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A SHORT REVIEW OF APPLICATIONS OF REVERSE OSMOSIS AND OTHER MEMBRANE SEPARATION PROCEDURES.

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ABSTRACT:
Reverse osmosis (RO) is a ground breaking membrane based technology to purify water by separating the dissolved solids from feed stream resulting in permeate and reject stream for a wide arena of applications in domestic , industrial and wide array of applications. Reverse osmosis or other membrane separation processes has an innovative vision which is extremely targeted towards environmental pollution control problems and environmental restrictions. Reverse osmosis has a vision which is anticipated from our present day environmental pollution control issues. Membrane separation processes will slowly enhance towards a ground breaking procedure. It is seen from literature review that RO technology is used to remove dissolved solids, colour, organic contaminants and nitrate from feed stream. Hence RO technology used in the treatment of water and hazardous waste, separation processes in the food, beverage and paper industry as well as recovery of organic and inorganic materials from chemical processes as an alternative method. This review paper presents the instinctive and innovative vision of RO technology as a visionary technique to treat wastewater in different industrial applications. The present short review outlines the applicability of RO system for different applications of environment pollution control.

Keywords: reverse, osmosis, membrane, reclamation, wastewater

1. INTRODUCTION:

Reverse osmosis (RO) is a visionary procedure that uses semi-permeable spiral wound membranes to separate and remove dissolved solids, organic, pyrogens, submicron colloidal matter, color, nitrate and bacteria from water. Feed water is sent under pressure through the semi-permeable membrane, where water permeates the minute pores of the membrane and is delivered as purified water called permeate water. The property of these membranes is that

these membranes are semi-permeable and reject the salt ions while letting the water molecules pass. The membranes used for RO membranes are made of cellulose acetate, polyamides and other polymers. The membranes are of hollow-fibre spiral wound used for treatment, depend on the feed water composition and the operation parameters of the plant. Reverse osmosis (RO) is a membrane based process technology for desalination and effluent water treatment. It is visionary that membrane-based sea water desalination and wastewater reuse are widely considered as possible and feasible solutions to augment water supply and prevent water scarcity. The most common membrane processes used are the reverse osmosis(RO) and the electrodialysis used for brackish water desalination and effluent water treatment.

2. Vision of membrane separation processes and reverse osmosis:

Membrane separation processes and reverse osmosis are ground breaking areas of effluent treatment and wastewater treatment [1]. An environmental engineer's vision is wide, innovative and unparalleled. Research pursuit and research hardship will go a long way in identifying membrane separation process as a visionary procedure. In recent years, it has become more and more relevant that conventional waste water treatment processes such as biological conversion, sedimentation, flocculation etc. are often unsatisfactory when large quantities of industrial effluents, which contain large amounts of highly toxic, biologically nondegradable , or high oxygen demanding constituents , have to be treated. Mainly in heavy industrialized areas which are in general also densely populated and where surface water is used for domestic water supply, the conventional waste water and effluent treatment have to be supplemented by more effective physical or chemical processes [1].

Actually, modern technology has made a large number of sophisticated procedures available capable of solving many effluent treatment problems, most of these processes have serious disadvantages. Rectification or sorption techniques are very much expensive , incineration or burning causes air pollution problems and many chemical precipitation processes produce large quantities of sludge. This sludge can result in serious water pollution problems.

So the need of alternative challenges and alternative vision. Thus the need of membrane separation processes or reverse osmosis.

3. Scope of reverse osmosis and its insightful vision:

The process has also been applied to treat municipal wastewater and effluent wastewater [12-14]. since conventional municipal treatment processes do not remove dissolved solids, but RO process is used for the removal of dissolved solids. RO is increasingly and extensively used as a separation process in chemical and environmental engineering science for the removal of organics and organic pollutants present in wastewater and effluent wastewater. It is seen from literature review and literature research that reverse osmosis (RO) procedure has been widely and extensively used for separation and concentration (recovery) of solutes in many fields [1].

The use of RO in the effective treatment of various effluents of chemical, petrochemical, electrochemical, food, paper and tanning industries as well as in the treatment of municipal waste waters have been extensively reported in research pursuits by many researchers.

Removal of organic contaminants by RO processes was first demonstrated by Chian et al (1975) [2]. The presence of individual contaminants can cause problems, hence the removal of individual contaminants by RO has been studied by very few researchers [3,4]. Murthy and Choudhuri, 2008 [5] studied the

paper on "Treatment of Distillery Spent Wash" where UF and RO membranes used for purification of the wastewater by removing the colour and the contaminants. A number of studies [6,7] have been reported on the application of RO for the removal of organics such as endocrine disrupting chemicals, plastic additives , pesticides, pharmaceutically active compounds(PhAC's), benzene and toluene. Cellulose acetate and polyamide membranes has good salt rejection for inorganic salts like NaCl, Na_2SO_4. However , for organics , the rejection is reported and researched to be lower and varies widely in the range of 0.3-0.96 [8,9] RO process removes fluoride proportionately ,if TDS is at tolerable level and fluoride content is high then one can use special alum-resin filter, works under gravitational force[10,1]

4. Vision of the study of membrane separation processes with the environmental engineer's point of view:

The vision of an environmental engineer and environmentalist is great, wide-eyed and innovative. Research struggles is opening up one window over another in this hardship towards visionary importance. The world of vision of environmental engineering and the subject of membrane science is opening the doors of extensive research pursuit. It has been scientifically proved that membrane separation process particularly reverse osmosis is very much effective in separation of recalcitrant chemicals in wastewater and effluent treatment. An effective and efficient scientific understanding of this greatly researched branch of technology will be an eye-opener towards other advanced oxidation processes or tertiary procedures of effluent and wastewater treatment [11].

5. FUTURE SCOPE AND FUTURE VISION:

The future of the study of effective environmental engineering procedures are wide, optimistic and innovative[11]. The optimism in research pursuits is universal amongst the scientific fraternity. Environmental engineering techniques such as membrane separation processes will be an eye-openerof most of the scientific community. Man's as well as scientist's vision will pave way to greater acceptance of these path breaking procedures on the part of environmentalist's point of view. The membrane separation process particularly reverse osmosis and its success will open up avenues and applications for other membrane separation processes. Hope and vision will not be further behind and it will not be an illusion. The success of these procedures lies at the hands of the environmentalist and at the hands of the environmental engineer. Vision and success in this domain is slowly opening up windows of optimism and innovation in future years to come.

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