

India's Water Magazine

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# WaterAge

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## MANAGING INDUSTRIAL & MUNICIPAL WATER

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Managing Industrial and Municipal Water

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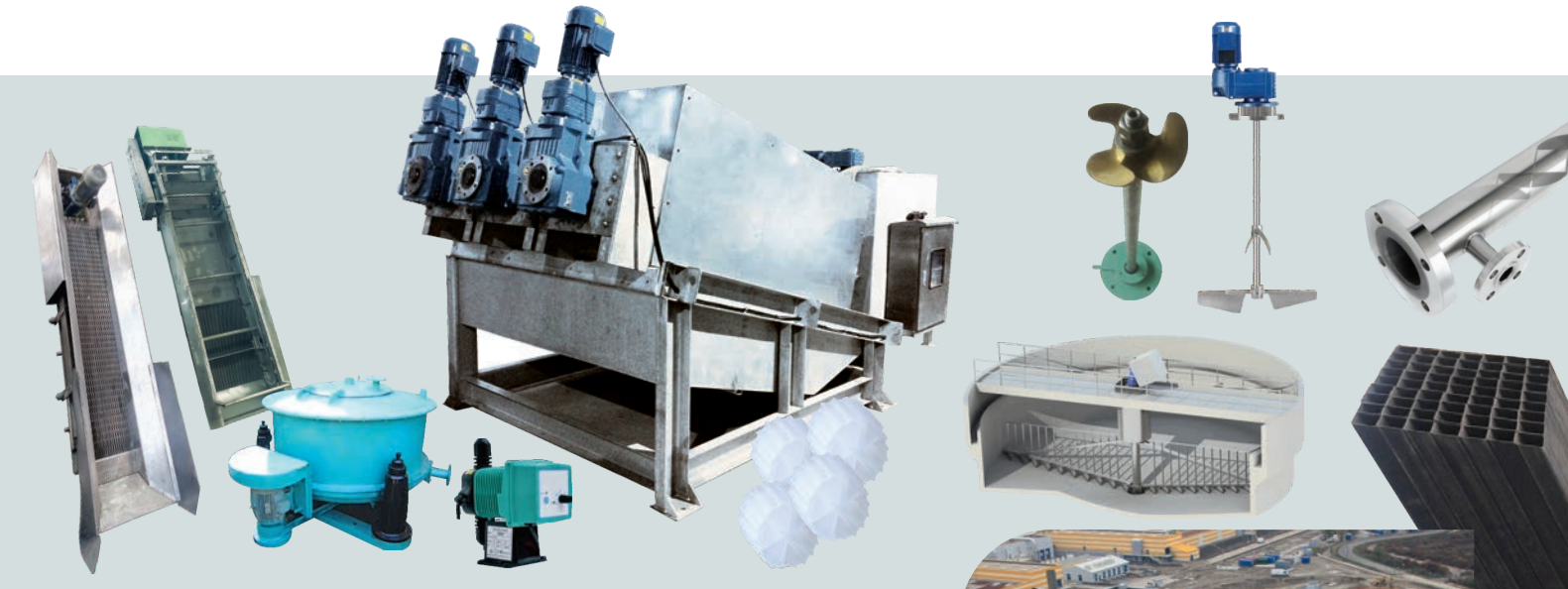
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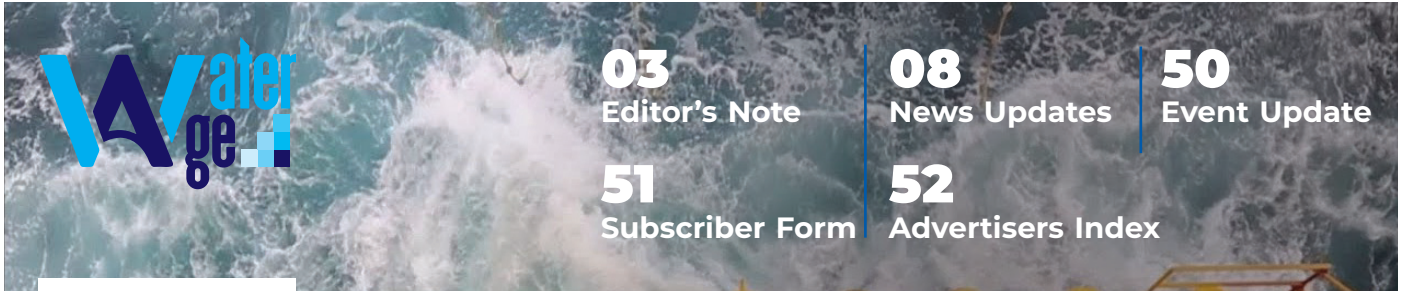


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**R E N U T O M A R**  
*(Editor-in-Chief)*

**DEAR READERS,**

One of the biggest challenges of 21st century for the humanity has been the lack of Access to Safe Drinking Water. Despite all the continuous efforts made, the sources of drinking water for the populace in many developing nations have been contaminated, resulting to more than half a million deaths every year due to diarrhea, with major cases in developing nations. Thus, technologies to inactivate the pathogenic microorganisms in water prove to be of great significance for the humans regarding well-being and good health. However, the conventional technologies of treating the drinking water has been effective, but possess present limitations that impede their application globally. Basically, such water treatment procedures often have high demand of energy consumption and chemical use that limits their application in preventing waterborne diseases in the most vulnerable regions. Therefore, to address such inadequacies, rapid research and development of innovative alternative technologies have come into commencement.

One of the highly effective and sustainable methods of the present time is solar disinfection that has been recognized by the World Health Organization as one of the best suitable methods of providing water that is fit for drinking to the populace of developing nations like India. This edition of 'WaterAge' will be emphasizing on such conventional and modern technologies that are being applied at medium to large scales for the process of water purification with new emerging technologies that are currently in development phase. Additionally, we will be throwing light on the merits and demerits of such technologies in the future.



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## INDIA'S CAPITAL FACES DRINKING WATER SHORTAGE AFTER PUMPS FLOODED

The Yamuna River that flows through New Delhi is at its highest level in 45 years after unusually heavy downpours.



**A man helps his son to climb onto a flyover under construction after being displaced by the rising water level of the Yamuna River in New Delhi [Adnan Abidi/Reuters]**

Supplies of drinking water in New Delhi will fall by a quarter on Thursday and Friday because three treatment plants have been flooded, the city government said, as the Yamuna River overflows after incessant rain.

The river that flows through the city of 20 million residents is at its highest level in 45 years after unusually heavy downpours in neighboring states like Haryana to the north.

The city also saw heavy rain over the weekend with flooding in low-lying areas that forced hundreds of people to seek shelter in relief camps.



**People fleeing the low-lying areas of the Indian capital [Arun Sankar/AFP]**

“There will be a water problem in some areas of Delhi,” the city’s chief minister, Arvind Kejriwal, said on Twitter.

“As soon as the Yamuna water recedes, we will try to start them as soon as possible,” he said of the three water treatment plants. Kejriwal said the water level in the river could peak later on Thursday and in the meantime, people were being evacuated from flooded areas.

“Saving the lives of people is most important. I appeal to all the people of Delhi to cooperate with each other in every possible way in this emergency,” he told reporters.



**People with their belongings waded through a flooded street in New Delhi [Arun Sankar/AFP]**

Northern Indian states near New Delhi had received record rainfall since the monsoon began on June 1, with Punjab and Himachal Pradesh recording 100 percent and 70 percent more rain than average, respectively, the India Meteorological Department said.

New Delhi recorded 112 percent above-average rainfall, the department said.

Flood barriers have been set up in the posh Civil Lines residential area, where some top officials, including Kejriwal, live in a bid to block the surging river water.



**A boy walks on a wall of his flooded house in New Delhi [Adnan Abidi/Reuters]**

Meanwhile, at least 88 people have died in the northern Himachal Pradesh state since the rains began on June 24, India’s ANI news agency reported. Flash floods in the state over the weekend brought down a bridge and washed away several clusters of residential huts.

Rescue teams were mobilised to assist 40 foreign travellers – including 14 Russians and 12 Malaysians – stranded at tourist destinations alongside several hundred Indian nationals, state police chief Satwant Atwal told AFP news agency.

At least 12 people were killed in neighbouring Uttarakhand state, including nine on Tuesday when debris fell on their vehicles on a national highway, officials said.



A popular pilgrimage to the state's Kedarnath temple, home to a revered shrine of the Hindu deity Shiva, was suspended due to heavy rains.

Incessant rain had caused significant damage across Punjab state, with at least 10 people killed in flash floods. In Uttar Pradesh, India's most populous state, at least 11 have died in rain-related incidents, according to state officials.

The monsoon brings South Asia about 80 percent of its annual rainfall and is vital for agriculture and the livelihoods of millions of farmers.

But it brings destruction every year in the form of landslides and floods. Melting glaciers add to the volume of water while unregulated construction in flood-prone areas exacerbates the damage.

The rainfall is hard to forecast and varies considerably, but scientists say climate change is making the monsoon stronger and more erratic.

## FRESH ROW ALONG GODAVARI AS EACH SIDE WANTS MORE WATER



**Abhilash Botekar and Prasad Joshi**

A dispute over water sharing between two regions in Maharashtra, through which the Godavari river flows, has resurfaced. The state water regulatory authority's decision to release 8.6 TMC of water

from dams in north Maharashtra to the parched regions of Marathwada has sparked opposition. Activists argue that previous court directives, including gravity-driven piped water supply and a review of committee recommendations, have not been implemented. The issue has now gone to court, with a local outfit and politicians challenging the water release. The dispute highlights the ongoing tensions over water management in the region.

**NASHIK/CHHATRAPATI SAMBHAJINAGAR:** The two regions in Maharashtra through which the mighty Godavari flows are again clashing over water sharing among the dams in the river basin. This time, the trigger is the decision of the state water regulatory authority to release 8.6 thousand million cubic (TMC) feet of water from dams in the upstream areas of north Maharashtra to the parched regions of Marathwada.

Godavari, the second-longest river in India after the Ganga, originates in the hills near Nashik in north Maharashtra. It flows through Marathwada before merging into the Bay of Bengal. As it meanders its way through Maharashtra, the use of water stored in the dams built in its basin has been the cause of bitter stand-offs. The dispute over water release from north Maharashtra to Marathwada has seen legal battles in the past and, once again, the issue has landed in court.

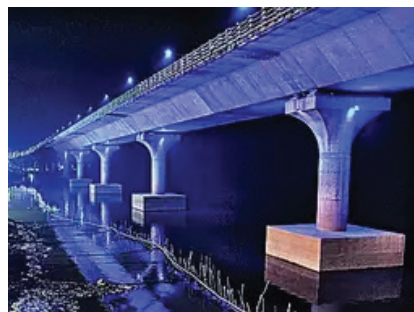
## 'Court gave clear directions on Godavari'

An outfit from north Maharashtra, with the backing of local politicians, has moved the Bombay HC against the order issued by the Godavari Marathwada Irrigation Development Corporation (GMIDC) on October 30, 2023, to release 8.6 TMC water. MLAs Devyani Pharande (Nashik Central), Saroj Ahire (Deolaligaon), Manik Kokate (Sinnar), Dileep Bankar (Niphad), Rahul Dhikale (Nashik East), Seema Hiray (Nashik West) are opposing the release of water.

Activists argue that the courts have given clear directives in the past and some of those have not been implemented yet. The directives related to providing gravity-driven piped water supply from upstream to downstream areas, or to review the Mendhegiri committee recommendations, have not taken off.

"The only directive of the Bombay HC that has been followed is the release of water from upstream to downstream areas. The government has not prepared a plan for the piped water supply," said Uttam Nirmal, a retired executive engineer of Nashik irrigation division of the water resources department.

## PMC SETS UP ENTRANCE GATES NEAR GHATS, CLEANS GANGA WATER



**Sheezan Nezami, Nov 16, 2023 – Patna:** Not just usual cleaning of river banks and marking of their approach roads, there are many firsts for Patna Municipal Corporation (PMC) this time vis-à-vis Chhath preparations. For the first time, the PMC is

erecting temporary entrance gates at nine points leading to the major ghats in the capital and has pressed in a trash skimmer machine for cleaning river Ganga water near the banks. It is also coming up with big air balloons at all the ghats with their names written to help devotees spot them from far.

As per the PMC, the entrance gates are being set up near Digha Patipul ghat, 93, 88, LCT, near AN Sinha Road leading to JP Ganga Path, NIT ghat, Gai Ghat, Bhadra and Kangan ghats. Public relations officer Shweta Bhaskar said there are 97 big and small ghats under them in the capital starting with Digha Patipul, all the way up to Kangan ghat. "The entrance gates are being set up at the big ghats, which attract a larger number of devotees. Decoration of the roundabout on JP Ganga Path is also being done," said Bhaskar.

The setting up of the entrance gates as well as putting up balloons began on Wednesday and are expected to be completed by Thursday evening. "We are already cleaning and decorating all the river ghats, as well as ponds, under our jurisdiction. All the ghats will also have a control room to



assist people coming for Chhath," said Bhaskar. Bhaskar added the trash skimmer machine was purchased by the PMC a few days back and will continue to clean Ganga water even after Chhath.

We also published the following articles recently

### Over 900 ghats prepared for Chhath, other arrangements will be made: Saurabh Bharadwaj

The Delhi government has prepared over 900 ghats for the upcoming Chhath festival, providing tents, light, sound, and other facilities for devotees. The festival, which involves fasting and offering 'arghya' to the Sun God, will begin on November 17. Due to pollution and frothing in the places where temporary ghats are set up. Chhath Puja is mainly celebrated in Bihar, Jharkhand, and Uttar Pradesh.

### Constable dies after being hit by earthmover at Nimtala ghat

A Kolkata Police constable lost his life in a tragic accident while on immersion duty at Nimtala ghat. The constable, Sandip Burman, was hit by an earthmover being used to remove idol structures. Despite being rushed to the hospital, he succumbed to his injuries. The driver of the earthmover was later arrested. The police are investigating the incident and seeking measures to prevent such accidents during future immersions.

### Police carry out anti-sabotage checks at city immersion ghats

Special Branch officers carried out anti-sabotage checks at major ghats along the Hooghly River in Kolkata. The checks were conducted as a precautionary measure ahead of an international cricket match between Australia and South Africa. The officers were ensuring that no one was carrying banned firecrackers during the immersions. Despite some controversies, traffic moved normally with extra deployment on the routes. Complaints were received regarding the use of DJ music during processions, which has been prohibited for several years in Kolkata.

Yamuna River, many families observe the festival at parks and other public.

## GMDA TO BUILD 5TH FILTRATION UNIT AT WATER TREATMENT PLANT



**Nov 17, 2023 – Gurgaon:** GMDA is planning to construct a filtration unit at Chandu Budhera water treatment plant and will begin the tendering process for the project by the end of this month. This will be the fifth unit and will have a capacity of 100MLD.

According to a GMDA official, the upcoming filtration unit will be built at an estimated cost of Rs 64 crore. Work on augmenting the water supply has already started, officials added.

Construction of the fourth unit at Chandu Budhera WTP is underway and is likely to be completed by June next year. After the addition of the fifth unit, its total capacity will be increased to 500MLD by 2025. The GMDA is expecting to complete the tendering process within the next three months and the work on the fifth unit is likely to start by the next financial year, the official added.

"In view of the growing population, especially new development along Dwarka Expressway and Southern Peripheral Road, we are working on strengthening and augmenting the water supply in the city in a phase-wise manner. While the work on the fourth unit is already underway, we have got the necessary approval and will now float the tender for the construction of the fifth unit at Chandu Budhera WTP by the end of this month. Once completed, the filtration unit will increase the treatment capacity to 500MLD from its existing 300MLD by 2025 at Chandu Budhera WTP," Rajesh Bansal, GMDA's chief engineer of infra-II division, said.

In addition, a detailed project report is being prepared for the construction of a 100MLD unit at Basai WTP. Earlier, the metropolitan authority planned to enhance the capacity of both WTPs by over 50% by 2024.

As per the infrastructure development plan prepared by IIT Roorkee, the city's requirement is estimated to touch 1,135MLD by 2031 for a population of 52 lakh and 1,408MLD by 2041 for a population of 66 lakh. At present, GMDA is supplying 300MLD water from Chandu Budhera and 270MLD water from Basai WTP in the city.

While the peak demand is 650MLD, resulting in a gap of 80MLD which is either met through borewells or private tankers.

We also published the following articles recently

### Societies in Gwalpahari to get piped water by 2025, GMDA set to build boosting station

The Gurugram Metropolitan Development Authority (GMDA) plans to construct a boosting station in Gwalpahari area to provide piped water supply to residential societies. The construction of the boosting station, which includes an underground tank and pump house, is expected to be completed in 18 months. The water supply will come from the Chandu Budhera water treatment plant and will be distributed among residential areas. The project, which has been in the making since 2019, was delayed due to pending litigation over land acquisition. The tendering process for the construction is expected to be completed within two months.

### Key drain network to tackle flooding by 2025: GMDA

The GMDA in Gurgaon is set to begin work on a master drain project to channelize stormwater to the Najafgarh drain. The project, estimated to cost around Rs 19.3 crores, will help prevent flooding of agricultural land along the Najafgarh drain. The first phase of the project will involve the construction of a 550m portion of the master drain leg-2. The remaining portions of leg-3 will be executed in the second and third phases.



Currently, there are three master drains in the city that carry rainwater to the Najafgarh drain.

### 'India is a complete team': Chandu Borde praises hosts ahead of semi-final against New Zealand

Former Indian cricketer Chandu Borde is optimistic about India's chances in the ICC Cricket World Cup semi-final against New Zealand. He believes that India's completeness and all-round performance in the league stage give them an advantage. Borde highlights India's high confidence level, home advantage, and strong support from the home audience as additional factors that could work in their favor. He also emphasizes the importance of a good start, the toss, and warns against underestimating New Zealand. Borde concludes by praising the overall performance of the Indian team.

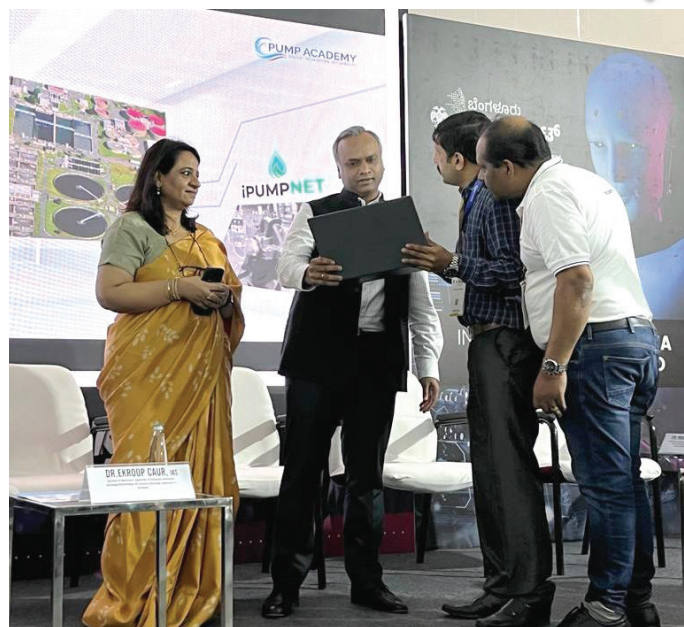
### IPUMPNET: UNVEILED BY IT & BT MINISTER OF KARNATAKA



**Mr. Priyank Kharge, Hon'ble IT and BT Minister, Govt. of Karnataka** unveiled the iPUMPNET, an IIoT-enabled digital solution developed by Pump Academy Private Limited during the 26th edition of the Bengaluru Tech Summit on 30th November 2023. As per the program, The Karnataka government unveiled 35 "ground-breaking" products and solutions developed by start-ups from various sectors including IT, Agri-Tech, Med-Tech, Healthcare, Clean-Tech, Artificial Intelligence (AI), Deep Tech, Blockchain, Cyber security and Environment Tech.

The iPUMPNET that empowers water utilities and industries with advanced technology driven solutions was also unveiled as the leading water technology solution. The innovative product helps them to operate their pumping systems more efficiently, cost-effectively, and sustainably. iPUMPNET provides a transformative solution that harnesses the potential of digital technology to optimize pumping systems like never before. Its real-time monitoring, predictive maintenance capabilities, energy efficiency insights, and seamless integration make it an invaluable tool for water utilities and industries seeking to enhance their operations while reducing environmental impact by minimizing energy consumption and carbon footprint.

Some of the significant benefits of implementing iPUMPNET in pumping stations could be:



- It can improve operational efficiency of pumping station upto 35%, reduce energy consumption upto 25%, reduce the life cycle cost (LCC) of upto 45%, and extend the lifespan of pumping systems upto 50%
- It is equipped with features that swiftly detect faults or anomalies, allowing for prompt troubleshooting and resolution, thus practically eliminating unscheduled breakdowns and maintenance
- It allows for remote control and automation of pumping station operations, reducing the need for physical intervention and enhancing operational efficiency
- The robust platform of iPUMPNET gathers and analyzes data, providing valuable insights that can support informed decision-making and drive operational improvements
- It helps water utilities optimize energy usage in pumping operations, estimated that almost 5 GW of energy could be saved per annum if iPUMPNET is implemented across all water pumping stations in India
- Through improved operational efficiency and energy optimization, iPUMPNET contributes to reduced environmental impact, significantly reducing the carbon footprints of pumping stations, estimated to save almost 3.06 million tonnes of carbon emission annually, if implemented across all water pumping stations in India
- The return on investment for optimization will happen normally within a year.

In essence, iPUMPNET is a powerful tool that empowers water utilities with advanced technology-driven solutions, enabling them to operate more efficiently, cost-effectively, and sustainably. By harnessing the capabilities of the Industrial Internet of Things (IIoT), Artificial Intelligence (AI), and Data Analytics, iPUMPNET empowers industries to achieve unprecedented levels of efficiency, reliability, and sustainability in their operations.



## KI‘STAGGERING’ 347 MILLION CHILDREN FACING WATER SCARCITY IN SOUTH ASIA: UN

**Published On 13 Nov 2023** – It’s the highest number among all regions in the world, the UN children’s agency says.



Women and children carry containers after filling them with water at an abandoned stone quarry in Chipiya Abhaypur village of the northern state of Uttar Pradesh [File: Ritesh Shukla/Reuters]

More children in South Asia are struggling due to severe water scarcity made worse by the effects of climate change than anywhere else worldwide, the United Nations says.

“A staggering 347 million children under 18 are exposed to high or extremely high water scarcity in South Asia, the highest number among all regions in the world,” the UN Children’s Agency said in a report on Monday.

The eight–nation region, comprising Afghanistan, Bangladesh, Bhutan, India, Nepal, Maldives, Pakistan and Sri Lanka, is home to more than one–quarter of the world’s children.

“Climate change is disrupting weather patterns and rainfall, leading to unpredictable water availability,” the UNICEF said in its report.

Homeless children walk along a road to collect water for their families in Mumbai [File: Danish Siddiqui/Reuters]The report cites poor water quality, lack of water and mismanagement such as overpumping of aquifers, adding that climate change decreases the amount of water replenishing them.

“When village wells go dry, homes, health centres and schools are all affected,” UNICEF added. “With an increasingly unpredictable climate, water scarcity is expected to become worse for children in South Asia.” At the UN COP28 climate conference next month in Dubai, UNICEF said it will call for leaders “to secure a livable planet”.

“Safe water is a basic human right,” said Sanjay Wijesekera, UNICEF chief for South Asia.

“Yet millions of children in South Asia don’t have enough to drink in a region plagued by floods, droughts and other extreme weather events, triggered increasingly by climate change.”

Last year, 45 million children lacked access to basic drinking water services in South Asia, more than any other region, but UNICEF said it will call for leaders “to secure a livable planet”.

“Safe water is a basic human right,” said Sanjay Wijesekera, UNICEF chief for South Asia.

“Yet millions of children in South Asia don’t have enough to drink in a region plagued by floods, droughts and other extreme weather events, triggered increasingly by climate change.”

Last year, 45 million children lacked access to basic drinking water services in South Asia, more than any other region, but UNICEF said services were expanding rapidly, with that number slated to be halved by 2030.

Behind South Asia were Eastern and Southern Africa regions, where 130 million children are at risk from severe water scarcity, the report added.

## UN: ONE IN THREE CHILDREN WORLDWIDE DO NOT HAVE ADEQUATE WATER

BY ROGER MCKENZIE



**November 16, 2023** – A boy fills up a bottle at the water fountain in M’tsamoudou, near Bandrele on the French Indian Ocean territory of Mayotte, October 12, 2023 | AP

About a third of children globally live in areas with limited access to water, according to a damning new United Nations report published on Monday. In a supplement to the landmark 2021 Children’s Climate Risk Index, the UN children’s agency UNICEF said last year around 739 million children across the globe were exposed to high or extremely high water scarcity. The report also said that 436 million children live in areas of high or extremely high water vulnerability.

The report said that every region of the world, including the richest



nations, faces challenges related to water scarcity, and with the climate emergency “the problem is projected to get much worse over the coming decades.”

Unicef said that droughts are becoming more frequent and more severe, lasting longer and covering wider areas as a consequence of climate change and increased water demand — and this was contributing to higher water scarcity.

It said: “Water scarcity not only presents a threat to agriculture, industry, and economic growth but also makes it more difficult to keep water, sanitation and hygiene services running.

The report said “Water demand is exceeding the available renewable resources, further compounding water scarcity. Globally, demand has more than doubled since 1960.”

According to UNICEF the worst affected area is South Asia where some 347 million children are facing severe water shortages.

The figure represents over half the number of children living in the region. South Asia is home to more than a quarter of the world’s children and is

increasingly affected by climate change–related disasters such as floods and droughts.

The UN says 55 percent of children in the area are affected by water scarcity, the highest rate worldwide.

It said: “Climate change is disrupting weather patterns and rainfall, leading to unpredictable water availability.”

After south Asia, eastern and southern Africa are the next most affected by climate change, with 130 million children facing severe water scarcity, the report said.

The report comes ahead of the UN climate conference in Dubai which begins at the end of this month.

Unicef said that the 28th Conference of the Parties must see more action by the international community to “ensure a planet worth living on for children.”

“Safe water is a basic human right,” said Sanjay Wijesekera, the Unicef chief for South Asia.



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**Virender Kumar**

**Smart city,  
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**Chirag Bhalla**  
Co founder & Director

**Harendra Pratap Singh**  
Co founder & Technical Director



**Q. Can you briefly introduce Liquiclear and its specialization in water purification and softening solutions? Are the solutions provided for commercial and domestic use?**

**A.** Liquiclear is a specialist in providing bespoke water purification solutions. We have extensive experience in the water industry, and over the years have introduced and manufactured innovative water purification and softening machinery. We have the best assemblage of water purification systems for commercial and domestic use, water softeners for industrial, commercial, and residential premises, and much more.

**Q. Could you provide more details about LDISF – A Resin and Salt free water softener?**

**A.** LDISF – Our LDISF Electronic water softener is a fully automated machine that reduces the hardness of water without the use of Salt or Resin. **Electric Water Softener (LDISF)** treats hard water and balances chemical composition in the water. Our LDISF electronic water softener not only eliminates hardness but also reduces the TDS in water by 50%, which is not possible using conventional ion-exchange water softeners.

**Q. Liquiclear is said to aim for the highest level of purity. Could you elaborate on the advanced water purification technology used by Liquiclear to achieve this goal with its products like LDI™?**

**A.** At Liquiclear, we have developed cutting edge

water purification technology that has garnered recognition and success in various projects around India. Our Unique Liqui Deionization (LDI) Technology works on removing excess minerals and impurities from water through a 3-step purification process that saves around 30–50% more water than RO. For every 5000 L of water production, LDI saves 1500 L more water in a day. As we know, RO systems rely on semipermeable membranes that can become fouled or damaged over time due to the high pressure and impurities in the water. These membranes require regular maintenance and replacement. In LDI systems, there are no membranes involved, reducing the need for frequent maintenance and potentially resulting in a longer lifespan for the system.

Benefits of LDI Water Purifiers:

- SAVE up to 80% water
- SAVE 1/3rd electricity
- SAVE maintenance costs
- SAVE essential minerals in water

**Q. Liquiclear focuses on cost-effective solutions. Could you explain how do you manage to provide best-in-class water purification while remaining competitively priced?**

**A.** We are committed to delivering best-in-class water purification solutions that are cost-effective and competitively priced. Unlike Ro our system does not require any maintenance. Our technology is made from high quality raw materials and do not have any membrane because of which lifespan of our machines are longer as compared to other

## Water Professional



**Hard water wearing down your appliances?**

*Our modern water-softening technology removes chemicals and contaminants to increase the longevity of your appliances.*



technologies which saves replacement costs, our mission is to give our customers state-of-the-art products with minimal maintenance solutions.

**Q. Could you provide a detailed explanation of Liqui Deionization (LDI) technology and its electrochemical process for water purification?**

**A.** Liqui-Deionization (LDI) is a water purification technology that uses an electrochemical process to remove ions and impurities from water

**How LDI works**

**Ion Absorption:** As the water passes through the LDI cell, the ions are attracted to and adsorbed onto the surface of the porous electrodes. Positively charged ions are attracted to the cathode, while negatively charged ions are attracted to the anode. The porous nature of the electrodes provides a large surface area for ion adsorption.





**Deionized Water Collection:** The ions are held in the porous electrodes until the electric potential is reversed or the ions are released through a regeneration process. The water that passes through the electrodes between the ions is deionized and collected as purified water.

**Regeneration:** Once the electrodes have reached their ion adsorption capacity, the electric potential is reversed, and the ions are released from the electrodes. This process is called regeneration. Regeneration can be achieved by momentarily short-circuiting the electrodes or by applying a voltage of opposite polarity.

**Q. How do Liquiclear's water purifiers contribute to health and wellness for domestic and commercial users?**

**A.** Domestic Use: LDI Electronic Water Purifiers are suitable for households and can provide clean drinking water for daily consumption. Their compact size and ease of use make them a convenient option for residential settings. Our water softeners are the ideal solution for all your hard water problems. They ensure there is the right proportion of minerals in the water. Moreover, hard water can also have a drastic impact on your skin. It can make your skin itchy, inflamed, and even dry. Water purifiers for homes refine the quality of water. It averts the side effects of hard water and facilitates good skin health.

Industrial and Commercial Applications: LDI technology is also well-suited for industrial and commercial applications, such as food and

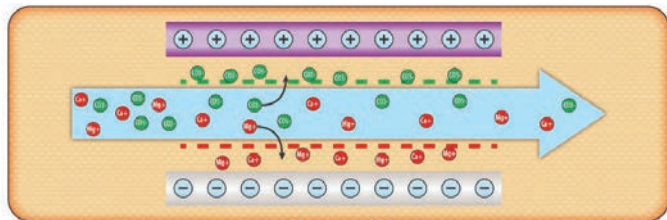
**LDI**  
Liqui De-ionization  
The Next-Generation  
Water Purification Technology

Natural  
Water,  
Pure Bliss

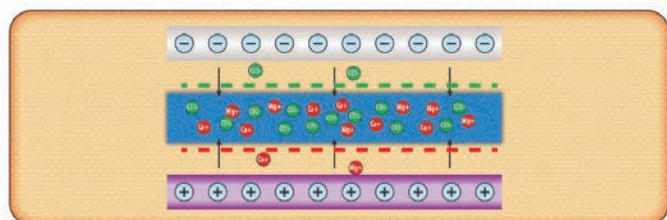
**Liquiclear**  
NATURALLY PURE

**01 ION ABSORPTION**

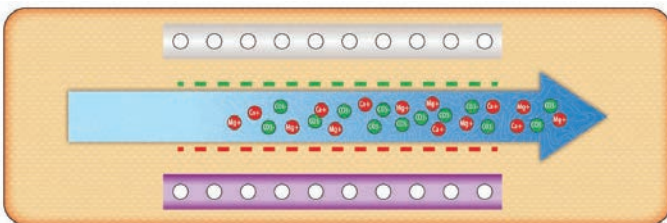
**PURIFICATION CYCLE**



**02 ION REMOVAL**



**03 BACKWASH**



- Low maintenance
- Environmentally friendly
- Easy installation



beverage production, pharmaceutical manufacturing, and water treatment in hotels and offices. The efficiency and cost-effectiveness of LDI make it an attractive choice for these sectors. Often you will find deposits of white substance in the pipes, appliance surfaces, floors, and other vital areas of commercial or residential premises. This accumulation of this white substance is due to the chemicals and contaminants present in the hard water, and, can have a drastic impact on the longevity of your applications as well as your plumbing system. Our LDI technology can be considered as a blessing as it does not allow chemical deposits on machines.

**Q. Tell us about some of the most unique features and benefits of your products.**

**A.** Liquiclear Technologies Pvt Ltd and its products are reckoned for exceptional technology LDI & LDISF.

Some of their most unique features and benefits are:

- No salt, No Resin
- Reduces TDS



### Dr. Amit Chaudhari

Associate Director (MEP & Infra)  
PMP, LEED AP  
KPM Engineering

Associate Director (MEP & Infra)

PMP, LEED AP KPM Engineering has rich educational background with the doctorate along with masters in engineering and management. Completed various certification courses related to the field and affiliated to the various professional organisations and institutes. Heading the vertical of MEP & Infrastructure. Designed the tallest building and largest infrastructure township in India.

# MANAGING INDUSTRIAL AND MUNICIPAL WATER

## Introduction:

Water is a precious resource that is essential for sustaining life and supporting economic activities. As the global population continues to grow, the demand for water in industrial and municipal sectors intensifies. However, ensuring efficient water usage, conservation, and proper treatment are becoming increasingly important to address water scarcity and environmental concerns. In this article, we will explore effective strategies and practices for managing industrial and municipal water, aiming to strike a balance between fulfilling water demands and preserving this invaluable resource.

## Embracing Efficiency for a Sustainable Future

Water conservation is a fundamental aspect of responsible water management. Implementing water-saving technologies and practices can significantly reduce water consumption in industrial and municipal settings. Installing low-flow fixtures, efficient irrigation systems, and water recycling/reuse systems are effective measures that promote sustainable water usage. By embracing water conservation practices, businesses and communities can optimize their water resources, reduce costs, and contribute to environmental preservation.

Managing industrial and municipal water involves the use of various tools and equipment to ensure efficient operations, water treatment, and maintenance.

By maximizing water reuse and recycling, businesses and communities can minimize their environmental impact and contribute to a circular economy.

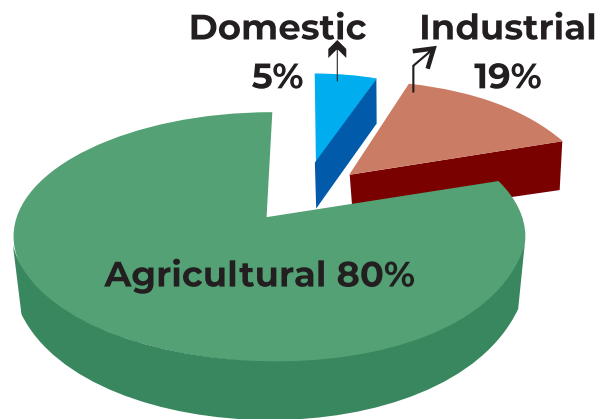
Reasons for Managing Industrial and Municipal Water:

- Ensuring Adequate Water Supply.
- Water Conservation.
- Regulatory Compliance.
- Protection And Public Health.
- Infrastructure Maintenance.
- Sustainable Resource Management.
- Economic Efficiency.

analysis of water consumption patterns, identify areas of high water usage, and pinpoint potential leaks or inefficiencies. By monitoring and tracking water usage, industries and municipalities can gain valuable insights into their water consumption, enabling them to identify opportunities for improvement and implement targeted conservation measures.



Water Usage in India



- Community Resilience.
- Stakeholder Engagement.
- Sustainable Management.
- Water Footprint Estimate.

According to estimates, Industries consume around 15–20% of the total freshwater resources in India.

In which Thermal Power consumes the maximum water.

**Water Audits:**

**Unveiling Insights to Drive Efficiency**

One of the first steps towards effective water management is conducting regular water audits. These audits provide a comprehensive

**Tools and Equipment Used in the management of industrial and municipal water:**

- **Flow Meters:** Flow meters are used to measure the rate of water flow in pipes and channels. They provide accurate data on water consumption, helping in monitoring and optimizing water usage.
- **Water Quality Monitoring Equipment:** This includes instruments such as pH meters, turbidity meters, dissolved oxygen meters, conductivity meters, and chlorine analysers. These devices are used to measure and monitor various parameters to ensure water quality compliance and identify any deviations.

By prioritizing sustainable water management practices, we can safeguard this invaluable resource for future generations while supporting economic growth and human well-being.



- **Water Treatment Systems:** Industrial and municipal water treatment often involves the use of equipment such as:
  - **Coagulation and Flocculation Systems:** These systems use chemicals and mixing devices to facilitate the aggregation of suspended particles in water, making them easier to remove during the treatment process.
  - **Sedimentation Tanks and Clarifiers:** These tanks allow for the settling of suspended solids through gravity, separating them from the water.
  - **Filtration Systems:** Filtration units, such as sand filters, activated carbon filters, and membrane filters, are used to remove particulate matter, organic compounds, and other impurities from water.
  - **Disinfection Systems:** Chlorination, ultraviolet (UV) disinfection, and ozone generators are commonly used to eliminate or inactivate microorganisms and pathogens in water.
- **Pumps and Pumping Stations:** Pumps are used to transport water from one location to another, such as from water sources to treatment facilities or from treatment plants to distribution networks. Pumping stations provide the necessary pressure to move water through the system.
- **Storage Tanks and Reservoirs:** These structures are used to store treated water before distribution, ensuring a consistent supply to meet demand fluctuations.
- **Distribution Networks:** Pipes, valves, and fittings form the infrastructure of distribution networks. They transport treated water from storage reservoirs to industrial facilities, commercial areas, and households.
- **Water Leak Detection Equipment:** Specialized equipment such as acoustic leak detectors, correlators, and pressure loggers are used to detect and locate leaks in water supply networks, enabling prompt repairs and minimizing water loss.
- **Water Recycling and Reuse Systems:** Equipment like reverse osmosis (RO) units, membrane filtration systems, and advanced oxidation processes (AOPs) are employed to treat and purify wastewater for reuse in industrial processes or non-potable applications.
- **Stormwater Management Tools:** These tools include rainwater harvesting systems, stormwater detention ponds, bioswales, and permeable pavement designed to capture, store, and treat stormwater runoff from industrial and municipal areas.

- **Data Monitoring and Control Systems:** SCADA (Supervisory Control and Data Acquisition) systems and telemetry devices are used to monitor and control various aspects of water management, including flow rates, pressure, water levels, and system performance. These systems enable remote monitoring, data collection, and real-time adjustments.
- **Laboratory Equipment:** Water quality analysis requires laboratory equipment such as spectrophotometers, titration kits, microbiological testing equipment, and chemical analyzers. These tools are used to analyze water samples for compliance with quality standards.
- **Water Testing and Sampling Equipment:** This includes devices such as water samplers, automated samplers, and portable testing kits used to collect representative water samples for analysis and regulatory compliance.

## Leak Detection: Preventing Water Loss, Preserving Resources

A critical aspect of water management is the proactive detection and repair of leaks in water infrastructure. Regular inspections and maintenance of pipes, valves, and storage tanks help identify leaks or faulty components promptly. Addressing leaks swiftly not only prevents water wastage but also minimizes financial losses associated with water treatment and distribution. By adopting a vigilant approach to leak detection, industries and municipalities can conserve water resources and ensure the efficient functioning of their systems.

## Water Reuse and Recycling: Maximizing Efficiency, Minimizing Waste

Water reuse and recycling play a vital role in sustainable water management. Industries and municipalities can employ advanced water treatment systems to purify and recycle water for various purposes. Technologies such as reverse osmosis, membrane filtration, and advanced oxidation processes enable the treatment and reuse of wastewater, reducing reliance on freshwater sources. By maximizing water reuse and recycling, businesses and communities can minimize their environmental impact and contribute to a circular economy.

## Education and Awareness:

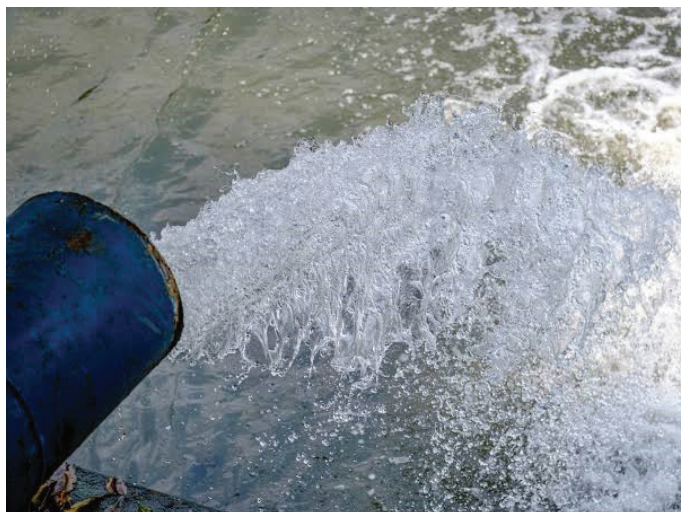
- **Public Outreach and Communication:**
- **Demonstrate Water-Saving Technologies:**
- **Water Audits and Individual Feedback:**
- **Incentive Programs:** Introduce incentive programs that reward community members for implementing water conservation measures.
- **Community Challenges and Competitions:** Organize friendly competitions or challenges within the community to encourage water conservation.
- **School Programs:** Collaborate with local schools to integrate water conservation education into the curriculum.
- **Community Gardens and Xeriscaping:** Encourage the establishment of community gardens and promote xeriscaping, which involves using drought-tolerant plants and landscaping

- techniques that minimize water requirements.
- Government Policies and Regulations.

**Conclusion:**

Managing industrial and municipal water is an evolving challenge that requires a holistic approach. By implementing strategies such as water audits, conservation measures, leak detection, water reuse, stormwater management, education, and collaboration, industries and municipalities can optimize their water resources, minimize waste, and contribute to environmental sustainability. By prioritizing sustainable water management practices, we can safeguard this invaluable resource for future generations while supporting economic growth and human well-being.

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### **Dr Mayur J. Kapadia**

*Trainer, Writer, Editor & Former AGM,  
Quality Control Dept, GNFC Ltd, Bharuch, Gujarat.*

He is a Trainer, Technical Writer, Editor, former AGM & Laboratory Head of GNFC Ltd, Bharuch, Gujarat, India. He possesses industrial experience of 40 years in the fields of Quality Control, Lab Set up, Cooling Water Management, ISI certification, and many other areas. He has to his credit technical suggestion awards, >25 publications and >20 presentations. He has been conducting training programs on Quality Control, NABL, ISI certification, Cooling Water Management, etc. He is an active member in committee of Bureau of Indian Standards, which has also conferred upon him an Appreciation award for his immense contributions.

## **ENHANCE WATER–USE EFFICIENCY IN LABORATORY THROUGH DESIGN CONSIDERATIONS AND WORK PRACTICES**

A laboratory is a designated space to carry out experimental tasks which may aim to advance science, quality control or optimization of certain processes prior to their industrial implementation. The laboratories are of various types depending upon purposes of establishing them viz. Analysis and Quality Control Lab, Research & Development Lab, Biosafety Lab and Clinical or Pathology or Medical Lab. Often, it is necessary to establish Production Lab for studying scale–up process of a product manufacturing process.

Whatever the type of Laboratory it may be, water is an essential component in jobs of each of them. Water is used in many applications like Dissolving substances, Carrying out chemical & biochemical reactions, Equipment cooling, Cleaning & Washing, Rinsing, Reagent preparation, Generating high purity water, Sample dilution, Warming samples & reagents, Staining process, Sterilization, Vacuum, Laundry, Sanitation and so on. Therefore, Laboratories are some of the most water–intensive spaces on the planet, that consume 5x water per square foot when compared to typical office building.

In view of global scarcity of fresh water and ever–increasing wastages, it is utmost essential to ‘Go green’ for Laboratories. Going green is no longer an option but a necessity to create a long–term positive change in the way we operate a Lab. In the current paper, some of the key points



are addressed for designing and establishing a sustainable and smart Laboratory, that can not only save water, but also reduce wastages; ultimately improving water–use efficiency.

**Create Water Reduction Plan**

First and foremost, a laboratory needs to conceptualize and develop its own water reduction plan and percolate it to the people

rebate is not missed out.

**Install all equipments needing cooling water at one place**

Allocate common area to install all equipments needing cooling water viz. distillation, reflux, condensation, water chiller etc together. Also create a common pool of recirculating cooling water by discharging part of hot water to grey



Laboratories, in general, are the most water–intensive spaces on the planet.

down the line. Once a plan is chalked out, appropriate and adequate actions to achieve the plan goals will spontaneously strike the brains of policy makers and operators.

**Contact local utility company for rebate**

The design team and stake holders of Lab should contact the local utility company to explore opportunities for rebates to assist in the implementation of water conservation measures, purchase of high–efficiency equipments and other measures. The rebates might be in the form of cash or kind or subsidy. Actions for establishing Lab should be initiated in line with guidelines prescribed by the local utility company so that opportunity of availing

water reuse system and making up the loss by fresh cold water.

**Fix double bowl sink on platforms**

These sinks facilitate separation of cleaning by tap water from rinsing by deionised water of glasswares and other labwares. Water discharged after tap water cleaning is contaminated with reaction masses, chemicals and other wastages, hence not recyclable. The discharged rinse water is relatively clean water which can be connected to grey water collection tank for recycling.

Glassware with stubborn stains of chemicals will need more water when washed under running tap water. Their soaking in soap water

A smart, sustainable, water efficient laboratory design offers a variety of benefits.



for small time period will help their subsequent cleaning with relatively less tap water. It is a general practice to make use of sink for soaking, sacrificing the sink for washing for the time being. Double bowl sink permits both the functions.



**Provide backup water source**

An interruption in water supply can result into failure of reflux / distillation / condensation types of experiments that need continuous cooling water. Abrupt stoppage of water supply will call for fresh experimentation and therefore additional water need. Provision of backup water source averts experiment failure in case of interruption in regular water supply.

**Exercise care when placing permanent water points**

Water point should be placed at the wall position as much as possible to avoid possibility of breakage of pipeline laid on the walk ways. The location of each water point in the laboratory must be scientifically located and decided in advance.

**Convert all regular taps into sensor taps on wash basins**

Automatic, motion-sensory taps detect the hand movement and allows the flow of water only when hands are moving around the tap. They

reduce water consumption by upto 70% as user cannot keep the tap continuously running.

**Install water meters at various locations**

Monitoring water consumption in different facilities of a Lab finds out top areas that use the most water. Identified areas can be targeted for water reduction measures.

**Fix low-flow aerators in lab Sinks**

Installing low-flow aerators in lab sinks can cut water flow by up to 50%, making it an easy engineering control to reduce water usage. Low-flow aerators simply screw onto the end of faucets and reduce flow without changing water pressure.

**Provide water flow-meters for optimized use of water**

In areas where equipments require mains-to-drain type of cooling, water flow meters should be provided for monitoring optimum water flow to equipments.

**Reuse Grey water through Sink-to-toilet system**

System should be installed to collect rinse water of glassware washing, laundry, cooling water discharge etc in a tank, which will supply flush water in toilets.

**Design water efficient toilets**

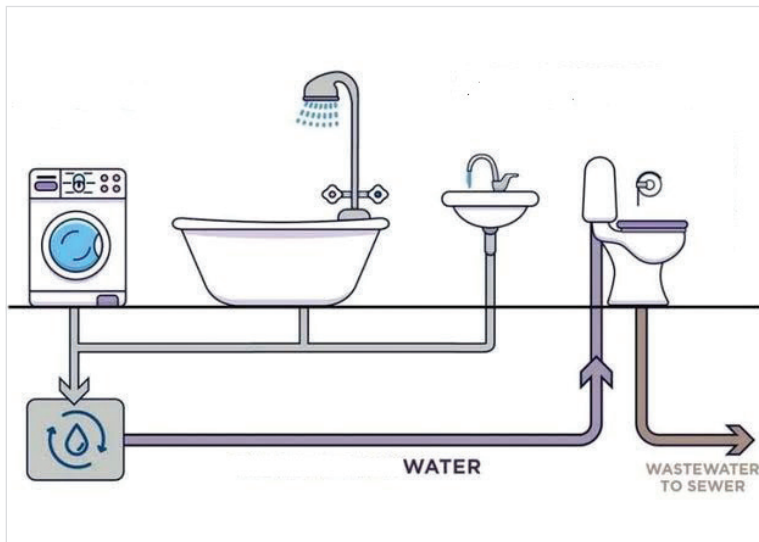
Toilets with ultra-low-flow (2-3 liters per flush), waterless urinals, dual flush toilets, ultra-low-flow lavatory faucets should be selected for Laboratories.

**Purchase Water-Efficient Equipments**

Opt for water-efficient equipment, especially those with eco-modes or built-in timers for shutdown. This goes for anything from tabletop lab equipment like water baths to bigger items like condensers and distillation apparatus. Keep an eye on water requirements while selecting a new equipment.



Low flow aerators



Sink-to-toilet system

### Equip existing equipments with Water Misers

This is a water saving and tempering device that monitors the drain temperature of steam condensate discharged from sterilizers and similar equipments and mixes cold water just sufficient to bring water temperature to permissible limits. It applies cold water only when needed. The temperature-actuated valve and built in thermometer of water miser ensures reliable and continuous monitoring of effluent temperature and mixing rate of cold water.

### Say bye-bye to vacuum aspirator

Vacuum aspirators should be replaced by vacuum pumps to save approx. 8–10 litres of water per minute going to waste. In addition to water saving, vacuum pumps offer a greater control and better performance.

### Eliminate Single-Pass Cooling Systems

Single-pass cooling system uses water only once to cool something, whereas a closed-loop or recirculating system reuses water continuously. Equipments like autoclaves and ice makers consume lot of water. Use of recirculating system or adopting air cooling can save substantial amount of water.

### Consider buying high purity water from outside agency

Water purification systems consume a lot of water, generate sizable reject water and have expensive filters. Instead of buying Lab's own system, pure water should be either purchased or unit should be operated in sharing with others.

### Install cold cycle laundry machine

Cold water wash cycle of machine consumes less water and energy. Machine without feature of hot water wash should be selected to save on water, capital cost and operating cost. Its rinse water should be reclaimed and reused for outdoor use. A storage tank may be allocated for this water to facilitate storage in case water has no immediate application.

### Make use of timers

Labs should be equipped with timers for critical or continuous water use applications to turn off equipment in evenings and weekends.

### Set Up a Sharing System

Instead of purchasing an additional unit of the equipment, it is better to leverage existing resources. The workflow should be so created that existing equipment could be shared by different functions of the Lab. It should also be an endeavour of a Laboratory to share its own system with other laboratories in need. Cultivating a sharing mentality helps in reducing resource consumption and fostering a culture of collaboration.

### Establish Standard Operating Procedures (SOPs)

Once lab is physically established, it should prepare SOP documents incorporating sustainable best practices and stick to those SOPs. These SOPs should not only be confined to Lab's experimental protocols but should also include maintenance checklists, protocols for waste handling, details on making smart and sustainable future purchases and so on.

### Pursue environmental certification

Motivated people contribute a lot in saving water. People are more motivated about goal if there is a larger future milestone to hit. EMS or other certification can help people become more aware of the part they play in saving water. From there, they can examine practical ways to cut down on water requirement. Hence, lab should consider getting an appropriate certification to continually improve upon water management.

### Conclusion

Designing a smart, sustainable, water efficient laboratory will offer a variety of benefits, including the reduction of energy, water, and waste; helping an organization reach its carbon commitments while simultaneously lowering operating costs and promoting a healthier environment. Examining energy and water requirements from a holistic perspective can definitely improve efficiency of the laboratories.



**Mandarr Kkamthe**  
Industry Expert—Water

I have been working in the water sector for 13 very fruitful years. I was previously associated with organizations like JUSCO, Suez Environment, Vishvaraj Environment Pvt. Ltd., Siemens etc. During this time, I achieved much in terms of expanding program offerings and enhancing the quality of existing Systems. Some of my main skills include the following:

- Expert in developing and implementing a strategy for program teams, as well as developing robust mitigation plans.
- Demonstrated ability to liaise with different engineering teams to increase system awareness.
- Able to report on system performance, and identify opportunities for continual improvement.
- In-depth knowledge of developing new programs to support the strategic direction of the organization.

# IoT Based Industrial Waste Water Monitoring and Recycling

## Basics of Water Reuse

Water reuse (also commonly known as water recycling or water reclamation) reclaims water from a variety of sources then treats and reuses it for beneficial purposes such as agriculture and irrigation, potable water supplies, groundwater replenishment, industrial processes, and environmental restoration. Water reuse can provide alternatives to existing water supplies and be used to enhance water security, sustainability, and resilience.

Water reuse can be defined as planned or unplanned. Unplanned water reuse refers to situations in which a source of water is substantially composed of previously-used water. A common example of unplanned water reuse occurs when communities draw their water supplies from rivers, that receive treated wastewater discharges from communities upstream.

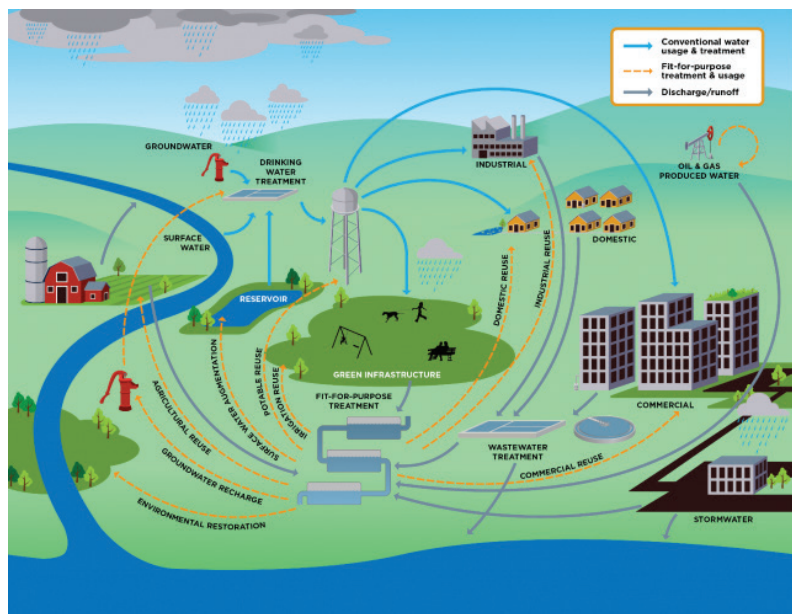
Planned water reuse refers to water systems designed with the goal of beneficially reusing a recycled water supply. Often, communities will seek to optimize their overall water use by reusing water to the extent possible within the community, before the water is reintroduced to the environment. Examples of planned reuse include agricultural and landscape irrigation, industrial process water, potable water supplies, and groundwater supply management.

## Types of Water Reuse

Sources of water for potential reuse can include municipal wastewater, industry process and cooling water, stormwater, agriculture runoff and return flows, and produced water from natural

resource extraction activities. These sources of water are adequately treated to meet “fit-for-purpose specifications” for a particular next use. “Fit-for-purpose specifications” are the treatment requirements to bring water from a particular source to the quality needed, to ensure public health, environmental protection, or specific user needs. For example, reclaimed water for crop irrigation would need to be of

- Indoor uses such as toilet flushing
- Dust control or surface cleaning of roads, construction sites, and other trafficked areas
- Concrete mixing and other construction processes
- Supplying artificial lakes and inland or coastal aquifers
- Environmental restoration



Examples of water sources and use applications

sufficient quality to prevent harm to plants and soils, maintain food safety, and protect the health of farm workers. In uses where there is a greater human exposure water may require more treatment.

**Uses for Recycled Water**

- Irrigation for agriculture
- Irrigation for landscaping such as parks, rights-of-ways, and golf courses
- Municipal water supply
- Process water for power plants, refineries, mills, and factories

**IoT Based Industrial Waste Water Monitoring and Recycling**

In this rapidly urbanizing country, environmental safety management has recently become the most challenging challenge. Waste water management is a way to treat waste that is reasonably reused and does not belong to the trash. Reducing and recycling is one of the most efficient ways to handle waste. Waste water treatment firms have been dealing with a slew of issues for decades based on how to prevent waste being managed Separating wastes that are discarded in the water, such as paints and battery wastes, is difficult, because

The presence of radioactivity in treated industrial waste water, as well as its clarity.

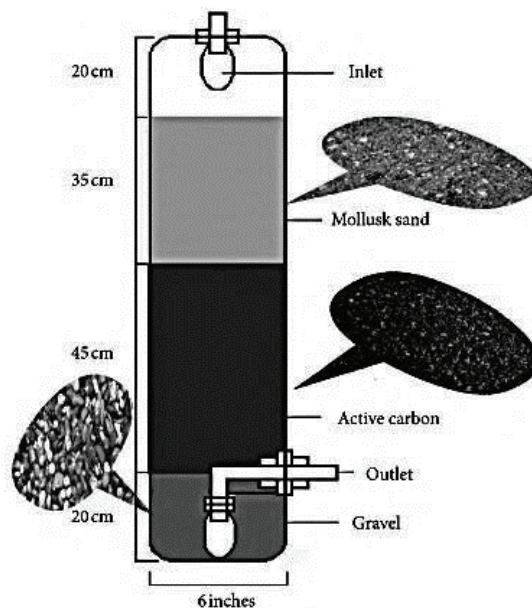


Figure 1. Filtering Tank Overview

This approach has the potential to make significant improvements in the water system and provide everybody with a safe living environment.



Figure 2. Mollusk Sand Raw Material

they need a special method to classify and recycle. To address these issues, we turned to the Internet of Things (IoT) for a waste managing system. It is simple to detect polluted mixed in water using IoT, which can be indicated to the consumer and recycled. In this way they can be made harmless and is again used.

### Introduction

Pollution can be avoided by removing discarded chemical or other hazardous materials from dumping sites. The method of extracting materials from there is both expensive and risky, since there is no way to distinguish between the different types of waste and the potential harm they can cause; in most cases, these processes can only be carried out by humans. Resource recovery entails the separation of waste materials, which is a labor-intensive process. Theoretically, collecting enough data on recycled items would lead to better recycling behavioristic it is focused on the collection of data through data analysis, this method can be subjective. It would be perfect if there was a system in place that could predict recycling trends at the point of disposal. Waste management organizations can monitor violations and recycling actions in real time this way. In this paper, it is trying to detect the type of water that are being dumped in the water bodies such as the lake, ponds, rivers etc. This is being worked by means of Internet of Things that is being connected to the server every time when the water is being pumped out of the industry the sensors like turbidity, temperature and pH sensor reads the water value and feed them to the server. When they are above the fixed value then they are being redirected to the recycling pit once again. This process is being continued till they met the fixed point of the sensors. Every time they are in to the recycling process the user is being given a notification. This process helps the prevention of waste water that is being dumped into the water bodies. Collecting violations in real time will assist waste management firms and environmental protection agencies in conserving capital and assessing perceived disposal costs.

### System Overview

Waste water recycling and reuse practices in Mediterranean basin was practiced since the ancient Greek and roman civilization. Raw or

partially waste water has been used in many places around the world, with significant public health and environmental consequences. The recycled water is further used for domestic purposes. The process water has to be purified before it can be discharged into the sewage system or into natural waters. The water recycled will be helpful to increase the ground water level and it will be helpful to people to reuse the water. The recycled water can be used for vehicles washing gardening and for washing floors, kitchen and also useful for agriculture. It improves the ground water level and should save water for future use without contaminating the water.

### Filtering Tank

Filtering tank (see Figure 1) is an iron storage tank which is used to filter the waste industrial water. The pebbles are placed at the bottom of the tank which is used to filtrate the water at maximum level and the sponge will be placed at the top of the pebbles bed which destroys the 50% of salt content in the waste water. Smart water quality monitoring system focused on the Internet of Things that aids in the continuous measurement of readings of water conditions. They are divided into four categories based on the physical properties of water (pH, electrical conductivity, temperature, and turbidity). The sensors are connected to the node MCU in a precise manner to detect water quality, and the data collected from the sensors is transmitted to a NET platform framework that compares the readings to WHO standard values. The proposed method will assess the water quality for reusing and drinking based on the calculated results. Field sampling and subsequent use for remote operations. This type of remote monitoring device must be able to withstand extreme temperatures ranging from  $-45$  degrees to  $30$  degrees. It must function without connection to the power grid and with minimal communication. It can house electrochemical, optical, physical, and radiation sensor modules that measure microbiological stability, nutrients, and salt levels, for example. The presence of radioactivity in treated industrial waste water, as well as its clarity.

### Mollusk sand filtering process

The concentration of Pb, the degree of flexibility, and pH increased



after the substances or substances in the wastewater passed through a filtered tube made of active coconut shell graphs, mollusk sand, and beads. The tube measures 120 cm long and is made of 10 cm of stone, 20 cm of mollusk sand, and 10 cm of active carbon granules. The function of the sand platform is generally, and the mollusk filter, which is 20 cm thick in particular, filters and reduces heat. Excess moisture contained in contaminated water is caused by dust particles such as lead particles, bird droppings, and micro-organisms, or is usually determined by pollutants in a particular area or city . Contaminants such as dust, metals such as Pb, and non-metallic materials such as bacteria, viruses, and the color of contaminated water will be successfully filtered through a mollusk san medium filter tube, which will form a film layer. The mollusk sand sand filter works best in lowering Pb levels. In contrast to conventional sand and active carbon, wastewater treatment uses quartz sand as an improved filter to improve the pH by 4.7 percent in treatment water from rivers and 2.9 percent in wastewater, while mollusk san has increased the pH by 26 percent. Mollusk shell sand (see Figure 2) has a better ability to increase the pH of contaminated water, due to the calcium oxide (CaO) content of 94.1 percent, sodium oxide (Na<sub>2</sub>O) of 1%, and silicon oxide (SiO) of 1% in mollusk sand. Mollusk sand has the ability to absorb heavy metals from the water and to hold suspended objects, making it an ideal water filter. Shell is one of the world's largest carbon-rich mineral resources. The mineral content of the shell varies

and is high; for example, calcium makes up 66.7 percent, magnesium makes up 22.28 percent, and SiO<sub>2</sub> makes up 7.88 percent. This is why minerals containing naturally rotten shells or sediments can raise the pH of contaminated water and carbonate can lead to lead.

### Active Carbon Filtering

Dirty water is not always a good source of clean, healthy drinking water; it has no color, taste, and clarity. The area where the waste falls has an impact on wastewater. Wastewater in rural areas can be contaminated by landfills, pesticides, and animal waste, while urban wastewater can be polluted by chemicals dissolved in tasteless, colorless, and invisible. Lead (Pb) was used for roofing, paint, tin, tar, dust, and asbestos, among other things. Volcanic eruptions and gas emissions from automotive and industrial fuels can also cause Pb [4]. Polluted water pollution can be caused by micro-organisms such as bacteria, viruses and parasites, in addition to chemical substances. The level of air energy, especially in polluted water, can be caused by suspended inorganic and inanimate matter, as well as air pollutants such as germs, germs and parasites. To reduce or remove airborne contaminants in polluted water, use mollusk sand filters and active carbon dioxide from coconut shells.

Sewage filtration is done by moving the wastewater through an inlet to extract particles that cannot be separated from the sediment. The

suction process can be used to deal with contaminants that avoid filtering in wastewater treatment.

As a result, it was found that a filtration process involving mollusk sand and carbon dioxide absorption was effective in reducing wastewater inefficiency, with a typical 20 NTU pre-treatment and 5.67 NTU post-treatment, meeting 72 percent of water requirements. The wastewater treatment system helps to prevent suspended chemicals and chemicals escaped from the filtering process from escaping, which is why this process works to reduce contaminants in contaminated water such as lead (Pb) concentration of wastewater that does not meet water needs has improved and is now meeting drinking water requirements.

-Pb in contaminated water does not follow water quality, with moderate filtration of Pb in contaminated water 131.7 g / l before treatment and 0.69 g / l after treatment [5] Effective carbon capacity to absorb Pb in wastewater is due to active carbon content large micro-pore and mesa pore volume, which makes it very easy to absorb pollutants (including Pb) in sufficient quantities. a absorbing structure consisting of a free amorphous carbon atom made up of free carbon and has a deep surface that allows it to absorb water many. st using a filtration method that incorporates mollusk sand and active carbon infiltration to reduce Pb concentration, turbidity, and increase the pH of wastewater.

The findings show a 99.47 percent decrease in Pb performance, a 72 percent increase in turbidity, and a 26 percent increase in pH performance, with a mean of 5.16 before treatment and 6.95 post-treatment. The concentration of Pb was reduced to 0.69 g / l after the process, the turbidity was reduced to 5.6 NTU, and the pH was increased to 6.95. The concentration of Pb was 10 g / l, the turbidity was 5 NTU, and the pH was 6.5–8.5, meeting the water quality process.

**Process flow**

In developing countries like India, the growth of industry occurs at a rapid pace, resulting in a slew of drawbacks. The main area affected is the water bodies, as all industries need a large amount of water. These waters are pumped back into the river without any consideration or recycling. The overall process of the proposed method is shown in Figure 3.

The proposed approach comes into play at this stage. The project’s main goal is to prevent the world from being ruined. Another crucial aspect is to have cost-effective recycling and reuse options. The consumer can easily identify the process. This project is used to automate the checking of the water that is being dumped in the water bodies by the use of Internet of Things (IoT). In this method the water that is being pumped out from the factory is being directly dumped in to the filtration tank. The output from the tank is being checked by using three sensors temperature, turbidity and pH sensors, if the sensors detects anything that is above the fixed value then the user is being indicated and the water is then once again send for recycling, this process is being continued until they reach the required level. Then they are being send out and can be reused again in the factory or household purposes. Every value of the sensors can be feed directly in to the server and they can be noted and alerted from any were in the world.

**Conclusion**

The most cost-effective and simple method of recycling and reusing is IoT-based industrial waste water monitoring and recycling. Since they are live feed in to the server, this approach can be seen from anywhere in the world. This approach has the potential to make significant improvements in the water system and provide everybody with a safe living environment.

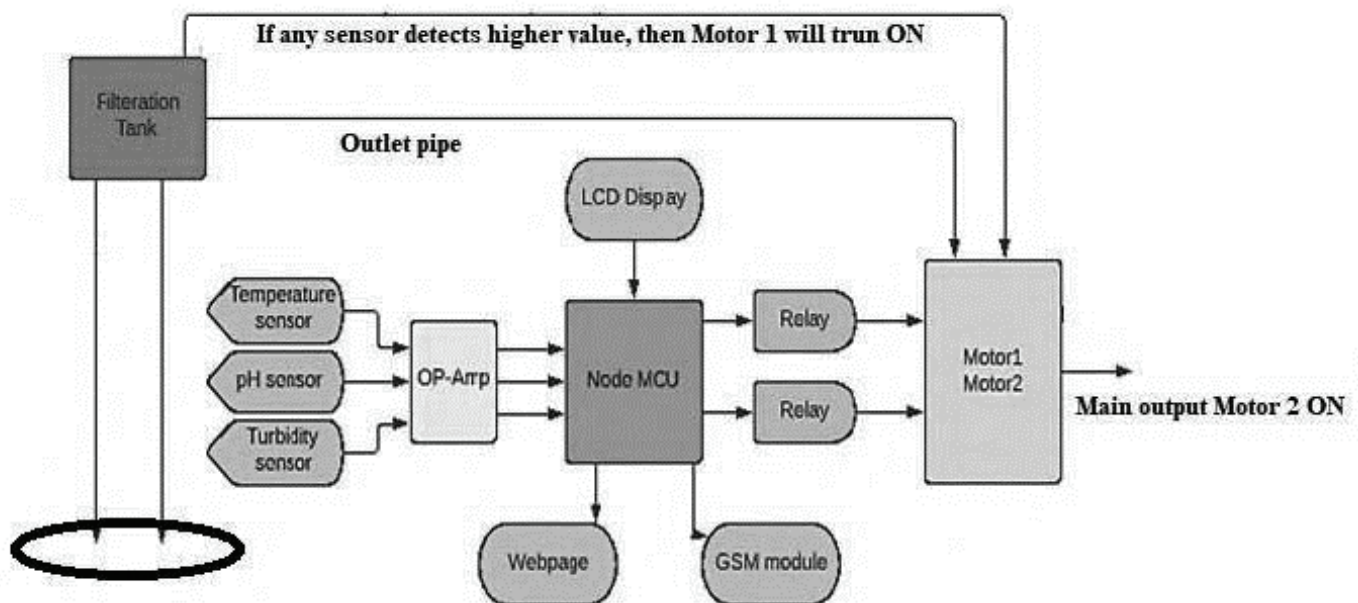


Figure 3. Overall Process Flow of Proposed Approach



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# REPURPOSING WATER THE ONLY SOLUTION TO MAXIMIZE THE <1% AVAILABLE FOR HUMAN USE.



**Nandita**

Director | Growth & Strategy at Hydromo

Nandita has over 20 years experience in areas of marketing, market research & digital marketing and is passionate about driving result & sales oriented marketing strategies including digital marketing for B2B and B2C. At Hydromo, which is South India's leading turnkey water treatment, waste water management & Solar turnkey solutions provider, she steers growth & strategy driving new technologies, identifying market expansion, gap analysis etc. At present, she also leads the digital marketing wing at Hydromo.

According to the United Nations, more than two billion people live in countries experiencing high water stress, and about four billion people experience severe water scarcity at least one month a year. Moreover, only 2.5% of the world's water is freshwater, and less than 1% is accessible for human use. This alarming fact proves there is an imperative need to conserve, recycle, and maximize the use of water in a sustainable and efficient manner.

### Water repurposing is the only solution

Water repurposing is an effective solution to water scarcity because it can increase the availability and quality of water for various uses, such as drinking, irrigation, industry, or recreation. Water repurposing involves treating wastewater from different sources, such as sewage, greywater, rainwater, or groundwater, and reusing it for different purposes.

Water repurposing can also recover valuable by-products from wastewater, such as nutrients, biogas, or metals.

### Stunning Facts on how African countries are repurposing & enhancing water to combat scarcity

Water reuse in Africa is a challenge and an opportunity, as it can contribute to urban food supply, poverty alleviation, and environmental protection. However, it also poses health and social risks due to the lack of adequate sanitation and regulation.

In Morocco, a country that suffers from chronic water scarcity, the reuse of treated wastewater for irrigation has been practiced since the 1980s. The country has developed a national strategy for wastewater reuse, which aims to increase the reuse rate from 8% in 2015 to 15% in 2030

In Namibia, a country that faces severe droughts and water shortages, the capital city of Windhoek has been recycling treated wastewater into drinking water since 1968. The Windhoek Goreangab Operating Company (WINGOC) operates a state-of-the-art plant that treats wastewater to potable standards using advanced technologies such as ozonation, biological activated carbon filtration, and reverse osmosis. The plant produces about 21% of the city's drinking water supply

In South Africa, a country that experienced a severe water crisis in 2018, the reuse of treated wastewater is seen as a potential solution to augment the water supply and reduce the dependence on surface water sources. The country has several wastewater reuse projects, such as the Durban Water Recycling Project, which produces 47.5 million liters of high-quality



water per day for industrial use.

In Africa as a whole, the estimated volume of wastewater produced in 2015 was about 62.5 billion cubic meters, of which only 8.5% was treated. The potential volume of wastewater available for reuse was about 23.4 billion cubic meters, of which only 2.7% was reused. The main sectors that reused wastewater were agriculture (58%), industry (27%), and municipal (15%).

Water treatment is the process of improving the quality of water to make it suitable for a specific end–use. Water treatment can remove contaminants and undesirable components, or reduce their concentration so that the water becomes fit for its desired end–use. Water treatment can also inactivate or kill any potentially harmful microbes in the water.

There are different methods and types of water treatment, depending on the source and quality of the water, and the intended end–use. Some of the common methods and types of water treatment are:

**Coagulation and flocculation:** This is a process that involves adding chemicals with a positive charge to the water, which neutralizes

the negative charge of dirt and other dissolved particles in the water. The particles then bind with the chemicals to form larger particles called flocs, which are easier to remove by sedimentation or filtration.

**Sedimentation:** This is a process that separates solid particles from the water by gravity. The heavier particles settle to the bottom of the water, while the clearer water remains on top.

**Filtration:** This is a process that removes smaller particles and germs from the water by passing it through filters with different pore sizes and materials, such as sand, gravel, charcoal, or membranes. Filtration can also improve the taste, odor, and color of the water.

**Disinfection:** This is a process that kills or inactivates any remaining parasites, bacteria, or viruses in the water by adding chemical disinfectants (such as chlorine, chloramine, or chlorine dioxide) or using physical methods (such as ultraviolet light or ozone). Disinfection can also prevent microbial growth in the distribution pipes.

**Reverse osmosis:** This is a process that

removes dissolved salts and other impurities from the water by applying high pressure to force it through a semipermeable membrane that only allows water molecules to pass through. Reverse osmosis can produce very pure water that is suitable for drinking or industrial use.

### Inspiring successful water conservation projects and campaigns that created impact.

The Naganadhi River Rejuvenation project in Tamil Nadu, India, revived a dry river by building 600 recharge wells and 12,000 rainwater harvesting structures along its catchment area. The project benefited over 250,000 people and increased the groundwater level by 6 meters.

The Colgate #EveryDropCounts campaign raised awareness about the amount of water wasted while brushing teeth. The campaign encouraged people to turn off the tap and save up to 15 liters of water per day. The campaign reached over 2 billion people and saved an estimated 155 billion liters of water.

The Sunlight Saves Water campaign in South Africa, provided water–efficient washing machines and laundry detergents



to communities affected by drought. The campaign reduced the water consumption for laundry by 70% and saved over 100 million liters of water in two years.

The Water Changes Everything project by Charity: Water, funded and implemented over 51,000 water projects in 28 countries, providing clean and safe water to over 11 million people. The project also improved health, education, and economic opportunities for the communities.

### Our Way of Maximizing Efficiency in the Residential Sector— India

Luxury villas often feature ornamental water features like fountains, waterfalls, and decorative pools. Using recycled water in these features helps prevent excess water wastage. Maximizing the efficiency of water touch points in luxury villas involves adopting advanced water management technologies and sustainable practices.

Installing smart sensors and automated controls can help optimize water usage at various touch points. These technologies can monitor water levels, detect leaks or abnormalities, and automatically adjust water flow or shut off when not in use. This ensures efficient water consumption by reducing wastage and preventing unnecessary water usage.

Implementing water recycling systems allows for the treatment and reuse of water from certain touch points. For example, wastewater from dishwashers, washing machines, or showers can be treated and reused for irrigation purposes or for non-potable water needs, such as toilet flushing. This approach helps conserve water resources and reduces the overall demand for treated water.

### Controlling Water Wastage in Filtration

To address water wastage in filtration systems, implementing reverse osmosis systems with 70% recovery rates can reduce wastewater generation significantly. One of the prominent areas where water wastage occurs is through filtration systems. Although necessary for ensuring clean water, these systems can inadvertently contribute to significant water loss. To address this issue, designers and homeowners must prioritize innovative solutions that balance conservation, convenience,

and effective management.

### Maximizing Reuse of Wastewater

Sewage Treatment Plants (STPs) are facilities that treat wastewater from households, commercial buildings, and municipal sources. The purpose of STPs is to remove contaminants and pathogens from the wastewater and produce an effluent that is suitable for discharge or reuse.

The effluent can be reused for various purposes such as irrigation, toilet flushing, industrial processes, or groundwater recharge. Types of technologies include Membrane Bio Reactor (MBR), Moving Bed Bio Reactor (MBBR) and Sequencing Batch Reactor.

Effluent Treatment Plants (ETPs) are facilities that treat wastewater from industrial sources. The purpose of ETPs is to remove pollutants and toxic substances from the wastewater and produce an effluent that meets environmental standards and regulations. The effluent can be reused for various purposes such as cooling, washing, or irrigation. Technologies include Biological treatment, Physico-chemical treatment, and Chemical treatment.

Innovative STP and ETP technologies can help protect groundwater quality by treating wastewater before discharge or reuse.

Hydromo is a pioneer in providing water conservation and recycling solutions that are not only environmentally friendly but also economically viable. Hydromo's products have the advantage of propelling sustainability goals while enhancing operational efficiency and profitability.

One of the most innovative and effective products that Hydromo offers is the MBR-powered Sewage Treatment Plant (STP), which meets the hygiene needs of small communities and industries by providing quality recycled water from sewage generated at the source. The STP uses a combination of biological digestion and membrane filtration to remove organic contaminants, pathogens, and bacteria from the wastewater. The treated water can be reused for various purposes such as toilet flushing, floor washing, irrigation, car wash, firefighting storage, or even fed to a reverse osmosis (RO) system for further purification.



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# BUSINESS CASE WATER TALE!

Tracking down Grasim Nagda's water management success story from scarcity to sustainability...

By Veolia Water Technologies & Solutions



As reports of alarming water table depletion and contamination continue to rise across Planet Earth, an extraordinary first-of-its-kind tale of successful collaboration for industrial water management, has emerged from 23.4453° N, 75.4098° E.

The location in Central India is of the Grasim Industries Limited's plant in Nagda. A flagship company of the \$65-billion Aditya Birla Group (ABG), and a leading global producer of viscose staple fibre (VSF), the Grasim plant has adopted cutting-edge technologies in its efforts to revolutionize water management practices at its manufacturing unit.

The Nagda plant today leads the way with the VSF business being the lowest water consumer globally. The facility also meets water needs of the entire city, railway and irrigation needs of the farmers through the 30

billion litres storage capacity built by Grasim. The Aditya Birla Group's emphasis on the three R principles: Reduce, Recycle, and Reuse to protect and conserve water has also resulted in a significant reduction in freshwater intake of its fibre production units.

It wasn't always like this though.

Nagda, located in a region with limited rainfall, has always posed a significant challenge for Grasim's water-intensive industry, which relies primarily on the Chambal River for its production requirements.

Over the past seven decades, water needs have surged from 200 million cubic feet (MCFT) to nearly 1300 MCFT, leading to operational interruptions during peak summer months due to water scarcity. Grasim's VSF plant at Nagda started production in 1954, and since

## About Veolia WTS:

Part of the French major Veolia Group, Veolia Water Technologies & Solutions (formerly SUEZ Water Technologies & Solutions) is a technology company focused on environment sustainability through its wastewater and water treatment businesses. Headquartered in Bengaluru, India, Veolia Water Technologies has been pioneering technological solutions for ecological transformation and sustainable development goals.

Veolia Group aims to become the benchmark company for ecological transformation. Present on five continents with nearly 220,000 employees, the Group designs and deploys useful, practical solutions for the management of water, waste, and energy that are contributing to a radical turnaround of the current situation. Through its three complementary activities, Veolia helps develop access to resources, preserve available resources, and renew them.

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then the Aditya Birla Group has diversified into various new sectors and industries, including the production of cement, sponge iron and chemicals.

Ergo, the growth of its industries has not only served to emphasize upon water requirements for the ABG, but has naturally led to its commitment towards water stewardship and concern for the environment. With excellence in water management practices being integral to its approach to growth, the company has been at the forefront of innovations to improve the efficiency of processes to reduce consumption and reuse of water multiple times. For this, Grasim has adopted state-of-the-art novel technologies, such as membrane processes, which clean up and recycle the wastewater. With its unwavering focus on environmental impact deriving inspiration from the UN SDG 6 to protect, conserve and regenerate the water eco-system, Grasim remains committed to improve the availability of water, the most precious shared resource, for everyone.

K. Suresh, Senior President, Staple Fibre Division, Grasim Industries Ltd. reflects on his company's water reform journey: "When I began my career here, we consumed approximately 200 cubic meters per ton of fibre. Through dedicated efforts spanning 35–40 years, we've reduced this consumption to a meagre 20 cubic meters per ton of fibre. This reduction involved intensive work on water consumption reduction, recycling, reuse, and process innovation."

It is therefore easy to see why Grasim Industries, Staple Fibre Division has been at the forefront of receiving industry accolades for industrial and environmental best practices – this includes Stockholm Industry Water Award 2004, 'TERI-IWA-UNDP Water Sustainability Awards 2021–2022' in the category of "Water for All, Water Stewardship category of the Network18 (CNBC) Sustainability 100+ Award and The Economic Times Promising Plants 2021.

Veritably, the Grasim Nagda story serves as an unprecedented case study, illustrating a remarkable success in water management within the global VSF industry. The solution

is the outcome of a collaborative effort, 'co-invented' by Grasim and global water technologies specialist Veolia Technologies.

### PROFITABLE PARTNERSHIP

A background update would be instructive here. In 2019, with a growing need to conserve water and reduce the usage of fresh water and to further cut down on production costs, Grasim extended invitations to prominent players in the water industry – this included the world's three foremost companies specializing in membrane technologies – to collaborate on the creation of cutting-edge systems. This endeavour presented a significant challenge since there was no Zero Liquid Discharge available which could effectively address the intricate aspects of viscose effluent treatment. Following extensive deliberations, followed by visits to model plants across the world by Grasim officials, it was decided to harness energy efficient technologies which could meticulously address the intricate aspects of viscose effluent treatment. The result of this pioneering initiative was that Veolia emerged as the player selected to meticulously craft a state-of-the-art Zero Liquid Discharge System.

"We had to collaborate with global technology suppliers to ensure the sustainability of our proposed facility. After thorough evaluation, we selected Veolia, as our partner. Together, we visited numerous facilities to fine-tune technology suitable for our operations and environment. We prioritized capability, equipment reliability, and the trustworthiness of technology suppliers throughout this collaboration," explains Grasim's Suresh.

It needs to be underlined here that developing such projects typically involves years of conceptualization before reaching fruition. The partnership between Grasim and Veolia commenced in late 2018 and continued through 2019–2020 even as Covid struck industries and businesses across the world. The joint venture progressed smoothly, overcoming challenges, and delivering a successful solution. By August 2021, the project was not only operational but also thriving, showcasing exceptional efficiency and success.

Suresh is naturally delighted with the outcomes achieved at his plant which celebrated Grasim's 75th anniversary in 2022.

"Nearly two years after commissioning the plant, we remain satisfied with its performance. We aim to replicate this model at various other facilities and make this environment friendly, cost-effective, and efficient technology available to similar situations globally, emphasizing resource recycling. Currently, we recycle nearly 98 per cent of the resources entering our plant and are actively working to further reduce the remaining 2 per cent."

### WHY VEOLIA?

Commenting on the choice of technological partner and reasons for the success of the ground efforts, Suresh is led to explain, "The collaboration between Grasim and Veolia was driven by Veolia's status as a global leader in this technology, which was paramount for our company's risk mitigation strategy. Although we contemplated handling the project internally, the learning curve and time constraints led us to prefer a globally reputed and established vendor. We didn't want to go with untested players. Veolia's track record with nearly 200 plants worldwide instilled confidence in our choice. During the design phase, our experts and Veolia's collaborated closely, addressing equipment construction, operating parameters, chemical usage, dosage patterns, recovery techniques, and membrane selection. This collaboration resulted in the creation of a pioneering recycling plant, marking a significant milestone in our industry."

### MISSION CLARITY

The project derived its success from clear objectives which were as follows: Firstly, the aim was to achieve Zero Liquid Discharge compliance, which involved treating various effluent streams and recycling the treated water to reduce the reliance on fresh water. Additionally, it aimed to provide comprehensive solutions that included effluent collection, membrane-based recycling, and crystallization processes. Another critical objective was to optimize recovery rates, thereby reducing the need for evaporators and crystallizers in the water treatment process. Maintaining a consistent Total Dissolved Solids (TDS) level of

less than 200 ppm in the treated product was essential to meet water quality standards. Lastly, the challenge was to develop an operationally efficient system with minimal manpower requirements, a reduced physical footprint, and a high degree of automation, enhancing overall system efficiency and cost-effectiveness. These goals collectively addressed the complex challenges associated with industrial water management while emphasizing on sustainability.

### INNOVATIVE SOLUTIONS

Grasim and Veolia innovated a series of innovative solutions involving optimal brine treatment, RO, and evaporation processes. The first notable installation was a patented clarifier, which played a pivotal role in enhancing water treatment efficiency. Subsequently, Veolia introduced the high pH RO system, a cutting-edge recycling system. This system proved highly effective, enabling the recycling of nearly 92 percent of water from the Reverse Osmosis (RO) process alone. To tackle the issue of RO reject and achieve Zero Liquid Discharge, Veolia further innovated by introducing thermal solutions.

One critical aspect of the project was sodium sulfate, which, though environmentally benign, raised concerns among certain stakeholders. The partners then innovated a solution which combined Veolia's expertise with Grasim's, resulting in an optimal brine treatment, RO and evaporation process by Veolia. Grasim officials reduced the brine concentrate volume by extracting sodium sulfate and then returned it to Veolia for final processing further highlighting the project's commitment to sustainability.

### PROJECT EXEMPLAR

The uniqueness and exemplary status of the project stems from its innovative solutions, which bring forth a multitude of benefits.

Notably, this high recovery solution achieves an impressive recovery rate of over 98 percent, setting a new global benchmark for Zero Liquid Discharge (ZLD) plants. Unlike many VSF plants that often bear substantial operational expenses, this plant was meticulously designed to address their primary pain point, Opex, making it a standout success. The revolutionary aspect of this solution lies in its recognition of the vast potential for resource creation and utilization within the VSF industry. The process generates valuable sodium sulfate and other usable salts, which are subsequently sold in the market, establishing an additional revenue stream.

In fact, this innovative approach has proven to be a significant revenue generator for Grasim, capable of recovering a substantial portion of the chemical solution production costs, accounting for 40–50 percent of Opex.

In terms of tangible benefits, the project not only positions the plant as a producer of sodium sulfate and usable salts but also as a source of recycled water. These interventions not only tackle water treatment challenges but also contribute significantly to income generation, operational efficiency enhancement, and overall sustainability. This

project stands as an outstanding case study, showcasing Veolia's pioneering technologies and execution capabilities, particularly its Zero Liquid Discharge solutions.

The Grasim Nagda project has without doubt created reference data with global applicability, paving the way for broader market penetration and a substantial contribution to global water recycling and pollution reduction efforts.

That augurs well for industries, businesses, water technology players – and most critically for an increasingly fragile global environment.

### ENVIRONMENTAL URGENCY

Veritably, it is empathy towards the environment, depleting earth resources, and the consequent need for application of industrial best practices which binds responsible global entities like Grasim and Veolia together. Grasim Industries' Viscose Staple Fibre plant at Nagda in Madhya Pradesh, certainly is an outstanding example of the success of Veolia's technology solutions as can be seen from the dramatic water tale turnaround.

For sure, while the use of membrane based novel technologies and the installation of the world's first Zero Liquid Discharge (ZLD) for the viscose industry at Nagda can be viewed as an exemplary solution for the country's water table depletion and contamination problems, there is a growing need for such technologies to be applied across the board in water reliant industries, and in civic settings. As it is indiscriminate urbanization, lack of planning, and the sheer absence of water and waste water treatment and disposal systems across residential, civic and industrial facilities, have led to almost 70 per cent of surface water in the country being rendered unfit for consumption. So much so, that India is counted among the most water stressed countries. Almost 40 million litres of waste water enter our rivers and water bodies each day, and only a fraction of the national water resource is 'properly managed'. This has negative ramifications for the country's social and economic growth. According to a recent World Bank Report, water pollution not only costs the national exchequer up to \$7.7 billion a year in losses, but also leads to a 9 per cent drop in agricultural revenue, a 16 per cent subtraction in crop yield, 40 million Indians being affected by waterborne diseases and 400,000 fatalities. All of these challenges, compounded further by lack of water conservation efforts, can pose a severe threat to the growth now being projected.

### FUTURE PROSPECTS

As India and many other countries continue to grapple with water scarcity and pollution, the Grasim Nagda project serves as a testament to the potential of industrial best practices and innovative technologies to reverse the tide of water depletion and contamination. It sets a new standard for sustainable water management, both in India and globally, offering a promising path toward a water-secure and environmentally responsible future.

It is here that entities like Veolia Water Technologies can step in as



key contributors to the India Growth Story. The French multinational, which has been in India for close to two decades now, has over 500 references of completing the most complex projects starting from treatment of drinking water, sewage treatment and industrial wastewater treatment. The solutions being offered include Zero Liquid Discharge with Mechanical Vapour Recompression (MVR), crystallizers and evaporators, Reverse Osmosis membranes etc. In India Veolia has successfully completed more than 25 Zero Liquid Discharge projects, also contributing to the delivery of a wide variety of equipment, water management solutions and other services for civic, industrial, residential and commercial projects across the country.

Gopal Madabhushi, Senior VP & Business Unit Leader India & South Asia, Veolia while underscoring his company's intent to make the world a water secure place dilates on business prospects: "With freshwater depleting very fast worldwide, the success being demonstrated at Grasim's Nagda plant sets an important precedent not only for India, but also for Veolia's global water agenda. It shows the user's confidence in our systems. We stand out because of our very own technologies and execution capabilities which differentiate us from the competition in the market. Veolia has introduced some unique solutions to this country for the first time, successfully delivering projects on site as a team. Our key goal is primarily to penetrate more markets on the membranes side which offer the best solutions for customers, also make strides in the

Zero Liquid Discharge market so that we are able to recycle as much as possible and reduce pollutants on the surface water."

That should be happy news for the future of water ravaged Earth.

### GRASIM NAGDA: PROJECT BENEFITS

- Veolia achieves 98% recovery rate, a ZLD benchmark for VSF industry
- Leads to creation of valuable products, like sodium sulfate, for added revenue.
- Innovation boosts Grasim's income by recovering chemical production costs.
- Benefits include recycled water and near-zero pollution discharge for Nagda's sustainability.
- Project while showcasing Veolia's tech process, enhances efficiency and sustainability.
- Grasim Nagda has contributed globally to water recycling and pollution reduction.
- Technology offers benefits for industries, businesses, and global environment.

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# HIDROING DEVELOPS SMART WATER SOLUTIONS FOR 144-YEAR-OLD WATER SUPPLY NETWORK IN ZAGREB, CROATIA

OpenFlows and OpenUtilities Save 16 Months when Delivering One of the Largest Digital Twins in Eastern Europe

By Sandra DiMatteo – Marketing Director, Bentley Systems



Courtesy: Hidroing was tasked with developing a GIS system and hydraulic model of one of the world's oldest water supply systems. Image courtesy of Hidroing d.o.o.

## Modernizing One of the World's Oldest Water Supply Systems

Originally constructed in 1878, the 144-year-old Zagreb water supply system is one of the oldest functioning water networks in the world. At that time, the capacity of the constructed system was 53.2 liters per second via a 4-kilometer-long pipeline that provides water to 11,150 of the 30,000 inhabitants in Zagreb, the capital and largest city of Croatia. ViO Zagreb has been responsible for the city's public water supply since its inception, including construction and rehabilitation of the network infrastructure. The organization ensures reliable water distribution to the growing number of residents. To cover water services for now over 900,000 people across 800 square kilometers, the water supply network was expanded, spanning 3,500

kilometers with seven water sources, more than 400 components, and a daily water intake of 310,000 cubic meters.

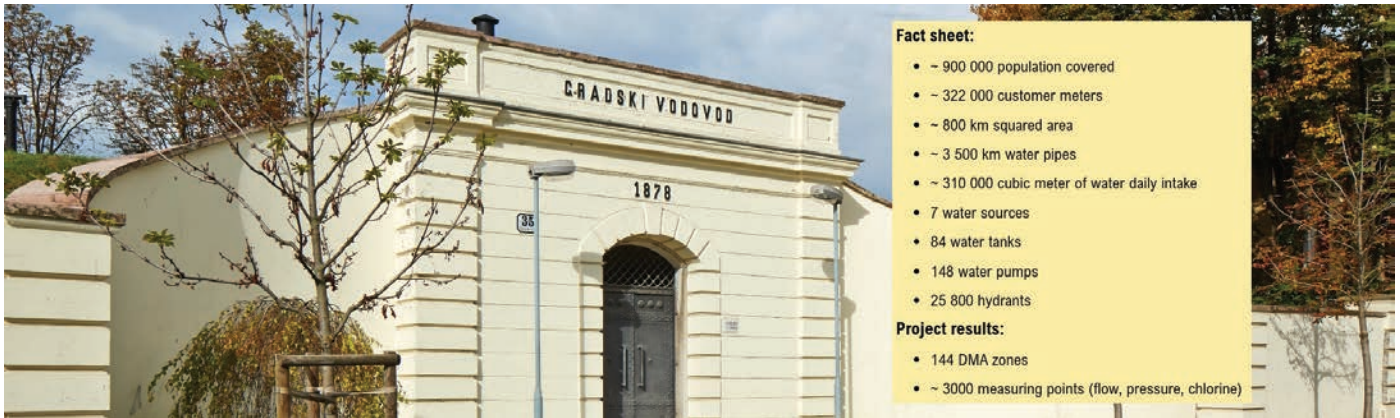
Over the last two decades, water loss has grown significantly and sharply worsened after the occurrence of earthquakes in 2020. To resolve these losses and modernize the network, ViO Zagreb retained Hidroing to develop a detailed master plan and water loss program, digitalizing the system for optimal water distribution over the next 30 years of operation. "The project was developed to be used as a statistical and reporting tool, [where digital] protocols were developed for direct data analysis in activities of water loss reporting," said Igor Dundovi, project manager at Hidroing.

## PROJECT SUMMARY

- **Organization** : Hidroing d.o.o.
- **Solution** : Water, Wastewater, and Stormwater Networks
- **Location** : Zagreb, Croatia



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



Courtesy: Using OpenFlows and OpenUtilities, they finalized the hydraulic model in just 20 months instead of the expected 36 months. Image courtesy of Hidroing d.o.o.

### Striving to Optimize Network Operations

The EUR 1 million project required Hidroing to develop a detailed hydraulic model based on an updated GIS model that enabled water loss analysis and detailed diagnosis of the supply system, including modeling of district meter area (DMA) zoning and numerous measurement points. “Our final goal was to establish a hydraulic model with all GIS data to be used for conceptioneering by ViO Zagreb development sector, and as a digital twin for ViO Zagreb’s operational sector,” said Dundovi.

However, Hidroing faced significant data collection challenges and difficulties measuring flow, pressure, and chlorine levels. To meet the owner’s digital expectations, streamlining access to reliable network data and optimizing network operations, they realized that they needed an integrated technology solution to facilitate smart water management.

#### Project Objectives:

- To combine all network analyses into a digital twin.
- To provide a single source of truth for improved decision-making and optimal water supply operations.

**Project Playbook:** ContextCapture, MicroStation, OpenFlows HAMMER, OpenFlows WaterGEMS, OpenFlows WaterOPS, OpenUtilities

### Bentley Applications Support Digital Twin Solution

After considering their options, Hidroing selected Bentley’s OpenFlows and OpenUtilities applications for GIS development, 3D modeling, hydraulic modeling, and on-site operations and facility management. “As a big project with a big database, our company decided to use Bentley products for all tasks,” said Dundovi. They modeled 3,000 measurement points, 144 DMA zones with individual scenarios and water balance management, and 3,500 kilometers of pipeline, creating and calibrating a hydraulic model. Using Bentley applications, they linked water loss calculation input data, including pipe length, the number of service connections, flow, real water loss, and average pressure. They stored and reported this statistical network data through the GIS platform and transferred it directly to the hydraulic model, providing a single source of truth to extract data based on real-life changes in the system and resolve water loss.

Bentley’s hydraulic modeling solution enabled them to combine all network analyses into a digital twin, simulating system operations and more than 150 scenarios, including scenarios for every DMA zone. The established model is one of the largest digital twin models in Eastern Europe, facilitating smart water solutions.

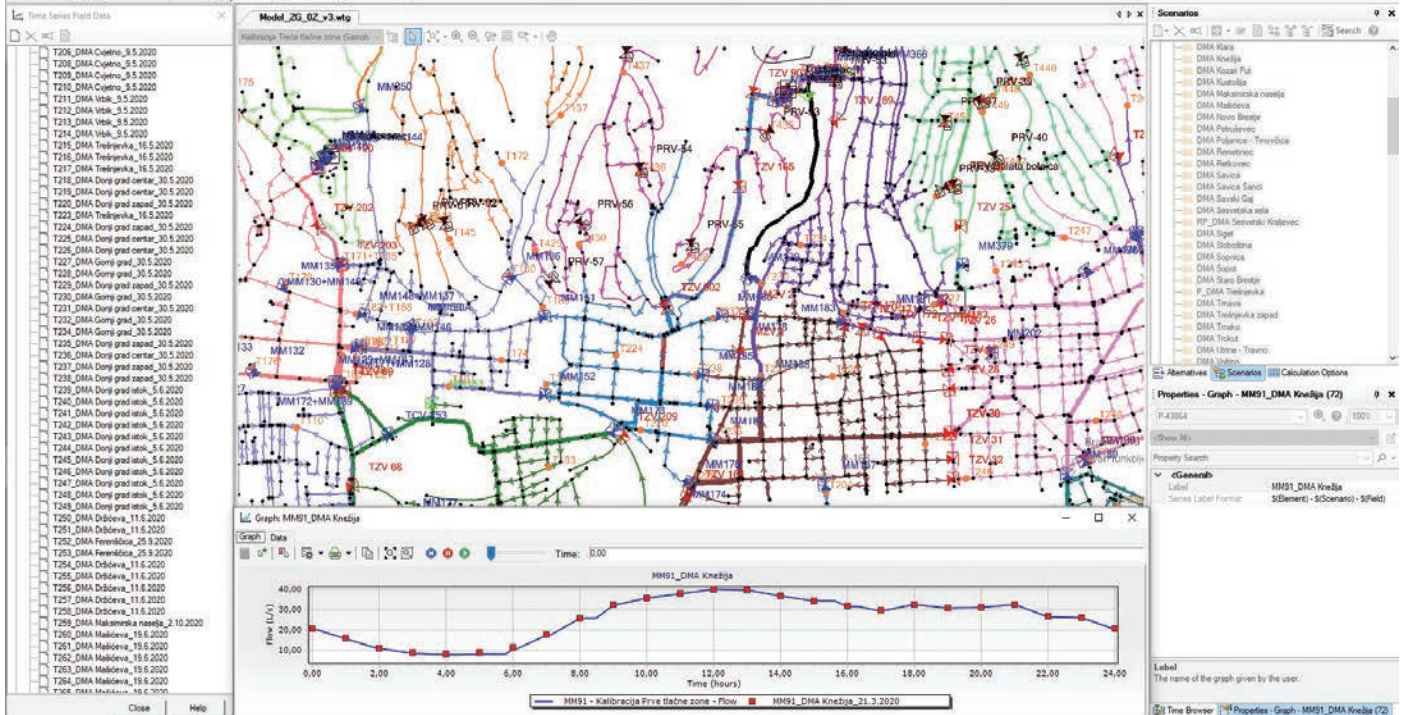
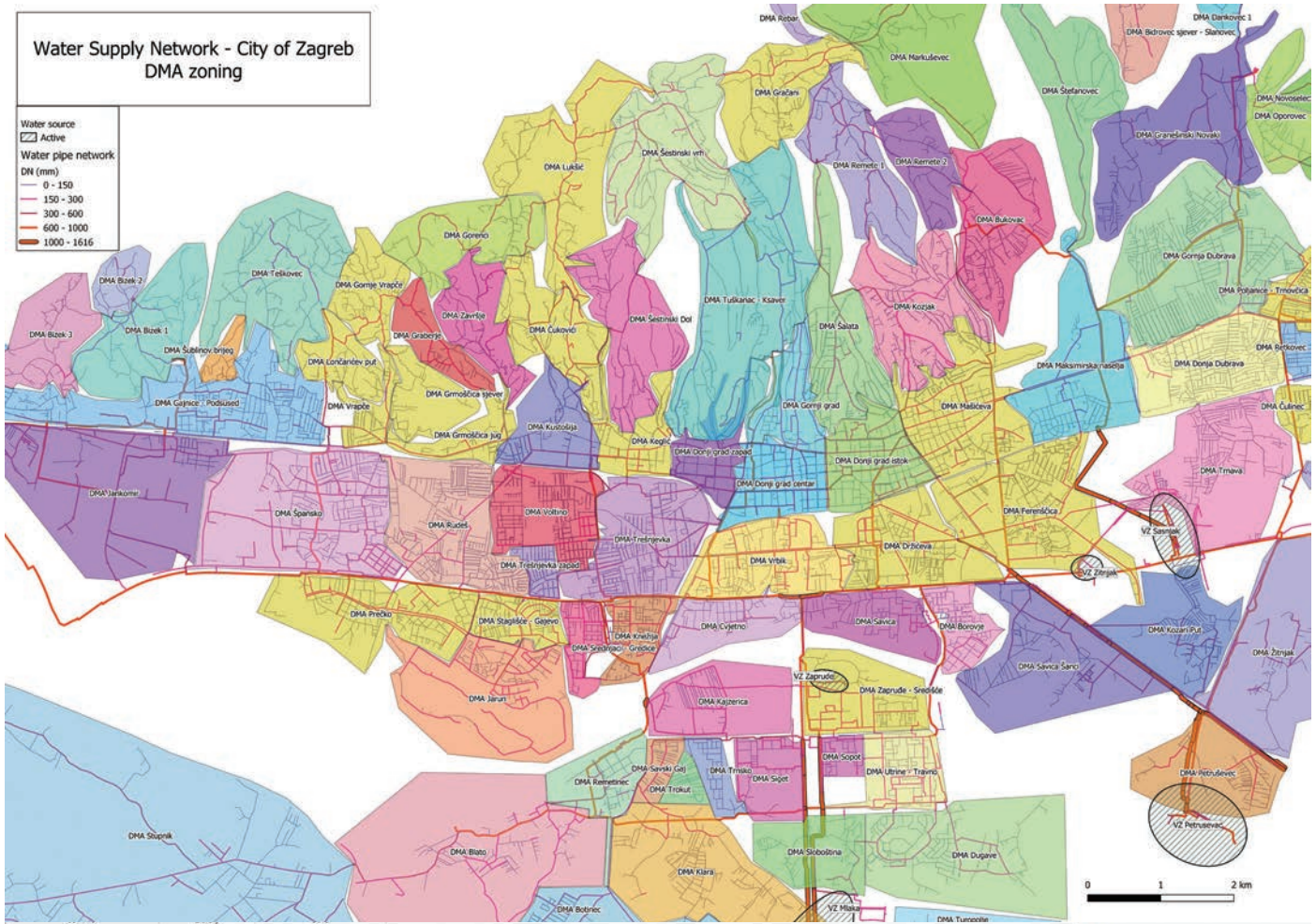
### A Digital Twin Industrializes Network Management

Using Bentley’s advanced digital platforms, Hidroing established a digital twin to improve processes and development of the Zagreb

water supply system. The integrated modeling and analysis solution enabled real-time processing of input data, eliminating time-consuming manual data manipulation and validation, accelerating model calibration and delivery by 16 months. Using OpenFlows and OpenUtilities, the team delivered a final model and digital twin, pinpointing 50 actions to reduce water loss. “Final delivery time was reduced from an estimated 36 months to 20 months. This time reduction enabled faster digital twin implementation and an earlier start to the water loss reduction program,” said Dundovi. The digital twin solution brings direct



Courtesy: The digital twin provides a single source of truth for the owner, improving decision-making and driving smart water management over the next 30 years. Image courtesy of Hidroing d.o.o.





savings in water loss and minimizes environmental impact by reducing water intake and electricity usage.

Given the recent earthquakes and frequent ruptures of the Zagreb water pipes over the last few years, ViO Zagreb recognized the importance of digitalizing their water network and implementing smart water management processes. To meet the owner's technology expectations, Hidroing delivered a digital twin that can be used for ViO Zagreb to make more informed decisions regarding their supply system's development, operations, and future planning, industrializing network management of the capital city's water infrastructure. "After devastating earthquakes during March 2020 in the city of Zagreb, these kinds of projects are even more significant in a way that during development of master plans, water safety and distribution alternatives are now mandatory," said Dundovi.

#### Fast Facts

- Recent earthquakes and significant water loss prompted ViO Zagreb to digitalize their water supply system for better network management.
- Hidroing was retained to develop a master plan and water loss program for the network's next 30 years of operations.
- Hidroing used Bentley applications to combine all network analysis

into one of the largest digital twins in Eastern Europe.

#### ROI

- Using OpenFlows and OpenUtilities, Hidroing modeled 3,000 measurement points and 3,500 kilometers of piping, creating a calibrated hydraulic model.
- Bentley's applications streamlined data integration between the GIS system and model, saving 16 months while delivering a network digital twin.
- The digital twin facilitates better decision-making and smart management for one of the world's oldest water supply systems.

Bentley products helped us in reducing [resource] hours, which directly increased the speed of final product implementation and the usage of the hydraulic model for water loss reduction.

Igor Dundovi, Project Manager, Hidroing d.o.o.



## DuPont Water Solutions Showcases Innovative Water Refinement Technologies at IFAT 2023

Shows Commitment Towards Transforming the Future of Clean Water

**Mumbai, October 27, 2023:** DuPont Water Solutions (DWS), a global leader in sustainable water refinement, showcased its prowess at IFAT 2023, India's foremost trade fair encompassing water, sewage, solid waste, and recycling sectors. Held from October 17th to 19th, 2023, this event served as a pivotal platform for DuPont to unveil its state-of-the-art water refinement solutions, pioneering technologies, and the introduction of new products like AmberLite™ P2X110 and MemPulse™ B50N Membrane Filtration Module.

Envisioning a future where the world's 7.8 billion inhabitants have equitable access to safe and clean water, DuPont Water Solutions addresses global water challenges in a responsible and inclusive manner. From launching the first Nanofiltration Membrane Elements for High Productivity Lithium–Brine Purification to introducing the first Ion Exchange Resin for Green Hydrogen Production, DuPont has contributed with numerous innovations for water refinement solutions to meet its customer's needs.

DuPont Water Solutions is committed to advancing new-age industrial technologies that address pressing environmental concerns, including wastewater management and clean water solutions. The company highlighted its range of wastewater treatment solutions and innovations designed to create a sustainable future for India and the world at IFAT 2023.

DWS offers a multi-tech portfolio that helps customers achieve their goal of reducing energy consumption with high recovery in wastewater treatment.





### About DuPont Water & Protection

DuPont Water and Protection is a global leader in creating water, shelter and safety solutions for a more sustainable world; enabling its customers to win through unique capabilities, global scale and iconic brands including Kevlar<sup>®</sup>, Nomex<sup>®</sup>, Tyvek<sup>®</sup>, Corian<sup>®</sup> Design, GreatStuff<sup>™</sup>, Styrofoam<sup>™</sup>, and FilmTec<sup>™</sup>.

### About DuPont

DuPont (NYSE: DD) is a global innovation leader with technology-based materials and solutions that help transform industries and everyday life. Our employees apply diverse science and expertise to help customers advance their best ideas and deliver essential innovations in key markets including electronics, transportation, construction, water, healthcare and worker safety. More information about the company, its businesses and solutions can be found at [www.dupont.com](http://www.dupont.com). Investors can access information included on the Investor Relations section of the website at [investors.dupont.com](http://investors.dupont.com).



In the past two years, industries across sectors have increasingly adopted water refinement and treatment. This reflects a growing awareness of environmental impact, prompting the integration of water treatment plants into manufacturing units. DuPont Water Solutions leads with innovative technologies supporting sustainable water management.

DuPont's pivotal role in the green hydrogen sector is underscored by its latest development – the DuPont<sup>™</sup> AmberLite<sup>™</sup> P2X110 Ion Exchange Resin.. This innovative resin will help produce green hydrogen by increasing the efficiency of the electrolyzer loop. DuPont's expertise and innovation have played a crucial role in advancing the technology behind green hydrogen, bringing us closer to cost-effective, sustainable hydrogen production. The company's commitment to greener energy solutions aligns with the global shift towards reducing carbon emissions and fostering environmental sustainability.

The new products showcased at IFAT 2023 are:

#### DuPont<sup>™</sup> AmberLite<sup>™</sup> P2X110

Electrolyzer polishers are crafted to address the unique demands of maintaining water purity in the Balance of Stack. Employing high-quality and resilient DuPont<sup>™</sup> AmberLite<sup>™</sup> ion exchange resins in these polishers effectively safeguards against impurity build-up, even when exposed to thermal and chemical stresses.

#### MemPulse<sup>™</sup> B50N Membrane Filtration Module

The B50N MBR module, part of the MemPulse<sup>™</sup> series, is the next step forward in MemPulse<sup>™</sup> MBR with high-quality effluent and low energy. The B50N module provides 25% more flow per module and additional aeration energy savings.

The two groundbreaking products are the epitome of advancements in water purification and filtration technology.

# Bentley Systems Recognizes the Year in Infrastructure 2023 as Groundbreaking for Infrastructure Intelligence

## Bentley Infrastructure Cloud Compounds Value of Engineering Data; iTwin Capabilities Added to Bentley Open Applications

**SINGAPORE – Oct. 17, 2023:** At its annual Year in Infrastructure conference, Bentley Systems, Incorporated (Nasdaq: BSY), the infrastructure engineering software company, described 2023 as a “groundbreaking year” for infrastructure intelligence. Citing users’ projects, CEO Greg Bentley highlighted how infrastructure organizations are overcoming the engineering resource capacity gap through infrastructure intelligence strategies. When asked to quantify the engineering hours saved through digital advancements, the Going Digital Awards finalists reported significant median savings of 18%.

Engineering data serves as the foundation and digital twins as the building blocks of infrastructure intelligence. With iTwin Platform, engineering data in Bentley Infrastructure Cloud (ProjectWise for project delivery, SYNCHRO for construction, and AssetWise for asset operations) can be aligned, queried, and managed to increase infrastructure intelligence over the lifecycle of projects and assets. Bentley Systems estimates that the company’s engineering users accumulate at least 100 million new unique digital components per month within their respective ProjectWise environments, teeing up potential infrastructure intelligence benefits across construction, operations, and maintenance. As an indication that digital twins are becoming mainstream, the proportion of Going Digital Awards finalists crediting iTwin has risen to 64% in 2023.

Greg Bentley highlighted multiple infrastructure intelligence strategies that organizations are using to further compound the value of their data, including reusing digital components, integrating subsurface modeling, and incorporating, into evergreen digital twins, operational data from IoT sensors, drones, and even crowdsourcing. He also explained how Going Digital Awards finalists and organizations in Singapore are accelerating their infrastructure intelligence through the use of AI. Groundbreaking Infrastructure Intelligence in Singapore.

In Singapore, the location for the 2023 Year in Infrastructure conference, digital twins are extensively used to optimize decision-making and operations:

- PUB, Singapore’s national water agency, is working in collaboration

with Bentley Systems on a Singapore National Research Foundation-funded project to develop a new system in detecting and localizing water system anomalies and leaks in near real time. Through a high-fidelity digital twin, AI-based predictive models, and hydraulic network model calibration and simulation, the project could potentially help in improving network resilience and water conservation.

- SMRT Trains, the leading multi-modal public transport operator in Singapore, uses AssetWise Linear Analytics software as the basis for its Predictive Decision Support System to prioritize maintenance. The digital twin system has enabled SMRT to meet its service reliability targets by optimizing maintenance deployments.
- Singapore’s Land Transport Authority (LTA) fully leverages Bentley Systems’ EMME and DYNAMIQ mobility digital twin software for its long-term and short-term planning, including operational traffic models for traffic impact and scheme analysis. This includes using Bentley Systems’ agent-based travel demand model.
- The Singapore Land Authority (SLA) is a leader in digital twin adoption. Dr. Victor Khoo, Director of Survey and Geomatics, SLA, joined the Year in Infrastructure conference to discuss Singapore’s national digital twin journey and share how a 0.225-meter accurate nationwide reality mesh from aerial surveying is incorporated with extensive inputs from other mapping datasets to produce a complete digital twin of the city, which is then shared with multiple agencies and research institutes to support Singapore’s sustainability initiatives.

### Accelerating Infrastructure Intelligence with Bentley Infrastructure Cloud

Following Greg Bentley’s keynote, Bentley Systems’ product and technology leaders explained how the company’s offerings increasingly help users derive greater infrastructure intelligence from their data.

“Bentley Infrastructure Cloud, including ProjectWise, leverages infrastructure digital twins to unlock data in order to apply AI and accelerate infrastructure intelligence,” said Mike Campbell, Chief



Product Officer.

Henry Okraglik, Global Director of Digital, WSP Australia, joined the Year in Infrastructure conference to explain the benefits of becoming data-centric through Bentley Infrastructure Cloud.

“As we’ve digitally matured, we’ve been able to embrace capabilities from Bentley Infrastructure Cloud to improve construction staging and planning, track and export quantity data across project phases, reduce the need for physical site visits, and a lot more,” said Okraglik.

For example, using ProjectWise, SYNCHRO, iTwin, and other Bentley products, WSP was able to reduce modeling time by 60%, increase productivity by 25%, and reduce the carbon footprint by 30% on a rail network project in Melbourne.

### Advancing Bentley Open Applications with iTwin

To systematically introduce the benefits of digital twins in the design phase, Campbell announced the addition of iTwin capabilities in Bentley Open Applications, for modeling and simulation, starting with MicroStation. With iTwin capabilities and workflows natively integrated, Bentley Open Applications will be able to automatically create digital twins during the design process, enabling users to collaborate in real-time, evaluate the impact of changes more seamlessly, reduce rework, and expedite infrastructure intelligence.

“Today, digital twins are critical enablers of how infrastructure assets are built and operated. With iTwin-powered capabilities coming to Bentley Open Applications, all our users will also be able to leverage digital twin technology to improve their efficiency and effectiveness during design,” said Campbell.

### Generative AI, powered by iTwin

Embracing AI’s potential to accelerate infrastructure intelligence, the company highlighted its existing analytical AI capabilities, powered by iTwin, for asset monitoring, and articulated its multi-faceted approach to generative AI for design. This approach is guided by the company’s commitment to help users gain ever more value from their own engineering data secured in Bentley Infrastructure Cloud – maximizing their potential from generative AI, while also ensuring each account retains explicit access and control.

Julien Moutte, Chief Technology Officer, provided examples of generative AI for infrastructure engineering, beginning with an AI agent assisting engineers in further optimizing site layouts by leveraging designs and data from previous projects. He also showed how generative AI can be applied to minimize time spent on project documentation by automating drawing production with fit-for-purpose annotations.







“We believe iTwin-powered generative AI capabilities will support engineers by augmenting the work they’re already doing. We see iTwin becoming a copilot to support better decision-making, reduce repetitive tasks, and increase design quality. It can help close the engineering resource capacity gap – not only by empowering current engineers to produce more, but also by enabling a more rewarding work experience, enticing future engineers to join the community advancing infrastructure,” said Moutte.

### About Bentley Systems

Bentley Systems (Nasdaq: BSY) is the infrastructure engineering software company. We provide innovative software to advance the world’s infrastructure – sustaining both the global economy and environment. Our industry-leading software solutions are used by professionals, and organizations of every size, for the design, construction, and operations of roads and bridges, rail and transit, water and wastewater, public works and utilities, buildings and campuses, mining, and industrial facilities. Our offerings, powered by the iTwin Platform for infrastructure digital twins, include MicroStation and Bentley Open applications for modeling and simulation, Seequent’s software for geoprofessionals, and Bentley Infrastructure Cloud encompassing ProjectWise for project delivery, SYNCHRO for construction management, and AssetWise for asset operations. Bentley Systems’ 5,000 colleagues generate annual revenues of more than \$1 billion in 194 countries.

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RESEARCH	DATA	EXAMINATION	METHOD	ANALYZING	RESULT



## Solid waste management and water solutions are the centre of attraction at IFAT India 2023



- Key conferences on Circular Economy principles for fashion, wastewater, used oil, etc, in addition to other relevant topics like solar panel recycling
- Largest ever edition with 50% growth over last year, and a dedicated hall for solid waste management technologies
- 370+ exhibitors from 25 countries and six country pavilions from Italy, United Kingdom, Germany, the Netherlands, Norway, and Switzerland
- IFAT India presents Startup Pavilion for the first time ever
- IFAT India 2023 will be held from 17–19 October 2023 at the Bombay Exhibition Centre, Mumbai, India.

**Mumbai, 12th October 2023:** Messe Muenchen India is proud to present this milestone 10th edition of IFAT India which has emerged as one of the country's leading trade fairs for water, sewage, solid waste, and recycling technologies. For over a decade now, IFAT India has been contributing towards the mission of Swachh Bharat by offering a platform to showcase globally competitive technologies for waste management and wastewater treatment, as well as promoting ideas and networks through its wide range of conferences, roadshows, innovation forums, seminars, etc.

Owing to its strong value addition to the Indian recycling ecosystem, IFAT India has developed an extensive network of industry partnerships and associations. Some of the key associations supporting IFAT India 2023 are the Indian Pollution Control Association (IPCA), International Council for Circular Economy (ICCE), All India Distillers' Association (AIDA),

International Solid Waste Association (ISWA), International Water Association (IWA), Centre for Environment Education (CEE), Associated Chambers of Commerce and Industry of India (ASSOCHAM), European Water Association, and the German Association for Water, Wastewater and Waste (DWA).

Some of the leading exhibitors at this edition are RE Sustainability, Thermax, Veolia, DuPont Water Solutions, Hermann Sewerin GmbH, Ion Exchange, Larsen & Toubro, and Terex India, among many others. The exhibition will cover nearly 30,000 sq m and attract 150+ high-quality conference speakers including environmental scientists, entrepreneurs, corporate leaders, think tanks, government authorities, etc.

In anticipation of the upcoming 10th edition, **Aditi Ramola, Technical Director, International Solid Waste Association (ISWA)**, says, "Today, waste management

# POST SHOW REPORT



technologies have achieved economies of scale and widespread acceptance across the emerging economies of the world. However, we need more collaborations between stakeholders in the public and private sectors as well as knowledge sharing between established and emerging players, especially startups operating in the solid waste management space. Therefore, I am delighted to see the first Startup Pavilion at IFAT India this year. More power to IFAT India.”

To promote its 10th edition of the trade fair, IFAT India organized a successful Swacch Bharat Yatra, a series of roadshows across the country which attracted 100+ high-profile speakers and panelists, in addition to 1000+ delegates and participants from the country's vibrant water and waste management sector. The Swacch Bharat Yatra series of roadshows was held in Delhi, Chandigarh, Jammu, Jaipur, Bhubaneswar, and Pondicherry.

**Sanjay Mehta, President, Material Recycling Association of India (MRAI)**, says, “Solid waste recycling has become a priority in our cities due to rising awareness among citizens, the proactive role played by government and municipal authorities, and good incentives for recycling companies. Today, we need more cooperation among the various stakeholders, including ragpickers, sorters and segregators, recycling companies, and policymakers. IFAT India is one such platform where all stakeholders can come together, and I am happy to see this platform promoting circular economy principles and applications over the last few years. We are happy to continue the conversation this year as well.”

**E. P. Sajit, Senior Vice President and head – Water & Effluent Treatment IC, L&T Construction**, says, “IFAT India is a very prestigious trade fair that encompasses various aspects of the environmental sector, including water management, sewage treatment, solid waste management, recycling technologies, etc. With a successful decade-long history, this event serves as a central hub and platform for decision-makers within the environmental sector, to promote knowledge transfer, networking of stakeholders, panel discussions

and workshops, and live demonstrations led by national and international experts from the industry, environmental associations, municipal sectors, and other stakeholders. As an Associate Partner, we eagerly look forward to this event as an opportunity not only to learn from others but also to showcase our track record, engineering capabilities, project management skills, and our contributions to the sustainable development of water infrastructure in India.”

On the significant value additions to this 10th edition of IFAT India, **Bhupinder Singh, CEO of Messe Muenchen India**, says, “Today we are witnessing the best minds in the country applying futuristic technologies like IoT and AI to solve the solid waste and water crises in our cities. We are glad to see 50% growth this year over the previous edition, and hence we are delighted to present the Startup Pavilion at the largest-ever edition of IFAT India with diversified participation from the water, waste management, and recycling sectors, and one dedicated hall for solid waste management technologies. We are indeed overwhelmed by the response to the Swacch Bharat Yatra roadshows across the country and we expect maximum participation during the main show days in Mumbai. With an engaging conference schedule, prefixed buyer-seller meetings, and the Young Professionals Program, I am sure that this edition will be one for the records.”

**For further press enquiries, contact Kavita Chhatani at [kavita.chhatani@mm-india.in](mailto:kavita.chhatani@mm-india.in).**

**More information on IFAT India 2023 is available at [www.ifat-india.com](http://www.ifat-india.com).**

## About Messe Muenchen India:

Founded in 2007 as a wholly owned subsidiary of Messe München GmbH, Messe Muenchen India Pvt. Ltd. is one of the largest trade fair organizers in the country today. The company has an extensive portfolio of B2B trade fairs covering a wide range of consumer and capital goods as well as emerging technologies. The company serves the Indian industry and international market with powerful brands such as air cargo India, analytica Anacon India/

India Lab Expo, bauma CONEXPO India, drink technology India, electronica India, IFAT India, Indian Ceramics Asia, Intersolar India/The smarter E India, LASER World of PHOTONICS INDIA, MatDispens, Pack Mach Asia Expo, Pharma Pro Pack, productronica India, SmartTech Asia, World Tea & Coffee Expo, and many others.

Messe Muenchen India works closely with industry stakeholders to develop well-researched trade fairs that bring latest innovations to the market and facilitate meaningful business interactions. Headquartered in Mumbai with offices in New Delhi and Bengaluru, Messe Muenchen India connects global competence by bringing professionals together for business, learning and networking.

## IFAT worldwide

Messe München demonstrates its considerable expertise in organizing environmental technology trade shows with the world's leading trade fair IFAT Munich. Other international events include IE expo China in Shanghai, IE expo Chengdu, IE expo Guangzhou, IE expo Shenzhen, IFAT Africa in Johannesburg, IFAT Eurasia in Istanbul, IFAT India in Mumbai, and IFAT Delhi in New Delhi. Together, the eight IFAT events form the world's leading network for environmental technologies.

## About Messe München GmbH

Messe München GmbH has been organizing trade fairs since 1964, and is one of the leading exhibition organizers worldwide, with nearly 40 of its own trade shows for capital goods, consumer goods and new technologies. Every year, about 29,000 exhibitors and around 1.4 million visitors participate in more than 115 events at the exhibition center in Munich, at the ICM – Internationales Congress Center München, the Conference Center Nord and the MOC Veranstaltungszentrum München as well as abroad. Together with its subsidiary companies, Messe München organizes trade fairs in China, India, Brazil, Africa, Turkey, and Vietnam. With a network of associated companies in Europe, Asia and South America, and with around 69 representative offices across 132 countries, Messe München has a truly global presence.

## India Water Show

10–12 January 2024  
Auto Cluster Exhibition Center, Pune, India  
+91 93632 35370  
info@indiawatershow.com  
www.indiawatershow.com

## Water Expo 2024

08– 10 Feb 2024  
Deccan College Ground, Yerawada, Pune  
<https://tradeshows.tradeindia.com/waterexpo-pune/>

## Water India Expo

17–19 January 2024  
Pragati Maidan, New Delhi  
[www.waterandcleantechexpo.com/](http://www.waterandcleantechexpo.com/)

## WWETT Show

January 25–27, 2024  
Indiana Convention Center, Indianapolis, IN  
[www.wwettshow.com/en/home.html](http://www.wwettshow.com/en/home.html)

## WATER TODAY'S WATER EXPO 2024

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## WEX Global 2024

4–6 March 2024  
Madrid, Spain  
<https://wex-global.com/>

## AWWA/AMTA Membrane Technology Conference & Exposition

4–7 March 2024  
West Palm Beach, Florida  
<https://www.amtaorg.com/awwaamta-membrane-technology-conference-exposition>

## IWA San Sebastián

14–17 April 2024  
San Sebastián, Spain  
<https://www.waterloss2024.org/>

## EDS European Desalination Society Congress

6–9 May 2024  
Sharm el Sheik, Egypt  
<https://www.edsoc.com/index.php/euromed-congress/>

## IFAT Munich

13–17 May 2024

Munich, Germany  
<https://ifat.de/en/>

## 18th IWA World Conference on Anaerobic Digestion

2–6 June 2024  
Istanbul, Turkey  
<https://iwa-ad18.org/>

## IWA World Water Congress & Exhibition

11–15 August 2024  
Toronto, Canada  
<https://worldwatercongress.org/>

## Water & Wastewater Expo 2024

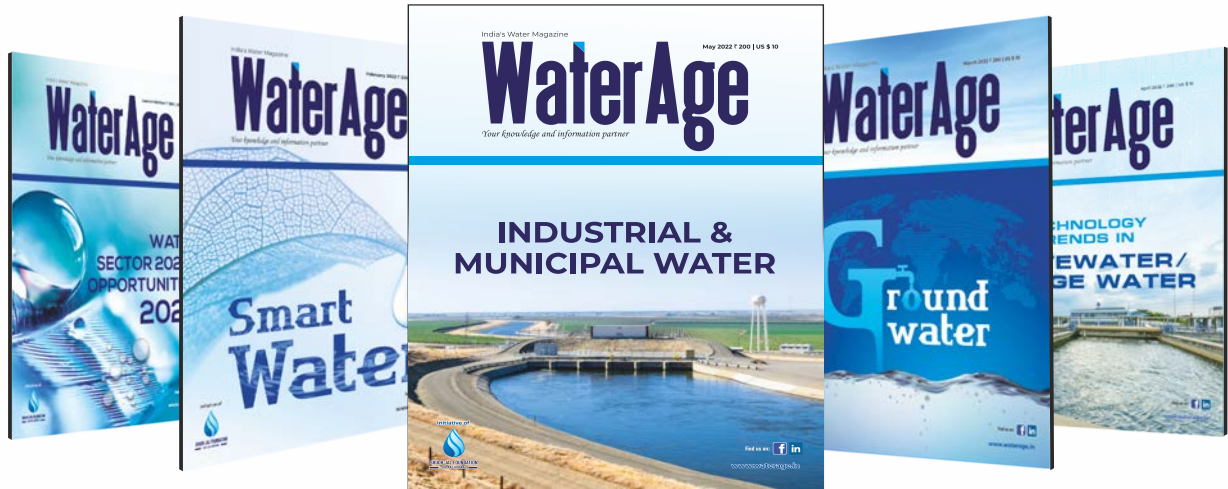
November 21, 2024  
At Dublin – The Pavilion Building,  
Leopardstown Racecourse,  
County Dublin, Ireland  
[www.waterengineering.ie/](http://www.waterengineering.ie/)

## Aquatech China

11–12–13 December 2024  
Shanghai New International Exhibition  
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[www.aquatechtrade.com](http://www.aquatechtrade.com)



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<input type="checkbox"/>	International	2 Years	24	USD 1200	20%	USD 960
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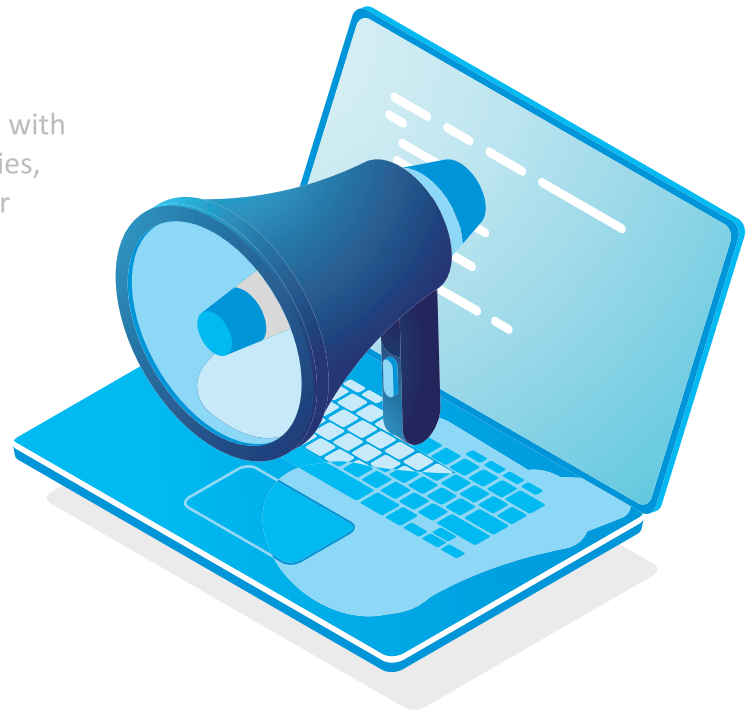
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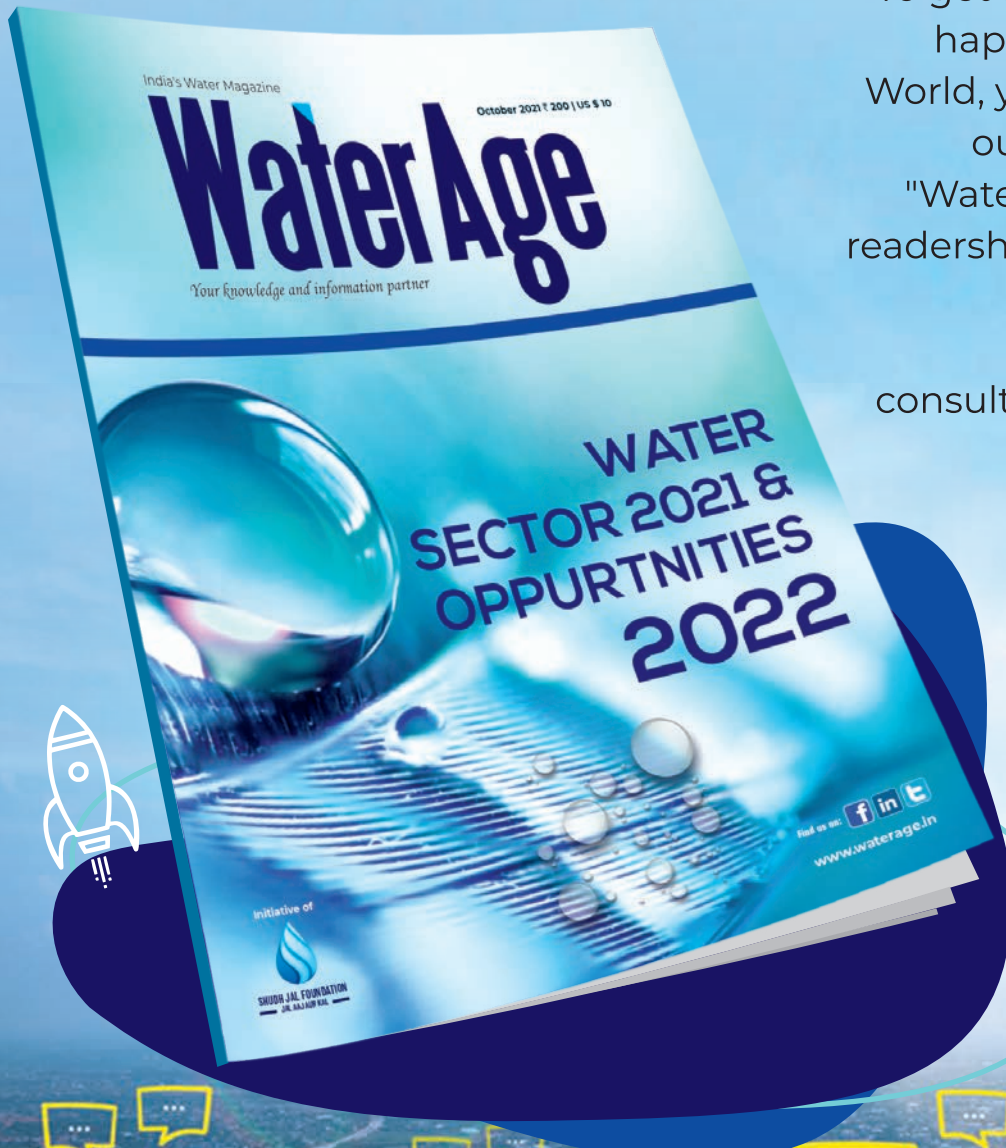
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