IJMRSETM

e-ISSN: 2395 - 7639

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH

IN SCIENCE, ENGINEERING, TECHNOLOGY AND MANAGEMENT

Volume 10, Issue 6, June 2023

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.580

Characterization of Various Treatment Methods for Wastewater Containing Starch

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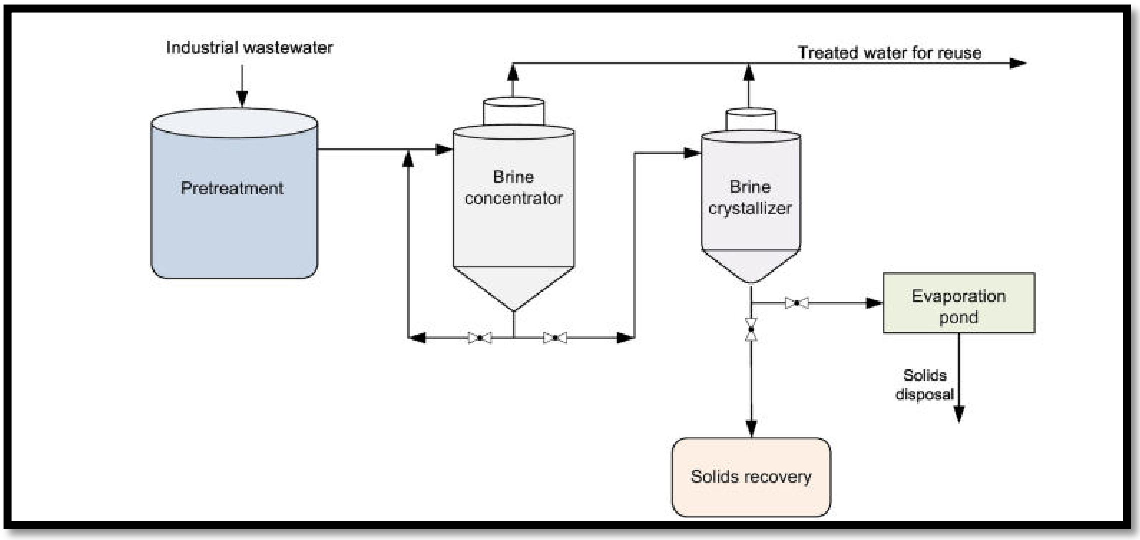
ABSTRACT- Industrialization is necessary for us of as economic growth. Increase in business improvement has extended water consumption and is resulting in depletion of water assets. On the other hand, water pollution is a chief difficulty. People have lengthy been trying to discover fee effective and dependable approaches to treat wastewater and recycle or reusing the handled water has turn out to be a need. Zero Liquid Discharge (ZLD) is a great state of affairs of entire closed loop cycle, in which discharge of any liquid effluent is removed; it's far a tremendous attempt of each enterprise who implements it to fulfill with the environmental regulation in a difficult manner. However, it's miles going through some challenges for its implementation consisting of its high expenses and electricity efficiency. Here on this evaluation, we've got supplied diverse ZLD technologies which are feasible for extraordinary commercial sectors and some modern technology by which the treasured water can be stored and recycled at supply.

KEYWORDS: Zero liquid discharge , wastewater, zld technologies , ETP industries, BOD, COD

I. INTRODUCTION

Zero liquid discharge (ZLD) a wastewater management strategy that eliminates liquid waste and maximizes water usage efficiency has attracted renewed interest worldwide in recent years. Although implementation of ZLD reduces water pollution and augments water supply, the technology is constrained by high cost and intensive energy consumption. Freshwater scarcity, one of the most critical global challenges of our time, poses a major threat to economic growth, water security, and ecosystem health. The challenge of providing adequate and safe drinking water is further complicated by climate change and the pressures of economic development and industrialization. The public and industrial sectors consume substantial amounts of freshwater while producing vast quantities of wastewater. If inadequately treated, wastewater discharge into the aquatic environment causes severe pollution that adversely impacts aquatic ecosystems and public health. Recovery and recycling of wastewater has become a growing trend in the past decade due to rising water demand. Wastewater reuse not only minimizes the volume and environmental risk of discharged wastewater, but also alleviates the pressure on ecosystems resulting from freshwater withdrawal. Through reuse, wastewater is no longer considered a “pure waste” that potentially harms the environment, but rather an additional resource that can be harnessed to achieve water sustainability. management strategy that eliminates any liquid waste leaving the plant or facility boundary, with the majority of water being recovered for reuse. ZLD obviates the risk of pollution associated with wastewater discharge and maximizes water usage efficiency, thereby striking a balance between exploitation of freshwater resources and preservation of aquatic environments. Achieving ZLD, however, is generally characterized by intensive use of energy and high cost. As a result, ZLD has long been considered not viable and has been applied only in limited cases. In recent years, greater recognition of the dual challenges of water scarcity and pollution of aquatic environments has revived global interest in ZLD. More stringent regulations, rising expenses for wastewater disposal, and increasing value of freshwater are driving ZLD to become a beneficial or even a necessary option for wastewater management. Zero liquid discharge (ZLD) aims to minimize liquid waste generation whilst extend water supply, and this industrial strategy has attracted renewed interest worldwide in recent years. In spite of the advantages such as reduced water pollution and resource recovery from waste, there are several challenges to overcome prior to wider applications of ZLD. Everyone needs water. Supplies of water are vital for agriculture, industry, recreation and human consumption. One problem that the water industry faces is disposal of concentrate from advanced water treatment processes.

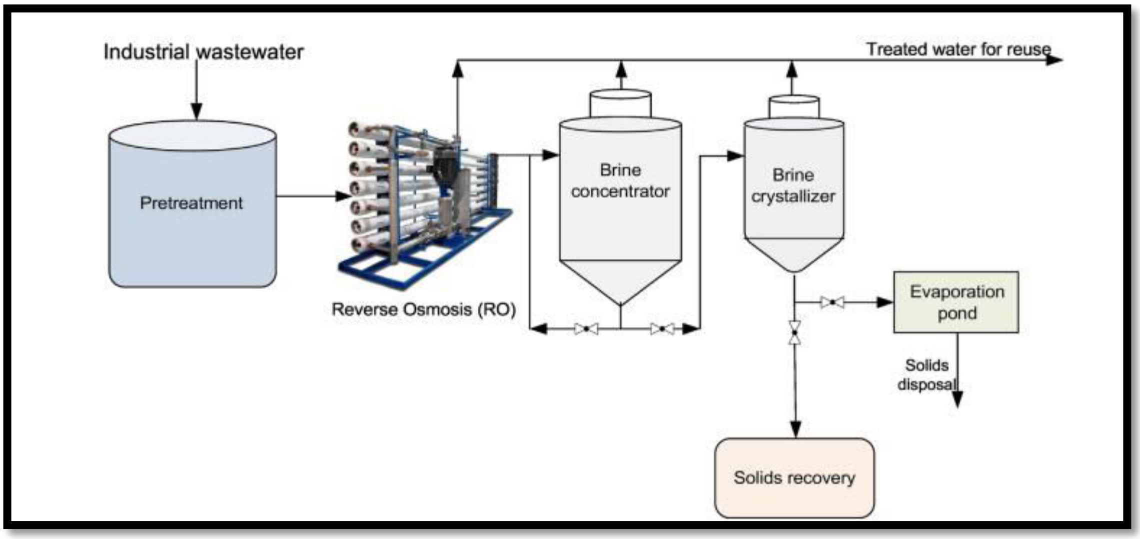
This project discusses Zero Liquid Discharge (ZLD) systems, one possible solution to concentrate disposal. ZLD disposal is the only option currently available in many inland regions where surface water, sewer, and deep well injection disposal are prohibited. A ZLD-system can produce a clean stream from industrial wastewater. Suitable for reuse in the plant and a concentrate stream that can be disposed, or further reduced to a solid. Furthermore, the prevalent technologies used for ZLD-systems and different types of components in a ZLD-system are being described in this project.



[Fig.1.1: A schematic diagram of a thermal ZLD system]

A zero liquid discharge (ZLD) can be defined as combination of techniques or facilities and system which will help the water loop of the industry to become close one for absolute recycling of permeate and converting solute (dissolved organic and in-organic compound/salts) into residue in the solid form by adopting methods like concentration and thermal evaporation.

ZLD will be recognized and certified will be based on two broad parameter that is, water consumption versus waste water reused or recycled(permeate) and corresponding solids recovered (percent total dissolved/suspended solid in influent).



[Fig.1.2: A schematic diagram of a RO incorporated ZLD system]

In a world where freshwater is an increasingly valuable resource, industrial processes threaten its availability on two fronts, unless the water is treated. Many industrial processes require water, and then reduce the availability of water for the environment or other processes, or alternately contaminate and release water that damages the local environment.

Although the history of tighter regulations on wastewater discharge can be traced back to the US Government's Clean Water Act of 1972, India and China have been leading the drive for zero liquid discharge regulations in the last decade. Due to heavy contamination of numerous important rivers by industrial wastewater, both countries have created regulations that require zero liquid discharge. They identified that the best means to ensure safe water supplies for the future is to protect rivers and lakes from pollution. In Europe and North America, the drive towards zero liquid discharge has been pushed by high costs of wastewater disposal at inland facilities. These costs are driven both by regulations that limit disposal options and factors influencing the costs of disposal technologies. Tong and Elimelech suggested that, "as the severe consequences of water pollution are increasingly recognized and attract more public attention, stricter environmental regulations on wastewater discharge are expected, which will push more high-polluting industries toward ZLD." gh-polluting industries toward ZLD." Another important reason to consider zero liquid discharge is the potential for recovering resources that are present in wastewater. Some organizations target ZLD for their waste because they can sell the solids that are produced or reuse them as a part of their industrial process. For example, lithium has been found in USA oil field brines at almost the same level as South American salars.

[Fig.1.3: ZLD Water Treatment Technology]

II. LITERATURE REVIEW

[1] Tiezheng Tong et al. The creator in this paper have surveyed three film based innovations – ED/EDR, thermolytic FO, and MD – as three arising ZLD advances to additional concentrate the feedwater after the RO stage. Notwithstanding, contrasted with the specialized development of RO and MVC brackish water concentrators, these advancements are less settled. More pilot or field studies are attractive to approve their enormous scope execution and suitability in seeking after ZLD. Particularly, their energy utilization and cost should be additionally assessed to make an immediate correlation with MVC saline solution concentrators. For MD and thermolytic FO, their capacity of saddling poor quality energy will essentially diminish the great energy interest, activity cost, and GHG impression of ZLD. Moreover, the natural effects of ZLD should be better perceived. A daily existence cycle appraisal investigation of the energy interest and GHG discharge will give extra experiences into the money saving advantage adjusting of ZLD. Alongside propels in working on the energy and cost efficiencies of ZLD innovations, especially by joining layer based cycles, ZLD might turn out to be more attainable and reasonable later on.

[2] M. Cheryan et al. The creator has assessed about the wide scope of enterprises experiencing oil and oil contamination. Modern squanders might be lower in volume, however contain a lot higher grouping of contaminations

.Industries like steel, aluminum, food, material, calfskin, petrochemical and metal ®nishing are some that report undeniable degrees of oil and oil in their effluents. Accordingly the utilization of UF and MF to treat oil±water emulsions is surely going to increment later on, particularly in applications where the worth of the recuperated materials is high, e.g., reusing watery cleaners and machining coolants. Layers could likewise be valuable in a half and half framework when it is joined with regular substance treatment frameworks to think mucks. . This survey of the creator depicts a few contextual investigations of these applications, and examines the potential entanglements and capability of in applying layers to the treatment of slick squanders.

[3] ValentinaColla et al. The creators in this paper did the exploration about the water reuse and office the executives ideas for the primary circuits in various steel plants of steel industry through salt end strategies. This review concerned two water circuits having a place with two coordinated steelworks where high salts fixations led to pertinent issues. In the main circuit, the high chloride and carbonate focus in the cooling water of the hot strip plant can influence the nature of the strips, because of the salt testimonies on the strip surfaces, and causes erosion of gear. In the subsequent circuit, the high substance of chlorides and fluorides in the process waters of a Blast Furnace gas cleaning framework causes erosion of different parts. . In the two cases the creator completed the tests to survey the likelihood to apply Reverse Osmosis execution and to assess the security of its subjective presentation to the saline water. The tests showed that pre-medicines are really required for colloids expulsion, and, subsequently, to ensure Reverse Osmosis layers: in the primary circuit, ultrafiltration, and in the second circuit customary coagulationflocculation-sedimentation framework followed by sand filtration have been carried out. . Results showed that, through Reverse Osmosis framework, most salts, like chlorides, fluorides, calcium, sulfates, and so forth can be taken out and different boundaries, like electrical conductivity, alkalinity and Total Dissolved Solids significantly diminished.

Appropriately critical outcomes have been accomplished, like new water utilization and water released decline, and the line administration life improvement, because of the decrease of consumption issues. The monetary reasonability at modern scale was additionally assessed and their execution came about plausible

[4] Tiezheng Tong et al. The creator in this paper have surveyed three film based innovations − ED/EDR, thermolytic FO, and MD − as three arising ZLD advances to additional concentrate the feedwater after the RO stage. Notwithstanding, contrasted with the specialized development of RO and MVC brackish water concentrators, these advancements are less settled. More pilot or field studies are attractive to approve their enormous scope execution and suitability in seeking after ZLD. Particularly, their energy utilization and cost should be additionally assessed to make an immediate correlation with MVC saline solution concentrators. For MD and thermolytic FO, their capacity of saddling poor quality energy will essentially diminish the great energy interest, activity cost, and GHG impression of ZLD. Moreover, the natural effects of ZLD should be better perceived. A daily existence cycle appraisal investigation of the energy interest and GHG discharge will give extra experiences into the money saving advantage adjusting of ZLD. Alongside propels in working on the energy and cost efficiencies of ZLD innovations, especially by joining layer based cycles, ZLD might turn out to be more attainable and reasonable later on.

[5] RihuaXiong et al. The creator in this paper learned with regards to the current status and innovation patterns of zld in coal synthetic industry of china . It has seen that Coal substance industry in China has been filling quickly in the previous decade and the pattern is relied upon to proceed before very long. It is assessed that the coal synthetic industry creates around 117 million tons of wastewater in China consistently and this number is relied upon to increment to 475 million tons by 2020.Therefore the creator has concentrated about zld utilizations and applications businesses i.e ZLD is regularly utilized as the wastewater the executives procedure in recently proposed coal compound plants. The ZLD framework include three stages i.epretreatment ,preconcentration and vanishing and crystallization with the film based preconcentration step pushing the water recuperation to 90–95%. The execution and Development of ZLD advancements in China has given a fast push to development of coal compound industry. In this review , plainly ZLD advances will be progressed towards better framework solidness, lower treatment cost and useful reusing of unadulterated salts from wastewater by carrying out new improved organics evacuation innovations, half and half film and room temperature crystallization advances, high saltiness layer focus advances, unadulterated salts situated crystallization advances.

[6] MekdimuMezemirDamtie et al. This paper learns about the Membrane-based advances for zero fluid release and fluoride expulsion from modern wastewater .This article inspected the half breed crystallization-switch assimilation procedure (HRO) considering transition, fluoride evacuation productivity, fouling inclination, mineral recuperation, going along zero fluid release (ZLD), and gushing release standard (EDS, which are the Several defluoridation methods utilized for the decrease of high starting fluoride focus (IFC) in wastewater which hhave been tried, yet a couple of them have accomplished the passable principles. The review showed low-pressure (30 bar) RO can't treat profoundly fluoridated wastewater (IFC ¼ 6600 mg/L). Its greatest ability was uniquely around IFC ¼ 614 mg/L. Thusly, a mixture of these two innovations (i.e HRO) was effectively applied toward lessening M.M. Damtie et al. /Chemosphere 236 (2019) 124288 9 fluoride to the ideal norm. Examination with other cutting edge innovations, like MD, HRO additionally showed cutthroat or surprisingly better execution as far as transition, fluoride dismissal, ecological neighborliness, and energy saving. In this way, lowpressure HRO can be applied as great as SMD to treat profoundly fluoridated modern wastewater with a decent propensity of mineral recuperation and less natural fouling.

[7] NupurBahadur et al . This research article is about the material and coloring industry wastewater of Novel pilot scale photocatalytic to accomplish process water quality and empowering zero fluid release which is the need of great importance in handling issues of point source contamination and Water Conservation in agricultural nations like India. Reuse of regarded water as interaction water further guarantees water re-use proficiency and execution of Zero Liquid Discharge. Which is relied upon to lessen freshwater necessity and guarantee maintainable administration of water assets in water focused on districts of non-industrial nations.

[8] Argyris Panagopoulos et al. This audit article learned with regards to the investigation, difficulties and possibilities of Minimal Liquid Discharge (MLD) and Zero Liquid Discharge (ZLD) systems for wastewater with their administration and asset recuperation . In this work, MLD and ZLD structures are investigated and assessed under 9 models (system stages, advancements, freshwater recuperation target, feed salt water saltiness, energy utilization of every innovation, GHGs outflows, cost sway, asset recuperation and social effect). In addition, a contextual investigation is introduced under two unique situations, Scenario 1 (MLD framework) and Scenario 2 (ZLD framework). Results showed that the energy utilization of the ZLD framework is 10.43 kW h/m3 which is 1.93 occasions higher than the energy utilization of the MLD framework (5.4 kW h/m3). The all out freshwater recuperation of the MLD framework is 84.6 %, while the absolute freshwater recuperation of the ZLD framework is 98.15 %. Generally, the outcomes propose that the MLD and ZLD systems can be important methodologies for wastewater use, reuse, and asset recuperation

[9] Galilee UySemblante et al This article will in general learn about the brackish water pre-treatment innovations for zero fluid release frameworks. Limits in salt water removal choices now and then require the utilization of zero fluid release (ZLD) approach. Saline solution pre-treatment is vital to the acknowledgment of layer based ZLD which is utilized to recuperate water and to additional concentrate saline solution – trailed by warm treatment. Writing shows that the most widely recognized brackish water pre-treatment process, substance precipitation, is by and large exorbitant due to high synthetic utilization and dangerous muck creation. A basic assessment of option pre-treatment choices was performed. It was observed that electrocoagulation and nanofiltration processes have promising execution as far as hardness and natural evacuations. In the interim, coagulation and adsorption processes show potential for natural evacuation. Further investigations ought to be performed on process improvement and cost examination to decide the achievability of applying these advances in ZLD frameworks.

[10] MutiuKoladeAmosaet al. This paper surveys the status, reasoning and capability of water reuse in Malaysia. The piece further mirrors the capability of cutting edge innovations to deliver recovered water offering explicit answers for modern or rural reuse needs from BPOME, subsequently proposing potential, reasonable and practical water protection frameworks through zero fluid release (ZLD) innovation and water recovery from BPOME release and suggests that , The determination of the most appropriate blend of cutting edge innovations ought to be tended to considering the last reuse focuses as the science of the wastewater and the objective reuse direct the treatment interaction designs.Recommended water quality principles, like APHA, USEPA, ASME, AWWA, BSS, WHO, FAO and so forth ought to be utilized as benchmarks during the wastewater treatment for a particular reuse scope.Low Pressure Membranes (LPMs) could be a suitable choice for partition of pollutants in Biotreated palm oil factory gushing for reuse in the modern or horticultural realm.Consumer discernment ought to be changed in making them mindful of the genuine worth of water just as the ecological effects identified with intense usage of new water.

[11] Muhammad Yaqub et al. In this viewpoint, zero-fluid release (ZLD) is considered as an arising procedure to limit squander, recuperate assets, treat harmful modern waste streams, and moderat e potential water quality effects in getting water streams. In ZLD frameworks, film based advancements are an appealing future technique for modern wastewater recovery. Thusly, this audit looks at why a more prominent spotlight on natural assurance and water security is prompting more inescapable reception of ZLD innovation in different enterprises. The creator has featured existing ZLD handling plans, including warm and layer based cycles, and talk about their impediments and expected arrangements. Creator has additionally explored worldwide use of ZLD frameworks for asset recuperation from wastewater. At last, he examine the possible natural effects of ZLD advances and give some emphasis on future exploration needs.More pilot-scale applications are accordingly expected to approve the full-scale execution and achievability of ZLD frameworks. The MD-and FO-joined ZLD frameworks utilize second rate energy that diminishes energy interest, activity expenses, and ozone depleting substance emanations. Later on, creating energy-proficient and financially savvy film advancements should make ZLD more suitable and economical. As far as natural worries, more examinations are required forever cycle evaluation of energy interest and ozone harming substance emanations to work on comprehension of the money saving advantage equilibrium of ZLD frameworks.

[12] Angela Ante et al. This article learns about steel industry in which Steel creation without water is incomprehensible. Given the expanding water shortage, SMS bunch is putting forth incredible attempts to foster its ecoplants items and cycles that are described by low energy and water utilization and reusing of assets. The developments introduced here incorporate interaction coordinated arrangements like the turning descaler Piroscale MAT and the ETL evaporator just as end-of-pipe arrangements, for example, the recovery of assets utilizing the Ciroval cycle or the reusing of water from cooling circuit blowdown, as carried out in the WEISS venture and zero fluid release arrangement.

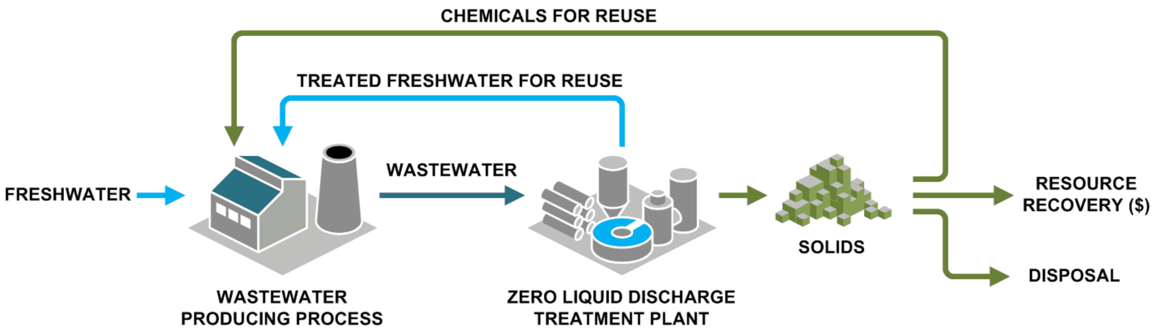
III. AIM & OBJECTRIVES OF THE PROJECT

3.1AIM OF THE STUDY

A study on Industrial Waste Management Plant to Acquire Zero Liquid Discharge In JSW Industry, Kalmeshwar, Nagpur.

3.2 OBJECTIVES OF THE STUDY

- To designed Zero Liquid Discharge (ZLD) system is to minimize the volume of liquid waste that requires treatment.
- Tio study the necessity of meeting the pollution control board norms, treating the wastewater helps in reusing tons of water within the industry and not wasting a single drop and hence it is called Zero Liquid Discharge.
- The research centered on the management and treatment of industrial wastewater, solid waste, and electronic wastes, as well as their associated health issues and environmental impacts.



IV. PROPOSED METHODOLOGY

4.1 ZLD TECHNOLOGIES

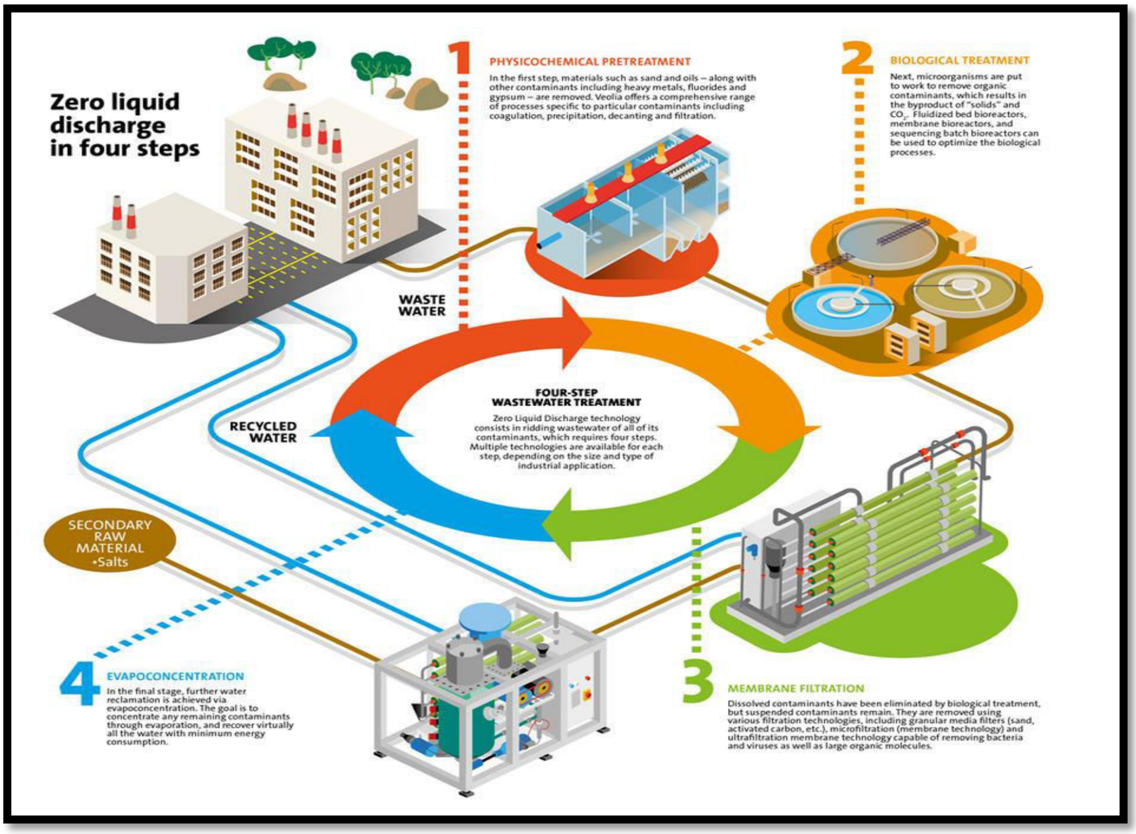
Main aim of ZLD is to recover useful products and salts from rejects, apart from recovery of maximum water for recycle.

Major ZLD Technologies are as follows:

I. Solvent extraction/Stripper
II. Membrane Bio-Reactor Technology (MBR)
III. Ultra-filtration/Reverse Osmosis
IV. Evaporation Technologies
V. Agitated Thin Film Dryer (ATFD)
VI. Incinerator

| ISSN: 2395-7639 | www.ijmrsetm.com | Impact Factor: 7.580| A Monthly Double-Blind Peer Reviewed Journal |

| Volume 10, Issue 6, June 2023 |

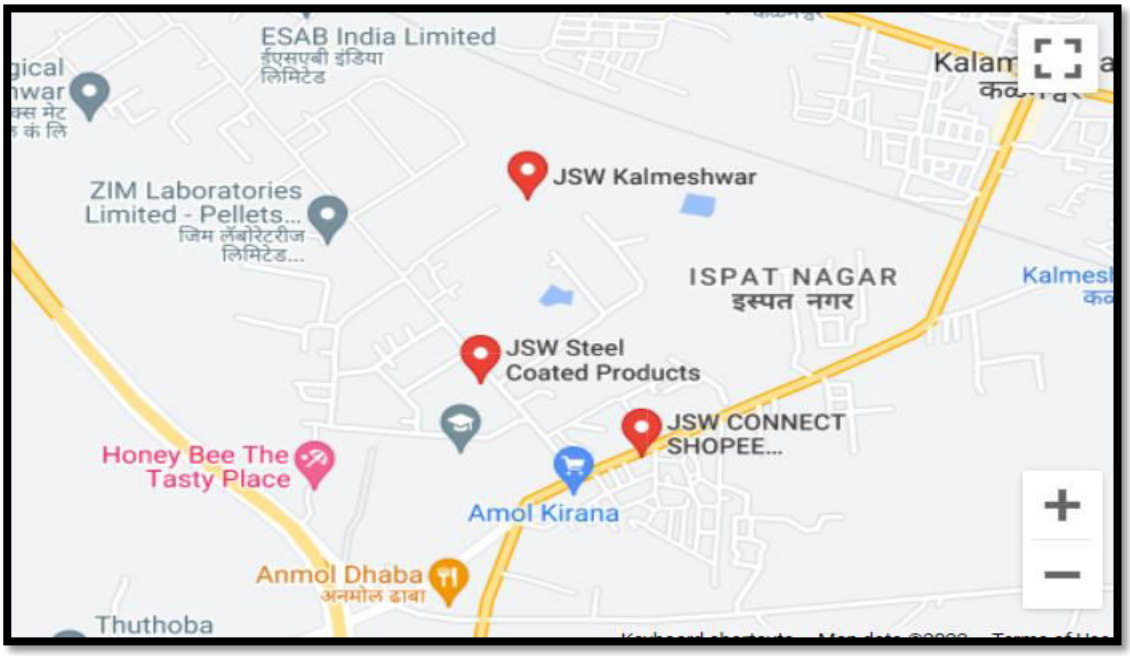


[Fig.4.1: Steps involved in ZLD]

4.2 STUDY AREA

JSW, Kalmeshwar, Nagpur-

JSW Steel Coated Product Pvt Ltd in Kalmeshwar, Nagpur is known to satisfactorily cater to the demands of its customer base.



[Fig.4.2: Map of JSW, Kalmeshwar, Nagpur]

V. RESULTS AND DISCUSSIONS

5.1 ANALYSIS OF WASTE GENERATING UNIT OPERATIONS

The most important part of ZLD is to reduce waste from source generation. For achieving this one has to go through in plant production process with influent characterization. On basis of characteristics and quantum of influent one can decide zero liquid discharge stages.

1) The first part is in plant treatment or diversified usage of waste water.
2) Second Part is segregation of unavoidable waste water depends on its strength.
3) Third part is further sub classified in various stages
   I. General Traditional ETP plant with efficient tertiary system
   II. Part of waste water went through typical ZLD guzzlers and part typical ETP
   III. The whole waste water need to passes through typical ZLD guzzlers

5.2 STUDY OF EXISTING WATER BALANCE DIAGRAM

Water balance estimation is an important tool to assess the current status and trends in water resource availability in an area over a specific period of time. By using water balance diagram we conclude that which amount of water use at plant and from that which amount of waste water is generated. With the help of water balance diagram is very useful to determine water quantity used at each and every unit or process, so we can identify the streams using excess water than required, which will be resulted in the reduction of waste water generated. All together reducing load on the ETP.

5.3 STUDY OF EXISTING ETP PLANT

Influent coming from the different plant is taken to the two equalization tank. They have provided two equalization tanks. In equalization tank 1 they accept influent having COD less than 2000 to 3000 mg/l. And in equalization tank 2 they add influent having COD more than this. Then fed this water in proper predefined ratio by adjusting valves into neutralization tank. In neutralization tank they add lime and poly electrolyte for increasing pH up to 9. This action of mixing coagulant is done manually.

Effluent from the neutralization tank sent to primary settling tank. Here flocks generated are settled down in given retention time. Overflow from this tank then fed to the secondary settling tank. Sludge of this primary and secondary settling tank is send to the filter press where moisture content of the sludge is decreases. And solid sludge is sent to the BEIL for land filling.

Table 5.1: Influent characteristic

Parameter	Strength in Equalization Tank-1	Strength in Equalization Tank-2
pH	5 to 8	5 to 8
COD (mg/l)	>3000	< 3000
NH3-N (mg/l)	200	400
TDS (mg/l)	4000	6000-7000

5.4 SEGREGATE THE EFFLUENT STREAM

In this sector most of the industries are operating based on partial ZLD system and partially treating effluent in the conventional way. In most of the cases domestic effluent is treated separately or mixed with either low or high TDS effluent. The mixed salt recovery and no takers of salt generated is one of the problems of the industry since there is no reuse of same by the industry. In pharmaceuticals the reuse of by products are not encouraged much since it is following very high quality standards for each raw materials. The effluent is generally segregated based on the strength of the pollutants in the early stages itself.

- Low TDS Effluent treatment system
- High TDS Effluent treatment system

5.5 SAMPLING AND ANALYTICAL WORK

We will collected almost all major influent streams for the analysis of the characteristics like Chemical Oxygen Demand (COD), Ammoniacal Nitrogen, Total dissolve Solids (TDS), and pH. We have personally performed the entire practical at our college laboratory. These practical include determination of COD, Ammoniacal nitrogen, pH, TDS, DO etc.

5.6 EXISTING ETP PERFORMANCE ANALYSIS

As a part of our work we will need to analyze the performance of existing ETP. It will help us to identify the experiments to carry out for, implementing its performance efficiency. For this first of all we decided certain points at the ETP. After collecting sample from the predetermined points and analyze on the basis of different parameters, on the basis of these performance of efficiency of each and every unit will determined.

Table 5.2: Analysis of parameter

Sample	pH	COD (mg/L)	TDS (mg/L)	NH3-N (mg/l)
Scrubber Water	8.88	6200	13000	45
Lab/Canteen	5.02	88	980	45
RO Reject	6.12	32	4620	76
Industrial Effluent (Boiler, Cooling Tower)	7	20	2000	NIL

5.7 TREATABILITY STUDY OF EFFLUENT

For treatability study we provide the air to the effluent of industry and take the sample from the effluent after 24,48,72 hr. And check the efficiency. According to the result Parameter are decrease by providing the air therefore we conclude that the efficiency of the ETP plant will increase.

Table 5.3: Treatability study

Parameter	Initial Parameter	After 24 hr	After 48 hr	After 72 hr	Percentage reduction
pH	5-8	6.5	4.8	3.1	53.65
		6.3	4.6	3.3	
COD	850	780	649	530	39.45
TDS	26500	17000	12800	8050	69.8
		16500	11000	8000	
Ammonical nitrogen	14.23	14.00	13.89	13.56	5.05
		14.17	13.67	13.47	

VI. CONCLUSION

The goal of a well-designed Zero Liquid Discharge (ZLD) system is to minimize the volume of liquid waste that requires treatment, while also producing a clean stream suitable for use elsewhere in the plant processes. A common ZLD approach is to concentrate (evaporate) the wastewater and then dispose of it as a liquid brine, or further crystallize the brine to a solid. The evaporated water is recovered and recycled while the brine is continually concentrated to a higher solids concentration. The effluents are desired to be treated to meet the regulatory limits. Basically the levels of COD and total suspended solids are to be reduced to acceptable values given by the Pollution Control Board and pH to neutral. Treated water can be reused for activities such as gardening, boiler feed, etc. and the removed waste is classified as organic and inorganic waste and treated accordingly. Other by-products during treatment, such as hydro carbons, lead etc. are used or sold according to the need of the industry. Other than the necessity of meeting the pollution control board norms, treating the wastewater helps in reusing tons of water within the industry and not wasting a single drop and hence it is called Zero Liquid Discharge. The role of engineer in Zero Liquid Discharge plant is to optimize operating cost, to increase steam economy and to increase solvent recovery. In this work, equipment design is carried out to scale up 100 kl capacity plant to 300 kl capacity.

FUTURE SCOPE

- The industries having high organic load and other refractory nature of pollutants will be requiring to adopt ZLD system.
- ZLD refers to a system which would enable and industry to recover clean water using back into industrial processes or domestic use and not subjecting to be disposed in ambient environment including use in industrial premises.
- Industries will have options to select technical system facilitating to achieve ZLD.
- Industries are liable to face closures if found violating the prescribed standards and not having installed on-line effluent monitoring devices where data will have to be available with regulatory bodies and also in public domain.
- Sectors like Pulp & Paper will immediately adopt charter which will facilitate them to reduce pollution load and maximize reduction in water usage / consumption as well as reducing in quantity of effluent disposed. However, such industries shall be subjected to regular vigilance and followed by stern action in case of their noncompliance to the existing stipulated / notified standards.

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