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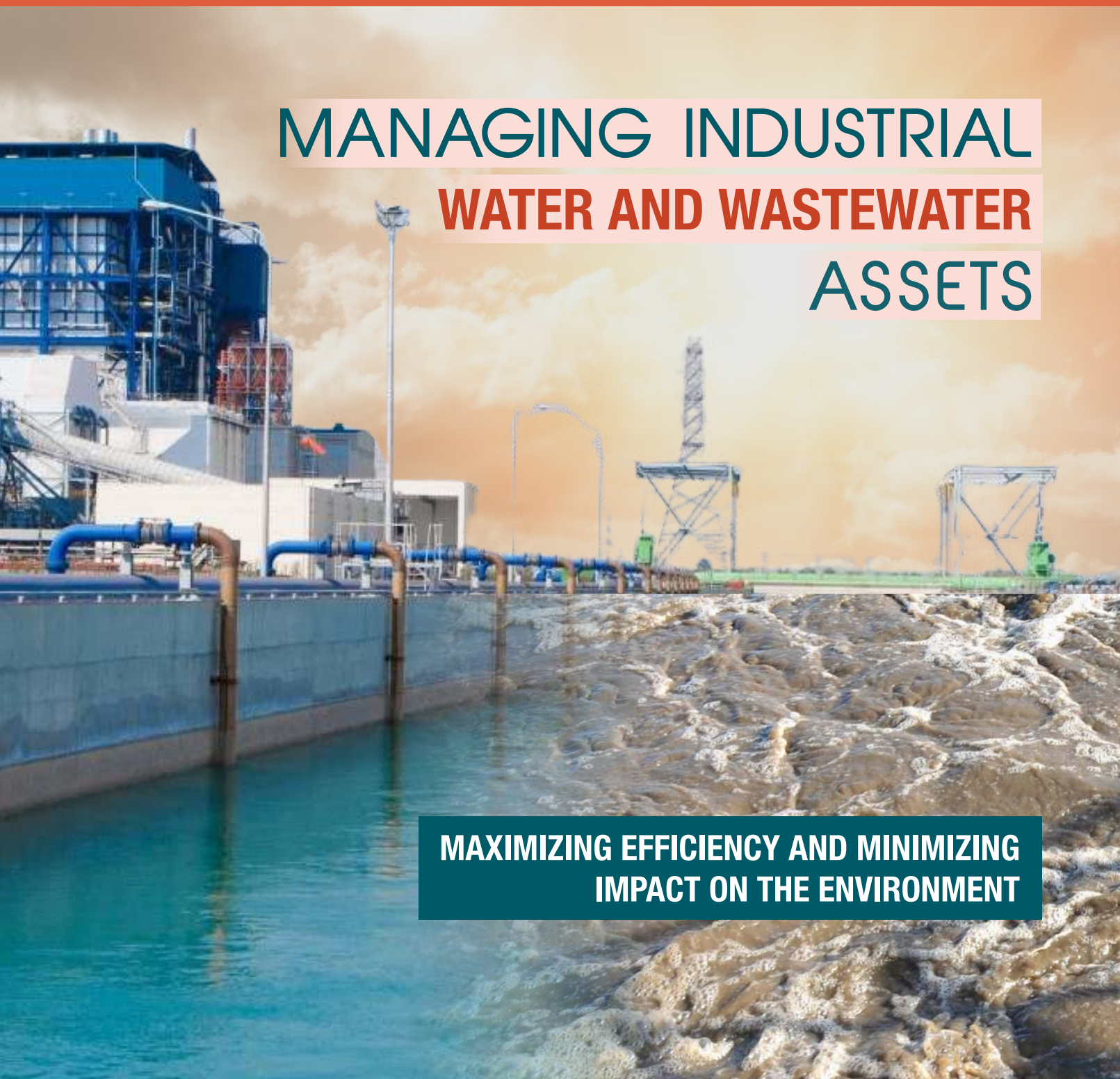
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APRIL 2024	ADVANCEMENTS IN WATER FILTRATION TECHNOLOGY
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HARMONY IN INDUSTRY: NAVIGATING EFFICIENT WATER AND WASTEWATER MANAGEMENT

Dear Valued Readers,

In this edition of EverythingAboutWater Magazine, we embark on an insightful journey into the theme of "Managing Industrial Water and Wastewater Assets." As industries continue to grow, the imperative to ensure efficient and sustainable management of water resources becomes increasingly vital.

Within these pages, we shed light on the intricate balance required for industries to thrive while maintaining a responsible approach towards water and wastewater assets. From cutting-edge technologies in industrial water treatment to innovative approaches for wastewater disposal, we delve into strategies that promise a harmonious coexistence of industrial growth and environmental stewardship.

This issue serves as a comprehensive guide, offering valuable insights to industry leaders, environmentalists, and policymakers alike. As you navigate through the impactful articles, envision a future where industrial progress seamlessly integrates with responsible water and wastewater management practices, ensuring a sustainable and water-secure world.

In conclusion, I extend my heartfelt gratitude for joining us on this exploration into "Managing Industrial Water and Wastewater Assets." May the distilled wisdom within these pages inspire transformative actions in your respective fields, fostering a future where industries play a pivotal role in safeguarding our precious water resources.

Thanks & Regards,

Simran Arora

Editorial Incharge

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NATIONAL W

DROPLETS

New Wave of Startups Scale Innovation to Solve Global Water Challenges

A new group of startups is tackling the world's growing water problems with novel technologies and new approaches to address water shortages, emerging contaminants like PFAS and other "forever chemicals," and the impacts of climate change.

Twelve startups were selected for the 2024 cohort of the Xylem Partnerships Accelerator run by Xylem Innovation Labs. Innovations from the 2024 cohort include advanced pathogen detection, novel leak detection materials, and artificial intelligence that can predict flooding, inspect pipelines, and simplify regulatory compliance reporting. Participants will gather this March for an Accelerator Symposium bringing together Xylem colleagues, customers, and the water innovation ecosystem.

Launched in 2022, the Accelerator was created to expedite the introduction of innovative technologies to address the toughest challenges faced by water utilities, industrial water users, and communities around the world.

Since its inception, the program has supported 35 companies from 13 countries, including EOMAP, a Germany-based software company that uses satellite data to give customers a holistic picture of water quality across entire watersheds. EOMAP's technology layered with Xylem sensor technology uses past, present, and predicted data to monitor critical water bodies ranging from protected coastal and inland environments to reservoirs. EOMAP is now partnering with Xylem to support customers ranging from oceanic research institutes and environmental protection agencies to national water authorities in the United States, Europe, the Middle East, and Australia.

"Being part of the Xylem Partnerships Accelerator was a transformative experience," said Dr. Thomas Heege, CEO at EOMAP. "It provided us with invaluable mentorship and opened up countless partnership opportunities. The power of our space-assisted solutions combined with Xylem's industry leading analytical instrumentation advances how we partner with clients to monitor and improve their approach to understanding aquatic systems."

The Accelerator addresses pain points of technology adoption in the water industry by collaborating with stakeholders across the innovation journey. Under the program, Xylem works with universities, startups, and technology companies to refine, optimize, and scale solutions through mentorship, interactive workshops, and commercial demonstrations.

"The purpose of the Accelerator is to solve our customers' water challenges with innovative solutions that Xylem is uniquely positioned to help bring to market," Sivan Zamir, Vice President, Xylem Innovation Labs, said. "By combining the creativity and agility of emerging tech startups with Xylem's extensive reach and expertise, the program is creating a dynamic ecosystem where effective, sustainable water solutions can flourish."



Four new water treatment plants to be ready by December

To augment drinking water supply, the state of Panaji is in the process of constructing new water treatment plants of which four will be completed and are expected to be made operational by this Dec. These include the 25MLD plant at Ganjem, 15MLD plant at Chandel, 30MLD plant at Tuem, and 10MLD plant at Pale. "Work on the Pale plant is almost complete, the Ganjem plant is 91% complete, and the Chandel plant is expected to be ready this May. The Tuem plant is likely to be completed by Dec 2024," said an official. At present, the drinking water requirement in the whole of Pernem taluka is being catered to by only one 15MLD treatment plant at Chandel. Once the new plant is ready, this will increase the capacity for treatment at Chandel to 30MLD. This along with the 30MLD Tuem plant will enhance Pernem taluka's water treatment capacity from 15MLD to 60MLD. A barrage is being constructed at Sal in Bicholim across the Chapora river, from where raw water and supply from the Tillari will be provided to these new plants in Pernem for treatment. This will also help meet the water requirements of the Mopa airport. Besides the plants, works for improvement of water supply in the St Andre and Cumbharjua constituencies are also under way and nearing completion. Goa is staring at 38% non-revenue water, or loss of water from the supply chain due to old pipelines. The state has been vying for central govt assistance in replacing the entire water supply pipeline network with a new one. Over Rs 300 crore will be needed to complete the task. Goa was the first state in the country to be declared to have achieved 100% water supply connections to households under the Har Ghar Jal mission. Despite this, it faces a shortage of around 65MLD of treated water.

Laying of pipelines for Edakochi STP to begin shortly

The laying of pipelines for the ₹18.6-crore sewage treatment plant (STP) for the Edakochi South Division of the Kochi Corporation will begin shortly. The project had been hanging fire for the last two years after widespread public protest. Even though the Corporation had launched the project in 2021, it was greeted with stiff public resistance. The agitators had demanded that the plant should not be installed in the region. It was the second STP project in West Kochi that was stalled following public protest.

ATER NEWS



Earlier, a ₹166-crore plant, which was proposed to cater to Divisions 1 to 5 of the Corporation, had to be dropped. Cochin Smart Mission Limited (CSML) had proposed the mega plant with an installed capacity of 6.5-million-litre-per-day on a 45-cent holding near the Kalvathy canal. However, concerted efforts and negotiations led by the Mayor and other civic authorities helped in creating an atmosphere conducive to the establishment of the plant in Edakochi South, said those associated with the project. The project will see a 20-km-long network of pipelines being developed to bring wastewater and overflow from septic tanks of households to the plant site. Pipes required for covering half the length of the network have been supplied. The plant will process 11 lakh litres of wastewater a day, officials said. Around 150 manholes have been cast for the project, which will be connected to the network of pipes. Civil works for the treatment plant have been completed. Funds from the Atal Mission for Rejuvenation and Urban Transformation (Amrut) scheme will be used for the project. The authorities have so far utilised around ₹2 crore for the project.

Haryana Government Approves Rs. 118 Crores for Water Treatment Plant in Kharkhoda

A Water Treatment Plant (WTP) with a capacity of 57 million liters per day (MLD) will be established in the Industrial Model Township, Kharkhoda located in Sonipat district of Haryana. In a meeting of the High Power Workers Purchase Committee (HPWPC) held under the chairmanship of Chief Minister Manohar Lal Khattar, about Rs. 118 crores was approved for the design, construction, and commissioning of this project. In addition, contracts and purchases of various items worth about Rs. 774 crores were approved during the meetings of the High Powered Purchase Committee (HPPC), Departmental High Powered Purchase Committee (DHPPC), and HPWPC. Approximately Rs. 30 crores was saved through rate negotiations with various bidders during the meeting. Urban Local Bodies Minister Dr. Kamal Gupta, Minister of State for Women and Child Development, Kamlesh Dhanda, and Minister of State for Labour, Anup Dhanak were also present at the meeting. A total of 32 agenda items were presented during the meeting, out of which 29 were approved. During the meeting, the agenda for the construction of a Government Women's College in Jatusana, Rewari district, was approved, with an estimated cost of approximately Rs. 13 crores. Additionally, approval was granted for the construction of a Government Women's College in Chammu Kalan, Kurukshetra district, at a cost of about Rs. 14 crores. Furthermore, to enhance educational infrastructure, approval was also given for the construction of govt colleges in Bond Kalan, Charkhi Dadri, and Dujana, Jhajjar. Both of these projects will be undertaken at an approximate cost of Rs. 28 crores.

DROPLETS

Danfoss Drives Pioneering Innovation in IRCON's Jammu-Baramulla Railway Project

Danfoss, a global leader in engineering solutions, has played an integral role in the monumental Jammu-Baramulla railway line project, marking a significant stride in enhancing critical infrastructure within India. With its expertise in Variable Frequency Drives (VFDs), Danfoss has been instrumental in ensuring efficient and reliable operation, particularly within the challenging high-altitude tunnels of the Jammu-Baramulla railway line, which spans an impressive 338 kilometers and connects the Kashmir Valley with the rest of India. The successful collaboration with the Jammu-Baramulla railway project has further underscores Danfoss's commitment to driving progress and innovation in critical infrastructure projects. The tailored solutions provided by Danfoss have addressed the unique challenges of the railway line, earning the trust and recognition of both consultants and end customers, and reinforcing its position as a preferred partner for infrastructure development initiatives. Addressing the distinctive challenges presented by the construction of India's longest railway tunnel, spanning 12.76 kilometers, Danfoss deployed a comprehensive solution comprising Variable Frequency Drives (VFDs) and specialized LR filters. The VFDs, including FC102 and NXP series, regulated the speed and direction of fans crucial for maintaining optimal ventilation and ensuring passenger safety within the tunnels. Additionally, the integration of 36 LR filters into the ventilation system has significantly enhanced operational reliability, particularly over long cable lengths, mitigating potential risks. Mr. Ravichandran Purushothaman, President, Danfoss India, highlighted, "Our collaboration with the Jammu-Baramulla railway line project exemplifies Danfoss's dedication to pioneering advanced solutions for challenging environments. The successful deployment of VFDs and LR filters underscores our commitment to ensuring the highest standards of safety, efficiency, and reliability within critical projects. We are proud to have played a crucial role in this landmark initiative and look forward to continuing to drive innovation in India's critical infrastructure development." The Jammu-Baramulla railway line was recently flagged off by the Prime Minister, Mr. Narendra Modi. The impact of Danfoss's innovative solutions will be felt across the 338-kilometer stretch, showcasing the company's unwavering dedication to powering critical infrastructure and enhancing connectivity across India. With a total project value of 39.8 million INR, Danfoss's contributions to the Jammu-Baramulla railway line project have not only fortified the success of the endeavor but also solidified the company's position as a trusted partner in driving progress in India's infrastructure landscape. A total of 90 Danfoss FC102 and NXP series Variable Frequency Drives (VFDs), along with specialized LR filters, were used for the TE049, the longest rail tunnel stretching 12.8 kilometers. Additionally, for the whole project, 384 drives from the FC102, NXP, and FC101 series were installed. Moreover, 181 LR filters were set up to address the challenges posed by long cable lengths. Danfoss' advanced solutions demonstrate their dedication to overcoming the distinctive challenges of critical infrastructure projects, serving as a benchmark for future initiatives within India's railway and transportation networks.

Hospitality Sector Becomes Prudent with Water Usage

From serving water in smaller glasses to reducing cutlery items in buffets, hotels and restaurants across Bengaluru are doing their bit to conserve water, amidst the ongoing crisis in the city. While most establishments have their own borewells and other water resources, the ones who are dependent on water tankers are facing the brunt. "Our establishment has set up a rainwater recycling system with a capacity to store 100 litres of rainwater. This initiative allows us to harness natural precipitation for various non-potable purposes within the hotel premises, thereby reducing our reliance on municipal water sources," said Irfan Khatry, Cluster General Manager – Ibis Hotel Bengaluru. While the tanker supply has not been entirely affected, there is a difference between when the hoteliers would want the tanker to reach them and when it is actually reaching them. "We have to book tankers one day prior and the rates have skyrocketed," said P.C. Rao, President, Bruhat Bengaluru Hoteliers' Association. Hotels and restaurants are aiming to conserve at least 20% water through these new conservation measures. "Buffets at star hotels require at least 15–20 cutlery items, we have asked them to reduce it. More than 60% of hotels in the city are placing empty glasses and full jugs on tables (instead of water filled glasses) so that customers can consume only as much water as they require and there will be no wastage. We will continue these measures for at least 60–90 days," Mr. Rao said. Utilising RO wastewater for washing utensils and cleaning washrooms, aerators for water taps and posters to educate consumers about water conservation are some of the measures taken up by restaurants. "Our taps have motion sensors and we have reduced the flow of water to what is sufficient, instead of letting it gush out. We are also serving drinking water in smaller glasses so that consumers can fill it up as and when they want.

This will go a long way in saving water," said Mukesh Tolani, owner of Toit Brewpub. Hotels which provide accommodation have also resorted to novel methods for water conservation. Some hotels are providing tag on the bed where patrons can indicate if their towels or linens have not been used, so that they do not have to be washed unnecessarily.

Luxury hotels, which also house spas, are also being prudent with the water usage in their spas. Eco-friendly and biodegradable spa products are placed at the spa as they help minimise water usage and environmental impact. We have also installed water-efficient equipment such as low-flow showers, faucets, and hydrotherapy tubs to minimise water usage, during spa treatments," said Natchimuthu Subbaraj, Director of Engineering, Conrad Bengaluru.



Ministry of Jal Shakti Signs Agreement with Indian Institute of Science, Bangalore for Establishment of International Centre of Excellence for Dams (ICED)

rehabilitation materials and comprehensive risk assessment in particular. In addition, ICED will have a Centre Development Fund. A part of the consultancy charges, short term training programs and any other revenue earning activity will be contributed to this fund. It is a holistic effort of the Government of India to equip our national institutions of eminence to develop capability and expertise at par with global institutions in the times to come. The setting of this Centre will empower 'Make in India' in dam safety by undertaking advanced research and developing technologies and application products; fast-track innovations to provide most appropriate solutions to various challenges in the dam safety for the agreed working areas; and create a pool of competent manpower for dam owning agencies and industry equipped with state of the art theoretical and practical knowhow. ICED, IISc Bangalore is the second International Centre in the area of Dam Safety. The first ICED has been institutionalized at IIT Roorkee upon signing of MoA in FEBRUARY 2023.





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Bengaluru Water Crisis: Plush Society asks residents to use disposable cutlery and wet wipes

Facing their worst potable water crisis, resident welfare associations across the city have begun rationing water in their localities and have issued a blanket ban on vehicle washing by residents and swimming pool activities with immediate effect. Going further, a prominent residential enclave in south Bengaluru has proposed to its residents to think of using disposable cutlery and wet wipes for washing hands and face. Days after communicating to its residents about the disruption of water supply following the crackdown on water tankers by RTO and BWSSB officials, Prestige Falcon City (PFC) Apartments on Kanakapura Road has suggested that if the situation worsens, they should consider using disposable items to avoid water wastage. Vasanth Kumar, president of the PFC RWA, told TOI that the idea is to reduce the usage of water as much as they can. "We used to source water through private tankers. But as there is scarcity even in tanker services, we're looking for alter-natives. We're aware that there is not enough water at the reservoir (KRS) and we must understand the scenario. I've only suggested using disposable plates, cutlery, wet wipes as this will reduce the usage of water and help us sail through the situation," he said. "Our tenants and residents are coming to terms with the situation, we're only mentally preparing for them in case the situation turns worse. Our MP DK Suresh has assured us that the scarcity will be resolved soon. We're eagerly looking forward to it. Nevertheless, the current situation is not alarming as the availability and supply is under control because of our water saving initiatives." Similarly, yet another RWA of a prominent gated community in Whitefield has deployed security personnel to monitor the misuse of water by its residents. With no supply of water from BWSSB over the past few days, the RWA is reliant on borewells and they could go dry at any moment. "If the residents don't reduce their water consumption by 20%, such households will be charged an additional Rs. 5000," the RWA is said to have informed residents in its internal message.

Swachhata Green Leaf Rating Initiative All Set to Revolutionise India's Burgeoning Tourism Industry & Promote Sustainable Tourism with World-class Hygiene & Sanitation Facilities for Tourists



In a major move to revolutionise sanitation practices in India's burgeoning tourism industry, the Department of Drinking Water & Sanitation (DDWS), Ministry of Jal Shakti, in collaboration with the Ministry of Tourism, has introduced the Swachhata Green Leaf Rating (SGLR) initiative. This visionary program aligns with Prime Minister Shri Narendra Modi's emphasis on providing world-class hygiene and sanitation facilities for tourists, marking a crucial step towards cleaner and more sustainable tourism practices. The Union Minister for Jal Shakti, Shri Gajendra Singh Shekhawat exhorted all tourist facilities to enhance aesthetic and sanitation levels at tourist destinations. He said "As ambassadors of our country's hospitality & development, all our tourist facilities should actively involve themselves in enhancing the aesthetic & sanitation levels of our tourist spots". Shri Shekhawat further added, "With its investment in the desired direction of responsible sanitation, the hospitality sector will be able to attract increased tourist footfall, while simultaneously achieving brand value for itself." Bison Resorts, Madhai, in the heart of Narmadapuram, Madhya Pradesh has taken the lead by obtaining the first Five Swachhata Green Leaf Rating Certificate of Recognition. This accolade solidifies the resort's commitment to responsible tourism practices and sets a commendable precedent for the industry. Union Minister, Shri Gajendra Singh Shekhawat, acknowledging this milestone achievement on 'X' (formerly Twitter), commended Bison Resorts for their dedication to raising sanitation standards. The Union Minister for Jal Shakti recognised the pivotal role the hospitality sector plays in attracting increased tourist footfalls while contributing to a positive image of responsible tourism. He said "As ambassadors of our country's hospitality and development, Bison Resorts exemplifies the spirit of responsible tourism. The Swachhata Green Leaf Rating is not just a recognition but a commitment to shaping the future of our tourism industry."



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The Secretary, Department of Drinking Water & Sanitation, Ms. Vini Mahajan said, "This recognition of Bison Resorts serves as a clarion call for other tourist facilities across all states/UTs to actively involve themselves in enhancing the aesthetic and sanitation levels of tourist spots. With the current progress trend of Swachh Bharat Mission and the SGLR, we have a potential to redefine the image of the tourism sector, positioning it as a global ambassador for cleanliness and responsible tourism." The launch of the "National Pilot on Swachhata Green Leaf Rating in Hospitality Facilities" was initiated at Pahalgam district Anantnag, Jammu & Kashmir and Kaziranga National Park, Assam. Orientation and interactive session with various hotels, resorts and homestay owners was conducted. The SGLR booklet, unveiled during a National Conference in Lucknow in January, 2024, acts as a guide for establishments committed to championing sustainable development and ensuring world-class sanitation standards.

The SGLR initiative seamlessly aligns with the Travel For LiFE (TFL) program under Mission LiFE, fostering awareness about sustainable tourism. By nudging both tourists and businesses to adopt practices harmonious with nature, the SGLR program aims to develop an economically viable, responsible, and resilient tourism industry.



Welspun secures Rs 4,123 crore order from BMC for water treatment plant

Welspun Enterprises Ltd.(WEL) on Friday announced that it has secured an order to design, build and operate a 2,000 million litres per day water treatment plant at Bhandup Complex in Mumbai from the Brihanmumbai Municipal Corporation (BMC). WEL is the infrastructure and energy arm of Welspun World. The contract, valued at Rs 4,123.88 crore, includes the design, construction, and operations and maintenance of the plant. It consists of an operations and maintenance (O&M) component of Rs 1,880.44 crore. The design and build of the project is expected to be completed within 48 months. After that, the company will undertake O&M responsibilities for 15 years. BK Goenka, chairman, Welspun World, said, "The Bhandup WTP project marks a significant milestone in Welspun Enterprises' growth journey." The water treatment plant will be located at BMC's Bhandup Complex, which currently supplies drinking water to Mumbai City through existing Water Treatment Plants.

In the announcement, WEL said that it has partnered with France-based Veolia as its technology provider. "WEL aims to leverage advanced treatment processes and technologies, in line with its commitment to maximising resource utilisation and developing sustainable infrastructure solutions," it said.

WEL is also currently executing some projects, including the Rural Water Supply Project under Centre's Jal Jeevan Mission in Uttar Pradesh, covering around 2,500 villages. It is also executing the 418 MLD Waste Water Treatment Facility (WWTF) project at Dharavi, Mumbai. In August 2023, WEL acquired Michigan Engineers (now renamed to Welspun Michigan Engineers Limited) to expand in the urban water infrastructure and tunnelling solutions segment.

Sandeep Garg, managing director at Welspun Enterprises Limited, said, "The water sector continues to be one of the key focus areas for us and this order synergises well with our overall growth strategy."

"Our team is fully committed to ensuring the highest standards of quality and efficiency in delivering this project, reflecting our unwavering dedication to excellence," he added.

CM Issues Orders to Set Up Expert Panel for Providing Clean Water to Ichalkaranji

Chief Minister Eknath Shinde on Friday issued directions to set up an expert panel to suggest measures for providing clean, regular and adequate water to the textile town of Ichalkaranji, residents of which have complained of health risks because of the polluted water received from the Panchaganga river. The residents, activists and leaders of Ichalkaranji have been demanding water from the Dudhganga river flowing through Kagal tehsil.

The Sulkud water supply scheme has already been approved by the state govt. Farmers from Kagal tehsil are, however, opposing the project, saying that they face water scarcity because of leakages in the upstream dam. "The clean water supply to the residents of Ichalkaranji is the need of the hour. I will ensure this and also make sure that nobody faces any scarcity. There is a need to find a middle path. Therefore, I have issued orders to the Kolhapur district collector to appoint a panel of experts, including activists and leaders from both sides, and officials of various govt. agencies. The committee will file a detailed report on measures enabling clean and regular water supply to Ichalkaranji residents. The report must be filed within a month, after which the final decision will be taken," the Chief Minister said. Political observers said the CM's order was aimed at thawing tension on both the sides, ahead of the Lok Sabha elections.

The meeting took place in Mumbai. Tensions rose after district Guardian Minister Hasan Mushrif took a strong stand against the Sulkud water supply scheme. Activists from Ichalkaranji have repeatedly threatened to show black flags to Mushrif and even to CM Shinde, who was earlier scheduled to visit Ichalkaranji on March 3, over the issue. Ichalkaranji comes under the Hatkanangle Lok Sabha constituency and Kagal in Kolhapur constituency. CM Shinde-led Sena is expecting to contest in both these seats and the issue could pose a huge hurdle in winning these two if left unresolved, according to topolitical observers.



62 Sewage Treatment Plants to combat pollution in River Yamuna and Gurugram Canal

The industrial effluent from stand-alone industries is being treated by these industries themselves. The monitoring of these industries are being done by HSPCB and action is being taken against defaulters. The pollution level in terms of yearly average value Bio-chemical Oxygen Demand (BOD) has come down from 32 Mili gram/litre in 2018 to 23 Mili gram/litre in 2023. He said that Haryana State Pollution Control Board is conducting Water sampling of Gurugram Canal on regular basis. The water in Gurgaon Canal is contaminated mainly due to polluted water received in river Yamuna from the states of Delhi, Haryana and UP. He said that Haryana State Pollution Control Board is regularly monitoring the industries in the catchment of river Yamuna and action is being taken against the violating industries. The HSPCB has levied Environment Compensation of approximately Rs. 80 Crore on 122 industries/units during the financial year 2023-24. A total 89 units have been closed and 30 prosecution cases have been filed.

Rajkot Civic Body's Nod to Set Up Treatment Plant to Reuse 90 MLD of Wastewater

To promote the use of wastewater and generate revenue out of it, the Rajkot Municipal Corporation (RMC) has initiated the process for setting up a tertiary treatment plant (TTP) on public private partnership (PPP) basis and then sell the recycled water. At its meeting on Wednesday, the RMC standing committee green-flagged a proposal to engage a consultant for a proposed TTP of 90 million litres per day



(MLD) capacity. The committee approved the proposal of hiring Bluestream Infrastructure Development Consultant Private Limited, a Pune-based firm. The consultant will prepare a pre-feasibility report, a detailed project report with cost estimates, technical and commercial specifications and bid documents for floating tenders and help identify the private player in the project, the proposal said.

Municipal Commissioner Anand Patel said the city needs to reuse its wastewater. "Sources of water in Rajkot are limited and therefore, reusing wastewater is the way forward. At the same time, seven existing STPs (Sewage Treatment Plants) are discharging water into the Aji-II dam after primary treatment and the irrigation department is supplying it to farmers for irrigation. We want to reuse this water by giving it tertiary treatment and create a revenue stream for the RMC," Patel stated. The RMC has two STPs in Madhapar, having cumulative capacity of 124.5 MLD, two in Raiyadhar (107 MLD), two in Kothariya (30 MLD) and one in Gavaridad village of 70 MLD capacity. The RMC is in the process of testing and commissioning its 8 MLD TTP in Raiya to cater to Raiya Smart City. This TTP will discharge water into the Atal Sarovar to maintain the water level in the reservoir as well as making water available for gardening purposes, Patel said.

"At present, we are selling some wastewater treated by STPs to farmers at token rates. But we want that industries and other sectors use wastewater treated by the proposed TTP. Water treated by TTP will be odourless and fit for many uses," he added. Kishor Dethariya, city engineer of RMC's drainage (projects) department, said that the civic body's sewage collection network collects an average of 260 LMD and almost all of it is discharged into the Aji-II dam after being treated by the seven STPs. "Our Gavaridad and Madhapar STPs are supplying water to farmers to irrigate around 40 hectares of land. The token amount that farmers pay generates around Rs 3.5 lakh revenue for RMC annually. Two new STPs are being set up in Ghanteshwar (75 MLD) and Raiyadhar (23 MLD)," he added.

Dethariya said that Surat, Vadodara and Ahmedabad have already commercialised wastewater treated by TTPs. "As part of the proposed project, RMC will provide land for TTP and supply wastewater treated by our STPs. The private agency will have to make the capital investment as well as take the responsibility of operating and maintaining the TTP," he added.

Urgency Meets Innovation: Tech's Role in Resolving Water Crisis

As you leaf through today's newspaper, the resounding message is crystal clear: we're facing a dire water crisis, and the urgency to address it is palpable as time ticks away.

India grew from merely 51 million tons (Mt) of food grain production in 1950/51 to over 314 Mt in 2022- a sixfold increase in production. What led to this remarkable outcome was the shift to science-led agricultural development, planner's vigour and the dedicated effort of millions of farmers. This transformed India from an acutely food-scarce and food shortage nation to a food surplus and food-exporting country.

However, these accomplishments came at a price-trading in water security, a resource even more essential for the survival of 1.3 billion people.

India has the highest demand for freshwater usage globally and extracts more groundwater each year than the US and China combined. 91% of this freshwater is used in the agricultural sector now, with groundwater contributing 62% of all irrigation water. Mismanagement, over-extraction, and inefficient irrigation practices have led to water scarcity in many regions. Moreover, climate change, growing population, and dependence on rain for replenishing these water reserves are not helping the case.

The issue operates in a dual manner: Inefficient agricultural practices contribute to water wastage, exacerbating water scarcity. Consequently, this scarcity threatens the future of agriculture, ultimately jeopardizing the livelihoods of 58% of the nation's population that is currently dependent on it. This underscores the need for responsible water management.

But before this, we need to understand the science of agriculture:

Agriculture centers on the cultivation of soil, farming practices, and the nurturing of crops through irrigation. 'Irrigation' means supplying water to land to make it ready for agriculture.

Few crops require less amount of water for irrigation and few crops like rice, wheat, cotton, etc. require huge amounts of water for growth and are thus considered water-intensive crops.

Rice, wheat, cotton, and sugarcane represent 90 percent of India's domestic production and take up more than half of India's cultivable land. One of the key reasons for their higher production could be the most effective Minimum Support Prices (MSPs) support for these crops given by the government, leading to a disproportionate incentive structure favoring water-intensive crops.

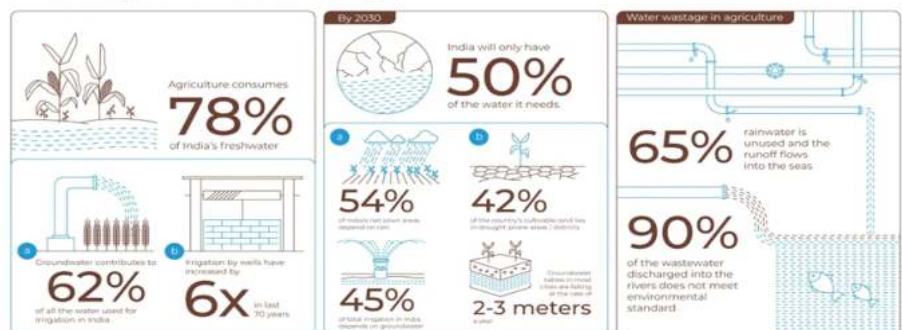
An in-depth analysis of crop distribution across states highlights how suboptimal planting patterns exacerbate water stress. In Punjab, 117 out of a total 153 blocks are observed to have over-exploited groundwater- still the main cropping pattern is rice & wheat.

Despite the significant water demand and shortage, Maharashtra contributes 22 percent of the nation's total sugarcane output.

A classic example is the Marathwada district in Maharashtra, where water scarcity has intensified due to three consecutive poor monsoons. The farming patterns in the semi-arid region have changed in the past few decades. Many farmers in the area have shifted from drought-resistant crops such as jowar (sorghum) and chana (chickpea) to water-intensive crops like sugarcane, lured by government incentives. Marathwada gets about 844 mm of average rain annually, whereas sugarcane ideally needs 2,100-2,500 mm. Traditional crops like moong and maize require 3.5-7 million liters of water per hectare, while sugarcane demands a significantly higher amount at 25 million liters per hectare. But sugarcane farming continues despite the drought and the area under sugarcane cultivation has gone up from 167,000 hectares in 1970-71 to 219,400 ha in 2014-15.

Thus, growing a water-intensive crop in already water-stressed areas is a recipe for water famine.

Why water is key



THERE ARE TWO PERSPECTIVES TO CONSIDER WHEN EXAMINING THE SOLUTION:

- Government policy and interventions need to shift to reset the revenue balance in favor of other less water-intensive crops. Currently, the government asks farmers to shift to less water-consuming crops, but it does little to support such a change. Fluctuating prices for vegetables, oilseeds, and pulses diminish the motivation for farmers to cultivate these crops.
- Technology & innovation to reduce water usage and wastage in water-intensive crops; and the ecosystem that is required to enable such innovation.

The nation has recognized that producing more from less is the key option to ensure sustainable development. Emerging technologies offer the ability to monitor, adjust, and promote more efficient use of water resources in agriculture. Further, these technologies should consider affordability by small-holder farmers since they make up 86% of India's farming households.

A perfect example of this is the Drip Pool Programme. This programme which was started in Gujarat, enables cotton farmers in India to use micro irrigation technology (drip irrigation) via community funding to provide interest-free loans to such farmers for adopting the technology. Programme farmers have reported using just 1,191 liters of water per kilogram of cotton, compared to the 5,923 liters consumed by non-programme farmers. They have also reported benefits such as uniformity in production, better yield of seed cotton and increased fertilizer cost efficiency as well as reduced weeding and lower labour costs.

HOWEVER, SPARKING NEW INNOVATIONS REQUIRES A VILLAGE.

Just as water is required for nurturing soil and seeds, so too are the enablers and ecosystem vital for propelling the technological revolution. There are four major facilitators of technology seeding:

- **Landscape of Research & Development-** Research and development within an industry, and learning by doing, can lead to technological change. The maturity of R&D centers and their collaborative synergy play crucial roles in this process.
- **Spillover from other industries** - Drawing knowledge and expertise from related/ similar industries, along with the ability to integrate platforms from diverse use cases nationwide, fosters a culture of hypothesis testing and prioritization for commercial viability.
- **Information Technology Infrastructure-** The effectiveness of existing technology infrastructure in swiftly and efficiently transferring data and decisions has accelerated the pace of technological shifts significantly.
- **Globalization-** The increasing interconnectedness of the global economy and access to markets beyond local boundaries have transformed technology into a lever for scalability, thereby fostering innovation on a large scale.

Israel serves as an exemplary case of collaboration, transitioning from predominantly arid land to a global agricultural powerhouse.

The key to this success lies at the combined role of government, market-orientation and an innovative system focused on problem-solving. Its robust innovation ecosystem addresses challenges across the value chain for farmers and private stakeholders. A dedicated government R&D agency collaborates closely with extension workers, farmers, and the private sector, emphasizing the identification of real problems, tailored solution design, and adaptive capabilities through local R&D centers. Substantial investments in education and research have propelled Israel into a prominent global R&D hub, marking a significant leap in scientific innovation.

More emphasis on these enablers and ecosystem is a pathway to have more innovation and a nudge to more social entrepreneurs to come up with innovative ideas and technology. A few solutions that can be looked at going forward are:

- **Advisory & Information Services:** solutions that incorporate on-site data, precision agtech, and external information systems to improve decision-making.
- **Irrigation as a Service:** a model that provides access to irrigation to those who do not own irrigation equipment.
- **Irrigation Mechanisation/ Automation:** solutions that provide machineries and automation technologies for irrigation.
- **Agriculture Biotech:** solutions that offer biotech/materials such as inputs, alternative ingredients, etc. to improve productivity and efficiency

CONCLUSION

The water challenges currently confronting India are daunting, yet not insurmountable. There is an urgent need for sustainable and cost-effective technological innovations which addresses the water crisis. Equally important is the ecosystem and the enablers that nurtures and are the building blocks of such innovations. Coupled with meticulously executed government policies, this approach can undoubtedly assist India in overcoming its water challenges and also positively impact the livelihoods of the 58% of the nation's population who depend on agriculture for their sustenance.

Author: Kanishka Chatterjee, Director & Head, The/Nudge Prize.



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DROPLETS

Erik Roesink Honored with AMTA 2024 Hall of Fame Award for Advancing Clean Water Solutions

Erik Roesink's, founder and Chief Technology Officer of NX Filtration, tireless dedication to enhancing clean and affordable water access for all has earned him the prestigious AMTA 2024 Hall of Fame Award. In light of mounting climate change and escalating water challenges, Erik's commitment to innovative solutions with reduced chemical and energy footprints stands as a beacon of hope.

Throughout his esteemed career, Erik has been a trailblazer in the field of membrane technology, particularly in the development of hollow fiber PES membranes for microfiltration, ultrafiltration, and nanofiltration applications worldwide. His journey began in 1985 at X-flow in the Netherlands, where he played a pivotal role in revolutionizing membrane technology.

As a distinguished Professor at the University of Enschede, Erik continued his groundbreaking work, focusing on hollow fiber membranes with Nanofiltration characteristics. His vision was clear – to introduce a new membrane technology capable of addressing global water challenges, particularly micropollutants, while minimizing energy and chemical footprints.

The culmination of Erik's efforts led to the founding of NX Filtration in 2016, marking a significant milestone in the industry. Since then, NX Filtration has emerged as a leader in providing sustainable solutions for drinking water and wastewater reuse applications worldwide.

NX Filtration's HFNF membranes, spearheaded by Erik's innovative research, have demonstrated unparalleled effectiveness in removing micropollutants such as pesticides, hormones, PFAS, pharmaceuticals, and color, along with bacteria and viruses. Notably, these achievements have been realized with significantly reduced energy consumption and chemical dosing compared to traditional UF/RO membrane combinations.



Minesto reaches historic milestone - first electricity to grid with tidal powerplant Dragon 12 (1.2 MW)

Minesto, leading ocean energy developer, announces that a key milestone has been reached: The utility-scale tidal powerplant Dragon 12 - rated at 1.2 MW - has been successfully commissioned and, in the early morning of FEBRUARY 9, delivered its first electricity to the national grid in the Faroe Islands.

The Dragon 12 is Minesto's first tidal energy kite in megawatt-scale. It has now been successfully commissioned and has generated electricity at satisfactory levels in its first phase of operation. The 12-meter wide and 28-ton heavy subsea kite, anchored with a tether to the seabed, is steered in an 8-shaped flight trajectory powered by the tidal flow. Dragon 12 is a 10-times scale-up (from the existing 100 kW Dragon 4) that delivers competitive performance and cost-levels for build-out of large-scale commercial subsea parks of tidal powerplants.

"This is a big day for Minesto. We have reached the most significant milestone in the history of the company by producing electricity to the grid with our mega-watt scale powerplant. We are both proud and happy and more than ever look forward to the journey ahead," said Dr Martin Edlund, CEO of Minesto.

"What the Minesto team has achieved today is extraordinary and set a new agenda for renewable energy build-out in many areas of the world. The competitiveness of the Dragon 12 is straight to the point; it's powerful, cost-effective and feeds predictable electricity to the grid," said Dr Martin Edlund.

Videos of the Dragon 12 is available at Minesto's youtube channel: Minesto - YouTube
The information in this press release is such that Minesto AB (publ) shall announce publicly according to the EU Regulation No 596/2014 on market abuse (MAR).

ATER NEWS



Despite Scotland experiencing a very wet autumn and winter, the Scottish Environment Protection Agency (SEPA) has reminded abstractors that they still need to plan ahead in case conditions change

SEPA has published the first Water Situation Report of 2024, providing information on water stores in the ground, lochs and reservoirs. Weather conditions over autumn and winter have a major influence on water resources and the risk of water scarcity in the following summer.

SEPA issued a record number of regional Flood Alerts and local Flood Warnings to the public this winter. A total of 720 messages were sent between 1st September 2023 and 16th FEBRUARY 2024. The previous record of 714 was set over autumn and winter 2015/16. Areas along the east coast of Scotland saw higher than average rainfall throughout autumn and winter, with some parts seeing 170% of the winter average. Elsewhere rainfall totals have been within the normal range, and natural water storage in lochs and groundwater is between normal and high for this time of year. However, if the country experiences particularly dry weather over spring and summer it could still lead to water scarcity and water users are urged to keep an eye on the situation and plan ahead to manage water supplies sustainably. Stephen McGuire, Senior Hydrology Specialist at SEPA, said:

“It would be easy to look at the amount of rain Scotland has seen over the last few months and think that water scarcity isn’t an issue. The risk is currently lower than normal as a result, but the reality is we can’t rule out a repeat of the water shortages businesses have experienced in previous years – if we have drier than average conditions over the next few months things can change quite quickly.

“Water abstractors licensed by SEPA need to make sure they are prepared to deal with water scarcity, so I would encourage them to consider how to improve their business resilience and manage water wisely during prolonged dry conditions. We can help by providing advice and guidance on ways to reduce pressure on the water environment. “Taking the right steps now will lower the likelihood of resources reaching a critical level again this summer and SEPA having to suspend licences to protect the water environment.”

DROPLETS

Aver Granted the Potential Taiwan Mittelstand Award

Aver Information Inc., an award-winning provider of video collaboration and education technology solutions, is honored to be one of the companies to be awarded as a Potential Mittelstand Enterprise in the 7th Taiwan Mittelstand Award, a testament to the brand’s expertise in video, audio, lens, and AI. Aver will continue to develop and innovate to support our clients with useful audio-visual technologies.

Aver continues to strengthen its core technologies in education and video conferencing technology. As a Google Cloud Partner, Aver visualizers and distance learning cameras perfectly integrate with Google Classroom and Google Meet, while video conferencing products incorporate Google, Zoom, and Microsoft ecosystem compatibility. With its factory located in its Tucheng Headquarters, it has actively pursued factory automation, introducing key production processes with its own AI technology while upholding quality management mechanisms to increase manufacturing accuracy and reduce production costs.

With the business philosophy of devoting oneself to serving the community, Aver has successfully marketed its products to more than 100 countries around the world with its outstanding products and impeccable customer service. Aside from exceptional products evident through winning recognition from many international awards, such as the iF Design Award, the German Red Dot Design Award, and the Japanese Good Design Award. Aver has always been committed to solving customer pain points, combining innovative technology and excellent quality into new products with unrivaled compatibility, stability, professionalism, and performance.

The Ministry of Economic Affairs conducts the selection of Mittelstand Enterprises every two years. The primary objective is to recognize and commend Mittelstand enterprises distinguished by their unique and vital technologies or service models within specific industries, demonstrating exceptional international competitiveness and serving as exemplary models for other enterprises to emulate. A total of 145 companies applied for this year’s Taiwan Mittelstand Award, only 10 companies were selected as Mittelstand Enterprises and 52 companies as Potential Mittelstand Enterprises.





Northumbrian Water is planning a £5m upgrade to its Felton Sewage Treatment Works, near Morpeth, helping to protect water quality in the River Coquet

The investment will see the renewal and replacement of elements of the site, helping to protect the environment and make sewage treatment more efficient, as well as enabling the site to continue to meet the demands of local population growth. The water company and its supply partner, Mott MacDonald Bentley (MMB), are set to start work on site in March 2024, with the project due to be completed by the end of March 2025.

Northumbrian Water's Project Manager, Mat Simmonds, said: "Delivering wastewater treatment that is fit for the future, meets the needs of our customers, and which protects the environment, is core to our business, and this investment reflects that, including protecting local watercourses, including the River Coquet."

South West Water has launched a new campaign to support customers in becoming water efficient and benefitting from more affordable bills whilst helping to protect the environment

The Water is Precious campaign will work with customers to demonstrate the true value of water and help them to save this precious resource and save money. Climate change makes it more difficult to reliably capture and store water and South West Water is working to deliver more drinkable water from an increasingly scarce natural resource.

This pushes up the true cost of water, both to the planet and its people. Through the Water is Precious campaign, South West Water is asking customers to use water more efficiently, and is playing its part with a



£125 million investment to increase water resources. By repurposing disused quarries, introducing desalination to Cornwall for the first time, and continuing to find and fix more leaks than ever before, by 2025 it will boost the region's resources in Cornwall by around 45% and in Devon by around 30%.

Laura Flowerdew, South West Water's Chief Customer and Digital Officer, said: "Capturing, filtering, treating, storing and delivering water is at the heart of our business, but in doing this we need to minimise the cost to our ecosystems and our landscapes as we take water out of the environment and build more storage and infrastructure.

"Reducing water consumption is important not just for the hotter months of the year. Through the Water is Precious campaign we're working with customers year-round to make positive changes that will conserve water, save money and protect the beautiful environment we all treasure." A key priority for South West Water's 2025-2030 Business Plan is the introduction of new and innovative tariffs to deliver fairer charging structures, where customers who use less, pay less.

Laura added: "Our customers have told us they want us to find new ways of charging and we want to make sure that the bills our customers pay are fair and reflect their usage. "Over the course of this year and beyond, we will continue to engage with customers and stake-holders, and work with our communities, to run pilots to understand what works well and what our customers consider to be fair ways of charging."

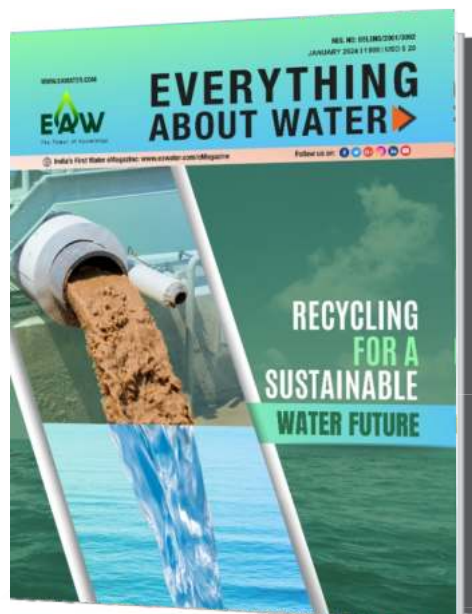
The first tariff trial began on 1 FEBRUARY 2024 and will see all household customers in Cornwall receive a credit to their bill if the county collectively reduces its water consumption between now and 30 April. £30 will be credited to each customer if a 10% reduction in water use is seen across Cornwall, or a £10 credit will be given if demand reduces by 5% over the same period.

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At the British Water Micropollutants Conference 2024, which took place in London on 8 FEBRUARY, keynote speakers from the UK's Environment Agency called for a cross-industry approach to tackling the issue

John Collins, deputy director of evidence assessment and evaluation at the Environment Agency, said that despite having one of the most robust pollutants testing systems globally, rapid investment in innovation is needed to detect all sources of contamination from both established and newly emerging pollutants. Speaking after the event, Collins said: "One of the key questions the Environment Agency and other regulators face is how to prioritise chemicals for targeted monitoring and management.

"The Environment Agency is exploring innovative sampling and analytical techniques to monitor a greater number of chemicals for ecological risk assessment. Simultaneously, we are using our existing chemical monitoring data to ensure we continue to monitor the right chemicals, in the right place, at the right time."

In a joint keynote with Matt Womersley, manager of the chemicals strategic & regulatory planning team at the Environment Agency, Collins outlined the current situation in the UK, including investment in research, advancing treatment technologies and, the use of nature-based solutions. The speakers also gave an overview of the existing and future legislative drivers that will be critical in preventing the release of micropollutants into the environment.

Innovative solutions:

Speakers explored the scientific evidence base and how regulation of micropollutants is evolving in the UK and across the EU. Some of the most innovative technologies and solutions in micropollutant removal were presented at the conference, including:

Recycling of spent activated carbon used in the removal of PFAS – CPL
Activated Carbons innovative UV technology – Van Remmen UV

Technology Sustainable micro pollutant removal with the B03-technology – Royal Harkening DHVO zone and granular activated carbon – maximising synergistic effects – Veolia UK Water Technologies & Solutions The use of superfine absorbents to reduce cost – Mecana Umwelttechnik Green technologies The potential of nature-based solutions was discussed by Luisa Orsini, co-founder & chief executive, Daphne Water Solutions, and Cynthia Carliell-Marquet, innovation architect at Severn Trent, reviewed how waterfleas, known as Daphnia, can be harnessed to remove pharmaceuticals, pesticides and industrial chemicals from wastewater, providing a low-cost and low-carbon treatment method with minimal toxic byproducts.

Prevention at source :

Addressing micropollutants in water requires a shift towards preventing their release in the first place, involving collaboration across industries including paramedical and agriculture, stronger regulations, and international cooperation. A panel discussion, hosted by Dr Pablo Campo, explored how the pharmaceutical industry can play a significant role in tackling micropollutant contamination by investing in research, adopting advanced treatment technologies, and collaborating with other stakeholders. Stewart Owen, principal environmental scientist at AstraZeneca, spoke from the pharmaceutical industry's perspective, highlighting current collaborations with universities and research institutions aimed at developing environmentally friendly drugs and production processes.

Reflecting on the conference, British Water's chief executive Lila Thompson said: "Tackling micropollutants demands a multifaceted approach including research and innovation, collaboration, technology adoption, and nature-based solutions, with collective responsibility across government, industry, and society. As events like this show, the water sector and wider supply chain stands ready to work in collaboration with key stakeholders in the UK and globally to tackle this important issue."

Thames Water on track to deliver £45 million supply upgrade in Swindon

Construction of the Faringdon to Blunsdon pipeline commenced in May 2021 and is due to come into service this spring, with the overall project completing in August 2024. The new pipe will build resilience, and significantly reduce leaks in an area that has a history of bursts.



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Chris Reeves, Head of Programme Delivery at Thames Water said: “It’s our job to deliver a safe and secure supply of water for all our customers. Our new water transfer pipe will build resilience across Swindon and ensure we keep the taps flowing for future generations. “The pipeline will also benefit the local environment, reducing reliance on groundwater sources that draw from chalk streams and the River Kennet during high demand and drought conditions.”

Andy Muncer, Project Director, Kier, said: “We’re proud to be using our expertise to deliver this vital project for Swindon. It’s a complex piece of work and we’ve taken an innovative approach to ensure it’s being delivered efficiently to a high-quality, and in a way which protects the local environment. “We’ve also launched several initiatives in the local area, such as volunteering days at Pennyhooks Farm Trust, in line with Kier’s commitment to benefit the communities in which we work. We’ll keep these active throughout the project.”

During the project, several archaeological investigations also took place, with Wessex Archaeology acting as advisors. Thames Water adopted targeted route changes to avoid known areas of high archaeological interest to minimise disturbing archaeological remains during works. Ahead of construction a small number of artefacts and archaeological evidence were discovered, with the most significant including the remains of Iron Age roundhouses and Anglo-Saxon burials.

Bianca San Martin, Fieldwork Manager, Wessex Archaeology, said: “Partnering with Thames Water and Kier on these vital pipe upgrades has not only ensured the works ran smoothly, their investment in heritage has also led to the discovery of a range of significant archaeological remains, from prehistoric roundhouses to Anglo-Saxon burials.”



UN recognizes seven World Restoration Flagships

From saving biodiversity in Europe, to re-greening African drylands, to reviving forests in South America, these seven initiatives have water at the heart of action plans to restore ecosystems at the tipping point of outright degradation due to wildfires, drought, deforestation, and pollution. They are now eligible for technical and financial UN support.

One of the initiatives is named “Living Indus – Restoring a Cradle of Civilizations”, focused on the Indus River in Central/South Asia. Some 90 per cent of Pakistan’s people and more than three-quarters of its economy reside in the Indus Basin, and it irrigates over 80 per cent of its arable land. Mismanagement, environmental degradation and climate change have threatened the river’s ecosystem, including its abundant fish and fertile lands.

“Living Indus” aims to restore 25 million hectares of river basin by 2030, encompassing 30 per cent of Pakistan’s surface area through the implementation of 25 high-impact interventions for policymakers, practitioners and civil society.



UN warns against 'vampiric' global water use

The world is “blindly travelling a dangerous path” of “vampiric overconsumption and overdevelopment”, the report says. Its publication comes before the first major UN water summit since 1977.

Thousands of delegates will attend the three-day gathering in New York which begins on Wednesday. UN Secretary General Antonio Guterres says water, "humanity's lifeblood", is being drained by "unsustainable water use, pollution and unchecked global warming".

The report, published by UN Water and Unesco, warns that "scarcity is becoming endemic" because of overconsumption and pollution, while global warming will increase seasonal water shortages in both areas with abundant water and those already strained.

Richard Connor, the lead author of the report, said that about 10% of the global population "currently lives in areas that are high or critical water stress".

"In our report, we say that up to 3.5 billion people live under conditions of water stress at least one month a year," he told the BBC. According to the most recent UN climate report, published Monday by the IPCC expert panel, "roughly half of the world's population currently experience severe water scarcity for at least part of the year". Mr Connor told reporters that "uncertainties are increasing" when it comes to global water supply. "If we don't address it, there definitely will be a global crisis," he said.

UNDP Associate Administrator Usha Rao Monari told the BBC that resources would need to be managed more carefully in the future. "There is enough water on the planet if we manage it more effectively than we have managed it over the last few decades," she said. "I think we will have to find new governance models, new finance models, new models of using water and reusing water than ever before. I think that technology and innovation will play a very large role in looking at how to manage the water sector and the use of water."

The summit, co-hosted by the governments of Tajikistan and the Netherlands, will gather some 6,500 participants, including 100 ministers and a dozen heads of state and government.



EU proposes key steps to manage climate risks to protect people and prosperity

Europe is facing the effects of climate change with extreme weather events like floods and wildfires. It is therefore no surprise that in a recent survey 77% of Europeans see climate change as a very serious problem, and more than one in three Europeans (37%) already feel personally exposed to climate risks.

The Commission seeks to address these concerns and to respond to the first-ever European Climate Risk Assessment by the European Environment Agency with a Communication on managing climate risks in Europe that sets out how the EU and its countries can implement policies that save lives, cut costs, and protect prosperity. Together with the Assessment, they are a call to action for all levels of government, as well as the private sector and civil society. There are four main categories of action:

Improved governance: EU countries should ensure that the risks and responsibilities are better understood. A closer cooperation on climate resilience between national, regional and local levels would ensure that knowledge and resources are made available where they are most effective. **Better tools for empowering risk owners:** Policymakers, businesses, and investors need to better understand how climate risks, investment, and long-term financing strategies interlink. The Commission will improve and widen access to data and scenarios to help regional and local authorities better prepare. To complement terrestrial alert systems, in 2025 the Galileo Emergency Warning Satellite Service will become available to communicate alert information to the public. **Harnessing structural policies:** To manage climate risks across sectors the Communication advocates for a better spatial planning in EU countries; embedding climate risks in planning and maintaining critical infrastructure; and linking EU-level solidarity mechanisms with adequate national resilience measures. **Right preconditions for financing climate resilience:** Mobilising sufficient public and private finance for climate resilience is crucial. The Commission stands ready to support Member States improve and mainstream climate-risk budgeting in national budgetary processes.

The Commission puts forward concrete suggestions for action in the fields of natural ecosystems, water, health, food, infrastructure and built environment, and the economy. Implementing existing EU legislation, that is already helping to reduce emissions and limit climate change, will go a long way to helping with successfully managing risks in many of these areas.



Kazakhstan Introduces Key Reforms in Water Code, Advances Water Sustainability

CA draft of the new Water Code aims to achieve and maintain safe levels of water use, promoting sustainable economic development, enhancing citizens' living conditions, and preserving the environment. Developed by the Ministry of Water Resources and Irrigation, it introduces significant innovations and facilitates the updating of Kazakhstan's water legislation, reported the ministry's press service on FEBRUARY12.

Minister Nurzhan Nurzhigitov emphasised the ministry's commitment to shaping a nationwide water conservation policy, engaging the public, and achieving a balance between efficient water use and preservation for future generations. Water conservation is a key focus, with users required to employ rational water resource practices, implement water-saving technologies, and prevent unauthorised use of drinking groundwater. Organisations lacking water reuse systems must provide a transition plan, particularly in agriculture and industry. Government support, in the form of subsidies and reduced tariffs, is contingent on the adoption of water-saving technologies.

Legislatively, the code tightens responsibility for water sector violations. Basin inspections of the ministry, in addition to state control functions, are empowered with supervisory roles, ensuring compliance with water body protection requirements and rules for hydraulic structure operation.

They also oversee the design, construction, and placement of new facilities on water bodies or in water protection zones, and the reconstruction of pre-designated water protection zones and strips. The code introduces requirements for improving drinking water quality, emphasising epidemiological, radiological, and chemical safety.

It includes an article outlining technical audits of centralised water supply systems and a section on rules for developing plans for water supply and wastewater systems.

The country's water resources receive special attention to prevent depletion, pollution, and contamination of water bodies. The code prohibits operations related to subsoil use, except for exploration or extraction of hydrocarbons in the Caspian Sea, as well as extraction of salt and medicinal mud.

Tightened requirements for water body protection include revised norms on permissible water withdrawal volumes to meet population and economic sector needs. Limits consider river flow necessary for ecosystem maintenance, including protection of water marshland areas and glaciers. A dedicated article addresses adapting the country's water sector to climate change, promoting strategies, engaging stakeholders, applying new technologies, and ensuring efficient water use.

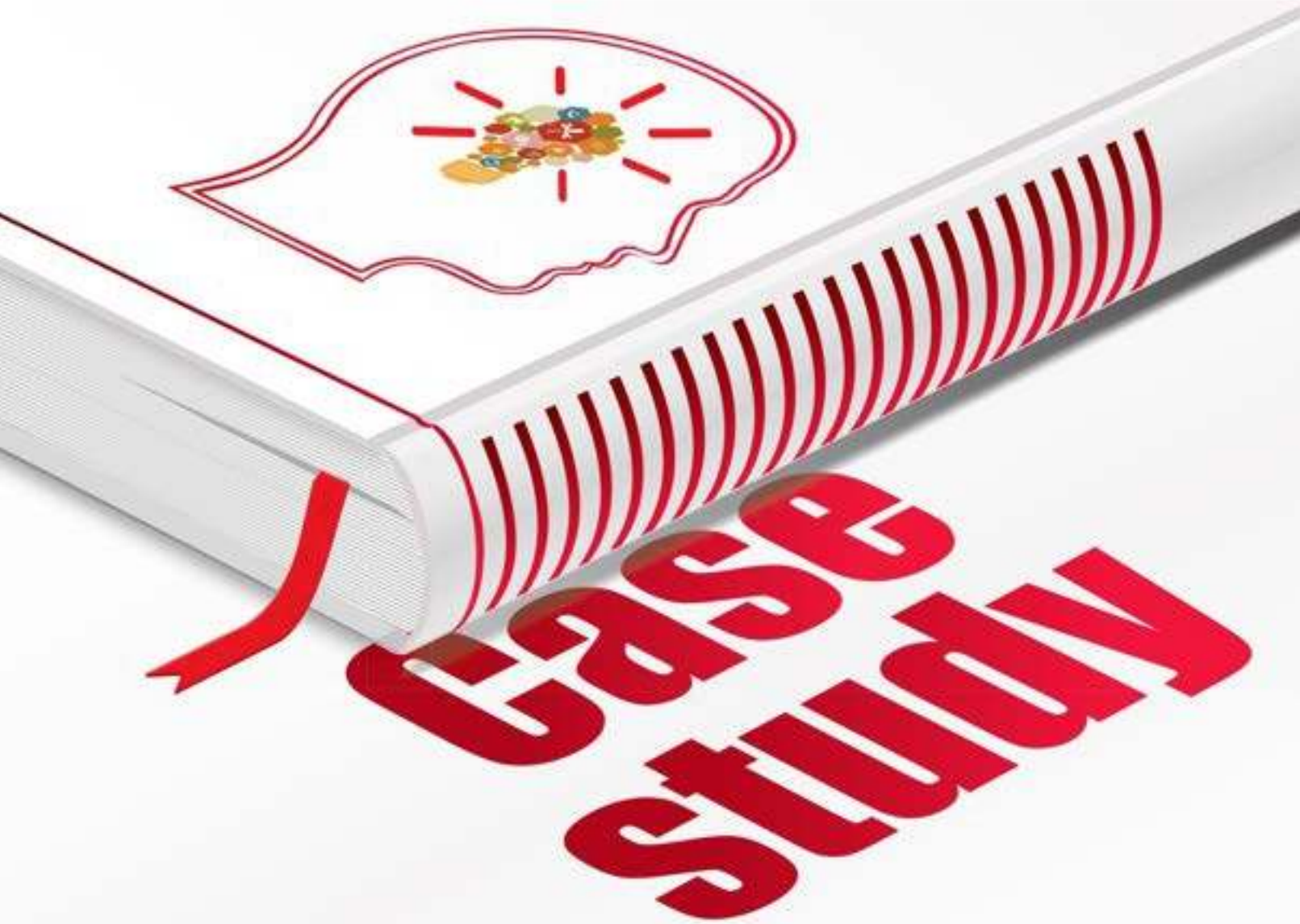
The code also establishes rules for non-profit organisations to obtain accreditation from the ministry for public oversight in water resource protection and use.

Safety issues of hydraulic structures are emphasised in a separate section. Enterprises are defined as responsible for their operation and for conducting multifactorial surveys, based on which a safety declaration is issued.

The code envisions developing technical regulations for the safety of hydraulic structures, specifying their types and construction features, safety requirements, design, construction, operation, reconstruction, and conservation.

According to the code, an annual national information report will provide information on the state of water, protection, and use, including river flow, hydraulic structure conditions, water resource protection measures, and investment projects.

Certain provisions of the new code aim to stimulate investment in the country's water sector and garner government support for scientific research and technical work.



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WATER & WASTEWATER: AN INTEGRAL ASSET OF CIRCULAR ECONOMY FOR THE INDUSTRIES

Dilip Yewalekar, Senior Vice President, Jain Irrigation

Manisha Kinge, M.Tech-Agri Engg, Jain Irrigation

Industrial water and waste water management is a critical aspects of sustainability for any manufacturing or industrial operation. Efficiently managing these assets not only ensures compliance with environmental regulations but also promotes cost savings, resource conservation, and community well-being. Water being asset should be treated a commodity of circular economy for long term sustainability and viability.

WHY WATER REUSE AND RECYCLING IMPORTANT?

Rapid urbanization-industrialization in Bharat have a considerable impact on water demand. Changes in food consumption, lifestyle, and land use patterns also play a major role in water requirements and management. Although Bharat received plenty of water as rainfall during monsoon, due to lack of storage only a small percentage of that water is added to the reserve. There is a significant mismatch between the spatial distributions of available water with the population, the situation becomes alarming, and ironically less water is available where more people live. As per the international norms, countries with per capita water availability of less than 1,700 m³ per year are categorized as water stress, Bharat falls under water stress country because 1,545 m³ water per capita available. Studies show that the projected water availability will become 1401 m³ in 2025 and 1191 in 2050. Average domestic water demand would also increase from 86 litre per capita per day in 2000 and 125 litre per capita per day in 2025 and 170 lpcd in 2050. Total industrial water demand is also increased 92 bcm by 2025 and 161 CMC 2050.

Therefore, it is necessary to treat water as an asset while implementing integrated urban and industrial water & waste water management policy. The United Nations (UN) too has given more emphasis on water conservation and has also targeted to ensure the availability and sustainable management of water and sanitation for all by 2030 through its Sustainable Development Goal 6 (SDG 6: Clean Water and Sanitation).

Water reuse and recycling offer several benefits, both to us and to the world (fig.1). The biggest benefit comes from preventing water shortages. That offers protection to the world's water resources, which would get drained to ensure that humans can continue to prosper while we run out of water. Recycling also ensures that we have enough water to grow crops, maintain our hygiene, and simply stay hydrated and run industries. Almost every aspect of human life uses water at some point, so running out could cause our entire civilization to collapse.

Recycling also helps to prevent pollution, especially in an industrial context. Many machines and appliances produce wastewater that carries some pollutants. If that water enters the environment without treatment, it can spread those pollutants across a surprising distance and give them a chance to kill plants and animals. Wastewater treatment and water recycling prevent the water from contamination our rivers, lakes, and groundwater.



Fig.1. Water Cycle-Re-cycle-Re-Use-Circular Economy

WHAT IS INTEGRATED WATER/WASTE WATER MANAGEMENT FOR URBAN AND INDUSTRIAL?

Integrated Urban and Industrial water management is the practice of planning and managing freshwater, wastewater, and rainwater for various applications and uses. This means consideration of water supply and sanitation within an urban and industrial sector by incorporating various scopes of utility technology. By introducing various water management techniques, urban and industrial areas can contribute to the sustainable use and conservation of water resources, helping to create resilient and water-secure communities. Table 1. Shows the water demand for various sectors in Bharat.

Table 1. Sector-wise water demand in Bharat [Ref-PIB 2013]

Sector	2010		2025		2050	
	High	Low	High	Low	High	Low
Irrigation	543	557	561	611	628	807
Drinking	42	43	55	62	90	111
Industry	37	37	67	67	81	81
Energy	18	19	31	33	63	70
Others	54	54	70	70	111	111
Total	694	710	784	843	973	1180

CPCB

The Central Pollution Control Board (CPCB), statutory organisation, was constituted in September, 1974 under the Water (Prevention and Control of Pollution) Act, 1974. It serves as a field formation and also provides technical services to the Ministry of Environment and Forests of the provisions of the Environment (Protection) Act, 1986. The Principal functions of the CPCB, as spelt out in the Water (Prevention and Control of Pollution) Act, 1974, (i) to promote cleanliness of streams and wells in different areas of the States by prevention, control and abatement of water pollution, and (ii) to improve the quality of air and to prevent, control or abate air pollution in the country. The CPCB has provided the guideline and norms on water quality parameters, waste water treatment and uses. And it cannot neglected or under-estimated in circular economy of water/waste water. Some of terminology and norms are reprinted here for clear understanding.

WATER QUALITY INDEX (WQI) (REFER: CBCP)

Water quality index (WQI) is one of the most used tools to describe water quality. It is based on physical, chemical, and biological factors that are combined into a single value that ranges from 0 to 100 and involves 4 processes:

- Parameter selection,
- Transformation of the raw data into common scale,
- Providing weights and
- Aggregation of sub-index values.

The background of WQI is presented in this review study. the stages of development, the progression of the field of study, the various WQIs, the benefits and drawbacks of each approach, and the most recent attempts at WQI studies. In order to grow and elaborate the index in several ways, WQIs should be linked to scientific breakthroughs (example: ecologically). Consequently, a sophisticated WQI that takes into account statistical methods, interactions between parameters, and scientific and technological improvement should be created in order to be used in future investigations.

The WQI is calculated by averaging the individual index values of some or all of the parameters within five water quality parameter categories:

1. Turbidity (NTU).
2. Dissolved oxygen concentration (mg/l).
3. Biochemical Oxygen Demand (BOQ) (mg/l).
4. Chemical Oxygen Demand (COD) (mg/l).
5. Total Organic Carbon (mg/l).
6. Total Nitrogen (mg/l).
7. Total Phosphorus (mg/l).
8. Bacteria: total coliform (per mg/l) and/or fecal coliform (per mg/l).

WQI NORMS

WQI Value	Water Quality	Color Code
<50	Excellent	Green
50-100	Good Water	Light Green
100-200	Poor Water	Yellow
200-300	Very Very Poor Water	Orange
>300	Water Unsuitable for drinking	Red

FORMULA TO CALCULATE WQI

$$WQI = \sum_{i=1}^{n=9} q_i \cdot w_i$$

Where;

WQI = Water Quality Index or relative weight

qi = quality rating

wi = relative of each weight

n = number of parameters

(In the next step a quality rating scale (qi) for each parameter is assigned by dividing its concentration in each water sample by its respective standard according to the guidelines published by BIS (Bureau of Indian Standards) and the result thus obtained is multiplied by 100.)

$$q_i = (C_i / S_i) \times 100$$

Where;

Ci = the concentration of each chemical parameter in each water sample in mg/l.

Si = the Indian drinking water standard for each chemical parameter in mg/l.

according to Parameters considered for ground water monitoring: pH, Total hardness, Calcium, Magnesium, Chloride, Total Dissolved Solids, Fluoride and Sulphate

WATER CLASS & USES AS PER IS : 2296-1982.

Designated-Best-Use	Class of water	Criteria
Drinking Water Source without conventional treatment but after disinfection	A	Total Coliforms Organism MPN/100ml shall be 50 or less pH between 6.5 and 8.5 Dissolved Oxygen 6mg/l or more Biochemical Oxygen Demand 5 days 20C 2mg/l or less
Outdoor bathing (Organised)	B	Total Coliforms Organism MPN/100ml shall be 500 or less pH between 6.5 and 8.5 Dissolved Oxygen 5mg/l or more Biochemical Oxygen Demand 5 days 20C 3mg/l or less
Drinking water source after conventional treatment and disinfection	C	Total Coliforms Organism MPN/100ml shall be 5000 or less pH between 6 to 9 Dissolved Oxygen 4mg/l or more Biochemical Oxygen Demand 5 days 20C 3mg/l or less
Propagation of Wild life and Fisheries	D	pH between 6.5 to 8.5 Dissolved Oxygen 4mg/l or more Free Ammonia (as N) 1.2 mg/l or less
Irrigation, Industrial Cooling, Controlled Waste disposal	E	pH between 6.0 to 8.5 Electrical Conductivity at 25C micro mhos/cm Max.2250 Sodium absorption Ratio Max. 26Boron Max. 2mg/l

Class A Water



Class B Water



Class C Water



Class D Water



Class E Water



WATER TYPES –TREATMENT-USES

Integrated Urban & Industrial Water Management aims at designing, managing the urban water system holistically. This section provides a basic introduction to the notion of integration water management and describes how it can help in the long run to use water resources more sustainably.

Urban and Industrial sustainable water management is crucial for ensuring the availability and quality of water resources in the face of growing urbanization and industrial activities. Integrated water management involves the responsible use, conservation, & protection of water sources to meet current needs without compromising the ability of future generations to meet their own needs. Table 2. Indicates types of water, treatment before use and its uses/application for various purpose

Table 2. Water types-Treatment-Uses.

Sr.No	Type of water	Treatment before use	Uses/ applications
1	Surface water	Pre-filtration, Sedimentation, coagulation, UV treatment, Chlorination,	Domestic, industrial, agricultural
2	Groundwater	Filtration, UV Treatment, chlorination	Domestic, industrial, agricultural
3	Salt water (sea water)	Desalination	Domestic, industrial
4	Frozen water	Heating, Filtration, UV Filter	Domestic, industrial
5	Atmospheric water	Filtration, UV treatment	Domestic, agricultural
6	Waste water	Pre-filtration, Sedimentation, Coagulation, UV treatment, Chlorination	Landscape, garden
7	Brackish water	Pre-filtration, Sedimentation, Coagulation, UV treatment, Chlorination	Landscape, garden
8	Mineral water	Filtration, UV treatment	Drinking water
9	Distilled water	UV treatment, add mineralization	Drinking water, battery, Nuclear reactor.
10	Rain water	Filtration, UV treatment, chlorination	Domestic, agriculture

WAY-FORWARD TO ACHIEVE WATER CIRCULAR ECONOMY

1. Industrial Water Usages

Before implementing any water management strategy, it's essential to have a clear understanding of how water is used within the industrial process

right from sourcing, uses, wastages, treatment and reuse. Some of common uses are:

- Cooling process (Cooling towers)
- Cleaning and washing
- Steam production
- Product formulation
- Transportation of materials

2. Implementing water efficiency measures

- Installing water efficient equipment and machinery.
- Conducting regular maintenance to fix leaks and drips.
- Reusing water within the production process.
- Optimizing cooling system for minimal water usage.
- Educating employees / end users on water conservations practices.

3. Treating Wastewater

After water is used in industrial processes, it becomes wastewater that must be treated before discharge. On-site wastewater treatment facilities are crucial for ensuring compliance with regulations and protecting the environment. These facilities can include

- Physical treatment (such as settling and filtration).
- Chemical treatment (such as coagulation and disinfections).
- Biological treatment (such as activated sludge process).

4. Storm water management

- Designing and implementing effective storm water management systems in urban areas to reduce runoff and prevent flooding.
- Incorporating green infrastructure, such as permeable pavements and green roofs, to enhance storm water absorption and reduce the burden on conventional drainage systems.

5. Integrated Water Resource management

- Adopting an integrated approach that considers the interconnectedness of water resources, including surface, groundwater, and rainwater harvesting.
- Collaborating with stakeholders across sectors to develop comprehensive water management plans that address the needs of both urban and industrial areas.

6. Community Engagement and education

- Raising awareness among urban residents

and industrial stakeholders about the importance of water conservation and sustainable practices

- Involving local communities in planning and decision-making processes related to water management to ensure their needs and concerns are considered.

7. Policy and Regulations

- Implementing and enforcing water related regulations and standards to ensure responsible water use in both urban and industrial contexts.
- Encouraging the development of policies that promote sustainability, innovation, and responsible water stewardship.

8. Technological innovation

- Investing in research and development of new technologies that improve water management efficiency, such as smart water meters, sensors, and data analytics for real-time monitoring.

9. Climate change adaption

- Considering the potential impacts of climate change on water resources and developing adaptive strategies to address changing precipitation patterns, rising temperatures, and extreme weather events.

10. Public-Private Partnerships [PPP]

- Facilitating collaborations between public and private entities to fund and implement sustainable water Management projects.

11. Research and innovations

- Invest in research and development to explore new technologies and innovative solutions for water management
- Foster a culture of innovation to continuously improve water efficiency and sustainability.

12. Continuous Monitoring and Optimization

- Lastly, effective management of industrial water and wastewater asses requires ongoing monitoring and optimizations, it involves:
- Installation of IoT/ AL based sensors and meters to tract water usages in real-time.
- Regular analyzing data to identify inefficiencies or software or AL tools.
- Conducting periodic audits and assessments.

- Cost, expenses, sales and revenue assessment and justifications.

13. Embracing Circular Economy Principles

A shift towards a circular economy model can greatly benefit industrial water management. This approach focuses on minimizing waste and maximizing resource efficiency in the context of water, means:

- Reusing treated wastewater in non-critical processes.
- Implementing closed-loop water system where water is continuously recycles.
- Partnering with other industries to exchange water and by-products.
- Sale of TWW (treated waste water) to Municipality or Highway Dept or Forest dept for irrigation purpose for maintaining greenery.

By adapting circular economy principles, industries can create a more sustainable water management system that reduces reliance on freshwater source and generate certain revenue to compensate the cost of waste water treatment.

CONCLUSION

Managing industrial water and wastewater assets is integral to sustainable and responsible industrial practices. By understanding water usages, implementing efficiency measures, treating wastewater on site, monitoring and helps to maintain sustainable circular economy for the industries. It is not only a regulatory necessity but also a moral obligation to protect our water resources for next generations and environment.



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The Dead Sea, located between Israel and Jordan, is one of the saltiest bodies of water globally. Its high salinity makes it nearly impossible for most aquatic life to survive, hence the name "Dead Sea."

OPTIMIZING RESOURCES FOR SUSTAINABLE OPERATIONS

Vikas Brahmavar Adiga, Founder, Boson Whitewater

Did you know that manufacturing a pair of jeans can consume close to 7000 litres of water? Does that sound like a mind boggling statistic to you? Unfortunately, this statistic is entirely true. The fashion industry is considered as one of the biggest consumers of freshwater. So, the next time you shop for a pair of jeans, do consider its impact on the environment.

At a time when the world is running out of freshwater, individuals as well as industries really need to relook at how they use freshwater. With urbanization and industrialization, the demand for freshwater is only going to increase over the next few decades. If we go by predictions, a quarter of all children around the world will be living in water scarce areas.

WATER USAGE IN INDUSTRIES

A report by TERI (The Energy and Resources Institute) in association with the Ministry of Jal Shakti, indicates that thermal power plants, heavy engineering, textile, pulp & paper, steel, sugar, fertilizer are among the most water intensive industries. The same report indicates that as the number of industries expand, the demand for water is expected to rise over the next few years. One of the key things to note is that many of these industries follow inefficient methods to manage their water requirement. Without improving how we use water, experts predict that by 2030, we'll need 40% more water than what's available. To ensure that water is being used more efficiently, we need to manage the demand better and find newer ways such as recycling to meet the requirement

Managing water in industries is crucial for sustainable



business practices, especially with growing concerns about water scarcity and environmental impact. Typically, industries acquire water from external sources, treat it using reverse osmosis (RO) methods, and then use it in their operations. However, this process often needs to be revised, leading to high costs and unnecessary resource use.

Though there are efforts being made to efficiently use water, we need a better framework, and maybe even national guidelines to ensure that water is being used efficiently by industries.

THE WHITEWATER ADVANTAGE

Industries need help sourcing and treating water from external sources to suit their specific requirements. This often leads to high costs and resource wastage. Emerging solutions like Boson Whitewater provide a promising alternative. Imagine a scenario where the excess treated water (STP water converted into clean water) from a nearby apartment community can be

supplied to industries in the vicinity. Alternatively, industries could recycle all their wastewater internally, resulting in no wastewater being discharged externally.

Whitewater, also known as recovered water, eliminates the need for RO systems by offering high-quality water directly from existing sources. This approach reduces procurement volumes by half, cutting costs significantly. Let's take the example of Jeeves India, located in Electronic city, Bengaluru. Their excess STP/ETP (Effluent treatment) volume per day was 30 kilo litres. Potable water that was produced after processing STP water was 30 Kilo litres. They were using borewells and tankers for their fresh water needs prior to opting for our whitewater solution, and their excess STP water was drained out. But, now Whitewater is used for uniform washing and boiler units. This process has allowed them to save up to 30 kilo litres of water per day. This demonstrates the effectiveness of Whitewater in saving costs and enhancing operational efficiency.

Additionally, using high-quality water from Whitewater reduces the need for resources like soap, further boosting sustainability in industrial processes.

Another example of this is a plastic recycling company based in Karnataka's Bidadi. Before implementing Boson Whitewater, the excess STP (Sewage Treatment Plant) / ETP (Effluent Treatment Plant) volume per day stood at 160 kilolitres, with an equivalent amount of potable water produced after processing the STP water. The water used previously relied on borewells and tankers to fulfill their fresh water needs. The excess STP water was typically sent to drains prior to the adoption of our solution. However, after integrating our solution into their operations, the excess STP water is now repurposed for various processes such as cooling tower operations and plastic washing units. This transition has resulted in a significant water saving of 160 kilolitres per day, highlighting the efficiency and effectiveness in optimizing water usage and promoting sustainability in industrial processes.



TOWARDS ZERO LIQUID DISCHARGE

The concept of Zero Liquid Discharge (ZLD) has gained traction as a viable strategy to address water scarcity and pollution concerns. Zero Liquid Discharge as the name suggests is ensuring that no liquid or wastewater from industries is drained into a waterbody. ZLD is mandated in India and it promotes water recycling and recovery. However, not all industries are able to comply with this policy. Efficient wastewater management is essential for industries looking to minimize their environmental footprint and optimize resource usage. Understanding the water balance, including intake and discharge volumes and quality, forms the foundation of effective wastewater management strategies. While traditional methods involve relying on external water sources and employing processes like softening and RO, sustainable alternatives like Whitewater offer a more cost-effective and environmentally friendly option.



Industries can further enhance wastewater treatment by integrating advanced technologies such as carbon additives and forward osmosis, moving closer to zero liquid discharge and addressing water scarcity challenges.

RETHINKING WATER ASSETS

Solar installations have traditionally been seen as valuable investments with established financial models in asset management. However, water treatment and recovery equipment have often been overlooked. The escalating global water crisis underscores the need to view water assets as vital components of industrial operations. Companies like ours advocate for classifying water treatment equipment as assets, emphasizing their role in revenue generation and sustainability. Industries can accurately assess their value and optimize resource allocation by evaluating water treatment equipment based on factors like output volume, energy consumption, and operational contribution.

A STRATEGIC IMPERATIVE

Integrating water asset management into organizational practices is essential for unlocking the full potential of industrial water and wastewater assets. Treating water purifiers and equipment as assets enables accurate assessment of their contribution to operations and facilitates proactive maintenance and monitoring. Establishing a dedicated water asset management category within companies streamlines processes, boosts efficiency,

and mitigates risks associated with water scarcity and environmental impact. By embracing proactive water asset management practices, industries can effectively navigate challenges and lay the groundwork for a more sustainable future.

TOWARDS SUSTAINABLE INDUSTRIAL WATER MANAGEMENT

In conclusion, optimizing industrial water and wastewater assets is critical for businesses striving to achieve sustainability goals and enhance operational efficiency. Innovative solutions like Whitewater offer a cost-effective alternative to traditional water procurement and treatment methods, while advanced technologies enable industries to minimize waste and reduce environmental impact. Recognizing water treatment equipment as assets underscores their importance in driving revenue generation and sustainability. This shift in perspective calls for a reevaluation of asset management practices. By embracing proactive water asset management strategies, industries can address water scarcity challenges, optimize resource utilization, and contribute to a more sustainable future for future generations.

UNLOCKING THE POTENTIAL OF WASTEWATER - HOW INDUSTRIES CAN OPT FOR WASTEWATER FROM APARTMENT COMMUNITIES?

Over the last several weeks, Bengaluru and many other cities across India have been facing acute shortage of water.

People are queuing up to get their water supplies. Every day, a city like Bengaluru produces approximately 1400 million liters of wastewater, with a majority flowing into drains and lakes. Residential apartment complexes generate between 30,000 to 3 lakh liters of wastewater daily. Currently, only a small portion of this wastewater is utilized, while the rest is discharged into lakes and rivers. What if excess STP treated water from apartment and commercial complexes is refined to high-quality standards suitable for industrial use and provided to nearby industries within a 2-3 km radius? This could create economically viable solutions for both parties and could be facilitated by private entities supplying processed water to industries. Wastewater has immense potential but we just need the right technology and mindset to make the most out of it.

THE ROAD AHEAD

A report from NITI Aayog reveals alarming statistics about water stress and quality in India, with nearly 600 million people experiencing high to extreme water stress.

. India's water quality ranks poorly, at 120th out of 122 countries, with around 70% of water sources contaminated. As urban populations expand, it becomes imperative to reduce reliance on freshwater sources and prioritize the use of treated wastewater. Continued depletion of freshwater reserves from rivers could lead to devastating consequences, especially for agricultural regions reliant on river water. However, utilizing treated wastewater presents a viable solution to address water scarcity and mitigate India's water crisis. By investing in wastewater treatment infrastructure and promoting the reuse of treated wastewater, industries can alleviate pressure on freshwater sources. Embracing wastewater as a valuable resource not only conserves precious freshwater but also offers a sustainable solution to India's pressing water challenges, safeguarding both urban and rural livelihoods.



About the Author



Vikas Brahmavar Adiga
Founder
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Vikas Brahmavar is passionate about water and water reuse. He has been in the water industry since 2008 and holds multiple patents. He is a leader who is convinced that the only way for cities of India to sustain in terms of water is to reuse every drop of waste water generated from the city.



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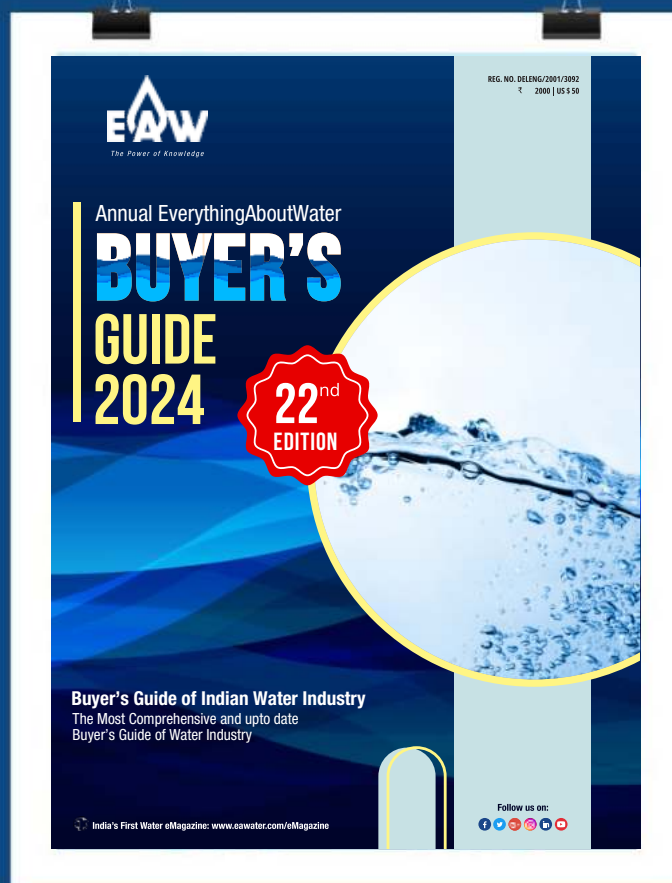
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WATER SUSTAINABILITY IN AUTO DEALERSHIPS AND SERVICE CENTRES

Vivek Datta, MD & CEO, Globe Toyota, A JCBL Group Company

In the rapidly changing world, environmental consciousness and responsibility are paramount. As the population grows and industrialization expands, the global water demand escalates to alarming levels. Businesses in the dealership and service and maintenance of vehicles sector face increasing pressure to conserve water. It is essential to recognize the critical role played by water conservation in sustainable business practices. In today's time, it has become imperative to proactively reduce water usage, meet regulatory requirements, and contribute to global sustainability goals. At Globe Toyota, we stand at the forefront of this movement by taking proactive measures to conserve water and reiterate our commitment to environmental stewardship within the larger industry.

CHALLENGES OF WATER SUSTAINABILITY IN THE AUTO DEALERSHIP AND SERVICE INDUSTRY:

The auto dealership and service and maintenance industry faces several challenges when it comes to water consumption:

1. Demand for Water: By the nature of the business, dealerships and service centers require large amounts of water for their operations. Activities like vehicle washing, cooling systems, equipment maintenance, and domestic consumption of water create a high demand that can strain the local water resources, especially in areas where drought-like conditions persist. On average, a car wash requires 180 liters of water. However, Toyota's Eco-Wash car service consumes just about 5% of the water as compared to traditional car wash. The Eco car wash method offers several benefits. It helps reduce water consumption and prevents soil contamination that often arises with the use of chemical products in conventional vehicle wash.

2. Quality of Water: When it comes to tasks like

vehicle washing and cooling systems, the quality of the water affects the performance and outcomes. It is essential to maintain water quality by implementing additional filtration and treatment measures. This makes the process more complex and adds to the costs of operations. For example, in traditional car washing soft water is required to uphold service quality. Impurities, sediment, and minerals in substandard quality water would bind to the chemicals used in car washing and lead to a significant loss in the quality of the service. A water treatment plant adds to the cost of operations.

3. Regulatory Compliances and Environmental Impact: There must be strict adherence to the regulatory requirements when it comes to water consumption as well as the discharge of wastewater. If there is failure to comply with the regulations, it may result in fines and penalties, loss of license, and damage to the brand's reputation. Improper water management has an adverse impact on the environment- water pollution, habitat destruction, and ecosystem degradation. It is essential to minimize environmental impact while maintaining the standards of operational efficiency. For eg. The National Water Policy of 2012 calls for recycle and reuse of water, a refund for properly treated water, and heavy fines for polluted effluents.

4. Seasonal Variability: Water consumption patterns fluctuate seasonally. Hot weather conditions require more water; industrial and domestic water usage at dealerships and service and maintenance centers increases substantially in the summer months. In India, unreliable monsoon seasons also affect the availability of water. These fluctuations require effective planning of water usage and water practices which is quite challenging and requires flexibility, planning, and adaptability.

5. Increased Costs: There is a significant cost

involved for water consumption in dealerships and service centers. Procuring water requires significant funds depending on the water resources available. Implementation of water conservation measures also requires investments that might only show returns in the long term. Technology and infrastructure upgrades, employee training and upskilling, and water management facilities all require financial planning and prioritization.

Addressing these challenges not only requires technical expertise but also a holistic approach towards environmental stewardship. By proactively managing water consumption and implementing sustainable practices, the dealership and service industry can manage to mitigate risks and reduce operational costs while contributing towards a responsible and sustainable future.

POSSIBLE MEASURES:

By implementing the below strategies, auto dealerships demonstrate their commitment to sustainability and inspire positive change:

1. Dry Wash Campaigns: Dry washing campaigns involve cleaning vehicles without using copious amounts of water. Instead of traditional water-based washing, dry wash techniques utilize specialized products such as waterless car wash sprays that remove dirt, grime, and contaminants from the vehicle's surface. By eliminating the need for water-intensive washing this method conserves a significant amount of water. These dry-wash products are designed to minimize runoff and prevent harmful chemicals from entering water bodies.

2. Low-Flow Fixtures and Equipment: A low-flow fixture is a water-saving plumbing fixture designed to achieve water savings by having a lower flow rate of water. Low-flow fixtures reduce water usage by at

least 20% compared to standard fixtures. Lower water consumption translates to reduced utility bills for auto dealerships. This method of low-flow fixtures in faucets, showerheads, and toilets uses significantly less water compared to conventional fixtures.

3. Rainwater Harvesting: Rainwater harvesting involves collecting and storing rainwater for various purposes. Auto dealerships can capture rainwater from rooftops, parking lots, and other surfaces. This water can be used for landscaping and irrigation as well as domestic use with proper treatment.

Methods:

- **Catchment-** This method helps to collect rainwater from rooftops and direct it to storage tanks or reservoirs.
- **Conveyance System-** In this method they transport harvested water to designated areas where it gets collected for reuse.
- **Filtering-** This method helps to remove pollutants and debris from collected rainwater.
- **Storage Tanks-** Once this water gets filtered then it is ready to store and use.

4. Effluent Treatment Plant (ETP): Effluent Treatment Plant is a process engineered to manage and treat industrial wastewater for either reuse or safe disposal into the environment. This system operates in compliance with environmental regulations and purifies industrial effluents by eliminating hazardous pollutants. This helps to mitigate ecological footprint and plays an important role in promoting sustainable water practices.

GLOBE TOYOTA'S EFFORTS FOR WATER SUSTAINABILITY

As a leading auto dealership, we are committed to reducing our environmental footprint. We have implemented a range of water conservation strategies to minimize impact on water resources while setting new standards for sustainability.

1. Rainwater Harvesting: We have invested in state-of-the-art rainwater harvesting systems across our dealership facilities. This system captures rainwater runoff from rooftops and paved surfaces, storing it for various non-potable purposes such as landscape irrigation and vehicle washing. Since implementing rainwater harvesting systems, we have reduced reliance on municipal water sources by 40%, resulting in significant cost savings and a measurable decrease in water consumption.

2. Efficient Irrigation Practices: Recognizing the importance of responsible water use in landscaping, we have adopted efficient irrigation practices.

This includes the use of a drip irrigation system, soil moisture sensors, and native plantings to minimize water waste and optimize irrigation efficiency. By transitioning to efficient irrigation practices, we have reduced outdoor water usage by 30% compared to conventional irrigation methods, while maintaining lush and attractive landscaping throughout its facilities.

3. Water-Efficient Fixtures and Equipment: We have upgraded our facilities with water-efficient fixtures and equipment, including low-flow faucets, toilets, and dishwashers. These upgrades help to reduce water consumption in restroom facilities, service areas, and employee kitchens. The installation of water-efficient fixtures and equipment has led to a 25% reduction in water usage. This led to resulting in tangible cost savings and a more sustainable model.

4. Continuous Monitoring and Optimization: To ensure the effectiveness of water conservation efforts, we conduct regular monitoring and optimization of water usage. This includes tracking water consumption data, conducting audits, and implementing targeted efficiency measures to further reduce waste. Through continuous monitoring and optimization, we have achieved a cumulative water savings of over 50 million gallons since the implementation of its water conservation initiatives, underscoring the dealership's commitment to sustainable resource management.

CONCLUSION

In conclusion, the exploration of the link between sustainable practices and water conservation highlights the critical role businesses play in addressing environmental challenges. Through innovative strategies and proactive measures, organizations like ours demonstrate how sustainable practices can effectively mitigate water scarcity while promoting ecological balance. As we continue to witness the interconnectedness of environmental stewardship and corporate responsibility, it becomes evident that prioritizing water conservation not only preserves vital resources but also fosters long-term sustainability and resilience. By embracing sustainable practices, businesses not only contribute to a healthier planet but also pave the way for a more sustainable future for generations to come.



About the Author



Mr. Vivek Datta
MD-CEO of Globe Toyota,
a JCBL Group Company

Mr. Vivek Datta, is the MD-CEO of Globe Toyota, a JCBL Group Company. He is a graduate of Delhi University with a Postgraduate Diploma in Business Studies from IMT Ghaziabad and possesses a refined strategic management acumen. Over the years, Mr. Datta honed his skills through diverse experiences at The JCBL Group, showcasing proficiency in international business, manufacturing procurement processes, and excelling in sales. Mr. Datta further enriched his expertise through a short-term management program at IIM Ahmedabad. He also attained a Certificate of Mastery in Sales from Business Coach India. These cumulative experiences became pivotal in his contributions to leading dealership groups, steering them toward sustainable success.

Mr. Vivek Datta's journey reflects a seamless integration of academic knowledge and practical expertise, making him a professional capable of navigating complex business landscapes and driving sustainable growth.



Antarctica holds about 60% of the world's fresh water in the form of ice. If all the ice were to melt, global sea levels would rise significantly.

INSIGHTS INTO WATER SERVICES – A CASE STUDY

Sourav Daspatnaik, Managing Director, Swach Environment Pvt Ltd

PROJECT SNAPSHOT:

- The project is based on PPP model (Management Contract with Revenue Sharing).
- Concession Period: 15 years starting from November 2019.
- O&M of the existing 2 nos. 25 MGD capacity Water Treatment Plant.
- Repair and upgradation of existing facilities of WTP, 4 nos. Pumping Stations and UGR.
- Repair and maintenance of existing 180 Km transmission & distribution network
- SCADA implementation.
- 24x7 water supply to Industrial, Commercial, Municipal and Domestic customers.
- Bulk water meter installation for Municipal customers.
- Billing and collection of payments from the customers.

BRIEF DESCRIPTION:

Haldia is an important industrial town in Eastern India with a residential population of ~3.25 lakhs and presence of several important industries. Haldia is a center for many petrochemical & manufacturing businesses and is being developed as a major trade port for West Bengal.

Haldia Development Authority (“H.D.A.”) is the nodal agency for providing water supply to various categories of customers like industrial, commercial, domestic and municipal in Haldia.

PHED, Govt of West Bengal had set up a water

treatment facility of 20 MGD capacity at Geonkhali in 1992, which was augmented to 25 MGD in 2005-06. Further, in 2008 a new 25 MGD water treatment plant was constructed. Later the asset was transferred to H DA.

In July 2019 the project for Repair, Up-gradation, Operation & Maintenance and Management of the 50 MGD WTP under PPP model for a period of 15 years was awarded to Haldia Water Services Private Limited, the Consortium of Shristi Infrastructure Development Corp. Ltd., Swach Environment Pvt. Ltd. and Ion Exchange (I) Ltd.

The key responsibilities of the HWSPL would be repair, up-gradation, operation and maintenance, and management of the Haldia Water Supply System including billing and collection of water charges from the customers, with water supply from Hooghly River, with all pumping stations, electrical installations, existing and new WTPs, connecting pipelines and distribution system including cost of all materials, power and labour at Haldia, Purba Medinipur.

PROFILE OF PROMOTERS OF HWSPL:

IHWSPL is a consortium of Swach Environment Pvt. Ltd. and Ion Exchange India Ltd.

Swach Environment Private Limited (“Swach”): Swach is one of the few companies of India, having the capability to Build, Operate & Maintain water utilities on a 24x7 basis, catering industrial, commercial, municipal & domestic consumers to contribute towards building a “water positive footprint”.

The Company operates in various areas under environmental infrastructure with unique business models under PPP viz EPC with O&M, BOOT, DBFOT, BOT and Hybrid Annuity.

Besides the HWSPL project, the company is involved in the following projects:

Nangloi Water Supply Project – One of the largest water supply system in India of 40 MGD water treatment plant with a distribution network of over 1600 km serving 1.2 mn population. Technical, financial, operational and management services for water plant of Nangloi Water Services Pvt. Ltd.

Jal Jeevan Mission Projects – To set up water supply network and ensure tapped water to rural households. Construction of rising mains, overhead tanks and pipeline networks, sinking of tubewell.

Namchi Smart City Project – Development of 24x7 Water Supply Network, Renovation of existing pipeline & Reservoir, Smart Metering in Namchi Smart City, Sikkim.

Delhi Jal Boards Haiderpur Project – Rehabilitation, Operation & Maintenance of 16 MGD Recycling Plant & WTP at Haiderpur, Delhi.

Ion Exchange (India) Ltd. (“IEIL”): IEIL formed in 1964 is a pioneer in water, wastewater treatment and environment solutions and caters to various industries, homes and communities and a one stop shop water solution’s provider in Asia. The Company is listed in BSE with a market capitalization of INR 3,454 crs.

The company has six manufacturing and assembly facilities across India and one each in Bangladesh and UAE.

The company has a very strong focus in Research & Development and has a well-established R&D since 1965. It has successfully made over 50 patents and commercialized over 100 products. One of the brand-Zero B has been awarded four times in a row as the most preferred RO Brand.

The company has supplied more than 30,000 plants in India and abroad, of which over 400 installations has been done at thermal and nuclear power plants, fertilizers, refineries, petrochemicals and other industries.

IEIL has expertise of working with following projects:

- Liquid Waste Management for leading customers in Chemicals (Gujarat Flurochemicals Ltd. – Dahej)
- Petroleum & Refinery (Reliance SEZ – Jamnagar & Reliance KGD6 Basin – Kakinada, Andhra Pradesh)
- Automobile (General Motors, Maruti-Suzuki), Infrastructure (4 MLD STP – Hebbal Lake Development - Bangalore)
- Food & Beverages (Heineken, UB, Green Field Project – Hyderabad)

PROJECT FEATURES:

- Area covered: Haldia city of about 11000 hectares spreading across 5 assembly constituencies.
- Population served: Over 325,000 populations with bulk water supply to Municipal Corporation which serves around 50,000 household connections.
- Customers: Domestic, Commercial and predominantly over 80 Industries viz. Haldia Petrochemicals, Indian Oil Corporation, MCPI, Tata Power, Hiranmayee Energy, Emami Agro, Electro Steel, Kolkata Port Trust etc.
- Industrial Coverage: Serving more than 80 various types of industries, supplying about 27 MGD of water, which is about 85% of daily demand of water supply, which also caters to over 100,000 people who are working in such industries.

HIGHLIGHTS OF THE CONCESSION AGREEMENT:

Asset handed over to HWSPL on November 1, 2019, for a period of 15 years. HWSPL shall continue to be the exclusive and dedicated operator as there is no other perennial source of water in Haldia.

FEES PAYABLE TO HDA:

Upfront one-time non-refundable and non-adjustable fee of Rs. 8.00 Cr payable on signing of Concession Agreement towards the right of the concession, refundable in case of termination due to a force majeure event, HDA event of default.

Performance Security of Rs. 20 Crs. in the form of guarantee of Scheduled Bank/ PFI to be issued before takeover / compliance date.

Fixed Annual License Fee of Rs. 24 Crs. payable in equated monthly instalments.

65.50% sharing of incremental revenue for water sales beyond 4.47 Cr kl p.a. (27 MGD) payable at the weighted average water tariff at the end of each concession year.

50% sharing of incremental revenue due to increase in water tariff for Industrial and Commercial incremental revenue beyond Minimum Water Tariff (5% increase p.a.) defined in the CA.

50% sharing of savings on power cost due to decrease in power tariff below the Base Tariff (4% increase p.a.) defined in the CA.

Take or Pay Clause: Contracts entered into by HDA with customers have “take or pay” clause, wherein, the customers are required to pay for minimum 50% of the contractual volume, at the prevailing water tariff, irrespective of the water consumed.

Revenue Collection: Revenue collection is over 95% predominantly from Industrial segment (>95%). However, in case of default in water payments for period of more than 120 days from the date of billing and HDA does not issue instruction for disconnection, HDA shall compensate the HWSPL for such amounts in default.

Minimum Water Tariff: Minimum Water Tariff defined for Industrial and Commercial customers with

an escalation of 5% p.a. at the end of each Concession Year. Applicable Tariff for Year 1 and Year 2 given below:

Customer Type	Year 1 (Per/kl)	Year 2 (Per/kl)	Year 3 (Per/kl)	Year 4 (Per/kl)
Industrial	18.35	19.27	20.23	21.24
Commercial	14.31	15.03	15.78	16.57
Domestic	5.96	5.96	5.96	5.96
Municipal	3.58	3.58	3.58	3.58

Threshold limit for Municipal & Domestic Sales:

Combined sales to the municipal and domestic sales beyond 0.99 Cr kl (6 MGD) shall be considered as sale under commercial tariff and the difference in rate is to be paid by HDA/ or adjusted against the License fees payable to HDA;

Repair & Upgradations Works: A list of Repair and Upgradation works defined in the CA to be completed within first 8 years of the Concession Period.

Service Area: There remains a restrictive clause on the existing and future customers to set up their own water treatment plant. Further, HDA shall ensure that new industries coming to Haldia are mandatorily required to purchase water from this water supply project.

Asset ownership to remain with HDA during the term, including any refurbishment or replacement of project facilities excluding any moveable assets installed to improve operational efficiency not transferred to HDA, all such amount invested by the SPV refundable in case of termination due to a force majeure event, HDA event of default.

Charge on Project Assets: HWSPL cannot assign or create any lien or encumbrance on the Project Facilities excluding creation of a security interest in favor of the Lenders on the grant of this Concession only, thereby giving them substitution rights.

Deterioration in raw water quality: Significant change in the raw water quality causing a failure to meet performance standards is covered through force majeure event under climate change. In case there is a need for repair and/or upgradation in the existing system to treat the poor water quality, the expenses shall be compensated by the HDA.

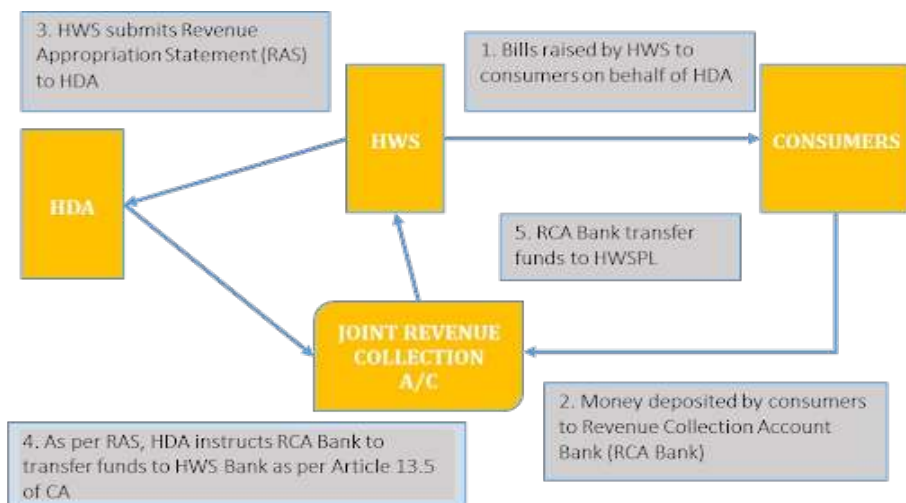


Figure 1: HWSPL Water Billing & Collection Cycle governed by Clause 11.5 of the Concession Agreement

- Billing within 5 days of the subsequent month as per meter reading & payment due date within 15 days of billing.
- Revenue from consumers (majorly Industrial consumers like Indian Oil Corporation, Haldia Petrochemicals, Tata Power, etc.) to flow into Joint Revenue Collection account controlled by HDA.
- Normal working capital cycle:
 - Power Bill from WBSedcl to be within 10th of the subsequent month.
 - 95% revenue collection by 20th day of the subsequent month.
- Revenue Appropriation submitted to HDA within 25th of the subsequent month and funding into HWSPL account after deduction of Fixed License Fee by end of the subsequent month.
- Payment for contractual manpower, chemicals, stores and spares within 5th of the following month after revenue appropriation.
- Amounts not received after monthly collection are pursued by HWSPL with regular reminders and follow-ups. If amount is still outstanding after 120 days of the billing, then such amounts shall be due from HDA under Clause 13.5 of the Concession Agreement.

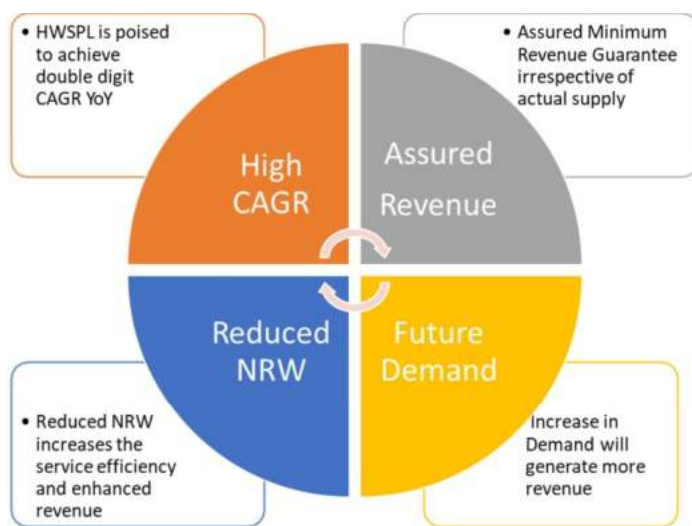
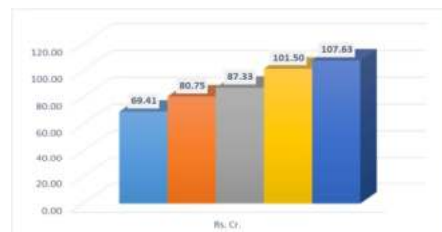
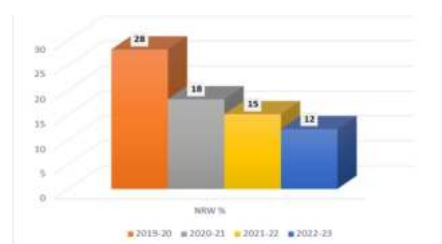


Figure 2: HWSPL Competitive Advantages

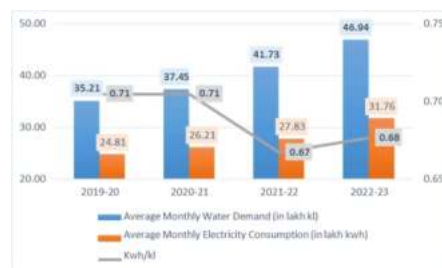
GROWTH IN REVENUE:



NRW REDUCTION:



IMPROVEMENT IN WATER CONSUMPTION AND POWER EFFICIENCY:



Such PPP projects to upgrade, rehabilitate, rejuvenate and operate and maintain such assets are the order of the day and must be explored for similar utilities to bring in cost efficiencies and effective delivery to end users and at the same time help the owners monetize the assets and prevent cost escalation and asset deterioration as well as recurring costs by ULBs and Govt bodies. Counter party risks play a vital role in ensuring bankability of such PPP projects.



The average person in the United States uses about 80-100 gallons of water per day, considering activities like flushing toilets, washing dishes, and showering.

 About the Author

Sourav Daspatnaik
Managing Director,
Swach Environment Pvt Ltd

During his professional career spanning over 35 years, he has worked with leading organisations such as Tata Motors, Jamshedpur, Tata Steel Ltd, Mercer HR Consulting. He is the one of the founding members of National Water Alliance of India supported by Industry bodies and part of the India-Israel Innovation Bridge for commercially developing technologies thru start-ups. He has proven track record of building businesses along with operational excellence.

Daspatnaik has worked closely with different Governments both states and Central Government in India to put clean drinking water and waste water as the main agenda on the table for industry and Society. He has been a thought leader in the space of Water and Waste water and developing Indian and Global partnerships.

In the recent past, Daspatnaik has served as Chairman, Skill Development Task force and Co-Chair Infrastructure Committee of Bengal Chamber of Commerce and Industry and national board member for the National HRD Network, an apex body for human resources professionals. He was a founder director of the Indian Iron & Steel Sector Skill Council, under the NSDC. He has played a vital role in the launch of the India-Myanmar Solar Energy Forum and India Myanmar Trade & Commerce including Border Trade with a view to strengthen the bilateral trade ties between the two governments and people.

Daspatnaik has a bachelor's degree in mechanical engineering from the Birla Institute of Technology, Mesra, Ranchi and holds a master's degree in operations management from the Stevens Institute of Technology, New Jersey, USA.



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ODOSERVE - ODOUR CONTROL HIGH PRESSURE AUTOMIZATION SOLUTION FOR FISH PROCESSING PLANTS ODOURS

Ajinkya Brahmane, Asst. Manager After Sales Services, Amalgam Biotech, Pune

Monika Singh, Sr. Application Engineer, Amalgam Biotech, Pune

1. BACKGROUND:

This company was established in seventies, it's the first Surimi plant in India. Company has expanded their business globally i.e. Hong Kong & USA location.

Fishmeal production capacity -

Gujarat: 10,000 MT / Year

Maharashtra: 16000 MT / Year

Karnataka :8,000 MT / Year

Total Production Capacity: 34,000 MT / Year

They have expanded with new-crab stick line. The company has global consumers with decades of trust & stringent quality norms.

2. CHALLENGES:

The fishmeal processing industry often faces a significant challenge when it comes to managing unpleasant odours coming from both the processing unit and the surrounding areas. This issue stems from the nature of the raw materials and the processes involved and it can have various negative consequences.

Processing Unit Odour: Within the fishmeal processing unit itself, the problem of bad odour is primarily caused by the decomposition of fish waste and residual matter. The breakdown of proteins and

other organic compounds during cooking, pressing and drying processes releases noxious odorous compounds such as amines, ammonia and sulphur compounds. This not only creates an unpleasant working environment for employees but can also impact the quality of the final product & surrounding society.



3. SPECIAL TECHNICAL SOLUTION:

Project Contributors visited the site to provide technical solutions for the bad odour problem. Based on the similar challenging situation handled, suggested to install engineered piping system for automization of product -OdoServe-Odour Control.

Automization system installed in processing & scrubbing area. High pressure Automization system consisting of pumps, ultra fine nozzles and automation panel suitable for 1000 m² surface area. System suitable for 8000 m³ of contained mal odorous gases.



4. PROJECT CONTRIBUTORS:

Monika Singh	Application Specialist	Conceptualization & Process Design
Yogesh Kulkarni	Head-R&D	Development of OdoServe for Fish Processing Odours
Ajinkya Brahmane	Head-Service Dept.	Project Commissioning
Shlok Salvi	Technical Sales Engineer	Project Installation

OdoServe- Odour Control is a unique product with special ingredients that neutralize offensive odours including ammonia (NH_3), hydrogen sulphide (H_2S), volatile organic acids like aldehydes, ketones, organic acids, mercaptans. Since OdoServe is organic, it is not harmful to humans ecosystem.

Analyzed the odour throughout the course of trial days and then optimized the dosage of odoServe chemical to 4.6 lit/day.

5. EXECUTIVE SUMMARY:

Amalgam Biotech offered an innovative solution for mitigating odours from fishmeal production industry.



We have engineered technological solution & employed a high-pressure automation system in combination with the organic odour control solution "OdoServe" derived from plant sources, ensuring its complete safety for human health. This system is strategically applied to target areas with foul odour emissions.

Our approach includes optimization to assess the OdoServe's odour-neutralizing efficacy while minimizing usage and energy consumption by the pumps. Amalgam Biotech specializes in providing comprehensive odour control solutions for process industries, focusing on reducing water, electricity, and chemical consumption.

Amalgam Biotech had Successfully Installed Automation System Which Worked Excellent with OdoServe-Odour Control!!



About the Author



Ajinkya Brahmane, an Assistant Manager After Sales Services at Amalgam Biotech, has spent 14 years pioneering solutions in water and wastewater treatment. He played a crucial role in developing OdoServe, a high-pressure misting system aimed at neutralizing odorous gases, showcasing his commitment to addressing environmental challenges.

Ajinkya Brahmane
Asst. Manager After Sales Services, Amalgam Biotech – Pune



Monika Singh holds a Bachelor of Technology degree in Chemical Engineering from Bharati Vidyapeeth (2016-2020) with an impressive 9.4 CGPA. She has been an Assistant Manager Engineer at Amalgam Biotech for the past 3 years, specializing in wastewater treatment, solid waste management, bioremediation, and odour pollution projects. Monika is a skilled technical expert with a passion for using biotechnology to address environmental challenges. She has successfully executed projects, including troubleshooting STP/ETP, conducting site visits, commissioning wastewater treatment plants, and implementing odour-neutralization solutions. Monika has received recognition as the 'Best Performer' in numerous projects highlighting her dedication and proficiency in her field.

Ms. Monika Singh
Sr. Application Engineer, Amalgam Biotech – Pune

ULTRASOUND BASED SILENT SOUND THERAPY FOR ALGAL BLOOM PREVENTION AND WATER QUALITY MANAGEMENT

Dr. Aditi Mullick, Prasinos Tech Innovations Pvt. Ltd.

Dr. Anupam Mukherjee, Prasinos Tech Innovations Pvt. Ltd.

Dr. Sobhan Ghosh; Process Research Consultant, Managing Innovation

INTRODUCTION

Water, which was perceived as a plentiful resource until the last century and the notion of conserving or reusing water was not given much serious consideration, moving towards the latter part of the preceding century, this perspective began to shift. Presently, water is recognized as one of the most crucial resources in both industrial and domestic sectors. While there is significant emphasis on purification and treatment for recycling or reuse, insufficient attention is often paid to maintaining water quality parameters, particularly concerning bacterial and biomass/algae growth during storage. Controlling these parameters (biomass/algae and microorganisms) is essential depending on the intended use of stored water.

Furthermore, Bloom-forming cyanobacteria, commonly referred to as blue-green algae, present a significant threat to both inland waters and estuarine environments when left unaddressed and this Harmful algal blooms (HABs), though occurring naturally, have witnessed a troubling surge in occurrence across lakes, reservoirs, and oceans in recent times. This global escalation of HABs, driven by harmful algal species, has evolved into a significant environmental concern. They have adverse effects on aquatic ecosystems and public health leading to fish

mortality, animal deaths, human health risks, and disruptions in food and water supplies. The increase in the frequency, severity, duration, and geographic spread of these blooms correlates closely with the rise in CO₂ levels and global temperatures. Increasing global temperatures, changing precipitation patterns, and more frequent and severe droughts collectively contribute to the spread of CyanoHABs. Prominent examples include the Bargi and Gandhisagar Dams in Madhya Pradesh, Ukai Dam in Gujarat, Stanley Reservoir in Tamil Nadu, and Chilika Lagoon in Odisha, as well as coastal waters along India's eastern and western coasts. A study conducted in 2012, which examined CyanoHAB occurrences in India, revealed a notable increase of up to 15 percent over the preceding 12 years. It is plausible to assume that the frequency of CyanoHAB occurrences in India has continued to rise since 2012.

In the industrial context, biofilm poses a significant challenge in water systems. It develops on the inner surfaces of storage tanks and can lead to complete blockage of pipelines, pumps, or filtration equipment if left unchecked. The formation of biofilm is a highly intricate process. Once it establishes a stable slimy foundation on the surfaces of storage vessels, it becomes a haven for bacteria growth, accumulating organic debris from the water to sustain microbial activity.

Consequently, it rapidly expands into a thick layer that can intermittently detach and obstruct water flow lines and pumps. Moreover, these biofilm deposits accelerate corrosion. Treatment typically involves chemical based routes such as coagulation, settling, and the addition of chlorine/ozone or specific chemicals. However, elevated levels of biomass or algae result in increased consumption of these chemicals. Conversely, preventing the formation and uncontrolled growth of biofilm poses significant challenges and expenses. Effective control of biofilm on cooling tower surfaces and sumps is crucial to prevent corrosion throughout the process lines and equipment such as heat exchangers, pumps, and filters.

ULTRASOUND: A CHEMICAL-FREE NON-INVASIVE WAY OF BIOMASS CONTROL

Ultrasound encompasses sound waves beyond the upper audible threshold of human hearing (20 kHz). At designated frequencies, these waves hold the capacity to manage algae growth. For a considerable time, it has been recognized that ultrasound possesses the ability to eliminate microorganisms and algae in water. Nonetheless, the widespread adoption of ultrasound technology has been hindered by its substantial energy requirements and challenges in technical feasibility for large-scale implementation.

However, in recent years, this chemical-free, environmentally friendly solution has been garnering increased attention owing to its straightforward application, extended service life, and minimal maintenance needs.

There is a distinction between high-power ultrasound that causes cavitation and the low-power ultrasound. The first category system operates at high power, utilizing cavitation as its primary mechanism to effectively eradicate algae and microorganisms. However, it demands significant investment and energy. Typically, these ultrasound systems are installed within flowing water lines.

The second type of ultrasound devices operate on a fundamentally different principle compared to their high-power predecessors. They are characterized by simplicity and remarkably low power consumption. Operating at levels significantly below the cavitation threshold, these devices do not rely on cavitation to eliminate algae and microorganisms. Instead, they proactively inhibit the growth of these organisms. Unlike high-power systems, these devices are typically installed in static bodies of water. Through the continuous, gentle vibration of random multiple frequencies generated by the ultrasound system, these low-power devices effectively disrupt algae colonies, impeding their reproductive cycles, disturbing the float-sink cycle of cyanobacteria and preventing the formation of biofilm on surfaces. The straightforward installation process, minimal initial investment, low energy consumption, reduced maintenance requirements, and prolonged lifespan have contributed to a notable increase in the adoption of low power ultrasound devices in recent times. The emergence of low-power ultrasound systems for algae control began at the turn of the century, but it wasn't until the last decade that their widespread adoption took hold. With an escalating number of systematic reports detailing large-scale field trials across various regions worldwide, these systems have demonstrated their efficacy and cost-effectiveness. Initially employed primarily for algae growth reduction, it also quickly became apparent that these systems were highly effective in biofilm control as well.

The following section describes an advanced ultrasound based algae control system and its working mechanism followed by some field studies undertaken by Prasinotech Innovations Pvt. Ltd.

SWANCav: A SMART ALGAE CONTROLLER

SwanCav comprises a group of advanced ultrasonic algae control devices that efficiently eliminate algal biomass growth and prevent biofilm formation, completely replacing the need for algicides.

This significant contribution aids in the restoration of water bodies. With multiple models featuring varied configurations and specifications tailored to specific applications, SwanCav emerges as the premier solution for algae remediation across industries, large water surfaces, and smaller bodies of water.

It operates on the mechanism of very low power variable frequency ultrasonic wave that prevents the growth for both algae and microorganisms. The continuous mild vibration generated by the ultrasound system reduces the colonies of algae thereby interfering with their reproductive system and prevents the deposit of biofilm on the surface. Algae cells float in the water column in a vertical movement while accessing the sunlight from surface during day time and acquiring the nutrients from the bottom at night. With a varying frequency range as emitted from the submerged transducers, the ultrasound restrict their vertical movement by resonating with their frequency of vibration and cause damage to their reproductive mechanism without cell breakage. **Fig. 1** below shows how the sound wave emitting from the ultrasonic transducers are modulating the buoyancy of the algae cells and restricting their vertical movements whereas **Fig. 2** shows the pictorial view of SwanCav.

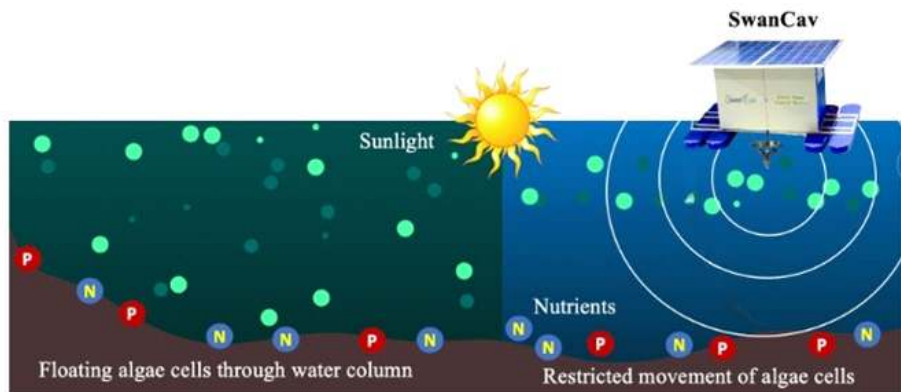


Fig. 1: Working mechanism of SwanCav

Understanding the science behind and the operating principles the smart buoy

The SwanCav comprises the following unique features:

- Multiple ultrasonic transducers covering 360 degree surrounding the buoy and emitting ultrasonic waves at a varying frequency range (20-60 kHz).
- Integrated solar panels for using solar energy as the power source with power storage and charge controller.
- Multiple water quality monitoring probes for in-situ water quality measurements.

- UV-resistive floaters fitted to the platform.
- Integrated anchoring facility.
- Integrated alarm system for security.



Fig. 2: Pictorial view of SwanCav

The major areas of applications of this device include:

- Recreational lake/large pon
- Industrial water storage
- Swimming pool/pond at golf course
- Aquaculture
- Municipal water storage
- Irrigation reservoir
- Hydroelectric dam

A CASE STUDY

Pimpri-Chinchwad is a city in the Indian state of Maharashtra. The city is about 15 km (9.3 mi) northwest of the historic city of Pune. Under Pimpri-Chinchwad Municipal Corporation, also known as "PCMC", Chikhali Sewage Treatment Plant (capacity of 36 MLD) plays a vital role in treating the sewage of the Pimpri-Chinchwad city mostly the raw water collected from Newale Wasti Pump House. Fig. 3 shows the overall process flow of the sewage water treatment which primarily uses Extended aeration process. Post treatment, the treated water is stored in a lake spanned over an area of 3.8 acres and used for recreational purpose, such as boating, gardening, and

other non-potable purposes such as cleaning, toilet washing etc.

- Decreased transparency,
- elevated chlorophyll content,

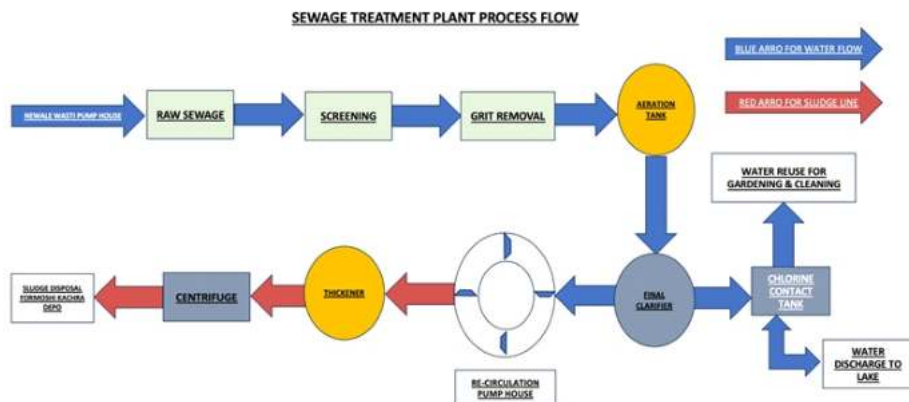


Fig. 3: Sewage treatment plant process flow at Chikhali

Table 1 shows the inlet and outlet water quality parameters from the treatment plant:

Parameter	Treatment unit- I		Treatment unit- II	
	Inlet	Outlet	Inlet	Outlet
pH	6.1	7.29	6.09	7.33
DO	Nil	2.5	Nil	2.7
TSS	140	9.0	142	8.5
COD	400	36	408	36
BOD	105	9.2	105	9.0
MLSS	3953		3870	

There are two treatment units in the plant and from both the units outlet, the treated water comes and is stored in the lake inside. Fig. 4 shows the schematic of the water body:

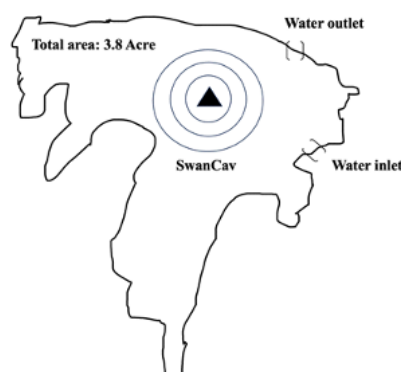


Fig. 4: The schematic of the water body

The primary challenge in restoring this water body was the frequent occurrence of algae and algal blooms, which not only marred its aesthetic appeal but also leads to:

- reduced dissolved oxygen levels or complete absence of it,

- Foul odors,
- Unsuitable for aquatic life.

Such a large and uneven water body is much prone to algae growth and accumulation. There is no practical way to control this except by manual cleaning. SwanCav is the only alternative solution to frequent cleaning. Also, despite attempting other conventional methods such as aeration and chemical algicides, the management sought a sustainable, chemical-free solution that wouldn't harm the environment.

Owing to that, a field trial was conducted with the advanced buoy - SwanCav for preventing algal blooms and restoring water quality in the water body.

Remarkably, visible improvements were observed within just one week of installation. After a month, significant enhancements were noted in terms of:

- Over 90% reduction in existing algae
- Complete elimination of algal blooms
- Increase in dissolved oxygen levels from 0.5 to 6 mg/L
- Reduction in Biochemical Oxygen Demand (BOD) to below 5 mg/L
- Minimal turbidity and chlorophyll content
- Elimination of foul odors
- Healthier aquatic lives and eco-habitats

Fig. 5 shows the changes in the water body after installation and Fig. 6 shows how the DO and BOD level of the water were varied throughout the study period:



Fig. 5: Change in waterbody after treatment

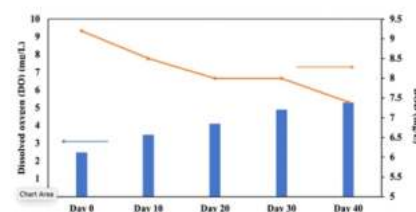


Fig. 6: Change in DO and BOD of the water during field testing

Also, Table 2 shows the improvement in water quality parameters:

Parameters	Day 0	Day 10	Day 20	Day 30	Day 40
Dissolved oxygen (DO) (mg/L)	2.5	3.5	4.1	4.9	5.3
BOD (mg/L)	9.2	9.0	8	8	7.4
Chlorophyll (mg/m3)	0.05	0.026	0.029	0.021	0.017
Turbidity (NTU)	0.5	0.1	0.1	0.08	-
pH	7.2	7.3	7.15	7.1	7.15

The observations are:

- Within few days after installation, some debris were found floating on the water surface generated from dead algae already present in the water body.
- After removing those debris, significant improvement was observed in terms of DO, pH and transparency of the water.
- The BOD level reduced from 9.2 to below 8 mg/L which is well within the State Pollution Control Board Limit.

Considering the Techno-economic analysis of SwanCav, it is completely solar power operated with battery back-up, the installation and maintenance cost is also minimal. Also no supervision is required. The system is indigenous and self operated.

SUMMARY & CONCLUSION

Utilizing advanced ultrasonic technology, the device which emits high-frequency sound waves is capable of disrupting algal cell structures, effectively inhibiting their growth and proliferation. By targeting algae at its source without the use of chemicals or harmful additives, this device offers an effective approach to water management. In spite of all, this technology is not yet grown or established in commercial scale due to various challenges such as high power consumption, high attenuation rate of the sound wave, possible unknown side effects on other aquatic lives over long exposure and difficulty to scale up. Alternatively, low power ultrasonic algae control devices offer an innovative solution to combat algae proliferation in various aquatic environments. By emitting low-frequency ultrasonic waves, these devices disrupt the growth and reproduction cycles of algae without harming other aquatic organisms. The gentle yet effective nature of these waves ensures minimal energy consumption while effectively managing algae blooms. Operating at low power levels makes them environmentally friendly and cost-effective alternatives to traditional treatment methods. These devices are versatile, suitable for use in ponds, lakes, and even wastewater treatment facilities, providing a sustainable approach to algae management while preserving the ecological balance of aquatic ecosystems.

About the Author



Dr. Aditi Mullick, a chemical engineer, is the Managing Director of Prasinos Tech Innovations Pvt. Ltd. She has worked in the field of sustainable water treatment technologies and material processing with a research experience of more than 10 years. Her domain of expertise include Ultrasound & Sonochemistry, Cavitation Technology for Process Engineering & Intensification.

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HYBRID COAGULANT FOR REMOVAL OF COLOR FROM TEXTILE INDUSTRY EFFLUENT

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INTRODUCTION:

Waste water generated in textiles and dye manufacturing industries is one of the most challenging effluents to be treated. The main reason is the high colour, chemical oxygen demand (COD), turbidity, dissolved and suspended solids [1-3]. Several treatment methods viz. adsorption, oxidation, membrane filtration, coagulation and flocculation are applied to remove dyes from effluent [4-6].

Coagulation is the most widely used technique due to its low cost and easy operation. Salts of Al(III) and Fe(III) have been conventionally used for treatment of coloured effluents. However, they face certain limitations, Fe(III) coagulants like FeCl₃ require large amount of lime for effective coagulation and maintaining pH, this leads to generation of huge quantity of sludge [7-11]. Second generation, coagulants like poly-aluminium chloride (PAC) and poly-ferric chloride (PFC) overcome these disadvantages up to a certain extent due to their polymeric nature and pH buffering tendency [12-14].

Organic coagulants like polyamine & poly-DADMAC, have been effective in replacing inorganic coagulants in effluent treatment (15-17). However, they are nearly 5 to 12 times more expensive than inorganic coagulants and are not efficient at removal of reactive dyes. These limitations have led to investigation of hybrid coagulants which overcome disadvantages of both organic as well as inorganic coagulants to a great extent (18-22).

In the present study, a hybrid coagulant is formulated and evaluated for removal of color, COD and TOC from actual textile processing plant effluent. The performance was compared to that of PAC with respect to Coagulant dose and pH.

MATERIALS & METHODS:

All the chemicals used for preparation of hybrid coagulants are commercially grade. Poly-aluminium chloride (PAC) giving 17 % alumina content and organic polymer were manufactured in-house by Grasim Industries Ltd., Vilayat.

CHARACTERIZATION OF EFFLUENT:

Effluent sample collected from textile (especially cotton) processing unit and analysed for different parameters.

Sr.No	Parameters	Results
1	Appearance	Deep Brownish Liq.
2	Odour	Obnoxious
3	pH at 30°C	7.48
4	Turbidity (NTU)	248
5	Conductivity(μsm/cm)	848
6	Total dissolved solids (ppm)	441
7	Chemical oxygen demand, (ppm)	1058
8	Total organic carbon, (ppm)	400

PHYSICO-CHEMICAL CHARACTERISATION OF HYBRID COAGULANT:

The coagulants taken for current case study were analysed for physico-chemical properties as shown in table 2. The effluent was mixed of different types of dyes.

Table 2: Physico-chemical characteristics of coagulants

Sr.No	Coagulant	pH(5 %)	Charge (meq / g)	Specific Gravity	Solid Content(%)
1	PAC	3.58	1223	1.3295	49.58
2	Incumbent Decolorant	3.21	1923	1.3421	44.99
3	VYTAL 625L	3.90	1742	1.3521	43.10
4	VYTAL 625H	3.81	1710	1.350	42.30

JAR TEST CONDITIONS:

800 ml of effluent was taken in a 1000 ml beaker and was placed in jar test apparatus (VELP Scientifica JLT 4). The jar test conditions were as follows: fast stirring at 200 rpm for 2 min after addition of coagulant, addition of anionic flocculant (APE-971), mixing at 60 rpm for 10 min for formation and growth of aggregates, settling for 15 min for clarification. The samples were then collected from 2 cm below surface and analysed for pH, residual colour, TDS.

Reduction in colour was calculated as follows:

$$\text{Colour Reduction (\%)} = \frac{\text{Initial color} - \text{Final color}}{\text{Initial color}} \times 100$$

EFFICACY TESTING ON EFFLUENT TREATMENT PLANT:

To assess the real-world utility of hybrid coagulant, a trial was taken on effluent treatment plant of a cotton processing unit at Jagadia, India and results were compared with conventional coagulant like PAC. pH of the effluent were adjusted using sodium hydroxide (5% wt.).

RESULTS AND DISCUSSION:

To evaluate the efficacy of different coagulants jar test was done. Dosage were optimized to achieve maximum reduction in color, COD as well as turbidity as shown in table.2

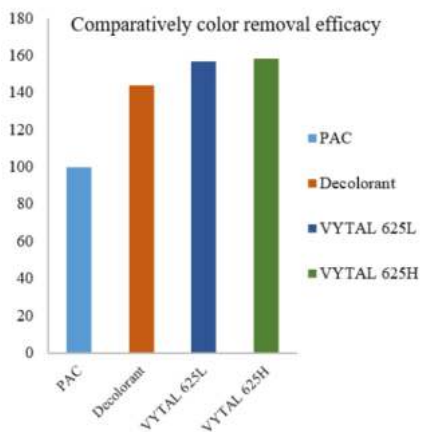


Table 3 Characteristic of treated and untreated effluent

Sr.No	Coagulants	Optimized Dosage (ppm)	pH	Turbidity (NTU)	COD (ppm)
1	Control	-	7.48	248	1058
2	Decolourant	900	7.10	42	705
3	PAC	1400	7.20	28	595
4	VYTAL 625L	900	7.11	27	588
5	VYTAL 625H	900	7.30	20	669

The above results clearly indicate that newly developed decolorant has excellent performance as compared to polyaluminium chloride. The color removal efficacy is 60% high than PAC. The performance of newly developed decolorant was at par with the existing decolorant in terms of efficacy but dosage was ~20% lower compared to existing decolorant. Similarly, dosage of newly developed decolorant was 35% less dosage than PAC. There was negligible impact on pH as compared to PAC. Floc size was better for VYTAL 625H as compared to VYTAL 625L as shown in Fig. 1.



Fig. 1 Treated effluent photo at optimized dosage

CONCLUSION

From the above study it can be concluded that the synthesized hybrid coagulant has following advantage over PAC as

- ~60 % higher color removal efficacy
- ~35% less dosage hence less sludge generation
- Less residual aluminium in the treated water due to less dosage
- ~ 20 % less dosage than incumbent decolorant
- Economical than incumbent decolorant

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About the Author



Dr. Hiten Mehta holds Master of Science in Organic chemistry and Ph.D. in Chemistry. He has 19 years of experience in industrial research. His expertise includes process development, Intellectual properties, regulatory guidelines for various regions of API, specialty chemical, personal care actives, Aluminium chemistry and applications focused product development. He has more than 20 patents and many research articles in national and international journals. He has presented papers, posters and research articles at various podiums.

Dr. Hiten Mehta



Mr. Amit Kumar holds Master degree in Chemical Engineering from IIT Roorkee. He is having 7 years' experience in speciality chemical for water treatment and oil & gas industries.

He is presently leading Industrial, new product and application development at Grasim Industries Limited.

Mr. Amit Kumar



Mr. Yogesh holds Master of science in Organic Chemistry, having 8 years of experience in organic synthesis along with Analytical chemistry in Bulk/ speciality Pharma/chemical industry. Presently working on Water treatment chemical synthesis.

Mr. Yogesh Thakare




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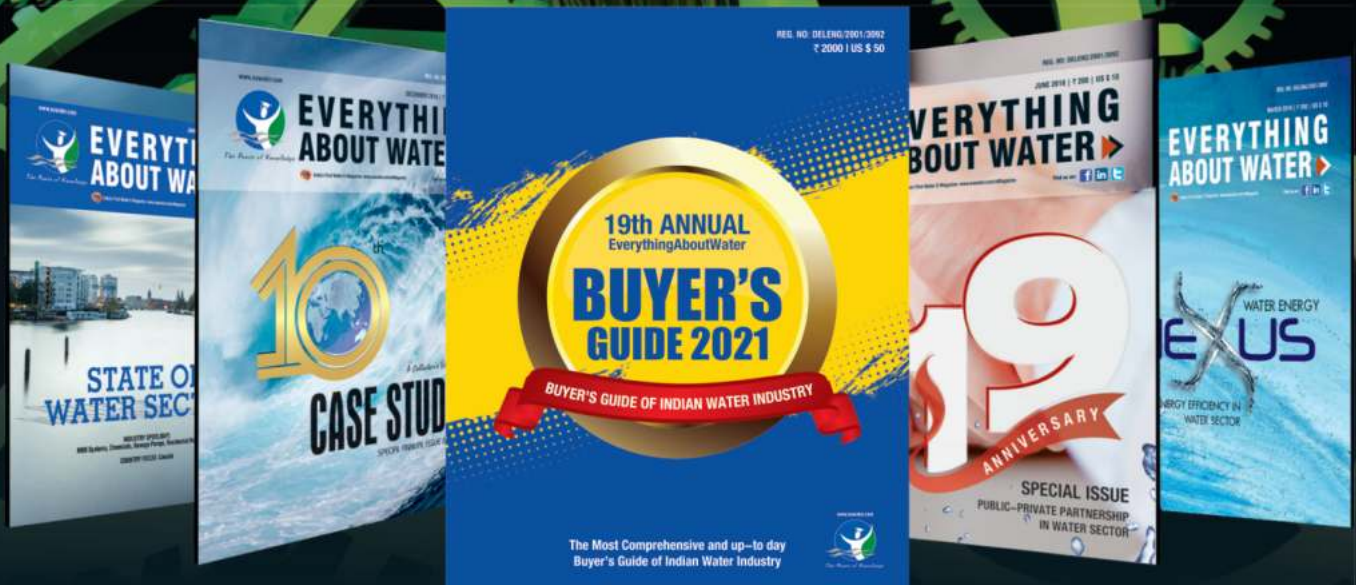
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GEOINFO SERVICES DESIGNS 24X7 PRESSURIZED WATER NETWORK TO PROVIDE CLEAN RELIABLE DRINKING WATER IN INDIA'S SACRED AYODHYA CITY

Neda Simeonova, Senior Product Marketing Manager, Water Infrastructure, Bentley Systems

OpenFlows Helped Save USD 1.5 Million in Annual Operating Costs and Eliminate 347 Tons of Carbon Emissions.

ESTABLISHING CITY-WIDE ACCESS TO CLEAN WATER

To provide continuous drinking water to emerging economies throughout the country, the government of India has implemented their AMRUT 2.0 program, mandating that all 3,000 utilities in 4,800 urban cities establish reliable, 24-hour water distribution and sewerage services accessible to all households. In accordance with this initiative, Ayodhya Authority appointed Geoinfo Services to engineer an urban pressurized water supply system to replace Ayodhya's existing gravity-fed distribution network. As one of India's most sacred and important pilgrimage sites where the floating population has reached [yearly] 24.2 million, there is an urgent need for a sustainable solution to the water and wastewater treatment, distribution, conservation, and management.

The scope of the project required Geoinfo Services to upgrade the city's intermittent, leaky, and aging network, which generates a 50% nonrevenue water (NRW) rate. They had to ensure the provision of safe and dependable drinking water through functional

taps to all Ayodhya homes. "The project envisaged to redesign the water supply system so that NRW can be reduced, and the existing system could be converted into a 24x7 pressurized piped water supply," said Sanjay Dahasahasra, a member of the government of India's National Task Force of 24x7 Water System. A revered, ancient destination city visited by millions every year, Ayodhya's new water supply scheme will significantly impact society and the region, establishing 24-hour access to clean water, reducing waterborne illnesses, and boosting the urban economy.

HIGH ENERGY COSTS, EXTENSIVE NETWORK, AND VOLUMINOUS DATA

Aligned with the government's AMRUT program, Geoinfo Services needed to implement direct pumping and increase the residual nodal pressure of the Ayodhya water network. "However, conventional constant speed pumps require high energy cost," said Dahasahasra. To avoid extensive energy consumption and cost, Geoinfo Services considered adopting variable frequency drives (VFDs) to operate pumps more efficiently and economically and accommodate the varying demands and pressures of Ayodhya's new pumped network during different periods throughout the year. Given the lack of legacy information available for piped and pumped water distribution in the city, as

well as the haphazard layout of the existing old pipelines, Geoinfo Services faced challenges modeling the large-scale network and digitally incorporating the new VFD technology into the hydraulic model.

Realizing that they needed a solution to model the existing large-scale network with hundreds of pipes and nodes, as well as develop scenarios to incorporate multisourced data and the pressurized VFD technology, Geoinfo Services explored various software options. Yet, these options failed to accommodate the extensive network size and voluminous associated data required to simulate and manage multiple digital distribution scenarios. "The software had a limitation of 400 pipes, and non-Bentley software does not have scenario management," said Dahasahasra. They also did not support the VFD-operated pumps. To address these challenges, Geoinfo Services needed advanced hydraulic modeling and digital twin technology.

GENERATING A HYDRAULIC MODEL AND DIGITAL TWIN

To transform Ayodhya's existing system into a dependable and energy-efficient network, Geoinfo Services turned to OpenFlows. They created 3D models of the city's 24-hour supply system,

introducing variable frequency control pumps to generate the required pressure at the nodes. OpenFlows WaterGEMS allowed hydraulic network modeling with an unlimited number of pipes and automated data integration within the model, enabling Geoinfo Services to easily generate digital analysis scenarios to obtain equal residual pressures at the tanks using the VFD pumps. “OpenFlows WaterGEMS has the capability of modeling VFD pumps. Using this, we would [see energy savings] of 1,082 million kilowatts per hour,” said Dahasahasra.

Using OpenFlows WaterSight, Geoinfo Services integrated data from the hydraulic model and Internet of Things (IoT) devices, as well as geospatial and consumer information, into a digital twin to provide real-time, cost-effective operations strategies. The performance data of the real-world Ayodhya water supply system is transferred into a digitized virtual reality, which is processed and made available to the network managers. With Bentley’s open, interoperable software, Geoinfo Services consolidated real-time critical information into an open, connected data environment, facilitating predictive analysis and actionable insight to optimize water management. “The digital twin of Ayodhya city is a virtual representation of its water supply system that spans its lifecycle. It is updated [with] real-time data, and uses simulation, machine learning, and reasoning to help decision-making,” said Dahasahasra. Having access to the digital twin allows Ayodhya’s utility engineers to observe measurements and analytically derive results, optimizing asset performance and

reliability for safe and continuous water distribution.

SMART WATER SOLUTIONS DELIVER SAVINGS AND SUSTAINABILITY

Bentley’s hydraulic modeling technology provided Geoinfo Services with the capability to model the innovative VFD pumps and design the transmission network to maintain equal and optimal pressures at each service tank. Working in a connected data environment reduced design time by 75% and optimized pipe diameters, saving USD 2.5 million. The new network is saving USD 1.5 million in annual operating expenses and USD 46,025 in annual energy costs. It also minimized the amount of land required for tank construction to save an additional USD 5.45 million in costs. At the same time, water losses will be reduced by 35%. “Before the start of the project, the NRW level was 50%, which will be brought down to 15%,” said Dahasahasra.

Generating a hydraulic model and digital twin, Geoinfo Services effectively converted Ayodhya’s water supply system into a 24x7 pumped distribution network, providing every city household with continuous access to clean drinking water, while reducing carbon emissions by 347 metric tons. Through smart water solutions, Geoinfo Services has eliminated the intermittent water supply and resulting negative social impact, addressing health concerns caused by leakages and poor-quality water. “With this project converted to a 24x7 system, health risks are averted,” said Dahasahasra.

Moreover, the digital twin facilitates virtual network monitoring with 95% confidence to improve decision-making and crisis management, mitigating emergency situations based on real-time data and analytics. Embracing intelligent digital engineering and urban water management workflows, Geoinfo Services has supplied millions of people in Ayodhya with the basic human need of clean water access, delivering a pressurized water system, built efficiently and sustainably.

PROJECT SUMMARY

Organization: Geoinfo

Services Solution: Water and Wastewater

Location: Ayodhya, Uttar Pradesh, India

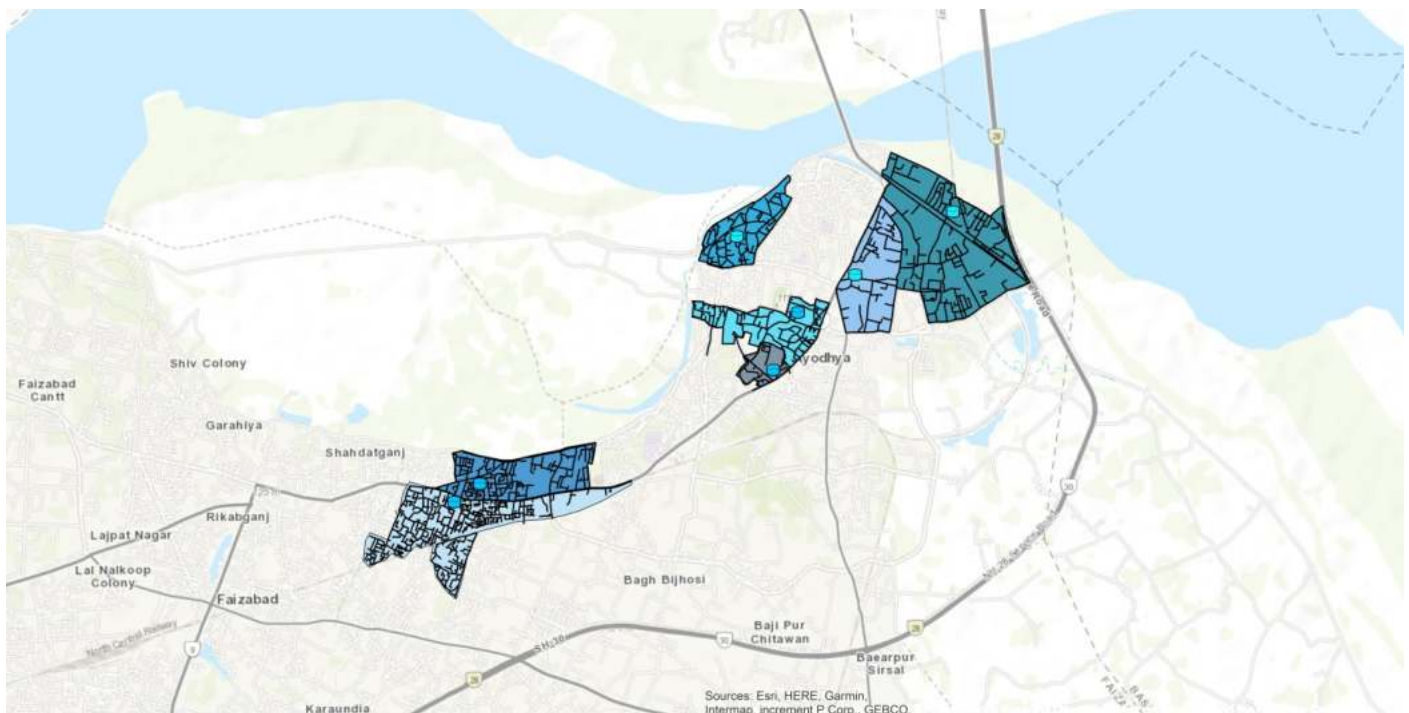
Project Objectives:

- To convert Ayodhya’s existing water supply system into a 24x7 pressurized, piped network.
- To generate a hydraulic model and digital twin of the city’s water infrastructure.

- **Project Playbook:** OpenFlows

Fast Facts

- Geoinfo Services converted Ayodhya’s gravity-based water distribution system into a pressurized network for uninterrupted access to clean water.



- Using OpenFlows helped evaluate design scenarios with innovative pumping technology to equalize pressure and reduce energy costs.
- Developing a digital twin facilitated real-time monitoring and predictive analysis to optimize operations and mitigate emergency situations.

ROI

- Leveraging Bentley's OpenFlows saved 1,000 hours planning, designing, and implementing a cost-efficient water supply solution.
- OpenFlows WaterGEMS' capability to model hundreds of assets saved USD 121.75 million in energy costs.
- The digital twin optimized pipeline diameters and network operations, saving 2.5 million in material costs and USD 1.5 million in annual system operating costs.
- The 24-hour water supply network reduces waterborne illnesses, saving 50% in associated family medical expenses.

Callout Quote: "This project removed fear of any epidemic and created confidence in people across the world." – *Sanjay Dahahasra, Member of National Task Force of 24x7 Water System, Government of India*



About the Author



Neda Simeonova
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Neda Simeonova is a senior product marketing manager, Water Infrastructure, at Bentley Systems.

She has been involved in the water, wastewater, and stormwater infrastructure industry for over 18 years, including as the former editorial director of Water & Wastes Digest, Storm Water Solutions, and Water Quality Products magazines where she focused on industry trends, technology advancements, and water policies.

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BIGGER, BETTER, STRONGER – DEVELOPMENTS IN INNOVATIVE PE100RC BLACK PIPE MATERIALS

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INTRODUCTION

In the Asia Pacific, Middle East and India, PE pipes have expanded their applications in a big way for water supply, industrial effluents, marine pipelines for desalination plants, corrosive chemical transportation, slurry transportation, city gas distribution networks and agriculture irrigation purposes. PE pipes are being preferred by designers and end users over ductile iron, cast iron steel, rubber lined metal, GRP/FRP and other conventional pipes. The successful track record of PE pipes especially for industrial applications like intake and outfall lines for desalination, thermal power and treated chemical effluent increases demand for large diameter and thick-walled pressure pipes. Tailor made solutions are required for high-pressure pipelines (>16 bars) requiring extra high wall thickness.

The engineering community has realised the value proposition of large diameter HDPE pipes due to higher flow design requirements and other desirable properties listed below:

- Production of large diameter pipes as per design and often with low SDR,
- High stress crack resistance material,
- Flexibility combined with Ring stiffness of pipe,
- Long term creep properties and excellent resistance to slow crack growth,
- Fatigue resistance,
- Meeting demanding installation methods – S Lay, HDD

- Sustainability and minimum Carbon footprint of PE piping material,

Large diameter PE pipe production facilities first started in the Middle East, Australia and Indian Subcontinent to meet challenging applications. Union Pipes Industry in Abu Dhabi was the first to set up plants for pipe sizes of 1600mm and 2000mm OD, while Jain Irrigation Systems Ltd., India built facilities for pipe production of from 1600 up to 2500mm. Production capabilities for pipe diameters up to 1200mm have increased significantly over the last 5 years. Producers in the Middle East region were ahead in acquiring large diameter pipe production facilities as scarcity of fresh water forced higher demand for desalination plants. These days, Middle East manufacturers are now planning for production of pipes >2600mm.

The changes in Global Standards helped in meeting industrial projects requirements. Some highlights include:

- EN12201-2011: Large Diameter of up to 2500mm
- ISO 4427-2019: Large Diameter of up to 3000mm
- MFR(I5) – Down to 0.15 gms/10 mins included to accommodate extra low sag material for large diameter pipes

Commercial examples: 3000mm x SDR 28 PN8 with 153.6mm thickness, 900mm x SDR 11 PN16 with 99.4mm thickness etc.

Lower SDR: SDR 6 and 7.4 for up to 25kg pressure rating (SDR is Standard Dimension Ratio = Outside pipe diameter / Pipe wall thickness).

The standard ISO4065 (Thermoplastics Pipes – Universal wall thickness table) was published in 2018 by ISO TC138 in a revised version to include higher diameters and wall thicknesses viewed as achievable by the industry, e.g., up to 3000mm pipe OD and up to 148mm in wall thickness. With pipe production stepping up to OD 3500mm extruded pipe, it indicates that the standard will gradually aim to reach the diameter of up to 3600mm and wall thickness of 171mm (SDR 21).

WHY THICK-WALLED OR LARGE DIAMETER PIPES?

Transmission of bulk water has led to an increased demand for large diameter pipes with a preference for HDPE PE100. SDR 17.6 is the most popular series. With pipe diameter >1600mm, the minimum thickness of pipe is >90mm. In chemical/industrial pipes, the need for lower SDR < 9 increased because of high temperatures of ~50°C, operating pressures >10kg/cm² and safety factor 1.5 for handling of critical fluids. However, the production of higher thickness pipes is still considered one of the biggest challenges in the industry. Achieving a uniform wall thickness distribution with existing tools and extrusion facilities is a critical issue. Production losses due to extra thickness over target in pipe cross section increase per meter pipe cost. The jointing of pipes with non-uniform wall thickness in field is also a big concern and may lead to failures.

Thus, there is a need for PE100 resins which can help with the production of PE pipes <SDR 9 for sizes >800mm and thickness >70mm with uniform thickness. Ease of production of large diameter pipes from very high molecular weight PE is an unmet need. These requirements can be met by tailored bimodal PE100 material characterized with better low sag properties (achieved through higher melt viscosity) and support from machinery development.

THE DEVELOPMENT OF HDPE RESINS, PIPE EXTRUSION, DIAMETER AND THICKNESS

In the 1990s, the extrusion capability of large diameter PE pipes ≥ 1600 mm and wall thicknesses of roughly 60mm were mostly limited in Europe, where pipes were produced using ready-made black pre-compounded HDPE PE80 resins. The extrusion constraints were comparative low due to low line speeds (meters/minute) which helped in processing and retained surface quality. The first ready-made black compounded, bimodal MDPE80 and HDPE80 materials started improving the output performance as those resins were tailored in terms of combining higher MW fractions, which avoided the sagging; and lower MW fractions working as lubricants, taking care of the Melt pressure and surface finish of the pipe. This was a remarkable step forward as the extruder manufacturer could focus on increased output rates while using a ready-made compound, ensuring a well-homogenised polymer with equal temperature distribution of the melt and lower average melt temperature. This resulted in faster extrusion as less cooling was required.

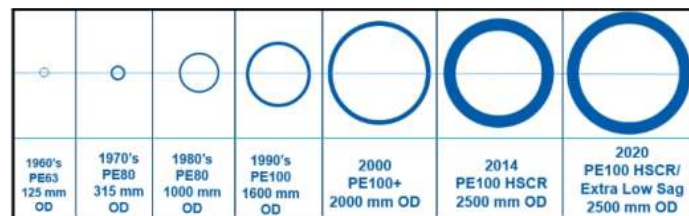
The introduction of PE100 resins enabled down gauging of the wall thickness at same pressure levels compared to PE80, leading to higher hydraulic capacity and the opportunity to run with higher line speed as cooling was easier with the thinner wall. Another option was to maintain or increase the wall thickness, thus increasing the pressure resistance properties that could now compete with other traditional materials in the pressure pipe market for water, gas and industrial applications.



(Photo Courtesy: Union Pipes Industries, Abu Dhabi)

Post 2014, the current state-of-the-art ready-made black or coloured PE100-RC compounds became new innovations, substantially increasing the resistance to slow crack growth (SCG), retaining resistance to rapid crack propagation (RCP) and further optimising sagging performance. The main benefit of PE100-RC pipes is very high resistance to scratches and indents, making them more suitable for demanding installation methods like Horizontal Directional Drilling (HDD), and other trenchless installation methods. These ready-made compounds ensure competitive pipe production of large OD/ thick-walled pipes at reasonable output rates. Additional line features like inner cooling with air or nitrogen are able to further support lower sagging and good output during the extrusion process.

Development of pipe size capability over the years supported by material/ machinery



THE DEVELOPMENT OF PE100 WITH HIGHER MRS

Improved Minimum Required Strength is important which will help to reduce wall thickness or increasing pressure rating for same wall thickness or increasing factor of safety for industrial application. The innovative PE 100 material achieve MRS 112 as per ISO 9080 and RC accreditation as per En1555.

THE DEVELOPMENT AND TESTING OF PE100 RC (RAISED CRACK RESISTANCE) MATERIAL



Accelerated Test Method	Test Condition	PE 100 RC
ANPT Accelerated notched pipe test	80°C, 4.6MPa Water-in Arkopal N100 110mm SDR11	>300hrs This correlates to 8760hrs (=1year) done in water-in water condition.
AFNCT (ISO 16770) Accelerated full notched creep test	90°C, 2% Dehyton PL 10mm square bar	>300hr at 5MPa >550kr at 4MPa
Strain Hardening, (ISO 18488) Crack Round Bar, (ISO 18489)	80°C, 300 micron dog bone Modified tensile test at 20mm/min 23°C, in air 14mm D rod 10Hz cyclic loading at 12.5MPa	SH modulus, Gp >53MPa >1.5 million cycles

Improved slow crack growth resistance is preferred choice for pipes in novel installation methods like No-Dig installation, eg Horizontal directional drilling, pipe ploughing, relining (Swagelining, sliplining etc).

POLYETHYLENE COMPOSITION FOR IMPROVED SAGGING AND EXTRUSION OF PIPES

In the manufacturing of large diameter pipes, one challenge is to maintain uniform dimensions all around the pipe. This is due to gravity flow of the polymer melt above softening point, causing it to flow from the upper part of the pipe to the lower part (often called "sagging"). Thus, the wall thickness at the upper part of the pipe becomes thinner than the lower part of the pipe. Sagging problem is particularly pronounced in thick-walled large diameter pipes. In order to achieve minimum required wall thickness of the pipe at 12 O'clock position, pipe producers land up producing pipes, which have thicker wall thickness in bottom half of the pipe. That leads to additional costs due to the unnecessary extra thickness and non-optimal final product quality. This can be practically eliminated by using Low Sag Pe100.

How does sagging affect the pipe?

- Produces pipes with an uneven wall thickness
- Increases ovality and offsets concentricity of the pipe
- Make producers life difficult to meet required wall thickness limits stipulated in international standards

- Forced to add extra thickness at bottom of the pipe, adding extra costs.

There is a need for special polyethylene compositions, which show an improved balance of low sagging behaviour and processability, to support large diameter pressure pipes with wall thicknesses of at least 100mm which can be extruded with existing lines and standard adjustments of die heads. The composition should also further show a good balance of mechanical properties and pressure resistance to meet PE100 requirements.

The present development of improved extra low sagging PE100 material relates to a polyethylene composition preferably consisting of:

1. Low sagging tendency with a high viscosity at a low shear stress, but also good processability and extrudability which can be seen from the melt flow rate MFR5 and seen in the rheological properties such as a higher shear-thinning index of the composition.
2. An improved balance of mechanical properties such as tensile properties and pressure resistance in the pressure pipe test.
3. These properties enable the polyethylene composition suitable for the production of thick-walled pipes, preferably with a wall thickness of 100mm or more, which are meeting PE100 standards, with existing extrusion lines and standard adjustments of die heads.
4. The invention with the specific property balance between density, MFR and viscosity at low shear stress provide not only low sagging behaviour but also highly advantageous mechanical properties and processability, as well as desirable resistance to internal pressure.

SOME TRENDSETTING PROJECTS IN ME AND INDIA REGION:



(Photo Courtesy – UPI)

Submarine pipeline in UAE : Zakum Development Company Ltd Submarine water Oil mixture disposal line linking Zirku Island with the ZADCO offshore water disposal platform. 560mm diameter and 80mm wall thickness (SDR 7).



(Photo Courtesy – UPI)

Cooling water supply pipes in UAE : Borouge Abu Dhabi Polymers Company. Discharge of 11700m³ per hour (4 x 2.8km), 1600mm diameter inlet pipes (6 x 2.3km), 1600mm diameter outfall pipes, In total, 25km of 1600mm pipes, produced in Abu Dhabi by Union Pipes Industry.



Nuclear plant pipeline: Kakrapar Nuclear Power Station NPCIL, (Gujarat)– Passive screen intake with air backwash with PE pipes. Upto 900mm pipe and tank sizes totalling about 10.4 kms. Replaced concrete tanks. Connection between tanks became very easy and reliable with welded joints.



(Photo Courtesy – COMACOE)

Seawater intake and outfall line: Bharat Heavy Electricals Ltd (BHEL): For cooling water requirement in thermal power plant. 2 x 800MW Capacity Udangudi Super Critical Thermal Power project, Tamil Nadu :2000mm OD x SDR 26 x 4.1km pipeline.

ADVANCED TECHNOLOGY

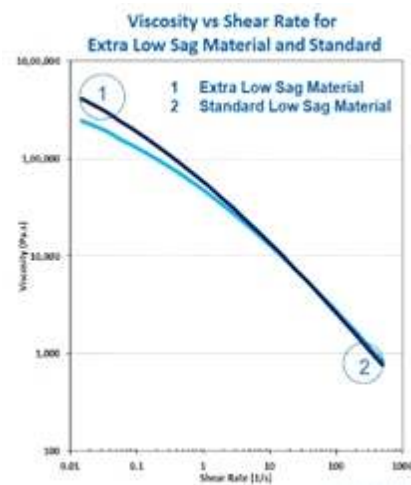
Proprietary Borstar technology that allows for the production of unique bimodal polymers that combine high strength with superior processability.

Product Design

- Extra low Sag PE100 designed with a tailored Molecular Weight Distribution to expand on its

sagging characteristic. The unique polymer design enables:

- A higher than regular melt strength (viscosity) at higher temperature and lower shear rates i.e. after the melt exits the die head
- The maintaining of normal viscosity values at higher shear rates i.e. during pipe processing



The PE Pipe industry is in quest for PE 125 (MRS 12.5). The certified MRS 11.2 development is first step towards achieving this goal. The PE material with MRS 11.2, raised resistance to cracking and extra low sag properties will help all stakeholders like pipe manufacturers, designers and consultants, installers and end user because of cost optimization in terms of unit cost of delivered water/fluid.

TRIALS RESULTS AND SUCCESS CASE STORIES:

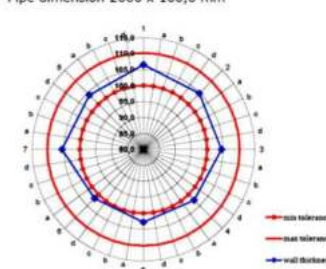
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Production Parameters

- 1) Extruder – solEX 120-40
- 2) Die Head – Helix 2600 VSI-TZ
- 3) Pipe Dimension – 2600 x 100mm
- 4) Through output – 1907kg/hour
- 5) Melt temperature – 191 OC
- 6) Melt Pressure 188bar
- 7) Wall thickness
 - a. Max. 106.5mm
 - b. Min 101.7mm
 - c. Delta 4.8mm
 - d. Medium 104.0mm

Wall-thickness distribution

• Pipe dimension 2600 x 100,0 mm



Muna Noor Manufacturing and Trading LLC, Oman

The trial was conducted for 1200mm x SDR 11 pipe with standard low sag material and extra low sag material. The trial clearly showed much better wall thickness distribution achieved with the extra low sag material.



(Photo Courtesy – Muna Noor Manufacturing, Oman)

Union Pipes Industry, Abu Dhabi

The customer conducted various trials and also used extra low sag material for pipe sizes ranging from 400 to 1600mm in diameter very successfully.

Three trials and commercial production were conducted and details are given below:
1600mm x SDR 13.6 (117.6 mm) x PN12.5, PE100, (OD observed Avg. 1607.3mm, Ovality 1.29 %)The commercial production was taken for the pipe which is not given in ISO 4427 as per end user requirement.



(Courtesy – Union Pipes Industries, Abu Dhabi)

Position	Thickness (mm)		Thickness (extra low sag resin)mm'
	Min	Max	
Top	117.6	138.7 (Special Application)	124.1
			123.6
Left			129.2
			121.0
Bottom			123.3
			130.1
Right			132.3
			122.3

The pipe was made easily using extra low sag material with very good internal and external surface.

The average weight of pipe achieved was 561.0kg/meter compared to minimum (525.4kg) and maximum (617.0kg).

1. Sea water pipeline for Prawn farm in Vietnam

Pipe Producer: Tien Phong Plastic (Tifoplast),
Project: Minh Phu Project at Vung Tau province.
Purpose: Sea water transportation into prawn farms
Pipe Sizes: 1200mm – 1600mm, SDR11 to 17

A durable pipeline with minimum maintenance costs to ensure stable operation of the prawn farm.



CHANGES IN POLYETHYLENE PIPE STANDARD TO KEEP UP WITH NEW DEVELOPMENTS:

Specification issues:

The Middle East region follows ISO 4427 standards and there was no issue in specification. However, pipe requirements for higher thickness/lower SDR pipes, which are not covered in ISO 4427 standards, is always a challenge.

On other hand, the Indian Bureau of Standards has set the IS 4984 : 2016 standard for PE pipes, with earlier limits up to 1600mm size, made amendment to accommodate pipe sizes up to 2500mm . Considering the upcoming production facilities and large diameter PE pipes projects there was need to make below changes:

1. Increase range up to 2500mm from 1600mm.
2. Lower the limit of MFR (I5) from 0.20 to 0.15 to accommodate extra low sag material along with inclusion of large diameter pipe.
3. Considering capability of recent improvement in PE 100 resins, extrusion equipment like die design, internal cooling systems and downstream equipment, the lower SDR pipes in complete size range of pipes. The changes have been accepted.

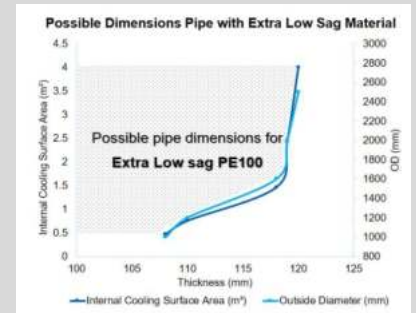
CONCLUSION

Improved MRS, Resistance to cracking and extra low sag material are the ideal choice of material properties for thick-walled and large diameter pipes.

The material is a “savior” for pipe converters while being an enabler for pipe designers and producers.

The graph on the left will help illustrate the relation between thickness, outer diameter and internal cooling surface area mm² across the trials and give an understanding of the processing.

With all the trials over past 5 years and commercial project execution, PE pipes manufacturing progressed in India, Asia pacific and Middle East regions with many processors invested in machine with diameter capability of 2000 to 2500mm. Simultaneously considering higher temperature, pressure and safety factors, requirements for pipes < SDR 11 have increased. The production of pipes with large diameter and higher thickness is no more a big challenge in the industry. The uniform wall thickness distribution, processability, optimization of production losses, jointing of non-uniform wall thickness in field were big concerns earlier. These requirements are being met by extra low sag Bimodal PE 100 Black readymade pipe compounds. The innovation PE 112 (MRS 11.2) pre-compound along with raised resistance to cracking (RC) will help industry to optimised wall thickness or go for higher pressure class/service temperature compared to standard PE100 (MRS 10.0).



ACKNOWLEDGMENT

Union Pipes Industry LLC, Abu Dhabi
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Muna Noor Manufacturing and Trading LLC, Oman
Battenfeld – Cincinnati
Tien Phong Plastic (Tifoplast)
Jain Irrigation Systems Ltd.
Sangir Plastics Pvt. Ltd.

REFERENCES

Trials at Pipe manufacturers.

KEYWORDS

Large diameter, extra low sag, pre compounded, wall thickness distribution.

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Prashant is Sr. Application Development Engineer – Infrastructure for Asia South Region of Borouge for past 10 years. An Agriculture Engineering graduate, Prashant did his post graduation in Irrigation & Drainage Engineering from GB Pant University in 1990. He also holds Diploma in Business Management and certification as Lead Assessor for Quality Management System. He started his career at Polyolefin Industries Ltd., Plastic Products division as Technical Service Engineer. Later he worked in senior positions in NOCIL, Dura-line Industries and Reliance Industries before joining Borouge. He has diverse working experience of over 26 yrs in various capacities in PE piping systems and Micro Irrigation in designing, product development & management, projects execution, production and quality control. He has contributed for preparing national standards on PE pipes and micro irrigation as an active member of BIS CED 50 committee. He is the winner of three Borouge innovation awards and had 3 international application patents.



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Srinivas Goud is Senior Manager – Market Development in Borouge Mumbai. He is responsible for marketing and development activities of Infrastructure business for Borouge in the Indian Subcontinent.

He joined Borouge in 2013 as a Sales Manager for the market development of PE/PP grades in Infrastructure business. He has 24 years of versatile experience in polymer industry from processing, machinery and polymers sales and marketing with leading organisations such as Reliance Industries, DGP Windsor, ITL (Nandi Group) & Indorama Polymers (in Africa).

Srinivas is a Mechanical Engineer from Osmania University, PG Diploma in Polymer Engineering from CIPET and PG Diploma in Supply Chain Management from XLRI, Jamshedpur.



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Chanchal is Application Marketing Manager (Infrastructure) for Borouge Asia South and is in charge of marketing of Borouge PE and PP Infrastructure products in Indian subcontinent.

A Chemical Engineer from Jadavpur University, Calcutta, Chanchal started his career at Indian Petrochemicals Corporation Limited in 1986, in Technical service and Application development for Polyolefins.

Since 2001, he is working for Borouge for market development of Borstar PE and PP grades for Infrastructure applications. He has presented papers in many international conferences, winner of Borouge innovation award on 4 occasions and have 3 application patents.




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Q: As an industry leader, what robust strategies can be implemented to ensure ongoing compliance of wastewater systems with both existing and upcoming regulatory standards, fostering sustainable and responsible operations?

A: In my opinion the following 5 step approach also known as the RITEC must be adopted RITEC stands for Regular monitoring of key parameters, Investing in latest Technologies, Training employees regularly, Engaging with pollution control authorities and Communicating with all stakeholders on ongoing basis

We at Superweld encourage and educate our customers to follow the above approaches and be compliant at all times

Q: In your experience, how do you balance the economic considerations of industrial water usage with environmental sustainability, and what innovative approaches have you employed to minimize water consumption and optimize reuse?

A: Economies that can be gained with water saving and reuse are well understood in the industry and we at Superweld develop innovative wastewater treatment products and techniques

1. We have developed technologies to make urinals water free and odor free
2. We have developed products to make STPS and ETPs perform better for example a 5-star hotel after using our products has been able to recycle 85% more water than before
3. We also guide our customers on the importance of optimization of their existing process whether it be a Hotel, a School or process industry like a textile mill or paper mill.
4. And last but not the least We also ask our customers to take early initiatives in

“educating the workforce” whether it be YouTube videos or reading magazines or attending webinars, EXPOs, the more the exposure the more easier will it be to adopt new water saving technology .

Q: In the dynamic field of biological wastewater treatment, what proactive measures can professionals take to stay abreast of the latest technological advancements and innovations, promoting continuous improvement in treatment processes?

A: That's a very interesting question and so is the answer

Firstly the owner, manager ,or a EHS head must refrain from a Overly cautions , conservative mindset. Only when we develop a risk taking ability and have a will to challenge the status quo New ideas and new technology can come into our doors . you will

a) stay informed to latest news, regulations , standards I keep visiting various wastewater treatment facilities and sometimes it surprises me that still many wastewaters professionals use Cowdung , UREA and DAP as a microbial sources where as I think we have come a far way from those conventional practices When the higher ups at an organization are open to change,

b) They network more,

c) Do inhouse RnD,

e) They invite companies to do pilot projects, demonstrations etc and this is how successful companies have adopted high end technologies like Biocultures, IOT sensors, sensor-based energy controllers, MBRs instead of clarifiers etc..

Q: Delving into financial aspects, what are the primary factors that influence the overall operating costs of a wastewater treatment plant,

and what optimization approaches can be adopted to enhance operational efficiency?

A: Primarily Major cost centres of a wastewater plant are factors like energy consumption, Chemical consumption, salaries and expenses of staff, Volumes of water being treated, Technology being used, but these costs can only be optimized if the plant is designed well ,and operate with a systems approach, I would like to explain this with a real life scenario There is a Municipal wastewater treatment plants know to us that is struggling to keep discharge levels within legal limits due to fluctuating incoming water volumes. This challenge forces them to spend lakhs of rupees daily on chemicals to adjust treatment processes constantly.

Now Here designing a larger collection tank for incoming wastewater could be a solution. This tank would act as a buffer, smoothing out fluctuations in water flow. With a steadier flow, the plant wouldn't need to adjust chemical use as frequently, potentially leading to significant cost savings.

Q: Exploring workforce management, what proven strategies can be employed to reduce labour costs in wastewater treatment plants without compromising operational effectiveness and employee well-being?

A: Consider this analogy, A wastewater plant is the battlefield where a war against wastewater is to be won. The labors, operators, technicians, engineers are our armed men

- They should must be fit and stay fit so their diet and workload must be monitored, they must know to how to help each other, so they must be well trained (regular training) on their jobs and cross-trained on indirect jobs,
- We should have the latest smart tools to measure daily parameters
- Software to automate repetitive tasks like sample collection, data entry, and equipment monitoring are need of the day.
- Well-laid written and pasted SOPs, Videos of how to troubleshoot must be available in internal portals, google drives etc..
- I think if the above is done regularly we can get impressive results.

Q: Given the increasing concerns about water scarcity, how do you prioritize water conservation

initiatives within industrial operations, and what role do water recycling and circular economy principles play in your approach?

A: Yes water conservation begins with a water audit

A water audit report gives us details as trivial as employee awareness, leakage points, faulty pipelines as well as current technology and current design, process flow etc.

Once the report is made, a water consultant must be engaged to plug the gaps, and find out best ways for water resource usage embracing circular economy principals and making necessary changes in the process where necessary.

I remember our visit to a kraft paper mill recently ended up in the installation of 2 DAF dissolved air floatation systems, these are fabricated machines to recover pulp and impurities in water, when originally the owners were skeptical of installing even one DAF system.

Q: In the context of climate change, how do you incorporate the management of industrial water systems to mitigate potential disruptions and adapt to changing hydrological conditions?

A: Industries can have become smart and efficient in the water is used, be it rainwater harvesting, irrigation of their factory premises, utilizing water for industrial process, they should maximize water reuse.

Water is just like a TShirt, you don't throw it, when it gets dirty, you clean it and wear it again.

Similarly if industries embrace this water reuse principle, they will be less dependent on outside events, and they will conserve every bit of water. Climate change seems to big to stop, but we can do our bit.

Q: Highlighting the crucial role of operator education, how does fostering awareness among wastewater

treatment plant operators about cutting-edge technologies contribute to effective asset management, and what initiatives can be enacted to elevate operator knowledge?

A: My friends are wastewater engineers and sometimes we joke about what job role did you write in your matrimonial profile (laughs..), because it is the hardest part for a wastewater engineer to describe the daily work they do.

They are acting chemists, plumbers, mechanical engineers, physicists, biologist at the same time.

- I feel in this industry experience must be rewarded more,
- consultants who have worked on critical projects must be welcomed regularly for seminars, mentorships.
- then there is immense knowledge in magazines like yours, on blogs, on youtube- we also run a channel by the name of Superweld Ecosolutions.
- Encouragement in terms of giving travel compensation for visiting events, expos must be done.

Q: Looking towards the future, what opportunities and challenges do you foresee in the Indian wastewater treatment market, and what strategic measures can be taken to navigate and capitalize on these dynamics for sustainable growth?

A: That a very good question indeed,

In India there is growing demand for clean water and for the infrastructure to treat water.

Governments are playing their role, but much more is needed. We need more schemes, more budget allocation for wastewater plants, we also drives for increasing O&M efficiency of the existing infrastructure.

More stringent Pollution enforcement is required and giving away water for free must be stopped immediately.

Having said that I also see a revolution brewing up in the Indian industry.

In India they veterans and industry owners are still conservative in spending money on wastewater treatment infrastructure but at the same time we have a many young entrepreneurs who are ready to take risks and develop new technology and products for the industry - this approach fosters the development of innovative products and techniques which have to perform in a tighter budget.

Our products like SUPER4 24, OXYSUPER are by products of a similar brew.

And so I am very bullish about the Indian wastewater market, I think we (our India wastewater industry) will set examples for world at large

Q: Lastly, What endeavours has your organization undertaken as part of its Corporate Social Responsibility initiatives to contribute positively to society?

A: We're a growing company with a focus on making it easy to treat complex wastewater, but we doing our small bits, like all washrooms at our office facility are waterless and use biocleaners, We keep our office cool by having a number of inhouse plants, We reuse water wherever possible, I think our biggest CSR is making products and spreading awareness about our products which can treat complex wastewater easily. Be it oil and grease digestion, ETPs, STPs provement, we are working with a range of industries like Paper, pharma, textile and so on

We say that

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Q: As an industry leader, what robust strategies can be implemented to ensure ongoing compliance of wastewater systems with both existing and upcoming regulatory standards, fostering sustainable and responsible operations?

A: In terms of regulatory standards and compliance, industries, apartments, all of them have been focused more on meeting compliance. The 'meeting compliance' part should change to commercial viability of any wastewater facility. The rules, norms have all started changing because of scarcity issues. So, I think industries have to adopt strategies on utilizing all available wastewater as the regulatory compliance will also force them towards meeting compliance and also it will become commercially viable for people to operate/manage any wastewater treatment facilities.

Q: In your experience, how do you balance the economic considerations of industrial water usage with environmental sustainability, and what innovative approaches have you employed to minimize water consumption and optimize reuse?

A: Industries who are using water from their borewells or from any municipal fresh water source are going to face difficulty in terms of sustainability as industries will be made to use recovered water. So we see a significant change in people adopting recovered water from apartments that can be used by industries near the apartments. So, things like that generally change. I think Bengaluru will be the pioneer in terms of activating this where we are already selling recovered wastewater from apartments to industries. So, unless otherwise we monitor/measure all the quantity of water coming into the industry and quantity of water going out of the industry, optimisation becomes

difficult so, first step in optimisation is to measure what has been drawn from borewell, what has been bought from the municipal supply and what has been recovered, then there can be strategies established. In variable measures we can put strategies to monitor and also economically make it viable for people to reuse water.

Q: In the dynamic field of biological wastewater treatment, what proactive measures can professionals take to stay abreast of the latest technological advancements and innovations, promoting continuous improvement in treatment processes?

A: In terms of wastewater treatment facilities, the recent innovation has been on monitoring the water quality, water quantity across various treatment processes. For example, in a biological treatment process, if efficiency of all the equipment like pumps, blowers can be monitored and run only when it is needed. If you don't need blowers to run where the dissolved oxygen in the water has already achieved a certain level and you don't need the blower, you should not operate. So, sensors for dissolved oxygen, sensors for various other parameters can be deployed to monitor/optimize the energy efficiency as well as operational efficiency of all the equipment running in the wastewater treatment facility.

Q: Delving into financial aspects, what are the primary factors that influence the overall operating costs of a wastewater treatment plant, and what optimization approaches can be adopted to enhance operational efficiency?

A: As we focus more on post treatment, we consider financial aspects in operating any wastewater

treatment facility. The predominant factor is manpower. So, there is a requirement of manpower for 3 shifts, so that can be reduced by automation where people don't have to put in 3 shifts. There is a significant cost implication in financial aspects that will all justify if we don't have to put manpower. The industry has to decide what sort of investment they will be able to make to reduce the manpower cost in any way in wastewater treatment facilities. If that is achieved then the unit economics will justify and it will become viable. The second major impact on the financial aspect is the power consumption of any STP. So all these need to be optimised and for optimisation, measurement is critical. People should know what is the energy consumption going to the current wastewater treatment facility then they will be able to validate if they can reduce the energy consumption.

Q: Exploring workforce management, what proven strategies can be employed to reduce labour costs in wastewater treatment plants without compromising operational effectiveness and employee well-being?

A: Until the operator's wellbeing is not taken into consideration in any wastewater treatment facility, it won't be able to operate efficiently. There has to be proper HVAC planning to be done to ensure that there is clean air in the region for the operator to operate the wastewater treatment plant. So, if the wellbeing is not there, the operational efficiency also takes a hit and the various other gases produced in the wastewater treatment plant will affect the operational wellbeing of the operator. However, to bring in viability, if we have value to the wastewater which is produced in the system then people will give importance to the operator's wellbeing as well.

Q: Given the increasing concerns about water scarcity, how do you prioritize water conservation initiatives within industrial operations, and what role do water recycling and circular economy principles play in your approach?

A: All cities of India will eventually have issues on water scarcity. The way we can combat water scarcity is to map wastewater generators with the demand wherever they require recovered/recycled water. So this mapping is critical. For example, there is an apartment complex in an industrial location, their wastewater can be mapped to the industrial water

requirement in that industrial area then this water scarcity issue comes down because freshwater demand will come down. Industries don't have to use freshwater for normal application and apartments won't have to dispose of their excess wastewater directly to the drain. So, this mapping is critical to manage water scarcity.

In terms of circularity in wastewater is possible only by both the industries and the domestic segment mapping. So, apartments can't use their entire wastewater within the building and industries don't have to depend on their own wastewater, they can depend on the next building's domestic wastewater which can be recovered. So, if this circularity is achieved within that region, it makes commercial sense and proper circularity can be achieved.

Q: In the context of climate change, how do you incorporate the management of industrial water systems to mitigate potential disruptions and adapt to changing hydrological conditions?

A: Climate change has to be looked at holistically. A few years ago we only looked at electric, now people have to start looking at it holistically. As one of my friend says, climate change is a shark, water is the teeth of the shark. So, water plays a critical role in climate change. If we are able to look at climate change holistically starting from the whole value chain, from the consumption patterns to the wastewater patterns to the freshwater patterns.

All these together will impact climate change, water cannot be separated from climate change, it is a part of climate change. Without that we cannot move any aspect of climate change.

Q: Highlighting the crucial role of operator education, how does fostering awareness among wastewater treatment plant operators about cutting-edge technologies contribute to effective asset management, and what initiatives can be enacted to elevate operator knowledge?

A: All the wastewater treatment management plants are managed by either unskilled or semi-skilled operators so there has to be a forum which is able to train. These forums could be the centralised water quality associations who can have courses conducted for operators or it could be STP operator's association or wastewater reuse associations or even Everything about water. Agencies like these can have operator training sessions which can be used by STP companies and I think agencies like these should scale up, have a team-charged people to train operators.

Q: Looking towards the future, what opportunities and challenges do you foresee in the Indian wastewater treatment market, and what strategic measures can be taken to navigate and capitalize on these dynamics for sustainable growth?

A: The challenges we see is the significant gap between the centralized infrastructure and decentralized infrastructure. So, when the government thinks they always look at centralized infrastructure, the central water treatment plant. They don't focus on decentralized infrastructure. With decentralized infrastructure, the pipeline network to manage the treated wastewater distribution, I see there is no network for the whole of our country and that is going to be a significant challenge. In terms of strategies which are implemented, for decentralized infrastructure, the drive has to come from the citizens of the city. In Bengaluru there are associations like Bengaluru Apartment Federation. They drive the change for decentralized infrastructure or wastewater treatment. So, that should be implemented across cities, the citizens should drive decentralized infrastructure.

Q: Lastly, What endeavours has your organization undertaken as part of its Corporate Social Responsibility initiatives to contribute positively to society?

A: Being a social enterprise, all activities which we do are socially impactful activities. So, as of today, since April we have recovered around 540 million liters of water. As a part of social responsibility, we are enabling the decentralized circular economy in wastewater in the city of Bengaluru, we are slowly moving towards Pune, Coimbatore, and Chennai.



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Q: As an industry leader, what robust strategies can be implemented to ensure ongoing compliance of wastewater systems with both existing and upcoming regulatory standards, fostering sustainable and responsible operations?

A: Danfoss emphasizes a comprehensive approach to ensure ongoing compliance of wastewater systems with regulatory standards for sustainable operations. Robust strategies include:

- **Zero Liquid Discharge (ZLD) and Minimal Liquid Discharge (MLD) Methods:** Danfoss' emphasis on the adoption of ZLD or MLD methods aligns with the company's commitment to sustainable operations and regulatory compliance. ZLD and MLD are ambitious wastewater management strategies that enable plant facilities to recover most of their wastewater for reuse, ultimately ensuring the conservation of water resources and environmental protection. These methods also help facilities meet existing and upcoming regulatory standards, showcasing Danfoss's proactive approach to adhering to environmental regulations while promoting efficient water usage.
- **Utilization of Advanced Water and Wastewater Solutions:** Danfoss' focus on advanced water and wastewater solutions reflects its dedication to extending water and energy resources while meeting regulatory standards. By leveraging these advanced solutions, Danfoss aims to ensure the complete usage of water resources, aligning with its sustainable operations approach. These solutions not only contribute to environmental protection through resource efficiency but also

developing and implementing technologies that support sustainable and compliant wastewater management practices.

Q: In your experience, how do you balance the economic considerations of industrial water usage with environmental sustainability, and what innovative approaches have you employed to minimize water consumption and optimize reuse?

A: Danfoss focuses on balancing economic considerations with environmental sustainability by employing innovative approaches to minimize water consumption and optimize reuse:

- **Implementation of Advanced Water and Wastewater Solutions:** Danfoss' strategic focus on implementing advanced water and wastewater solutions exemplifies its commitment to minimizing water consumption while optimizing reuse, thereby effectively balancing economic considerations with environmental sustainability. By integrating cutting-edge technologies in water management, Danfoss can enhance operational efficiency and reduce water usage within its facilities. These advanced solutions enable Danfoss to achieve significant water savings and maximize the reuse of water resources, showcasing the company's dedication to sustainable practices that align with its dual goals of economic efficiency and environmental responsibility. This proactive approach underscores Danfoss's commitment to achieving a harmonious equilibrium between economic viability and eco-friendly operations through forward-thinking initiatives in water conservation and resource optimization.

Q: In the dynamic field of biological wastewater treatment, what proactive measures can professionals take to stay abreast of the latest technological advancements and innovations, promoting continuous improvement in treatment processes?

A: In the dynamic field of biological wastewater treatment, Danfoss encourages proactive measures to promote continuous improvement in treatment processes:

- **Embracing Latest Technological Advancements in Biological Wastewater Treatment:**

Danfoss' proactive stance in promoting continuous improvement in treatment processes through the adoption of the latest technological advancements in biological wastewater treatment showcases its commitment to innovation and environmental compliance. By leveraging cutting-edge technologies in wastewater treatment, Danfoss can optimize treatment processes, enhance treatment efficiency, and ensure adherence to stringent environmental regulations. These advanced solutions not only improve the overall effectiveness of wastewater treatment but also demonstrate Danfoss's dedication to sustainable practices that prioritize environmental responsibility and operational excellence. This strategic approach underscores Danfoss's proactive efforts to stay at the forefront of technological innovation in biological wastewater treatment, leading to enhanced treatment outcomes while upholding environmental standards.

Q: Delving into financial aspects, what are the primary factors that influence the overall operating costs of a wastewater treatment plant, and what optimization approaches can be adopted to enhance operational efficiency?

A: The primary factors influencing the overall operating costs of a wastewater treatment plant include energy consumption, maintenance, and compliance costs. Danfoss focuses on optimization approaches such as:

- **Energy Consumption:** By reducing energy consumption in wastewater treatment, Danfoss aims to lower operational expenditure while promoting sustainable practices. This focus on energy efficiency not only minimizes

costs but also aligns with Danfoss's commitment to environmental responsibility.

- **Maintenance Costs:** Danfoss' emphasis on leveraging predictive maintenance technologies serves to optimize maintenance costs by ensuring efficient equipment maintenance. By utilizing predictive maintenance, Danfoss can proactively identify and address equipment issues, thus minimizing downtime, reducing maintenance costs, and enhancing equipment reliability and longevity. This proactive approach not only reduces operational costs but also contributes to the overall efficiency and effectiveness of wastewater treatment operations.

This strategic focus underscores Danfoss' commitment to driving operational efficiency and cost-effectiveness in wastewater treatment while promoting sustainability and environmental stewardship.

Q: Exploring workforce management, what proven strategies can be employed to reduce labour costs in wastewater treatment plants without compromising operational effectiveness and employee well-being?

A: To reduce labor costs in wastewater treatment plants without compromising operational effectiveness, Danfoss implements proven strategies such as:

- **Implementation of Automation and Digitalization:** Danfoss focuses on implementing automation and digitalization to streamline processes within wastewater treatment plants. By leveraging advanced technologies, such as sensors and intelligent computer control, Danfoss aims to optimize operational efficiency and reduce reliance on manual labor. This approach not only minimizes labor costs but also frees up human resources for higher-value tasks, thereby enhancing productivity while containing operational expenses.
- **Comprehensive Training Programs:** Danfoss offers comprehensive training programs designed to empower the workforce and enhance operational efficiency without necessitating a significant increase in manpower. By equipping employees with the knowledge and skills required to leverage automation and digitalization effectively, Danfoss ensures that the workforce can adapt to the evolving technological landscape, leading to improved operational

effectiveness and reduced labor costs over the long term.

These strategies underscore Danfoss' commitment to embracing technological innovation and empowering its workforce, with the goal of achieving sustainable operational efficiencies in wastewater treatment.

Q: Given the increasing concerns about water scarcity, how do you prioritize water conservation initiatives within industrial operations, and what role do water recycling and circular economy principles play in your approach?

A: Danfoss prioritizes water conservation initiatives within industrial operations by:

- **Adoption of Water Recycling Systems:** Danfoss is dedicated to encouraging the adoption of water recycling systems within industrial operations to minimize water usage and alleviate strain on freshwater sources. By promoting the implementation of innovative water recycling technologies, Danfoss aims to ensure the efficient reuse and repurposing of water resources, fostering a sustainable approach to industrial water management. These efforts not only demonstrate Danfoss's commitment to environmental stewardship but also contribute to the preservation and responsible usage of vital freshwater sources, aligning with the company's overarching sustainability goals.
- **Integration of Circular Economy Principles:** Embracing circular economy principles is a key aspect of Danfoss's approach to water conservation. By striving to develop and implement circular business models with its customers and suppliers, Danfoss actively participates in creating more sustainable industry practices. This approach includes transforming waste and wastewater into valuable resources and prioritizing closed-loop systems, thus reducing the overall demand for freshwater resources while minimizing the environmental impact of industrial operations. Through its collaborative initiatives focused on developing circular solutions, Danfoss continues to drive the adoption of sustainable water management practices, reinforcing its position as an industry leader committed to environmental responsibility and resource preservation.

Q: In the context of climate change, how do you incorporate the management of industrial water

systems to mitigate potential disruptions and adapt to changing hydrological conditions?

A: In the face of climate change, Danfoss incorporates the management of industrial water systems to mitigate potential disruptions and adapt to changing hydrological conditions by:

- **Resilience to Extreme Weather Events:** Danfoss focuses on developing water management systems that can withstand extreme weather events, such as heavy precipitation or drought, caused by climate change. By integrating robust infrastructure, intelligent monitoring, and control technologies, Danfoss aims to build resilience into industrial water systems, ensuring that these systems remain operational and effective even in the face of unpredictable and severe weather conditions. This proactive approach underlines Danfoss's commitment to anticipating and addressing the impacts of climate change on water resources and industrial operations, providing reliable and sustainable water management solutions.
- **Adaptation to Changing Hydrological Conditions:** With the recognition of changing hydrological conditions due to climate change, Danfoss endeavors to develop adaptive water management systems designed to address the evolving needs of industrial operations. By incorporating adaptable and flexible technologies, such as real-time monitoring and analytics capabilities, Danfoss seeks to enable industrial water systems to respond dynamically to fluctuations in water availability, water quality, and hydraulic conditions. This adaptability ensures that industrial water systems can continue to operate effectively even as hydrological conditions change, thereby contributing to the resilience and sustainability of water management in the face of climate change.

Q: Highlighting the crucial role of operator education, how does fostering awareness among wastewater treatment plant operators about cutting-edge technologies contribute to effective asset management, and what initiatives can be enacted to elevate operator knowledge?

A: Danfoss is dedicated to fostering awareness among wastewater treatment plant operators by offering comprehensive training and development programs. Through these programs, operators are equipped with

the knowledge and skills required to understand the latest technologies and best practices in wastewater treatment. This education contributes to effective asset management, empowering operators to optimize the performance of wastewater treatment facilities. The training programs ensure that operators stay updated with the advancements in the field, enabling them to make informed decisions and implement innovative solutions for efficient and sustainable wastewater treatment.

Q: Looking towards the future, what opportunities and challenges do you foresee in the Indian wastewater treatment market, and what strategic measures can be taken to navigate and capitalize on these dynamics for sustainable growth?

A: Danfoss foresees opportunities in the Indian wastewater treatment market, such as:

- **Leveraging Advanced Water Solutions for Growing Market Demands:** Danfoss recognizes the opportunity in the Indian wastewater treatment market to capitalize on the growing demand by leveraging advanced water and wastewater solutions. By implementing cutting-edge technologies and innovative processes, Danfoss can meet the escalating market requirements efficiently. This strategic approach not only positions Danfoss as a frontrunner in the industry but also enables the company to align with and surpass evolving regulatory standards in wastewater treatment.
- **Addressing Infrastructure Development Challenges and Regulatory Compliance:** The Indian wastewater treatment market presents challenges related to infrastructure development and rigorous regulatory compliance.

- To navigate such hurdles effectively Danfoss concentrates on strategic measures to enhance infrastructure capabilities and ensure compliance with regulatory requirements. By addressing these challenges proactively, Danfoss can position itself for sustainable growth in the Indian market. This approach demonstrates Danfoss's commitment to adapting to the regulatory landscape by implementing sustainable practices and driving innovations that align with changing industry standards, ensuring long-term success in the Indian wastewater treatment sector.

Q: Lastly, What endeavours has your organization undertaken as part of its Corporate Social Responsibility initiatives to contribute positively to society?

A: Danfoss has undertaken various Corporate Social Responsibility (CSR) initiatives aimed at contributing positively to society across multiple domains. Here are the endeavors undertaken by Danfoss as part of its CSR initiatives:

Integration of CSR with Business: Danfoss India has integrated CSR with its business operations to ensure corporate citizenship, sustainability, social responsibility, compliance, workplace safety, product safety, and environmental safety.

Community Engagement: Danfoss actively engages with the local community near its office locations. It contributes to the development of areas surrounding its campuses, particularly focusing on villages near its new campus. The company's initiatives aim to bridge the skill gap in the Indian Refrigeration & Air Conditioning industry, providing sustainable livelihoods and creating a trained talent pipeline.

Vulnerability Analysis: Danfoss formulated its CSR strategy based on global CSR policies, the UN Global Compact, and the India Companies Act 2013. It identified key challenges of the local community through interactions with regional authorities and conducted a pilot study to address community needs.

Contribution to Sustainable Development Goals (SDGs): Danfoss aligns its CSR efforts with the United Nations' Sustainable Development Goals. It focuses on SDGs related to clean water and sanitation (SDG 6), affordable and clean energy (SDG 7), sustainable cities and communities (SDG 11), and responsible consumption and production (SDG 12).

CSR Report: Danfoss publishes CSR reports detailing its sustainable projects and their impact on economic and social growth. The company aims to implement projects that have ongoing direct benefits for the local community.

Areas of Focus: Danfoss India's CSR initiatives focus on education, environment, health, and sustainable livelihood. These initiatives include supporting education initiatives, improving infrastructure in schools and training institutions, creating awareness about environmental sustainability, promoting a clean and safe work environment, providing healthcare infrastructure improvements, and facilitating vocational training for local youth.

Overall, Danfoss demonstrates a comprehensive approach to CSR, encompassing various aspects of social responsibility, environmental sustainability, and community development. Through its initiatives, Danfoss strives to make a positive impact on society while aligning with its business objectives and global sustainability goals.



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HOW TO EVALUATE AND SELECT AN OZONE GENERATOR

PART-2

CONTINUING FROM LAST MONTH

The solubility of Ozone in water is only partial and is governed by Henry's Law (the solubility of the gas in water is directly proportional to its partial pressure in the gas phase). Consideration of Henry's Law leads to the obvious conclusion that the higher the Ozone concentration the greater will be the solubility of ozone in water. The more ozone is dissolved in water the more effective it is as a disinfectant. It is therefore very clear that Ozone generated through UV radiation, not much of Ozone is available in the water for both Oxidation and disinfection. The following table explains:

Table ref. STOVER et al 1986

Temperature Deg. Cel	GAS PHASE OZONE CONCENTRATION (% w/w)					
	0.	0.1%	1% CD	1.2%	2%	3% CD
	UV-254 nm	UV 185 nm		CD		
	EQUILIBRIUM OZONE WATER SOLUBILITY mg/liter					
5 Deg Cel	0.007	0.74	7.39	11.09	14.79	22.18
25 Deg Cel.	0.004	0.35	3.53	5.29	7.05	10.58
30 Deg Cel	0.003	0.27	2.7	4.04	5.39	8.09

SOLUBILITY OF OZONE IN WATER (in mg/liter) AS GENERATED BY UV VS CORONA DISCHARGE

UV LAMPS USED

Most UV Ozone generators available today use 254 nanometers (nm) radiation. 89% of relative spectral energy of UV lamps are at 254 nm, and low of 218 nm. Maximum production of UV ozone occurs at 260 – 265 nm. Hence by using 254 nm UV bulbs, it is impossible to produce more than traces of Ozone.

CHICKS LAW

The disinfection process of ozone is governed by Chick's law. This law follows the CT Factor more commonly known as Contact time factor.

Just as antibiotics used have specific doses for different strains of Bacteria, and the minimum inhibitory concentration of that particular antibiotic in the blood will decide on the efficacy of the antibiotic, Ozone also has different CT factors for bacteria / virus etc. Therefore for effective Ozonation, CT levels are to be maintained if full benefits are to be achieved. Therefore the concentration/ and time factor is the most important in ozone disinfection, both of which are not achievable with UV ozone.

Air-borne Bacteria/ virus are more easily destroyed by ozone than water borne organisms. This is the precise reason why for air treatment ozone requirement is so very low.

MECHANISM OF ACTION

This is the most important difference. The ozone generated by UV ozone is immediately decomposed by UV radiation to form free Hydroxyl radicals. In aqueous solutions these Hydroxyl free radicals (OH⁺) are very powerful oxidizing agents. But the greatest disadvantage is that the half-life of these Hydroxyl radicals is in the order of MICROSECONDS compared to 22 minutes of Ozone. Consequently Ozone Generated by UV method cannot be expected to remain in solution for sufficient period of time to provide adequate disinfection, although chemical oxidation can occur. As a result UV produced Ozone is only remotely effective when it comes to air sterilization.

PLATE TYPE CORONA DISCHARGE METHOD OF OZONE GENERATION

The plate type Technology was first developed in Russia and has now been considered out dated. All over the world this plate type Technology has been superseded by the tube technology due to the following reasons:

The plates are usually connected to the high voltage wires by means of alloy solder. During the course of the Corona discharge formation, the system is at a very high-energy state and resulting also in significantly high temperature. This combination creates weakness in the solder and together with the reaction with the ozone produced at the critical phase, the joints break-up within a short time causing generator failure.

The other factor is that when air is passed through the parallel plates, the small width of the space between the plates would increase the resistance to the airflow that only a portion of the air is available for Ozone production.

ISSUED IN PUBLIC INTEREST BY
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ENCHANTING MYSTERIES: THE HESSDALEN LIGHTS ILLUMINATE LAKE HYDALEN'S WATERS



Nestled in the scenic landscapes of Norway, Lake Hydalén has become a haven for both nature enthusiasts and curious minds alike. Amidst its tranquil waters and picturesque surroundings lies a phenomenon that has captivated the attention of locals and scientists alike – the mesmerizing Hessdalen Lights.

As the sun dips below the horizon, Lake Hydalén transforms into an ethereal stage for the unexplained light phenomena that have become synonymous with the region. The Hessdalen Lights, a series of mysterious illuminations dancing across the night sky, have puzzled researchers for decades. These elusive lights, resembling floating orbs, have made Lake Hydalén a beacon of intrigue and wonder.

Scientists have long sought to unravel the mysteries behind these captivating lights, with theories ranging from atmospheric anomalies to extraterrestrial encounters. Yet, as the scientific community grapples with explanations, the allure of the Hessdalen Lights continues to draw visitors to the shores of Lake Hydalén.

One of the most remarkable aspects of this phenomenon is its recurring nature. The lights have been reported since the early 1930s, creating an enduring enigma that has become deeply ingrained in local folklore. Residents of the area share tales of these spectral lights, passing down stories from generation to generation, adding a touch of mystique to the already enchanting lake.

Lake Hydalén, with its calm waters mirroring the night sky, serves as a canvas for the mesmerizing light show. Visitors often find themselves spellbound by the interplay of natural beauty and unexplained phenomena, creating an unforgettable experience that transcends the ordinary.

For those seeking a blend of adventure and mystery, Lake Hydalén provides a unique opportunity to witness the Hessdalen Lights firsthand. While the scientific community continues its quest for answers, the magic of these lights persists, casting a spell on anyone fortunate enough to witness their dance across the Norwegian night sky.

In the heart of Norway, Lake Hydalén remains a testament to the inexplicable wonders our world has to offer. Whether you're a seasoned researcher or a curious traveler, the mystique of the Hessdalen Lights in this serene water haven promises an otherworldly encounter that will linger in your memory, much like the lights themselves linger in the folklore of Lake Hydalén.



T E N D E R

Installation, Commissioning And Testing Of Effluent Treatment Plant 50 Kld & Associated Sewer Line Works At Fatehpur Station Under Sr. Asstt. Divisional Engineer/ North Central Railway/Fatehpur.

Category	Miscellaneous tenders		
Location	Uttar Pradesh, Prayagraj		
Bid Open Date	18 Apr 2024	Tender Value	1.58 Cr
Doc Collection Date	18 Apr 2024	FTID	24031421420

Providing Consultancy For Effluent Treatment Plant At 4 Th Ctu Depot Cum Workshop At Raipur Kalan, U.T. Chandigarh. (Ch To 5055 C.O. (P) Expansion And Development Of Workshop

Category	Construction, Infrastructure, Civil Work tenders		
Location	Chandigarh , Chandigarh		
Bid Open Date	20 Mar 2024	Tender Value	1.18 Lac
Doc Collection Date	20 Mar 2024	FTID	240214443740

Providing Generators For Sewage Water Treatment Plant Pumping Stations At Onden

Category	Construction, Infrastructure, Civil Work tenders		
Location	Kerala , Kannur		
Bid Open Date	23 Feb 2024	Tender Value	92 Lac
Doc Collection Date	21 Feb 2024	FTID	240214459940

Supply, Delivery And Replacement Of Air Circuit Breaker And Other Electrical Accessories At Sub Station Room Of Water Treatment Plant Of Sub Surface Water Based Piped Water Supply Scheme At Tapan West

Category	Electronics, Telecom tenders		
Location	West Bengal , Englishbazar		
Bid Open Date	21 Mar 2024	Tender Value	14.20 Lac
Doc Collection Date	19 Mar 2024	FTID	240314425820

Arsenic Free Water Treatment Plant With Soakpit At Beside Shop Of Alom At Mouja- Khasbalanda Sansad - Vii Under Khasbalanda G.P. Of Haroa Block

Category	Chemical tenders		
Location	West Bengal , Adampur		
Bid Open Date	21 Mar 2024	Tender Value	3.49 Lac
Doc Collection Date	19 Mar 2024	FTID	240314415020

Running And Maintenance Of Swtp At Jatanbari/Sh 1.20 Mgd Surface Water Treatment Plant At Jatanbari Nutan Bazar Repairing And Rewinding Of Vt Pump-Motor Under The Jurisdiction Of Dws Sub-Division, Kar

Category	Miscellaneous tenders		
Location	Tripura , Jatanbari		
Bid Open Date	10 April 2024	Tender Value	9.24 Lac
Doc Collection Date	10 April 2024	FTID	240314440160

T E N D E R

Renovation And Painting Of Old Water Treatment Plant 6.80 MI At Lambaline Section Under Phed Apwd, Prothrapur. Sw Renovation Of Internal Electrical Installation.

Category	Electrical and Electrical Equipment tenders		
Location	Andaman & Nicobar , Port Blair		
Bid Open Date	4 Mar 2024	Tender Value	3.68 Lac
Doc Collection Date	14 Feb 2024	FTID	240214481850

Supply Of Liquid Waste Treatment Plant

Category	Miscellaneous tenders		
Location	Jharkhand , Godda		
Bid Open Date	23 Mar 2024	Tender Value	1.83 Lac
Doc Collection Date	23 Mar 2024	FTID	2403144172570



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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 enter,
Marlborough, USA
www.newwassociation.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

Asia Water

23 - 25 Apr 2024
Kuala Lumpur Convention Centre, Kuala Lumpur,
Malaysia
<https://www.asiawater.org/>

SDARWS Rural Water Expo

24 - 25 Apr 2024
Best Western Ramkota Hotel, Rapid City, USA
<https://www.sdarws.com/>

International Green Energy Expo

24 - 26 Apr 2024
EXCO, Daegu, South Korea
<https://www.greenenergyexpo.co.kr/eng/>

Water Expo Bangladesh

25 - 27 Apr 2024
International Convention City Bashundhara
(ICCB), Dhaka, Bangladesh
<https://www.limraexpo.com/water/index.php>

Green Vision Summit & Expo

30 Apr - 02 May 2024
MFCC - Malta Fairs & Conventions Centre, Malta
<https://10times.com/e15k-f3dd-4fx4>

May 2024

Maryland Rural Water Association Conference

06 - 09 May 2024
Roland E. Powell Convention Center, Ocean, USA
<https://10times.com/mrwa-ocean>

Power of Water Canada Technical Conference & Trade Show

08 - 10 May 2024
Niagara-on-the-Lake, Canada
<https://www.owa.ca/conference/>

IFAT Munich

13 - 17 May 2024
Exhibition Munich, Munich, Germany
<https://ifat.de/en/trade-fair/>

Renewable Energy Show

16 - 18 May 2024

EVENT CALENDAR



International Convention City Bashundhara (ICCB), Dhaka, Bangladesh
<https://10times.com/renewable-energy-show>

Water Management Show

16 - 18 May 2024
International Convention City Bashundhara (ICCB), Dhaka, Bangladesh
<https://10times.com/water-management-show>

West Africa Water Expo

21 - 23 May 2024
Landmark Centre, Lagos, Nigeria
<https://elanexpo.net/waweeexpo/>

June 2024

SIEE Pollutec

02 - 05 Jun 2024
Add Safex - Foire d'Alger, Mohammadia, Algeria
<https://siee-pollutec.com>

International Exhibition on Environmental Technology & Green Energy

03 - 05 Jun 2024
COEX Convention Center, Seoul, South Korea
<https://www.envex.or.kr/eng/main/index.asp>

Watertech Africa

05 - 07 Jun 2024
Kenyatta International Convention Centre, Nairobi, Kenya
<https://www.expogr.com/watertech/>

GreenTech Amsterdam

11 - 13 Jun 2024
RAI Amsterdam, Amsterdam, Netherlands
<https://www.greentech.nl/>

China (Guangzhou) International High-end Drinking Water Industry Expo

14 - 16 Jun 2024
China Import and Export Fair (Canton Fair Complex), Guangzhou, China
<http://www.ihe-china.com/cn/Invitation/40.IWE/>

Singapore International Water Week

16 - 20 Jun 2024
Singapore
<https://www.siwv.com.sg/>

Egypt Infrastructure & Water Expo

25 - 27 Jun 2024
Egypt International Exhibition Center, Cairo, Egypt
<https://www.egyptinfrastructureexpo.com/>

July 2024

European Wastewater Management Conference & Exhibition

02-03 July 2024
The Point at Emirates Old Trafford, Manchester, UK/Online
ewwmconference.com/

Thai Water Expo 2024

03 - 05 Jul 2024
Queen Sirikit National Convention Center, Bangkok, Thailand
www.thai-water.com

12th Annual International Forum on Water

15-18 July 2024
Athens, Greece
www.atiner.gr/water

Water and Aqueous Solutions Gordon Research Conference

20 - 21 Jul 2024
Holderness School, Holderness, USA
<https://www.grc.org/water-and-aqueous-solutions-conference/2024/>

August 2024

The Water Expo 2024

20 - 22 Aug 2024
Miami Airport Convention Center, Miami, USA
www.thewaterexpo.com/

AgriTech India 2024

22 - 24 Aug 2024
BIEC Bengaluru International Exhibition Centre, Bengaluru, India
agritechindia.com

September 2024

19th EverythingAboutWater Expo 2024

10-12 September 2024
Yashobhoomi, IICC, Dwarka, New Delhi
www.eawaterexpo.com

EcwaTech 2024

10 - 12 Sep 2024
Crocus Expo, Moscow, Russia
en.ecwatech.ru

CamWater 2024

11 - 13 Sep 2024
Diamond Island Convention and Exhibition Center, Phnom Penh, Cambodia

www.camwaterexpo.com

Taiwan International Water Week 2024

11 - 13 Sep 2024
Taipei World Trade Center, Taipei, Taiwan
www.taiwanintlwaterweek.com

Water & Wastewater Management Expo 2024

11 - 12 Sep 2024
The Emergency Services Show, Birmingham, UK
www.ess-expo.co.uk

Indo Water Expo & Forum 2024

18 - 20 September 2024
Grand City Mall & Convex Surabaya, Surabaya, Indonesia
indowater.com/

Water and Wastewater Fair 2024

24 - 26 Sep 2024
Elmia, Jönköping, Sweden
www.elmia.se/en/va-massan/

October 2024

Aqua Ukraine

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

WWEM - Water, Wastewater and Environmental Monitoring Conference

09-10 Oct 2024
NEC, Birmingham, UK
www.ilmexhibitions.com/wwem/

WETEX 2024

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

IFAT India

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

Cairo Water Week 2024

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

BAYWATCH



Date: 23 - 25 April 2024

Venue: Kuala Lumpur Convention Centre, Malaysia

Website: www.asiawater.org

Get ready for ASIAWATER 2024! It's back in the heart of vibrant Kuala Lumpur, Malaysia, at the Kuala Lumpur Convention Centre from April 23 to 25, 2024. This time, the spotlight is on "Water and Climate Change: Innovation for Resilience".

In its 13th edition, ASIAWATER will host over 20,000 top-notch trade attendees, including key players and enthusiasts from the water and wastewater industry across Asia and beyond. It's where industry leaders gather to explore cutting-edge solutions, technology, and products. With over 1,000 brands and companies under one roof, ASIAWATER 2024 promises to be the ultimate platform for driving transformation in the water and wastewater service industry. Expect insightful discussions led by industry experts at our flagship Conferences & Seminars, charting the course for effective solutions to current challenges.



Date: 16-18 April 2024

Venue: ADNEC, Abu Dhabi

Website: www.worldfutureenergysummit.com/en-gb/water

The Water Exhibition & Conference is a powerhouse event that sparks vital discussions on global water security right here in our region. It's not just about talks – it's where public and private sectors come together to forge partnerships that drive innovation and sustainability in water projects. Picture this: market leaders unveiling cutting-edge solutions for sustainable water desalination, clever resource management, and boosting water efficiency. It's like a one-stop shop for everything water-related in the MENA region – from production and distribution to treatment and reuse. Plus, you'll get the latest updates on projects tackling our region's water challenges head-on, along with insights into the water-energy connection to supercharge efficiency. It's the ultimate gathering for anyone passionate about making waves in the water world!

BAYWATCH



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Where the Water Community Comes Together

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.

Date: 10 - 12 September 2024

Venue: IICC, New Delhi

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

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 Everything About Water 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.



Addressing urgent global water shortages and environmental challenges is crucial for creating a sustainable society. Japan, grappling with population decline and climate risks, requires concerted efforts and fundamental revisions. Corporate engagement is pivotal, demanding activities aligned with a decarbonized society and Sustainable Development Goals (SDGs).

InterAqua2024, themed "Exhibition of water business supporting sustainable corporate activities," transcends showcasing innovative technologies. In its 15th year, this exhibition serves as a global and domestic platform to address water environment issues, evolving with market needs. Seize InterAqua2024 as a gateway for new business opportunities and insights into ongoing corporate activities, fostering a sustainable future.



TEXAS WATER 2024
APRIL 9 - 12, 2024 | FORT WORTH, TX

Date: 09-12 April 2024

Venue: Fort Worth Convention Center

Website: www.txwater.org

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113	Customized Webinar by EAW	67	+91 85889 11033	enquiry@eawater.com	www.eawater.com
114	EverythingAboutWater eMagazine	11	+91 85889 11033	enquiry@eawater.com	www.eawater.com
115	EverythingAboutWater Expo 2024	Back Cover	+91 85889 11033	enquiry@eawater.com	www.eawater.com
116	EverythingAboutWater eMagazine	19	+91 85889 11033	enquiry@eawaterexpo.com	www.eawaterexpo.com
117	EverythingAboutWater Magazine	21	+91 85889 11033	enquiry@eawater.com	www.eawater.com
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10-12 SEP 2024

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NEW DELHI, INDIA

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