

AICE²²

INTERNATIONAL CONFERENCE & EXHIBITION 2022

“TOTAL WATER SOLUTIONS”

DECEMBER, 5 & 6, 2022
AT TAJ GANGES, VARANASI

**PUBLICATION
OF ABSTRACTS**

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INTRODUCTION

The American Water Works Association (AWWA) is an oldest and leading organization dedicated to improving water quality and infrastructure.

AWWAIndia Association (AIA) is the first international and independent registered Association in India of AWWA, focused on addressing India's unique water challenges.

In November 2021, “AWWAIndia Association” was established as a not-for-profit organization with its own membership, Board of Directors and Committee Structures for India water professionals residing in India.

AIA works with water practitioners, public and private utilities and authorities on advocacy related to promoting sustainable practices in water management and technological advances in India including capacity building.

AIA conducted its 1st Annual International Conference & Exhibition in December, 2022 at Varanasi which was attended by more than 300 water professionals from various sectors.

ABSTRACTS

24x7 Water Supply Under AMRIT 2.0 Program

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ABSTRACT

India is the seventh largest country by geographical area, second most populous country with 1.4 billion people residing in it and it is the most populous liberal democracy in the world. 50% of population is expected to live in urban areas by the turn of the year 2050.

India has made substantial progress with respect to ensuring access to safe piped water supply for urban households. Apex planning agency of India, i.e., NITI Aayog in its Composite Water Management Index (CMWI) in 2019, stated that 93% of India's urban population has access to 'basic water supply'. Efforts towards universal coverage are underway under the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) in 500 cities of India. Despite the advancements, access to piped water supply in urban areas is not yet universal. Thus, there lies a great challenge ahead to supply every household with treated water tap.

There are many challenges like Non-Revenue Water (NRW) reduction. After survey of 900 cities in the six states, it is observed that on an average, extent of NRW is still 31%, consumer metering is just 22%, continuity of water is just 2.7 hours in a day, and most importantly the quality of water is just 95%. Similar challenges are faced by most of the developing countries.

Presently, most of the cities in India are supplying water on intermittent mode. Though the present systems operate on intermittent mode, the goal should be to ultimately achieve the world-class standard of continuous water supply with tap connections to all households with a smooth transit. For achieving this goal, an innovative and implementable approach has been devised and presented in this paper.

Under AMRUT 2.0 program of Government of India (GoI), all 500 AMRUT cities are mandated to undertake reforms for water conservation including 24x7 water supply projects with 'Drink from tap' facility. It is one of the admissible components and these projects should cover at least one ward or DMA with at least 2000 households in the contiguous manner.

Objective of this paper is, therefore, to present the approach for achieving the target of achieving 24x7 water supply in 500 cities with the selected areas with at least 2000 connections of these cities.

NEW TECHNOLOGIES

Powerful tools, now available, such as Geographic Information System (GIS) and simulation of pipe network technology are discussed in the proposed approach. It is observed that the technique and science of rational allocation of demands to the nodes of distribution pipe network is not uniformly practiced in the country. This paper describes the method for realistic distribution of the total design population/ total design demand in the various wards of the city based on equivalent area, forecasted density and by using GIS technology so that nodal demands are accurately given for hydraulic modelling.

Uniqueness of the approach is to consider one operational zone for each service reservoir. If the operational zone is not sized properly, it leads to malfunctioning of reservoirs like emptying or overflowing. A detailed methodology describing how to fix the boundaries of operational zones of existing reservoirs and then fixing of boundaries of operation zones of unserved areas has been incorporated in this paper.

If DMAs within operational zones are not made hydraulically discrete and are not properly established, water audit (NRW computation) is not possible. By way of this paper guidelines are being proposed to urban local bodies (ULB)s to design proper DMAs.

Inequitable distribution of water with designed pressure is the great discrepancy in water supply system in India. The decentralised planning presented also resolves this perpetual problem.

CONCLUSIONS

A detailed action plan is proposed to decide mode of communication for different target groups and stakeholders involved with the project. The approach suggested is expected to bring about important reforms in water sector of India.

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EXPERIENCES OF INDIA IN CONTINUOUS WATER SUPPLY AND NON-REVENUE WATER LOSS REDUCTION – RELEVANCE/FUTURE POTENTIAL

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CPHEEO/Research advisory board member for ICCW an IIT Madras initiative/
Strategic advisor , Mentor and Investor in water technology start-up's**

In India as per the Constitution, drinking water is a State / Local Body subject. Thus far, the sector has been developed and implemented entirely by public agencies. The performance however has been well short of expectations. The sector is characterised by poor quality of service (supply side) and poor demand management. The gap between demand and supply continues to increase. Concurrently, public agencies do not charge the economic price of water delivery services, and due to lack of investment in asset creation and maintenance, alternative sources of unregulated drinking water have emerged such as tanker supply, water cans and bottled water. The eventual cost of water has therefore become extremely high both in terms of actual costs and health. In this, the poor face very high challenges, both in terms of cost as well as health. Therefore to improve the quality of service, the private sector has been invited to partner with Government agencies. Water and Sanitation remain the biggest challenge in our urban areas today in terms of quality, quantity and demand side management. The challenges faced are particularly severe in small and medium towns.

In view of the above, various models for partnering with the private sector have emerged, to improve supply side efficiencies, introduce greater accountability and transparency in operations and maintenance, and at the same time improve demand side management. The various models that have emerged, with different levels of success are described below.

Models :

Build Own Operate and Transfer (BOOT):

In a major paradigm change, an initiative has been taken to partner with the private sector, where the private entity would be invited to develop the sector. The fundamental objective being to obtain non public funding for upfront investment, and subsequently to operate and maintain the facilities for efficient supply of drinking water and sewerage services.

Examples:

Tirupur Water supply and Sewerage projects developed Tamil Nadu water Investment Company and Chennai (Minjur) desalination projects are a few projects which have been implemented but have been mired in legal issues.

Continuous Water Supply system - 24 x 7:

Another model for private sector participation is for companies to refurbish existing assets and then operate and maintain the system to achieve a continuous 24 x 7 water supply system on established quality parameters including NRW. In this, depending on the circumstances of the particular project, it may be part or fully funded by the Government. Any funding gap would be brought in by the private sector. Examples are Karnataka (Hubli, Dharwad, Bangalore), Nagpur, New Delhi and Coimbatore.

All the above projects however are under implementation, and still to achieve any substantial results. The exceptions are the Karnataka pilot projects, which have been completed and have demonstrated good success, in terms of improving supply side efficiencies and lowering of NRW. This model is socially getting acceptable now even though consumer metering and legislations are still being resisted by the political fraternity.

Facility Development:

In a number of cities, critical components of the water supply have been newly built by the private sector with the further responsibility of operating and maintaining that facility. This is mainly with reference to water treatment plants which is one of the most critical components of a water supply system. Some examples are in Delhi, Indore and Ranchi

Engineering Procurement and Construction (EPC) along with Operations and Maintenance beyond five years and above:

While various initiatives have been taken on the above models, the drinking water remain under developed for private participation. At the national level, with a few exceptions the bulk of the projects continue to be implemented through public agencies on the Engineering Procurement and Construction (EPC) model that has been traditionally followed in the country. As such the drinking water sector remains to be nascent and shallow.

Historically and even in today's context the sector is developed mainly through public funding but with the EPC being done by private companies. Upon completion of construction the facilities are operated and maintained by the public entity. This is the principal model upon which the sector has been and continues to be developed. However, this model can be modified slightly to invite the private sector to not just do the limited job of EPC, but also to operate and maintain the facilities on a long term basis with a minimum of ten years with a better focus on NRW.

On the eve of general elections, Hon. Prime Minister of India made the important announcement to integrate all water related Departments/Ministries by creating Ministry of

Jal Shakti. The Ministry of Jal Shakti was established by integrating only two Ministries, i.e., Water Resources and Rural Water & Sanitation, but the urban water supply and sanitation sector handled by the Ministry of Housing and Urban Affairs was left out.

By now it is widely accepted in India that 24x7 (continuous) supply is the preferred way forward, with such supply being more hygienic (better water quality), more cost effective (less leakage & breakdowns, less investment by consumer) and more productive for the consumer.

The attempts towards 24x7 have brought forward a multitude of problems facing the utility; bringing the realisation that 24x7 could only happen if both the distribution network and the Utility itself underwent a transformation.

Current practice to address this transformation is the use of tender procedures to select preferably an international Water Operator to *rehabilitate* and subsequently *operate* a pilot zone, with the objective of extending a successful implementation to the remaining city.

This approach is often met with an outcry from parts of the public and stakeholder organisations with arguments that are sometimes justified and sometimes not. For example, many perceive that forthcoming tariff increases are due to the 24x7 supply, the high rehabilitation costs and the possible subsequent privatisation of the Utility.

Rehabilitation is currently the perceived way forward to transformation of the distribution network by the Private EPC including short term O&M and later takeover of the assets by Govt Utility is the perceived way forward to transformation of Utility management.

Although this arrangement could work there are many shortcomings brought about by the manner in which both the tender terms of reference and the contracts are executed. Current practices can result in Rehabilitation costs being many times more expensive than what is required and Operations by the Govt Utility will not necessarily result in effective Utility management; a condition that might result in unsustainable operation once the EPC departs or might make the authority dependant on the EPC for many years to come.

Why NRW contracts are not encouraged

Various aspects of the proposed work are carried out. However the following shortcomings are identified:

- a. Little effort is given in establishing a validated network data set both in terms of network data evaluation, due to the lack of appropriate information systems and in terms of comprehensive field surveys; as a result hydraulic analysis that will follow gives misleading results with regard to the capacity of the existing system.
- b. Network component condition assessment is rarely carried out, making the asset's effective life calculation very difficult, often resulting in conservative and expensive assumptions with regard to asset replacement.
- c. Commercial data analysis is rarely carried out due to the lack of appropriate information systems.

- d. Commercial audits, if carried out, are usually done so in a manner ignoring the current data structures in the billing system resulting in unreliable results, having little effect in improving commercial data quality (property/ customer/ connection/ meter data).
- e. Identifying illegal connections is usually limited to sight inspections.

Reasons for Failure:

A limited number of projects have been or are under implementation..

Lack of understanding in Risk sharing by Public Entities

- Very high risks placed on private sector
- Unrealistic expectations from the private sector
- A continuing regulatory approach rather than one of partnership by the public agencies
- Variations in requirements from the private sector
- Lack of experienced consultants
- Lack of exposure of authorities
- Project structuring – qualification, experience, partnerships, etc
- Issues of bankability – payment terms, termination payments, demand risk, etc
- Lack of Indian Operators to undertake these opportunities.

Criteria for Selection of Cities:

The water supply and sewerage sector is facing extreme stress in all aspects (quality and quantity, and demand side management). The challenge faced by households is particularly severe in small and medium towns. It is therefore imperative that an initiative should be launched to upgrade and modernise the water supply both in terms of capital investment and then subsequently in the operations and maintenance of the facility for delivery of efficient services. This initiative should be implemented in partnership with the private sector in the various models that have been outlined in the earlier section. At the outset, cities can be selected for a major initiative on the following criteria.

- All State capitals
- Cities with a minimum of 0.5 Mn population
- Urban Local Bodies which are financially healthy

- Particularly those that have or are initiating recovery of at least covering operating and maintenance cost above 50%

Funding:

In order to thrust forward an initiative to develop the drinking water in partnership with the private sector, the critical component could be the funding of such projects. The various forms of funding that would attract the private sector would be based on the following models.

- Upfront full funding by the public sector both in terms of capital expenditure as well as operating and maintenance cost (at least 10 years).
- Funding through multilateral agencies such as World Bank, Asian Development Bank, JICA or other bilateral agencies.
- Annuities
- Any other variation

Way forward / Reforms

As noted earlier, drinking water supply is a State / Urban Local Body subject. However, neither at the national level or any State Government has provided any form of ownership or leadership for developing the drinking water to attract private participation, beyond the EPC structure. As a consequence there is a complete lack of uniformity in the structuring of projects which invites projects beyond the pure EPC format. Therefore at the outset what is required is development of a model Concession Agreement by the Government of India to ensure commercial viability and bankability in projects inviting private participation. An example in this regard is the National Highway Authority of India (NHAI) which has implemented significant projects. Based on this experience, including contract structures, various State Governments have been able to borrow from these examples and then develop and implement Highway programmes in their respective States. A similar initiative could be taken up by the Urban Affairs Ministry to provide direction and guidance to bring about uniformity in the development of the sector with private participation. The Government of India funds various programmes to the State Governments for development of the sector. This funding should be used as conditionality for bringing about reforms in the contractual arrangements and related factors to encourage the participation of private sector.

Development of procedures for award of mandates to the private sector should provide greater weightage for demonstrated track record for delivery instead of being based only on a lowest price bid (L1) system.

In the current context, the water supply sector continues to remain in a nascent state. However, various Indian companies have not been able to establish themselves on the BOOT format, despite the opportunities that have emerged. The “water market” is also moving steadily towards development of water supply systems on a refurbishment and operations and maintenance (24 x7) model. Other than Suez, Veolia which have Indian offices only L&T in the private sector and WATCO (SPV of Odisha State) amongst Indian Govt ULBs have some experience in supply and distribution to be able to qualify for such NRW contracts or continuous water supply projects. It is incumbent that the Government of India and State Governments should encourage Indian companies to partner with specialised companies/ consultants who have the experience, technology and methodology in place take the market share in this sub sector as otherwise this sector of continuous water supply will be undeveloped and will remain in its present status quo .

Conclusions

Therefore, the Ministry of Jal Shakthi should handle both urban and rural to give special focus on improving water quality and other service delivery. While India’s growth in other infrastructure areas has been tremendous, we are still lagging behind on water supply compared to other Asian countries like Malaysia, Cambodia, Philippines etc . The sectoral targets and outcomes in water sector to be achieved in the next ten years in a phased manner under this initiative could include the following

- 100% population to be covered under piped water
- Quality of water should at least meet WHO standards so that consumers may be able to drink water off the tap without use of any local filtration/treatment in individual houses
- Conversion from intermittent supply to 24x7 pressurized water supply system in each city in a phased manner
- Non-Revenue Water (NRW) should be brought down to at least 20%
- ULBs should aim for complete cost recovery in 10-15 years

AWWAIndia Association's (AIA)

International Conference & Exhibition on Water, Reuse, and Sewage
5th & 6 December 2022 at TAJ Ganges Hotel
Varanasi, U.P.

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ABSTRACT – Word Count 245**Keep it flowing 24/7 – Reliability through Sustainability and Resiliency Best Practices**

Twenty-four-hour seven day a week (24/7) water utilities comprise the most critical foundational infrastructure elements necessary to protect public health, improve quality of life, and build a strong economy.

Water utilities range from simple to very complex systems. Regardless of size or complexity, water utilities require highly skilled and dedicated staff to lead, manage, and operate the system. All water utilities have several “*failure point factors*”. Ignoring these factors will result in severe service outages and expensive system failures.

This paper’s focus will be two-fold. First, it will demonstrate what happens when actual utilities fail to properly fund and use “best practices”. Second, it will highlight the necessary “*best practices*” to facilitate the highest-level risk reduction, enhance resiliency, and build sustainability to reduce the risk of service failure.

This paper’s review of demonstrated cases of utility failures is tantamount to looking in the mirror and honestly reflecting on the reality of the utility condition. If the utility condition does not reflect the “*best practices*” highlighted by this paper, it will just be a matter of time before the utility experiences a sudden catastrophic loss of service and decline in customer confidence.

On the other hand, if the reflection visually shows the “*best practices*” of this paper, the utility can know that they have chosen a path of future stability and success that will minimize risk. “*Best Practices*” are necessary to “*Keep it flowing 24/7*”.

Abstract For

AWWA India ASSOCIATION'S (AIA) INTERNATIONAL CONFERENCE & EXHIBITION ON WATER, REUSE AND SEWAGE, 5 & 6 TH DECEMBER, 2022 AT TAJ GANGES HOTEL, VARANASI, U.P.

Title: Success stories on JICA's Water Sector Assistance to India over the past two decades

Authors: Mr. Mahendra Pal Singh, Chief Development officer, JICA India
JICA – Japan International Cooperation Agency (JICA), Japan

Government of Japan through JICA has been always at the forefront as a close friend of India in assisting India in its growth in various sector. JICA has contributed to all facets of water sector project in India, including but not limited to providing drinking water supply systems to implementing sewerage systems & wastewater treatment plants for pollution abatement and rejuvenation of Ganga, Yamuna and other rivers in India.

This presentation will focus on JICA's contribution in the City of Varanasi, right from Ganga Action Plan -I, implemented in 2003 to this date with current on-going projects, including implementation of various pro-people activities, sewerage and sewage treatment plants, reuse of water, ghat rejuvenation, including construction of state-of-the-art auditorium under grant-in-aid named "Rudraksh - Varanasi International Cooperation and Convention Center" showcasing as a symbol of friendship between Japan and India in 2021.

Abstract 1: Addressing Wide Spectrum of Technical and Managerial Challenges Using ANSI/AWWA Standards

Proposed Speaker:

- Mr. Paul Olson, Senior Manager of Standards, AWWA, Denver, CO, USA
- Email: polson@awwa.org

Description of Session

Attendees will learn about the structure and function of the ANSI/AWWA standards program, which has been serving AWWA members for more than 100 years. These standards include those for products, materials, appurtenances, and both installation and repair and maintenance practices.

Learning objectives:

1. Participants will learn about the structure and practical use of the ANSI/AWWA standards, with a featured introduction of the Utility Management Standards.
2. Participants will learn how to access these valuable management resources, as well as others, from AWWA and AWWAIndia.

Why is this session important and what is in it for the learner (give examples of any skills, tools, or solutions the session will provide)?

Utility leaders and managers can gain insight into a proven set of standards that apply broadly to many aspects of everyday utility operations, as well as about a proven process for organizational improvement based on a special subset of these standards.

What is the pain point or utility challenge that this session will help to solve and what action should the viewer/utility take as a result of the session?

Utility managers worldwide face a lot of common challenges – from materials and equipment, to water scarcity and water loss, and to management and operational challenges such as asset management. This session will help participants learn how to access the resources and materials to facilitate positive change in everyday operations.

**AWWA India -International Conference & Exhibition on Water, Reuse and Sewage 5 & 6th
December, 2022**

Topic: Success and Challenges in implementing a 24X7 water supply system from an intermittent system

Title: Water Loss Control – the key functional requirement for migrating from intermittent to continuous pressurized (24/7) water supply

Author: Anand Jalakam, Director, Jalakam Solutions Private Limited, Bangalore

Abstract:

India with over 1.3 billion population resident in 7,000 towns and cities and about 650,000 villages constituting about 17% of world population is seriously limited by about 4% world water resources. There had been negligible investments in drinking water infrastructure until early 80s in the rural areas and until late 90s in rapidly expanding cities and towns. The historical low capital investments and dependence on meagre budgets for operations and maintenance in the absence of water user charges, the performance of prevailing assets and services deteriorated affecting the service delivery resulting in intermittency of supply at customer tap and utility professionals losing the domain knowledge and expertise. The failure of service expansion and unreliable service quality by the public water utilities and with the advent of drilling technologies in early 80s, the dependency on locally available untreated ground water had substantially increased. The local governments as well as affordable customers resorted to tapping local ground water sources, storage, pumping and point of source water treatment systems within customer property.

The recent success stories in demonstration zones in the three cities of Hubli-Dharwad, Belagavi and Kalaburigi and town wide service improvements in Ilkal in the State of Karnataka and Malkapur in the State of Maharashtra and more recently the city wide improvements in Puri in the State of Odisha have demonstrated that universal coverage and continuous availability of water is feasible and prime most requirement to ensure public health, conserve precious water resources and to achieve financial sustainability of water service delivery.

Substantial investments are underway under Jal Jeevan and AMRUT missions in different parts of the country to augment the water resources, enhance the coverage and improve service delivery funded both by the State and Central Governments and multi-lateral and bilateral financial institutions.

The ongoing investments focus on major proportion and often, total replacement of existing network assets with the assumptions that lack of network infrastructure data, unknown level of water losses, and to ensure division of networks in to smaller manageable zones, the District Metering Areas (DMAs). There is also trend to enhance service storage conflicting with meagre availability of land in the rapidly growing urban city environments.

This paper presents the learnings from the demonstration projects in Karnataka and a case study on different towns of Odisha to address some of the myths prevailing in the water service improvement programs in the country and highlights the need of effective water loss control by ensuring robust preventive maintenance of networks duly optimizing the performance of existing assets while migrating from intermittent to continuous water supply services and to sustain the continuous supply to mitigate the risk of falling back to intermittency.

Abstract For

AWWA India ASSOCIATION'S (AIA) INTERNATIONAL CONFERENCE & EXHIBITION ON WATER, REUSE AND SEWAGE, 5 & 6 TH DECEMBER, 2022 AT TAJ GANGES HOTEL, VARANASI, U.P.

Title: Wastewater Sludge (bio-solids) Management, prospective Regulations and Reuse to achieve effective Circular Economy in India – Need of the Hour

**Authors: Uday Kelkar, Ph.D., P.E., BCEE, Sany Kumar Guleria, Parul Goal, Sagar Kohli
NJS Engineers India Pvt. Ltd.**

While treated Sewage can be discharged to the recipient water bodies after the desired treatment as per the requirements and/or the standards set by the statutory agencies such as CPCB, MoEF&CC or NGT, handling of sewage sludge (bio-solids) and its treatment remains complicated. As more and more STPs are being implemented with advanced unit operations involving nutrient (nitrogen and phosphorus) removal along with stringent discharge standards to achieve effective recycle and reuse of the treated wastewater for variety of applications or discharge, large quantity of sludge is generated from these STPs as by-product. This sludge generated at the STP is presently being either given to farmers at no-cost as manure or for soil amendment or sent to unsecured landfill/dump yards through the Contractor operating the STP.

It's going to be a big challenge to scientifically and systematically handle the quantity of sludge generated at present as well as in future STPs. Therefore, need of the hour is to focus now on solids stream in addition to the routine emphasis on liquid stream while finalizing the treatment process for the STP and its Contracts. The function is to create an effective sludge (bio-solids) classification scheme based on its moisture and pathogen content (level). While developing sustainable management (recycle and reuse with circular economy) practices of treated sewage sludge (Bo-solids) from STPs in India.

This paper will present the outcome of two current projects, that assessed available technologies, classification requirements of bio-solids, cost analysis, HAM & PPP models and how reuse of sludge could be benefited through circular economy. The two projects were, one completed for Delhi Jal Board as part of their sludge management strategy for reuse of these bio-solids (based on FR & DPR) and another conducted for NMCG in developing India wide guidelines for sludge management and evaluation of technologies for four different cities in India, including Varanasi.

Global Perspectives on Challenges in Policy Formation and Compliance for Wastewater Reuse

Abstract of Paper

Increasing population and climate change are becoming a great challenge for freshwater resources. Nearly 380 trillion litres wastewater is generated every year¹, of which 63% is collected, 52% of collected wastewater is treated² and only 4% of the treated wastewater i.e 1.2% of total is recycled³. Reuse of wastewater does not only limit the risks of pollution discharges into the environment but also reduces the reliance on freshwater resources, strengthens a country's water security and saves infrastructure cost.

Several countries have taken initiatives and formulated policies for wastewater reuse. In Australia, water reform policies, led to guidelines for recycled water. Pipelines for treated wastewater were installed along with freshwater. However, due to lower cost of catchment water & desalinated water, water policy complacency followed⁴. In Namibia and Singapore, wastewater is treated based on reuse applications. Due to high social acceptability and advanced treatment technologies, the treated wastewater is used for potable purposes. In Israel, through stringent environmental regulations and combination of economic tools including tariffs and close market principle, nearly 85% of the wastewater is recycled⁵.

Globally, regulatory and enforcement authorities faced significant obstacles during implementation, including acceptability by end users, standards for fit for reuse of treated wastewater, efficiency of treatment plants and economics of treated water. This paper will discuss various wastewater reuse policies & challenges faced by regulatory authorities when formulating policies, provide a novel global perspective on wastewater management and assist in drawing lines in Indian context.

¹ [https://www.downtoearth.org.in/news/water/new-study-maps-how-much-energy-nutrients-and-water-are-locked-in-world-s-wastewater-69177#:~:text=The%20world%20generates%20about%20380,Health%20\(UNU%20DINWEH\).](https://www.downtoearth.org.in/news/water/new-study-maps-how-much-energy-nutrients-and-water-are-locked-in-world-s-wastewater-69177#:~:text=The%20world%20generates%20about%20380,Health%20(UNU%20DINWEH).)

² <https://essd.copernicus.org/preprints/essd-2020-156/essd-2020-156-manuscript-version2.pdf>

³ <https://journals.openedition.org/factsreports/6341#:~:text=Worldwide%2C%20only%204%25%20of%20waste water%20is%20recycled.>

⁴ <https://www.sciencedirect.com/science/article/pii/S2666445320300064>

⁵ <https://www.oecd.org/environment/resources/Israel-case-study-urban-water-quality-management-diffuse-pollution.pdf>

Title: Global perspectives on challenges in policy formation and compliance for wastewater reuse

Abstract:

India houses 18% of the population and has access to 4% of the world's freshwater resources. As per National Institution for Transforming India (NITI) Aayog, 85% of drinking water supply and 60% of requirements in agriculture are dependent on the already stressed groundwater sources, subsequently, reducing the per capita availability of water from 1400 cu.m by 2025 to 1250 cu.m by 2050.

The policy framework and several flagship missions of the Central Government while rightly prescribing wastewater recycle and reuse, lacks the implementation framework to make this a reality.

The implementation framework will need to have a market-led approach for institutional and legal environment to emerge. The inherent nature of water limits the possibility of water to be "freely traded" like electricity, but economic pricing of water coupled with some fiscal incentives can help in the evolution of the market. This paper will capture learnings from more mature markets, assess the feasibility of recent efforts in India to make water trading a reality and suggest a roadmap to allow water to emerge as a tradeable commodity, spur the demand of recycled water and support the buyers and sellers to converge and enter commercially feasible transactions.

The paper also outlines the institutional reforms required for adopting optimal pricing for financial sustainability wastewater reuse in India and provides a global perspective not only in the form of learnings from mature markets but also by capturing all the nuances to create a market for recycled water.

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*AWWAIndia Association's (AIA) International Conference &
Exhibition On Water, Reuse And Sewage, 5 & 6th December, 2022
Supported By Ministry of Housing and Urban Affairs (G.O.I.)*

Reflections of Global Water Reuse Case Studies and Blue Chips for Indian Policy Makers

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Scarcity of Water and Climate change has impacted traditional sources of water supply which has posed challenges to meet current and future demands. Global Water utilities are considering Integrated Water Management solutions to mitigate risks/ uncertainties and bring resiliency to their overall Water portfolio. India as a Country may consider recycled water and desalination as alternative sources of supply for inland and coastal areas respectively. The paradigm of recycled water programs requires utilities are required to do much more for developing implementable programs rather than adopting traditional Indian approach of developing water infrastructure. Utilities across the country challenged with finding a balanced policy framework that can make these programs implementable.

The need of the hour is to adopt a flexible yet well directed approach that is based on community outreach, institutional framework, and finance structure to deliver recycled water programs. Global case studies suggest that customization of programs at regional/ local level has been more successful in adopting policies and making the program successful. The presentation aims in drawing some lessons and best practices from global case studies such as Orange County Water District (OCWD), California and Public Utility Board (PUB), Singapore to identify broad contours for the Indian policy makers. Concepts of AWWA Water Conservation Manual M-52, and its applicability will be discussed.

Reuse of Municipal Wastewater – Global Practice and Indian Perspective

Anil Rai

Associate Director, AECOM

Research Scholar - IIT Bombay, M. Tech. (Env. Engg.) - IIT Bombay

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Abstract

Freshwater utilization has increased by a factor of more than 6 in last 100 years and continues to grow at around 1% annually. The adverse consequences of over exploitation of the natural resources are further damaging our environment by polluting, this has been realized and global efforts are being made to handle the situation. Alternatives viz. brackish water desalination, sea water desalination, water conservation and reuse are being tried to discourse the water disaster. Over the last decade serious efforts are made for the reusing the treated municipal wastewater and complement the available freshwater.

It is very evident that water reuse is practiced in many countries around the world under a controlled mode. The review of global practice and various standards, regulations and guidelines adopted by various countries/organization establishes that a lot of emphasis and efforts have been put to ensure safe usage of reclaimed water mainly for agricultural and irrigation purpose, however it also highlights that many of this reuse guidelines and standards are focused on conservative parameters like TSS, BOD5 and Coliforms but silent on emerging pollutants.

The objective of this paper is to present worldwide wastewater reuse practices with focus on key milestones for reuse of wastewater, understanding challenges and risks associated with residual pollutants in recycled sewage, highlight important reuse water quality guidelines, standards and regulation practiced globally and present a case study of a decentralized wastewater plant with recycling capabilities in India.

Keywords

Recycled Water, Direct Potable Reuse, Indirect Potable Reuse, Guideline, Standard, Regulation.

Suggested Title: Estimation of Number of Certified Water Operators Needed to Support the Jal Jeevan Mission.

The accomplishments of the Jal Jeevan Mission are breath-taking. To triple the household tap water connections in India from 16.90% in August 2019 to 53.66% in October 2022 is not only a remarkable achievement but it is a continuing effort. The Jal Jeevan Mission Operational Guidelines drives the installation of new infrastructure and also recognizes the need to train and certify water system operators to ensure that the new water system infrastructure is properly operated and maintained in the long term.

Research of the water operator certification programs in the United States was recently completed and utilized to help support a proposal to implement an operator certification program in the Philippines. Due to the Philippines and India having similar population densities, this work can also be utilized for the Indian Water Sector. In particular, a defensible regression equation was developed that allowed estimation of the number of water operators needed for a given population, at a selected level of household tap water connections. This equation is used to provide an estimate of the number of water system operators needed in India now and at the final goal of provided household tap water connections to all by 2024.

The presentation will also outline common elements of an operator certification program as well as the benefits of implementing the program which includes providing a national embedded capacity to respond to water related calamities, further professionalizing the water system operator sector through the certification process and by creating community and common purpose.

Author: John Brady

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Abstract 2: How to Start Organization-Wide Improvement Using ANSI/AWWA Utility Management Standards

Proposed Speaker:

- Mr. James F. Ginley, Owner, Jim Ginley Consulting, LLC, Littleton, CO, USA
- Email: jim.ginley23@gmail.com

Description of Session

Attendees will learn about how to use a subset of the ANSI/AWWA standards known as “Utility Management Standards” to facilitate positive change and continual improvement in all aspects of everyday operations in a water sector utility. This will include an overview of the groundbreaking training program that been provided to utilities all across India, featuring examples of how some have begun to use the standards.

Learning objectives:

1. Participants will learn about the structure and practical use of the ANSI/AWWA standards, with a featured introduction on the Utility Management Standards.
2. Participants will learn about the inaugural training program for Indian utilities designed to show how to use and implement ANSI/AWWA standards as part of overall organizational improvement, including the use of ANSI/AWWA standards G100, G200, G400, G510, and G520.

Why is this session important and what is in it for the learner (give examples of any skills, tools, or solutions the session will provide)?

Utility leaders and managers can gain insight into a proven process for organizational improvement based on a special subset of these standards. Attendees will be shown how to do a quick self-assessment or “gap analysis” to identify both strengths and areas to improve.

What is the pain point or utility challenge that this session will help to solve and what action should the viewer/utility take as a result of the session?

This session will help participants learn how to access the resources and materials to facilitate positive change in everyday operations, including information about future training programs on the Utility Management Standards and other important topics.

Role of Private Sector in Infrastructure Management:

Rapid urbanization has led to a significant increase in water utilization, sewage generation and the need for water infrastructure projects that reduce consumption while managing water & wastewater even better.

With over 57 years of experience, Ion Exchange is a leader in industrial water management and now leads the change in Water & Waste infrastructure projects - all while aligning and contributing to the Sustainable Development Goals (SDGs) of our customers in India and across geographies we serve.

Ion Exchange's investment in privately managing and improving water infrastructure, its quality and services for a major industrial township in India, received positive recognition from its beneficiaries and is testimony of our commitment to SDG 11. Consistent with SDG 9, our innovative, cutting-edge technologies will soon benefit a major Municipal Corporation to augment its existing water treatment plant for increased capacity and quality requirements. Further aligning our business activities with SDG 1, 5 and 6, our ongoing projects with State Water Supply and Sanitation Mission, will enable us to cater to the water supply requirements of millions in the Varanasi and Aligarh districts of Uttar Pradesh. Awarded by the Sri Lankan Governmental Authority – National Water Supply & Drainage Board (NWSDB), Ion Exchange is at near completion of the Integrated Water Supply Project which includes designing, engineering, execution and O&M to help improve water supply in remote areas of Kalutara district in Sri Lanka.

In addition to industries, Ion Exchange's strong focus on offering water and wastewater treatment solutions to institutions, communities, municipalities and realty through developmental projects for drinking water supply schemes and distribution systems, sewage treatment and disposal, sea water intake and desalination and solid waste management including waste to energy projects, provides much needed 360° environment management solutions to augment water infrastructure across sectors.

Title: Framework for PPP in urban water supply– An introspection

Abstract:

Over the last two decades, several policy documents and pronouncements have reiterated the need to develop water supply projects with private sector participation (PSP).

The idea of PSP got a fresh impetus with the successful pilot projects for 24x7 water supply in the three towns of Karnataka – Hubli-Dharwad, Belgaum and Gulbarga. The success of the pilots led Indian cities to experiment with water PPPs.

It was also observed that water supply projects required higher viability gap funding (70% or more) than the prescription of GoI VGF guidelines (40%).

The launch of Jawaharlal Nehru National Urban Renewal Mission (JnNURM) provided grant of upto 70% of the project cost for cities with less than 1 million population. This helped cities design several PPP projects, but the success stories did not go beyond the three pilot projects of Karnataka of early 2000s.

The scale-up in retrospect seemed like higher jump than what Indian cities could achieve.

The failure of the PPP projects goes beyond the availability of finance or the willingness to pay on the part of the consumers such as risk distribution between parties. These challenges though continue to remain but can be surmounted. But what is holding back the idea of successfully mainstreaming PPPs in urban water supply is the institutional and governance structure of Indian cities.

This paper will introspect and provide a way forward for developing urban water supply projects and in the process redefine the role of the private sector calibrated to the needs to the sector.

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Improved Filtration Efficiency - Getting the most out of your Filters

Filtration efficiency, typically measured by Unit Filter Run Volume (UFRV), is a key metric by which we must evaluate an overall water treatment plant performance. Improvements in UFRV efficiency directly improve water utilities in several key ways; more water to distribute to customers, less waste to treat, and less energy used in production. Key advancements in filtration efficiency and UFRV have been made in recent years, this discussion will examine the technology and process changes to increase water treatment plant performance.

Matthew Roberts

Roberts Filter Group

AWMAIndia Association' s (AIA)

International Conference & Exhibition on Water, Reuse, and Sewage

5th & 6 December 2022 at TAJ Ganges Hotel Varanasi, U.P.

Author: GUIZANI Mokhtar (PhD.)

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Advanced technologies for sewage plants' operation optimization

Sewage plants' operation optimization is urgently needed to sustain plants' operation and reduce energy consumption. For this purpose, Nihon Suido Consultants (NSC) promotes several advanced technologies for plant' s operation optimization. As a New Energy-save Wastewater-treatment System (NEWS) optimization of reactor operation by dissolved oxygen (DO) control is considered as a key technology. The necessary sensors and control devices are combined to control the amount of air blown according to the nitrogen removal target, thereby realizing a reduction in electric power consumption. This technology is particularly well fit for the improved sequential batch reactor (SBR) where online $\text{NH}_4\text{-N}/\text{NO}_3\text{-N}$ sensors integrated with operation process automatic control program allows optimized operation of improved SBR and reduced energy consumption instead of timer operation. These optimum controls allow the reduction of the number of cycles to about 3 to 5 cycles in normal weather. In wet weather, the mode is changed to increase the number of cycles and to accept up to four times the amount of water.

And to enhance the automated control and optimization to reduce O&M costs, platforms for wide-area and centralized management of the treatment plants are now being introduced. These platforms operate on a cloud-based system, where wide range data are collected, for monitoring and control. Collected data are used for asset management as well. Then using Artificial Intelligence (AI), data are analyzed and used for plant diagnosis and full automated operation. It should be noticed that the platform can be used to operate several plants (sewage plants or water supply plants) at a time and monitored from a distant center, therefore achieving efficient water business operation.

Moreover, NSC is promoting the use of satellite real-time monitoring for plant operation optimization. Indeed, by acquiring weather information from small SAR (Synthetic Aperture Radar) satellite constellation and Real-time Detection of Flooded Area, it will be possible

for plant operators to implement more effective and preventive plant control activities as well as efficient and safe sewage treatment plant operation and pumping stations.

Water Reuse and Integrated catchment approach

Hrushikesh Sandhe PE LEED AP

Head of Infrastructure

Walter P Moore Engineering India

Unregulated development in urban centers is one of the major reasons for water loss to rivers and urban floods. Additionally, lack of maintenance of drainage system is topping the risk. Water Reuse and Flood disaster management needs to look at urban network and river system as integrated approach to identify mitigation solutions. The flash flood events are posing more risk to communities than flooding due to rivers.

Hence an Integrated catchment modeling is more realistic and appropriate to make sure design is resilient to any extreme event. In this process water balance, water reuse and drainage network behavior in combination with ultimate outfall to river system is analyzed to understand flood risk.

For any site level or city level study offsite runoff should be incorporated. The timing of this offsite runoff is going to be shorter than the back water from river flooding. During flash flood events the community or city is prone to get flooded sooner. Hence as part of design or evaluation process this should be considered, and the sizing of water storage with network should be done accordingly. Additionally, if onsite approaches such as ponds or underground tanks are used to store the runoff it will reduce urban flood risk too. But all this can only be evaluated if Integrated Approach is applied.

There are various tools and dynamic softwares available to represent this integrated catchment approach. We will be showcasing application of this approach to current Indian projects from various regions.

Paving the Future for Optimized Waste Water Treatment

Approximately 80% of water consumed by populace, comes out as waste water. For the longest possible time human kind discharged waste water into surface water bodies, lakes, rivers, sea. This made the environment completely untenable for the flora and fauna as well as end users who relied on various surface water sources. With passage of time, integrated sewer network connecting the last mile ensured that all waste water is collected and sent to treatment plants before disposal. From the age old ASP and SBR processes, technology moved to IFAS, FBAS, A2O+SBR (CSBR), MBBR or MBR. Conventional technologies consumed enormous space, smelled and aesthetically did not appeal. Advanced technologies took into account these and evolved. CSBR, FBAS or IFAS, integrated features from various technologies and ensured one step treatment for organic pollution. Adoption of these integrated technologies reduced footprint, odor and lowered capital expenditure due to lesser civil work, lower energy consumption etc. While technologies advanced, focus moved to resource recovery and what was thought to be of no use, became useful. Treated waste water is reused for various activities like construction, horticulture, cooling tower make up etc. Gas generated from treatment of sludge produced from waste water treatment became a conduit for electricity generation through gas run engines pushing towards a zero carbon footprint. The byproduct sludge is pre-processed to give it better consistency (30%+) to be reused as manure. Thus we can see once what was only to be disposed off, now has value and is reused.

Word Count excluding Title- 248

Move from Smart Water to Intelligent Water

Venkatraman Radhakrishnan

Smart Water has been a buzzword in our industry for the past few years and has been touted as the saviour or magic pill by many utilities and industry leaders. Tools like Hydraulic models, GIS, SCADA, AMI, etc have been implemented by many utilities but are not delivering the results as expected. Though these are smart tools with lots of specific uses, they are not “intelligent”

Intelligent Water is more than implementing digital tools to solve specific water problems. It is a holistic approach leveraging all the stakeholders, tools, and technology to arrive at human-centric solutions that last.

In this presentation, we will learn What really is “Intelligent Water”? How is different (or the same) as Smart Water? We will look at how we can include the Smart Water tools one already has to make “Intelligent” decisions and investments. We will look at the implementation of Intelligent Water techniques and tools in Asset Management. Do Digital Twins have a role to play in the world of Intelligent Water?

Topic: How BIM is beneficial in Optimizing, Coordination & Collaboration in Water Industry Projects!

Authors: Vishnu Chaitanya & Jaydeep Vekariya
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With substantial growth in population leading to Urban development, the infrastructure to supply water and recycle the wastewater has been a challenge for the urban municipalities. BIM has been a major tool for developing all the infrastructure projects. Use of such intelligent platforms in Water and Wastewater sector shall help in raising the quality of projects.

Building information modeling (BIM) is an intelligent software modeling process that architects, engineers, and contractors can use to collaborate on a building's design, construction, and operation.

In this presentation, we would like to demonstrate how we can use the latest digital tools like BIM (Building Information Model), CDE (Common Data Environment) more effectively to make project management in a real sense of agile. We will also demonstrate how BIM models can be utilized in design optimization, fast tracking the design activities, clash free designs, development of Construction sequencing and renderings. We will look at how a CDE became a game changer in the creation of collaborative environment in execution of large and complex water and wastewater projects.

OPTIMIZING WATER & WASTEWATER MANAGEMENT – THE IOT WAY!

Garima Mittal^{1*}, Chetan Chaudhari² & Kaajal Rai³

Abstract

Rapid urbanization and burgeoning global population have placed lot of stress on world's water supplies. The deteriorating water environment demands new technologies to achieve sustainable and smart management of urban water system. Hence, we need to start thinking SMART and incorporate platforms like IoT for water & wastewater management.

The SCADA systems used by most wastewater treatment plants today are outdated and inefficient in comparison, Internet of Things (IoT) solutions can deliver more efficient data collection that can be used to optimize system performance while ensuring safety. Treatment facilities can install smart sensors at different points to collect data on water quality, pressure changes, chemical levels, etc. A facility can optimize its treatment processes by ensuring that contaminants released don't exceed regulatory limits. High energy intensive pump data can reveal that a malfunctioned pump exerts more energy. This empowers plant managers to address malfunctioning machinery and improve operational efficiency.

Sensors send data via 3G connection to apps that give operators actionable data. Smartphones are also used to run instances of cloud-connected web applications connected to an EAM (Enterprise Asset Management)/ CMMS (Computerized Maintenance Management System). These systems display IoT sensor data in real-time, enabling few people to manage vast processes, increasing efficiency.

IoT with novel sensors, wireless communication, and smart control need to fast become part of water & wastewater management. 'Simple', 'Easily access data', 'Real-time control' are top 3 IoT's features which operators require. Hence IoT is poised to make plants safer, more efficient and with reduced operating costs.

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Innovative Applications of Surge Shaft for Inlet Pipeline from Dam, Suction Tank, and One Way Surge Tank for Rising Main

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Abstract: Raw water for the “95 MLd Amravati water supply scheme” abstracted by pipe from the Wardha dam is transmitted through 1200 mm diameter, 850 m long MS inlet pipeline, suction manifold, and suction pipes to 5 vertical turbine pumps with positive suction arrangement. Thus, the impounded reservoir practically functions as a sump. However, inlet pipeline is subjected to high water hammer pressure under power failure conditions due to pump stoppage and rapid changes in inflow velocity.

If burst occurs in the inlet pipeline, water in large quantity from impounded reservoir may flow out through the burst, potentially causing disastrous flooding of the downstream area. A 27 m high **surge shaft** of 700 mm diameter was provided adjacent to the pumping station for protection of inlet pipeline.

Similarly, 18 MLd rural water scheme for 70 villages was implemented with the same inlet pipeline and positive suction for separate pumping installation. Controlled water hammer pressure in inlet pipeline for increased flow was checked and found to be within safe limit. Piping arrangement was made such that the **surge shaft** can also be function as **suction tank** for positive suction of new pumps.

The surge analysis shows that entire 5000 m long rising main is subjected to sub atmospheric pressures and high-water hammer pressures. The **surge shaft** can also be used as **one way surge tank** for protection of the rising main from sub atmospheric pressures and consequent reduced overpressure.

The **surge shaft** is thus, serving as a **water hammer control device, suction tank and one way surge tank** for inlet pipeline, pumps and rising main respectively.

Key words: positive suction, water hammer, sub atmospheric, surge

Paper for the Conference - “TOTAL WATER SOLUTIONS” to be held at Varanasi

TITLE : **Issues of Significance in converting Intermittent Water Supply Systems to 24/7 Continuously Pressurised Water Supply Systems**

AUTHOR : **M M Pandit (Member No 03506444)**

ABSTRACT

It is since the year 2001 that there are efforts for converting the intermittent water supply systems of metropolitan and other cities in India to 24/7 continuously pressurised water supply systems. Such continuously pressurised systems are those ideally desired for providing the best of the services of water supply. However, the efforts in India have till now a bit far away from the objective being set. Some of the challenges are of adequacy of sources, workmanship of those executing the works in the field, selection of appropriate materials to support the objectives, right directions in planning, designing & implementation, Non-Revenue Water Management and its impact, planning & implementing a data collection & remote monitoring system with state-of-the-art equipment & data science, sustained monitoring of the system developed and being operated, lack of sustained support by consumers in achieving objectives etc. This article looks into the efforts, of the water authorities & their partners in development, that have gone into in past two decades with externally funded projects and tries to look for the issues that have been of importance and how these obstacles can be annihilated and the objective achieved.

Modelling and Simulation Application

These days, for efficient implementation of 24x7 water supply projects, hydraulic modelling has become an integral part. However, engineers using the software shall understand that it is only the **tool** designed to assist with hydraulic analysis. Since, simulation results are governed by the inputs, hence we should be well aware of all the inputs data and its authentication.

Indeed it is more crucial to understand the modelling tool, when it is used to design the system which is expected to operate intermittently. To understand how the modelling tool functions and best interpretation of the simulation results, engineers operating intermittent water supply system shall think over the hydraulic concept of intermittent supply to understand the hydraulic modelling procedures.

Thus, it is very essential to understand the basic concept of the modelling, especially when system are operated intermittently.

- Modelling software's assume that all pipes are pressurised.
- Customer demand is volumetric base, independent of pressure.
- Software do not consider time to recharge the pipe.
- Flow of water is governed by the head difference, rather than elevation difference.

Modelling software are very strong mathematical tools; interaction between fluid and surrounding is interlinked with different mathematical equations. Some typical models are: Average Day Demand, Average Day Calibrated, Maximum Day Demand, Future Maximum Day and Fire Flow.

Models can be used for various studies: Master Planning, New System Design, Analysis Storage Capacity, Water Quality Investigations, Daily Operation, Fire Protection Studies, Pressure Management, Leakage Analysis, Mains Rehabilitation, Mains Replacement and many more.

Floating Reservoirs for Pressure Improvement in 24x7 Water Supply Networks

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ABSTRACT

Elevated Reservoirs are provided in water distribution networks to facilitate supply of water by gravity and achieve equitable supply to consumers through number of reservoirs located at different places in the city. However, there is always a restriction on height of the reservoir. Each reservoir is usually a command area. With aging, the existing WDN may not be able to satisfy the requirement of consumers at enough pressures and consumers far away from the reservoirs experiences low pressure problems, especially during the peak periods. In such a case, a WDN augmentation of network is necessary. Pressure can be improved either by providing boosters, replacement of old pipes and additional parallel pipelines, cleaning and relining of pipes and/or by providing additional reservoir on the downstream side of the WDN that will be floating on the network. This paper discusses on various alternatives for improvement in nodal pressure and focusses on the provision of floating reservoirs. Main objective of floating reservoir is to store water during non-peak period and supply water during peak demand period to improve pressures and thus ensuring continuous supply at minimum required pressure. A case study of redesign of existing WDN is considered for illustration.

New generation composite membranes for energy-efficient heavy metal removal for water reuse

Utkarsh Misra^{1,2*}, Najmul Haque Barbhuiya¹, Swatantra P. Singh^{1,2†}

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Abstract:

Membranes are efficient, compact, and reliable for the treatment of water-wastewater and seawater. Fouling, scaling, and biofilm formation on the membrane surface are one of the major drawbacks of membrane technology. Due to these the output of the membranes reduce and the performance degrades overtime. Incorporating nanomaterials, hydrophilic additives, and surface modification are suggested approaches to mitigate these problems. New generation membrane technology utilizes a small electrical potential across the membrane to improve membrane filtration performance and output over time through Donnan exclusion, local pH modification, and reactive oxygen species generation. Laser-Induced Graphene (LIG) is a novel material fabricated through a facile and single step process. It has some extraordinary properties like conductive, antimicrobial and antibiofouling properties. Incorporation of LIG in the membrane makes the membrane electrically conductive, here in this paper, we have demonstrated laser-induced graphene-based novel electrically conductive composite membranes. The membranes are tested for flux and BSA rejection, along with the enhanced performance for charged heavy metal ion removal under a small applied potential. The fabricated membranes showed an improved metal removal with good antifouling properties. This electrically conductive membrane can further be used in wastewater treatment train to degrade and reject emerging contaminants and improve the pure water quality.

Keywords: Laser-induced graphene (LIG), electroconductive membranes, composite membranes, Electrochemical filtration, and water reuses