

RO MEMBRANES

SNRDC. Indigenous Thin Film Composite Reverse Osmosis Membrane Technology Developed at :- Central Salt & Marine Chemicals Research Institute, Bhavnagar.)

Osmosis is the process of diffusion of molecules through a semipermeable membrane from a place of higher concentration to a place of lower concentration until the concentration on both sides is equal. Plants employ this to get nutrients. By applying pressure exceeding the osmotic pressure, the movement of solvent can be reversed, i.e., flow of solvent from solution to pure solvent. This process is known as reverse osmosis (RO), and is useful for generating pure water from saline water.

There are five important characteristics of semi permeable membranes which determine their quality, namely.

- * Salt rejection efficiency
- * Flux
- * Tolerance to temperature, pH variations, chemical constituents
- * Fouling tendency
- * Durability

Thin film composite (TFC) RO Membranes have become popular as RO membranes.

TFC membranes and modules for desalination of brackish water, dewatering applications, and treatment of industrial/domestic effluents for water reuse have now been developed at CSMCRI, Bhavnagar.

Market

There are five primary areas where RO technology can be used. These are (i) Producing potable water (ii) treatment of saline industrial effluent, (iii) treatment of tertiary treated sewage water and reuse, (iv) dewatering and concentration, and (v) ultra pure water.

RO systems have become popular for all the above applications in India. The market is growing fast. OEM and replacement market is increasing

Proposal

A unit with following product mix can be considered

10000 sq. m./month of RO membrane.
500 Nos modules per month

Manufacturing process

Thin film composite membrane TFC comprises a fabric, a polysulfone film, and an ultra thin salt rejecting barrier coating. A further protective coating on top of the barrier layer is also desirable. The membrane is prepared in successive steps of (i) solution casting of polysulfone on the fabric, (ii) interfacial in situ polymerization of the polyamide barrier layer on the polysulfone, and (iii) introduction of the protective layer.

Raw materials:

- * Non-woven polyester fabric as a base material.
- * Polymers such as polysulfone, polyether sulfone.
- * Solvents such as dimethyl formamide, dimethylsulfoxide, dimethylacetamide, n-hexane, n-heptane.
- * Diamines such as metaphenylene diamine, polyethylenimine, piperazine.
- * Acid chlorides such as trimesoyl chloride, isophthaloyl chloride, terephthaloyl chloride.
- * Chemicals like polyvinyl alcohol, glycerine and PEG.

Materials required for making TFC spiral modules

- * TFC membrane
- * Melamine impregnated knitted spacer
- * LDPE net feed spacer
- * Adhesives
- * Product tube, end cap, fibre glass cloth.

Building Requirement

About 1000 sq. m. carpet area will be required of which 30% should be air conditioned.

Plant and Machinery

- * Chemical laboratory with heating mantle, stirrers, ovens, conductivity meters, pH meters, balance etc.
- * Polysulfone casting machine
- * Thin film forming and curing machine
- * Membrane protective layer forming machine
- * Membrane quality control test kits
- * Analytical instruments recommended for membrane quality control : FT-IR, Bubble porosimeter, GPC, GC, HPLC
- * Power generating set, water chilling machine, dehumidifiers.

Manufacture of TFC spiral elements

- * Module making facility comprising (i) membrane spiral making machine, (ii) membrane cutting device, (iii) membrane rolling machine (iv) spiral element trimming machine, (v) product tube making machine, (vi) end caps moulding machine, (vii) outer hard wrapping machines, (viii) sonic welding machine, (ix) permeate and feed spacer automatic cutting machine.
- * Spiral element test benches, water filters, chemical dosing, circulating pumps, high pressure pumps, etc.

Project cost

The estimated cost is Rs.500 lakhs.

Economics

Membrane production cost

The variable cost of membrane manufacture would be ~ Rs.200/sq m

Module Cost

The variable cost of production of a 4" diameter TFC spiral module will be around Rs.6100

5000 liters per hour Brackish water (10000TDS) RO Plant based on indigenous Thin Film Composite (TFC) Membrane Technology may cost about Rs 20 Lakhs and potable quality water from this plant will cost about Rs. 2 per liter.

Turnover and profitability

Turnover of Rs. 10 crores with 6 to 8 % PAT margin can be expected

Suggested location : Near Hyderabad

Strategy/ options

Replacement market can be targeted. Application support can win over industrial consumers.

Consultancy from APITCO : Sourcing technology. Selection of plant and machinery. Market study. Detailed project report preparation.