

“Management of RO Waste Water in Agriculture”

Manoj Kumar Jadaun¹, Mr. Mukesh Chaudhary², Dr. Bharat Nagar³

¹M.Tech Scholar, ²Assistant Professor, ³Professor, Dept. of Civil Engineering, Jagan Nath University Jaipur, Rajasthan, India

Abstract: Water is an essential ingredient of animal and plant life crediting to its unique physical, chemical and biological properties. So wastewater reclamation and its reuse for useful reasons is a common goal of many nations, especially in nations around the globe under water stress. To purify water and sewage, cutting-edge techniques such as inverse osmosis (RO), micro and ultra-filtration are often used. Treated water was used as control and used to prepare dilutions of 20%, 40%, 60% and 80% along with RO wastewater. Germination percentage, mean germination time, shoot length, root length and fresh weight were recorded seven days after sowing and analyzed statistically. Amaranths and maize performed well from the combination of 40% wastewater and 60% purified water. Meanwhile, combination of 20% wastewater and 80% purified water showed positive effect on the germination of cabbage and green gram. The results indicated that the possibility of using RO rejected wastewater as part source of irrigation water.

- Discharge into an area sewer plant could also be preventive as a result of the high salinity in Ro rejects / Ro concentrate. It can even be prohibitively pricey to move waste matter to a treatment plant.
- Typical levels of TDS-rejected Ro / Ro are ordinarily among the vary of 30, 000–50,000 mg / l. Salt in resolution will vary from extremely soluble Na and K salts to less soluble or inverse soluble metal and metal salts. Note: because the temperature of the answer rises, the word reverse soluble suggests that reduced solubility. Note: As the temperature of the solution rises, the word reverse soluble means reduced solubility.

1. INTRODUCTION

Drinking water comes from a variety of sources including water from the government, private wells, and bottled water. It can be as simple to ensure safe and healthy drinking water as changing the tap from an EPA-regulated public water system. Water fluoridation check or a septic tank inspection not too close to a personal well may be needed by other water sources. Reverse Osmosis will take away from water several types of dissolved and suspended chemical species also as biological species (mainly bacteria) and is employed in industrial procedures also as in drinkable production. Use Ro waste water for 15-20 days and check its result on crop development. Every plant can respond otherwise to the present amendment, providing you with a transparent understanding of that plant can respond higher to Ro waste matter.

2. IMPURITIES IN RO WASTE WATER

2.1 Total dissolved water

While Ro is a good waste matter medical aid technique, it is often an issue what to try and do with concentrate or dismiss water (typically the maximum amount as 20-50% of the quantity of Ro feed water).

2.2 Osmosis

Osmosis could be a phenomenon and one amongst the foremost necessary processes of nature. It's some way of migrating a weaker saline to a powerful saline. Samples of osmosis are once soil water is absorbed by plant roots and our kidneys carry our water within the blood.

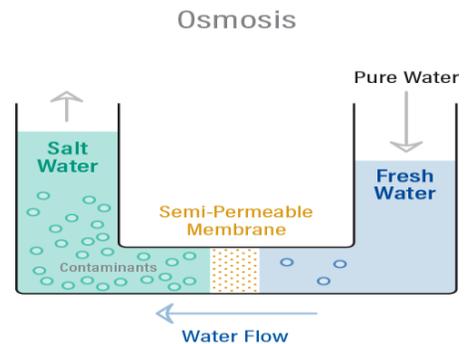


Fig.1- Osmosis process

Reverse Osmosis

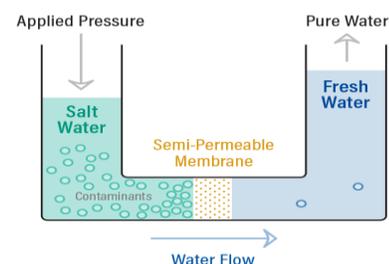


Fig. 2. Reverse process

3. METHODOLOGY

Strategies used to take away Total Dissolved Solids (TDS) from reject water from RO:-Using Evaporators to Dewater Reverse Osmosis Reject Streams:- RO is usually employed in industrial environments to get rid of complete dissolved salts (TDS) from industrial waste or industrial waste treated and yield permeates with relatively tiny levels of TDS.

ACCORDING TO WHO: "Total dissolved solids (TDS) square measure the term wont to describe inorganic salts and little quantities of organic matter in water resolution."

The principal constituents square measure typically atomic number 20, magnesium, sodium, and K cations and carbonate, carbonate, chloride, sulfate, and nitrate anions.

In the easiest method TDS is that the add of the cations and anions in water. And TDS check is barely used as Associate in Nursing indicator check to work out the overall quality of the water.

According to a report of WHO— the presence of dissolved solids in water might have an effect on its style. The taste property of beverage has been rated by panels of tasters in relevancy its TDS level as follows:

Excellent, but three hundred mg/liter;

Good, between three hundred and 600 mg/liter;

Fair, between 600 and 900 mg/liter;

Poor, between 900 and 1200 mg/liter;

And unacceptable, larger than 1200 mg/liter. Due to its flat, insipid style, water with exceptionally tiny TDS levels may additionally be unacceptable.

In India, thanks to the insufficiency of water the water with TDS Level of 200mg / l is ready to acceptable limit & 2000mg / l TDS level is most because the permissible limit by Bureau of Indian Standards. Except for 2000mg / l TDS that's unacceptable notwithstanding it's to be consumed then it ought to experience a legitimate supply of purification system to form it drinkable & free from contaminants.

TDS Calculator:- Total Dissolved Solids (TDS) could be a term accustomed categorical the overall quantity of charged ions, together with minerals, salts or metals, dissolved in an exceedingly given volume of water. TDS is sometimes expressed in mg / L or ppm. The hectometer Digital ® TDS-EZ Water Quality Tester will browse the TDS levels in your H2O and in your artificial language

product water to work out the effectiveness of your artificial language water purification system.

Table: 1 TDS Water Quality Tester

Step 1:	Step 2:	Step 3:	Step 4:
Rinse the TDS Water Quality Tester with reverse osmosis water.	Fill a small glass with RO water and use the TDS Water Quality Tester to read the TDS. Key in your results below.	Rinse the TDS Water Quality Tester with RO water again. Then test your tap water with your TDS Water Quality Tester and key in your results below.	Click on the calculate button below to view your results.
	RO Water Result:	Tap Water Result:	Your result is:
	<input type="text"/>	<input type="text"/>	<input type="text"/>

4. DESRIPTION OF RO WASTE WATER

It's best to work out the TDS level within the reject water before deciding to recycle for alternative functions. as a result of if the TDS level is just too high within the artificial language waste water then it would not be appropriate for recycle, the waste water ought to even be tested for presence of inorganic and chemical impurities like atomic number 11.

4.1 Use of RO discharge: The total amount of artificial language waste water from one artificial language plant is approx 15-25 nothing.

4.2 Wash Your Car: - A single automobile wash may consume anyplace between fourteen liters (for automobile wash employing a bucket) to seventy five liters (for automobile wash employing a hose pipe) of water. Keeping in mind the scarceness of water, exploitation such lot potable water for automobile wash appears unreasonable and no lesser than a criminal offense. Water with a TDS level of 1200 – 1500 PPM is safely used for automobile laundry. If the TDS level of waste water is high you'll be able to combine H2O to dilute it. This could lower down the TDS level.

4.3 Watering Your Plants or Home Garden:- For gardening/irrigation use, a TDS level of up to 2100 PPM is permissible. You must conjointly verify the share of atomic number 11, it ought to be but hour (i.e. atomic number 11 / atomic number 11 + Ca + Mg). High atomic number 11 content causes loss of soil consistency and thus harmful for soil fertility within the long haul. **4.4 Wash Your Utensils:-** Another helpful application for artificial language waste water is to scrub your utensils. Merely store the waste water in bucket or tank, certify you place the bucket for grouping artificial language waste water close to your sink therefore it is used simply once you clean your utensils.

4.5 Floor Mopping:- Dilute waste Ro water with equal amount of water as a result of plain Ro waste water with high TDS could stain or leave salt particles on floor.

- Use the Ro waste water for floor swabbing on alternate days this may cut back the possibilities of any stains or salt deposits.

4.6 Cleaning and Flushing Your Toilets:- Ro waste water may be used effectively to cut back this wastage of unpolluted water by victimization it to flush your bogs. After you begin, perpetually monitor your bathroom seats for any discoloration on ceramic ware surfaces when few days.

5. TESTS TO BE DONE ON WATER BEFORE USING IT FOR IRRIGATION

Some general concerns to require under consideration once creating research laboratory check of irrigation water square measure listed below:-

- Usually 1L of sample is decent
- All samples ought to be tagged to point date, location, time and different pertinent information.
- Take seasonal samples for representative information because of variation of water quality by climate conditions.
- Take samples before and when the treatment plant for recycled water and different representative samples once applicable like when the vessel, etc.

Gravimetric Method

Determination of TDS based on conductivity

Deep well injection method

6. RESULTS

Table.2. methods with result:

METHODS	RESULTS
At Domestic Level PHYTO-REMIEDIATION	Utilizing waste high TDS water for growing crops and Plant species which are suitable for growing in High TDS water. The probability of the recuperation and re-utilization of significant metals increases
(Recreational Purpose) AQUARIUMS	Utilizing RO reject water containing high TDS for recreational purposes like in aquariums at domestic level reduces the risks of mixing up of high TDS water with freshwater streams and also reduces water wastage from RO.
Treatment of water (Removal of Fluoride) Tulsi plant	Drenching of Tulsi leaves for eight hours can reduce the water fluoride level from 7.4 sections for each million, to just 1.1 parts for every million. And it is found that leaves and stem can detoxify water by filling in as a characteristic magnet to draw in particles of fluoride from the water.
Pine Char	Swells in water due to its high oxygen content causing Osmosis of fluoride on its subsurface solid volume causing adsorption. It is more efficient than activated carbon.
(Removal of Arsenic) Ultrafiltration process	Gives safe drinking water free from primary contaminant like arsenic and also optional contaminants like iron and microorganisms.

Oxidation	Arsenic removed or neutralized by Oxidization of arsenic by process of air oxidation in few weeks which is further catalyzed by microscopic organisms, solid acidic or antacid arrangements, copper, powdered initiated carbon and high temperature.
Passive oxidation & Sedimentation	Arsenic lessening by plain sedimentation seems, by all accounts, to be reliant on water quality and this process also permits framing covering of iron hydroxide on sand grains around the strainer of the well and results in reduction of Arsenic and iron from the water re- gathered from the well.
Coagulation & Filtration	Coagulation and filtration with metal salts and lime took after by filtration is proved to be the most intensely reported strategy for arsenic expulsion from water. During the time spent coagulation, arsenic is expelled from arrangement through precipitation, co-precipitation and adsorption.
At Commercial Level Vertical Tube Falling Film Brine Concentrator	The saline solution is concentrated to around 17 percent add up to solids in the salt water concentrator.
Evaporation Ponds	Evaporation of fresh water takes place leaving behind the dissolved salts on the surface of the pond.
Deep Well Injection Process	This process implies saline solution reject would need to be channeled and pumped many miles to a reasonable area with porous rock formations. One other factor is that Oil rich territories, oil wells are getting to be plainly exhausted. Such spent wells are contender for disposal wells.

7. CONCLUSIONS

As a consequence of this, only up to 15% of water is recovered out of the water which is given as the input to the system discharging the rest of the water as the waste part. As there are several contaminants in the rejected water, it makes unfeasible the recovery of water from the rejected bulk. The connection is made between the waste water discharge and the drains and so the septic tanks face a heavy load. Up to 90 gallons of water is discharged by the RO unit which delivers around 5 gallons of purified water in a day. As the large scale units including municipal or other industrial units can produce higher pressure in comparison to the domestic one, they are capable of recovering up to 80% of the water fed to the system which sometimes may even hike up to 90%.

This research focusses on several small scale techniques which can be employed at domestic level for recovering or putting to use that reject water from RO. Although main emphasis is at domestic level like Phyto-remediation, removal of fluoride and arsenic from reject water, using it for recreational purposes, a bit of commercial scale techniques like deep well injection have also been proposed which can prove to be counter-productive.

References

- [1] B. der Bruggen, C. Vandecasteele, T. Van Gestel, W. Doyen, and R. Leysen, A review of pressure-driven membrane processes in wastewater treatment and drinking water production, *Environ. Prog. Sustain. Energy*, vol. 22, no. 1, pp. 46–56, 2003.
- [2] R. Saravanan, A. Arun, S. Venkatamohan, Jegadeesan, T. Kandavelu, and Veeramankandan, Membraneless dairy wastewater-sediment interface for bioelectricity generation employing sediment microbial fuel cell (SMFC), *African J. Microbiol. Res.*, vol. 4, no. 24, pp. 2640–2646, 2010.
- [3] D. Bose and A. Bose, Graphene-based Microbial Fuel Cell Studies with Starch in sub-Himalayan Soils, *Indones. J. Electr. Eng. Informatics*, vol. 5, no. 1, pp. 16–21, 2017.
- [4] D. Bose and A. Bose, Electrical Power Generation with Himalayan Mud Soil Using Microbial Fuel Cell, *Nat. Environ. Pollut. Technol.*, vol. 16, no. 2, pp. 433–439, 2017.
- [5] J.-P. Schwitzguébel, E. Comino, N. Plata, and M. Khalvati, Is phytoremediation a sustainable and reliable approach to clean-up contaminated water and soil in Alpine areas? *Environ. Sci. Pollut. Res.*, vol. 18, no. 6, pp. 842–856, 2011.
- [6] A. P. P. Santos, B. H. Oliveira, and P. Nadanovsky, Effects of low and standard fluoride toothpastes on caries and fluorosis: systematic review and meta-analysis, *Caries Res.*,

vol. 47, no. 5, pp. 382–390, 2013.

[7] P. Mondal and A. Nandan, Removal of fluoride from water by suitable low cost environmental friendly methods, 2014.

[8] S. P. S. Teotia, M. Teotia, and N. P. S. Teotia, Symposium on the non-skeletal phase of chronic fluorosis: The Joints, in Symposium on the non-skeletal phase of chronic fluorosis: The Joints, 1976, vol. 9, pp. 19–24.

[9] J. M. McArthur, P. Ravenscroft, S. Safiulla, and M. F. Thirlwall, Arsenic in groundwater: testing pollution mechanisms for sedimentary aquifers in Bangladesh, Water Resour. Res., vol. 37, no. 1, pp. 109–117, 2001.

[10] W. F. Heins and others, Is a paradigm shift in produced water treatment technology occurring at SAGD facilities?, J. Can. Pet. Technol., vol. 49, no. 1, pp. 10–15, 2010.

[11] Ingram, Dewayne. 2014, Understanding the results of irrigation water testing and their implications for the management of nursery and greenhouse crops, University of Kentucky Cooperative Extension Service, HO-111

[12] Will, Elizabeth and James Faust, 1999, Irrigation Water Quality for Greenhouse Production, University of Tennessee Cooperative Extension, Publication PB 1617

[13] Water Quality for Crop Production, University of Massachusetts Extension, Greenhouse Crops and Floriculture Program

[14] WATER ANALYSIS 2016 32 7.1. IS: 3025 part 16 – 1984 (Reaffirmed 2002)- Methods of Sampling and Test (Physical and chemical) for water and Waste Water : Filterable Residue (Total Dissolved Solids)