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"TEXTILE WASTEWATER TREATMENT BY ZERO LIQUID DISCHARGE PROCESS (ZLD.)"

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Abstract : Difficult to clean wastewater or in cases where water shortages require recycling Zero Liquid Discharge (ZLD) technology helps you achieve environmental compliance, reduce your carbon dioxide emissions by converting them into solid waste solid waste and recycling them. about 95% of your waste waste is recycled. ZLD treatment process can be accepted as advanced wastewater treatment products in products that can easily decompose and reduce toxicity, pH, COD, TDS, SS, BOD parameters .Zero Liquid Discharge (ZLD) system reducing the amount of fluid. Waste that needs to be treated, while also producing a clean stream that should be used elsewhere in plant processes. ZLD is able to reduce all types of wastewater and make it recyclable and recycled for a variety of uses. As research results show that 99% TDS, 100% of both COD and BOD, 98% SS and reduced TSS (Removed) make it a Zero liquid release. The ZLD industry has produced high quality water ready for recycling in plant yards which has led to reduced water use. The ZLD treatment system uses advanced water treatment systems that are environmentally friendly and highly reliable.

Keywords: **- ZLD, UF, RO, UASB, MEE Pharmaceutical Waste Water Treatment.**

INTRODUCTION

Investing in a ZLD wastewater treatment plant can help your area save important water in your system while protecting vital services in your community. The Zero Liquid Discharge treatment system uses advanced water purification technologies to limit liquid waste at the end of your industry process so that the name raises an environment that is environmentally friendly and highly reliable. For solid extraction guidelines and provide effective treatment at the lowest possible life cycle cost ZLD is the solution. ZLD system based on independent thermal / evaporation processes, membranes or a combination of these two systems namely hybrid systems that lead to increased value, easier operation and reduced operating costs. Increasingly, industries have been banned from discharging any liquid waste from their facilities. The Zero Liquid Discharge treatment program can help us to achieve.

1. Treat different types of waste and sewage.
2. It can be helpful to prepare chemical rolls.
3. This treatment process gets about 95% of your liquid waste for reuse.
4. The system can be managed and finds important products in your trash.
5. The system can produce a solid dry cake to dispose of
6. In the towers of cooling industry a large scale
7. It can be used for the purpose of watering plants and grass.
8. Boiler feed water. (Mainly to produce MEE steam)
9. In water scrubber as scrubbing media.
10. Preparation of ETP lime slurry.
11. Various industrial cleaning activities.

LITERATURE REVIEWS

After the ZLD treatment process the amount of water from the industry is divided into COD / TDS high and low COD / TDS streams. The Stripper followed by the Multiple Effect Evaporator is operated by a stream of highly concentrated wastewater from the production process. WTP rejection is sent to MEE and condensate water from MEE is sent to ETP and other low COD / TDS waste streams namely cooling, washing and boiling and ETP followed by RO, permeate from -RO is also used for cooling and refuses to be sent to MEE. There is therefore no wastewater treatment in the industry and the unit maintains Zero Liquid Discharge. [2] .Beating water in the MEE is obtained and recycled while clean water is concentrated at high concentrations and COD levels and content are suspended. Solid should be reduced to acceptable values given to the Pollution Control Board and pH to be neutral. [3] .The ZLD is a system that benefits industry, municipal organizations and the environment because there is no waste, or waste, left over. In 2013 the Veolia water treatment ZLD programs utilized state-of-the-art wastewater treatment technology to clean and recycle all wastewater produced within the facility. Dirty Separation, Successful Treatment, Complete Reuse, COD Conversion is Organic Living and TDS of Dry Salt to Be Disposed in Safe Waste Disposal Program with Zero Liquid-Based Treatment Program.

[5] With the use of activated carbon powder and reversible osmosis approximately 50% of TOC removal occurred during the coagulation-lime softening process which included the use of activated carbon fiber. The remaining amount of TOC is removed by a receding osmosis (RO) output was approximately 0.2 mg / L. With coagulation-flocculation turbidity the removal was about 60% and increased to 80% after the pH adjustment that occurred when the adjective was released. Read by Laine et al. 2000 using a multimedia filter reduced turbidity to less than 1 NTU values and further decline occurred in the water filtering phase to less than 0.1 NTU. [6] RO has a strong aperture (Membrane used under 0.001 micron) effectively removes up to 99% of salts (ions), particles, colloids, organisms, bacteria and bacteria in the feed water. With ZLD management - the system can produce a clean stream from industrial wastewater that is suitable for reuse on a plant and an established stream that can be discarded or reduced to a solid. In the ZLD system 40-50% of water is rejected during the RO process but this budget can be reduced to 20-25% by re-using refined water to achieve its 70-75% efficiency target. [7] .Designed to be available at> 87.5% as condensate MVR Evaporator to be used. In the ZLD system the main use of MVR-Evaporators was designed to handle 15% of R.O disposal and the auxiliary Evaporator was designed to handle 2% of recycled alcohol from Softener and Decolorate Resin filters. Part of the liquid residues that can evaporate from MEE by salt shining. [8] In the zero emission system the total load reduction was 99.2 percent in TDS, 99.9 percent in COD and 100 percent in both TSS and BOD. Through various experimental analyzes that release the ZLD unit designed to be effectively used for the treatment and recycling of manufactured API units, which help meet legal requirements and reduce concerns about groundwater depletion. With experimental testing of MEE (Multiple Effective Evaporator), ATFD (Agitated Thin Film Drier) and LCS contamination treatment unit with SBR (Sequential Batch Reactor) and MBR (Membrane Bio-Reactor) with another unit called water recycling unit. which includes RO (Reverse Osmosis) is an ZLD experimental industry that has shown significant decline in TDS (Total Dissolved Solids), TSS (Total Suspended Solids), BOD (Biological Oxygen Demand) and TSS (Total Suspended Solid) to -99.2, 100, 100 and 99.9 percent respectively.

STUDY AREA AND METHODOLOGY

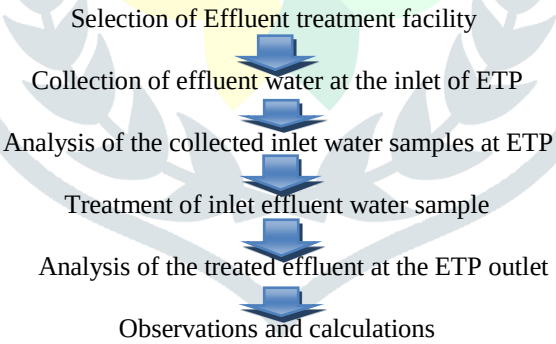
This chapter includes the area of study in detail and the methods we are gone used to propose the best suitable for the Treatment of wastewater to achieve zero liquid discharge

Area of concern

The objective of analysis is to determine the treated waste water parameter are in the range of limits specified by pollution control board & applying advance waste water treatment method to achieve zero liquid discharge where water flow in closed loop so that there is no discharge of water in surrounding & treated water is re-used in process thus reducing the water demand & cost.

Methodology Flowchart

The different phases of this project of work are shown in the following diagram. The figure simply describes the experimental strategy of this study step by step.



BASIC ZLD SYSTEM

The ZLD medical technology that will make the institutional treatment plan will vary greatly depending on the volume of dissolved solids present in the waste and the required flow rate of the system and what contaminants are present. ZLD System Integrating the Three Step Process

1. Pre-treatment and condition

In the ZLD system pre-treatment is used to remove simple substances from a stream of contaminated water that can be filtered or drained, to fix water and fixed solids and substances that can be measured and / or contaminated following treatment steps. The ZLD treatment block contains a specific type or precision reactor for removing metals, hardness, and silica. The liquid that is then compressed is filtered into a solid, resulting in a very low solution for solid solids and without the ability to increase concentrated treatment.

2. Phase one concentration

The first phase concentration is usually done with a membrane such as reverse osmosis (RO), brine agents or electrodialysis. This stream also immerses it in a high salt and extract it up to 60-80% water.

3. Crystallization

The next step is the solid production process by heating or evaporating when you evaporate, collect, and recycle. The remaining debris from the evaporator to the crystallizer continues to boil everything water until all impurities in the water are polished and filtered as solid.

These steps used in your particular ZLD program will vary depending on the individual needs of your institution. Wastewater treatment research conducted to ensure that contaminants in wastewater are handled appropriately. The specific pollution, the amount of that pollution and the flow rate of the system will all affect what technology is building your ZLD system. In the ZLD system if your plant is operating consistently with a low flow rate you are usually looking at your own lower capital costs and If your plant operates with a higher flow in the short term your capital costs are usually higher.

Unit operations or processes used in ZLD system

1. Solvent Recovery - Air Stripper - Used to dissolve solvents / ammonia by providing air

Advantages - In economics where soluble solvents are present in polluted water and a standard proven method for dissolving solvents.

Disadvantages - Works only if a large amount of solvent with low solubility in water is present in contaminated water. It is difficult to photograph a solvent when you are at a low level.

Applications - Replacement of beneficial solvents, ammonia in pharmaceutical industry, Pesticide industry, Chemical industry.

2. Solvent Recovery - Steam Stripper - Solvents can be reused or sold.

Advantages - Useable or minimal amount of soluble substances present in wastewater.

Disadvantages - Scaling occurs in a column that should be cleaned periodically.

Applications - Pesticide Industry, Chemical Industry.

3. Ultra-Filtration (UF) - Used for the removal of colloidal matter and bacteria and viruses and Used for previous treatment in RO.

Benefits - Removes fixed, colloidal particles, bacteria, germs.

The best pre-treatment for RO.

The most effective salt removal treatment (TDS) with salt resistance over 99%.

Disadvantages - Replacement of membranes after 5 years is required.

Very high cost.

Applications - Pre-treatment of RO in all ZLD plants.

4. Reverse Osmosis (RO) - Used to remove excess salt (TDS) and residual organisms by transferring contaminated water into a slow-moving membrane by applying high pressure.

Advantages - Clean technology and no handling of acid / alkali chemicals such as ion exchange technology and Permeate water ions are ion free and can be used in industrial processes.

Disadvantages - High power consumption due to high pressure pumps.

Membrane replacement is required after 3 years application. Frequent cleaning of the membrane due to damage to the Reject Water membrane

Applications - Pre-treatment of RO in all ZLD plants.

5. Multiple Effect Evaporator (MEE) - Used to evaporate wastewater to separate water and salt through steam heating in a series of vessels.

Advantages - Proven method of obtaining water in brackish water and salt separation.

Disadvantages - High operating costs due to the need for smoke.

Applications - Pharmaceutical Industry, Textile Industry, Pesticide Industry, Dye and Dye Medium, Metal Industry, Fertilizer Industry.

6. Mechanical Vacuum Compressor (MVR) - The water vapor produced by the evaporator is pressurized to a high pressure that acts as a heat source of evaporation.

Benefits-Eliminates the need for thermal energy. Useful when steam is not available. Low operating costs.

Disadvantages - It is only suitable for liquids with low boiling point (BPR).

Ideal if the right steam is not in the industry.

Applications - Fabric Industry.

7. Crystallizer - Used to dry TDS high water or products using heat.

Benefits - Used to replenish salts such as Sodium sulfate, Sodium Chloride, Sodium Thiosulphate, Zinc Sulphate etc.

An easy way to evaporate with a single effect. Good thermal conductivity can therefore be used for viscous liquids.

Disadvantages - Measurement and corrosion of the unit is a problem. It needs regular cleaning.

Applications - Application in restoring salt in Dye and Dye Intermediates, All Industrial Sectors.

8. Agitated Thin Film Dryer (ATFD) - Used to dry TDS high water or products using a rotating rotor in a heat jacket. Advantages - Soft evaporation and high evaporation rate. Continuous cleaning of the hot spot.

Disadvantages - Measurement and corrosion of the unit is a problem. It requires very high power.

Applications - Fabric Industry, Pharmaceutical Industry for final drying before disposal of the Medical Industry.

9. Heat-Used to heat impurities concentrated by thermal energy

Advantages - A useful method for very high energy (High COD) wastewater that is difficult to reduce. No further treatment is required.

Disadvantages - Operating costs are high. The high cost is high. It only works for small amounts of waste.

Applications - Dye and Dye Intermediates, Pesticide Industry

Different treatment methods used in ZLD

1. Basic Treatment

In the ZLD Basic Treatment Phase process the wastewater disposal process will be collected in an existing ventilation tank. After the ventilation system has been incorporated into the new ETP area in the oil / Melt separator to remove any oil / floating oil separation. It is finally collected in the tanks of the collection where it will be mixed to ensure uniform consistency and to extract any flow variations. Neutrality Water Processing will be lime or HCL in the neutralization tank, depending on the pH. The contaminated water will then be re-mixed with Ferrous Sulphate and lightened mixed with polyelectrolyte to ensure proper flow through the Polyelectrolyte. Eventually the wastewater will be clarified in the Main Reference and will be collected in the UASB feed sump for further anaerobic treatment.

2. Second Treatment

Refined wastewater from the UASB Feed sump will be pumped to the UASB reactor where anaerobic bacterial culture will reduce pollution due to the lack of free oxygen and reduce the bulk of the biological load (COD / BOD). Deterioration of Anaerobic impurities and contaminated waste water will then be transferred to a pre-ventilated tank to extract the depth and trapped gas which will allow the solid particles to remain in place when a solid fixer is provided. Wastewater specification is performed to separate solids and specified wastewater will be subjected to aerobic biodegradation treatment where biomass contamination will be determined by biomass in a second specification. The need for BOD concentration is low in the RO feed system will be fitted with a well-designed aerobic system in extended ventilation mode to ensure maximum biological emissions.

3. Tertiary Treatment

In a high-quality treatment process the purified water from the second precursor will be disinfected with sodium hypochlorite and re-treated with a Sand Pressure and Emerged Carbon Filtration filter. For further treatment and higher education definition it may be necessary to extract the silica content from the waste water before the RO feed. After disinfection the wastewater is purified and the additional treatment expected to extract silica will be fed to the Ultrafiltration (UF) program to remove colloidal matter and improve the silt density index (SDI) before feeding to Reverse Osmosis and permeate produced in RO will be recycled and reused. the process of performing a proper function while the Reject produced in the RO will evaporate from the MEE to separate the salt to be filled in the authorized area for the Disposal of Protected Disposal.

4. Reverse Osmosis Systems

Reverse Osmosis systems in one complete stage and all peripherals will suffice for high permeate recovery that can be reused. The leaked liquid will be recycled depending on the quality of the permeate and the suitability for re-use in this process. The rejection of RO Systems will evaporate from the Multi Effect Evaporator and the separated salt will be sent to the Safe Disposal Area. Condensate will be managed in ETP.

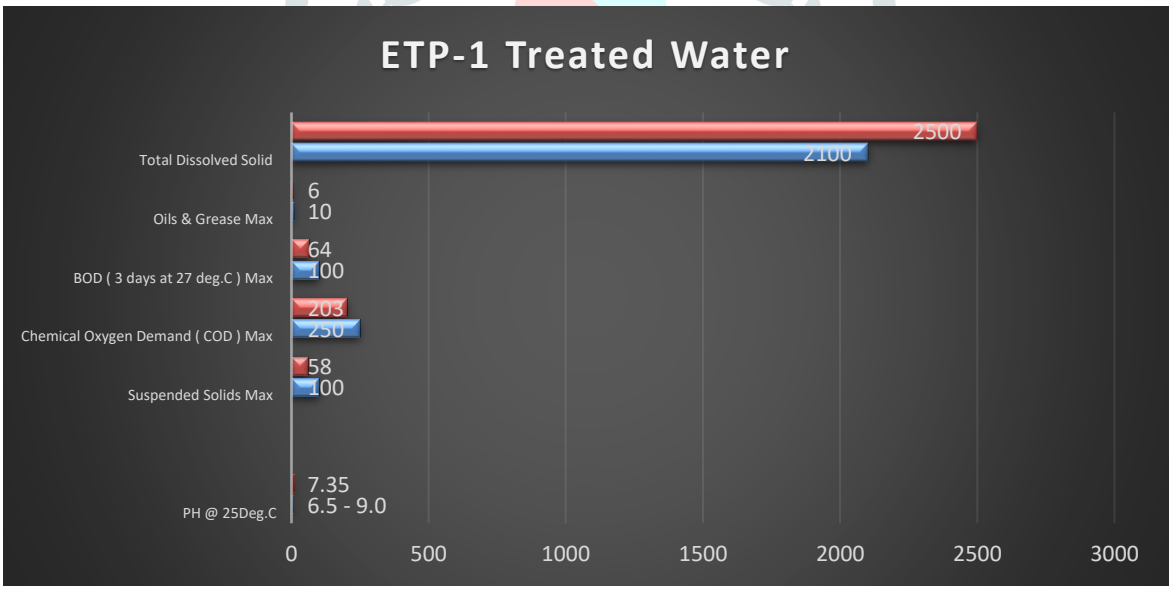
5. Multi Effect Evaporator

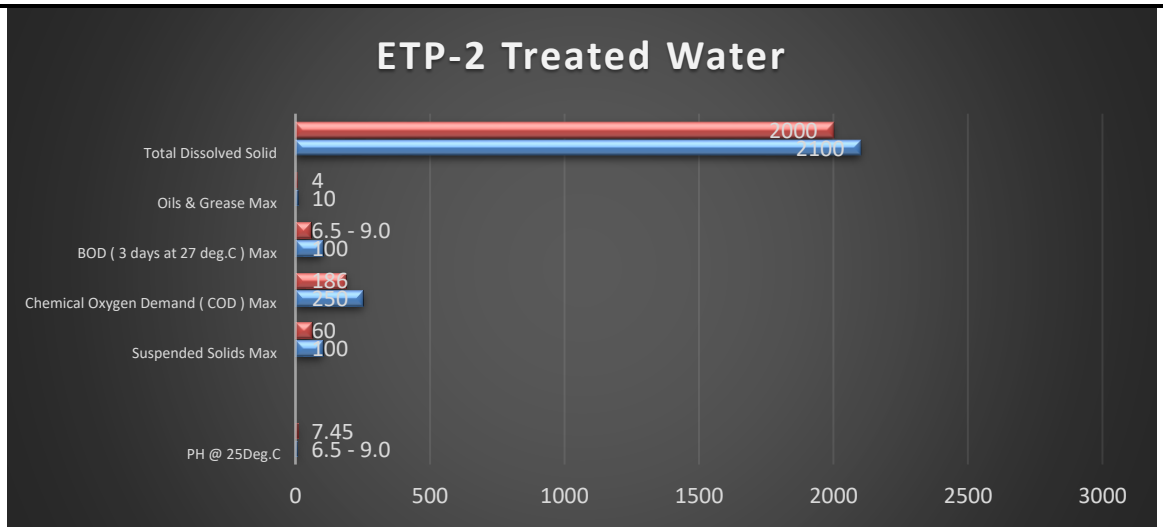
MEE will be offered to treat RO Rejects basically consisting of soluble solvents and condensate will require additional treatment and will therefore be managed in ETP. MEE will be followed by an agitated thin film dryer (ATFD) to confirm converting the slurry into solid solids almost dry. Separated salt will be disposed of in a secure waste disposal facility

RESULT & DISCUSSION

Effluent is treated in ETP plant, treated effluent parameter is measured at the outlet of ETP.

Parameter is measured as per IS 3025 standard & result obtained is shown below were we can observe that all parameter except TDS is at higher level which is concern & we can use this water for any process use.

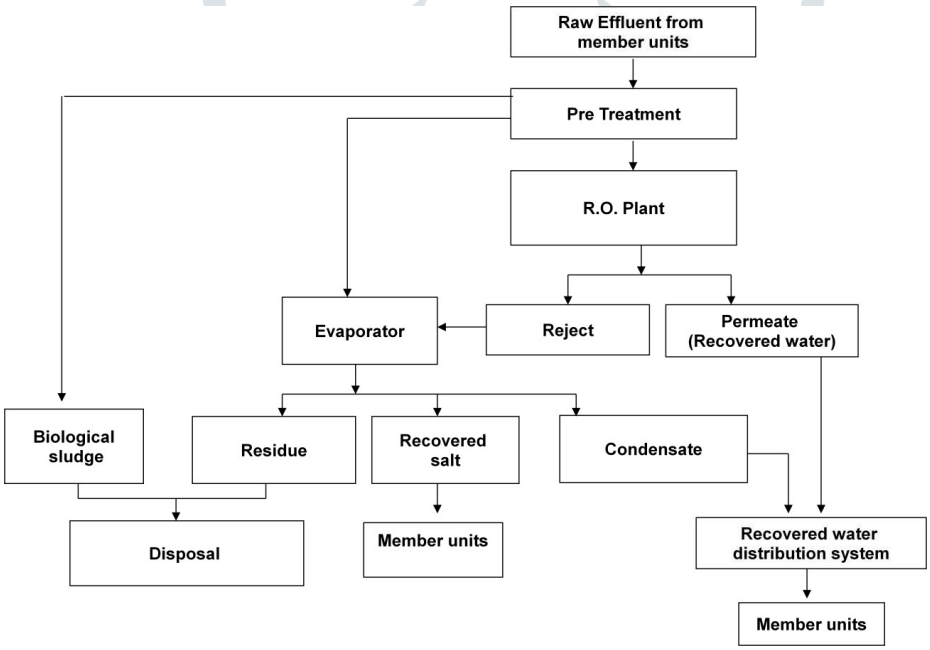




This study presents a situation of the existing wastewater treatment plant and an assessment of the zero liquid discharge process for wastewater treatment and re-use of treated waste water in process. After comparing tested results it is found that the treated effluent parameter PH , TSS , COD , BOD are within limit set by pollution control borad . TDS of waste water is above limit & and at higher side, this high TDS water cannot be re-used back in process.

The use of the zero liquid process for collected wastewater can give comparatively good results were we can achieve recovery of 90 to 95 % of waste water & useful salt Industrial Grade Sodium Chloride and Sodium Sulphate.

ZLD process flow source P. Raja Shankar, s. Rajesh (2015)



Conclusion

This study presents a situation of the existing wastewater treatment plant and an assessment of the zero liquid discharge process for wastewater treatment and re-use of treated waste water in process. After comparing tested results it is found that the treated effluent parameter PH , TSS , COD , BOD are within limit set by pollution control board . TDS of waste water is above limit & and at higher side, this high TDS water cannot be re-used back in process.

The use of the zero liquid process for collected wastewater can give comparatively good results were we can achieve recovery of 90 to 95 % of waste water & useful salt Industrial Grade Sodium Chloride and Sodium Sulphate.

FUTURE SCOPE AND BENEFITS

- •ZLD can be adopted to treatment of waste water.
- •ZLD can be used as an additional treatment to treat waste water.
- •ZLD process can make waste water for reusable.
- •This treatment process can treat any type of industrial waste water so have wide scope to treat different types of industrial waste water.
- •ZLD capable to make recyclable any type of waste water canavoid the shortage of waste water and Recover around 95% ofyour liquid waste for reuse.

BENEFITS

1. Water Conservation
2. ZLD systems employ the most advanced wastewater treatment technologies to purify and recycle virtually all of thewastewater produced.
3. Reduces the wastewater discharge i.e. reduces waterpollution
4. Preferred option for industry where disposal of effluent is major bottleneck
5. Prevents exploitation of hydraulic capacity of disposal system
6. Separation of salts / residual solvents improve efficiency of ETP and CETP
7. Separated solids valuable by-product which helps inreducing the payback period
8. Mixed solvent separated in stripper can be reused or used asCo-processing
9. Ease in getting environmental permissions
10. More focus on production/ business rather than trackingafter regulatory authorities
11. Reduction in water demand from the Industry frees upwater for Agriculture and Domestic demands.

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NOMENCLATURE

ATFD - Agitated Thin Film Drier BOD - Biological Oxygen Demand LCS - Low concentrated Sludge MBR - Membrane Bio-Reactor MEE - Multiple Effective Evaporator NTU - Nephelometric Turbidity Units SBR - Sequential Batch Reactor) TDS - Total Dissolved Solids), TSS - Total Suspended Solids), TSS - Total Suspended Solid TOC – Total Organic Carbon ZLD - Zero liquid discharge