TECHNICAL TUESDAYS

DEVELOPMENTS IN EFFLUENT TREATMENT – PART II

REF: TT/ OCT 2021/ WK 4

Zero Liquid Discharge (Continued...)

The Zero Liquid Discharge or ZLD System removes dissolved solids from the waste matter and returns pure water to the system. Main steps followed in this system are as follows:

- **Equalization** - First all wastewater from all sections of operation is collected in common tank. Then, pH of the wastewater is neutralized by addition of acid or alkali as per the requirement.
- **Gravity separation method** – In this method, the solid particles gets collected in bottom of tank by gravitational force.
- **Primary treatment** – This is done by biological method.
- **Secondary treatment** - This part of the treatment is carried out by membrane processes such as Reverse osmosis, ultra-filtration or nano filtration.
- **Ion exchange based methods –** Ion exchange based methods are used to remove hardness and to get high purity water.
- **Thermal process** – This process is carried out for thermal destruction of concentrated streams.

Challenges associated with Zero Liquid Discharge system

- Zero Liquid Discharge or ZLD results into generation of large amount of solid wastes causing solid waste management challenges.
- Power usage in ZLD system is high. Which Increases the energy usage tremendously and subsequently the high carbon foot print.
- ZLD requires use of higher amount of chemicals in wastewater treatment.
- Maintenance and operation cost of this system is quite high. The major challenges faced are related to corrosion of metal, scaling and leakage/choking in pipes.

Reverse Osmosis (RO)

The polluting effluents of textile industries which is of major environmental issues are treated by physico-chemical and biological process. The physico- chemical process contains membrane technologies like **Reverse Osmosis** / Nano filtration and ultra-filtration.

Reverse osmosis is a method for the restoration of wastewater/effluent by removal of wide range of organic pollutants, bacteria and viruses, dissolved organic matter, and inorganic salts. It is economical and ecofriendly process of purifying water. By this process, some percentage of water is recovered for reuse in the operation and the balance formed as RO reject or concentrate. Concentrate is formed by membrane fouling **(Fouling is the accumulation of unwanted material on solid surfaces)**, coagulation and flocculation process as it cannot be further purified due to high osmotic pressure.
The application of membrane separation processes comprising ultrafiltration and reverse osmosis units includes disposal of reverse osmosis rejects through evaporator. Reverse Osmosis Membrane rejection is influenced by interaction between effluent composition and membrane properties.

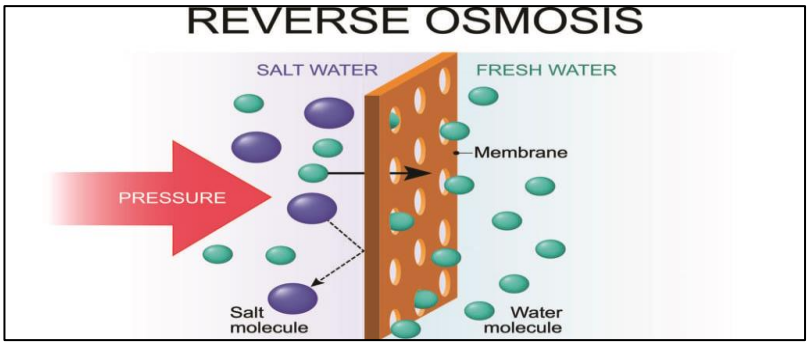

Fig 1.1 Reverse Osmosis
Ref: freshwatersystems.com

After primary, secondary and/or tertiary treatment, further purification by removal of organics and dissolved salts is possible by use of reverse osmosis. The process of reverse osmosis is based on the ability of certain specific polymeric membranes, generally cellulose acetate or nylon to pass pure water at high rates and to reject salts. To achieve this, wastewater is passed at high pressures through the membrane. The applied pressure has to be high enough to overcome the osmotic pressure of the stream and to provide a pressure driving force for water to flow from the reject compartment through the membrane into the clear water compartment.

References:

1. https://www.hyperfilteration.in/textile.html
2. https://www.ionindia.com/
3. http://ripublication.com/
4. https://www.ceeindia.org/

.....To be continued.....

UNSCRAMBLE THE JUMBLE WORDS
VRTAIYG
NEGHEXCA
MARRIYP
ERNACTI

Last week`s Answers: 1) CONVENTIONAL 2) REVERSE 3) OSMOSIS 4) WATER

Wishing you a great week ahead!

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