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AICE23

2ND ANNUAL INTERNATIONAL CONFERENCE & EXHIBITION 2023

"WATER SECURITY & SUSTAINABILITY"

OCTOBER, 6 & 7, 2023

AT THE LALIT HOTEL, JAIPUR

PUBLICATION OF ABSTRACTS

TABLE OF CONTENTS

1. INTRODUCTION – AWWAINDIA ASSOCIATION
2. ABSTRACTS

S. No.	Name of the author	Topic of the abstract
DAY ONE – 6th October 2023		
1.	Dr. Dhinadhayalan, Advisor, CPHEEO (INVITED)	24X7 Water Supply AMRUT Mission
2.	Dr. Colin Chung, Kayuga Solutions USA	Importance of Asset Management in 24x7 Water Supply Systems for reliability & Resiliency
3.	Dr. Dharmendra Gill – HP, Jal Shakti Vibhag	Challenges in transformation of intermittent supply into 24x7 water supply
4.	Mr. Aniruddha Mishra, CEO Rarean Fluid-Tech Pvt Ltd	Achieving 24x7 water supply with PE pipes
5.	Mr. Bhavesh Kumar, ADB	Building water resilience - ADB's role and Contributions
6.	Ms. Isabelle Bardem, Chief, UNICEF Rajasthan State Office	Need for Inclusion Equity and Gender lens in Achieving Water Security and Sustainability
7.	Mr. Matt Robert - Robert Filters, USA	High-Rate Treatment A Case Study in Saving Space & Capital
8.	Mr. Vivek Kapadia – Rtd Director, Water Resource Department	Roles Of Water Professional in taking up challenges posed by climate change
9.	Blessing Isaiah, Mott McDonald	The Role Of Women In Water Management - Empowering Agents Of Suitable Development
10.	Susan Franceschi, Chief Membership Officer, AWWA	DEI in America and global water industry
11.	Adress by Punita, CPHEEO - Women in Water	Navigating Challenges, Forging Solutions
12.	Adress by Mrs. Shipra, PHED Rajasthan	Role of Women in Water Management - Case study of PHED Rajasthan
13.	Ms. Garima Mittal, Black & Veatch	Sustainable Water

	Pvt Ltd	Management: IoT & AI to Reduce NRW and Combat Water Pollution
14.	Mr. Bodhisattwa Dasgupta, JWIL	Achieving 24x7 Water Supply – Helping India Achieve 24x7 Water Supply Service
15.	Mr. Agam Mathur, MD STS	Challenges & Mitigation Measures In Implementing 24x7 Water Supply Service
16.	Mr. Snehalkumar Bokare, Bentley	Digital Twins for Water Infrastructure - A Sustainable Approach to Climate Change and Achieving Sustainable Development Goals with operational excellence
17.	Patrik Franklin, Aqua Metrology USA Case Study	On-site Generated Reagents for the Removal of Heavy Metals
18.	Dr Uday Kelkar, NJS Global, Japan	Evaluating the sustainability of direct potable reuse from Advance Tertiary Treatment of wastewater to meet United Nations SD6 Goal
19.	Mr. Anil Rai – AECOM	Treatment Plant Design Using Advanced Stimulation Technique – A Review
20.	Owais Farooqi – Black & Veatch Pvt Ltd	Digital Transformation Of Water Loss Control
DAY TWO – 7th October 2023		
1.	Praveen Ankodia – RUIDP, Jaipur	24x7 Water Supply sustainable and institutional Reforms
2.	Mr. K B Singh, Chair, ASME Pipeline India Chapter	Technologies for Internal / External Corrosion Protection of Carbon Steel Water Pipelines – coatings and Cathodic Protection for as Sustainable Environment
3.	Mr. Hrushikesh Sandhe, Walter P Moore	Low Impact Development and integrated catchment approach

4.	Mr. Abhinav Patel, Aqua Pumps	Submerged Centrifugal Pumpsets (SCF), an Evolved Technology
5.	Ms. Deshpande M, Motts India	Our Water Projects & Carbon Emission – Can We Reduce The Impact
6.	Ms. Akansha Srivastava, HBTU Kanpur	Application of MOORA MCDM to carry out benchmarking of Indian water utilities
7.	Mr. Satish Jain, SE, PHED Rajasthan	Water Conservation
8.	Mr. Chandra Mohan MS – Pump Academy Pvt Ltd	An Artificial Intelligence (AI) enabled Internet of Things (IoT) based water pump station monitoring and management system with predictive maintenance system.
9.	Ms. Kato Maria, JICA, India Office	Integrated Water Resource Management and JICA's activity in India
10.	Mr. Joseph Ravikumar, Independent water & sanitation specialist	Chennai's reuse attempts to improve water availability and become water Source.
11.	Mrs. Maheshwari, Department of Biosciences, Manipal University Jaipur	Integrating Constructed Wetland with Microbial Desalination System for Effective Reverse Osmosis Reject Water Management.
12.	Ms. Sangeeta Gupta, Jacobs	Enhancing Water Resiliency - A Case Study on Recycled Water for Sustainable Development of Industrial Areas in Maharashtra
13.	Mr. Wadhwane, Water Utility Management Professional	Design & Implementation of 5 MLD & 7.5 MLD Tertiary Treatment Plant Projects for NMMC to recycle and reuse and secondary treated sewage.
14.	Mrs. Parul Goel, NJSEI	Wastewater Sludge (bio-solids) Management in Delhi

15.	Ms. Nishmitha, Central University, Kerla	Optimization of Waterborne Pathogens by Ozonation
16.	Mr. Dheerendra Rajpurohit, M.B.M University	A Review Study on removal of Nitrate by Adsorption Process using various natural and modified organic substrates.
17.	Ms. Lalita Solanki, M.B.M University	A Study on removal of Fluoride from groundwater by Adsorption Technology
18.	Mr. Shyam Lal Choudhary, M.B.M University	Water Quality Prediction by Artificial Intelligence Techniques - A Review

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 2nd Annual Internation Conference & Exhibition in October, 2023 at Jaipur on the topic “Water Security & Sustainability” which was attended by more than 300 water professionals from various sectors.

ABSTRACTS

ROLE OF WATER PROFESSIONALS IN TAKING UP CHALLENGES POSED BY CLIMATE CHANGE

Vivek Kapadia[1]

ABSTRACT

Climate change has posed many threats including extreme floods that may cause huge damages to the existing dams and draughts that may lead to economic and social consequences. Extreme events were earlier not unknown to the water professionals but their frequencies and severities were not as high as what today the world is facing. Role of water professionals has become quite challenging from several aspects as the time for preparation to respond to the crisis in not sufficient and predictability of the crisis is yet an issue in spite of development of advanced meteorological models. Uncertainty is the most critical element in extremity handling that makes the Water Resource Management (WRM) the most challenging.

Strategies for deficit management are much different from those meant for surplus management in the field of WRM. They require engineering and economic interventions. Not only the infrastructural adaption measures but also the institutional preparedness require different sorts of interventions in case of different types of extremities. Revision of hydrology of basins, creating storage potentials and their utilization, flood control measures, demand management, groundwater governance, etc. are the technical and administrative measures to be rolled out to adapt to the climate change. Institutional and economic measures must go in congruence. All such tasks to be handled with an element of balancing in conflicting situations require a great vision and a special skillset to maintain the liveability of a particular regional canvas. As the problem definition and constraints of a particular regional canvas would be different from others, copying some other's solution would not work. Thus, uniqueness of solution demands originality and creativity in a way while its formulating.

This paper discusses with some examples of Gujarat State of India as to how difficult is the role of water professionals in wake of climate change and what type of strategies are required for adapting to it and mitigating its effects. Emerging need of water experts in the coming time is also underlined with an objective of gearing up the world for combating upcoming challenges.

Key Words : *Climate change, Deficit, Extremities, Surplus, Water Resource Management*

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The Role of Women in Water Management: Empowering Agents of Sustainable Development

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ABSTRACT

Water management is a critical global challenge, impacting various aspects of human well-being and sustainable development. The active participation of women in water management is essential for achieving equitable and sustainable outcomes. This paper explores the multifaceted roles of women in water management, highlighting their contributions, challenges, and the importance of their inclusion in decision-making processes. The paper is substantiated by some of the contributions of women who have led change in the water discipline in the engineering sector. It also examines the potential benefits of empowering women in water management and identifies strategies to enhance their participation and leadership in this domain. By acknowledging the role of women as agents of change in water management, we can foster inclusive and resilient societies while achieving water security and sustainable development goals.

Keywords: Women, water management, empowerment, participation, gender equality.

Sustainable Water Management: IoT & AI to Reduce NRW and Combat Water Pollution!

Garima Mittal[1*]

Abstract

Internet of Things (IoT) and Artificial Intelligence (AI) are revolutionizing the way we manage water resources. By leveraging power of IoT and AI, we can better track water usage, detect leaks, and reduce Non-Revenue Water (NRW) losses. Additionally, these technologies help us manage water pollution more effectively by identifying and addressing sources of contamination.

For NRW reduction, IoT sensors are installed throughout the water distribution network to track water flow and detect leaks in real-time. AI algorithms analyze this data to pinpoint location of leaks and predict areas where leaks are likely to occur. This allows water utilities to take proactive measures to repair leaks before they become major issues, reducing both water loss and cost of repairs.

Similarly, IoT sensors are used to monitor water quality and detect pollution in real-time. This information fed into AI models, identifies sources of pollution, and suggests mitigation measures. AI algorithms also analyze data from sensors placed in rivers and lakes to identify sources of pollution including agricultural runoff or industrial discharge. This information helps inform policymakers on how to reduce pollution and protect water resources.

These technologies also help in managing wastewater treatment plants. IoT sensors monitor water flow and chemical levels, while AI algorithms optimize treatment process to reduce energy consumption and improve treatment efficiency.

IoT and AI are powerful tools in fight against NRW and water pollution. By leveraging these technologies, water authorities can improve operational efficiency, reduce water loss, mitigate pollution incidents, and ensure sustainable use of water resources.

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Evaluating the sustainability of Direct Potable Reuse from Advance Tertiary Treatment of wastewater to meet United Nations SDG6 Goal

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Right from the beginning the impoundage, piped water supply and long conveyance system bringing water by gravity have remained the unique characteristic of Mumbai's water supply. Rapid population growth has, necessitated repeated augmentation of water supply to keep pace with the demand. Erratic and delayed rainfall on account of climate change results in depleted storage in the lakes till onset of monsoon forces Birhanmumbai Municipal Corporation (BMC) to make a 15 – 20% cut in the daily water supply during pre-monsoon period to tide over the reduced water availability. Over the past decade, there have been several deliberations and discussions within the BMC engineering wing, municipal administration, and Government of Maharashtra, to look for and pilot alternative sources of water, to meet the growing water demand, and if found feasible and sustainable to scale the pilot to increase water availability, build resilience and make the city water secure.

The initial feasibility report and/or plan prepared in 2007, and then in 2010, looked at various options including identifying additional locations for new reservoirs/lakes, transferring water through linking of rivers, desalination and direct potable reuse (DPR) project to augment existing drinking water supply by 2030, while maintaining the required water supply throughout the year in meeting the Sustainable Development Goal 6 (SDG 6).

The primary objective of this unique and first-of-its-kind in India project is to establish a 12 MLD full scale advanced tertiary treatment facility (ATTF) as well as a 0.1 MLD pilot ATTF facility (mounted inside a Trailor) at its 37 MLD existing wastewater treatment facility (WwTF) at Colaba, Mumbai. It is envisaged that in the future, the 0.1 MLD pilot facility can be moved to various wastewater treatment plant locations in Mumbai to experiment and develop new approaches. The DPR project will have a treatment process based on worldwide practices and will consist of Ozone, GAC/BAC, Ultra Filtration, Reverse Osmosis, Ultraviolet disinfection, remineralisation facility with chlorine for distribution residual management to meet the multi-barrier approach for mitigating risks associated with physical, chemical and biological while producing water of drinkable quality. Apart from technical and engineering designs and construction, this project also envisages extensive public awareness campaigns to remove the stigma of reusing of wastewater for potable applications.

This paper presentation will provide current worldwide experiences in developing and implementing the Direct Potable Reuse Project(s) as well as various treatment scenarios being adapted for removing various contaminants and how these will be adapted in Mumbai's pilot project based on extensive water quality analysis. This presentation will also discuss how the selected treatment process at Mumbai's pilot plant will explore to mitigate removal of emerging contaminant of concern, the per-and polyfluoroalkyl substances (PFAS) being considered for regulation in drinking water in USA, Europe and other countries.

Energy neutral wastewater treatment plant design using advanced simulation technique – A review

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Abstract

Wastewater treatment plants are typical case of water-energy exchanges. With stringent effluent quality requirements and rapidly increasing number of wastewater treatment plants, the issue of energy efficiency in wastewater treatment plants has been drawing rapid attention across the globe. Energy consumption in wastewater treatment plants has been a major concern and contributes to the top two or three item in operation and maintenance of wastewater utility budget. Over the years various development has been witnessed for creating energy positive schemes along with alternatives like energy conservation, on-site generation, and renewable energy to meet higher standards of wastewater treatment. The practical possibility of achieving energy efficient water treatment is being stressed by technological advances in combination with operating best practices.

This paper presents an application of advanced simulation technique to improve understanding of the difficult interaction between wastewater quality and energy consumption in wastewater treatment plants. Steady state model is developed and calibrated to predict the plant performance and evaluate the potential for reduction in net energy required. This study of highlighting the benefits of advanced simulation-based approach provides a platform to ULB's and policy makers to make decisions to build new wastewater treatment plant as well as upgrade the existing wastewater treatment plants and achieve sustainable wastewater treatment.

Keywords – Wastewater treatment plant; simulation; modeling; energy consumption; BioWin; Membrane Bio Reactor.

AWWAIndia Association's (AIA)
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Digital Transformation of Water Loss Control: Enabling the Drive Toward 24/7 Supply

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Leveraging decades of water loss control experience worldwide, this presentation outlines case examples utilizing software tools integrated with metering and acoustic leakage detection sensors. The focus of this session is on the development of the state-of-the-art water loss evaluation and management programs.

The real-world utility program discussed here integrated SCADA data from the utility distribution system along with the automatic data feed from a large DMA consisting of about 12,000 customer connections and master meters already installed in the system. This data was then used to develop automated water audit calculations viewable through custom reporting dashboards, all following the standard methods defined in AWWA Manual M36.

Relevant data sets were segregated, then the water audit calculations and dashboards were defined and programmed into the system. The results are automatically updated daily as the data is reported from the Advanced Metering Infrastructure (AMI) system. Water supply, water consumption, and water loss metrics were calculated at hourly and daily intervals to identify and quantify the areas with the highest amount of water loss. These results were used to more efficiently dispatch their ground-based leakage detection teams to locate points of leakage. This system was used on a 24/7 supply, but the methods and processes are just as applicable for intermittent supply systems.

This presentation outlines the digital transformation of the utility from reactive leakage detection through to fully automated analysis of system water losses including assessment of apparent losses (meter error, theft of service, etc.). The initial configuration of the system and software, through to

the reporting, targeted leakage detection and monitored return on investment will also be discussed. Utilization of this tool to follow MoHUA guidelines for 24x7 water supply will be assessed.

24x7 Water Supply – Sustainability and Institutional Reforms

Numerous projects with the aim of achieving a continuous 24x7 water supply has been taken up in various urban cities, supported by initiatives such as the Atal Mission for Rejuvenation and Urban Transformation (AMRUT), Smart Cities Mission, and external funding sources. The primary objective of these projects is to ensure that citizens always have access to safe and potable drinking water. They focus on enhancing water infrastructure, distribution networks, and management practices to optimize water supply system and ensuring safe and committed drinking water. While challenges may arise during the implementation and commissioning of these systems, the ultimate challenge lies in ensuring the long-term sustainability of these projects.

Achieving sustainable 24x7 water supply necessitates a persistent commitment from multiple stakeholders, including government agencies, service providers, communities, and private sector entities. Institutional reforms, coupled with technical solutions and active community participation, play a pivotal role in securing the enduring success of 24x7 water supply. In this context, comprehensive investigations into resource management, water demand and consumption patterns, reduction of non-revenue water, institutional framework enhancements, policy formulation, capacity building initiatives, and community engagement efforts are imperative to establish a robust foundation for long term sustainability of 24x7 water supply system.

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TECHNOLOGIES FOR INTERNAL / EXTERNAL CORROSION PROTECTION OF CARBON STEEL WATER PIPELINES - COATINGS & CATHODIC PROTECTION FOR A SUSTAINABLE ENVIRONMENT

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Present Chair: ASME Pipeline India Chapter – 2022-2024

ABSTRACT

Sustainability is the capacity to endure. In large measure, the longer something lasts, the more sustainable it is. Therefore, the less we have to replace infrastructure over time, the fewer greenhouse gases emitted from construction, the fewer resources consumed, etc. This is not the case when a country has to replace steel water pipelines within a span a 20 to 30 years. The choice of pipes material in a water distribution network for bulk transmission of water is oriented by the design conditions based on hydraulic, pressure, geological, static and economic evaluations and still the best choice of material is carbon steel. However carbon steel in contact with soil (external) and water (inside) both electrolytic conductive medium corrodes. To prevent corrosion, external and internal coatings have to be applied to steel surface. There are many external & internal coatings / linings as recommended by American Water Works Association (AWWA) in AWWA M11 Manual for design, installation, and maintenance of steel water pipe and fittings for potable water service. The external coatings recommended are Extruded polyethylene coatings, Fusion bond epoxy coatings, Liquid high build expoxy coatings, Polyolefin tape coatings, Polyurethane coatings Cement mortar and Coal tar coatings. The internal linings recommended are – Epoxy linings, polyurethane lining, fusion epoxy bond lining and cement mortar lining.

Each coating has a unique functional properties to prevent corrosion and is a complex subject for correct selection of the coating / lining to prevent leaks in the water system for a sustainable environment.

The coatings / linings have to sustain for the design life of the water pipeline system which today in modern world is +50 years to prevent leakages and environmental damages. This paper describes the advantages and disadvantages of various coating systems being used by various states in India thru case studies and recommends the best coating / lining system for main pipelines, girth weld joints and specials both for external / internal surfaces of pipelines in conjunction with or without cathodic protection.

Lom Impact Development and Integrated Catchment Approach

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Water management for reuse or infiltration is one of the sustainable aspects of design. But if water management is evaluated in isolation of flood risk than the design for site or any facility will not be resilient. With climate change impacts and increased rainfall intensities its very critical that water management solutions are evaluated from a flood risk management perspective.

The traditional approach of collecting rainwater through a drainage network and discharging to a river is not a sustainable and effective solution. It is often useful to maximize the infiltration capacity of a site at the source of flooding. Thus, practices such as low-impact development (LID) have frequently been suggested as adaptation strategies to local climate change. Recently there has been a lot of high intensity small duration events, which surcharge drainage systems or sometimes floods streams and rivers too. The potential effects of LID can be useful to mitigate or reduce the effects of such flash flood events. The site discharge should be controlled to pre-development quantities as practically possible. Additionally, instead of looking at solutions only at the site level, a holistic watershed-based approach will be more effective.

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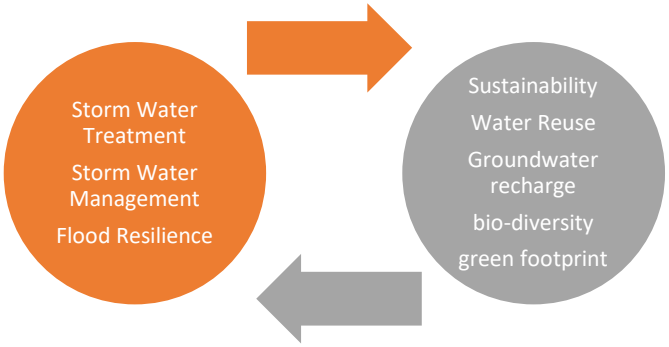

Figure 1 : Water Recharge, Reuse and Sustainability

GIS technology can be used to interpret site survey data, onsite and offsite, utility mapping, critical structures identification based on Aerial images, site elevation gradation etc. The hydrologic calculations such as catchment delineation, time of concentration, flow direction etc can be developed using GIS tools.

GIS tools can be used for catchment delineations for the site, which will help calculate runoff quantities onsite and offsite. Based on the runoff quantities within property boundaries and contour data, GIS tools can help to identify locations for Low Impact Development solutions.

Infiltration Trench

Bioretention

Permeable Pavers

Storage Tank

Low impact development implementation also helps exhibit environmental and social awareness responsibility. These solutions help to alleviate Flood Risk by reducing peak flow using infiltration techniques, improves groundwater recharge, and reducing dependency on public water. The opportunity of increasing Water Sustainability increases using such nature-based solutions.

Abstract for Technical Paper for International Conference and Exhibition on 6th & 7th Oct'2023 at Jaipur, organised by AWWA India.

TITLE

Submerged Centrifugal Pumpsets (SCF), an Evolved Technology.

Related / Potential Topics

1. Achieving and Implementing 24x7 Water Supply.
2. Climate Change & Water.
3. Water Technology.

ABSTRACT:-

The evolution of Submerged Centrifugal Pumpsets has resulted in very effective Pumping solution. These pumpsets are not only suitable for emergency conditions but most suitable for regular water supply applications also. Some projects executed with SCF Pumpsets have been referred as Engineering Marvels by users.

These Pumpsets are unique choice for 24x7 applications, as these applications involve VFD's. The absence of coupling in SCF pumpsets, their inherent cooling by water immersion, extremely safe critical speed etc. make these pumpsets as most suitable for VFD applications. LT and HT SCF Pumpsets including VFD applications, have been successfully operating in field for quite a few years.

Climate change has resulted in large floods in many areas. SCF Pumpsets can best cater to the applications of flood control & storm water drainage etc.

Some salient features of SCF Pumpsets are as below:

a. Most Compatible for 24x7 VFD applications.
b. Economical Life Cycle Cost, as they save space & cost of pump room and run with optimum system efficiency.
c. Eliminate Suction Piping and hence no corresponding Frictional Losses.
d. Reduce maintenance costs, with longer durations of mean time between overhauls and grease refilling.
e. Lesser Consumables.
f. Have optimum Wire to Water Energy Costs.

There have been many innovations in Submerged Centrifugal Pumpsets, like Tubular Pumpsets for large discharge medium Heads or Elbow Pumps etc. These are application specific solutions and have resulted in many end user advantages. Large Submersible Pumpsets of more than 2000 HP, 6.6KV are already manufactured and tested in India.

This paper describes the Technology, its field applications and benefits of technology & product, availed by end users.

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Integrating Constructed Wetland with Microbial Desalination System for Effective Reverse Osmosis Reject Water Management

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Abstract

Reverse Osmosis technology is a versatile and efficient method for water purification and has played a significant role in addressing water scarcity and providing access to safe and clean water in various sectors and regions worldwide. Despite wide use and significance of RO technology, managing the RO reject stream can be challenging, as it requires careful consideration to prevent environmental pollution and find sustainable disposal or reuse solutions. The highly saline reject water must be handled effectively to prevent groundwater contamination, environmental pollution and health risks over a longer time period. Thus, researchers and engineers are continuously working to develop innovative and eco-friendly methods for RO reject management, ensuring efficient water purification while minimizing the adverse environmental impacts. In this direction, deployment of an integrated Constructed Wetland (CW) with Microbial Desalination Cell (MDC) for the reject water management could be a viable solution. Integrating traditional CW technology with modern MDC technology will provide salient features like relieving the stress of salt ions on microorganisms and plants, improving CW's efficiency, and increasing water conductivity and power generation efficiency, which would further enhance the system's performance. Such an integrated system would deliver an extended scope of CW-MDC to reuse water resources.

Keywords: Reverse Osmosis Reject Management; renewable; Constructed Wetland; Microbial Desalination Cell.

Abstract

Enhancing Water Resiliency : A Case Study on Recycled Water for Sustainable Development of Industrial Areas in Maharashtra

Authors: Sangeeta Gupta[1], Vinod Singh[2] and xxx[3]

Maharashtra, a highly urbanized and industrialized region of India, has historically faced significant challenges due to its sole dependence on monsoon rains. Severe water shortages, including a prolonged drought, have compelled the State Government to even deliver the drinking water through railway tankers to certain areas. Also , industrial areas have experienced up to a 40 percent reduction in regular water supply, negatively impacting industrial production.

Recognizing the crucial role of water in sustaining industries and its direct impact on employment and revenue generation, the Maharashtra State Government took determined steps to address the water shortage challenge now and future due to expected impact of climate change. Their primary objective was to ensure that water availability does not become a critical constraint for industrial operations and build water resiliency measures to safeguard industrial output, even during drought periods when industries often receive lower priority compared to other water users.

Inspired by Singapore's successful water recycling (NEWater) program, the Maharashtra Industrial Development Corporation (MIDC) initiated a sustainable water strategy for various MIDC industrial areas in 2017. To achieve this ambitious goal, MIDC partnered with Jacobs to develop a comprehensive water resiliency plan through the recycling and reuse of water from the selected Common Effluent Treatment Plants (CETPs).

Project involved rehabilitation, upgrade and expansion of 10 existing brownfield CETPs across Maharashtra and 3 CETPs in greenfield areas based on advanced recycle technologies. Most of the CETPs in brownfield areas faced challenges such as not meeting effluent discharge standards, lacking redundancy, using outdated treatment technology, and experiencing leakage incidents leading to color and odor issues. These issues were addressed by implementing appropriate rehabilitation, upgrades, or expansions to ensure compliance with discharge standards. The upgraded plants are now compliant with the discharge standards and plan to be upgraded into recycling plants in the next phase. For greenfield areas advanced treatment technology was provided that enabled CETP to produce the recycled water suitable for non-potable applications in industries. This paper also presents the specific case study for Taloja CETP that has been successfully rehabilitated, upgraded and expanded under the above programme.

This project stands as the largest rehabilitation and upgrade initiative undertaken by MIDC to date. The collaboration between MIDC and Jacobs, drawing inspiration from Singapore's experience, showcased a commitment to address water scarcity issues and related risks to manufacturer. The success of this breakthrough initiative resulting in increased water resiliency continue to attract industries and , preserving employment opportunities and securing investment and revenue for the state. Additionally, it serves as a model for similar ventures in other industrial areas nationwide, providing a blueprint that benefits industries, societies, and the environment.

Key Words: Water resiliency, recycle and reuse, common effluent treatment plant (CETP).

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Abstract for
AWWA India ASSOCIATION'S (AIA) INTERNATIONAL CONFERENCE & EXHIBITION ON WATER SECURITY AND SUSTAINABILITY, 6th & 7th OCTOBER 2023 AT HOTEL LALIT, JAIPUR, RAJ.

Title: Wastewater Sludge (bio-solids) Management in Delhi

Authors: Parul Goel, Sanjay Kumar Guleria, Sagar Kohli, Uday Kelkar (Ph.D., P.E., BCEE), NJS Engineers India Pvt. Ltd.

Category: Water Pollution and Quality: Addressing challenges related to water pollution

Sludge management is one of the most difficult and challenging tasks of wastewater treatment plants due to its high water content and poor dewaterability. 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. Till date, due importance has not been given to this activity in the STPs. Due to improper management of this sludge at most of the existing plants, it somehow finds its way back to the waterbodies and leads to water pollution; thereby defeating the entire purpose of separating these solids from wastewater.

Given the challenges in sludge disposal, there is a need for a comprehensive sludge management plan. This paper will present the outcome of the current project of sludge management for Delhi Jal Board. As a part of the sludge management strategy for reuse of these bio-solids, the project involved assessment of available technologies, market interactions to explore possible end-use specific to Delhi location, sludge testing and analysis, and how reuse of sludge could be benefited through circular economy.

Considering the features of a metropolitan city like Delhi where the quantum of sludge is huge, land resource is limited and there is no agricultural land in the vicinity; the most preferred option of composting the sludge and using as fertilizer is not economically feasible and hence not recommended. Hence, the solution leading to significant sludge volume reduction will be most feasible, e.g. thermal treatment (like gasification and torrefaction). Moreover, the method should be self-sustainable – either in terms of meeting its auxiliary fuel requirement or producing an end-product which is saleable to recover its operational / transportation expenses. The aim should be that only end-product (of sludge) shall leave the STP premises and not the sludge.

Optimization of Waterborne Pathogens by Ozonation

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Waterborne pathogens, including *Klebsiella pneumoniae* and *Shigella sonnei*, pose substantial threats to public health, necessitating robust disinfection strategies for safe drinking water. This study aims to determine the optimal parameters of ozonation, particularly pH and time, for the efficient inactivation and elimination of these pathogens from water. The confirmation of pathogen inactivation is comprehensively carried out through advanced techniques, including flow cytometry, scanning electron microscopy (SEM), and transmission electron microscopy (TEM).

A Response Surface Methodology (RSM) is employed to design a series of experiments, varying the pH and ozonation time, and assessing their combined impact on pathogen inactivation. RSM allows for the identification of the optimal parameter settings that maximize the efficiency of the ozonation process while minimizing the required ozone dosage. Using flow cytometry, pathogen viability and ozone efficiency are assessed in real-time. SEM and TEM techniques visualize morphological changes in treated cells, unraveling the inactivation mechanism. Optimal ozone conditions are identified, enhancing water treatment and public health protection.

By integrating the results from RSM, flow cytometry, SEM, and TEM, this study comprehensively characterizes the relationship between pH, time, and pathogen inactivation efficacy during ozonation. The confirmed optimal ozonation parameters derived from RSM are crucial for the successful elimination of *Klebsiella pneumoniae* and *Shigella sonnei* from water, ensuring the delivery of safe and potable water to the public. This research provides invaluable insights for water treatment, policymakers, and researchers combating waterborne pathogens.

Keywords

Flow cytometry, *Klebsiella pneumoniae*, Ozonation, Response Surface Methodology, *Shigella sonnei*

A Review Study on removal of Nitrate by Adsorption Process using various natural and modified organic substrates.

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Abstract

In the world, nitrate is probably the most widespread groundwater contaminant, posing a serious health risk and contributing to eutrophication due its high water solubility. As a treatment technology for nitrate removal, adsorption has been explored extensively and offers satisfactorily results especially when using minerals and/or Modified surfaces as adsorbents. In this Paper, literature reviews have been conducted in an effort to compile an extensive list of various adsorbents for nitrate removal available in various literatures, along with highlighting and discussing key advances in the preparation of novel adsorbents, tested for nitrate removal.

Removal of nitrate with organic substrates viz cotton, newspaper, cotton coir, wheat straw, local clay, granular chitosan-Fe^{3+} beads, amine grafted cotton seed fodder, amine modified cocoa shell, bamboo based biochar is also studied and this study aims at analyzing the studies done so far for nitrate removal at optimum level. A consideration to electro chemical adsorption and nitrate absorbing plants and flora is also given to aim at nitrate removal through modifications of the methods.

Keywords: *Nitrate Removal, adsorption, organic substrates, electro chemical adsorption, denitrifying flora and fauna etc.*

A Study on removal of Fluoride from groundwater by Adsorption Technology

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Abstract

Fluoride is electronegative element and rarely occurs free in nature. it generally combines with other elements to form fluorides and normally found as the fluoride ion (F^-) in minerals. Contamination due to presence of fluoride in excess in ground water is a serious problem well recognized worldwide. Fluoride content above permissible limit is responsible for human dental and skeletal fluorosis. Various water treatment processes are in practice for fluoride removal such as coagulation – precipitation, membrane separation processes, ion exchange, electro-dialysis and adsorption process etc. among these technologies adsorption process is widely explored and offers satisfactory results especially mineral based and novel bio adsorbents.

The paper presents a compilation of defluoridation capacities of various adsorbents from literature search and review. Adsorption capacities under various conditions like pH, initial fluoride concentration, contact time and temperature etc reviewed for different adsorbents with their advantages and limitations. it is evident from literature survey that various adsorbent in practice have shown good potential for removal of fluoride. However still there is a need to find out such a developed adsorbent which is sustainable, eco-friendly and low cost in terms of both capital and Operation and Maintenance cost.

Key Words: *Water treatment, Fluoride removal, Adsorption, Review, Viable adsorbent etc.*

Water Quality Prediction by Artificial Intelligence Techniques - A Review

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Abstract

Water quality appraisal is one of the most crucial tasks to ensure safe drinking water sources. A water quality index (WQI) is a mathematical tool and composite indicator that provides information to be communicated to end users based on selected water content variables, converted into a single unit less value. Conventionally, WQI computation consumes time and is often found with various errors during sub index calculation. The WQIs have an advantage of determination of water quality status without interpreting the parameters individually. In recent past Artificial intelligence techniques gaining popularity in modelling of water quality prediction. Multilinear regression (MLR), Random forest (RF), M5P tree (M5P), Random subspace (RSS), Additive regression (AR), Artificial neural network (ANN), Support vector regression (SVR), and Locally weighted linear regression (LWLR) are used world widely to generate WQI prediction as Artificial intelligence algorithms.

In this review article, review of literature is presented in an effort to compile Neural Network based AI technique to generate WQI. The artificial neural network is a system of processing elements called neurons, which are connected to each other by a set of weights. It takes number of inputs weight them, sums them up, adds a bias and uses a results as the argument for singular valued function, the transfer function, which results in the neurons output. In the ANN model, three layers are used first one is input variables, then hidden neurons and the output. The input variables are processed with some weight and the predicted output is delivered. Neural networks have flexible nonlinear function mapping capability that can approximate any continuous measurable function with arbitrarily desired accuracy, whereas most of the commonly used empirical models do not have this property. Second, being nonparametric and data-driven, neural networks impose few prior assumptions on the underlying process from which data are generated.

Keywords: Water quality index, Artificial intelligence techniques, Artificial neural network, Water quality Prediction.