12th
Water Quality India Association
Meeting Minutes
07th August 2020 (11:00AM – 01:30 PM)
Via virtual platform

1. **Call to order: Dr. Chandrasekhar**, COO, WQIA called the meeting to order at 11:00 AM, he welcomed and announced names of attendees of the 12th WQIA meeting.

2. **Presidential address by Dr. Neeraj Gupta**

- Key items highlighted below:

- Currently 254 members on roll and 16 new members, including 1 gold member added since last February 2020 meeting.
- There were 2 QWP programs that were conducted via online video-conference and 13 professionals received their QWP certificates.
- WQIA organized 3 webinars on Water Filtration, Science of Activated Carbon, and Introduction to IPR- Patents, Trademark & Copyright for WQIA members as knowledge sessions
- WQIA is officially enrolled in the BIS committee for updating RO Standard IS 16240 and in revision of Drinking Water Standard IS 10500. Committee meeting held on virtual platform in July 2020 and in future will have more committee meetings scheduled to further finalize standards in the coming time. WQIA will continue to provide the industry perspective and all the support needed by BIS in upgrading these standards.
- Continued to engage IAPMO India for operational management of the association.
- Highlighted the efforts of WQIA after the Honourable Supreme court's order on the NGT judgement for limiting the use of RO technology/systems. Honourable Supreme Court has directed MoEF to consider all the materials submitted by WQIA before it arrives at any conclusion for issuing the notification for limiting the use of RO technology as directed by NGT order.
- In continuation to the efforts, representatives of WQIA has attended personal meetings fixed with the Secretary of MoEF on December 2, 2019, and subsequently on December 11, 2019. Thereafter, in the light of the Supreme Court Order dated November 22, 2019, based on the voluminous data submitted by WQIA, MoEF filed a Status Report before the NGT on January 10, 2020. At the hearing, MoEF & CC pointed out that they have incorporated in the Status Report the submissions, materials and documents furnished by WQIA. NGT thus granted four weeks' time and ordered MoEF to publish the required notification by February 7, 2020, and then adjourned the case to March 23, 2020.
- Following these developments, MoEF invited WQIA as an association representing water treatment industry in a meeting chaired by Joint secretary Mr. Jigmet Takpa for the

discussions on documents submitted by WQIA and the contents of the draft notification. Dr. Neeraj Gupta attended this meeting representing WQIA and provided the industry point of view on the subject.

- MoEF prepared the draft notification and the same was put-up on their web-site for public comments on 3rd February 2020. WQIA had conducted serval meetings and extended workshops including industry partners to collate the information and suggestions. WQIA thus submitted the feedback giving the industry perspective on the draft notification put up by MoEF. The next meeting to be scheduled by MoEF & CC for further discussion is awaited.
- Due to sudden outbreak of COVID-19, the Government of India announced nation-wide lockdown to contain the spread of the virus on March 22, 2020. Thus the hearing of the NGT scheduled for March23, 2020 was delayed. The case was subsequently was taken up for hearing by NGT via video conferencing on July 13, 2020, wherein MoEF sought further time to issue the notification for limiting the use of RO systems.
- Considering the situation, NGT granted MoEF further time up to December 31, 2020 to bring out the notification and next hearing will take place on 25th January 2021..
- Several member companies came forward to provide financial support to fight NGT lawsuit.
- Considering the sensitivity of the situation, WQIA had engaged a PR agency to speed up the association initiatives on NGT matters and for creating consumer awareness on the requirements and merits of RO technology.
- During this current pandemic, WQIA actively worked and followed up with central government and several state governments for allowing operations of water treatment equipment and components manufacturing plants/facilities and services during the lockdown time on behalf of members.
- WQIA conducted more than 10 board members meeting over conference calls since last February meeting to deliberate on various association work requirements and taking stalk of industry needs in this pandemic.

3. Keynote speaker: Dr. Pawan Labhasetwar, Chief Scientist & Head Water Technology and Management Division, CSIR- National Environmental Engineering Research Institute on WATER Policy, Technology Assessment and R&D needs

- Technological advancements in watershed management
  - Improve water use efficiency e.g. irrigation water requirements based on SAP flow measurements
  - Reduce evaporation losses from reservoir
  - Creating real time catchment prediction models to manage catchment

- Water use against water demand
  - Narkhed-Pandhurna Critical Zone Observatory is intensively irrigated watershed
  - 60% land utilised for agri-horticulture
  - Extensive use of Ground Water for irrigation of orange orchards
  - Watershed is in overexploited condition
  - (GW stage development >100 %)

- Technological advancements in water source and treatment
  - Model change in water quality
  - Utilize energy in Break Pressure Tanks
  - Retrofit existing water treatment plant
    - Move beyond PAC
    - Advance filtration process
    - Explore using Ultrafiltration
    - Optimize clari-floculator
    - Identify alternate disinfectant with “residual”

- Technological advancements in water distribution
  - Leak detection systems
    - Dynamic systems e.g. GPR
    - Static systems leak noise loggers
  - Water distribution optimization
  - Cost-effective flow meters, pressure gauges, pressure reduction valves
  - MBR/ESR/GSR cleaning equipment
  - Bladder vessels/Shafts
  - Pigging equipment
  - SCADA software

- Technological advancements in households/community water supply
  - Households
    - Modify design of ferrule, water meter, flow reducing valves
    - Technologies – cavitation,
    - Plumb-in greywater treatment
  - Community
    - Technologies – CDI, forward osmosis
    - Adsorbent media
    - Vessels/reactors
    - Sensors
    - Waste management

- Hydrodynamic cavitation- Cavitation occurs by pressure variation in the flowing liquid due to the presence of throttling devices such as venturi, orifice etc.,

- Import substitution in water sector
  - Imported despite availability of most of them in Indian Market:
    - Adsorbent media for fluoride, arsenic and iron removal)
    - FRP Pressure vessels
    - Electrodes (e.g. titanium electrodes in electro-chlorinator)
    - Sensors (e.g. chlorine sensor)
    - Ultrafiltration and Reverse Osmosis membranes
    - Water meters
    - Pressure sensors (for leak detection and pipe isolation)
    - Flow meters
    - Software in SCADA system

    - Mud pumps (for desilting, desludging)
    - Leak detection kits
    - Diffusers (only part such as membrane covers)
    - Sludge dewatering components e.g. screw press, volutes
    - High pressure pumps e.g. in desalination/RO plants
  - Common reasons for import
    - Cost competitiveness
    - Quantity
    - Quality

- Estimated import of select items in Water Sector
  - Wastewater treatment and waste to energy
    - Market size is Rs 25,000 crores
    - Imported items such as sludge dewatering components, biogas engines above 100 KW etc.
    - Imported items ~ 10% of market size
    - Import is about Rs 2500 crores
  - Water treatment for geogenic contaminants
    - Cost of 8000 lph capacity water treatment plants ~ Rs 10 lakhs
    - Cost of likely imported items such as FRP Pressure Vessels, Media ~ Rs 4 lakhs
    - Plants likely to be constructed in 2020-21 ~ 20,000 (Bihar, Uttar Pradesh, Jharkhand, Odisha)
    - Plants likely to use imported items ~ 10,000
    - Cost of imported items – Rs 400 Crores
  - UF and RO Membranes in point-of-use water treatment systems
    - Household water treatment systems (RO based) sold in India – 1.3 Crore units (2018)
    - Use of imported RO Membrane – 1.15 Crore Units (2018)
    - Cost of RO Membrane in each unit – Rs 1000
    - Total import – Rs 1150 Crore

4. Technical Presentation- Softeners: From Concepts to Recent Advances by Mr. Clifford Dsouza, Associate Vice President – Technology, Ion Exchange

- What causes hard water
  - When rain or snow hits the Earth as precipitation, its soft and slightly Acidic
  - Water percolates through layers of Limestone and Gypsum picking up Calcium and Magnesium salts

- Understanding hard water: Hard water primarily consist of calcium (Ca^{2+}), and Magnesium (Mg^{2+}) Cations, and sometimes other dissolved compounds such as Bicarbonates and Sulphates.

- Hardness of water may also be defined as the soap consuming capacity of water, or the capacity of precipitation of soap-consuming capacity of water, or the capacity of

precipitation of soap as a characteristic property of water that prevents the lathering of soap.

- Permanent Hardness
  - It is usually caused by the presence of Calcium and Magnesium in the water and also sulphates or chlorides which become more soluble as the temperature rises.
  - The hard scale can clog pipes, ruin water heaters, coat the insides of tea and coffee pots, and decrease the life of toilet flushing units.
  - It cannot be precipitated by boiling.

- Understanding hard water: Temporary Hardness
  - Temporary hardness is caused by a combination of calcium ions and bicarbonate ions in the water
  - Boiling promotes the formation of carbonate from the bicarbonate and precipitates calcium carbonate out of solution, leaving water that is softer upon cooling.

  - Hard water- Rating
  - Soft: 0-60 mg/L
  - Moderately hard: 61-120 mg/L
  - Hard: 121-180 mg/L
  - Very hard: >181 mg/L

  - Hard Water – Units
  - Parts per million (ppm)- Usually defined as one milligram of Calcium Carbonate ($CaCO_3$) per litre of water
  - Grain per gallon (gpg)- Defined as 1 grain (64.8 mg) of Calcium Carbonate per US gallon (3.79 litres)
  - 1 grain per gallon= 17.118 ppm

  - The hard effect of hard water
    - Turn clothes, towels and fabrics rough and dry
    - Damage clothes and reduce fabric life
    - Increase detergent usage and expenditure
    - Deteriorate and fades color of fabric by 15%
    - Spoil flavour of tea, coffee and other beverages
    - Cooking gas consumption increases by 30%
    - Minerals deposit and leaves spots on crystals and silverware
    - Scale build-up in sinks, tubs, faucets, and appliances
    - Scale deposits on metallic surface
    - Damage appliances
    - Sops and detergent do not lather
    - Unpleasant taste
    - Stiff, messy and unmanageable hair
    - Dry, itchy skin and scalp

  - Some know methods of water softening
    - Lime Soda softening

- Chemical precipitation is one of the more common methods used to soften water
- Chemicals normally used are lime (calcium hydroxide, $Ca(OH)_2$) and soda ash (sodium carbonate, Na_2CO_3).
- Lime is used to remove chemicals that cause carbonate hardness
- Soda ash is used to remove chemicals that cause non- carbonate hardness.
- These precipitates are then removed by conventional processes of coagulation/ flocculation, sedimentation, and filtration.
- Suitable of industry use, LARGE CAPEX AND OPEX, BIG FOOT PRINT, WASTE DISPOSAL ISSUES

- Zeolite based softening
  - Zeolite process is used for softening hard water via Ion Exchange technique using natural or Synthetic Zeolite media
  - Zeolite can exchange its Sodium cations reversibly with Calcium and Magnesium ions in the water softening process
  - After some time, the zeolite bed gets exhausted
  - Then exhausted media is regenerated with concentrated solution
  - Not suitable if water contains carbonate/ bicarbonates hardness and turbidity
  - Simple to build and low on cost
- Nanofiltration based softening
  - Nanofilters have the ability to effectively remove divalent and trivalent ions
  - Nanofiltration is frequently used to remove hardness from water while leaving the total dissolved solids content much less affected than would RO
  - For the reason, it has been called the softening membrane
  - Saltless, high clarity removes health contaminants
  - Potential to foul, high capital cost and footprint

- Narrowing down to water softening solutions

  Water Softeners Market segmented as below:
  - Water Softeners Market
    - Salt- Based Ion Exchange Water Softener
    - Salt- Free Water Softener
    - Other Water Softener (Magnetic softeners)
  - Water Softener Market- By End-User
    - Commercial
    - Industrial
    - Residential
    - Other
  - Salt- Free Softeners
    - Anti scale systems sometimes referred to as Salt-free Water conditioners or descalers, use Template Assisted Crystallization (TAC) to crystallize the hardness minerals and render them unable to form scale
    - Anti-scale systems do not actually soften the water. They are water conditioners
    - The water is still as hard as it was before the crystallization process, the minerals are just unable to adhere to surfaces

        - Anti-scale systems are adept at preventing scale from clogging your home's faucets and pipes (the hardness crystals can actually clear out the pre-existing scale from pipes)
        - Water conditioners will not brighten laundry, improve soap's lather, or prevent your dished from looking cloudy and unwashed
    - Magnetic Softeners
        - Magnetic water treatment are considered invalid for claims on soft water effects
    - Ion Exchange Process- Salt based softeners – IX Resins
        - This softening process uses by Ion Exchange resins
        - The IX resin matrix is formed by cross-linking hydrocarbon chains with one another in a process called polymerization
        - The cross-linking gives the resin polymer a stronger, more resilient structure and a greater capacity (by volume)
        - The chemical composition of more resin in Polystyrene, certain types are manufactured from Acrylic
        - The resin polymer then undergoes one or more chemical treatments to bind functional groups to the ion exchange sites located throughout the matrix
        - These function groups gives the IX resins its separation capabilities, and will vary significantly from one type of resins to the next
    - The most common Ion Exchange resin for softening are
        - Strong Acid Cation (SAC) exchange resins- SAC resins are composed of a polystyrene matrix with a Sulphate (SO_3^-) functional group and charged with Sodium ions (NA^{2+}) for softening applications
        - Weak Acid Cation (WAC) exchange resins- WAS resins are composed of an acrylic polymer that has been hydrolyzed with either sulphuric acid or caustic soda to produce carboxylic acid functional groups. Due to their high affinity for hydrogen ions (H^+), WAC resins are typically used to selectively remove cations associated with alkalinity

- Ion Exchange Water Softening Concept
    - Softening – Ion Exchange Process
        - The sodium charged IX resins beads takes up the hardness causing Ca and Mg from hard water in turn releases Na- Softening Cycle (Service Cycle)
        - Until a point when the resin is fully loaded with Ca and Mg- Exhausted
        - The IX resin needs to be now Recharged with using Nacl, Brine – Regeneration Cycle
    - Softening – Regeneration Process
        - The exhausted resin is recharged using a Brine solution prepared in a Brine tank (NaCl)
        - As Brine solution is passed over the resin, the Na from the Brine solution displaces all the Ca and Mg from the resin- Brine Injection
        - A slow rinse with the incoming water completes the Recharge cycle
        - A fast rinse may be required to wash away salts and sediments

      *Salt consumption of a softener- The RL setting or the regeneration level setting determines the salt consumption. A RL of say 120 means per every litre od resin in the vessel 120 gms of salt will be used

- Ion Exchange Softener- Type by End User
  - Commercial Softener/ Backyard POE Softener for homes
    - Needs a services pump- Typical flow 3-5 M3/HR
    - Will need a small pump for regeneration (above pump will be almost throttled during regen)- Injection flow as low as 10 LPM
    - Big footprint, for outdoor/ Basement installation only
    - Comes with separate tank
    - Suitable for Villas, Institutions
  - Duplex Softener/ Backyard POE Softener for homes
    - Needs a service pump- Typical Flow 3-6 M3/HR
    - Will not need a separate pump for regeneration (since at any given time one vessel is in service)
    - Big footprint, for outdoor basement installation only
    - Comes with separate brine tank
    - Suitable for Villas, Institutions
  - POE Residential Softener/ Service Balcony Installation
    - Suitable for Indoor with line pressure of minimum 1.5 KG/CM2
    - Compact low on footprint – upto 2M3/ HR service flow
    - Comes with separate or built in brine tank
    - Suitable for villa and apartments
  - POU Softener
    - For Shower/Geyser
    - Flow rate 500 LPH
    - Built in salt chamber
  - POU Residential Softner
    - For a single point life washing machine, Bathroom – upto 1M3/ R service flow
    - Works on line pressure of 1.5KG/CM2
    - Built in Brine tank

- Ion Exchange Softeners
  - Yet brine discharge into the ground during the recharging process remains a concern
  - This has lead to a various enhancements in Ion Exchange softeners
  - Enhancement - by regeneration efficiency
  - Enhancement - by process design
  - Enhancement – by resin characters

- There are two measures for regeneration efficiency – A. Brine Efficiency B. Water Efficiency
  - Brine Efficiency
    - Brine efficiency is a measure of how much salt the system uses to remove hardness from water
    - It is expressed as the grams of hardness (PPM)/ grams of salt
    - NSF/ANSI STD 44 – 330 grains / pound salt
  - Water Efficiency

        - Water efficiency is a measure of how much water is used by the system to remove hardness from water
        - It is expressed as the litre of water/ grams of hardness
        - NSF/ANSI STD 44- 5 gallons of less/ 1000 grain of hardness removed

- By Choice of Flow Patterns
    - Conventional Co- Flow Softeners
        - The brine recharges the extreme exhausted top layer fairly well
        - By the time brine reaches lower zone it is all spent
        - The bottom zone is moderately recharged / low output capacity
        - Additional brine would be required to fully recharge this zone
    - The efficient counter flow softeners
        - The brine from bottom encounters an un-exhausted zone, hence brine is intact
        - Brine reaching upper zone carries abundant sodium
        - Top zone gets fully recharged as a result/ higher output
        - Saving in brine due to above dynamics

- Softeners – enhancement of brine efficiency by equipment & process design
    - A commercial softener uses a single large resin tank
    - When demand flow is much lower than the design flow
    - Channelling of flow takes place, resulting in unused resin, loss of salt
    - For the same low flow, a smaller softener vessel will have an even distribution
    - Better usage of resin, improved capacity, resulting in saving of salt

- Responsive flow technology
    - Use an array of smaller vessels
    - On low demand connects just one softener online
    - On increase demand connects more vessels proportionately
    - Standby softeners are taken into regeneration
    - Reports 50% saving in salt and significant saving on water used for regeneration

- Softeners – enhancements of brine efficiency by choice of efficient resins IX
    - Fine Mesh Resin
        - Resin with size of 0.3 – 0.4 MM are 10% efficient over standard mash resin
        - Its high surface area results in better exchange kinetics
        - 50% lower backwash flowrate due to its light nature
        - High pressure drop across resin bed, but manageable with residential softeners
    - Uniform Beads Resin
        - Relatively efficient compared to standard size resin
        - Good flow characteristics and better utilization of resin
        - Reduce rinse water requirements
        - Well suited for industrial softeners
    - Shallow Shell Resin
        - High efficiency resin with an inert core and a functional surface
        - Highly rapid dynamics of softening and regeneration, excellent capacity

- Unsurpassed salt efficiency, low leakage and 50% less rinse water requirement

5. BIS Update by Dr. Muralidhara Rao

- WQIA participated in 1st meeting of Water Purification systems sectional committee FAD 30 held on 2nd July 2020 under the able guidance and leadership of Dr. Pawan Kumar.
- Based on the suggestions received from members during the meeting the committee recommended to include organizations like Confederation of Indian Industry (CII), Federation of Indian Chambers of commerce & Industry (FICCI), Indian plumbing Association IPA, Indian Water Works Association IWWA.

- Decisions taken by the committee with regards to IS16240:2015 Draft Amendment – 1 & deliberations resulted in to Amendment-2
  - Title: Reverse Osmosis (RO) based point – of 0use (PoU) Water treatment system for Drinking water purposes- Specification. Addition
  - Clause 4.3 Sr.no K TDS Display meter - Required to display TDS of the product water – Addition
  - Clause 4.3 of IS 16240. additional components/ combinations must be in series (whether they are pre-treatment or post-treatment w.r.t. RO membrane element) and agreed/ decided that there shall be no bypass of the input water into the system.
  - The Committee further decided to request few experts in the field & WQIA to jointly work and provide specific inputs on brief description/ specifications.

  - Clause 5.1 Materials in contact with water shall comply with the overall migration limits of 60 mg/L max for various plastic materials when tested by the method prescribed in IS9845.
  - Committee decided to take up the issue of addressing safety of remaining wetted material/ parts in due course. Inputs submitted by WQIA:

  - Table – 1 Sr.No ix) Iron reduction test is deleted.
  - 8. Table -1 Sr.No: xi) $\geq 10^7$ / 100 ml to be substituted for 10^7/100ml
  - 9. Table -1 Sr No;xi substitute 99.9999% reduction (LRV 6) for 99.9999% reduction and 99.99 % reduction (LRv 4) for 99.99% reduction
  - 10. Clause 6.3.4.1 Requirements in Table -2 shall be optional.
  - Cryptosporidium, Giardia or Microspheres.
  - 11. Clause 6.7 ‘Type Pressure Test (Hydrostatic test)’: WQIA’s suggested method is under examination.
  - 12. RO system is not recommended for Arsenic level above 0.1mg/L, Fluoride level above 8mg/L, Iron level above 0.3 mg/L.
  - The Committee discussed the need to formulate Standards for
    - Contaminant specific water purification systems

- Specific technologies like UF, MF, etc.

- The Committee decided to recommend (to FADC) the following new subjects for standard formulation:
  - Water purification systems for contaminants such as Arsenic, Fluoride, Nitrate, etc.
  - Ultrafiltration (UF) based Water purification systems
  - Microfiltration (MF) based Water purification systems
  - Industrial RO systems for for Drinking Purposes
  - Household and Community based water purification systems for rural associations
  - Code of practice for design, installation and maintenance of Community based water purification systems

6. Sub Committee Updates

- Membership by Mr. Himanshu Budhia
  - Total Members as per 7th Aug 2020 : **255**
  - Total Active Members (Dues Paid) : **195**
  - Timely renewals by payment of annual membership dues is a moral obligation of each member.
  - This small commitment from your end is essential to keep the association healthy and relevant.
  - Usage and logo policy of member logo
  - Announcements of new members
- Education by Dr. K Chandrasekhar
  - Introducing E-Learning for Qualified Water Professional Level -1
  - Two QWP programs were conducted via virtual platform on 23rd June and 15th July 2020
  - 13 professionals received their QWP certificates.
  - Successful candidates names are updated on WQIA website
  - WQIA webinars conducted 23rd April 2020 on Water Filtration, 19th May 2020 on Science of activated carbon in water filtration and 26th June 2020 on Webinar Introduction to IPR- Patents, Trademark & Copyrights
- NGT updates and Question & Answers by Mr. Suresh Redhu
  - NGT Draft notification was put up on MoEF & CC web site for public comments on 3rd February 2020.
  - WQIA's NGT committee conducted a 2-day workshop to study the draft notification provide our inputs. The note with comments against each point submitted to MoEF & CC.
  - WQIA also shared the note with all members for reference and requested members to submit their comments to MoEF & CC independently.
  - In all, MoEF & CC has received over 4000 comments from various stakeholders in water treatment space including consumers.

- WQIA received an email invitation from MoEF & CC to attend meeting in the second week of March 2020 but the meeting couldn't happen because of nation-wide lockdown.
- The case came up for hearing on 13th July 2020 where MoEF & CC requested for extension for issuing the notification. The NGT Court has given extension up to 31st December 2020 for submission of notification to MoEF & CC. The next date of hearing is on 25th January 2021 and the compliance report is expected to be submitted to the honourable court on this day.

- Frequently asked Questions from Members were discussed

7. Vote of Thanks by Mr. Suresh Redhu

8. Next Meeting Date- 11th /12th February 2021, Mumbai

9. Meeting adjourned at 1:40PM