

BEYOND EXPECTATIONS

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SMART WATER & WASTE WORLD

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COVID-19 & LOCKDOWN IMPACT ASSESSMENT SPECIAL EDITION



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CERTIFICATION, POLICY REFORMS,
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COVID-19 & LOCKDOWN: IMPACT ASSESSMENT - SPECIAL EDITION

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WATER QUALITY & DISINFECTION

By Madhukar Swayambhu

For the first 75 years of millennia of the 1900s, chemical clarification, granular media filtration, and chlorination were virtually the only treatment processes used in municipal water treatment, however in the last 30 years there have been newer technology developments in the field of water disinfection that we shall explore during the course of this article.

The key objectives for the research and development of newer technologies in this sector are targeted around the following factors:

- Lower capital expenditure
- More cost-effective operations and maintenance
- Higher efficiency
- Ease of operations
- Better effluent water quality
- Lower cost of sludge management
- Reduced manpower cost
- Higher sustainability quotient
- Greener and eco-friendly technologies, and so on

Based on the above factors, the researches have been happening in almost all fields of science, from physics (membrane filters to UV radiations) to chemistry (using the latest innovations in biocides to chlorine kind of alternatives being used traditionally after Second World War) to biology and microbiology (using cyno-bacteria to aquatic weeds to floating islands and so on) for both water quality improvement till disinfection. We've even seen some of the recent ecological approaches like Cownomics® technology being used in India.

We will try to evaluate each of these upcoming technologies for their highlights and flip sides

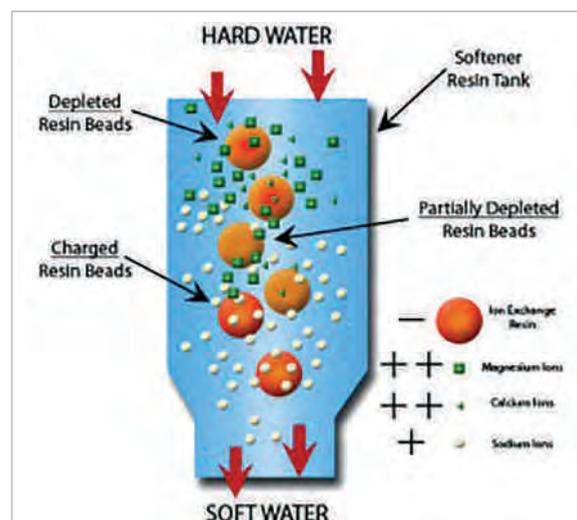


in this article for an easy understanding of the jargon for our readers. So, let's straight away proceed to our first technology:

1) The Ionization Process

This is another widely used demineralization process for water

softening, wherein various chemicals are used for neutralizing Calcium and Magnesium ions, the presence of which is known to make water hard. The technology is commonly designed as a fixed-bed process in which a synthetic resin is packed. As water passes



through the resin bed, contaminant ions present in the water are exchanged with ions on the resin surface, thus removing the contaminant ions from the water and concentrating them on the resin. The resin is frequently regenerated to remove the contaminant from the resin surface and replenish it with the original exchange ion.

Highlights: As it is a chemical-based process, the industry finds it easy to use and implement due to the comfort with chemicals. Largely implemented in industries for demineralization needs and second-largest implementation is in water softening.

Flipside: work primarily in demineralization only, not in qualitative improvement in Water quality or disinfection. Moreover, every chemical reaction has its own residue, thus it makes it unsafe for human consumption.

2) The UV Filtration

Ultraviolet (UV) irradiation technology is primarily used in the water and wastewater treatment industry as a disinfection process that capitalizes on the germicidal effect of UV light in the wavelength range of 250 to 270 nm. The technology focuses on microbial disinfection as most of the microbes can't withstand the UV radiation. Thereafter, a narrow channel of water is passed through UV lights and the radiation kills the pathogens. The process consists of a series of UV lamps enclosed inside quartz sleeves that pass light through the quartz into the water. This process is considered apt for restaurants, highway rest areas, airports, schools, camps, factories, rest homes, and hospitals.

Highlights: Wide acceptability, expected to be high-precision in disinfection, considered compact process since the exposure is in seconds thus considered fast.

Flipside: Because of the high energy emitted by the UV lamps, the temperature of the quartz sleeve rises substantially, causing precipitation of various scales on the surface of the sleeve, which blocks the passage of the UV light into the water and dramatically reducing the efficiency of the process. The scales are commonly caused by the precipitation of calcium, iron, or magnesium salts.

3) The Ozonization Process

This started somewhere in the late 70s or early 80s. The application of ozone in water treatment has been done especially for color removal, taste-and-odor control, and microbial disinfection. Ozone is just a derivative of Oxygen, wherein instead of two atoms of Oxygen (O_2) when they bind together as three atoms it becomes Ozone (O_3).

Highlights: Off late this has become quite a popular technology and with increasing footprints, it is also becoming affordable. This also helps oxidation of Water thus has a ripple effect in Water quality improvement too.

Flipside: Installation of a separate system for Ozonizing adds to extra cost the whole plant. After the process, removal of the ozone residual with hydrogen peroxide is not always very effective and almost nil in alkaline Water. But the biggest threat or flipside to this technology is the potential to form bromate (BrO_3^-), a carcinogen when the water being treated contains bromide.

4) The Membrane Filters

As the name suggests, the concept is of a perforated membrane through which water can pass,



but solids can't. Thus passing Water through the membrane is expected to clean the Water up to some extent. There are many technologies as a subset of membrane technology like Reverse Osmosis (RO) technology, pressurized filtering through the membrane, high-pressure filter-

bodies and municipalities, from sewage treatment to Water Softening plant to desalination plants till drinking Water treatment plants.

Highlights: Easily available, widely acceptable, huge install base, cost-effective versions also avail-



ing, low-pressure filtering, and so on. Then there are various sizes of filters (measured in microns) creating variations in the technology, but the basic principles remain the same. Water is passed through a membrane and whatever the membrane can hold is filtered with a variation subject to the filter size and the pressure.

This technology is being used widely and is considered quite successful due to huge acceptability across the urban local

able in the market.

Flipside: Frequent service, device-dependent, not very high precision in results.

5) The Cownomics® Process

This is an ecological process in which the aquatic ecology is reinstated. The process is easy to adopt and implement by urban local bodies and municipal corporations and has been fairly

successful in waterbody rejuvenation projects across West, Central & North India and has resulted into remarkably good improvement in Water quality among all parameters. The disinfection in the process is based upon the Oxidation-Reduction Potential (ORP) negativity. It has been observed in various researches across the globe that most of the microbial infestation by disease carrying pathogens like Escherichia Coli, Salmonella, Klebsiella, Enterobacter, Cyntrobacter, Edwardsville, Streptococci, and Clostridium, etc die their natural death in ORP negative water. And thus in this treatment, the water gets disinfected as the water turns ORP negative with this treatment with the major electrolytes getting balanced in the restoration process.

Highlights: Sustainable, treats the waterbodies in-situ, ease of use, cost-effective, eco-friendly, no dependency on machines/chemicals, zero energy usage.

Flipside: Can only be used in natural water bodies with soil in the bottom, water on top of the soil surface and open on top, enabling sunlight to penetrate the water surface.

Thus, depending upon the kinds of requirement and usage, technology can be adopted for a particular scenario. Each technology has its own highlights and flip sides, and therefore, a careful selection and optimization is required by the user authority for selecting an apt technology for specific usage.

About the Author

Madhukar Swayambhu has been an IT professional for 25 years in the industry. The Environment, Ecology, Vedic Sciences, Sanskrit, and Indic knowledge has been his passion for all these years.

Vedic Cownomics Private Limited is a result of this journey in which "They make ecology alive".

