

Pharmaceutical Solutions

Esmil and our Partners have conducted much research and gained vast experience in effluent treatment and product recovery within the pharmaceutical sector. From bench scale studies right the way through to full scale plant operations we strive to offer BAT (Best Available Technology) using state of the art pervaporation, membrane separation and other treatment processes.

Industry Experience

- Solvent recovery / dehydration
- Wastewater Treatment
- API recovery / removal

Specialist Partners

Esmil work closely with DeltaMem Ltd, which was established through acquisition of Sulzer Membrane Technology business. Together we offer membrane systems applicable to the pharmaceutical industry for the dehydration of alcohols and solvents as well as the removal of methanol from organic solutions.

DeltaMem provides:

- Sound expertise and know-how in membrane technologies
- Largest installed base of pervaporation and vapour permeation plants
- Expert team, specialized in membrane technologies
- Reliable membrane technology with proprietary **PERVAP™** membranes
- Experience with combining technologies (process intensification) into innovative hybrid process solutions
- Continual R&D of new and better membranes with higher flux, better selectivity and broader chemical resistance producing state-of-the-art membrane technology for new process concepts.

Pervaporation

Pervaporation is a membrane process which enables solvent dehydration without dependency on vapour/liquid equilibrium. The separation mechanism is based on high water affinity of the membrane material; in this way water is easily and preferentially adsorbed and permeated through the dense membrane. The process can be operated with liquid feed (pervaporation) or with vapour feed (vapour permeation) in batch or continuous mode depending on the feed flow as well as on production needs.



PERVAP™ plant

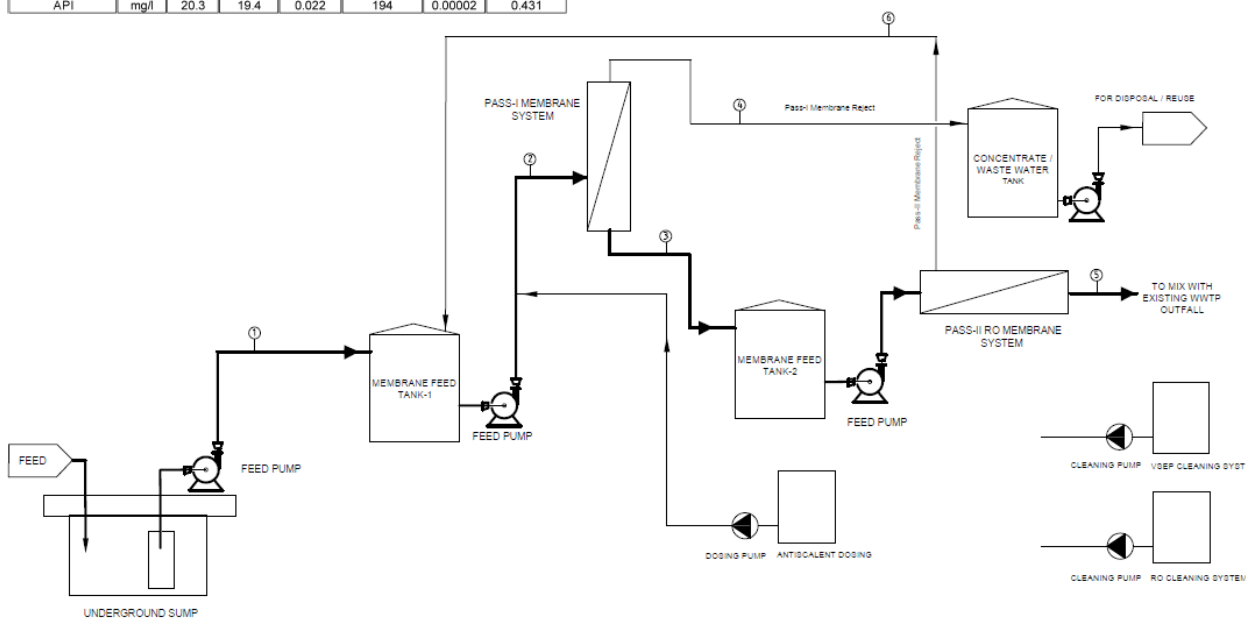
Wastewater and API's

Esmil has vast experience in the membrane industry supplying turnkey packages for a variety of industries and applications. This includes and pre or post treatment as required giving us the ability to tackle even the most challenging wastewaters using membrane technology whilst providing economic and environmental benefits to the customer.

Our wastewater treatment solutions ranges from simple pH balancing prior to foul sewer discharge all the way up to ultrapure water production for process reuse utilizing reverse osmosis, activated carbon and ion exchange technologies.

Due to the selectivity of membranes or effective 'pore size', valuable components of aqueous streams such as API's can be recovered or removed in certain applications. The difference in molecular size between contaminants and valuable components allows separation of these using membrane technologies. For example, if an API or other compound of value is insoluble or has a large molecular weight, this could be retained by a membrane such as micron or Ultrafiltration with lower molecular weight cut off (MWCO) than API or other compound. Whilst allowing water and either smaller or soluble contaminants to permeate through the membrane. This idea is applicable in a reversed situation by using a 'tighter' membrane such as Nanofiltration or Reverse osmosis membranes.

		Pass-I				Pass-II	
		Feed 1	Net Feed 2	Permeate 3	Concentrate 4	Permeate 5	Concentrate 6
Flow Rate	m ³ /day	14.0	14.7	13.19	1.5	12.5	0.66
Suspended Solids	mg/l	208.3	198.9	0.022	1,989	0.000002	0.442
API	mg/l	20.3	19.4	0.022	194	0.00002	0.431



The figure above depicts a two pass membrane system designed by Esmil to treat a pharmaceuticals plants combined effluent. The API of interest was of concern due to its potential negative ecological effects at these concentrations. Test work found the API in the effluent to be in both the insoluble and soluble forms; requiring both Ultrafiltration and Reverse Osmosis to effectively remove almost all traces of the API prior to foul sewer discharge.

Utilizing our experience and knowledge of membrane systems Esmil are able to turn waste streams into value added commodities including product recovery and water suitable for reuse through our membrane processes.

Esmil Expertise

- Pre-treatment – Chemical dosing, dewatering, DAF, Oil Separation, media filtration, etc.

- Membrane grades ranging from Micron filtration all the way up to Ultra High Pressure Reverse Osmosis and everything in between
- Variety of membrane configurations; spiral wound, vibrating (VSEP), tubular, submerged among others
- Further post treatment such as granular activated carbon (GAC) and ion exchange (IEX).



Pharmaceutical Industry Design Philosophy

We strive to use the most appropriate solution to suit your treatment and/or recovery requirements. We are not limited to a single technology as we have a vast range of experience in the majority of treatment and specialist technologies. This includes membrane bio reactors, aerobic treatment, media filtration, pervaporation and other membrane technologies across a range of effluents and industries.

As no two processes are equal it is essential to follow a number of steps to ensure that your tailored pharmaceutical application treatment/recovery process performs as well and economically as possible to achieve your treatment goals.

- Laboratory tests
- Long term site pilot trial to allow for feed variation and data gathering
- Extensive plant design incorporating capital and operating expense calculations
- Build, Installation Supervision, Commissioning and Start-up assistance
- Comprehensive service support including maintenance and system upgrades.

References:

- Available on request?

Esmil Process Systems Ltd

The Loft, 30 Abbey Barn Road High Wycombe HP11 1RW

Buckinghamshire England

Telephone: +44 (0) 1494 526155

e-mail: info@esmil.co.uk website: www.esmil.co.uk