



“Har Kaam Desh Ke Naam”

Proceedings of Workshop on “Increasing Water Use in Industries”

Scope Complex, New Delhi

5th March 2020

National Water Mission

Department of Water Resources, RD & GR

Ministry of Jal Shakti

Government of India

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Welcome Address: Tapping the untapped for accelerating efficiency gains in Water Sector



Shri. G. Asok Kumar
Additional Secretary & Mission
Director,
National Water Mission

Shri Asok welcomed the audience and spoke about workshop on Industrial Water Use Efficiency in Industries which will keep going as a series of workshop. He also spoke about series of on-going workshops on improving water use efficiency in agricultural sector through campaign "Sahi Fasal". He told that there is a chance of improvement of water use efficiency of about 5% in industrial sector but 80% - 90% in agricultural sector. There is a little focus on industrial water demand side management but industrial re-engineering is possible in technology process to reduce water consumption. The water consumption is reduced by 50% to produce 1 ton of paper which is quite significant. There is a scope of improving water use efficiency and re-use of treated water for non-potable uses. More focus should be on Sewage Treatment Plant output in industries to produce more treated waste water to replace fresh water intake to improve water use efficiency.

Inaugural Address: Every cloud has a silver lining, so does present water crisis in India



Shri U.P. Singh

Secretary,
Department of Water Resources, RD & GR

Shri U P Singh welcomed all the delegates present in the workshop. He highlighted about distribution of rainfall and run-off with respect to spatial and temporal change. Climate change was more impacted due to rainfall pattern change with time and space that are very much connected with extreme disasters such as floods and droughts. Distribution of rainfall depends upon amplitude and intensity increase so utilization of rainfall is more important than amount of rainfall received. He had discussed about Jal Jeevan Mission under which there is a target of providing 55 liters per capita per day (lpcd) of water as service level benchmark in rural areas through "Functional Household Tap Connection (FHTC)" to every rural household.

His focused attention was towards reduce non-revenue water generation and consumptive water use in industrial sector as ground water is declining at faster rate in many states of India. Also, there is a need to emphasis on reduction of water consumption in various water intensive industries with reduced waste water generation. Water stewardship can be done in Industries.

Setting the Theme: Challenges and Opportunities in Industrial Water Management India



Shri Anshuman
Associate Director,
The Energy and Resource Institute

Mr Anshuman explained the existing challenges in the industrial water sector and where the industry stands today in term of improvement of water use efficiency. He also pointed out as to how we need to come out with an integrated framework of water use efficiency, being a part of water shed, and understanding that we aren't isolated in water use and other users and players are interacting with us too. He also talked about specific water consumption for different industries such as thermal, Paper and Pulp, Leather, Textile and Beverages.

Plenary on Theme 1: Enhancing Water Use Efficiency: Challenges, Opportunities & Solutions



Dr B. P. Thapliyal,
Director,
CPPRI, Saharanpur

Dr Thapliyal highlighted about Indian Paper Industry status in term of water consumption. Water is not a raw material for making paper; however it was a critical process input for papermaking. It was also critical for the paper sheet forming process. Only 10% of the water was evaporated or retained with paper and remaining 90% is returned to rivers or recipient stream.

Due to increase in demand of paper and paper products, the consumption of fresh water was bound to on the increase in future. In order to sustain its operations, the Indian paper industry is exploring all possibilities to minimize the water consumption. Currently, 50 to 60 cubic meters water is consumed to produce 1 ton of paper. But paper industry is moving towards further water reduction to 40 cubic meters to produce 1 ton of paper by year 2025.



Shri Taj Alam,
Vice Chairman,
UP Leather Industries

Shri Taj Alam has represented leather industry of Uttar Pradesh Cluster. He has represented best practises that leather industry has adopted to reduce, reuse and recharge water with minimum waste water pollution. He gave an example of one of the leather industry which has installed about 54 Rain Water Harvesting Structures which collects 3000 KL water for water conservation, adopted a pond in nearby village to maintain aquatic life and biodiversity as per Central Ground Water Board norms; using lime Water Recycling & Re-use System in waste water treatment process which saves about 600 KL of fresh underground water per annum;

He also told us about innovative technology for hides tanning and polishing. The normal process involves water which generates chrome liquor resorting to Chrome-recovery & reuse. But we are doing Waterless Chrome tanning which ensures a total uptake of BCS and no discharge of chrome bearing waste water. So, from this year we have adopted this sustainable

technology to eliminate water usage and also to reduce Chlorides & TDS level in the waste water. They are also moving towards Zero Liquid Discharge Phase as per National Green Tribunal guidelines. They are using Electro-oxidation based ZLD technology with the help of Central Leather Research Institute.



Shri Jayant Joshi,
CGM,
Engineer India Limited

Shri Jayant gave the perspective of Oil Refinery Industries for water utilization and how they are improving water use efficiency. He pointed that water is emerging as the next global issue after energy diversity and security, Climate change and local air pollution. Fresh water stress is rising faster than expected at global level. He gave the dynamic status of India oil refinery scenario where we have the oil refining capacity of 260 MMTPA (Million Metric Ton Per Annum).

In oil refining process, 130 million cubic meter waste water is generated per annum which is a huge quantity. But many interventions have done to reduce specific water consumption in oil refining process. In India, oil industries recycling around 2800 cubic meter water per hour is recycled during the process. He gave five best water management practices which need to be followed: minimize the water volumes at surface, maximize re-use of water by internal circulation process, reduce water footprint, use beneficially all-natural resources and safeguard open water reservoirs and aquifers. But there are some rising challenges of water scarcity for oil refineries such as: generation of huge amount of waste water, treatment of waste water consists of oil, cyanide, sulphides, phenols and heavy metals; management of high Total Dissolved Solids (TDS) reject coming from reverse osmosis (RO) process and compliance with the new rules & regulations related to environment protection & safety and Zero liquid discharge for a land lock refinery.

There are some opportunities for refiners for recycling of water like water/ steam pinch is done to reduce fresh water; refineries treat their waste water using state of art technologies available worldwide and

treated water can be reused as cooling water makeup, fire water make up and for the production of De - mineralized water.



Shri Debajit Das,
National Project
Coordinator,
UNIDO

Shri Das spoke about United Nation Industrial Development Organization's (UNIDO) unique approach to build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation focusing on Sustainable Development Goal 9: Industrial Innovation and Sustainable Development Goal: Clean Water and Sanitation. Their approach is to create sustainable industrial infrastructure with creation of common resources pool sharing property with local people and safeguarding the environment. Water Users must focus on water stewardship with catchment management and water balancing. Zeroing out the discharges of polluted effluents and the net extractions of clean water. Industrial water management should include resource efficient technology, cleaner production, better process control, equipment modification, Technology change, UNIDO optimizing water and energy use and re-use between companies in industrial parks and developing Eco- Industrial parks. He informed us about projects which are on-going in India to reduce water pollution and improve water use efficiency such as "Kanpur Leather Development Project" and "RECP in Textile Industries". UNIDO has given training to many workers and professionals of leather industries to use leather cleaner technology with zero waste generation. He also talked about innovative water less technologies used in textile industry now a days such as Nike Color Dry technology. UNIDO is also promoting Clean Tech Innovation and Entrepreneurship with prototype development and it's commercialization for water use improvement. Water is essential source of productivity and innovation across wide range of industry sectors

Plenary on Theme 2: Towards Zero Liquid Discharge in Industries – Reality Check



Dr. MS Parmar,
Joint Director, North
India Textile Research
Association (NITRA).

Dr. Parmar presented water-use related statistics of the textile industry, and expounded that the industry is amongst the top ten consumers of water – guzzling around 79 BCM of water per annum. This demand is only expected to double by 2030. He continued explaining water efficiency related trends in the industry and lamented that Indian textile producers consumes 3-5 times more water as compared to industries operating in other developing economies. Interestingly, textile industry’s current usage is equivalent to the water demand of 110 million people for an entire year. Accordingly, he highlighted the urgent need of introducing scientific tenets of water usage efficiency for bolstering the objectives of water conservation.

Dr. Parmar further explained the sequence of processes involved in producing a finished fabric, and showed related water consumption statistics. Dr. Parmar stated that NITRA carried out a survey of 10 wet processing industries covering different product mix from different geographical locations. Findings recorded several instances of faulty practices prevalent in the case study industries, and thereafter, explored interstices where strategic interventions can yield positive results vis-à-vis water use efficiency. Three key suggestions that distilled out of the survey includes: installation and maintenance of water measuring devices/gadgets, process modification and waste water reuse. The study further zeroed in on the technical fixes whose application, as mentioned, will expectedly overhaul textile industry’s water efficiency statistics. Some of the suggestions included increasing the RFT percentage, modification of dyeing processes, adoption of single bath scouring and bleaching, reusing condensed water found in caustic recovery plant for washing purposes, &c.



Shri Yogesh Kumar
Sharma, DGM, NTPC,
Raipur

Shri Sharma highlighted the various initiatives NTPC has/ is planning to undertake for improving their plant's water use efficiency. As explained, NTPC account for 22% of the total energy generation in India, with a total installed capacity of 58156 MW. Whereas a power generating facility represents 38% of the total water withdrawals across sectors in India, the specific water consumption (SWC) varies across different types of plants. As Shri Sharma explicated, coal & gas based plants have some of the highest SWC and they account for 97% of the total installed capacity of NTPC and its joint ventures. In terms of SWC across the systems/areas, Shri Sharma elucidated that highest amount of water is lost through evaporation and drift followed by its usage in service and fire systems. He also articulated how NTPC is categorizing wastewater into steady and unsteady streams, with a view to target specific interventions suitable for different stream types.

As he continued with his presentation, Shri Sharma shared one of the key principle adopted by NTPC, viz. 'what can be measured, can be managed'. In alignment with this philosophy, he explained, NTPC has completed work of installing ~ 500 water meters across their plants, and is diligently organizing triennial and quinquennial water audits in their thermal and gas based plants respectively. NTPC has, moreover, installed water dashboards to institutionalize the practice of continuous water monitoring across the plant area. SCADA and flow meters abet periodic monitoring of area wise water consumption. He also presented few measures which NTPC is mulling/has initiated for increasing water use across its plants and these includes:

- Increase COC (Cycle of Concentration) of cooling water to reduce Blow down,
- Optimize ash water ratio (~ 1:8) to reduce water consumption or install HCSD (High Concentration Slurry Discharge Systems),

- Install AWRS (Ash Water Recirculation System) to reuse and recycle ash slurry water, High Efficiency (0.005%) Drift Eliminators in Cooling Towers,
- Separation of storm water drain from process drains, and
- Use of STP effluent for horticulture purposes.



Shri John Thomas,
Technical Advisor,
GIZ

Shri Thomas began his presentation by charting the contours of extant discourse around zero liquid discharge in Indian context. He elucidated what the concept of ZLD entails and what it does not, with a view to elucidate audience about the principled canons of this much-acclaimed but poorly understood concept. He thereafter expounded the policy conundrums that represent the bulk of contemporary policy debates in India being organized around the appalling prospects of growing environmental pollution and ensuing costs to economy and human health.

As this concept is taking on new meanings with the prospects of evolving environmental complexities in India, Shri Thomas continued, it is pertinent to weave together the domains of social, technical, scientific and risk, to channelize their assimilative capacities for enhanced output and outcome results. Calling for an integration of disciplinary concerns, he further expounded the principal factors that are directing the choice of actions amongst industries regarding adoption of ZLD. To him, these factors are broadly categorized into two dimensions, viz. 'industry-specific imperatives', and 'macro-level ecosystem' within which the industries are situated. Some of the key factors which, as he explains, do influence decisions in favor of ZLD concept includes, but are not limited to: legal requirements, water shortages, lack of recycling options, availability of heat source, increasing stress on receiving environment, &c.

Shri Thomas also posited for mainstreaming 'production-integrated approach' whereby, according to him, "the potential for improving efficiency and cutting

costs is greater". This approach, he continues, allows for an appreciation of energy-wastewater-solids/residues nexuses which can subsequently bolster our aim of reaching even greater efficiency goals. He concluded his presentation with a snapshot of global scenario vis-à-vis ZLD, and explained how it has become a practice in vogue in certain regions of Europe, Australia and Western parts of USA where the peculiar context favors its adoption at scale.



Prof. Vivek Kumar,
IIT Delhi

Prof. Vivek Kumar expounded the concept of Zero Liquid Discharge (ZLD) and presented two broad parameters used to ground the concept of ZLD, viz. water consumption versus wastewater reused or recycled and corresponding solids recovered. He outlined technical specifications guiding the adoption of ZLD in industries, and covered elements of CPCB recommended technological options for distilleries primarily covering (i) technologies for concentration of spent wash, and (ii) technologies for drying/incineration of concentrated spent wash. Further, he expounded global efforts from pulp and paper sector to achieve targets of ZLD, and this included measures such as 'complete closure of water loop' and 'establishment of standalone facilities for treatment of effluent water for its reuse'. This followed a schematic flow diagram explicating the concept of process flow based on Mass Basis. He then presented figures on financial imperatives of ZLD based plants.

Prof. Vivek concluded his presentation by sharing the results of a study titled "Assessment of pollution load from pulp and paper industries in Ganga Basin". As he mentioned, hosts of technical parameters were evaluated to assess the impact of implementation of the Charter for "Water Recycling & Pollution Prevention in Pulp and Paper Industry" prepared by CPCB 2015".

Plenary on Theme 3: Stakeholder's Perspectives Towards Enhancing WUE in Industries



**Dr. Makarand
Barhanpurkar,**
Unit Head-Bhadrachalm
ITC Limited

Dr. Barhanpurkar highlighted some of the accolades ITC has received from national and international certification and regulatory institutions and alliances, including a Platinum Rating from CII for its integrate pulp and paper mill (PSPD). He explains the nature of water crisis India is grappling with, and said, by 2050, industrial demand for water will quadruple – leading to incidences instances of conflicts and competition across users and river basins. Such recognition has galvanized ITC to implement innovative measures for water consumption both within and beyond the factory gates of PSPD unit in Bhadrachalm. ITC's commendable work in water conservation is reflected by the fact that "ITC is creating a saving potential of more than twice of what it consumes". ITC has adopted watershed approach to promote water security across the basin by building check dams, farm ponds, and supplying treated effluent to farmers for their irrigation use. Shri Barhanpurkar further elaborated the six key pillars defining ITC's approach towards increasing water use efficiency, viz.

- Reducing consumption by 5%,
- Maximizing reuse in processes,
- Increasing recycling of treated effluent,
- Adoption of innovative water efficient fixtures,
- Enhancing capacity of employees, and
- Water conservation work beyond the fence (watershed approach).

The designing of ITC's 'portfolio of water conservation strategies' entailed institutionalizing a system of corporate governance which allows for mainstreaming of the principles of water conservation in ITC's overall business portfolio. This has not only abetted in mobilization of adequate financial and human

resources, but with the adoption of clear targets and goals, the company has also been able to undertake periodic performance assessments/auditing thereby measuring the performance against these well-crafted goals and objectives. This innovative management paradigm has resulted in increased efficiency gains for ITC-PSPD. For example, as per a report of National Productivity Council, ITC-PSPD has a water use efficiency of 38 m³/ton against a national average of 63 m³/ton. Company has also outperformed NPC's treated effluent discharge standard of 50 kl/ton by discharging only 35.5 kl/ton of treated effluent in 2018-19.

Shri Barhanpurkar then presented some cases of ITC-PSPD's innovations in the context of 3Rs: Reduce, Recycle and Reuse. These measures, as he articulated, abetted ITC-PSPD to achieve efficiency standards higher than those proposed by NPC (2008). He continued presenting cases of ITC-PSPD's work in water efficiency and showed how ITC-PSPD is working with farmers to support adoption of a system of Rice Intensification for accelerating improvement in irrigation water use efficiency in the watershed area. Shri Barhanpurkar concluded his presentation by underscoring key challenges and opportunities facing pulp and paper industries, and enunciated that while businesses are facing operational and regulatory risks owing to water scarcity and poor water efficiency, opportunity exists in cross sectoral collaboration and learning.



Dr. Arvind Kumar,
President,
India Water Foundation

Dr. Kumar articulated key challenges facing the industrial water management, viz. absence of clear regulatory policies & scientific data, fragmented responsibility and control over water use for industrial purposes &c. Building on these challenges, he expounded the principles of circular economy, as a way to navigate some of the challenges he presented. To him, the concept entails going beyond the current “take-make-waste” extractive model, and rather implies:

- Designing out waste and pollution,
- Keeping products and materials in use, and
- Regenerating natural ecosystems.

Unraveling the value of this concept, he explained the idea of ‘12Rs’ that he believes provides a much more comprehensive framework for action. He thereafter presented outcomes of two conferences and how his organization – India Water Foundation (IWF) - is bringing about sustained paradigm shift in industrial water use through these collaborative dialogues and forums. The first example introduced the salient outcomes of an international conference on industrial water use efficiency, organized by IWF in partnership with Rajasthan Industrial Development and Investment Corporation, Jaipur in 2011. Key outcomes included: efficiency gains through technological innovation, robust institutional designing, regulatory means to incentivize adoption of water conservation by industry players, and application of stakeholder-driven approach towards water use efficiency.

His second example covered recommendations from another workshop which IWF organized in partnership with UNEP on the topic of water quality monitoring in Asia and the Pacific (2012). Some of the key recommendations presented are as under:

- Training, capacity building and infrastructure development of water quality monitoring lab and staff
- Emphasis on reinforcement of global and regional collaborative water quality monitoring ventures.
- Need for increased interaction with GEMS/Water and GEMStat in data sharing, networking and data exchange on water quality.
- Emphasis on an all-inclusive collective approach in tackling water related problems by bringing all stakeholders on a common platform to share their expertise, exchange knowledge and experiences and networking.

Dr. Kumar concluded his presentation by stressing the need for an integrated industrial water policy which shall cover the institutional, technological, regulatory and capacity related issues in a comprehensive manner.



Shri M.A. Patil,
Senior Director
(Resource & Management),
FICCI

Shri Patil provided an overview of FICCI and the activities of its Resource Conservation and Management Division. He highlighted following areas where strategic interventions are warranted, viz. development of low cost technologies, availability of technical advisory services, access to finance, up gradation of technical skills and designing of enabling regulatory mechanisms. Following this, he also highlighted some of the key factors driving industries to increase their water use efficiency, and this includes: reputational concerns, regulatory and operational risks, inconsistent product quality, water security challenges in the basin, &c.

Shri Patil explained the concept of water audit and provided cases of water-use auditing in selected industries whereby FICCI is supporting industries in achieving their water efficiency goals through implementation of water saving measures. As he proclaimed, "FICCI studies helped industries to achieve water efficiency up to 10-50% with payback periods less

than 2 years.” Many of the cases he presented showed water savings in the range of 15-50% with payback period ranging from less than 1.5 years to 2.5 years. He concluded his presentation by highlighting key initiatives which FICCI has organized for nudging industries to adopt efficient water use and management practices, and these includes:

- Annual FICCI Water Awards,
- FICCI-HSBC Knowledge series on sector specific case studies of water use efficiency,
- Annual FICI Water Conclave for policy level dialogues and sharing of best practices,
- Capacity building and water audits,
- Bilateral business dialogues, and
- Technical reports/white papers.



Dr. Vikrant Tyagi,
Project Coordinator,
GIZ

Dr. Tyagi presented a comparative assessment of Treated Waste Water Reuse (TWWR) Policies between India and Europe to form a base of cross-country learning whereby an evidence based formulation and implementation of TWWR Concept can be fostered in the context of Indian polity. Before presenting his analysis, Dr. Tyagi first explored the concept of Treated Wastewater Reuse, and underscored its potential to reduce water scarcity pressures on existing freshwater resources across India. This comparative assessment, as he articulated, forms a formative part of ‘EU-Support to India’ for the development of a national policy on Treated Wastewater Reuse. Further, this comparative assessment included Spain and Italy from EU – two of the highest user of treated wastewater – and Gujarat and Haryana from India –first to adopt a comprehensive policy in this regard.

Dr. Tyagi provided a snapshot of prevalent policies on TWWR in the selected regions, and compared it along the following indicators: Focus, Aim, Size, Ambition, and Regulation. It is interesting to note that while EU, Spain and Italy promotes reuse of Treated Wastewater for irrigation and non-potable use, Indian States of Haryana and Gujarat restricts reusing treated wastewater only for industries and thermal power

plants. These are bound to have implications on the choice and application of wastewater treatment technologies. Moreover, while EU, Spain and Italy, and India, with its constituents of Gujarat and Haryana, has/is planning to adopt relevant policy measures, India still lacks a coherent regulatory framework in the form of laws/acts to guide appropriate behavior amongst key stakeholders for adoption of right mix of actions in this regard.

Developing his arguments further, Dr. Tyagi elucidated key differences between EU and selected states with respect to specific indicators, viz. objectives of policies, implementation mechanisms, and risks and constraints.

As he explained, While EU and the two constituent states promote integration of wastewater reuse within the broader suite of strategies for solving basin wide water security issues, Indian States makes no reference to basin water balance and remain indifferent towards mechanisms for monitoring freshwater use status. Moreover, Policies of Gujarat and Haryana also overlooks the issues vis-a-vis human health and e-flow. Dr. Tyagi continued with his assessment of objectives of respective TWWR Policies and highlighted riveting differences with respect to the core concerns of 'economic growth and financing' and 'trade barriers and resource efficiency'.

Dr. Tyagi, subsequently, explored the second pillar of his assessment, viz. implementation mechanisms, and covered therein the sub-elements of 'institutional mechanisms, technological options, and wastewater quality related regulatory ecosystem and norms'. He lastly explored how concerned States identifies and deals with the issue of potential 'Risks and Barriers' with respect to adoption of TWWR across scale, and covered the elements of 'regulatory and management barrier', 'water allocation', 'research and innovation' and 'project development'. In this connection, he enunciated several innovative schemes and programs whereby EU and its constituents are addressing some of the highlighted barriers with respect

to financing, technological viability, institutional restructuring, &c. Some of these included: European Regional Development Fund, Water Reuse Action Groups within European Innovation Partnership, Cohesion Fund, &c.

Dr. Tyagi concluded his presentation by reiterating some of the salient features of his analysis and, furthermore, articulated as to how “[t]his comparative assessment can be helpful in providing necessary directions and guidelines for developing a comprehensive national TWWR policy for India”.

The workshop ended with Mr. S.K. Arora , Advisor (C&M) , NWM , thanking all the speakers with a token of appreciation. Hearty appreciation was also extended to the participants for enriching the overall quality of discussion.