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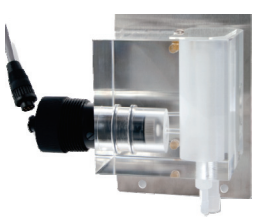

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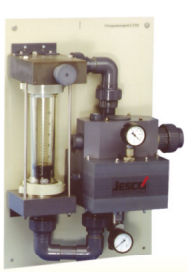
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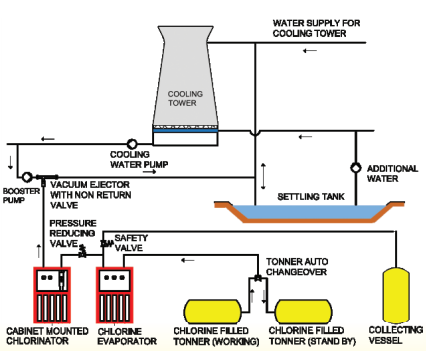
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INNOVATIONS AND WATER

Water has been identified as one of the major problems and biggest challenges for this Century. This has prompted huge investments in the water sector and a number of multinational companies have identified it as a focus area. With increasing demand in the drinking, industrial and wastewater sector, there is an acute need for new approaches and technologies. I recently had the opportunity to interact with some of the leaders of the water sector in Europe, North America and Asia and our discussions were focused on the same subject. Where are the innovations in the water sector going to come from?

Despite widespread claims about the need for water conservation, treatment and recycling, it is an accepted fact that the water sector has not seen a breakthrough technology in the last decade. Discontinuous advancements in the industry like Membrane Technology, Nanotechnology or Plastic Material Introduction all happened over a decade back. Significant research and efforts have been made to make incremental improvements like energy recovery or higher recovery. These are laudable and not at all to be discredited. But, generation-changing innovations need out-of-the-box thinking and a fresh approach.

Being a multi-discipline field, there is a need to think beyond rigid boundaries of engineering disciplines. It is also possible that new untested technologies do not get the kind of financial backing and management support that is needed at an initial stage.

Innovation is a truly difficult thing to explain. It comes out in the most unexpected situations and locations. One theory is that studying it too closely and applying scientific analysis to it, might itself defeat the purpose of innovation. From my end, all I would like is that we create the right environment for it to nurture and flourish. That should benefit everyone.

One of such technology I would like to discuss in particular is of Desalination. Out of the 70 cities in the world with no direct access to additional fresh water source, 42 are in coastal areas.

About 97.2 percent of earth's water resources are in the sea. 39 percent of the world's population (2.4 billion people) lives within 100 kms of the sea. With increasing demand for good water and all other water sources depleting, the desalination sector has been growing rapidly in the last decade.

Seawater desalination is most effective when implemented in water sectors with strong water policies, well-defined water resource availabilities and demand, and strong technical expertise. Currently, desalination plants provide approximately 1 percent of the world's drinking water supply and this number is increasing every year. Estimating the global market value for desalination is extremely difficult as it is composed of a few large projects. However, the global market is roughly USD 12 billion per year - about USD 6 billion per year in capital expenditures and about USD 6 billion per year in operating expenditures.

There is no denying the fact that water is an increasingly scarce resource, and likely to become more expensive. Other prudent solutions like water conservation and wastewater recycling need to be included in an overall water management plan. But the sea is a dependable source, which will never run dry. Involving all stakeholders in arriving at the right mix, will help in a more informed debate. Leading water professionals and technology-providers must take the lead. Using the massive resources of the sea might well provide the solution to the water problems of the world…

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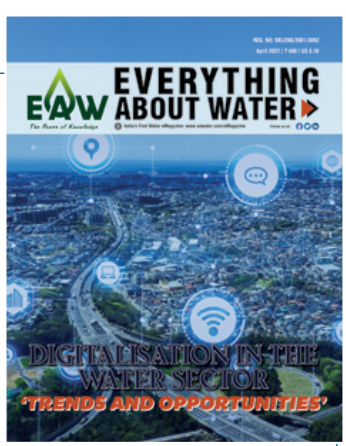
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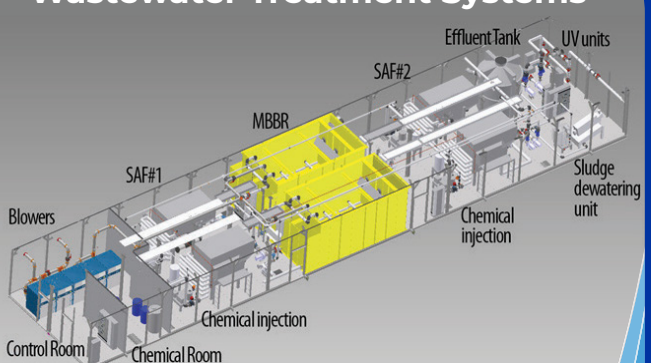
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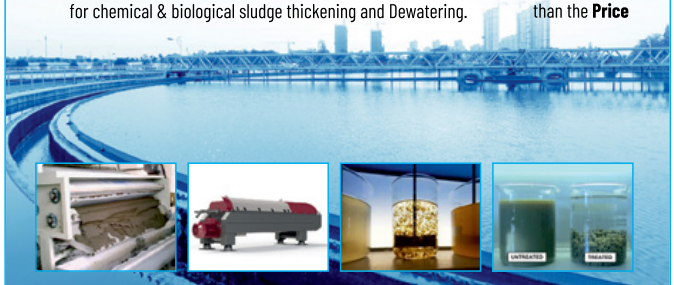
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DROPLETS

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1. Pune Municipal Corporation awards an order to ENVIRO CONTROL- TOSHIBA WATER SOLUTIONS JV for Project for Pollution Abatement of River Mula-Mutha in Pune



Gurugram, India - Toshiba Water Solutions Private Limited (Toshiba Water), a wholly owned subsidiary of Toshiba Infrastructure Systems & Solutions Corporation (hereafter TISS) announced, ENVIRO CONTROL-TOSHIBA WATER SOLUTIONS JV is awarded contract for 11 STPs along with associated main sewers with 15 years of O&M(*1) from Pune Municipal Corporation (PMC) of Pune City, the second largest city in Maharashtra, India. This project is funded by an official development assistance (ODA) loan from the Japan International Cooperation Agency (JICA) and its estimated project cost is 22.443 billion yen, of which 19.064 billion yen will be from the loan.

Rising population accompanied by exponential economic growth has led to an increase of sewage discharged in Mula-Matha river in Pune. The city lacks the capacity to treat all the sewage it generates. The sewage exceeding its capacity is discharged into the Mula-Mutha river without being treated properly. Therefore, Pune is in urgent need to construct sewage treatment plants in order to treat all the sewage that is expected to continue increasing.

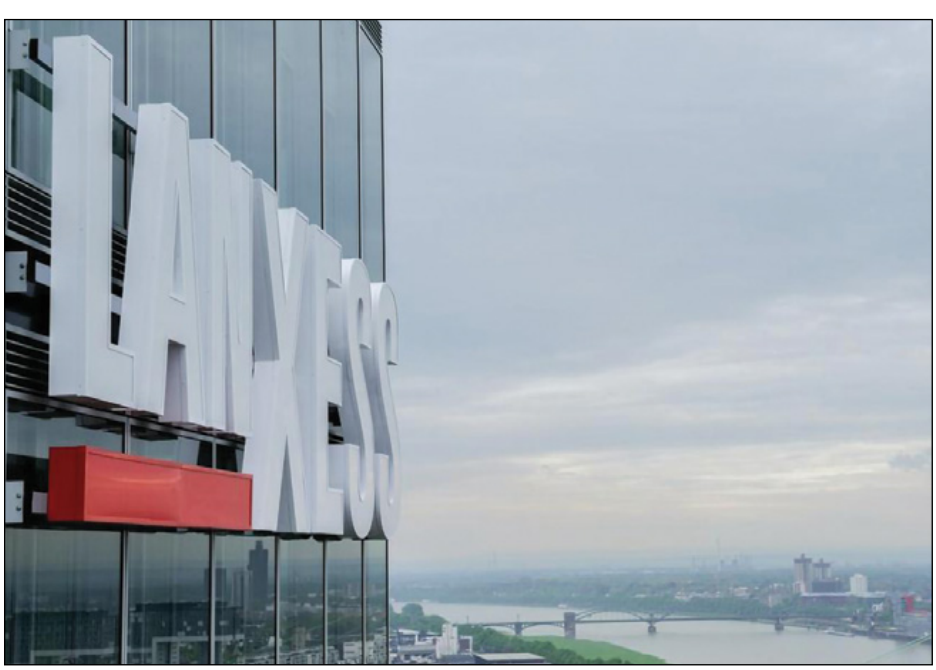
The purpose of the Mula-Mutha River Rejuvenation Project is to improve the condition of the Mula-Mutha river and the

1. LANXESS makes strong start to fiscal year 2022

Mumbai, May, 2022 - In a challenging environment, specialty chemicals company LANXESS made a strong start to the year 2022. Today, it confirmed the preliminary figures for the first quarter released on April 19. LANXESS is also confident going into the second quarter, in which the Group expects EBITDA pre exceptionals of between EUR 280 million and EUR 350 million. In the prior-year quarter, the company had generated EUR 277 million. For the full year, LANXESS still expects EBITDA pre exceptionals to be significantly higher than in the previous year. However, the guidance does not take into account potential further impacts of the war in Ukraine and the contribution of the acquisition of IFF's Microbial Control business. The transaction is expected to close in the third quarter.

"With our focus on specialty chemicals, we have built up strong market positions in recent years, which are particularly paying off in the current situation. We can thus pass on higher raw material and energy costs via our selling prices. However, it is impossible to predict the impact of the war in Ukraine on future business performance. We are therefore monitoring the further developments very closely," said Matthias Zachert, Chairman of the Board of Management of LANXESS AG.

In the first quarter of 2022, EBITDA pre exceptionals increased considerably and amounted to EUR 320 million, 32.2 percent higher than the previous year's figure of EUR 242 million. All the company's segments contributed to the growth, with the Specialty Additives segment performing particularly well. LANXESS passed on the significantly increased raw material and energy costs via higher selling prices. The successful acquisitions, especially that of Emerald Kalama Chemical, likewise made a positive earnings contribution. The EBITDA margin pre exceptionals came to 13.2 percent, against 14.3 percent a year ago.



ATER NEWS

Group sales amounted to EUR 2.432 billion in the first quarter, up 43.7 percent on the previous year's figure of EUR 1.693 billion. Net income reached EUR 98 million, after net income from continuing operations of EUR 63 million in the previous year.

Higher raw material and energy costs passed on in all segments

Sales in the **Advanced Intermediates** segment rose by 35.6 percent from EUR 452 million in the prior-year quarter to EUR 613 million.The sales development was in particular the result of higher selling prices as LANXESS passed on the significantly increased raw material and energy prices. The segment's EBITDA pre exceptionals amounted to EUR 87 million, up 24.3 percent on the previous year's figure of EUR 70 million. The EBITDA margin pre exceptionals was 14.2 percent, compared with 15.5 percent in the prior-year quarter.

In the **Specialty Additives** segment, higher selling prices and generally improved demand resulted in a positive development of sales and EBITDA pre exceptionals. This was due in particular to good demand from the construction, oil and gas industries and the continuing recovery of the aviation industry. The development of exchange rates, especially of the U.S. dollar, likewise had a positive effect. The segment's sales amounted to EUR 730 million, up 41.2 percent on the previous year's figure of EUR 517 million. EBITDA pre exceptionals increased by a considerable 83.8 percent from EUR 74 million in the previous year to EUR 136 million, reaching the highest figure in the company's history. The EBITDA margin pre exceptionals increased to 18.6 percent, against 14.3 percent a year ago.

The **Consumer Protection** segment's sales and earnings improved compared with the prior-year quarter. The new Flavors & Fragrances business unit made a particularly positive contribution here. This unit comprises the business with specialty chemicals for the consumer goods sector from the acquisition of U.S. company Emerald Kalama Chemical. In addition, all the segment's business units achieved higher selling prices. The development of exchange rates had a positive effect, too. Lower sales volumes due to a generally difficult logistics situation had an opposite effect. Sales amounted to EUR 506 million, up 48.4 percent on the prior-year quarter's figure of EUR 341 million. EBITDA pre exceptionals grew by 13.2 percent from EUR 76 million in the previous year to EUR 86 million. The EBITDA margin pre exceptionals reached 17.0 percent, against 22.3 percent a year ago.

The development of the **Engineering Materials** segment's sales and earnings in the first quarter was influenced by the sharp rise in selling prices, which resulted from the pass-through of increased raw material and energy prices. Sales amounted to EUR 576 million, up 52.8 percent on the previous year's sales of EUR 377 million. EBITDA pre exceptionals grew by 13.6 percent from EUR 59 million in the previous year to EUR 67 million. The slightly weaker demand from the automotive industry due to supply shortages led to a volume-driven decline in earnings, especially in the High Performance Materials business unit. The EBITDA margin pre exceptionals decreased from 15.6 percent in the previous year to 11.6 percent.

DROPLETS
SNIPPETS

sanitary and living environments of the residents in Pune city and the river basin. This project includes the construction of 11 sewage treatment plants (total daily capacity: 396,000 m^3) to cater to the estimated water usage for the year 2027 as well as the construction of a sewage carrier pipeline. The construction period is three years, followed by 15 years of O&M. This project is planned to be completed by 2040.

2. Grundfos India organizes an afforestation drive in Sriperumbudur



Chennai, April 2021: Grundfos India, the world leader in pumps and water solutions, recently initiated an afforestation drive at the company's land in Sriperumbudur, Tamil Nadu. More than 10,000 native saplings have been planted, using the urban forest plantation technique called the Miyawaki method. Around 300 employees of the company participated and contributed by planting the final batch of saplings.

In the coming years, the company aims to contribute to 220 tonnes of CO2 savings per year through this project, thereby playing its role to limit global warming to 1.5 degrees, a decision that was adopted globally by countries as per the 2015 Paris Climate Agreement.

As a part of this afforestation effort, more than 20 species of native saplings including Peepul, Ashoka, Tamarind, Pongamia, Jamun, Guava, Indian Gooseberry among others were planted using the Miyawaki method. This

DROPLETS
SNIPPETS

afforestation technique will help in creating a multi-layered ecosystem with indigenous and varied vegetation for a self-sustaining, dense forest area. To ensure water supply, a solar pump was also installed.

Commenting on this, George Rajkumar, Country President, Grundfos India, said, "Restoration efforts towards protecting our biodiversity plays an important role in addressing concerns around climate change and greenhouse gas emissions. We hope that this afforestation effort at our Sriperumbudur site will act as a natural carbon sink in the region. We are also proud of the overwhelming participation from our employees and their families in these efforts, where we are investing in our planet.

3. LANXESS implements variable pricing surcharge for ion exchange resins and iron oxide adsorbers

Mumbai, April, 2022 - Specialty chemicals company LANXESS will globally implement a variable pricing surcharge for its Lewatit ion exchange resins and Bayoxide iron oxide adsorbers which will be applied with immediate effect. The existing fixed surcharge will be adjusted based on the most relevant input costs on a monthly basis. In April/May 2022 the adder will be at around EUR 0.9/l or the equivalent amount in national currency. Customers will be contacted individually.

This step became necessary since the already tense cost situation has worsened even further due to the war in the Ukraine. The markets worldwide are experiencing an unprecedented volatility and prices for energy, raw materials and transportation increased at unexpected and unpredictable magnitudes.

The LANXESS Liquid Purification Technologies business unit is one of the world's leading global solution providers for water treatment and liquid purification. Ion exchange resins and iron oxide adsorbers are used in numerous industries and applications to purify water and other liquid media effectively.

2. Evonik opens its first Zero Liquid Discharge plant in India



Essen/Dombivli. Evonik Catalysts has opened a new Zero Liquid Discharge (ZLD) plant at its facility in Dombivli, India. The new plant reduces the amount of fresh water required for production processes and turns material that was previously considered waste into saleable products.

ZLD purifies and recycles wastewater at the end of an industrial process, leaving little to no effluent remaining when it is completed. This means not only more efficient water use, but also a significant reduction in waste liquid.

"Environmental excellence has always been a top priority for Evonik in India, and the ZLD plant at our catalysts site is a centerpiece in Evonik's efforts to minimize its production-associated ecological footprint," said Sanjeev Taneja, Senior Vice President and General Manager, Catalysts business line, at the inauguration of the plant.

"The efficient reuse of process water, and products extracted from it, is in line with our circular economy principles, and a key contribution to the sustainability targets of Evonik and our customers."

Evonik is developing site-specific action plans as part of its global water management system. One focus is on sites in regions that could be affected by water scarcity. It also strives for the most efficient use of water.

The main ambition with the Dombivli ZLD plant is to improve the treatment of process water. It goes through a multi-stage process and then the byproducts go through further processing. An estimated 600 m^3 of wastewater - the equivalent of between 25 and 30 tankers - enters the ZLD plant every day and the plant is expected to recirculate around 55 percent of that - approximately 300-350 m^3 - or process reuse and the balance water for re-use as cooling tower make up thus reducing Evonik water use requirements and thereby reducing Evonik's dependence on municipal water supplies requirement for fresh

water will be reduced by 65 per cent after stable operation of zero liquid discharge and the company is targeting further reductions through process optimization.

In addition, processing leads to the production of 15-20 metric tons of sodium sulphate and certain mixed salts which can be resold as a commercial product.

"At Evonik, we see responsibility and long-term business success as two sides of the same coin," says Vinod Paremal, Regional President, Evonik India Subcontinent. "Sustainability is a central element in our purpose 'Leading Beyond Chemistry', and we look to provide innovative solutions that help to make everyone's lives more sustainable, healthier, and more comfortable.

"Sustainability is important to our customers and the end consumer and has long been a growth driver in many of our businesses. This new ZLD initiative carries forward that sustainable outlook."

The ZLD plant is set-up on a 'BOOT' Model between Evonik and Remondis, with the latter responsible for building, owning, operating, maintaining and transferring the ZLD plants to Evonik.

3.Odisha state government to start second water treatment plant for Vyasanagar



JAJPUR: The State government is planning to set up a second water treatment plant near Jajpur Road to meet the needs of Vyasanagar residents. An engineer of Public Health Engineering Organisation (PHEO), Jajpur Road said Rs 70 crore will be spent on construction of the second water treatment plant which will have a capacity of 30 lakh litre.

After completion, the plant will be able to provide potable water to more than one lakh population. Initial works on the project have already been started and the plant is expected to be completed by 2023. Currently, 9.5 lakh litre of potable water is being supplied to residents of Vyasanagar per day.

While the town is getting 7 lakh litre from the existing water treatment plant at Mundamal, the PHEO is supplying 2.5 lakh litre of potable water through boring system. Officially, the population of Vyasanagar town is around 50,000. Sources said the population of the town

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4. Advanced Watertek commissions Water Treatment system on a remote island in Oman.



A 45-minute speed boat ride from Kasab (Oman) brings you to a quaint island-village called Kumzar. Residents of this village, rely on a Sea Water Desalination Plant(Reverse Osmosis Plant) for their drinking water supply. Given that this plant was in service for over a decade, the plant operator, a local contracting company, appointed Advanced Watertekto build a new Reverse Osmosis plant with higher production capacity and energy efficiency.
Mohammad Farghaly, CEO of Advanced Watertek said, "We've built thousands of systems in the past 35 years, but each job is unique. This project had various challenges… but we made it happen!"

Unique transportation challenge overcome with innovative engineering: Kumzar village is accessible by boat from Kasab. Being a small port, only small ferries, dhows, or speed boats are locally available for carrying of cargo to the island. Special army vessels are commissioned for larger consignments if required.

Keeping size restrictions in mind for transportation, loading & unloading without any lifting equipments, the Engineer Design Team at Advanced Watertek worked very hard, visited the site and designed an RO system using what they called the 'nuts-bolts method'. RO components were dismantled for easy handling and transportation and then re-assembled on-site. The dismantled parts were conveniently transported using boats locally available at Kasab. Simple as it sounds, it is a job that requires skill and technical

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know-how to ensure proper functioning as per design specifications. Eliminating the use of a special vessel for transportation was a significant cost saving for the client.

Increase in production capacity and energy efficiency achieved without substantial increase in system size: The system capacity of the old RO Plant was 100m^3 per day, while the new RO plant was designed to have a system capacity of 300m^3 per day. This meant an increase in no. of membrane vessels as well as feed pump and high-pressure pump capacity and size. Advanced Watertek introduced an energy recovery device into the design to recover wasted high pressure brine energy, in turn reducing the high-pressure pump& motor size as well as lowering energy consumption. The result? A higher capacity, energy efficient system without considerable increase in the overall footprint of the system.

5. 190-MLD water treatment plant to be set up in Aluva

KOCHI: A new water treatment plant to tackle drinking water shortage in Kochi corporation, five municipalities, and 13 panchayats in the district, will come up in Aluva in 18 months. The Rs 285-crore plant is being established on Kerala Water Authority's (KWA) 3.9-acre land in Aluva, said a release. The plant will have the capacity to treat 190 million litres per day (MLD), it said.

It will supplement the existing water treatment unit in Aluva, which has an installed capacity of 225 MLD. Besides the corporation, the new plant will also benefit residents of Aluva, Kalamassery, Thrikkakara and Eloor municipalities and 13 panchayats. The detailed plan for the project has been prepared and the construction will begin immediately after the administrative sanction, KWA officials said.



has grown manifold due to increase in industries in its vicinity and commercial activities.

4. Q4FY22 Preview: Larsen& Toubro: Revenues seen at Rs 33,000 crore, PAT at Rs 2,980 crore

May 2022 - Larsen & Toubro (L&T) witnessed EPC order inflows between Rs 9,000-22,000 crore (ex-services segment) during the March2022 quarter. These inflows encompassed segments of railway, hydrocarbon, power T&D, water treatment, heavy engineering and buildings & factories. Healthy order inflow is commendable given the challenging macro environment.

5. IIT Madras to set up a new research centre on wastewater



IIT Madras is establishing a new research centre that will test wastewater for organisms and chemicals and make the data available to the public. The facility will act as an intelligence unit to track and prevent a virus outbreak in its early stages.

The International Centre for Clean Water (ICCW) is establishing this Wastewater-Based Epidemiology research facility. This project is being supported with funding of $ 1 million by Cryptorelief , an initiative started by Sandeep Nailwal . The data obtained from various wastewater sources and treatment facilities will be analysed. Gradually, this facility will be extended to other parts of India.

The benefits of wastewater analysis include water fingerprinting to study the chemical and biological molecules in it. The WBE project includes aspects such as tracking pollutants, pesticides and drugs.

6. iTIC Incubator at IITH investing ₹1.7 crore in DeepTech startups

iTIC Incubator at the Indian Institute of Technology, Hyderabad (IITH) recently selected nine deep tech startups from across India to support them via their pre-incubation and incubation support programmes. A signing and onboarding ceremony was organised to facilitate and give a boost to top-notch startups.

iTIC Incubator is investing up to ₹25 lakhs each in six prototype ready startups: Learn and Empower- working on building an accessible game-based learning platform for children

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with hearing loss, LiqSure Systems - building a water purification system using hydrodynamic cavitation principal for greywater treatment, Milatronics -building automated feeding system for aqua farmers, Pranahita Biotrinics - developing AI-powered low-cost testing kits for COVID and other viruses and Eaffocare - working on regenerative products for gums and periodontitis treatments.

iTIC is also investing up to ₹10 lakh each in three Proof of Concept stage startups namely -- Humus Biosystems, which is working on water treatment using microbes and biomaterials, Raibo Systems -- which is working on developing surgical assistive robots, and Sridevi Machinery -- which is working on building automated power weeder.

"The focus of IITH is on translating the innovations into technologies useful for humanity. Hence, it is good to see startups working on themes of water treatment, aquafarming, assisted technology for children with special needs, affordable COVID testing and others," said Prof B. S. Murty, Director, IITH.

Asserting the startup initiatives of IITH, Prof Suryakumar S, faculty-in-charge, Incubation, Innovation & Startups, said: "Our aim is to provide a vibrant platform for the startups to convert their ideas into successful businesses. We are thankful for the financial support from establishments like NMDC and HDFC in making that happen."

7. Aurangabad civic body bans use of fresh water for construction activities

The civic body in Aurangabad in Maharashtra has decided to ban the use of fresh water for construction activities in order to tide over water scarcity in Marathwada's largest city, an official said on Monday.

The Aurangabad Municipal Corporation will also seek three million litres per day (MLD) addition water supply from the Maharashtra



Industrial Development Corporation (MIDC), Commissioner Aastik Kumar Pandey told reporters.

8. L&T Construction awarded contracts for its Water & Effluent Treatment Business

The Water & Effluent Treatment Business of L&T Construction has secured a repeat EPC order from the Department of Water Resources, Government of Jharkhand, to execute the Masalia Ranishwar Megalift irrigation scheme on a turnkey basis.



The project envisages providing water to irrigate 22,283 Ha. of Culturable Command Area (CCA) in the Dumka district of Jharkhand by way of pumping water from the Sidheshwari River. The scope includes survey, design, and constructing a 158 m long barrage across the Sidheshwari river. The scope also includes survey, design, procurement, installation, testing and commissioning of intake and intermediate pump houses, delivery chambers, MS, DI & HDPE pipeline of various diameters and pipeline distribution networks with all allied works.

The Business is already executing a similar lift irrigation project in the Garhwa district of Jharkhand. With this order from the irrigation sector, the Business has reinforced its credentials of possessing the technical and executional capability to deliver the elementary requirement of water to the farmers and drive the growth of agriculture across the state.



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9. Kolkata Municipal Corporation ramps up water production for steady supply amid scorcher



Kolkata Municipal Corporation ( ) has augmented its production capacity at waterworks and two water treatment plants at Garden Reach and Dhapa by 11 million gallons per day to meet the rising demand. According to a KMC water supply department official, the production capacity at Palta waterworks was recently raised from 235 million gallons to 242 million gallons keeping in view the soaring mercury and the Ramzan month. “We have raised the production capacity at Palta waterworks gradually since March. The production units at Palta were put on high alert apprehending a further rise in. Similarly, the production capacity at Garden Reach and Jai Hind water

According to a KMC water supply department official, the production capacity at Palta waterworks was recently raised from 235 million gallons to 242 million gallons keeping in view the soaring mercury and the Ramzan month. “We have raised the production capacity at Palta waterworks gradually since March. The production units at Palta were put on high alert apprehending a further rise in. Similarly, the production capacity at Garden Reach and Jai Hind water treatment plants (Dhapa) has gone up by 5 million gallons, “said an official.

Though no major water crisis has so far been reported for many parts of the city, keeping in view the shortage of potable water in large parts of the Tollygunge-Jadavpur belt and areas off EM Bypass, the KMC water supply department has decided to keep water tankers ready for residents who are dependent on groundwater. “With the soaring temperature, the ground water level in several parts of the city is getting depleted fast. So we need to keep water tankers ready for residents who stay in the tube well zones,” said a civic official.

According to a source in the KMC, the water supply department was supplying around 80 tankers to dry pockets across the city. But the majority of this supply is being sent to residents who stay in the tube well zones. “Normally, we need to supply around 50 water tankers. But now given sudden spurt in the demand in water, we have started supplying 80 tankers to different parts of the city. Majority of these tanks are being sent to the Tollygunge-Jadavpur belt and areas off Bypass,” said a KMC water supply department official.

At the same time, the water supplies officials have been asked to keep tabs on the wastage of potable water. “Based on complaints, we will conduct a survey of water wastage in some specific pockets and take measures to prevent such wastage,” said a civic official.

10. Sewage treatment plant project: BMC finalises contractors



The Brihan mumbai Municipal Corporation (BMC) has finalised contractors for its ambitious Rs 29,653 crore-Sewage Treatment Plants (STPs) project, after several hiccups since it was first planned in 2002. Now, the corporation will submit an affidavit before the Supreme Court seeking further direction for the project. The BMC has proposed to construct seven STPs at Worli, Bandra, Dharavi, Versova, Malad, Ghatkopar and Bhandup having capacity of treating 2464 million litres of sewage daily under the Mumbai Sewage Disposal Project-II (MSDP).

In February, the civic body had scrapped the tenders following a controversy over the high bidding price from the contractors and the Opposition’s allegation of cartelisation. Contractors had quoted 30% to 70% above the BMC estimates of six STPs. It was the fourth time in the last few years when the tender for MSDP-II had to be cancelled.

Details from the MSDP department show that while the revised estimated cost for construction and maintenance of all seven STPs is Rs 29,653 crore, the contractors finalised have agreed to execute the project for Rs 25,963.32 crore.

While this time civic body has invited tenders for all seven STPs,



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In August, 2020, the BMC had floated tenders for construction of six STPs (excluding Malad). The revised estimated cost for six STPs has seen a 42 per cent increase in the last 20 months. Back then, all six were costing Rs 16,412 crore.

11. Sobha City, Thrissur, recognized as India's first operational project with Net Water Positive (Platinum) rating



Sobha has been recognized for its efforts toward implementing sustainability practices in its projects. Sobha City Thrissur is now recognised by the India Green Building Council (IGBC) as India's first Net Water Positive (Platinum) operational project.

The mammoth 55-acre project has set a benchmark by meeting 100% of its freshwater requirement through rainwater, while irrigation needs are met with STP treated water with no dependence on groundwater or any other alternate sources. Additionally, around 20% of excess rainwater is given back to nature.

Born out of an idea envisioned by founder PNC Menon way back in 2006, an artificial lake, spread over an approximately 6.5-acre of land was conceived in such a way that all the water needs for the township including landscaping are met without dependence on municipal water or other sources – even during water scarce seasons. This manmade lake was completely transformed into an architectural marvel by the Sobha team, which now is the recreational open space and focal point, around which the entire property has been designed and developed.

Sobha City Thrissur, a landmark destination provides a world-class living experience, offering conveniences and comfort for modern-day life. As an integrated project it hosts residential, retail and entertainment spaces with almost every amenity a contemporary project has to offer. This project conceived by PNC Menon, founder chairman of Sobha Group and Sri Kurumba Educational and Charitable Trust, is also a prominent philanthropist, who has received several national recognitions.

Jagadish Nangineni, MD, Sobha, said, "This recognition by IGBC encourages us to further enhance our efforts towards a more sustainable planet. This is possible because of the passion and commitment of our people, immaculate planning and execution, which is the Sobha DNA. Sustainability continues to be an important part of our focus and is reflected in all our projects and across our operations."

12. Rs 12 crore fine imposed on 2 companies assigned to build STPs in Karnal



The Karnal Municipal Corporation (KMC) has imposed a penalty of Rs 12 crore on two companies assigned to construct two sewage treatment plant with the capacity of 20 MLD in Phoosgarh and 8MLD in Shiv Colony. In a joint venture, both companies had been assigned the work to lay the sewerage lines of 152 km in various colonies. The fine has been imposed due to delay in the completion of projects under the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) project, one of the flagship programmes of the Ministry of Housing and Urban Affairs.

"A penalty of Rs 12 crore has been imposed for delay in work," said Naresh Narwal, Commissioner, KMC. The KMC had assigned the work to TPL, KIPL to construct two STPs, a sewerage line of around 152 km and two intermediate pumping stations, Saidpura and Sugar Mill (Meerut road) at the cost of around Rs 130 crore, said Satish Sharma, XEN, KMC. The work began on July 1, 2017 and since then the deadlines has been extending and last, it was extended to February 28,2022, but still the work was incomplete, he added.

13. Delhi govt to give free sewer connection to 25,000 households; RO water in JJ clusters

The DJB has announced plans to providing free sewer connections to 25,000 households in and installing 30 reverse osmosis plants



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in Jhuggi-Jhopri (JJ) clusters to provide clean drinking water to their residents.

The utility has earmarked Rs 19 crore to provide free sewer connectivity in 12 colonies in Karawal Nagar and Mustafabad under the 'Mukhyamantri Muft Sewer Connection Yojna'.

It will prevent 2.5 crore litres of sewage from directly falling into the Yamuna river, the Delhi Jal Board (DJB) said after a board meeting.

It has also decided to install 30 RO plants in JJ colonies to provide free, clean drinking water to their inhabitants. Officials said the plan is to install 1,000 such plants in the national capital. "These plants will operate round-the-clock and will be equipped with eight to 10 dispensing units at different locations to cater to a large population in a hassle-free manner," a statement said. Each RO machine can dispense up to 65,000 litres of water every day. A fixed quantity of water will be dispensed per household a day for which RFID cards will be issued to families.

"The RO plants will replace tankers which will help residents circumvent the often tiring and time-consuming process of getting water and eliminating the chances of social tensions," the utility said. The availability of clean water will help reduce the financial burden on families in JJ clusters due to diseases caused by unclean water. The board also approved the laying of a 10-km sewer line in Narela and a 25-km sewer line in Burari, respectively. The sewage will be routed to the Narela and the Coronation sewage treatment plants. A 10-km sewer line will be laid in the Singhu Group of colonies in the Narela sewage treatment plant (STP) catchment area, and a 25-km sewer line will be provided in the Pradhan Enclave falling under the Coronation STP catchment area. At present, the untreated sewage from these areas falls into the Yamuna directly. Living conditions of around 15,000 residents of Narela and 41,000 residents of Burari will benefit once the project is completed. The DJB has also decided to upgrade and comprehensively operate and maintain the 40 MGD Rithala STP on a unique financial model -- the government will only have to pay Rs 24 crore for the initial phase and the total amount of Rs 260 crore will be paid in installments over a period of 10 years. The Kejriwal government has also planned to create a lake in 100 acres of land at Iradat nagar which will be fed from treated water of this STP. To deal with the long-standing issue of treating the increased ammonia in raw water being received from Haryana, the board approved the work of rehabilitating an existing non-functional WTP into a six MGD plant to treat ammonia up to 10 ppm. The conventional water treatment plants (WTPs) can treat ammonia up to 0.5 ppm only."The DJB has cut short its expenditure by utilising the 15 yearold existing but defunct facilities at Okhla," the DJB said.

14. NTPC ties up with Delhi Jal Board to convert waste into energy

New Delhi, State-owned NTPC has partnered with Delhi Jal Board to convert sludge produced in latter's sewage treatment plants into energy. In Delhi-NCR alone, Sewage Treatment Plants (STPs) produce up to 800 MT of sludge per day.

"In an endeavour to reduce the carbon footprint, NTPC Ltd, India's largest integrated energy company has come together with Delhi Jal Board (DJB) to utilise the sludge produced in the STPs of DJB," a statement said on Thursday. To refied waste sludge was fired into NTPC's unit 4 boiler at Dadri for power generation. Firing sludge into the boiler will reduce net CO2 emission as well as water and land pollution. It will pave the way to utilise the waste and convert it to energy in an environmentally friendly manner, the statement said.



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DIGITIZATION IN WATER INDUSTRY: AN OVERVIEW

By Manoj Nainani, Executive Director, Egis India



The growing water demand associated with bourgeoning population, expanding urban clusters. lifestyle advancement, expansion of industries and climate change has resulted in continuous exploitation of natural water resources.

According to United Nations study, almost 1 billion people don't have access to safe water and over 2.5 billion don't have access to sanitation and hygiene. UN World Water Development Report, 2015 exhibits; global water demand for manufacturing industry alone is expected to increase by the tune of 400% from 2000 to 2050.

As per Water Resource Group (WRG) report "Charting our Water Future"; by 2030, under an average economic growth scenario and if no efficiency gains are assumed, global water requirements would grow from 4,500 billion m3 today to 6,900 billion m3 which is about 40 percent above current accessible and reliable supplies. Therefore, there is an extreme need on developing world's water infrastructure in pace with growing demand. Implemented solutions must be able to attract resources, partners, suppliers and customers to create cooperative networks for achievement of speculated objectives.

Implementation of smart water solutions that include hardware, software and data analytics; improves capital and operating efficiencies. Key focuses for smart water markets area water scarcity, improved services at lower cost, environmental awareness, regulatory compliance measures and service provider's innovation and adaptation.

The digitization of water sector has potential to transform water infrastructure in both developed and developing economies. In developing countries there is need of development of infrastructure in expanding urban centers and rural areas. Whereas, in developed economies many centralized systems needs upgradation to avoid system failures and inefficiencies due to aging infrastructure. Digital technologies encompass both improvement and adoption distributed, decentralized, off-grid water treatment technologies and improved water use across various sectors.

In line with the evaluation of internet of things since 1950, water industry has been growing steadily towards digital transformation. Various stages of industrial digitization evolution involved:

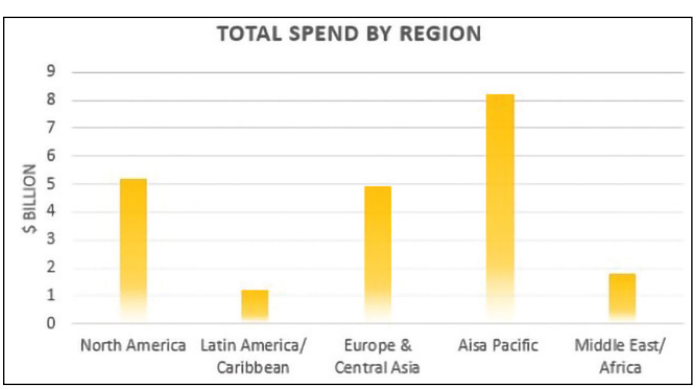
1. Machine level resource optimization (1950-1960s),
2. Enabled Facility - level resource optimization (1970-1980s),
3. Enabled Enterprise - level resource optimization (1990-2000s),
4. Enabled Global Network Resource Optimization (2010-Today).

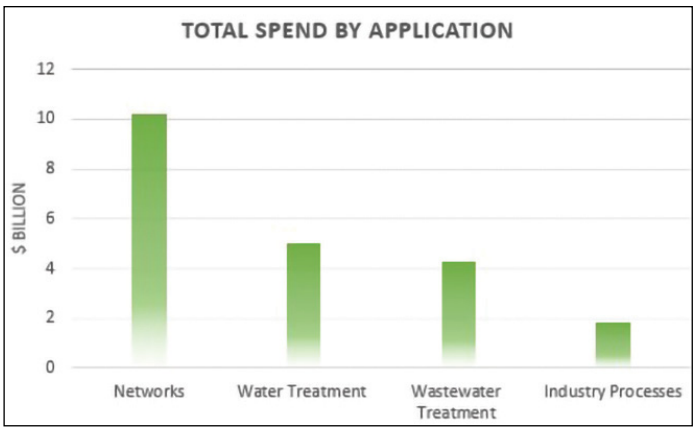
The digitization provides clear pathway to obtain efficient and sustainable water future. The data related to utilities including pipelines, pumping stations, treatment plants is crucial in adopting proactive measures to avoid inefficiencies and loss of water and revenue. Also, lesson learnt shall be useful in planning new infrastructure and rehabilitation/ renovation plan for utilities.

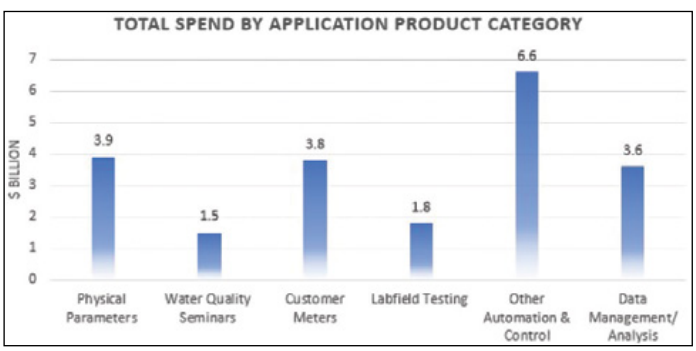
Component wise parameters to be considered for optimization of water infrastructure:

Component	Parameters
Water Resources	- Demand Forecast - Permit - Asset Management and Ownership - Water Quality Monitoring - Capacity Monitoring
Water Treatment	- Planning Scenarios - Power optimization - Chemical Optimization - Demand Forecasting - Asset Management
Water Collection and Storage	- Water tight tanks - Optimum hydrostatic pressure - Water Quality
Water Distribution	- Pressure Monitoring - Water Quality Monitoring - Leakage Analytics - Demand Forecasting
Water Users	- Customer Analytics - Water Conservations - Consumption Management - Customer Water Cost Forecasting
Sewage and Stormwater	- Data analytics - Sampling - Asset Condition - Best use of capital - Compliance
Wastewater Treatment and Disposal	Plant Performance Sludge Management
Water Reuse	Planned non-potable usage

The size of global opportunity in water utility sector is significant. As per Global Water Intelligence (GWI), a leading authority on market intelligence, news and analysis on the international water industry, the 2016 market for digital solutions for water utilities was $17.7 billion in 2016. GWI expects the market to grow to $25 billion by 2021.GWI estimates the global market for control and monitoring solution may rise from $21.3 billion in year 2016 to $30.1 billion by the year 2021 with an average rate of 7.2%.







Source: Global Water Intelligence (GWI - 2016): Water's Digital Future

Digitization and Policy Transformation

Regulatory authorities define the set of rules and guidelines to be followed. These must be a balance of needs of stakeholders, scope of additional supply, its benefit and delivery of the benefits to the end consumer.

- Communicating the impact of policy decision on water demand
- Implementation challenges of technical measures
- Quantifying the economics of adoption for end-users

Implementation Challenges:

- Difficulty in scaling
- Underdeveloped local supply chain
- On-going Management Complexity
- Organizational issues

Digitization and new technologies are enabling water utilities providers and industries to make informed decisions, improved water conservations and provide water to the end users at an optimized cost. As per estimates approx. 30 % of water utilities expenditures can be optimised through dynamic and real-time monitoring which include reduction in non-revenue water leakages, billing errors and energy consumption. Next to US (leading in terms of metering) and Europe (smart operational solutions) other potential countries on the path of smart water solutions include Australia, Singapore and Israel, being water stressed and receptive to advancement

of technology adoption.

Digitalization in water sector has brought about following positive trends:

1. Analysis sensors: Analytic sensors majorly in Pump controls, measurement technology and drinking water analysis. Better communication between the various components can enhance the security of the supply and optimise energy and resource efficiency.

2. Opportunities from a "Digital Twin": Digital twin is a data model which depicts a system or complex infrastructure with all its information and interdependencies. Digital twin enables to work out real – life simulation without risk to test various approaches to optimize them.

3. Better identification of customer needs: Digital change in the field of municipal water supplies has been greatly recognized. Analysis of large data available assist in understanding the customer needs which in turn gives a reasonable basis for developing new and more suitable products and policies.

4. Maturity model water supply 4.0: Development and implementation of maturity model water supply 4.0 shall support on digitalization by presenting overview of current practices to further enhance improvement measures.

Water-conscious and water saving regulatory reforms are need of the hour to improve efficiency in industry and municipal system across globe.

About the Author

Manoj Nainani has been with Egis since October 2015 and holds the position of Executive Director - Infrastructure (Water, Ports, Energy & Specialized projects and he is also IOSIS partner and holding position in Management team of Egis India. He is in charge of Pradhan Mantri Awaas Yojana (PMAY), DRIP, AMRUT (Water Project) which are largest projects of Egis in India

Manoj is a dynamic professional with over 28 years of rich experience in Strategic Planning, Business Development, Sales & Marketing and Key Account Management. He has held various senior positions in Essel Infra projects and SPML, before joining Egis.

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INTERNET OF THINGS (IOT) FOR WATER MANAGEMENT

By Mandarr Kkamthe, Technical Consultant-Water Projects



It's often said that water is the world's most valuable commodity. With rapid urbanization - nearly 70% of the world's population lives in cities - it is estimated that almost half of the population will live in water stressed areas by 2025. This means that water will become one of the biggest expenses for cities in the future and will directly impact economies.

As infrastructure is updated, utilities can implement Internet of Things (IoT) technology throughout to help make water management more efficient and safer for consumers and workers. These smart devices and sensors can help with real-time data collection and alerts to prevent issues from occurring and reduce the workload on the workers responsible for physically checking every inch of infrastructure.

Given the strong digital presence in our everyday life, it might be hard to believe that many utilities still track devices and data manually. This outdated and inefficient process can lead to old, inaccurate and incomplete measurements of data and assets. When upgrading, utilities need to think about how to scale to thousands - or even millions - of sensors, water meters and valves. When handled correctly, the infrastructure update can unlock new insights and reach unprecedented levels of efficiency.

Objectives of smart water management

- The primary objective of smart water management is reasonable and sustainable usage and recycling of water resources. Growing population, increasing environmental issues and pressure on the food and agriculture sector make water even a more precious asset.

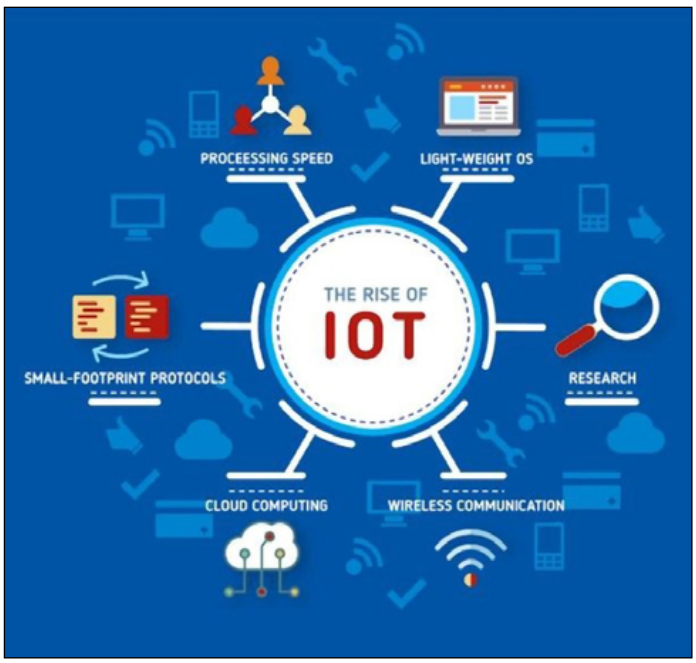
- In this respect, water management technologies and activities pursue the following objectives:

1. Improve water quality and prevent contamination by chemical waste and natural pollution such as acidification. In order to improve and maintain the quality of water, companies use sensors and IoT technology for real-time monitoring and control.

2. Enhance the efficiency of water systems such as water collectors, treatment plants, distribution mains and wastewater recycling centers. Using IoT and data solutions for asset management, companies can keep important measurements such as water pressure, temperature, flow, etc. at hand, integrate predictive maintenance and avoid breakage and downtime of equipment.

3. Implement leakage control by using smart water management devices equipped with leak and moisture sensors. Given that almost $3 billion are spent on fixing the damage caused by leakage yearly, leakage control is essential to keep water resources and budgets safe.

4. Practice consumption monitoring via IoT-based water management systems. It helps to optimize and keep under control the usage of water resources at different levels - households, communities, countries and the whole planet.



IoT water management solutions

- The Internet of Things offers new solutions for improving water management, to maximize efficient use of this precious resource. Comprehensive water management strategies can reduce water costs by up to 20%, which has a real impact on cities. Water projects can be particularly complex since many cities rely on aging infrastructure, and the IoT also presents opportunities for municipalities to reduce operational expenses around construction, maintenance, and more.

- Whilst traditional major infrastructure assets such as trunk mains, pumps or reservoirs have been instrumented for years using systems such as SCADA, the vast majority of the reticulation network - the final pipe network that delivers water to a customer's premises - has always been "dark" to the utility. That is, utilities rely almost exclusively on the customer acting as their sensor - when there's a fault, the customer phones up to complain.

- Here are a few of the ways IoT can improve water management:

- Water leakage detection

- More efficient systemic water management

- Water quality and safety monitoring

- Quality control on water reserves

- Transparency on consumption

- Prescriptive maintenance on infrastructure



How Internet of Things assists in determining water demand in a city

One of the crucial challenges of water management as well as conservation in a city is to determine the amount of water that any particular city is going to utilize during the next day. This can be calculated to precision with the use of predictive analytics. This is done by keeping a track on the history of water consumption in the city on any given day. Based on the historical data collected and analyzed by predictive analytics and combined with the consideration of special events, holidays, as well as the weather in that city, we can determine the amount of water that the entire population is going to consume in one day.

Let us take into consideration the collective consumption of water on a winter day as well as a summer day. It is a known fact that the consumption of water is comparatively very less during winters. This we could easily determine from the historical data collected as well as the fact that there is less water consumed for washing as well as bathing purposes during winters. On the other hand, take into consideration a day like Holi where there is a huge amount of water consumed throughout the day. Given to the fact that water often gets wasted unnecessarily during such festivities, it would not be wrong to say that there is comparatively more consumption of water during summers.

This is also where the importance of historical data as well as predictive analysis comes into consideration. When we have knowledge about the amount of water that is required for overall consumption in a city on any given day, it becomes easy for the water authorities to maintain the level of water in a water reservoir/ tank and then pump the water into overhead tanks as required throughout the day.

Not only this, the Internet of Things technology also helps in scheduling the maintenance as well as shutdown of pumps on a regular basis. There are optimization techniques which can beforehand convey to the residents of a city regarding the unavailability of water during any particular point of time. This helps the water regulation authorities in not only meeting the adequate water demands in a city; rather it also aids in the conservation of resources and energy.

Another advantage of Internet of Things in water management is the reduction in energy pricing and consumption. Keeping in mind the goal

of meeting the water requirements in a city, predictive analytics can be used to calculate the price of energy during different hours in a day. This information can then be used for scheduling the pumps throughout a day in such a way that there is no loss of unnecessary energy or resources.

Major Components of IoT Water Management

IoT Water Flow Meters

By using smart IoT water flow meters, manage the flow between multiple distribution lines. Save power by knowing how much water flow is needed for a specific distribution line. You can even prevent the non-revenue water loss caused by meter inaccuracy and recover lost revenue and deliver more accurate billing.

Smart Water Meter

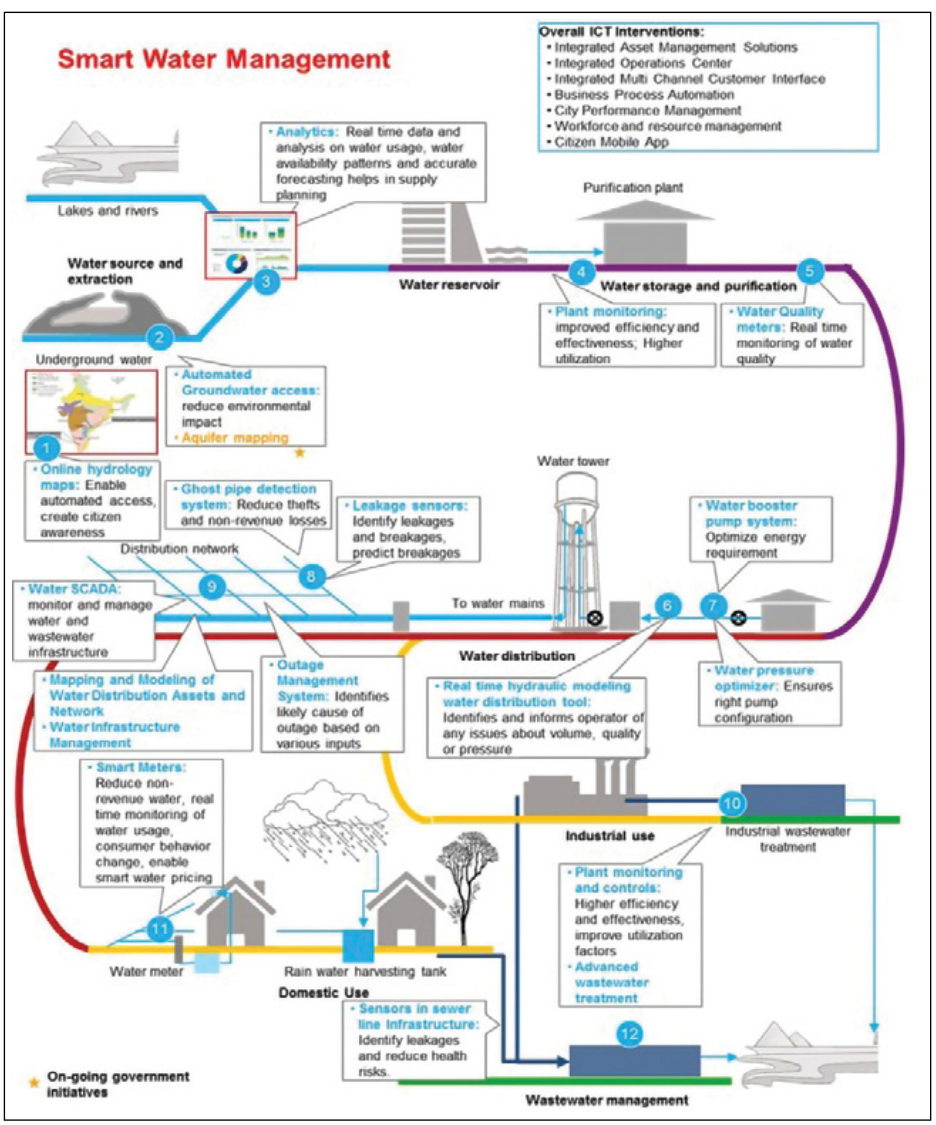
An IoT smart water meter tracks the quality, pressure, and consumed quantity of water in a household or industry. An IoT smart water sensor can be used to track the flow of water across the entire plant and over the distribution channels. Helping in leakage detection, to reduce water wastage.

IoT Water Valve

When a water pipe bursts, not only the water gets wasted, worth thousands of dollars, but the entire water distribution system is affected. You can prevent such accidents installing IoT water valve in your water distribution network. The IoT water valve can be controlled remotely via internet by using the mobile application.

Intelligent Pricing

IoT smart water management solutions let you get configurable, intuitive, and insightful analytics to analyze the data collected from IoT water sensors and price the water according to the demand of the water like we can price the water different in winter and summer. This strategy can influence the water consumption habits of households and industries.



Water Quality Testing

The IoT water quality measuring system monitors the quality of water in real-time using various sensors which sense pH level, conductivity, TDS, Salinity, and Temperature to know the live water quality status of water. Proximity sensors alert the officials by notifying them via the cloud in case someone tries to pollute the water body.

About the Author

Mandarr Kkamthe has 15+ years of experience in Water management, O&M and related activities. Currently he is working as a Free Lance Technical Consultant-Water Projects. He has worked for companies like Vishvaraj Environment Private Limited (VEPL), Suez Projects Private Limited (SPPL), Jamshedpur Utilities and Services Company (JUSCO) Ltd., Joost's Engineering Company Limited etc.

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DIGITALIZATION IN WATER SECTOR: TRENDS AND OPPORTUNITIES

By Dushyant Jindal, Co-Founder, Hitech Enviro Solutions



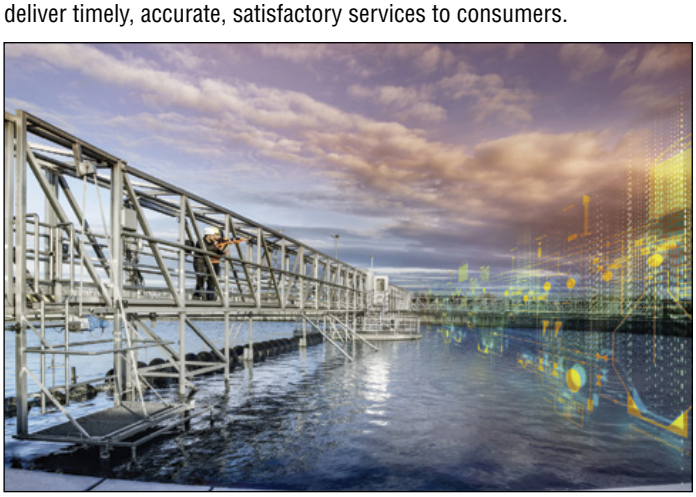
The water industry has changed radically in the past two decades. Water utilities' duties to supply water and wastewater services have expanded into resilience planning, acting as conduits between all water users and the water environment, and adjusting to ever more demanding customer service expectations. Replacing analogue with digital systems has already enabled companies to rise to these requirements more efficiently but now 'digitalisation' offers more significant step changes.

How much important is digitization today in the water industry? The water and utilities sector, understood in its entirety as a supply chain, has a very high strategic value. The water crisis, linked to an acceleration of climate change, has been indicated as one of the main global risks for some years now (World Economic Forum, 2015). The huge and unresolved environmental issue is not the only thing that complicates this already complex and sensitive sector.

Digitization in the water industry starts with data

While the average level of digital literacy was still low just over a year ago, the huge amounts of data produced, extracted, and processed every day by water companies - as well as energy, waste management, and gas companies - was accompanied by an increased need for planning, which is essential to drive business decisions, both short and long term.

In order to build a resilient and sustainable water future, identifying potential impacts and developing adaptation plans, now as then, it seems necessary not only to have adequate infrastructure in place, but also to develop domain-specific knowledge that will enable water operators to deliver timely, accurate, satisfactory services to consumers.



Advanced digitization in the water industry cannot start if you are unable to extract useful insights for the decision-making process, both that of plant operators, managers and end customers from the large volumes of data available. Today's end customers are increasingly called upon to take part in a real conversation and no longer to witness a simple one-way communication.

Data collection and interpretation is therefore an important preliminary phase and it concerns all of the processes that make up the water cycle. Water companies can now optimize the efficiency, profitability, and resilience of their plants and improve the quality of their customer care by setting up truly personalized initiatives, thanks to integrated solutions that provide real-time information, proactive recommendations, and even predictions about the behaviors of the various elements of the supply chain.

Translating data into truly useful information

The quality and success of digitization projects in the water sector are closely linked to the attention and investment on the collection, management, and classification of data, which must be structured and stored in order to then be able to identify correlations and knowledge, to be used to optimize operations and discover new processes. Data is transformed into useful information. This is the case with advanced meters, which can automatically collect data in real time, or communication systems, which utility managers can analyze and use to make critical decisions in a proactive way.

Data collection is only the first step. For it to be useful, these big data streams must be translated into useful information, enabling end users to understand and act quickly. Utilities and water companies must move to a way of operating that data-centric, fully transparent, and interoperable.

How digitization can transform water industry infrastructure and services

Digitization has profoundly impacted both infrastructure and services in the water sector, and in the latter case, it's been especially impactful on the services developed and offered by marketing departments.

- Impact of digitization on infrastructure. Digitization in the water industry has helped to make investments in IT and Asset Management projects more efficient and it has made it easier to set up data-driven strategies. The use of data has supported the innovation of internal processes, increasing their efficiency, in terms of:

  ◊ Reduced resource consumption thanks to plant automation and remote control initiatives, capable of optimizing production cycles by improving maintenance response and thus decreasing, often drastically, water dispersion
  ◊ Reduced site impacts thanks to techniques that make it possible to carry out low impact restoration interventions, minimizing the occupied areas, the intervention times, the emission of dust and noise, and the inconvenience to the road system.

- Impact of digitalization on services. Digital water, through an increasingly active marketing strategy, is destined to profoundly change the relationship with customers both in terms of greater mobility and omnichannel marketing and in terms of a different type of communication that is more inclusive and service-oriented, and in the entertainment potential offered by different formats and platforms. Companies in the water sector are beginning to establish innovative strategies to engage consumers through:

  ◊ High-level administrative services that ensure timeliness and quality in relations with customers (management of paperwork, billing/invoicing)

Customer care services that promote brand values (such as sustainable water use) using innovative tools such as microsites or personalized videos, creating reports using real-time data from smart sensors, and allowing users to easily access information about their usage.

How are digital technologies transforming the customer experience? Below are the four most promising ways.

1. Performing analytics and implementing automation

Predictive analytics and modeling, where data from a variety of sources, such as weather and temperature data, is combined and interpreted, can encourage preventive actions by customers.

2. Influencing behavioural change

While we should all be using less water, changing ingrained behaviors is often very difficult. Digitization in the water industry, however, makes it possible to use data to identify peaks in household usage, helping people understand consumption trends and change their habits.

3. Create and engage communities

Digital tools are meeting a need for greater consumer / user engagement and creating the conditions for establishing a relationship that goes beyond the functional contact of customer service and problem solving. New online platforms are making it easier for customers in the same community, whether defined locally or along lines, to interact with the company and with each other, and the data from these conversations are used to improve the service itself.

4. Gain autonomy (and freedom)

The ability to perform some important user management tasks autonomously, in a way that could be defined as "digital self-service," contributes to making organizations more cost-efficient and also gives customers greater control over their spending. As a result, customers are more engaged and aware of the water service and their role within it, and the company can operate more quickly and effectively.

In all four of the digitization developments we've briefly described, we're not so much talking about transformations related to the specific use of

a tool, but rather the construction of a new conversational framework in which customers and firms can experience different - and more balanced - forms of interaction. In other words, what these technologies enable, both as a whole and individually, is a more informed and effective dialogue.

The majority of water companies' needs can be grouped into one or more of these central categories.

- Efficiency is generally associated with utilities within the developed world that have well-established water networks. Water companies looking to improve efficiency are constantly investigating ways to do more with less.
- Environmental factors are important within the developed world and the developing world. Whether these factors are driven by regulation or a desire to address the impact of climate change, water companies must take this into account almost continuously.
- Expansion is primarily a driver in the developing world, as urbanization adds increasing pressure to already stretched utilities on a daily basis.

When considering the impact of digitalization in the water industry, goals, requirements and benefits will generally fall into one or more of these three categories.

Digitalization and Regulatory Compliance

Regulation is a central consideration in the water industry, with water quality being increasingly subjected to tight controls and stringent requirements all over the world. There is no room for mistakes when working to meet regulatory requirements, but digitalization can help remove the potential for error.

For example, digital data recorders make accessing real-time information and historical data much easier. An effluent discharge application, for example, would benefit from being able to have information stored securely and accessible immediately.

Digital recording applications also offer functionality, such as early warning notifications sent via email. If a limit is approaching, rather than having to rush out to site, staff can get an email alert well in advance, thus allowing them to address the problem before it arises and ensuring that the company does not fall foul of the regulatory authorities.

These applications tend to be comprised of a digital device surrounded by software and applications, which enhance the functionality of the device and make the measurement process easier.

This is largely possible without the need for significant capital expenditure because these systems essentially combine the company's existing IT infrastructure (where email and resource planning systems are based) and the company's operational technology (the instruments in the field).

Digitalization connects these two areas together, driving additional value.

Ensuring Drinking Water Quality via Digitalization

Consumers have a high level of expectancy from their drinking water. The final water should be clear, odorless, non-corrosive and most importantly, free of harmful bacteria and microbes.

Any unexpected deviation in quality could have a major impact, not only on the water treatment facility and distribution network but, more importantly, on the consumer. Many people take drinking water for granted, but a great deal of effort is required behind the scenes in order to deliver consistent quality and to meet regulatory requirements.

Delivering these results can be challenging, especially when faced with issues around poor connectivity, lack of skills, increased regulations, consumer demands and productivity challenges.
Even generic water treatment facilities will vary slightly in the approach they take to water treatment. In general, though, these facilities will maintain a common sequence of water treatment stages, starting with the water intake and ending with the final discharge stage.

A generic water treatment facility will tend to utilize five basic areas of treatment, each with its own demands from a measurement standpoint. These are the water intake, the pre-treatment stage, coagulation/ sedimentation, filtration and ultimately, the final water treatment process. Each of these stages plays an important part in the overall water treatment process.

Looking at these typical stages and combining all the analytical measurements in use can result in as many as 26 different parameters requiring monitoring and adjustment, all in a single facility.

This presents a sizeable challenge in terms of monitoring, maintaining and operating all of these measurement points during the facility's day-to-day operation.

In addition, if there are no additional backups to the measuring points, any disruption to their operation can have a huge financial, regulatory and environmental impact.

Digitalization can play a significant role in helping water treatment companies improve operations without the need for complicated process adjustments or large financial expenditures.

About the Author

Dushyant Jindal is an Engineer with MBA has an extensive experience working on environmental project for different sectors of Government and non-government organizations in India. He is the Co-Founder at Hitech Enviro Solutions, engaged in environmental monitoring services and consultancy.

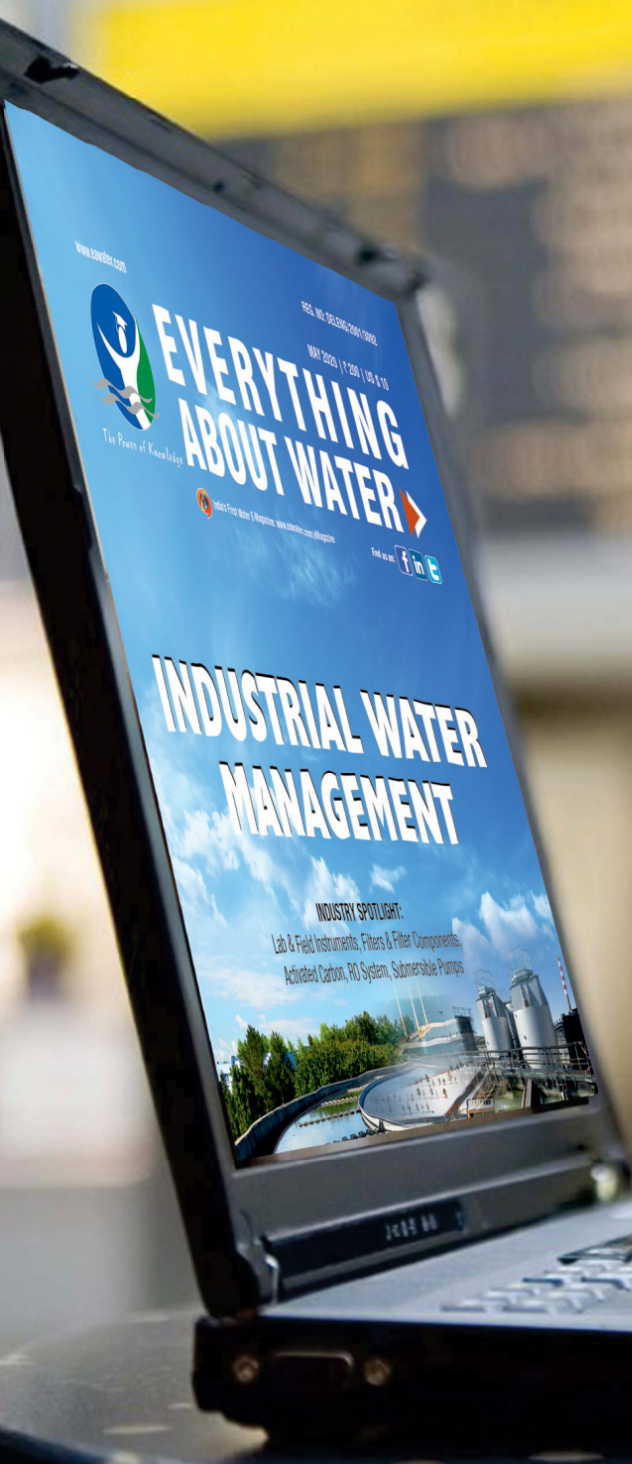
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WATER WITH DIGITAL INTELLIGENCE

By Abdul Rahman Mohammed, CEO, Sahara Industry



Water is an important natural resource. The consumption pattern globally has become unsustainable while its quality and contamination by human activities are constantly growing. The integrated water resources management paradigm emphasizes the importance of considering all water sources as a valuable resource to bridge the artificial disconnect between water quantity and water quality. Whether any water source is depleted or rendered unusable by pollution, it is a lost resource and may lead to a failure to meet basic human needs.

India is home to almost 18% of the world's population, but only holds 4% of the freshwater resources. Not only is water scarce in India, the quality is also deteriorating gradually. The traditional approaches to managing water assets are no longer sustainable. The current method of stretching equipment life and making patches and repairs to aging infrastructure puts them at even greater risk of failure. The water utilities have limited visibility and control over these assets amplifies the challenge which gets multiplied as they are dealing with constrained budgets that constantly force them to rethink and prioritize where and how they should invest in modern technologies.

Water utilities across the globe are under tremendous pressure to innovate and address the growing challenges of population growth, increasing demand, water scarcity and deteriorating asset health which were further compounded by the pandemic outbreak that saw demand for water rise considerably and workforce mandated to work from home.

Smart Water Management for Increased Efficiency

Water utilities have to find better solutions that complement the infrastructure needs and available technologies. The old system is not going to be replaced instantly but providing deeper insight into operations, with real-time analysis to enable meaningful and effective management decisions will be the key factor to change.

Adoption of modern technology can help accurately analyse the demand-supply, predict flow volumes, availability at source and determine next steps in real time basis. The solutions will add intelligence to the pumps, allowing automated processes to reduce manual work, remove latency, reduce breakdowns, and eliminate delays enabling real-time decisions.

Artificial intelligence (AI) and Machine Learning (ML) have revolutionized our lives, but water sector has been slower to adopt smart solutions than others. Despite AI systems underpinning everything from power grid regulation to Google's search tools, water and wastewater services have only recently embraced data-driven technologies mainly after the safety protocols have been stiffened after the pandemic. After years of lagging behind other industries, the waste sector is making up for lost time, and smart systems are taking off, however, has been comparatively slow in India as compared to European and Middle Eastern nations.



FRP Pressure Vessels of Different Capacities

Water utilities have traditionally been conservative due to various reasons. They have been resistant to change while focusing on stability rather than taking a chance with new technologies despite knowing that it could improve performance over time. They are hesitantly going for upgrades with new sensors, monitors, and tracking capabilities that needed substantial capital investments.

Data Management and Analytics

Today's world has greater access to data than it ever had. But the water industry is still developing data collection, management, analytics, and controls to more effectively use those data for informed decision-making across all management and operational functions. Many water treatment facilities have centralized supervisory control and data acquisition (SCADA) systems or distributed control systems (DCS) for plant process and equipment control. Operators monitor equipment for status and performance, with perhaps thousands of signals collected as unique data points in the control system that can be stored in a data legacy.

It is still often works manually, combining key operating data such as water flows with laboratory data to develop trends for process analysis that can be very time consuming. As a result, much of this data is relatively untapped to support decisions that would enable higher levels of performance and control. Recent advancements that leverage business-intelligence tools offer an opportunity to save time extracting, transforming, visualizing, and analyzing data for faster and more meaningful performance monitoring.

Data management platforms that serve as a data hub using inputs/data from the SCADA or DCS, laboratory information management systems (LIMS), and computerized maintenance management systems (CMMS) enable more efficient combination of these datasets for dashboards, tracking of key performance indicators, automated reports, and saving executive time for other things. Facility-specific systems can provide real-



50 M3 hr Reverse Osmosis Plant Installed in Logistic Park, Hyderabad

time (or frequent) updates for management and operations staff.

Once collected and organized, advanced analytics can identify trends and predict outcomes that in turn provide opportunities to optimize the performance of equipment and processes. Utilities are also starting to incorporate digital twins for asset management. Advanced equipment monitoring and data analytics yield insights into equipment health and performance that maximize prioritization benefits.

Asset Management

Asset management is a key for optimizing capital investments in treatment and distribution facilities. Taking care of equipment and infrastructure to ensure that it performs as required for the full design life of the facility is essential to managing cost and risk. A data-driven mindset is essential in this regard. Utilities continue to develop monitoring programs to collect the right data, populate maintenance management systems, and track and analyze data to facilitate better decisions. Implementing asset-level likelihood-of-failure and consequence-of-failure metrics, asset condition assessment procedures, and onsite condition assessment of critical assets at treatment plants, could provide easy access to selected performance data at the facility and asset levels.



Fully Automatic Water Softener

Looking outside the water industry will also help the water utilities to advance asset management practices for facility optimization. Development of ISO standards demonstrated the value of collaboration across industries and countries for effective asset management. There is room to learn more from manufacturing, energy, oil and gas industries, particularly with their advanced monitoring and diagnostics of asset health.

Enhanced Operational Efficiency

The water sector continues to focus on operational efficiencies to enhance performance reliability and reduce consumption of resources such as energy and chemicals. Selecting treatment strategies that reduce consumption of resources is a foundational opportunity to optimize a facility.

It's important to consider the impacts of mechanical and electrical design choices on efficiency over the life of the facility. The design life of water treatment facilities often projects 20 years or more into the future. However, equipment that is sized and selected for efficiency at a future design capacity may operate inefficiently under conditions of lower flows and loads, thus increasing energy demands relative to the level of water treatment in the near term. Incorporating appropriate new processes and tools into planning and design and simultaneously considering operation and asset management for the full life of the facility is a challenging, but essential, balancing act.

Water utilities are mindful of how the designs affect future maintenance, the true costs and challenges of maintenance are often not fully realized until well after commissioning. Knowledgeable engineers enhance designs by incorporating risk-management practices such as hazard-and-operability review (HAZOP) and failure modes, effects, and criticality analysis (FMECA) results into facility designs or upgrades. The quality of 3D models and building information modelling (BIM) and the ability to link equipment information can provide an intuitive way for operations and maintenance professionals to access equipment data and other information.

Initiatives by Sahara Industry

Being market oriented with modern system and processes, Sahara Industry has a client-centric approach to provide high quality products with excellent service standards. The technical expertise and in-depth understanding of the water sector has enabled it to offer the best integrated and strategic approach to industrial and municipal water and wastewater treatment systems. The Company provides multi-disciplinary water and wastewater treatment and engineering services and delivering ideal solutions based on the experience of implementing hundreds of plants and projects with integrated project approach.



Ultra-Pure Water Tretament Plant

In a legacy of about two decades, it has contributed immensely by making water safe for drinking, industrial and institutional purposes. The ISO 9001:2015 certified company; it has executed water and wastewater projects in the length and breadth of India as well as in several other countries. The technologically advanced machineries and manufacturing solutions combined with professional engineers and well-qualified teams to achieve the rare feat of being an indigenously creator of advanced water and wastewater treatment solutions matching with world standards.

Foreword

With the price of inaction mounting each day and the tools to improve India's water and wastewater infrastructure in smart, sustainable ways increasingly available, now's the time to do what we can to secure our water future. Water Innovation 2050, the water industry's vision for the sector, had some fantastic ideas. Solving its problems is not just about developing new solutions but using the innovations that already exist. It is time to look at replacement, not the whole water network, but where the limited available funds will have the greatest impact on the functioning and enhancement of the system.

Deploying alternative approaches, solutions, and more efficient water management strategies that enable society to live with unexpected climate events will take on greater priority. The municipal water reuse systems have increasingly become necessary, irrespective of cost, to mitigate water supply risks for cities. At the same time, rising investments in more innovative irrigation and farming practices, which are on the rise, are poised to scale. When digital transformation is taken up with complete commitment the results does not always take time to materialise. Hence, it is time to take the initiative, commit, and you will reap the rewards.

About the Author

The young entrepreneur with an MBA in marketing & finance, he is the Founder & CEO of Sahara Industry, providing technologically advanced, economical yet best quality water and wastewater treatment solutions. His success lies in his dynamic leadership and his group company has achieved turnover of over INR 1000 million.

To know more about the contributor of this case study, you can write to us. Your feedback is welcome and should be sent at:
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DIGITALIZATION IN WATER SECTOR: TRANSFORMATION PROCESS, CHALLENGES AND FUTURE

By Dr. Mayur J. Kapadia, former Additional General Manager & Head, Quality Control Division, GNFC Ltd., Bharuch, Gujarat



The increasing scarcity of drinking water, increasing water costs, stress on water systems and economic conditions have been compelling organizations and industries to search for cost effective solutions to generate ample availability of water suitable for domestic and industrial uses. Pollution of water bodies by industrial wastes as well as water wastages are depriving billions of lives to live without access to basic water needs. Digitalization has the power to help water and waste water industry to solve a lot of these challenges. Digitalization of Water means adopting a smarter approach to water management. The process can help integrate and optimise smart pumps, valves, sensors and actuators, and enabling each device to 'talk' to each other. Furthermore, it can also talk to a customer's smartphone, and send real-time information that can be accessed and shared over the cloud to take timely actions.

Organizations managing water for drinking, irrigation and industrial purposes have realised significance of digitalization to become resilient and to deal with issues of water scarcity, economic downturns, climate change, water conservation, plant operational efficiency etc. Digitalization can also help in extending the life of aging assets, reducing leakages, faults and attacks in the distribution network, improving water quality monitoring, better service levels and reliability of water supply and so on. With 'Internet of Things' (IoT) being a norm these days, the water industry is going through a transformation and moving digitally forward. By investing in innovative digital water solutions and implementing a technology-focused strategy, organizations can increase efficiency, ensure compliance and help communities by reusing and recycling water to reduce waste.

Digital Transformation is a step - wise process.

To become a digital water utility, there is a need for the Utility to internally evolve from various layers of physical assets having 'no data' into an integrated system having sensors and analysers generating 'lot of data' that provide meaningful knowledge supporting business and community goals. Transformation from non-digital to digital state is a step-wise process that an organization needs to understand and attempt.

Problem identification: Irrespective of the stage in digital adoption, the utility should identify a problem to solve on a daily basis. Each problem should be considered as an opportunity for a digital injection. Carrying out own research and search for a solution through dialogue with nearby utility systems and / or industry partners to solve the problem with a digital perspective can help the utility in moving one step closer to digitalization.

Pilot project: Pilot plants are an excellent proof of concept. They provide opportunity to learn from the process and fine tune the outcomes, thereby they make it easier to take a leap of faith on a small scale towards digitalization. With measurable results, the decision makers can easily determine costs and savings to be expected on a larger scale deployment.

Return on Investment: Most digital solutions will deliver a measurable Return On Investment (ROI). When a utility can model ROI, it makes a much stronger case for investing in smart

assets that will lower costs or improve services in the long run.

Data platform: For marching towards digitalization, the industries and organizations need to create a central platform that allows use of data for many purposes. Such digital platform should be built on open architecture and standardization so that programming interfaces can retrieve data from any software application. This way, one will be able to retrieve historical or active sensor data from the systems. In many cases, it becomes possible to retrieve the old data over the new platform without losing the old but important data.

Partnership: A short lifespan is highly common and a reality in the technology sector. Partnering with trusted vendors that understand the water industry and assist industry in updating the technology is likely to work well.

Retrofitting: This is obvious and makes fiscal sense. A lot of water infrastructure was built to last several decades. Moreover, with proper maintenance and rehabilitation, the life of this infrastructure can often be stretched even further than planned. Turning the 'dumb' infrastructure into 'digital' and 'talking' infrastructure is possible with the addition of sensors, smart pumps, valves, actuators etc.

Barriers are smaller than benefits.

There are a lot of reasons why the adoption of digitalization is taking longer in the water industry.

Fear: There is a fear of technology, especially in a water industry that has a large aging workforce and has been accustomed to a defined role where their experience is their biggest asset. Giving this workforce the responsibilities of a connected device can be perceived as a threat. In addition, they may not be as comfortable with technology as the new generation entering the workforce.

Resistance to change: The water industry has traditionally been cautious and resistant to wholesale changes.

Age old systems: Old legacy systems often keep data in closed loops, making system integration and inter-operability a big hurdle. The analytical data in many industries lies in disconnected systems such as spreadsheets, paper records, etc. This prevents them from fully utilizing the potential of their data even though they are already collecting valuable insights about their water usage and quality.

Cybersecurity: Threat of 'hacking' of the system is another growing concern that gives rise to a whole new set of fears.

Uniqueness: The most profound challenge for building a digital utility is that no utility is alike. There cannot be a 'one-fits-all' kind of solutions. Within a single organization also, there could be different set of utility systems for different geographical locations. Likewise, the distribution systems are also unique which call for different requirements for their digitalization.

Policy: The water policies and the mindset of people are not fully aligned with technology. There is difficulty in getting proper support for new technology. Therefore, the adoption remains an inflated expectation of the service providers, water experts and champions advocating for change.

Lack of real-time data: The old systems have 'no' or 'limited' capabilities in collecting real-time information. Even if they are collecting data, they are not collected in real-time. The usefulness of the data decreases since the data could change by the time, they have determined actionable insights.

Investment: The transformation into digital platform involves investment towards sensors, their up-keep, calibration as well as software costs and upgradation of software time to time. The spending at present is a kind of 'half-hearted' towards digitalization, as a result, there has been a limited progress towards this important aspect.

Future is Bright.

The continual technological developments with advent of the Internet of Things (IoT) have supported in overcoming the resistance to change. Technological advancement is a key driver to getting everyone on board and to seamlessly integrate new capabilities. The user industry has been fetching advantages of the technology in daily domestic lives. Having realized the benefits of technological leap, the old age systems and highly experienced people have been gradually changing their stances in favour of digitalization.

The digital utility uses data insights to do predictive maintenance and continually improve processes and workflows, thereby the improvements undertaken towards digitalization reduce operational costs, optimize asset management and improve revenue. At the same time, a digital utility can service its customers better with reliable water and extensive information such as consumption, predictive billing, and conservation. The overall monetary benefits have been reaching the insights of decision-making fraternity slowly and steadily.

Against threat of cybersecurity, the IT players have developed cloud security software tools that are layered into most of the mainstream water utility platforms. The continued updates of security tools have successfully overcome the threat of cybersecurity. Many cloud hosted technologies are designed to be user friendly and intuitive with customizable visual dashboards, alerts, and automated processes. Cloud hosting also offers a maintenance-free solution for utility IT departments. There is no need for local installation, debugging or upgrading of software. Everything is managed in the cloud and all a user has to do is log in to get access to the most recent version of software.

While the last 2-3 years had put a pause on many infrastructure projects, the period did not pause the development of technology solutions. Advancements in technology have compounded with time, raising opportunities to resolve water issues.

The new generation entering the industries and government / municipal bodies is highly tech-savvy. This generation quickly adopts to the technological changes and is expected to accelerate digital transformation. The 'white-collar' and 'brown-collar' jobs are getting converted into a 'no-collar' kind of job with hybridization and integration of machines with human workforce. The new generation

continually adapts and learns new skills as technology inevitably evolves.

Companies and organizations have started looking at digitalizing their water quality as an investment, both in technology and people. Technology-keen people are being onboarded so that the youth of this nation is interested in being part of the digital water sector.

Every individual being brought into the fold of this industry has been acting as an advocate for digital transformation. The solutions deployed at plants are no longer a knowledge that is not transferable.

In nut shell, the future of digitalization of water sector looks very bright for the next decade. The digital water market is on a steep growth trajectory which outpaces the broader municipal and industrial water and wastewater sector. As the digitization of water accelerates, utilities have started following a step-by-step process toward their digital transformation.

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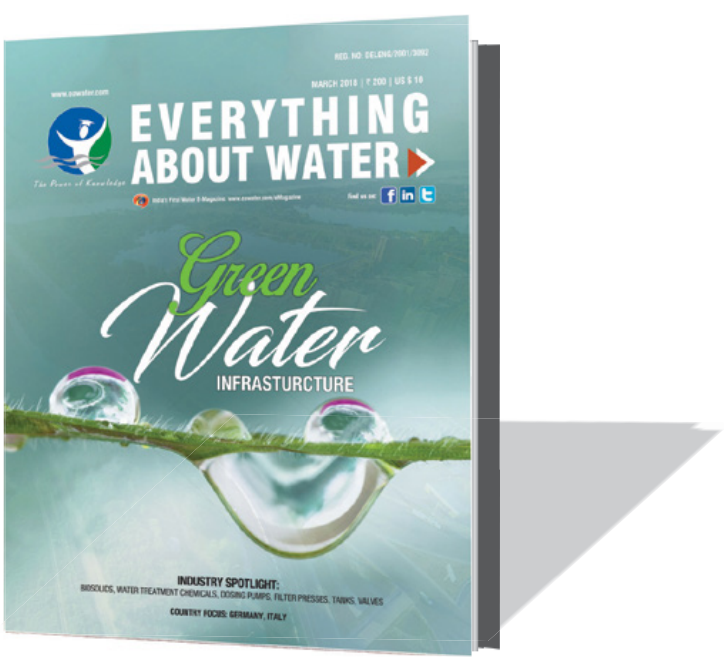
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DIGITIZATION IN PUBLIC WATER SUPPLY IN THE INDIAN CONTEXT- SOBRIETY VS FANTASY

Dr. S Saktheeswaran and Dr. S Sundaramoorthy

Abstract

Digital technologies in public water supplies are advocated by advanced countries as offering unlimited potential to transform the water systems, helping utilities to become more efficient, resilient, innovative and empowering to arrive at more economically viable strategies in managing the system vis a vis their finances and has become the fantasy in developing countries. However, the intermittent water supplies and sometimes supplies on alternate days in developing countries is the nadir as opposed to the zenith in advanced countries with "drink from the tap", anytime 24 * 7, and piped waters even at fifth or sixth floors, watering the lawns, washing the car etc, all from public water supply. The hopping onto the band wagon from advanced countries is to be tempered. Perhaps the most candid admission of this is cautioned by the article jointly by the members of Indian Institute of Science, Bengaluru, India, Australian Rivers Institute, Griffith University, Brisbane, QLD, Australia, and Fenner School of Environment and Society, Australian National University, Canberra, ACT, Australia as "societal acceptability of digitalization depends majorly on the mode of implementation and not so much on the technology" (1). In simple terms, automatic recording meters with GSM capability are at the core of the digitization technology, but are of no relevance in the intermittent water supply as in most developing countries where the operating cost itself is unable to break-even with revenues and is subsidized as in India (2). Chennai is producing desalinated seawater at close to Rs 50 per kiloliter but the domestic tariff is only about Rs. 5 per kiloliter. Chennai also shut down its piped water supply for almost an year (3) and water was "rationed" to each house door by door for the 4.5 million population at 175 million liters at paltry 38 liters per person that too on alternate days. Written in this background, this article puts forth an approach as "part of the whole" limited to water volume inputs vs tariffs on a flat rate system for the domestic sector and metered system for bulk consumers instead of automatic recording meters with GSM "all over the place" and recognizing this alone is the sobriety to sustain the digitization and all other sectors like monsoons, droughts, floods need only "ad-hoc" redressal and not digitization.

1. The SWM and AWM

These two acronyms rough-ride the water digitization. Smart water metering (SWM) is a digitalization process to combine the outputs of an automatic water meter (AWM) data at a high frequency, at specified intervals like 15 minutes for example and aligned with a short-term data storage of a few months and transfer the data to a central server for storage, management, retrieval and if need be put through a Continual System Modulation Programme (CSMP). It is claimed as not only cutting down human labour and associated errors and instead provide data that can be used to understand variations in water demand even within a day and accordingly optimize water supply network systems and operations, finally resulting in reduced operation, maintenance and energy costs and conservation of water, but then, AWM is itself a high-end technology at a very high cost as compared to mechanical water meters plus the need for an automatic metering infrastructure to support the smart meters in terms of data transmission, and storage (1). Thus unless there is a fault-free AWM, the SWM is a mirage.

2. The AVM Vs the Flat Rate System

Installing the AVMs at domestic consumer ends is basically debatable. What is the purpose? It is stated to get info on the rate of water utilization through the day and night. However, at least in the Indian context, public water supply is not drawn through pumped system for uses like watering the lawns, washing the cars, skimming of the open walkways multiple times with detergents, rinsing, etc. The general pattern in Indian situation is water is drawn for "domestic" uses only and Sundays mark a higher drawal for the weekly washing machine duties. After all, the domestic consumer does not store water in huge receptacles but only in loft tanks and some HDPE

tanks that it is available when needed over 24 hours. The basic argument is a domestic consumer can draw only that much water he can use and this can fluctuate at best in summer and winter extremes. It is easy to promulgate a law mandating all consumers to be metered like in California, in the law AB2572; requiring all California cities to have water meters and usage-based billing by 2025 (4), but then as rightly observed in (1) it is the mode of implementation and not so much on the technology. Just imagine a whole city roads dug up (potholes are already there??!!) and installing meters which are liable for stealing smashing up and sold as scrap by jobless people and ultimately the whole situation ending up in massive opportunistic political debate. After all, there is a system already in place with all local bodies about what is called the "Property Tax" which is levied based on the locality, area of the property, the type of building, its nature of use etc and it is a simple case of superimposing the flat rate for water instead of the famous quotation of a philosopher who searches for a blind cat in a dark room where the cat if at all is in perpetual movement when it senses being caught. Anyway, linking the flat rate to the above approach can also be questioned as water consumption is based on the number of people in a dwelling and not the area of the building. The flat rate system has withstood the test of time in the Chennai Metropolis over decades of the onslaught by the proponents of metering all over the place and of late metering is being insisted for commercial establishments which is understandable. The greatest benefits of flat rate pricing are its simplicity and predictability. A flat rate pricing plan is easy to communicate and, therefore, is easy to sell. If the customer values simplicity or needs a straightforward solution for a straightforward problem, flat rate pricing might work well.(5).

1. Where and Why the AVM is justified

Given the fallacy of AVMs in domestic consumers as above especially in the intermittent system as in urban Indian cities, we need to acknowledge that these AVMs still do have a place. These are at the origin and at the bulk dispensation branches of a distribution system with the simple purpose of telling us how much water as put into the distribution system actually reaches the distribution loops and thereby it will reveal the losses. The Bengaluru habitation is reported as second of the eleven cities as Sao Paulo, Bengaluru, Beijing, Cairo, Jakarta, Moscow, Istanbul, Mexico, London, Tokyo and Miami to run out of water (6). The other lesser known habitations may also be heading to this. So much so, the craze of AVMs at domestic ends etc is just not that much relevant at this stage. What is crying for help is the identification of water losses and negating these. For instance, Bengaluru is stated to have succeeded in reducing their losses from a mind boggling 48 % to something like 41 % and the laudable effort is stated as continuing. Fact of the matter is India does not have an atlas of these water losses in at least its urban cities but the water digitization at domestic level has become the buzz-word.

2. The Chennai Case Study of Strategic Metering

Historically, it was the tree type system which forked out water lines and ending up as dead-ends. There have been various exotic computational models also in design aiding of these systems. The issue is this system has the maximum inbuilt risk of water loss as the accumulated dead-ends start corroding the pipe joints and these progresses. The higher the water pressures in the line, the higher the losses. The Chennai city also had the same problems, but has overcome the same, by completely changing the house service connections as a single flight of medium density polyethylene (MDPE) pipes from the distribution main in the road to inside of the property boundary and also the hydraulic floating ring main concept as in Fig.1 whereby water is in circulation and there are no dead-ends (7).

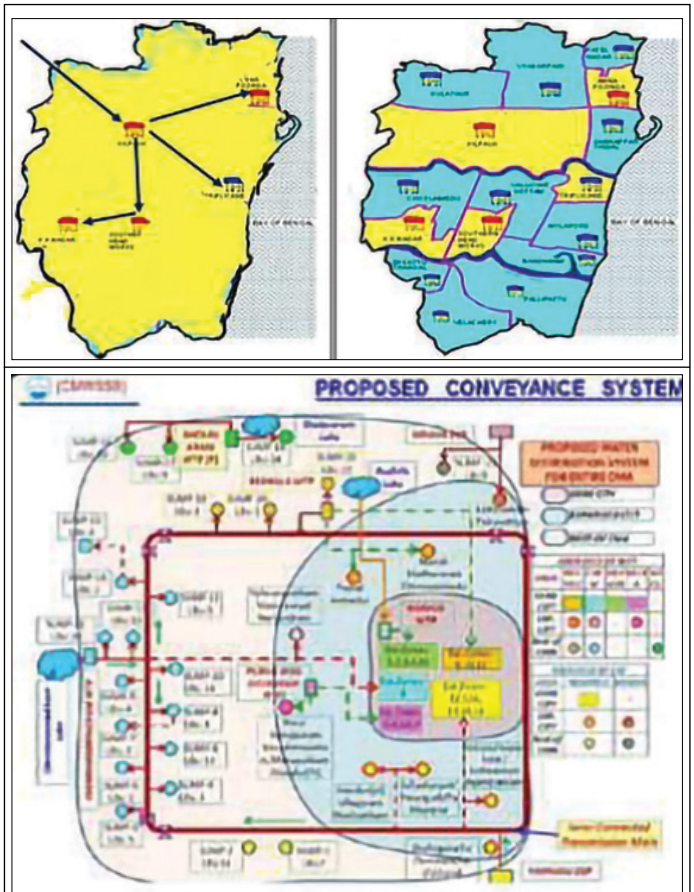


Fig.1. The historical British system was from a far away reservoir to city by gravity and lifted to a master and 4 other elevated service reservoirs by pumping (steam engines). The World Bank study in 1990's carved out 16 micro zones as and conceptualized pumped ring main as an idealized retrofit of the water distribution linking the old elevated service reservoirs with a "ring main" around the city and all internal sub-zones fed by the floating hydraulics and terminate in ground level reservoirs and pumped directly into the respective distribution systems.

The ring main is pressurized to feed the sub-distribution pipe loops and thus, referred to as the hydraulically floating ring main. When the water quantity that enters the ring main and the sum of water quantities that leave the ring main are compiled by AVMs, that would show the water losses if any in the floating ring main. The water losses in the sub-distribution 16 micro zones are the next issue and this is where the installation of AVMs in the consumer ends is being debated. In the system as depicted, it is otherwise addressed at how much water enters each of the micro zones and how much money is collected from each of such micro zones as a combination of flat rates in domestic users and AVMs linked levies in bulk consumers and commercial users. As an example, the income for the financial year 2017-2018 was

merely Rs. 5 million from unmetered connections to domestic consumers whereas it was Rs 32 million from metered commercial connections (8). And this reveals the futility in metering the domestic connections relatively. Moreover, It is public knowledge that political administration is always wary of approving of any interventions or upward levies of anything domestic and as such the flat rate system for domestic is here to stay. The entire picture looks differently from that perspective in many reasons and in a democracy, the technocrats dispensing advisories may have to be prepared for some of these readily accepted and many being put in cold storage and some outright relegated.

3. The Case of Madurai City Water Supply Augmentation

The water supply scheme for Madurai in Tamil Nadu at 125 MLD million liters daily (MLD) has 44 existing and 56 new zones with overhead tanks as in Fig. 2 (9) and its simplification is in Fig. 3

It needs to be recognized that the "clock is being put back" by resurrecting this dead-end tree type distribution system aimed at delivering a pre-determined quantity at each node in underground tanks and lifted to respective overhead tanks. The following logistics are impregnated in this "stillborn".

5.1 Desired apportionment of flows into each underground tank node is possible only by solenoid operated diaphragm valves at each branch and such valves are too sophisticated for inheriting in public water distribution and in public roads and the unfailing power supply to these fittings implies its own power backup system. Even otherwise, it is not uncommon for these diaphragms to get stuck in their pistons and this warrants the entire system to go astray even if one of the so many valves gets stuck like this.

5.2 The added challenge is the routine overhead tank pressure of about 5m above ground level which has to sail through past these 6 branches to reach the final terminus and given the fact that the minimum pipe size in public water mains is 110 mm, clearly, it will be a sluggish flow even at midpoint of the traverse itself which in turn will result in the stray suspended solids to gradually agglomerate in the pipeline and the desired flow hydraulics will go out of control.

5.3 The cost of even one of these solenoid valves runs into at least a couple of lakhs of Rupees and imagining about 60 such valves and fixtures prohibit their purchase in public water systems. The cost of at least about 20 % valves as store-standby increases the cost further.

5.4 Attending to repairs of such valves will require the technician who will take couple of days to arrive and the repair included disruption of water supply for those days and the designed rates of apportionments of flows go into a "sixer"

5.5 The argument usually put forth by public water utilities is that the valves are pre-throttled at each location and there is no need to adjust these on a day to day basis. This however gets truncated in a system like this if we try to model these settings in reality.

To sum up the above, there is the overriding and compounding factor when the public at the far ends and tail ends get aggrieved for want of adequate

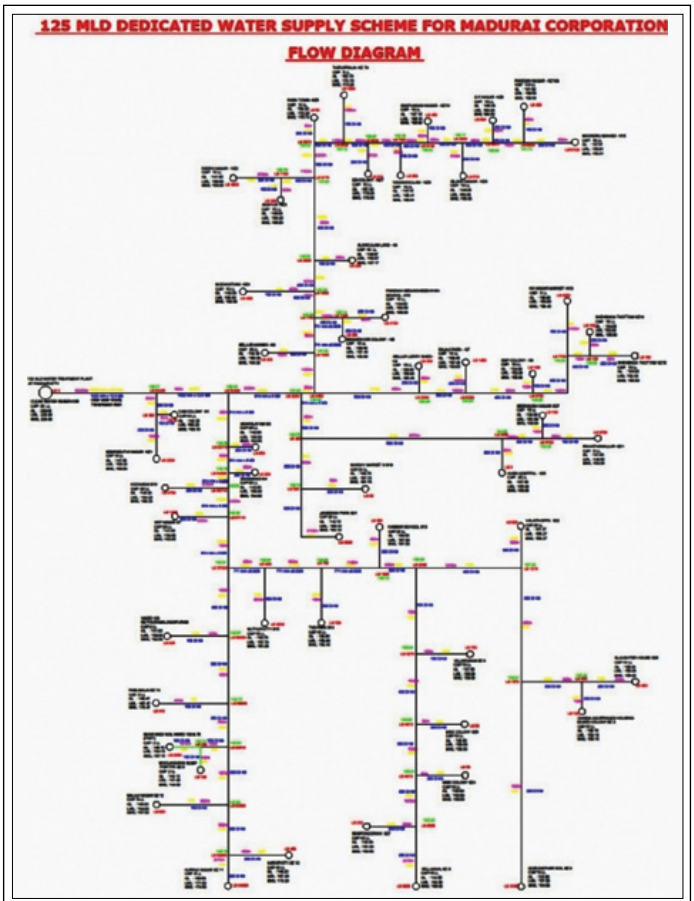


Fig. 2. Proposed Tree-Type Water Distribution Zones for Madurai Each with its Overhead Reservoirs

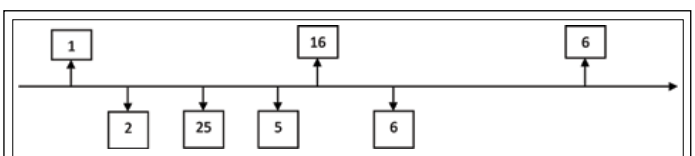


Fig. 3. Hydraulic Simplification of the Distribution Tree of Fig 2. The numbers are the delivery nodes

water and take matters under their control and open the valve settings on their own much more sometimes and local political bosses are also at a loss to control the situation from their own "vote bank" concerns. This, in turn precipitates local law & order situations. Consequently, the overall maintenance becomes pacification.

Thus, it will be perpetual day to day newer and newer problems in the operation and maintenance of the system. Clearly, the advances of modern control systems have not been taken note of.

4. From Here to Eternity or Water Security

Rudyard Kipling's 1892 poem "Gentlemen-Rankers", echoes the soldiers

of the empire who had "lost their way" and were damned "from here to eternity". That phrase has since become a synonym in literature. The consistent methodology of designs of water sector unit operations are presently suffering this wilderness and in blinkers to what has been done before as a safe bet and this explains the above said Madurai tree type distribution system that too on such a massive scale. In contrast there is also the water distribution system for the L&T Shipbuilding (LTSB) at Kattupalli off Chennai and project managed by the authors. Water from the Chennai Seawater Desalination plant is available at the location marked as 1 In Fig.9 in a ground lever reservoir for "flat pumping" and controlled by pressure transducer sensed pressure drop on drawal in factories / submarine repair yards. The layout is in Fig. 4

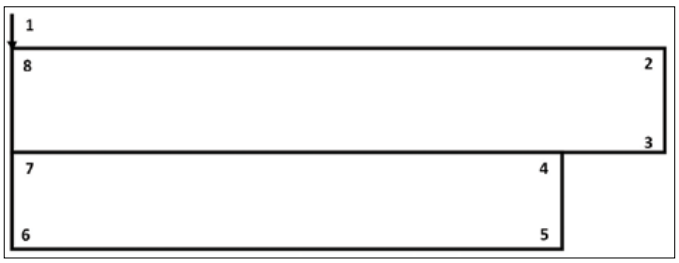


Fig. 4. The Mimic of the Layout of the Water Distribution Network cited

The water enters at 1 and loops in 1-2-3-4-5-6-7-8-1 based on drawal in 70 usage centers along the 4 km of pipes. The hydraulics was solved by assuming the stretch 1-7-4-3 as the hydraulically floating "spine" and sum total of all drawals at node 3 at residual of 14 m and pumped head of 32 m at the node 1 in a 150 mm HDPE pipe throughout. The system was evaluated for options in arterial-loop chosen for resilience. Pneumatic controls at node 1 boost the pressure as needed based on a pre-designed logic to have inputs of pressure as sensed by a Pressure to current (P I) converter and used to trigger a relay system of pump control. All drawals are concordant over the past decade. Another major factor of preference for this distribution system is the water quality as reflected in stagnating water in outflanked dead ends where the quality deteriorates and over a period of time may well becomes auto-toxic are all avoided. Actually, it does not require a time consuming and susceptible microbiological testing of water in the distribution lines for faecal coliform and the paradox of knowing of pollution after 72 hours of collection !!!. This is possible only in the arterial loop as prescribed and used in the client industry. Such a system can be easily inherited and incorporated in the Madurai distribution system for uniform and simultaneous water supply to all the nodes and eliminate chances of public interventions with the system. It is time to come free of blinkers in the practice of designs in public water undertakings that too wetted by institutions of the scale of Asian Development Bank.

1. Water Digitization is not mereby AWMs and SWMs.

The AWMs and SWMs are of miniscule importance if we can recognize the magnum-opus of digitization to govern, forewarn, forearm, imbibe artificial intelligence and bring in a totality of decision making.

A comprehensive depiction of Digitization as a decision support and fast-track system is in Fig. 5. (1)

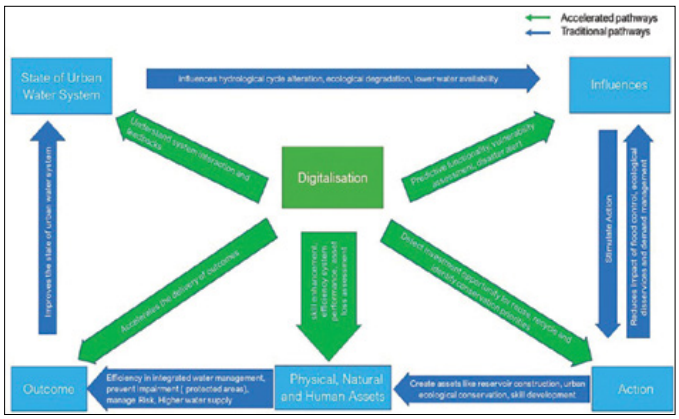


Fig. 5 The Accelerated Pathways Digitization to Water Sector Management as a Whole

For example, let us consider progressive increase in urban population which will progressively exhaust existing water resources and cause water scarcity. This will inspire action that can either be short-term or long-term. Digitalization can predict repeats functionalities, and assess vulnerability and provide accelerated pathways or accelerate the traditional pathways by investment opportunities and priorities.

2. The Myths in Digitization

Digitization as a panacea is a myth. Every water company has to decide where to act first, what to throw over board, what to keep, and how fast to adapt digitization as customized (10). These would be

8.1 The Water Sources Itself

Unless there is an assured year round water resource and a truly 24 * 7 supply, a blanket import of digitization modules from advanced countries may well end up in the proverbial "Seven Year Itch" only to discover in the eighth year the annulment thinking will arise, but, by that time, enough and more of the taxpayer money spent is gone.

8.2 The Hard Fact

A family in an urban India uses only that much quantity of water daily. Thus, there is no gain in installing meters in all domestic consumers and hence, the flat rate system is pertinent. The AWMs and SWMs do have a place in bulk commercial consumers and in the hydraulic floating ring main / spine distribution system.

8.3 Digitazation is not an Exclusive I T Domain

IT is only a part of digitalization as a computational procedure, but things will not work out without the IT conferencing with people who know what has been / can be done how and at what cost

8.4 Need to Keep on Reinventing the Governing Model

But adopting digital transformation is not a yes or no, black or white, all

or nothing decision. There are many facets between what has been done and reinventing the business model. Digitization will only check if it is still "future-proof" and if not, refresh it or scrap it at least now to reinvent anew.

8.5 The System-Human Interface

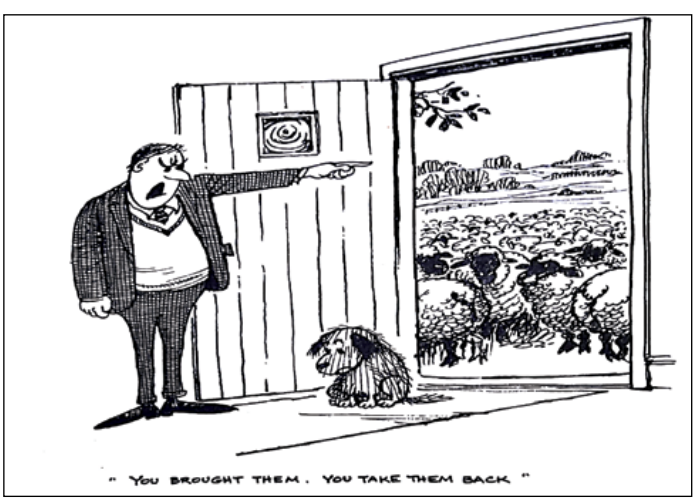
The place where a certain technology is used makes a big difference as at the end of a process, there will be a user interface. And if this is too complicated no one will use it.

8.6 The Entire Company Need Not go Digital

Water sector does not and need not get into sudden freights as "Now is the time to act!. Commercial savviness and slice down the digital transformation into palatable bits to not lose the employees is the key.

1. Fantacy may Become a Liability

A blanket import of the digitization technology fantasy with all over the place metering etc will be a burden in frequent droughts etc and a quandary of what to do with it and the consultant will also be helpless. This is best conveyed by the cartoon (11). The poor dog has harnessed all the sheep and barked them home. What can the ranch owner do?



2. Conclusion

Digitization is welcome but only in parts and as locally applicable in employee comfort and even then, is not a panacea. It requires intuition. The biggest weakness in the Indian context is the unwillingness of consumers to pay at break even and compounded by droughts, floods and climate change impacts which mimics "robbing Peter to pay Paul" as applicable to AWMs for bulk & commercials Vs flat rate for domestic.

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- Account details: Bank Name: IDFC First Bank, Golf Course Extension Road Branch
- Account Number: 10056535743, Swift Code: IDFBINBBMUM, IFSC/RTGS/NEFT Code: IDFB0040101, PAN No.: AAACE7028F, Account Type: Current

International Subscribers

Note:
- All payments to be made by T/T (Wire transfer) only, in favour of "**EARTH WATER FOUNDATION**"
- For T/T transfer, bank and account details:
- Bank Name: IDFC First Bank, Golf Course Extension Road Branch
- Account Number: 10056535743, Swift Code: IDFBINBBMUM, IFSC/RTGS/NEFT Code: IDFB0040101, PAN No.: AAACE7028F, Account Type: Current

Date_____ Signature_____

Mail to: Earth Water Foundation, A-1/152, Neb Sarai, IGNOU Road, New Delhi 110 068, India,
Call: 91- 85958 45490, Email: subscription@eawater.com, Web: www.eawater.com/in

DIGITALIZATION IN WATER SECTOR

By Dr. Anil Kumar Mishra, (Bacteriologist), Delhi Jal Board, Govt. of NCT Delhi



Water is an essential and vital component of life and required for performing different type of metabolic activities in all type of living organisms (microorganisms to higher plants and animals). In present scenario, water scarcity and contamination (physical, chemical and microbiological contaminants) are major problem in India and worldwide and required to sustainably use it, so that our future generations may get sufficient quantity of potable and wholesome drinking water as per theirs requirement. People are using grounds as well as surface water resources for drinking, irrigation, industrial and other purposes. However, due to rapid growth of population, urbanization, industrialization and agriculture activities, water resources are under stress. Hence, sustainable water management system may be adopted in a holistic way which should be based on various principles related to Integrated Water Resource Management and other such type of technologies/approaches. The main approaches of Integrated water management should be as underneath:-

1. Fresh water is a finite and vulnerable resource which is essential to sustain life, development and environment.

2. Water related resource development and management should be based on participatory way means all the stakeholders like users and policy-makers work together at all the levels of management.

3. Women may play pivotal role in management, safeguarding and other approaches related to water management.

Water is a central hub for all type of economies (agriculture, industries etc.) and other activities. Without water, we cannot get anything like food, oxygen, shelter etc. It is also playing important role in climate change / maintaining environment. In the view of above facts, various agencies like Government, NGOs, regulatory organizations, public and other stakeholder making their best efforts to manage it in useful manners, so that sufficient quantity of good quality of water may be available for everyone like plants, animals and other users like industrialist etc. For better management of water and its sources, following steps may be adopted by all the stakeholders:-

1. Improve data related to water sources and its qualities by various ways like water auditing and digitalization of all the activities/ resources related to water treatment, quality monitoring and its distribution till consumers houses.

2. Adopt the principle of Treasure the environment by various means like sustainable and judicially using of water and other environmental resources for various purposes.

3. Reform water governance by adopting various policies related to sustainably use of water for various purposes, its management, reuse and proper disposal.

4. Adopt revitalization system for agricultural water used by various means like applying advanced and sophisticated technologies for irrigation of crops, reuse of agricultural waste water and other related aspects.

5. For properly management of urban and industrial water supply and demand, digitalization of water meters and other systems from water treatment plant/ used water treatment plant till consumers houses / industries or by using other suitable IoT (Internet of things) based technologies for real time monitoring of quality and quantity of water in each and every steps. By adopting district metered area (DMA) system (means divide the particular areas into small sectors) for proper supply and maintenance of water in particular area with sufficient pressure and this may confirm by installing water meters and other digitalized technologies in inlet and outlet point of DMA areas.

Digitalization of Water means adopting a smarter approaches, required for better management of water resources and other related activities. Digital technologies having unlimited potential to transform the world's water systems and helping utility organizations to become more innovative, and efficient and empowering them to adopt more economically viable strategies required for better management of water from WTPs till consumer houses. Digital Control means using IoT supporting data-driven models that can help integrate and optimize smart pumps, valves, sensors, quality parameters related equipments etc. and we can get all the real time information's in smart phones that can be accessed and shared in various networks and further utility organizations may analyze, automate, correct in real time, predict and minimize risks by adopting digital infrastructure. These will equip them to address many of the current challenges they face, including extending the life of old equipments and pipelines, reducing leakages, chemical and biological attacks, natural calamities or other abnormalities in the distribution network. Some other important benefits of digitization of water network are as underneath:-

A. Smart water metering & remote sensing technologies are important for monitoring of the water and sanitation network, equipment management, control of water losses, and water quality for human consumption in remote areas.

B. Digital solutions such as network of sensors, artificial intelligent equipments (quality and process control related), real-time monitoring of data and its analysis and advanced simulation tools enable the utilities to be better prepared to theirs changing environment due to any natural or manmade calamities.

C. Digital solutions such as Advanced Metering Infrastructure (AMI) and advanced data analytics of the metering network help to increase meter accuracy, maximize billing potential and provide an opportunity to the utility organization to add more quality and value-added services within their business models.

D. Tackling a large number of complaints regarding low pressure, odd time and low water supply are concerns that are likely to rise during calamities (natural, manmade pandemic etc.)

For, attainment of goals of sustainably use of water, proper management of Water resource (activity of planning, developing, distributing and managing the optimum use of water resources) by Digitalization of all the process control, management and quality monitoring system are utmost important step, because by using different type of IoT based technologies, we can properly manage and control the wastage of water in each and every step and this saved water may be utilized for other purposes. Digitization has playing pivotal role in management of water resources at infrastructure and services level. The rising issues related to water scarcity, increasing costs, and economic conditions have compelled us to search for cost-effective solutions which are independent of continuous manual supervision. Digitalization is the necessity of the hour and has the power to help the water and wastewater industry to resolve a lot of its challenges. Key application areas include extending the life of aging assets, reducing leakages, attacks, or other abnormalities in the distribution network, improving water quality monitoring, service levels and reliability of supply, promoting water conservation, increasing revenue through operational efficiencies. Although India's and worldwide digital journey of water is gaining momentum, we would need more constructive efforts and collaborations within water industry stakeholders to accelerate this transformation, mitigate water crisis on the ground level and create a more sustainable environment for the present and future generations.

About the Author

Dr. Anil Kumar Mishra is presently working as Bacteriologist in Delhi Jal Board, Govt. of NCT Delhi, since August 2007. He has qualified CSIR-UGC (NET) June 2002 for Lecturer-ship and ICAR (NET) 2004 and 2006 for Lecturer-ship. He also qualified UNERA fellowship of Australia government for advance studies in January and June 2006. He secured IInd level prize in senior level comprehension certificate test on Right to Information Act-2005 in the year 2011 conducted by Govt. of NCT Delhi.

He is the recipient of Best Employee Award for the year 2019-2020 for Delhi Jal Board by Chief Minister of Delhi.

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DIGITALIZATION IN WATER SECTOR: AN OVERVIEW

By Alok Kumar Bhadra, Head Digital & Special Projects (Middle East, Africa & India), Ecolab - Nalco Water



Digital technologies are rapidly evolving in the field of Industrial Water management. Data driven insights and predictive analytics add significant value for users by improving operational performance of production lines and utility assets, whilst positively impacting sustainability goals & objectives.

Digitalization –> Higher Visibility –> Speed to Action –> Reduced cost of operation

Digital Tools & Platforms used in water sector help in processing related data from multiple sources to provide "holistic" / "one canvass" view of a single site or multiple sites, helping to track, benchmark performance and highlight risks … all of which result in "speed to action." This in turn impacts "Total cost of Operation" & profitability of the plant and enterprise overall.

To set the context, let us recap a few statistics from industrial water management space

- Over 50% of the industry takes 7 days or longer to respond to critical issues
- Out of spec occurrences average at least once every 4.5 days
- 36% of utility assets have no online visibility
- Only 8% have Enterprise level Visibility

Just to elucidate the point further, a blowdown valve leakage of 1m^3/hr if noticed & acted in 8 hrs time (vs 7 days) can potentially save 160 m^3 water loss; & if there are 2 such occurrence per week per plant, this will result a savings of 16,640 m^3/yr ~ 16,640$/yr per plant (assuming water cost to be 1$/$m^3$)…. The loss / savings can be further extrapolated by multiplying the figure with the no of operating plants in Industrial space where water is either moved, heated, cooled, or treated as part of operational requirement of production / utility lines.

Similar conclusion was derived from studies done in the context of North America industrial water space which highlighted the following:

"Industry does not have the insight to act quickly to these dynamic changes & complexity (in water side KPIs), resulting in ~ 220B$ overspending in North America alone"

Today, the water sector is rapidly deploying IOT enabled sensors, connected chemistries, capable platforms to close the "Action Loop" faster and harness the power of Digital in managing water intelligently & real time. An example of such Digital technology could be Ecolab 3D - a cloud based secure platform hosting "Water Quality & Finance Impact" module, commercialized by Ms Ecolab & used across several Industry segments.

Digitization –> Descriptive insights to Predictive Outcomes –> Profitability

Digitization is revolutionizing how we connect with users, ingest their real-time process and water data, and deploy intelligent algorithm & Mixed Reality tools that deliver optimal performance results that maximize profitability

Industry leaders in water space are building Digital architecture on secure Industrial cloud platforms to leverage the combinational experience of "onsite" & "online" services along with "connected" chemistry & "intelligent" dispensing technology that can be remotely monitored & controlled real time.

Besides the speed of digital adoption, the other progressive trend has been the shift from "descriptive" interpretation & "reactive"

response for the water side critical parameters towards more "predictive" outcomes & "proactive" intervention for unit operations and process performance that are impacted by water. This has been possible by leveraging the power of Advanced Data Science, Machine learning, Artificial Intelligence & Digital Twins etc. .

Here are some tested and proven examples to illustrate the above:

- Developing a dynamic water balance map for an Automotive Plant with algorithm to predict potential optimization opportunities & track the response time & outcome in managing the leaks to achieve specific water consumption mandate of xxx (m3water usage/car produced)

- Interpreting Power Plant water cooled Condenser Performance & predicting opportunities to optimize operation through mechanical / operational changes & not just be limited to water treatment chemistry adjustment (as in the past), thereby impacting plant economics ($/MW power produced)

- Tracking Cleaning in Place (CIP) compliance in a Dairy plant & predicting food safety risk due to "machine drift" during cleaning process, along with water & energy savings opportunities that are not feasible to be monitored manually

- Predicting potential Legionella outbreak in a hotel cooling system through algorithm connecting past history & current weather data with system microbiological counts & water system operating parameters… triggering proactive interventions to protect the health & well being of the guests & staff + brand protection for hotel chain

Furthermore, another rapidly evolving trend is the use of Mixed Reality tools (e.g., HoloLens, Real Wear) to overcome logistics resulting from geopolitical challenges or otherwise where in subject matter experts would not need to physically travel to sites but could connect remotely (using Mixed Reality Tool) and provide visual guidance during site inspection & trouble shooting. The adoption of mixed reality tools can significantly impact productivity, speed of response & cost of operation. Needless to say, Covid has fast forwarded adoption of such digital tools in Industrial water space & more of this to come in the near future.

Digitization –> Corporate Sustainability Goals –> Smart Water Management –> Net Zero

Industry at large is fast adapting to new Business Paradigm, moving away from just "Growth & Profit" to "One Platform" for Business & Sustainability Mission, and in this journey Digitization is fast evolving as a key enabler... especially in the water & energy space.

In other words, sustainability projects come with a price tag. Here is where smart use of digital technology (examples mentioned previously) help reduce the total cost of operation & bring resiliency to sustain implementation of projects for net zero journey and yet stay profitable

The other key driver is the fact that the world today is facing unprecedented challenges in sourcing water. World Resource Institute (WRI) projects a 56% shortfall in freshwater by 2030 if nothing changes .There are Digital modelling techniques that can play a key role in increasing resilience for the industry to water & climate related issues. "Smart Water navigator" (**www.smartwaternavigator.com**) is one such modelling tool that can provide risk adjusted future cost of water in a given geography, set sustainable water withdrawal targets to manage water risk, take actions to meet water reduction targets with Industry guides and track performance over time for adjustments as needed.

Conclusion

Digitization is bringing a transformational change in how Industry manages quality & quantity of water "smartly" and also in tracking the impact of "smart water management" on asset life & production line efficiency / productivity / operating costs with clear quantifiable metric

Digital innovations will progressively be used in combinational and convergence mode (IOT enabled sensors & dispensers, Industrial Cloud Platform, Connected Chemistry, Data Analytics, Machine learning, Artificial Intelligence, Digital Twins, Mixed Reality tools etc.) to provide the enduser in water sector with "intelligent experience" through higher visibility, benchmarking, risk assessment, predictive / prescriptive recommendations for faster decision making and outcome measurement vs objectives

As corporates bridge their Business and Sustainability goals into one, Digital innovations will play a key role in managing the water-energy nexus at lower overall cost of operations. At the same time, corporates will be using digital models to assess and quantify water-related risks in financial terms & plan for initiatives to achieve sustainability and net Zero ambition for greater good.

About the Author

Alok Kumar Bhadra has over 32 years of international experience with Ecolab - Nalco Water in Business Leadership & General Management, across India, Asia Pacific, Middle East & Africa Region. Presently, he is the Head of Digital & Special Projects - Ecolab (Middle East, Africa & India) for Industrial, Institutional & Specialty, Healthcare & Life Science Division & operates out of Dubai, United Arab Emirates.

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DIGITAL CONTROL FOR CITY WATER SUPPLY SCHEME IS A NEED!

By Dilip Yewalekar and Manisha Kinge, Jain Irrigation Systems Ltd., Jalgaon India





Introduction

In June 2017, Hon Prime Minister formally launched 'Digital India' a dream program touse Digital Technology for transparent administration, operation, monitoring, and management in all sectors from financial to water supply by the involvement of a pool of intelligence, knowledge, and information at one platform to render the services to end-users, as well as a service provider for achieving need base, targetedaccurate results without creating hindrance.

What is digital?

Digital describes electronic technology that generates, stores, and processes data in terms of two states: positive and non-positive. Positive is expressed or represented by the number 1 and non-positive by the number 0. Thus, data transmitted or stored with digital technology is expressed as a string of 0's and 1's. Each of these state digits is referred to as a bit.

Prior to digital technology, electronic transmission was limited to analog technology, which conveys data as electronic signals of varying frequency or amplitude that are added to carrier waves of a given frequency. Broadcast and phone transmission have conventionally used analog technology.

Communication with digital technology

Digital technology is primarily used with new physical communications media, such as satellite and fiber transmission. A modem is used to convert the digital information in your computer to analog signals for your phone line and to convert analog phone signals to digital information for your computer.

Configuration of Water Supply System

Water Supply System comprises of following components (Fig 1. Configuration of Digital Water Supply System).

- Water Source (River / Lake / Dam).
- Intake Structure (Intake Gallery, Intake Pipe, PumpSet).
- Aeration.
- Coagulant Plant.
- Sedimentation Plant.
- Filtration Unit.
- Disinfectant Plant.
- Finished Water Storage.
- Elevated Storage Tank (ESR).
- Water Distribution System.
- Digital Control - Automation (IoT Based) - SCADA System.

Philosophy of Digital Control (IoT)

Philosophy of Digital (IoT) Based Automation system is based on backward integration of governing parameters like Per capita Demand, Fire demand, Green zone demand, and its judicial use along with price, viability, and assessment of risk. The prime objective of Digital Control (IoT) is to optimize hassle-free operation, monitoring, management, Billing, Revenue Collections, and on-time service.

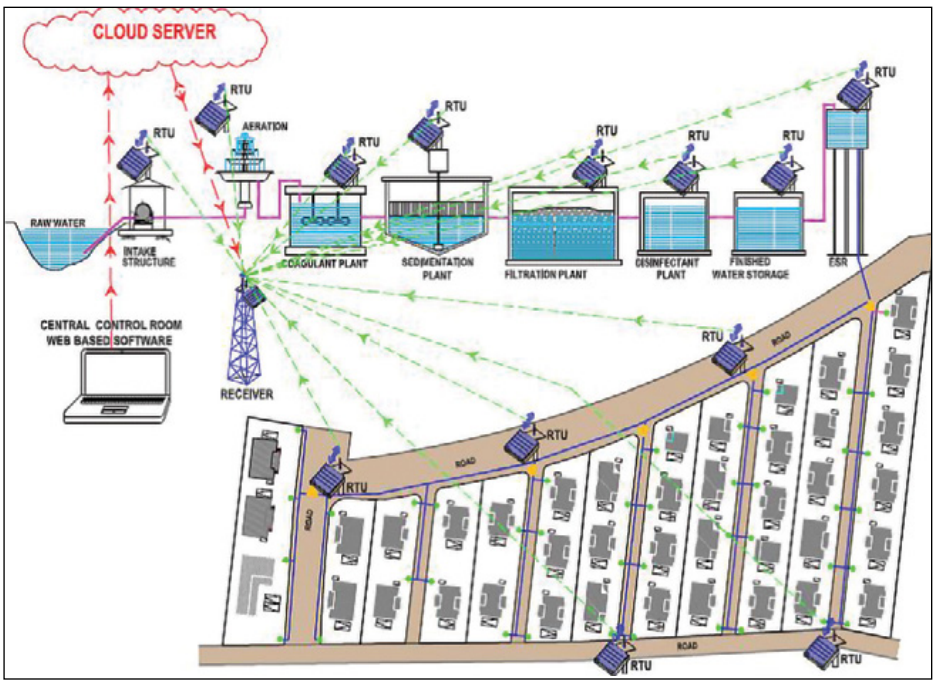


Fig 1: Configuration of Digital Water Supply System.

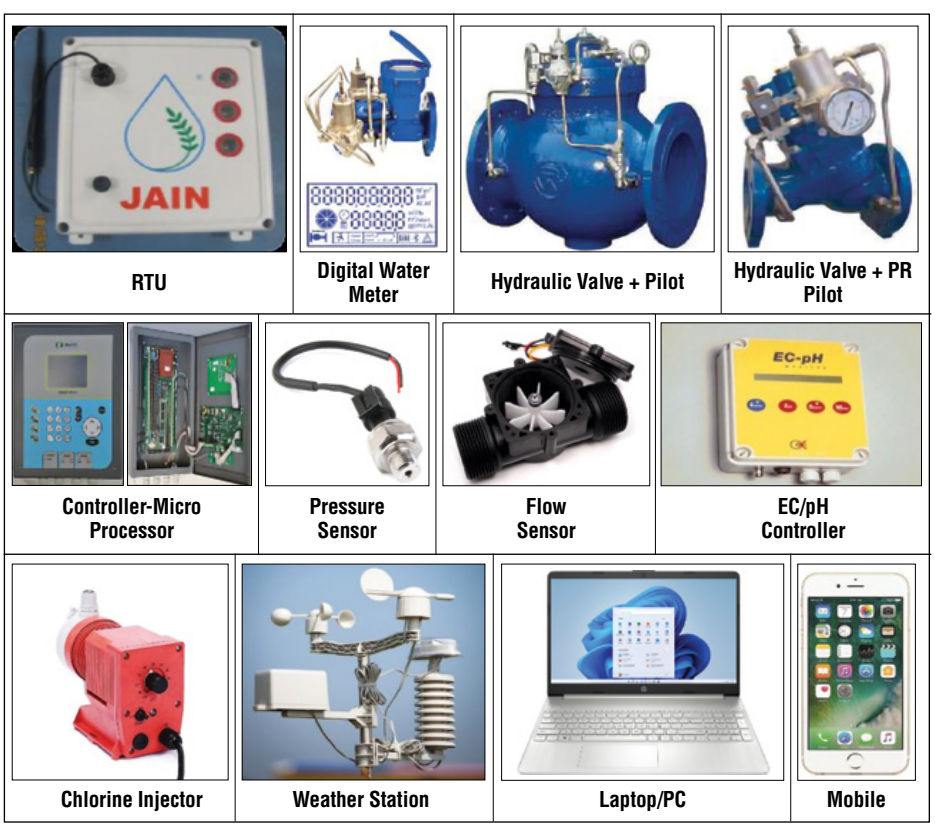


Fig 2: Hardware components used under Digital Control System

Digital automation is comprised of Radio Frequency (RF), Microprocessors, Flow Sensors, Pressure Sensors, Water Level Sensors, EC/ pH Control, Water Quality Sensors, Injectors, Electronic Water Meter, Controller, Internet/ cellphone connectivity, Laptop / PC, Software for interpreting the information and makethe decision to execute the command of various activities in order to provide feedback to users via SMS / What'sapp / Email in a fraction of time.

Various options and combinations of control & operations of input-output are possible on a need basis. Considering the benefits, adaptability, and instant feedback & action facility, the Digital Automation system has great potentials large-scale water supply system for a city in the world and is successfully implemented in India and abroad at many Municipalities under AMRUT Scheme.

AMRUT Scheme.

Atal Mission for Rejuvenation and Urban Transformation (AMRUT) was launched in June 2015 by PM under the Government of India. The AMRUT scheme is an initiative to provide basic civic amenities to the urban areas to improve the quality of life with major focus to the poor and the disadvantaged. It is the first focused national water Mission, which was launched in 500 cities and covered 60% of the urban population.

The AMRUT Scheme focuses on establishing an infrastructure for ensuring adequate sewage networks and water supply in the urban areas through the implementation of the urban revival projects. The main objectives of the **Atal Mission for Rejuvenation and Urban Transformation (AMRUT)** are mentioned below:

- To ensure a proper supply of water and a sewage connection in every household.
- To develop green and well-maintained open spaces and parks to increase the amenity value of the cities.
- To reduce pollution by switching to public transport or through the construction of non-motorized transport facilities such as walking and cycling.
- Atal Mission for Rejuvenation and Urban Transformation (AMRUT) aims in covering around 500 cities that are having a population of over one lakh with notified municipalities.

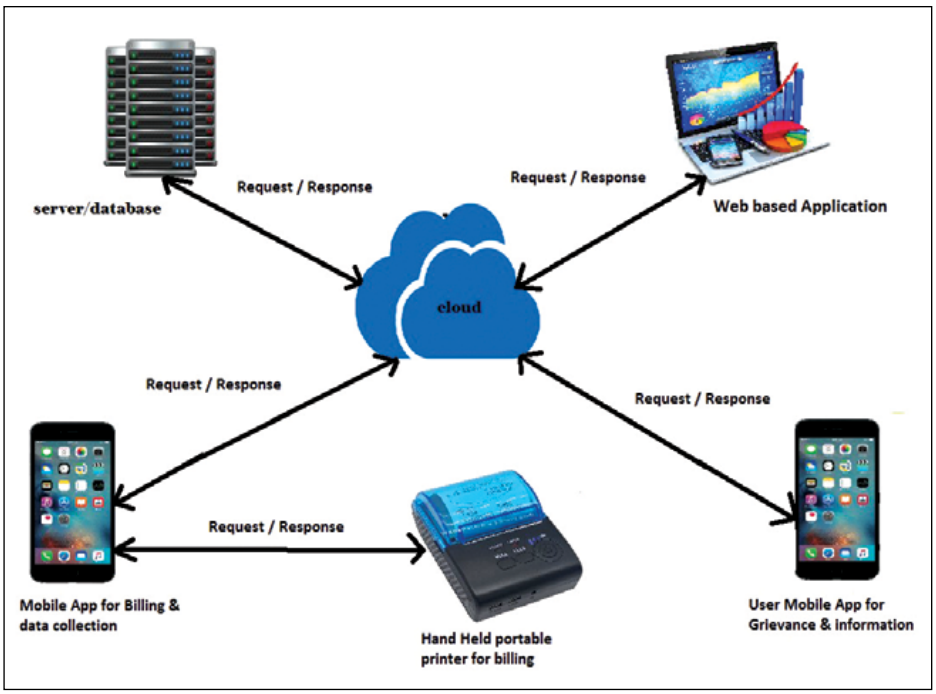


Fig 3: Networking

- Digital control of water supply Scheme.

Components of Digital Control

Digital Control System incorporated with hardware and software components for communication of various data from source to end users within a fraction of time very preciously and honestly. The entire data of the project is stored in cloud-based storage and retrieved at any time.

a. Hardware. (Fig 2. Hardware components used in Digital Control System.)

- Mobile (Android)
- Laptop/PC.
- Digital Water meter.
- RTU (Radio Terminal Unit)
- Controller–microprocessor-based.
- Pressure Sensors.
- FlowSensors.
- Water level sensors
- EC(Electricalconductivity) &pHSensors&Monitor.
- Chlorine / Ozone Injector
- Hydraulic valves + pressure pilot + Solenoid
- Weather Station

b. Software (Fig 3. Networking)

- Operation & Billing software program.
- Internet network (GSM).
- Cloud Server-Storage

Jain Irrigation Systems Ltd has played a significant role in developing/implementing Digital Control in water supply scheme for City water supply Scheme. In this system, communication among the various equipment/ devices is established via electronic media - email orinternet, to view the status at glance and accordingly ease to takethe decision to optimize utilization of facilities in the right directions- control of timing, uniform distribution of water, water quality control, billing & revenue collections.

The level Digital Control can best be understood and defined by subdividing automation into six stages.

1. Regulating Devices (Control valves, Pressure Regulating valves, Solenoids).
2. Measuring Devices (Watermeter, flowmeters).
3. Sensors (EC/Ph sensors, Pressure Sensors, Flow Sensors, Water level sensors).
4. AuxiliaryDevices(weather station).
5. Interpreters/Transmitters/Communicators/ Receiver(RTU,modem,Controllers)
6. Display, Monitor & Admin + Software(Laptop, mobile, App).

A command is the name given to the mechanism (work to be done) through which a change instatus is achieved in field remotely or as per pre-program (egg. On/off command). Commands canbe conveyed through a number of media via Wi-Fi & radio frequency to receptor controller andthen finally executed through hydraulically or electrically to get specific result or output. After successful work done acknowledgement message is sent to end users to complete the cycle withpreference, predictions, warnings, next turn of work etc.

Following task can be monitored in **Digital Automation System**:

- Water Supply by Pre-paid /Post-paid meter to end-users.
- Leak detections in the system.
- Pressure check and regulation.
- Water quality check and control entrances - exist for a cluster network.
- Chemical treatment such as Chlorine / Ozone to cluster network/zone
- Operation of hydraulic valves based on sensors or flow meter or water meter.
- Alarming/ warning in case of fault and manual overriding.
- Quantification of water used/demand.
- Trouble shooting in the operation of the system.
- Assessment of risk factors and remedies.
- Record of water volume and accurate billing.
- Optimizing water price to end-user.
- Water conservation.
- Power conservation.
- Assessment of risk factors and mitigation.
- Storage of all data in hard disc and
- Monitoring/ Accounting: cost - economics.
- Optimization of the entire process and future planning.

Advantages

1. Water conservations

Water can be conserved both by increasing the technical (network) efficiency in thesystemby introducing leak & fault detections devices,

water allocation errors and exploitation of optimum irrigation by interpreting soil moisture, weather data and crop water demand.

2. Effective utility of multi water source
Many Water Supply Schemes have more than one water sources located at various distances. Integration ofvarious water sources can be done effectively to minimize the expenses of power and waterlosses.

3. Water Quality Control
Greater efficient dosing of chlorine.

4. Energy or Fuel Conservation
Electrical motor pump sets / Diesel Generator sets can be integrated with Demand-Supply ratio and operation of entire water supply process can be optimized as per need base and thereby consumption of electrical power or fuel cost be optimized.

5. Administration cost savings
The abolishment of the need to physically switch on each and every water clock, to manually record each and every flow meter are the main factors that help to reduce the administration costs as well as pinpoint fault location.

6. Convenience - The Human factor
It is really impossible to evaluate, quantify and cost & benefits of this factor. In many instance, in addition to wishing to improve the human efficiency, reasons quoted are 'self-esteem', Saved persons hours may be quantified but it is harder to evaluate the effect of convenience factor.

DISADVANTAGES

1. Investment
It requires a substantial amounts of additional and peripherals equipment and investment. A fault in these equipment and computer itself can interrupt entire project.

2. Maintenance cost
Maintenance costs of all electronic devices are high and have to be replaced if damaged by labour or animals. Electronic devices are not available in the local market and need to be sourced from same company.

3. Knowledge of software
A person should know basis knowledge of email / internet, computer and basic software to understand the program.

4. Email / Internet / Radio frequency government policy
It is subject to government policy of free radio frequency, email / internet & mobile connections.

About the Author

Dilip Yewalekar is the Senior Vice President of Jain Irrigation Systems Ltd. He has over 36 years of experience. He has done M.Tech - Civil - Structural Engg, PG Diploma in Piping Engg, AMIE,UK, ASAE, USA. He is a Google scholar, Member of ICID.

He also has Fellowship of World Bank and Mashav, Israel and is a Faculty at Govt College of Engg, Jalgaon. He is also a faculty at Micro Irrigation Course of ICID & CWC, Govt of India. He has been awarded the EEF Global Water Leadership Award - Global Water foundations. Strategic Leader in Micro Irrigation - ABSA Award, Professional Excellence Individual Award - Aqua foundations and Best Innovative Article in Sabujeema International Magazine. He has 70+ papers/publications at national/international conference/magazines/books to his name.

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NOTE ON IOT BASED SMART WATER MEASUREMENT & MONITORING SYSTEM FOR JAL JEEVAN MISSION

By Susanta Ghosh, Chief Manager, Project Management and Pranab Das, Head Business Development, Swach Environment Pvt. Ltd.





Water is a critical resource that lies at the heart of social and economic growth. Water is essential for survival, and its absence can impact the health, food security, and livelihoods of families across the world. India's water resources are under immense pressure due to declining per capita water availability, lack of storage capacity, and spatial and temporal variation. The pressure stated above is due to a plethora of reasons ranging from anthropocentric to climate-induced reasons. In recent years, decreasing per capita average annual water availability in the country has become a cause for concern, especially since India has already been categorised as a 'water-stressed', as per the United Nations classification. Also, the issue of water contamination is also rapidly increasing due to large-scale, unplanned urbanization and untreated effluents emitted by industries.

With the growing population and expanding economic activities, there is an increase in demand for water in various sectors, while the source of water remains finite. The widening demand-supply gap is further compounded by other challenges like depletion of groundwater caused by over-extraction, poor recharge, low storage capacity, erratic rainfall due to climate change, presence of contaminants, poor Operation and Maintenance (O&M) of water supply systems, etc. Thus, finite availability and competing demands make water management a complex issue. In such a scenario, it is imperative to conserve water and also improve water use efficiency across sectors.

Why we need smart water distribution and governance?

With the advent of the digital era, governance systems for utilities too have continuously adopted to newer and more advanced technologies in order to upgrade old systems while also transitioning to a more data-centric understanding of the sector. In 2018, when Cape Town developing an improved water database requires investments in various technologies ranging from flow measurement to installation of meters and digital water level recorders at a small-scale, to Supervisory Control and Data Acquisition (SCADA) system to use satellite data on a much larger-scale. Globally, utilities are accelerating the adoption of technologies such as remote sensing (e.g., sensors, satellite, and drone), asset management (e.g., inventory of assets and maintenance), customer engagement (e.g., water use and service), predictive analytics (e.g., asset failure prediction), artificial intelligence (e.g., asset management), augmented reality and virtual reality (e.g., water utility maintenance and training) and cybersecurity (e.g., access to customer information and service disruption) among others. These technologies, apart from providing crucial data, also solve many other problems faced by water utilities.

The recently announced Jal Jeevan Mission (JJM), which aims at providing Functional Household Tap Connection (FHTC) to every rural household by 2024, is a crucial policy decision that could potentially welcome smart water governance is new systems. The programme focuses on service delivery at the household level on a regular basis in adequate quantity and of prescribed quality. This necessitates use of modern technology in planning and implementation of water supply schemes, development

of water sources, treatment and supply of water, empowerment of Gram Panchayat / local community, focus on service delivery, partner with other stakeholders, convergence with other programmes, methodical monitoring of the programme and to capture service delivery data automatically for ensuring the quality of services. Therefore, in addition to enabling urban water utilities to manage water better, it is important for India to also superimpose the conversation around smart water governance for rural areas as well.

Smart Water Management System

Smart water management system is a computer system designed to support the water resources management function of department of water affairs and forestry (DWAF)

SWM system consist three sub - systems:-

- IOT based Management and Monitoring - MM is used for to manage resource quality operational monitoring on a national / State basis an effective and efficient manner.
- Water resource management (WRM) - is used to achieve the sustainable use of water and the protection of the quality of the water resources.
- Geographic Information System (GIS) - is used to geographically display water resource information in order to assist in interpreting and determining the quality and status of the water resources.

Why We need Smart Water Management System:-

- Agriculture, domestic and industrial sectors impacted by increasing demand and limited supply.
- Infrastructure is aging and failing.
- Climate change is forcing drought mitigation measures and flood management strategies.
- Fragmented water management domains and conflicting interests of stakeholders.
- Worldwide energy needs drive water needs, and vice versa.
- Regulatory frameworks force decisions.

Water Information Management Platform:-

- IOT based Intelligence networks applicable to Enterprise Water Management, Water Infrastructure Management, Water Resource Management scales.
- Provides IOT based sensing of physical environments.
- Provides water quality, quantity, integration, storage, analysis, modelling, and a management dashboard on a local or regional basis.
- Provides records management and reporting capabilities for regulatory and compliance requirements.
- Provides energy usage information to pinpoint energy efficiency opportunities related to water.
- Provides advanced asset management and advanced meter management capabilities.
- Provide intelligence to proactively manage risk related to extreme weather events.

Components under IoT based Smart Water Measurement & Monitoring System

The following components are under IoT based Smart Water Measurement & Monitoring System for Jal Jeevan Mission:

1. Bulk Flow meter
2. Chlorine Sensor
3. Ground water level Sensor
4. Flow meters at nodes / DMA inlet or habitations (or DMAs)
5. Pressure sensor at the farthest end / highest level of the network (0.2 Bar to 0.7 Bar)
6. Pump Controller unit
7. Consumer Flow meter (optional in future implementation)

Design, Implementation & Maintenance of Centralized IoT Platform at State level

Software application at State level

- Centralized IoT Platform (Data server and applications) will directly ingest IoT data coming from villages across States, and provide front-end application for all users across States.
- State authorities will have access to standard dashboards, GIS views, decision support system, alerts, vendor SLA management dashboards, analytics and access to all data on the Centralised IoT Platform.
- Specific dashboards and decision support systems will be available tailored to the needs of different levels of governance - village / GP level, block / division / sub-division level, district level and at a State level.
- States must send data to centralized IoT platform and leverage the pre-existing dashboards with multiple views for different stakeholders to save costs such as cloud/ server, storage, application development, and maintenance; and utility the free access to dashboards from central dashboard.
- States can further use this data through APIs / integration to develop additional custom applications on top for further innovation and meet specific needs.

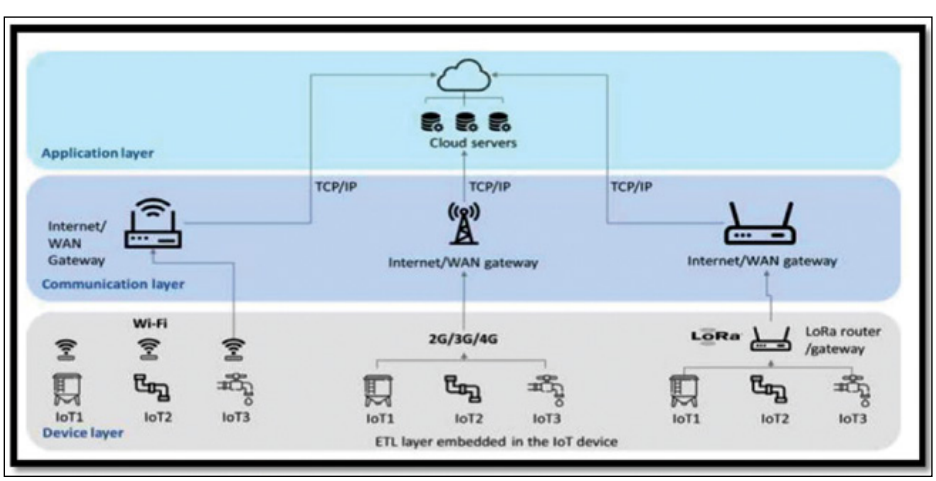


Fig 2: Sketch indicating Networking Technologies for Data Transmission

About the Author

Susanta Ghosh is the Chief Manager, Project Management at SWACH ENVIRONMENT PVT.LTD. He has over 27 years of experience in Project, Contract & Procurement Management, Execution, Cash Flow, Business plan, Cost Analysis, Techno Commercial Evaluation, Project Risks and Mitigation, Business Development, Communication etc. He Works in Project Monitoring Department of the Company, currently working as member of Project Management Monitoring Unit at Nangloi Water Project

Has previously worked with BGR Energy System Ltd,Doshion Water Solution Pvt Ltd, Steel Plantech Engineering Company, Ion Exchange Infrastructure India Ltd, United Conveyor Corporation (India) Pvt Ltd, DC Industrial Plant Services Pvt Ltd. He has diploma in Mechanical Engineering from West Bengal.

Pranab Das is Business Development Head at SWACH ENVIRONMENT PVT.LTD. He has over 20 years of experience of successful engagement in Project Management as well as in Business Development in various technological sectors as well as EPC companies in the field of water and wastewater infrastructure projects.

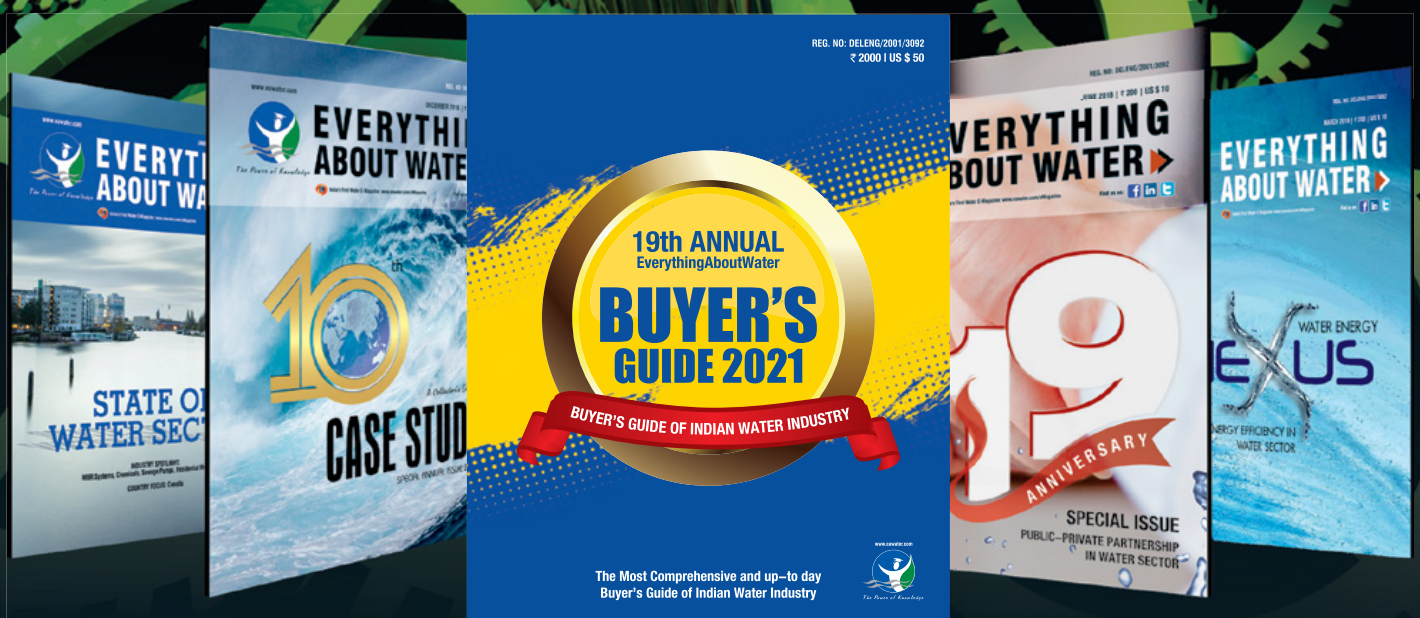
He is currently heading business development initiatives with focus on projects under various missions - Jal Jeevan Mission, National Mission for Clean Ganga, Atal Mission for Rejuvenation and Urban Transformation and Swach Bharat Mission. He has previously worked with S::canGmbH, Fives Group, Ion Exchange Infrastructure Limited, Balmer Lawrie & Co. Limited.

He is MBA in Production and Operation Management from Calcutta University, B.Tech in Mechanical Engineering from Rajasthan University.

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APPLICATION OF BIM TECHNOLOGY IN THE DONGTAIZI RESERVOIR PROJECT: A CASE STUDY

By Amy Heffner, Manager, Product Marketing, Civil Design, Bentley Systems



User Name: Liaoning Water Conservancy and Hydropower Survey and Design Research Institute Co., Ltd.

Project Name: Application of BIM Technology in the Dongtaizi Reservoir Project

Location: Chifeng, Inner Mongolia, China

Overview: Liaoning Water used OpenRoads and OpenBuildings to cut design error by 90% on the Dongtaizi Reservoir project, helping mitigate future severe flood risks to the area.

2021 *Going Digital Awards* Winner; Land and Site Development

Alleviating Severe Flood Risk, Supplying Natural Resources

Liaoning Water Conservancy and Hydropower Survey and Design Research Institute was responsible for delivering the engineering design of the Dongtaizi Reservoir. This project is one of 172 major water conservancy endeavors meant sponsored by the Chinese government to tackle China's water scarcity and flood risk issues. The proposed infrastructure is a rockfill dam with an asphalt core wall and a concrete gravity dam with a total storage capacity of 321 million cubic meters. Located in the upper and middle reaches of the Xar Moron River in Chifeng, Inner Mongolia, the reservoir will mitigate severe flood risk in the lower reaches of the river and supply water and agricultural irrigation to the areas adjacent to bottom of the river basin.

Challenging Boundary and Structural Conditions

The surveying tasks and engineering specifications on the Dongtaizi Reservoir Project were immense. The site's complex terrain required an accurate geological survey of the rock mass foundation types and structural plane upon which the dam design would be based. A curved ecological fishway that enables migrating fish to pass through the dam demanded significant excavation that necessitated using more than traditional 2D processes. Designing the rockfill dam section involved many control conditions and complicated interactions with the landscape, which cannot be solved with conventional 3D modeling. Additionally, multidiscipline engineering and visualization capabilities were essential to design the metal structure, hydraulic machinery and engineering, and an electromechanical system. Therefore, Liaoning Water realized that they had to adopt building information modeling (BIM) solutions to overcome traditional design limitations on this large-scale water conservancy project.

BIM Applications Overcome Traditional Design Restrictions

After considering their options, the team employed Bentley's BIM software for accurate 3D design. Liaoning Water integrated OpenBuildings and OpenRoads Designer to streamline collaboration among multiple engineering disciplines and to manage data. They surveyed the landscape and created a detailed 3D geological model to precisely calculate excavation volumes and plan excavation processes. This visualization in OpenRoads also allowed the project team to accurately position the ecological fishway and connect the structure's complicated

spatial curve to the landscape. The rockfill dam section was designed using OpenRoads' linear engineering capabilities to generate a truthful 3D model incorporating all control and boundary conditions. Several engineering disciplines collaborated on the design of the concrete dam in OpenBuildings, allowing the hydraulic machinery, metal structure, and electromechanical equipment to be designed to avoid collisions.

Leveraging BIM Technology to Deliver a Digital Twin

By using Bentley applications, Liaoning Water reduced design error by 90%. Delivering a technologically advanced model minimized changes to the overall design during construction. Accurately calculating project cost in the design stage of the project decreased the government's overall investment. With the support of open modeling technology, the project team improved design efficiency by 40% to deliver the plans two weeks ahead of schedule. They leveraged BIM software to produce a digital twin that provides full lifecycle support of the dam, including management during construction, operations, and maintenance. Using this project as the foundation for BIM usage on future water conservancy projects, Liaoning Water has implemented corporate 3D collaborative design standards and trained personnel to become a regional leader in BIM application.

Project Playbook: OpenBuildings Designer, OpenRoads Designer

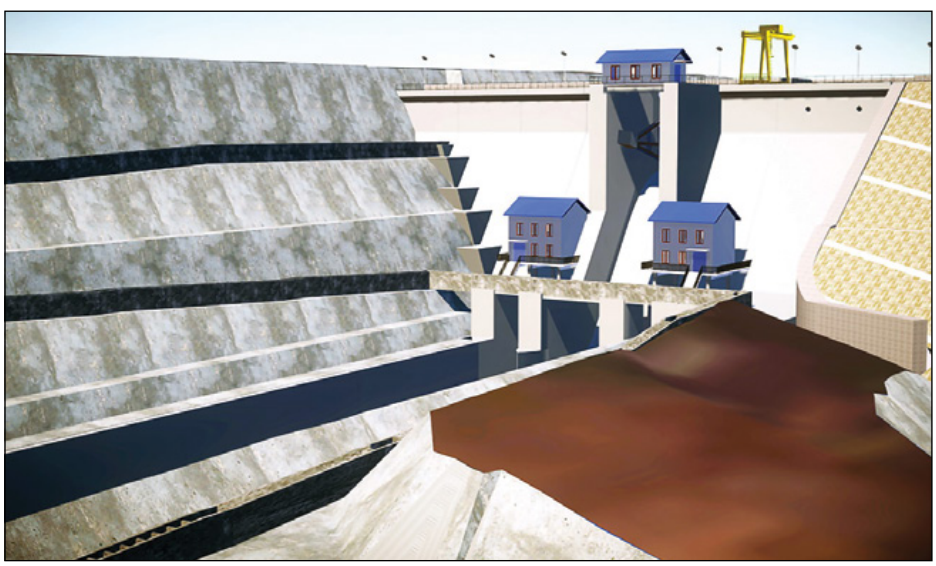
Outcome/Facts

- The Dongtaizi Reservoir Project is one of 172 major water conservancy projects in China and one of 12 key livelihood projects in Inner Mongolia meant to mitigate severe flood risk and combat water scarcity.
- Complex terrain and infrastructure design required 3D modeling solutions to quantify structural elements and excavation amounts.
- Using BIM applications reduced design error by 90%, avoiding design changes and rework during construction.
- Design efficiency increased by 40% to deliver the engineering design two weeks ahead of schedule.

Quote:

"The use of Bentley software has solved the important and difficult problems in the engineering design of Dongtaizi Reservoir, provided strong endorsement for designers, improved the design efficiency of our institute, reduced design errors, and made the digital transfer of design results possible."

» *Wang Yixin, Director of the Digital and Smart Engineering R&D Center, Liaoning Water Conservancy and Hydropower Survey and Design Research Institute Co., Ltd.*



The Dongtaizi Reservoir Project is one of 172 major water conservancy projects in China and one of 12 key livelihood projects in Inner Mongolia meant to mitigate severe flood risk and combat water scarcity. *Image courtesy of Shanghai Investigation, Design & Research Institute Co., Ltd.*
Image courtesy of Liaoning Water Conservancy and Hydropower Survey and Design Research Institute Co., Ltd.

About the Author

Amy Heffner is a manager of civil product marketing at Bentley Systems, focused on the promotion of Bentley's civil design applications. Joining Bentley in 2007, Heffner has held various roles in product marketing, corporate marketing, and user-focused events and trainings. She has over 15 years of experience in marketing, event planning, communications, and project management. Prior to her time at Bentley, Heffner worked as an associate producer at WPVI Philadelphia and as a marketing manager for Design Design, Inc., a Philadelphia area industrial and creative design firm.

To know more about the contributor of this case study, you can write to us. Your feedback is welcome and should be sent at:
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OZONE VS CHLORINE - A COMPARISON IN SWIMMING POOL MANAGEMENT

The looks of the pool matching the ambience and the landscaping, have been prime most in the minds of architects who design the pool. Pool accessories marketers have flooded the markets with accessories that facilitate this. There are numerous good looking tiles, water body features, fountains, floor bubblers, LED lights that are all incorporated to improve the looks of a swimming Ultimately what could be more important is the health of the pool. Regular swimmers often complain of many side effects of. Most often these side effects have been attributed to the use of chlorine as a primary disinfectant

Physical properties: Advantage 1

Chlorine has to be stored, protected from heat and moisture, handled carefully, as it is a very corrosive agent. The activity of chlorine deteriorates on storage .Chlorine in the form of solid and liquid if stored for more than 30days is expected to lose 70% of its activity

Ozone: Ozone IIs a gas and generated at site. Ozone therefore does not loose efficacy on storage. There is no requirement to store ozone. There is no need for handling ozone as it is pre installed and the ozone gas is automatically injected into the water

Mechanism of Action: Advantage 2

Chlorine: 1.) **Residual chlorine levels**: Chlorines action as an disinfectant require contact time Hence it is important that the residual chlorine level is maintained very carefully at 1.0 PPM. Bacteria can proliferate when these chlorine levels are not maintained

2) **pH of water monitoring** Chlorine action is dependent on the pH of the water. The required pH is to be maintained and monitored

3) **Heat:** Sunshine and extreme hot conditions will affect the efficacy of chlorine action in the water

OZONE: 1) ozone is 3000 times more than Chlorine and requires contact times less than 4 minutes. Its activity is not dependant on Storage (since it is generated at site), not dependant of pH, TDS and its actions are always consistent. Hence results of disinfection are more predictable with ozone. Residual chlorine required is 0.5 ppm only. Chlorine after ozone is SAFE as no by products are formed

Spectrum of Activity: Advantage 3

Chlorine: The action of chlorine is bacteriostatic low doses which means it does not kill Chlorine is very poor in its action against Virus such as hepatitis, polio, and other water borne viruses. It requires a very high contact time and high doses for achieving a good antivirus action. Chlorine is ineffective against Pseudomonas, cryptosporidium that are very often found in pool waters.

OZONE: It is very effective against Bacteria, viruses and also unicellular organisms. Infect ozone is the only agent effective against pseudomonas and cryptosporidium. Ozone is very effective against water borne viruses. No super chlorination is required with ozone treatment

Health Benefits: ADVANTAGE 4

Chlorine: Chlorine forms by products in water that are carcinogenic. They cause lots of side effects normally associated with pools like burning of eyes, scaling of the skin,

OZONE: Eco friendly product. No by products, hence by suing ozone, the pool user does not get burning eyes, rashes, and other side effects. These effects cannot be quantified, but health benefits of ozone are numerous

Pool maintenance: Advantage 5

Chlorine: Pool water parameters are to be carefully monitored. TDS should be controlled, pH monitored and corrected regularly, alkalinity tests on regular level (at least one a month) to determine the buffering levels. Daily back wash, once in a fortnight super chlorination is a must to remove organic build up.

Ozone: Ozone disinfection is NOT dependant on TDS, pH or alkalinity. NO Super chlorination is required as Ozone itself removes organics on a day to day basis and prevents build up

Pool Appearance: Advantage 6

The Ozone pool will be much cleaner, which means dirt, grease, oils, organics and other materials will wind up in the filter system much faster than with chlorinated systems. The water will be sparkling and deep ends are distinctly visible due to this clarity. An ozonated pool is a beauty. The pool will match very well with the landscaping. Chlorine is famous for destroying pool infrastructures, rusting out ventilation systems and destroying pool liners etc. Ozone poses no such problems.

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TENDERS

1. Preparation Of Dpr For Augmentation Upto 7.5 Mgd From Existing Water Treatment Plant At Mangalpur And Existing Raw Water Intake Well At Ballavpur, Raniganj With All Ancillary Work Including Replacement Of Rising Main Pipeline And One New 500 M3 Ohr

Authority
Asansol Durgapur Development Authority

Name: Executive Engineer Adda Asansol
Address: Vivekananda Sarani, Senraleigh Road Near Kalyanpur Housing More, Asansol -713305
Location: Asansol | West Bengal | India

Bid Open Date: 23 May 2022
Doc Collection Date: 23 May 2022

Competition: Domestic Competitive Bidding
FTID: 220510220280

2. Annual Maintenance Of Water Treatment Plant, Sector 19p I, Sirsa. Watch And Ward Of Hsvp Reserve Store Sector 19pii, Sirsa And All Other Works Contingent Thereto For A Period Of 10 Months I.E 01.06.2022 To 31.03.2023.

Authority
Haryana Urban Development Authority

Address: Executive Engineer Hsvp Division No.Ii, Hisar, Pincode 125055
City: Sirsa
Location: Sirsa | Haryana | India

Bid Open Date: 20 May 2022
Doc Collection Date: 20 May 2022

Competition: Domestic Competitive Bidding
FTID: 2205104143450

3. Upgradation Of Sewage Treatment Plant (Stp) Of 3.00 Mld Capacity Based On Moving Bed Bio Rector (Mbbr) Technology Located At Near Govt. Iti, Rewari Road Kosli Town

Authority
Public Health Engineering Department

Address: Phedkosli, Pincode 123302
City: Bhakli
Location: Bhakli | Haryana | India

Bid Open Date: 23 May 2022
Doc Collection Date: 20 May 2022

Competition: Domestic Competitive Bidding
FTID: 2205104143400

4. Design, Construction, Erection, Testing And Commissioning Of 90 Kld Mps, 30 Kld Capacity Sewage Treatment Plant Based On Combined Moving Bio Film Reactor And Activated Sludge Process With 30 Kld Tertiary Treatment Plant

Authority
Public Health Engineering Department

Address: Executive Engineer, Public Health Engg. Division No.2, Karnal Near Chhoti Market Model Town, Karnal, Pincode 132001
City: Karnal
Location: Karnal | Haryana | India

Bid Open Date: 19 May 2022
Tender Value: 86.16 Lac
Doc Collection Date: 19 May 2022

Competition: Domestic Competitive Bidding
FTID: 2205104143440

5. Mla-Ads, Construction Of Sewage Treatment Plant For Ksrtc Complex, Pathanamthitta

Authority
Public Works Department

Name: Executive Engineer
Address: P W D Buildings Division, Pathanamthitta
Location: P W D Buildings Division, Pathanamthitta

Bid Open Date: 16 May 2022
Tender Value: 38.50 Lac
Doc Collection Date: 16 May 2022

Competition: Domestic Competitive Bidding
FTID: 22051027590

6. Supplying, Instatllation And Commissioning Of Effluent Treatment Plant (Etp) Pumpsets At Hunagund Depot.

Authority
North West Karnataka Road Transport Corporation

Name: Varghese P O
Address: Senior Manager (Projects And Planning), Fact (Cochin Division), Ambalamedu Ernakulam
Location: Ernakulam | Kerala | India

Bid Open Date: 04 May 2022
Tender Value: 9.00 Lac
Doc Collection Date: 04 May 2022

Competition: Domestic Competitive Bidding
FTID: 22041929010

7. Bid Document For Design, Build, Commissioning And Operation And Maintenance For Two Years Of 1.00 Mld Capacity Sewage Treatment Plant Based On open Technology With Extended Aeration Process With Pumping Mechinary And Repairing Work Of Existing Under Ground

Authority

Road And Building Department

Address: Narmada Bhuvan, C Block, 3rd Floor, Vadodara, Pincode 389001
City: Godhra
Location: Godhra | Gujarat | India

Bid Open Date: 31 May 2022
Tender Value: 1.75 Crore
Doc Collection Date: 30 May 2022

Competition: Domestic Competitive Bidding
FTID: 220510418070

8. Designing, Constructing, Commissioning Of Grey Water Treatment Plant Of 1.0 Mld Capacity Including 1 Month Trial Run And 2 Years O And M At Village – Vanthvadi Ta. Mahemdavad Dist: Kheda

Authority
Gujarat Water Supply And Sewerage Board

Address: Office Of Superintending Engineer, Public Health Circle, B Das Laboratory Compound, Above Little Kingdom School, Behind Railway Station, Nadiad 387002, Pincode 387001
City: Bharmour
Location: Bharmour | Himachal Pradesh | India

Bid Open Date: 24 May 2022
Tender Value: 5.53 Crore
Doc Collection Date: 23 May 2022

Competition: Domestic Competitive Bidding

TENDERS

FTID: 220510419050

9. Biennial Rate Contract For Mechanical Maintenance Jobs In Effluent Treatment Plant At Rcf, Trombay Unit.

Authority
Rashtriya Chemicals And Fertilizers Ltd.

Name: Dgm Cc And Phs
Location: Mumbai | Maharashtra | India

Bid Open Date: 24 May 2022
Doc Collection Date: 24 May 2022

Competition: Domestic Competitive Bidding
FTID: 220510223480

10. Providing Sewerage Scheme To Bharmour And Adjoining Area, Tehsil Bharmour, Distt. Chamba, Himachal Pradesh. Sh Construction Of 1.00 Mld Sewage Treatment Plant, And Sewer Network For Zone

Authority
Himachal Pradesh Irrigation And Public Health Department

Address: Executive Engineer Jal Shakti Division Bharmour, Pincode 176315
City: Nadiad
Location: Nadiad | Gujarat | India

Bid Open Date: 24 May 2022
Tender Value: 84.14 Lac
Doc Collection Date: 21 May 2022

Competition: Domestic Competitive Bidding
FTID: 2205104140460

11. Design, Construction, Erection, Testing And Commissioning Of 90 Kld Mps, 30 Kld Capacity Sewage Treatment Plant Based On Combined Moving Bio Film Reactor And Activated Sludge Process With 30 Kld Tertiary Treatment Plant, Operation And Maintenance For 12 Months During Defect Liability Period After Trial Run Of 3 Months And 4 Years Thereafter In Place Of Safety For Boys At Madhuban Distt., Karnal

Authority
Haryana Government

Name: Executive Engineer
Address: Executive Engineer, Public Health Engg. Division No.2, Karnal Near Chhoti Market Model Town, Karnal
Location: Karnal | Haryana | India

Bid Open Date: 19 May 2022
Tender Value: 86.16 Lac
Doc Collection Date: 19 May 2022

Competition: Domestic Competitive Bidding
FTID: 2205102770

12. Providing Roofing With Steel Truss Over Clear Water Sump At 1.125 Mgd Water Treatment Plant Mehjoor Nagar. Jkidfc 1203

Authority
Public Health Engineering

Name: Executive Engineer Water Works Division Srinagar
Address: Executive Engineer Water Works Division Srinagar Lal Chowk Exchange Road Srinagar
Location: Srinagar | Jammu & Kashmir | India

Bid Open Date: 18 May 2022
Tender Value: 6.30 Lac
Doc Collection Date: 18 May 2022

Competition: Domestic Competitive Bidding
FTID: 22051022390

13. Providing And Fabrication Of Ornamental Grill Steel Gate At P.S.T Site And Construction Of Cement Concrete Retaining Wall, Breast Wall On Right Side Of Approach Road Leading To Pre Settling Tank Site At Water Treatment Plant Alusteng Srinagar. Jkidfc

Authority
Public Health Engineering

Name: Executive Engineer Water Works Division Srinagar
Address: Executive Engineer Water Works Division Srinagar Lal Chowk Exchange Road Srinagar
Location: Srinagar | Jammu & Kashmir | India

Bid Open Date: 18 May 2022
Tender Value: 21.00 Lac
Doc Collection Date: 18 May 2022

Competition: Domestic Competitive Bidding
FTID: 22051022540

14. Detailed Project Report Preparation For Effluent Treatment Plant Of Capacity 6000klpd At Tio2 Pigment Production Plant At Kmml

Authority
Kerala Minerals And Metals Ltd

Name: Hou-T
Address: Tp Unit, Kmml, Sankaramangalam
City: Nadiad
Location: Kollam | Kerala | India

Bid Open Date: 09 Jun 2022
Doc Collection Date: 09 Jun 2022

Competition: Domestic Competitive Bidding
FTID: 220510230010

15. Supply Of Drinking Water Through 12000 Ltrs. Capacity Truck Mounted Water Tanker Ar Bypass Road Water Treatment Plant. Jamuniya Water Treatment Plant Other Oht S Sumpwell In Sehore Town Rates Shall Include Cost Of Driver, Diesel And Water. Rates To

Authority
Directorate Urban Administration And Development

Name: Cmo Sehore
Address: Nagar Palika Sehore
Location: Sehore | Madhya Pradesh | India

Bid Open Date: 24 May 2022
Tender Value: 41.00 Lac
Doc Collection Date: 24 May 2022

Competition: Domestic Competitive Bidding
FTID: 220510241030

16. Providing Sewage Treatment Plant S (Stps) At The Locations Of 1) Ananthavaram (0.20 Mld) 2) Dondapadu (0.50mld) 3) Thulluru (0.20 Mld) 4) Madadam (0.20 Mld) 5) Inavolu (0.30 Mld) 6) Nowluru (0.30 Mld) 7) Penumaka (0.30 Mld) 8) Nidamarru (0.30 Mld) (Total 2

Address: 4th Floor Ntr Administration Block, Pincode
City: Kurnool
Location: Kurnool | Andhra Pradesh | India

Bid Open Date: 23 May 2022
Doc Collection Date: 23 May 2022

Competition: Domestic Competitive Bidding
FTID: 220510456710

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