfall, the need for responsible tourism and environmental conservation becomes increasingly vital. The fragile marine ecosystem that thrives in these waters requires protection from the impact of human activity. Local authorities and environmental organisations are working diligently to balance the appeal of this natural spectacle with the need to safeguard it for future generations. In a nutshell, the underwater waterfall of Mauritius stands as a testament to the boundless wonders that our planet conceals beneath its surface. Its mystery, combined with the array of thrilling activities it offers, beckons explorers to venture into its depths. From scuba diving with schools of fish to witnessing the illusion from a helicopter high above, every perspective offers a new layer to this captivating phenomenon. As we marvel at the underwater waterfall, let us also remember the importance of preserving such treasures for generations yet to come.



T E N D E R

Repairs/Maint Of Chlorination Plant And Pump Set Dozer, Various Capacity Pump Se			
Authority	Municipal Corporation Address: Madhya Pradesh, Morar		
Location	Madhya Pradesh, Morar		
Bid Open Date	17 Nov 2023	Tender Value	49.00 Lac
Doc Collection Date	09 Nov 2023	FTID	231021447890
Construction Of 5 Nos. Filter Chamber (WasteWater Treatment Plant) At Gunduria Village Of Gunduria Gram Panchayat Under Bharatpur-I Panchayat Samity.			
Authority	Zilla Parishad Address: Executive Officer, Bharatpur-I Panchayat Samity, Bharatpur, Murshidabad.		
Location	West Bengal , Murshidabad		
Bid Open Date	09 Nov 2023	Tender Value	2.23 Lac
Doc Collection Date	07 Nov 2023	FTID	2310184311880
C/O Zoological Park At Thrissur.Sh: Domestic Water Distribution, WasteWater Collection Treatment, Rain Water Storage And Disposal. Sh: Sewage Treatment Plant With Treated Water Pump Sets, Sewage Transfer Pump Sets, Rain Water Collection Pump And De Water			
Authority	Central Public Works Department Address: 98 B Pocket F, Pincode City : Thrissur		
Location	Kerala : Thrissur		
Bid Open Date	03 Nov 2023	Tender Value	3.44 Lac
Doc Collection Date	03 Nov 2023	FTID	231019474390
Construction Of New Sewerage Line Including Sewerage Treatment Plant For Gc, Crpf, Mokamaghat, Bihar.			
Authority	Central Public Works Department Address: Ee(E), Cpwd, Patna, Pincode City : Patna		
Location	Bihar : Patna		
Bid Open Date	26 Oct 2023	Tender Value	8.26 Crore
Doc Collection Date	26 Oct 2023	FTID	231016470070
Design And Construction Of Sewerage Treatment Plants 01 No.-275 Kld, 01 N 0-25 Kld Capacity At Pantha Chowk Camp And 01 No 175 Kld , 01 No-25 Kld Capacity At Zewan Camp Based On Microbial Additive Based Anaerobic Stp Followed By Advance Eco Rea			
Authority	Indo Tibetan Border Police Force Address: Second In Command Chamber Shq (Snr) Itbp Zewan Camp Near Pantha Chowk Srinagar J And K Phone No 01933 222918, Pincode 191101		
Location	Jammu & Kashmir : Srinagar		
Bid Open Date	27 Nov 2023	Tender Value	4.55 Lac
Doc Collection Date	26 Nov 2023	FTID	2310074303090
Construction Of Faecal Sludge Treatment Plant In Existing Campus Of 4.50 Mld Sewerage Treatment Plant Kalka Distt. Panchkula.			
Authority	Public Health Engineering Department Address: Ee Phe Division Panchkula, Pincode 134118		
Location	Haryana : Ambala		
Bid Open Date	25 Oct 2023	Tender Value	9 Lac
Doc Collection Date	25 Oct 2023	FTID	2310204115280

T E N D E R

Hodal Town Construction Of Feacal Sludge Treatment Plant In Existing Campus Of 9.00 Mld Sewerage Treatment Plant Hodal, Distt. Palwal.

Authority	Public Health Engineering Department Address: Ee Phe Division No. 3 Palwal, Pincode 121102		
Location	Haryana : Palwal		
Bid Open Date	03 Nov 2023	Tender Value	8.30 Lac
Doc Collection Date	03 Nov 2023	FTID	2310204285480

Work Of Operation And Maintenance For The Existing Sewage Treatment Plant In Govt. Medical College Thrissur

Authority	Directorate Of Medical Education And Research Address: Principal Govt. Medical College Medical College P O Mulangunnathukavu Thrissur - 680 596, Pincode 680596		
Location	Kerala : Thrissur		
Bid Open Date	30 Oct 2023	Tender Value	8.00 Lac
Doc Collection Date	27 Oct 2023	FTID	230930420550

Comprehensive Annual Maintenance Contract Of Sewage Treatment Plant (Stp 150 Kld), Water Treatment Plant With Ro Purification (Wtp 80 Kld), And Drinking Water Ro, Uv, Ozonized Plant (2 Nos Of 250 Lph) Including Existing Faults Rectification Work.

Authority	Chennai Metro Rail Limited Address: Metros, Anna Salai, Nandanam, Chennai 600 035, Pincode 600035		
Location	Tamil Nadu : Chennai		
Bid Open Date	28 Oct 2023	Tender Value	24.00 Lac
Doc Collection Date	27 Oct 2023	FTID	231005410720

Interception And Diversion For Tapping Nallah And Setup Of Sewage Treatment Plant For Used Water Management For Rehti Town Under Swachh Bharat Mission (Urban) 2.0

Authority	Nagar Palika Parishad Address: Municipal Council Rehti District Sehore M.P. 466446, Pincode 466446		
Location	Madhya Pradesh : Rehti		
Bid Open Date	09 Nov 2023	Tender Value	2.77 Cr
Doc Collection Date	07 Nov 2023	FTID	231010426050

EVENT CALENDAR



September 2023

Water Indonesia

Wed, 13 - Sat, 16 Sep 2023
Jakarta, Indonesia
www.waterindonesiaexpo.com

CamWater

14 - 16 Sep 2023
Phnom Penh, Cambodia
www.camwaterexpo.com

THAI WATER

Wed, 30 Aug - Fri, 01 Sep 2023
Bangkok, Thailand
www.thai-water.com

SR Onshore Wind Conference

Wed, 06 Sep 2023
Glasgow, UK
www.scottishrenewables.com

Gat Wat

Wed, 06 - Thu, 07 Sep 2023
Cologne, Germany
www.gat-wat.de

WasteEcoExpo

Tue, 12 Sep 2023
Krasnogorsk, Russia
en.waste-tech.ru

Contamination & Geotech Expo

13 - 14 Sep 2023
Birmingham, UK
www.ess-expo.co.uk/four-shows/clr

Taiwan International Water Week

Wed, 20 - Fri, 22 Sep 2023
Taipei, Taiwan
www.taiwanintlwaterweek.com

P3 Water + Energy Summit

21 - 22 Sep 2023
San Diego, USA
www.p3electrified.com/

Water Expo - Hyderabad

Thurs, 21 - Sat, 23 Sep 2023
Hyderabad, India
waterindia.net/

LANKAWATER

21 - 23 Sep 2023
Colombo, Sri Lanka
lankawater.org/

WCW Conference & Exhibition

Mon, 25 - Thu, 28 Sep 2023
Saskatoon, Canada
www.wcwwa.ca/page/AnnualConf

October 2023

Wetex

Mon, 02 - Wed, 04 Oct 2023
Dubai, UAE
www.watex.ae

AWT Convention and Exposition

Wed, 04 - Sat, 07 Oct 2023
Grand Rapids, USA
www.awt.org/events/annual-convention

Envitech

Tue, 10 - Fri, 13 Oct 2023
Brno, Czech Republic
<http://envitech.co.in>

VietWater

Wed, 11 - Fri, 13 Oct 2023
Ho Chi Minh, Vietnam
mwww.vietwater.com/en

Minnesota Water Resources Conference

17 - 18 Oct 2023
Saint Paul, USA
wrc.umn.edu/events/conference-2023

IFAT India

Wed, 18 - Fri, 20 Oct 2023
Mumbai, India
www.ifat-india.com

Pak Water & Energy Expo

Wed, 25 - Fri, 27 Oct 2023
Lahore, Pakistan
pakwaterexpo.com

Aqua Ukraine

17 - 19 Oct 2023
Kiev, Ukraine
10times.com/aqua-ukraine

Water In Industry

Tue, 31 Oct 2023
Moscow, Russia
www.aquatechtrade.com/news/industrial-water

November 2023

Water Loss Forum

01 - 03 Nov 2023
Lutfi Kirdar International Convention & Exhibition Center, Istanbul, Turkey
www.waterlossforum.org

Bangladesh Water Expo 2023

02-04 Nov 2023
Dhaka, Bangladesh
www.bangladeshwaterexpo.biz

Aquatech Amsterdam

06 - 09 Nov 2023
RAI, Amsterdam, Netherlands
www.aquatechtrade.com/amsterdam

The International Water Conference

12 - 16 Nov 2023
San Antonio Marriott Rivercenter, San Antonio, USA
iwconf.org

Smart City Expo - Dubai

14 - 15 Nov 2023
The Ritz-Carlton, Dubai, UAE
10times.com/smart-cities-nh

WETEX and Dubai Solar Show

15 - 17 Nov 2023
Dubai World Trade Centre, Dubai, UA
www.watex.ae

Myanwater

16 - 18 Nov 2023
Myanmar Expo, Yangon, Myanmar
myanwater.com

Sand Water Rv Expo

17 - 18 Nov 2023
Lake Havasu State Park, Lake Havasu, USA
sandandwaterexpo.com

Cairo Water Week

29 Oct - 02 Nov 2023
Cairo, Egypt
www.cairowaterweek.eg

East Africa Water Summit

29 Nov - 01 Dec 2023
Nairobi, Ikoo, Kenya
www.eawaters.com/

December 2023

East Africa Water Summit 2023

29 Nov - 01 Dec 2023
Nairobi, Ikoo, Kenya
www.eawaters.com/

Water Bangladesh International Expo

07 - 09 Dec 2023
International Convention City Bashundhara (ICCB), Dhaka, Bangladesh
www.water-exhibition.com

SRW India Water Expo 2023

20 - 22 Dec 2023
Chennai Trade Centre, Chennai, India
www.waterexpo.in

World Conference on Sustainability, Energy and Environment 2023

EVENT CALENDAR



08 - 09 Dec 2023

City Hotel Berlin Mitte, Berlin, Germany
www.steconf.org/conference/world-conference-on-sustainability-energy-and-environment/

Malaysian International Water Convention 2023

05 - 07 Dec 2023

Putra World Trade Centre, Kuala Lumpur, Malaysia
www.miwec.tech/home

GoGreen Summit 2023

29 - 30 Dec 2023

Bali, Indonesia
www.gogreen.bioleagues.com

January 2024

Water India Expo

17 - 19 Jan 2024

Pragati Maidan, New Delhi, India

Water & Wastewater Equipment, Treatment & Transport

24 - 27 Jan 2024

Indiana Convention Center, Indianapolis, USA
www.wwetshow.com/en/home.html

WWT Wastewater Conference and Exhibition

25 - 26 Jan 2024

The National Conference Centre, Solihull, UK
www.10times.com/wwt-wastewater

Nevada Water Resources Association

Annual Conference Week

9 Jan - 01 Feb 2024

Tuscany Suites & Casino, Las Vegas, USA
www.nvwra.org/2024-symposium

Local Water Management Crossroads

31 Jan - 01 Feb 2024

Parc Expo Rennes, Rennes, France
www.10times.com/carrefour-des-gestions-locales-de-leau

InterAqua

31 Jan - 02 Feb 2024

Tokyo Big Sight, Koto, Japan
www.interaqua.jp/eng/

Smart Energy India Expo

17 - 19 Jan 2024

Pragati Maidan, New Delhi, India
www.smartenergyindiaexpo.com

Utah Green Conference & Trade Show

22 - 24 Jan 2024

Mountain America Expo Center, Sandy, USA
www.10times.com/utah-green-trade-show

February 2024

Annual Water Expo

06 - 08 Feb 2024

Delta Hotels by Marriott Fargo, Fargo, USA
www.10times.com/water-system-expo-fargo

Mountain States Ground Water Expo

08 - 09 Feb 2024

Aquarius Casino Resort, Laughlin, USA
www.mountainstatesgroundwater.com

AquaFarm

14 - 15 Feb 2024

Pordenone Fiere, Pordenone, Italy
www.aquafarm.show/en/aquafarm-program

World Water Tech Innovation Summit

20 - 21 Feb 2024

Hilton London Bankside, London, UK
www.worldwatertechinnovation.com

E-World Energy & Water Exhibition

20 - 22 Feb 2024

MESSE ESSEN GmbH, Essen, Germany
www.e-world-essen.com/en

Pacific Water Conference

20 - 22 Feb 2024

Hawaii Convention Center, Honolulu, USA
www.hiawwa.org/2024-pacific-water-conference

UF Water Institute Symposium

20 - 21 Feb 2024

J. Wayne Reitz Union, Gainesville, USA
www.conference.ifas.ufl.edu/waterinstitute

WATER TODAY'S WATER EXPO

28 Feb - 01 Mar 2024 Chennai Trade Centre, Chennai, India

www.waterexpo.biz

Water Garden Expo

28 Feb - 01 Mar 2024

Grand Casino Hotel & Resort, Shawnee, USA
www.wgexpo.com

WAPTAG Water Expo

29 Feb - 02 Mar 2024 Mahatma Mandir

Exhibition Hall, Gandhinagar, India
www.waptag.org

March 2024

Roorkee Water Conclave

03 - 06 Mar 2024

Indian Institute of Technology Roorkee, Roorkee, India
www.iitr.ac.in/rwc

New England Water Well Expo

07 - 09 Mar 2024 Best Western Royal Plaza Hotel & Trade Center, Marlborough, USA
www.newwassociaation.org

WaterReuse Research Conference

10 - 13 Mar 2024

Hilton Denver City Center, Denver, USA
www.watereuse.org/event/2024-watereuse-symposium

Start by this : Water Policy Conference

18 - 20 Mar 2024

Washington Hilton, Washington DC, USA
www.10times.com/e1zk-rr53-h02x

Rural Water Conference

18 - 21 Mar 2024

Penn Stater Conference Center Hotel, State College, USA
www.prwa.com/annual-conference

Aqua Netherlands

19 - 21 Mar 2024

Evenementenhal Gorinchem, Gorinchem, Netherlands
www.aquanederland.nl/en/

KRWA Conference & Exhibition

26 - 28 Mar 2024 Century II Performing Arts &

Convention Center, Wichita, USA
www.krwa.net/TRAINING/Conference

April 2024

Florida Water Resource Conference

02 - 05 Apr 2024

Gaylord Palms Resort & Convention Center, Kissimmee, USA
<https://www.fwrc.org/>

Texas Water

09 - 12 Apr 2024

Fort Worth Convention Center, Fort Worth, USA
www.txwater.org

AZ Water Conference & Exhibition

10 - 12 Apr 2024 Phoenix Convention Center, Phoenix, USA

www.azwater.org/group/annualconference

Water Expo & Forum

16 - 18 Apr 2024 Abu Dhabi National Exhibition

Centre - ADNEC, Abu Dhabi, UAE
www.worldfutureenergysummit.com/en-gb/water.html#/

IE Expo China

18 - 20 Apr 2024 Shanghai New International

Expo Centre (SNIEC), Shanghai, China
www.ie-expo.com

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All Ireland Water &
Wastewater Expo



The All-Ireland Water & Wastewater Expo is where municipal, industrial, and domestic water & wastewater experts unite. We tackle the sector's critical challenges.

€6 billion for water infrastructure! By 2026, thanks to the National Development Plan, we're going world-class. New facilities, upgraded plants, and more!

Our investment spans projects and national programs. We're fixing networks, reducing leaks, and ensuring efficient delivery nationwide.

Industries like pharma, food, electronics, and more demand top-notch water quality. They're stepping up to meet EU standards, driven by ESG & Sustainability concerns. Big things are happening in water efficiency and waste to energy programs.

Date: 23 November 2023

Venue: The Leopardstown Pavilion, Leopardstown Racecourse, Ireland

Website: www.waterengineering.ie



AMSTERDAM
INTERNATIONAL
WATER WEEK



Amsterdam International Water Week unites water leaders from around the world, bridging the gap between the challenges we face today and the needs of the future.

We view water as a catalyst for accelerating resilient and sustainable development.

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The two-day AIWW Conference is your inspirational and networking hub for water sector experts and enthusiasts alike.

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Date - 6 - 9 November 2023

Venue- RAI Amsterdam

Website - www.aiww2023.com

BAYWATCH



19th EVERYTHING ABOUT
WATER EXPO
SOUTH ASIA'S LARGEST WATER
EXHIBITION AND CONFERENCE **2024**

10-12 | **IICC**
SEPTEMBER 2024 | New Delhi, India

The 19th EverythingAboutWater Expo 2024 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 2025. 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 19th EverythingAboutWater Expo 2024, 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: 10 - 12 September 2024

Venue: IICC, New Delhi

Website: [//www.eawaterexpo.com](http://www.eawaterexpo.com)

Where the Water Community Comes Together

معرض دبي للطاقة الشمسية 2023
WETEX 2023 DUBAI SOLAR SHOW

WETEX and Dubai Solar Show organised by Dubai Electricity and Water Authority (DEWA), are in line with Dubai's vision to build a sustainable future for the Emirate and is held annually under the directive of HH Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE, Ruler of Dubai and under the patronage of HH Sheikh Ahmed bin Saeed Al Maktoum, Chairman of the Dubai Supreme Council of Energy.

The exhibition provides a leading platform for international organisations to present their latest solutions and products, and to learn about innovative technologies from all over the world in the sectors of energy, water, sustainability, green technologies, renewable and clean energy, green mobility solutions, sustainable development, green buildings, water desalination technologies, smart cities and others. Through specialised seminars and panel discussions held on its sidelines, it also provides opportunities to exchange ideas with several international experts and specialists.



Date: 15-17 November 2023

Venue: Dubai World Trade Centre (DWTC)

Website: www.wetex.ae/en

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119	EverythingAboutWater Magazine	45	+91 85889 11033	enquiry@eawater.com	www.eawater.com
120	India Water Intelligency	53	+91 85889 11033	enquiry@eawater.com	www.eawater.com
121	India Water Show	31	+91 93632 35370	info@indiawatershow.com	www.indiawatershow.com
122	Malaysia International Water Week	15	+603 6140 6666	info@protempgroup.com	www.miwec.tech
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See you there!

Where the
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