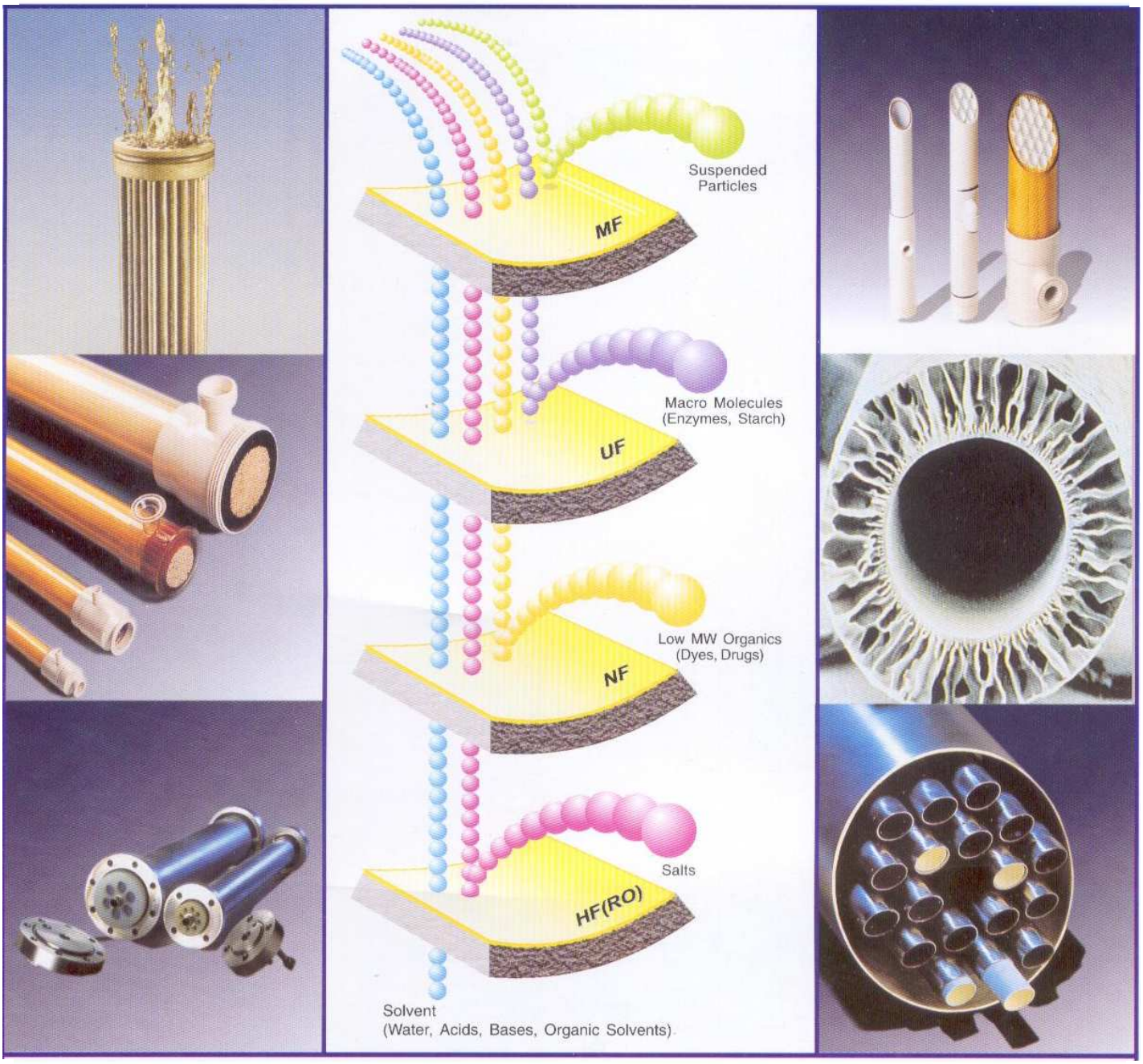
Innovative Membrane Solution



Genesis Membrane Sepratech Pvt. Ltd

WEB SITE: www.genesismembrane.com • WEB PAGE: www.indiamart.com/genesismembrane

About us

Genesis Membrane Sepratech Pvt. Ltd was established in 1992 to offer various kinds of Membrane based separation system for process as well as waste streams. GMS provides complete package to Pharma, dye and intermediates, textile, Fruit Juices, Automobile and dairy industries besides water and wastewater recycling. GMS has designed, built and commissioned over 135 plants in various industries using innovative RO, NF, UF and MF membrane geometries (such as Spiral, Hollow Fiber, Tubular etc) and Polymeric / Ceramic materials.

GMS offers pilot plant facilities for process development and feasibility studies based on which commercial plants are designed and built.

Applications

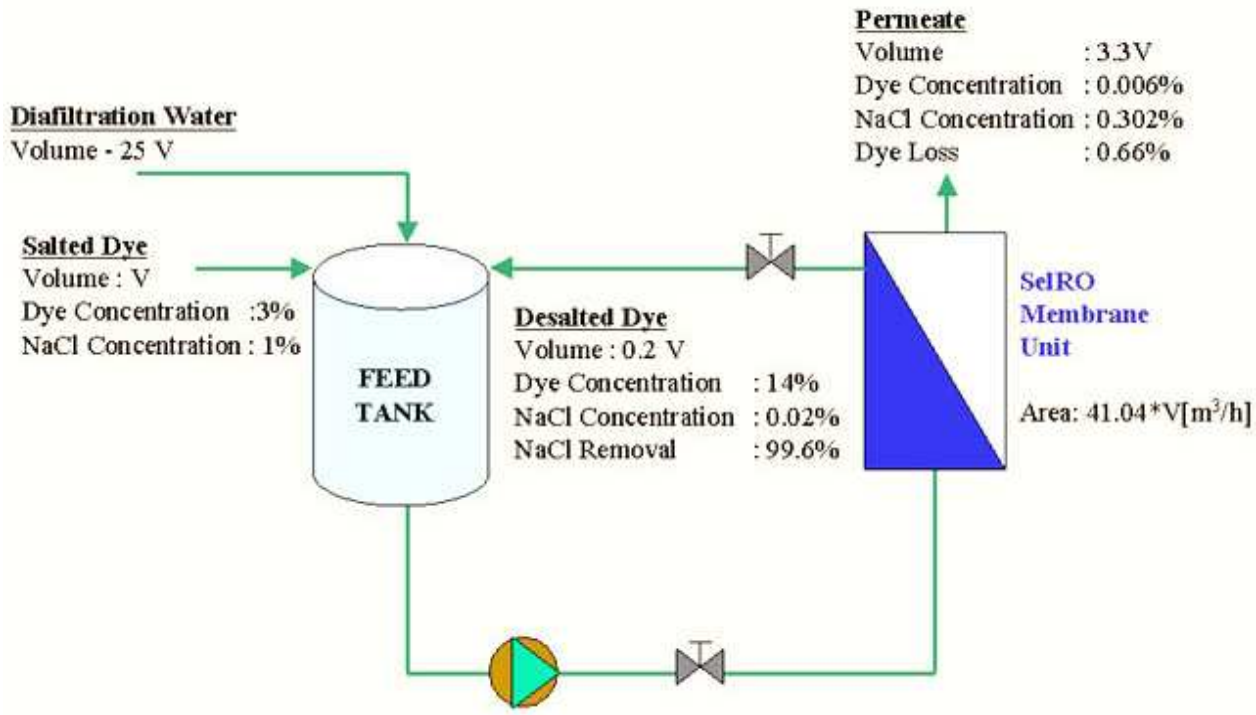
- *Dye desalting and concentration*
- *Recovery of bulk drug from mother liquor*
- *Caustic recovery in textile, dairy and food industry*
- *HPLC product concentration & solvent recovery*
- *Removal of heavy metals from acids*
- *Waste water recycling including zero discharge*
- *Desalination of brackish and sea water*
- *De-greaser recycling*
- *Enzyme concentration*
- *Fermentation broth clarification and cell harvesting*
- *Pre-treatment to RO by back washable UF*
- *Membrane Bio-Reactor*
- *Clarification and de-ashification of cane juice for high yield*
- *Recovery of AED – CED paint from ED bath in Automobile industry*
- *Recovery of Oils from Oily waste water*
- *High purity water for Pharma and Electronic Industry*
- *Recovery of Solvents by Pervoporation*

Applications In Details

Dye Desalting and Concentration

Concentration & Desalination of Dyes is being done all over the world for production of salt free concentrated high purity product. This has been possible through use of proprietary membranes developed after years of research.

Dyestuff producers require the salt content in the concentrated dye to be reduced to a certain level. The following is an illustration:

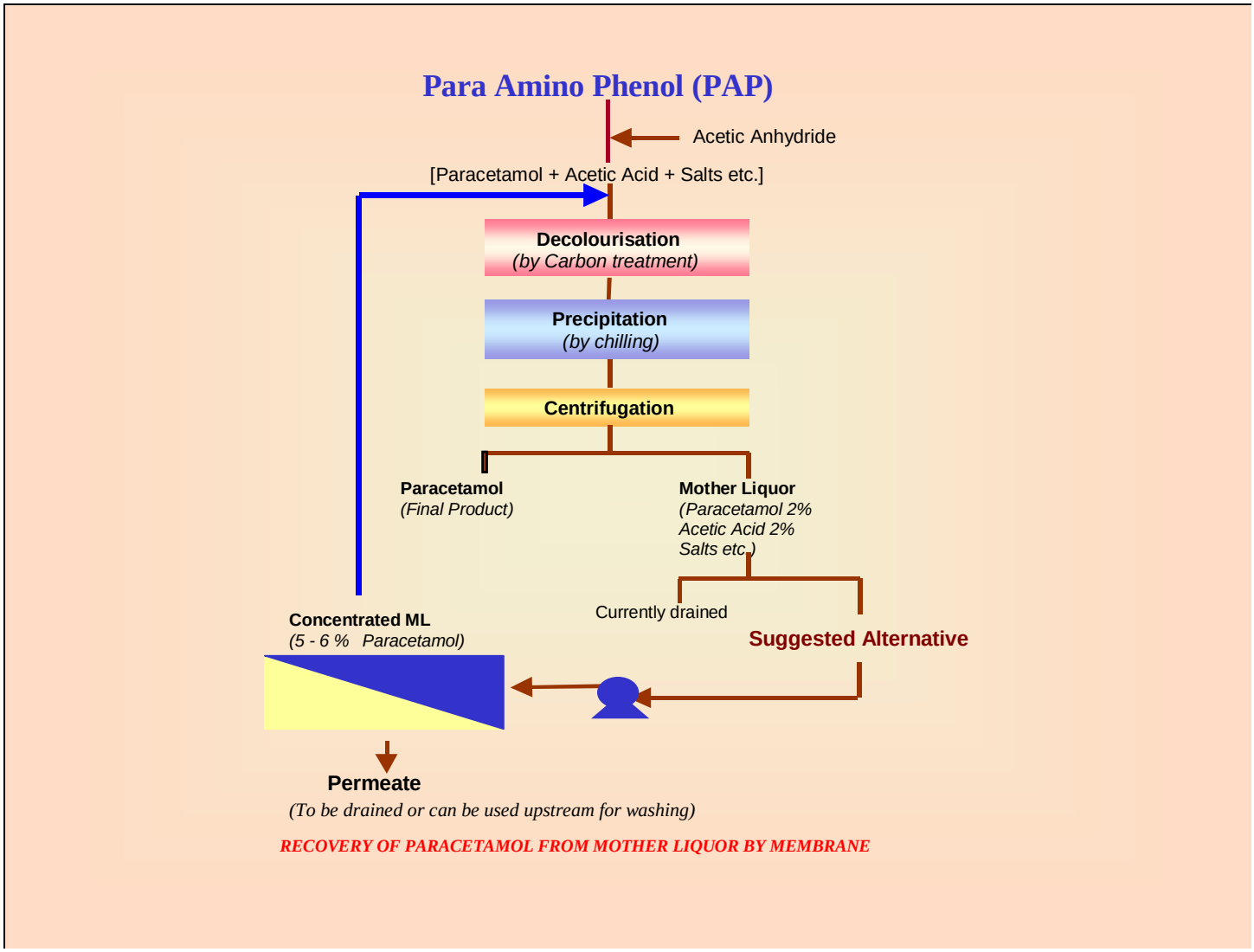


Recovery of Bulk Drug from Mother Liquor

In the production of bulk drugs the main molecule is produced in the reactor/fermenter followed by multi-step separations and purifications involving various types of physical and/or chemical processes. At the penultimate stage often the drug is precipitated and separated by centrifugation or filtration. The centrifugate/filtrate, also known as Mother Liquor (ML), is normally sent to ETP for further treatment essentially to reduce BOD, COD, SS, TDS etc. to acceptable limits fixed by the respective pollution control boards.

Incorporation of suitable RO on the ML can recover the valuable drugs which otherwise causes pollution when drained to the ETP. Typically 0.2 to 3% of the valuable drugs, depending upon their solubility, are lost into the ML as the existing processes are incapable of further recovery. However, this small but significant quantity can be recovered if concentrated through RO. Therefore RO acts as a partial pollution control system besides being a source of additional revenue. Following Illustrations explain the general scheme recovery of specific drug/precursors.

Recovery of Paracetamol from Mother Liquor

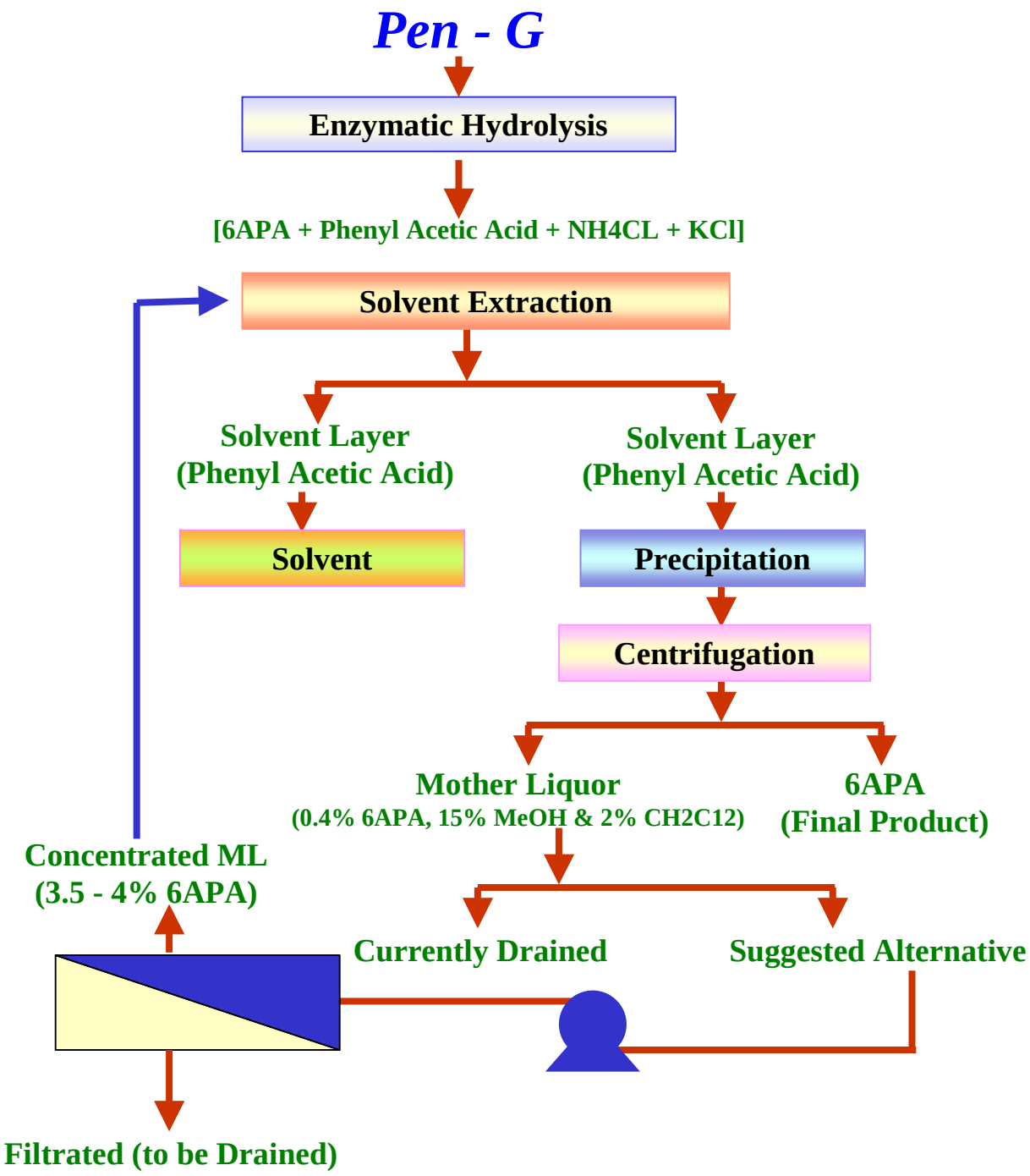


RECOVERY OF PARACETAMOL FROM MOTHER LIQUOR BY MEMBRANE

RECOVERY OF 6 APA FROM MOTHER LIQUOR

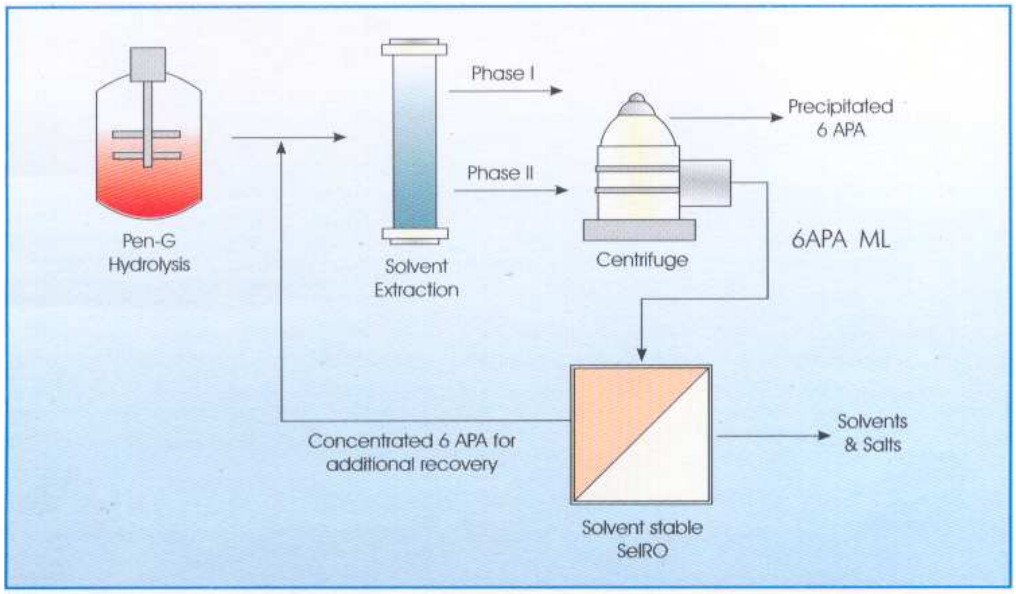
General

6-Amino Penicillanic Acid (6 APA) is an intermediate, in the manufacturing of synthetic penicillus, with a molecular weight of 216. It is manufactured by enzymatic hydrolysis of Pen-G salt.



Process of Manufacturing of 6 APA

The typical mother liquor from a chemical reaction contains 0.3 to 0.4% of dissolved 6 APA, 15% Methanol, 2% Methylene Chloride and 3 - 4% salts. The membrane process concentrates the 6 APA to 3 - 4% using the solvent stable SelRO membranes. *These membranes being solvent stable are not affected by organic solvents.* The concentrated 6 APA solution thus obtained, can be added upstream before solvent extraction for additional recovery, the permeate stream obtained from the membrane system goes to the effluent with reduced pollution load to the extent of 6 APA recovery. Typically 70% recovery is possible, which makes the membrane process extremely attractive with pay back period of less than 6 months.



GMS developed process for recovery of 6 APA from ML

Caustic Recovery in Textile, Dairy and Food Industry

Recovery Of Spent Caustic In Dairies

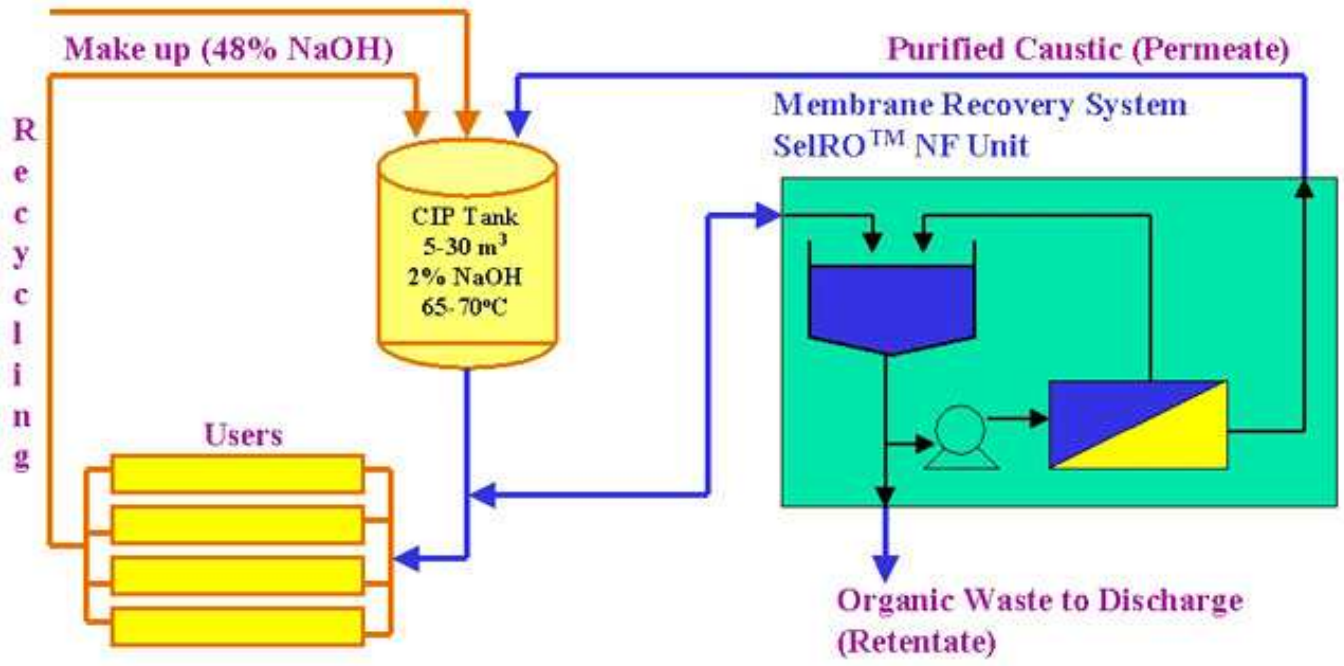
Introduction:

To maintain high hygienic standards and to ensure proper functioning of the equipments, dairy evaporators, pipe line and other equipments are regularly cleaned after each production cycle. The cleaning solution typically contains 2 to 4% caustic and additional compounds such as antifoams and chelating agents. This solution removes caramelized organics, precipitated proteins, pectins and fats from the surface of tanks, pipes, heat exchangers and evaporators.

The contaminated solution, after cleaning, still contains high concentration of active caustic. This solution is generally reused in one of the following ways:

The solution is reused 7-10 times and then the CIP tank is completely discharged.
Approximately 10% of the caustic solution is discharged daily while the remaining volume is recycled to the CIP tank.

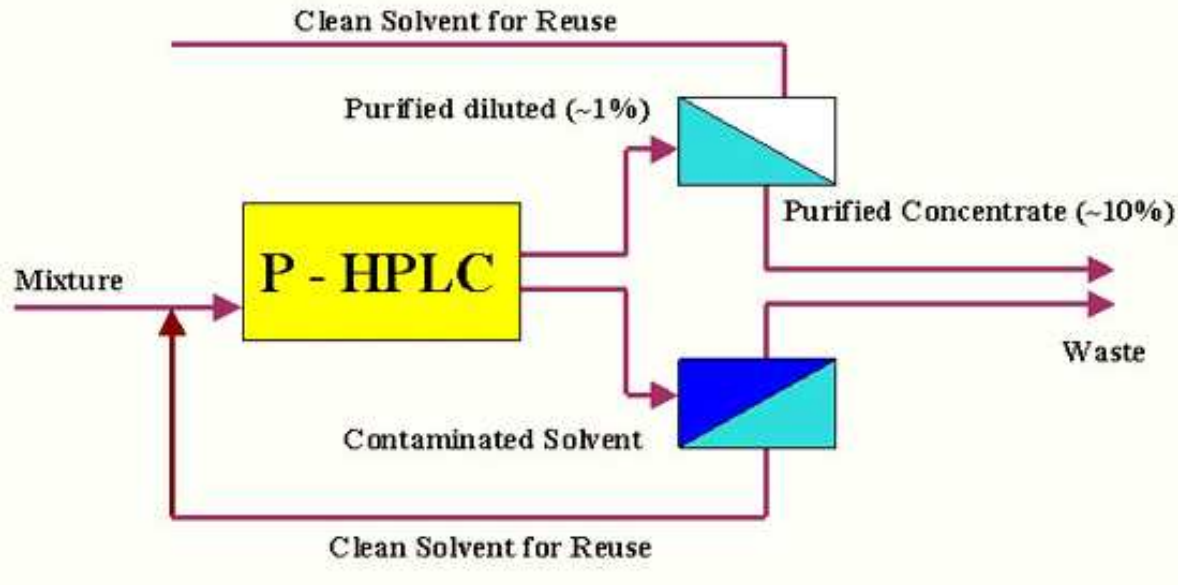
In both the cases, discharged caustic solution is heavily loaded with dispersed and soluble organic contaminant which has to be neutralized. It is also difficult to discharge this effluent due to pollution control regulations and also from ecological point of view. As a solution to the above, the spent caustic solution can be passed through membranes for very effective reuse. Membrane system is very compact, energy saving, easy to operate and eco friendly.



HPLC Product Concentration & Solvent Recovery

Preparative HPLC is used in reverse phase (water/solvent) or normal phase (solvent/solvent) to separate the main product fraction from the contaminating molecules. The waste stream is spent solvent that must be discarded. While the main fraction contains the product that is to be concentrated.

A hydrophilic solvent stable membrane is used for reverse phase separations. In this example, the product stream from the HPLC contains a low molecular weight pharmaceutical compound dissolved in a methanol: water solution (90:10). The compound concentration is 0.5% leaving the HPLC. The product is concentration (0.025%) in the same solvent composition and is processed in the solvent recovery system. The overall solvent recovery is 96%.



Removal of heavy metals from acids

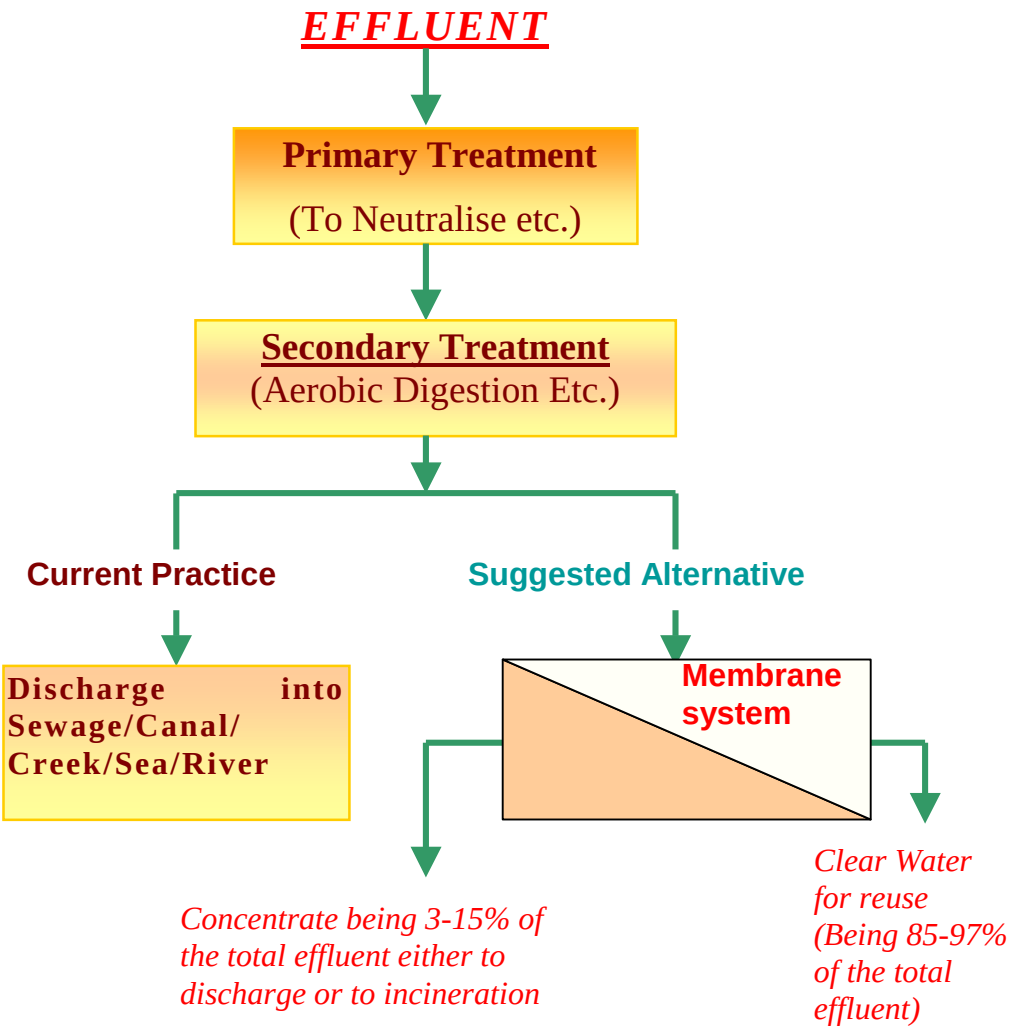
Decolorisation of Heavy Metal Removal from Acidic Stream

Due to stability in acidic and basic conditions, NF membranes can be applied in the processing of inorganic acids and in the treatment of acid waste streams. The membranes can be used in the entire pH range (0 – 14) and at temperatures reaching 70^{o}C.

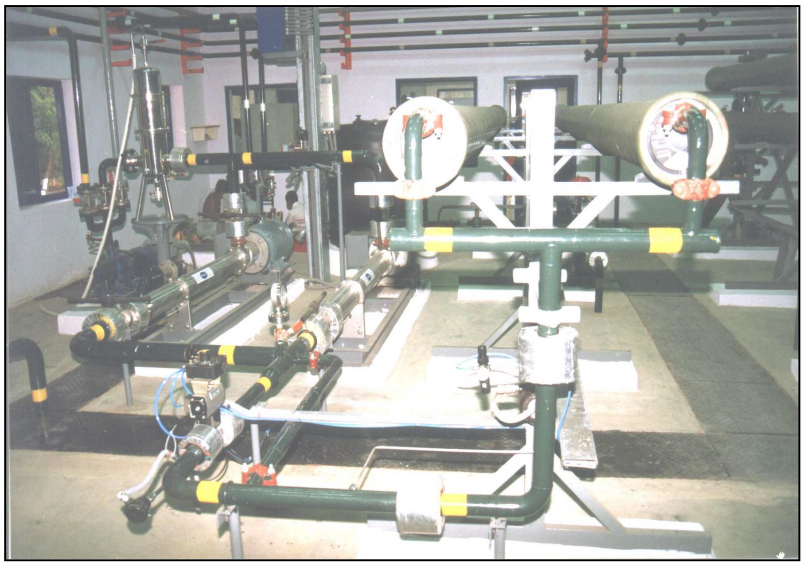
The mineral acid product quality is effectively enhanced by the use of the membrane system in the down stream processing. The membranes allow the product (acid) to pass with practically no retention (0-4%). The contaminants, such as dissolved organic molecules, which give the acid a characteristic coloration, are retained by the membrane with high retention values (>98% - 99%). In this manner a colourless acid stream, free of organic, is obtained. One popular example of this application is Decolourisation and Up-gradation of Green Phosphoric Acid.

Waste water recycling including zero discharge

INCORPORATION OF MEMBRANE SYSTEM IN EFFLUENT TREATMENT

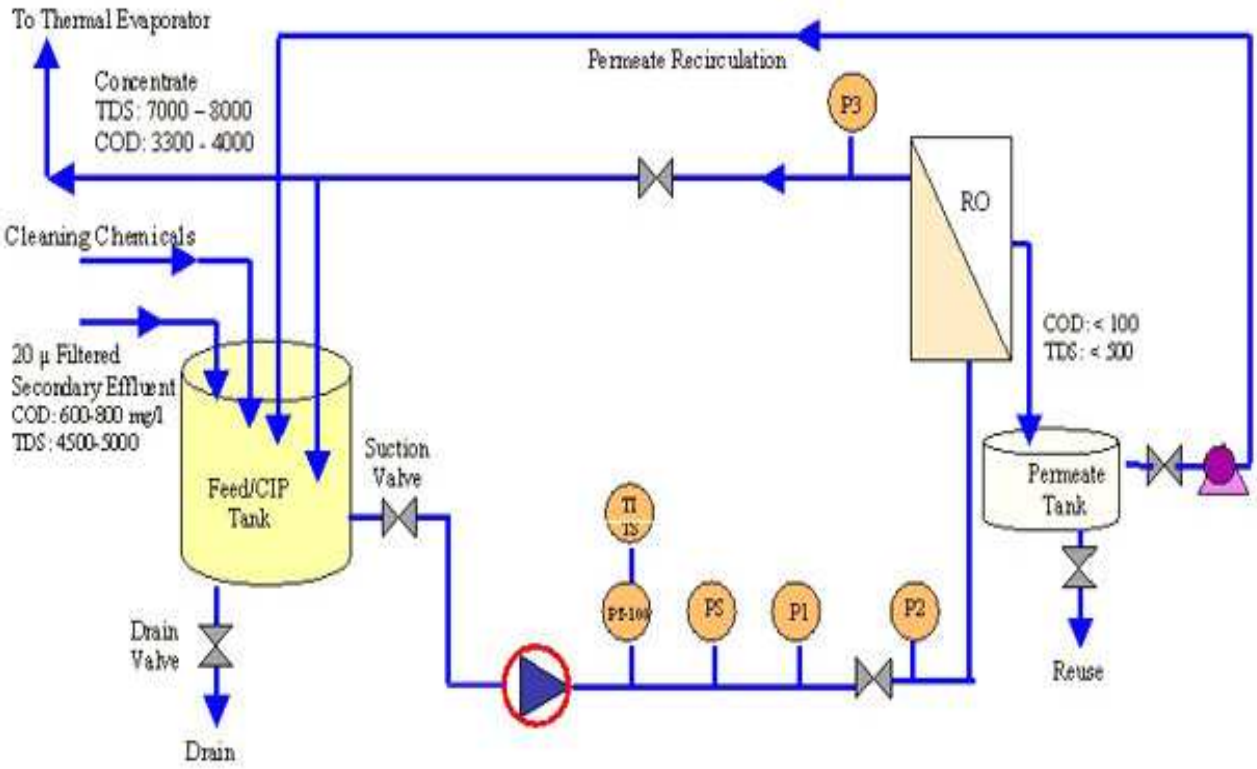


Tertiary Treatment By RO



Generally primary and secondary effluent treatments are given by industries to meet the statutory requirements set by State & Central Pollution Control Boards for disposal of industrial effluents. The import parameters which are deciding criterion to evaluate the quality of treated effluents are total dissolved solids (TDS), total suspended solids (TSS), pH, Biochemical oxygen demand (BOD), Chemical oxygen demand (COD), Oil & grease, colour, many heavy metals etc.

The major effort in primary and secondary effluent treatment is directed towards meeting the above-mentioned parameters. Even though it may be possible to achieve necessary disposable quality by primary and secondary treatments the treated water never becomes reusable and therefore it is discharged into sewer/water bodies such as canal/creek/sea/rivers. It is also difficult to monitor the quality of the effluent discharged by individual units about their consistency in meeting the required parameters. As per the existing law water cess is being levied on all the industries which are disposing treated/untreated effluents out of their factory premises.



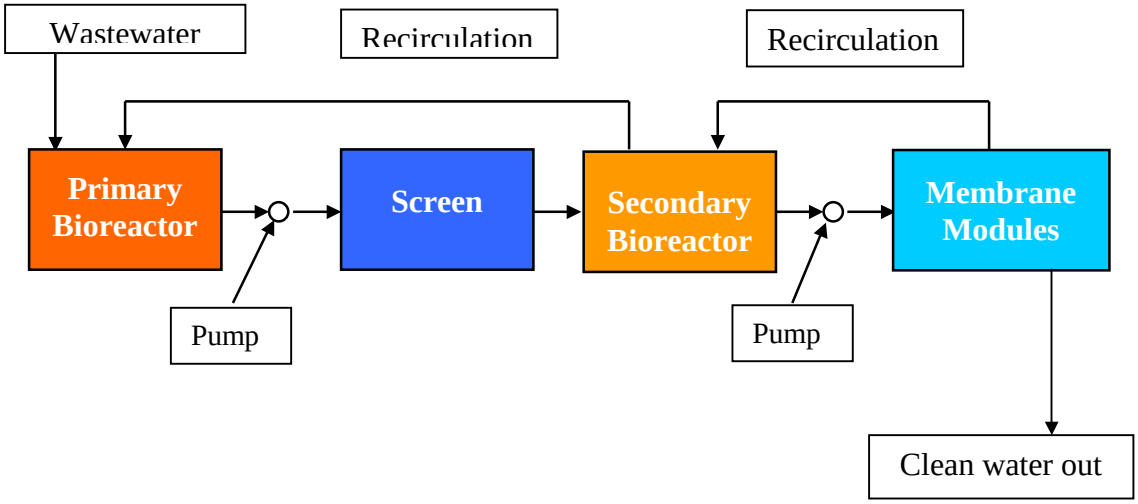
In order to produce reusable grade water from the primary/secondary treated effluent Reverse Osmosis (as a tertiary treatment) is being used regularly. Incorporation of RO ensures very high quality water which is almost free from colour, BOD, COD, TDS, TSS and other heavy metals etc. This is found to be extremely beneficial as it significantly reduces the water cost of an industry on one hand and achievement of almost zero discharge on the other.

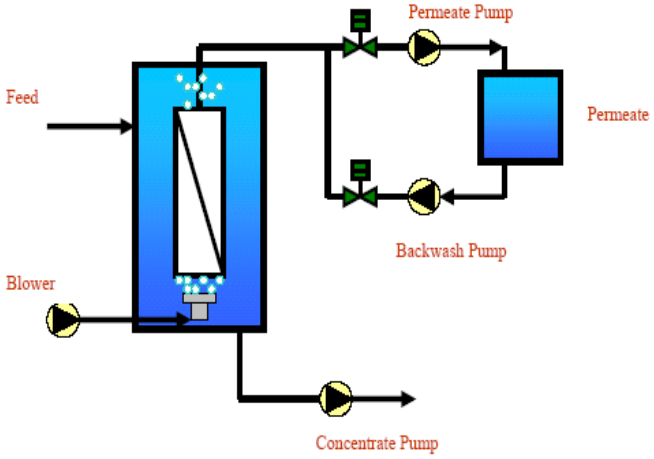
Pre-treatment to RO by UF

In order to provide high feed quality to RO in terms of lowest SDI and lower fowling index Genesis introduced back washable MF/UF in hollow fibre configuration systems for the first time in India in 1994. Even though the utility of such a high quality pre-treatment before RO was not accepted then it has become a Industry standard today.

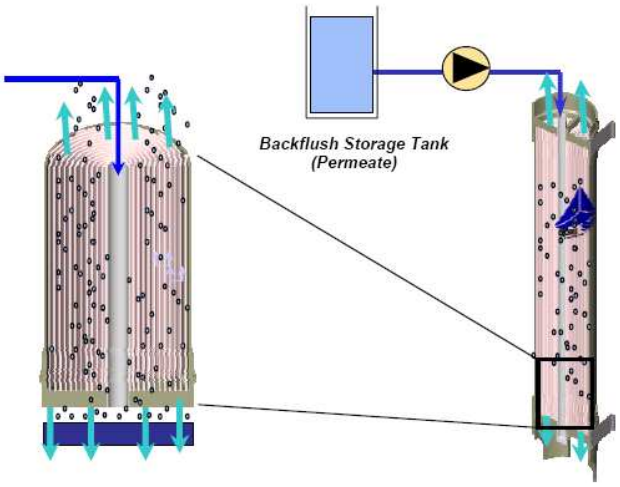
Membrane Bio-Reactor

Membrane Bio-reactor is a combination of two well tested wastewater treatment technologies. Namely Activated Sludge where bacteria consume pollutants resulting in waste minimisation and membrane filtration where separation of clean water from activated sludge is achieved. Following is a schematic illustration on the working of membrane bio-reactor in association with activated sludge process:





Negative Pressure, Immersed Operation for Permeate Production in a Bio-Reactor



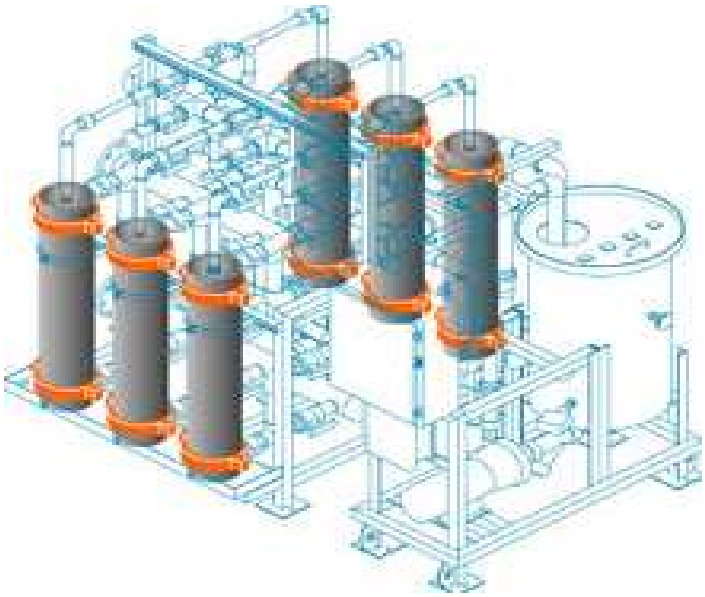
Backflush Operation in a Bio-Reactor of Trisep Corporation, USA

Clarification of cane juice for high yield

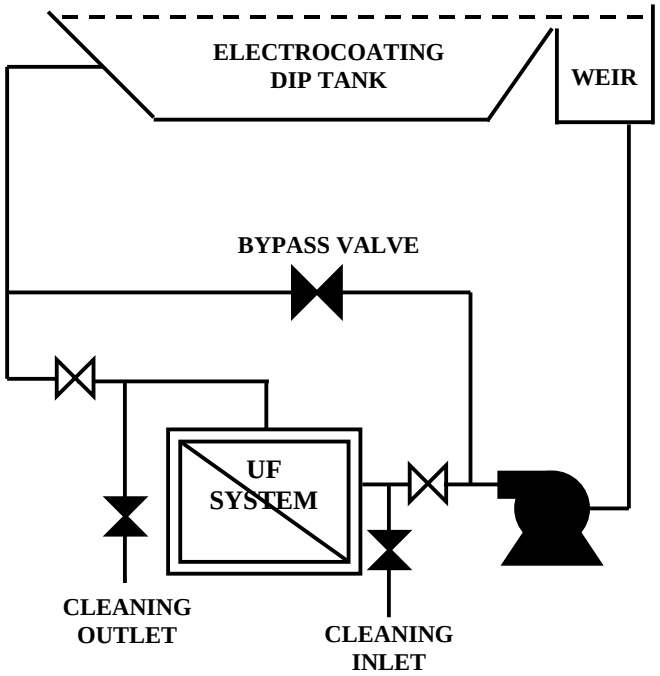
In the production of white sugar crystals from cane juice various separation techniques are employed to separate sucrose from those of other components present in cane juice. Since sugar manufacturing is an old process based on conventional techniques the separation efficiency as well as energy efficiency are low. Periodic heating/cooling coupled with adjustments of pH to acidic/basic conditions cause significant loss of the sucrose molecule in to molasses and else where. Incorporation of appropriate membrane technology has been tested to produce sugar with higher yield and with lower energy consumption. The resulting molasses has been found to be of much better quality in terms of colour and salt content. Such molasses will be of very high value for those industries where it is used as feed-stock.

Recovery of AED – CED paint from ED bath in Automobile industry.

In electrocoat paint systems, the permeate produced by the ultra filter contains water and paint solubilizers. The permeate is used in the paint line rinse section. This recycling method provides a closed-loop rinse system for recovering paint drag-out. The permeate can also be diverted to drain to reduce the conductivity of the paint.



Paint Circulation loops:



Recovery of Oils from Oily waste water

Genesis supplies complete system for the recovery of oil from machine shop using proprietary tubular membranes manufactured by Koch Membrane Systems INC. The system is suitable for :

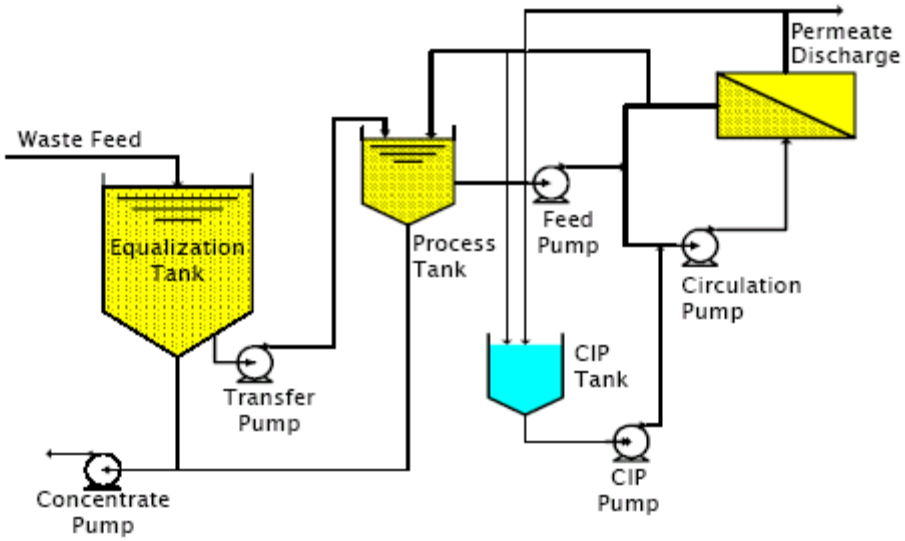
- ☞ High suspended solids/oils and grease concentration in untreated waste water.
- ☞ High cost of concentrate handling or disposal.
- ☞ Need for rugged, durable and reliable membranes capable of withstanding a variety of conditions.
- ☞ Requirement for highest possible concentration factor.

The primary benefits and features are:

- ☞ Ability to be mechanically cleaned with sponge balls, which permits removal of foulants not possible with other membranes. This feature yields reliable and consistent performance in difficult applications.

- ☞ Ability to operate at maximum suspended solid concentrations without plugging, which minimizes prefiltration and retentate handling expenses.

TYPICAL UF SYSTEM FLOW SCHEMATIC

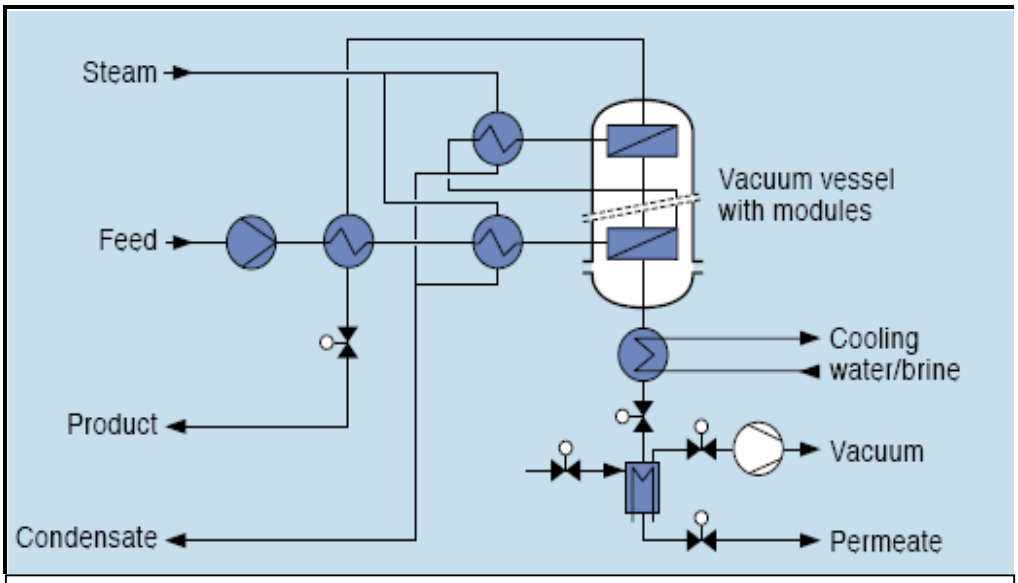


Recovery of Solvents by Pervoporation

Pervaporation is a process in which a specific component in a feed mixture passes through a dense, non-porous membrane by solution – diffusion transport mechanism. Then, the permeate is collected as a vapour at the other side of the membrane while being kept under vacuum conditions.

Some of the Applications include Dehydration of Organic Solvents. The PV process can easily dehydrate solvent mixtures. The binary or ternary azeotropes can be dehydrated without the use of entrainers. In some cases, where distillation is not possible, pervaporation is the only alternative to costly incineration of waste solvent streams.

In addition to above a wide range of organic solvents can be extracted from waste water such as hydrocarbons, chlorinated hydrocarbons, esters, ketones, ethers, alcohols. The PV systems can also reduce COD requirement of waste water streams going to biological treatment units, or pre-concentrate organic wastes to incinerators.



A TYPICAL PROCESS FLOW DIAGRAM

ADVANTAGES

- **Superior for azeotropic mixtures**
- **Pollution free process**
- **Energy efficient**
- **Flexibility**
- **Modular construction**

Other Unique Products

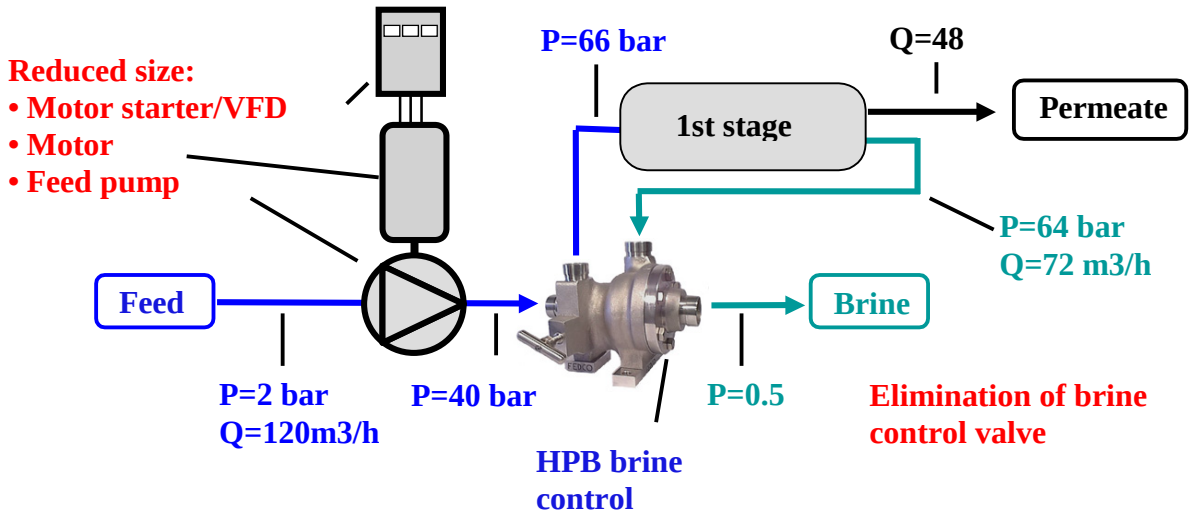
Hydraulic Pressure Booster

Energy Recovery Devices manufactured by FEDCO, USA. Is the most innovative and cost effective mechanical device, which is a must for energy recovery in SWRO and for inter-stage boosting in BWRO.

The Hydraulic Pressure Booster or HPB is a fully self-contained brine energy recovery device for seawater and brackish water systems. With over 850 units in field service, the HPB has earned a reputation for reliability, ease of operation and most importantly as the best value in energy recovery to day.

The HPB generates a pressure boost in the feed stream ranging from 20 to 40% of the total membrane requirement. The unit is entirely energized by the brine stream. The brine and feed provide all lubrication and cooling. The HPB includes an integral valve for brine pressure regulation.

How the HPB Save Energy And Capital Costs



The HPB is installed between the HP pump and the feed inlet to the membrane.

The HPB produces up to 50% of the membrane pressure requirement, thereby, reducing the size and energy requirement of the HP feed pump and motor and motor starter.

MSS Series HP Pump

- 7-250m3/hr capacity in ten (10) models
- Pressures to 83 bar
- Multistage, horizontal, barrel type
- Flanged construction, one piece shaft for durability
- WATER BEARING Integral thrust bearing
- Materials for SWRO service

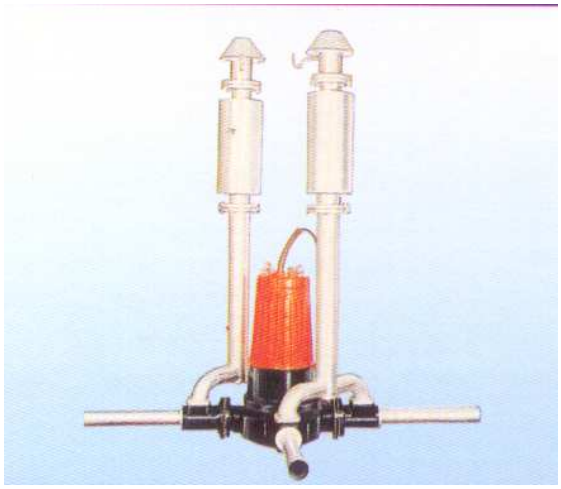
Hydraulic Pressure Booster(HPB) Energy Recovery Turbine

- 10 – 500m3/hr
- up to 1,000 m3/hr with custom-engineered units
- Pressures to 83 bar
- Constructed in Duplex SS 2205
- Integral brine control valve; No external tubing
- No auxiliary equipment or instrumentation required
- Lowest life cycle cost of any Energy Recovery Device

High Performance Chemicals

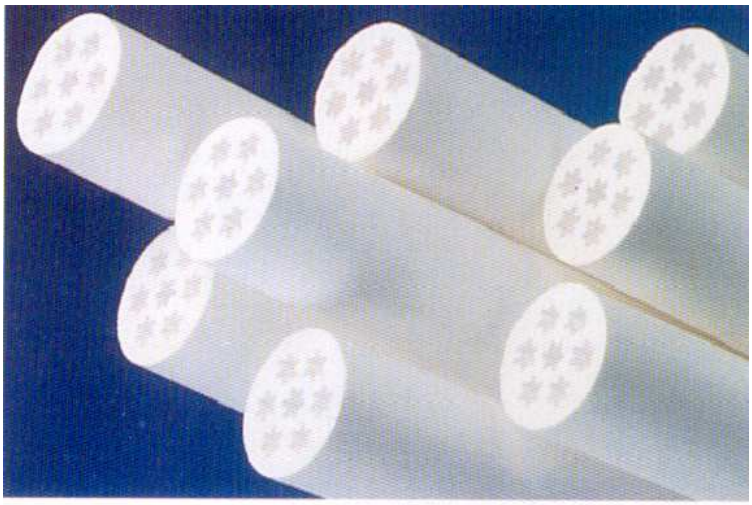
GMS provides service to its customers through evaluation of Chemicals in use and studying the problem faced in a particular scenario. Based on its evaluation GMS advices usage of Generic chemical or a particular formulation which ever is effective and cheap. GMS has also solved problems in many big installations in India where the problem faced by the customer was purely due to improper usage of branded chemicals or due to lack of understanding of the problem it self. GMS supplies High performance chemicals for cleaning, scale prevention, bio growth retardation, etc. These are extremely efficient in the control of membrane fouling, removal of scales and flux restoration. These tailor made chemicals have been proven to be superior to generic chemicals, in some cases, besides being compatible with membranes.

Submersible Aeration System for ETP



Generally surface aerators are used in the secondary effluent treatment plant for oxygenation. Typically a surface aerator transfers 0.9 to 1.0 kg oxygen per HP of motor per hour. The design and location of surface aerators create anaerobic pockets in the aeration tanks besides frothing at the surface of effluent which results in very low or no oxygen transfer. The submersible aeration system is extremely useful for aeration due to very high oxygen transfer efficiency as against surface aerators/ diffused air systems. **Typically the oxygen transfer efficiency varies between 1.6 to 1.9 Kg/HP/Hr**. The other advantages are **no foundation, no noise, no sprays, low maintenance, thorough mixing, flexibility in layout & space saving**.

Ceramic Micro filtration Membranes



GMS supplies micro filtration system based on ceramic membrane with built-in backwash systems for various applications such as bio-mass separation, Sterile filtration, fermentation broth clarification, cell harvesting, Solvent purification, precious metal recovery and enzyme concentration.

Some of the benefits are better permeate quality, higher flux and lower operating cost. It has long life due to high resistance to temperature, pressure & solvents. It is sterilizable by steam as well as chemicals. GMS has supplied many Ceramic MF systems for pretreatment in RO plants for effluent treatment and Zero discharge. The first Juice clarification system based on Ceramic MF in India has been supplied by GMS.

Photograph of a PLC-SCADA controlled Hollow fiber (Make: Koch, USA) UF plant for pre-treatment to RO for a Zero discharge system built by Genesis for a large pharmaceutical industry in India.

GENERAL CHARACTERISTICS OF MEMBRANE MODULES

(Basic guidelines for selecting the right module geometry for a specific application)

Characteristics	Spiral Wound	Hollow Fiber	Tubular	Plate-and-Frame
Typical packing density (ft^2/ft^3) (m^2/m^3)	245 [800]	1830 [6000]	21 [70]	150 [500]
Required feed flow rate (ft^3/ft^2-s) (m^3/m^2 -s)	0.8-1.6 [0.25 - 0.50]	~0.016 [~0.005]	3-15 [1.0 - 5.0]	0.8-1.6 [0.25 - 0.50]
Feed side Pressure drop (psi) (Kg/m^2)	43 - 85 3 - 6	1.4 - 4.3 0.1 - 0.3	28-43 2 - 3	43-85 3 - 6
Membrane fouling propensity	High	High	Low	Moderate
Ease of Cleaning	Poor to good	Poor	Excellent	Good
Typical feed stream filtration requirement	10 - 25 µ filtration	5 -10 µ filtration	Not required	10 - 25 µ filtration
Recommended applications	**Clean dilute streams such as water for desalination. Not good for high concentration & fouling chemicals**	**Very clean streams such as water. For UF/MF on dirty streams with built-in back wash system.**	**For high conc. in dirty streams or streams containing fouling chemicals, such as dye desalting & concentration.**	**Laboratory work and membrane evaluations. Good for high viscous liquids.**

Hand Operated RO

Genesis has deep social commitments and tries to contribute towards providing safe drinking water to villagers at affordable price. Genesis is installing few RO plants for rural drinking purposes in water scares areas of Gujarat.

In order to provide safe drinking water to villagers Genesis has developed very cheap Hand operated RO plant which can deliver safe drinking water at three paise per liter even in areas which are without electricity.

Manually operated RO System for water purification for rural masses.

The Hand Operated RO plant is proved to be a boon in areas where water is contaminated with arsenic and/or fluorine. The operation of the plant is very simple and therefore can be operated by anyone. It is so designed that practically dose not requires any maintenance except for some cleaning and membrane replacement.

Some of our Esteemed Customers

Atul Ltd
BASF India Ltd
Jaysynth Dyechem Ltd, Mumbai
Paramount Minerals & Chemicals Ltd
Diamond Dyechem Ltd

Aurobindo Pharma Ltd
Ranbaxy Laboratories Ltd
Dr. Reddy's Laboratory Limited
Lupin Ltd
Malladi Drugs & Pharma Ltd
Kopran Ltd

TATA Motors
General Motors India Ltd
International Cars & Motors Ltd
Ashok Leyland Ltd
Fait India Ltd
Bajaj Auto Ltd
TVS Motor Company
Mahindra & Mahindra Ltd
Haden International Group (I) P. Ltd

CSIR Labs:
Central Glass & Ceramic Research Institute
Central Salt and Marine Chemicals Institute
Central Food Technology Research Institute
Indian Institute of Chemical Technology
National Environmental Engg. Research Institute

Bhabha Atomic Research Centre
UDCT, Mumbai University

TATA Coffee
Gujarat Ambuja Cement Ltd
Nirma Ltd
Dabhol Power Projects Ltd. (Enron)
Zenith Ltd
Godrej Industries Ltd
Pundit Textile Mills
Chennai Petro Chemicals Ltd

Dr. B Chakravorty, MD of Genesis delivering plenary lecture at Confederation of Indian Industries at Delhi

Mrs. Sheila Dixit, Chief Minister Delhi and Dr. Mitra, Secretary General of FICCI at the Genesis Pavilion in the FICCI Exhibition at Delhi

Genesis Membrane Sepratech Pvt. Ltd

18, Vardhaman Complex, 10, L.B.S. Marg, Vikhroli (W), Mumbai – 400 083
Phone: 0091-22-2577 5458 / 2577 5456 · Fax: 0091-22-2579 0608 / 2577 6110
E-mail: genesis@bom5.vsnl.net.in · Web Site: www.genesismembrane.com
Web Page: www.indiamart.com/genesismembrane