

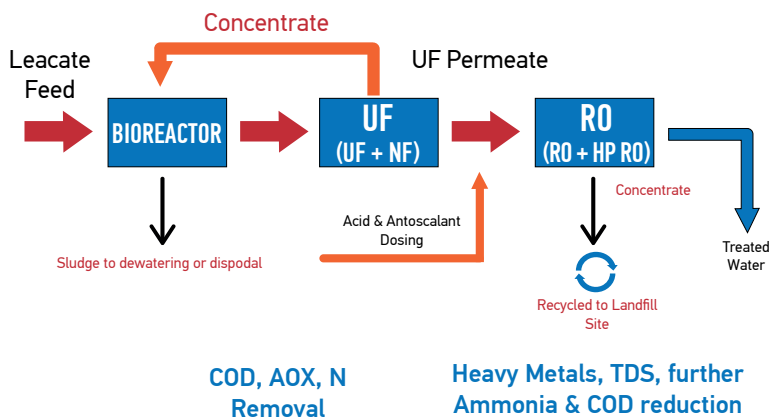
# LEACHATE TREATMENT

Esmil and our Partners have conducted much research and gained vast experience in the field of Leachate treatment. 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 membrane separation and dewatering processes.

## PROCESS DESCRIPTION

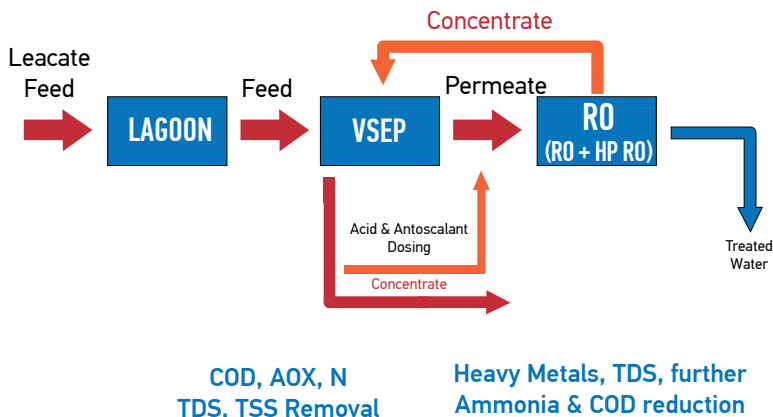
Our Leachate treatment system consists of 2 major process units (main stage and polishing) and is able to produce sludge or dry solid cake (Optional) and a highly quality water suitable for process reuse or disposal.

### OPTION-I

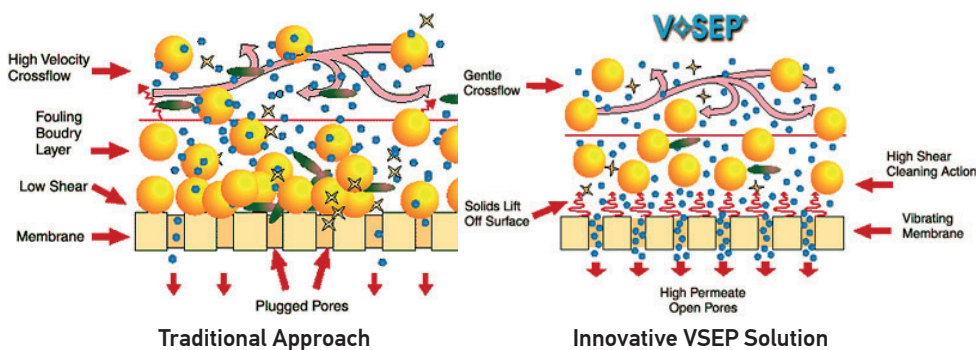


The first stage in our Leachate treatment process is the Biological Process where microbes are used to degrade pollutants that are then filtered by a series of UF membranes in the second stage. Permeate is then treated using RO membranes to produce water suitable for reuse or discharge to the local sewer. The key property of effluent is its biodegradability or COD/BOD ratio.

### OPTION-II



Alternately, for the Leachate treatment we make use of another of our Partners proprietary technology. This is effectively a fouling resistant- vibrating membrane or VSEP (Vibratory Shear Enhanced Processing). The Leachate waste expected to have suspended solids with other soluble contaminants. This may cause serious issues for standard membrane systems; as they are highly susceptible to fouling. VSEP technology however, vibrates the membranes causing high shear forces at the membrane surface, greatly reducing the risk of fouling.



The high shear processing exposes the membrane pores allowing for maximum permeation of treated water. The contaminants and a portion of the water are rejected by the membrane and remain on the concentrate side. This 'concentrate' will contain the vast majority of pollutants from the feed and therefore can potentially be sent to Evaporation Pond, Evaporator or Reapplied to the landfill.

Our final stage of the treatment is a spiral-wound reverse osmosis membrane technology. This acts as a polishing stage further treating the permeate (treated water) from the VSEP units.

## TYPICAL LEACHATE WASTE WATER ANALYSIS

PARAMETERS	TYPICAL RANGE (MG/L)	UPPER LIMIT (MG/L)	MBR REMOVAL	VSEP REMOVAL	POLISHING RO
<b>Total Dissolved Solids</b>	1,000–20,000	55,000	0%	90-95%	99%
<b>Chemical Oxygen Demand</b>	100–51,000	99,000	20-90%	80-85%	95%
<b>Biological Oxygen Demand</b>	1,000–30,300	195,000	95%	80-85%	99%
<b>Total Nitrogen</b>	2.6–945	1,416	95%	60-95%	60-95%

## FINE AMMONIA REMOVAL

To ensure the reusability and high quality of the treated water, a small amount of acid may be dosed to convert any remaining ammonia from its gaseous form to ammonium sulphate. In this form ammonia is effectively rejected by the membranes, along with any other remaining contaminants; producing a water quality highly suited for reuse within the process.

## DISCHARGE OR REUSE

Available options will be site specific. The attainable treated water quality is dependent on effluent quality and technology provided. Typical options include:

- Reuse Onsite: plant washing or cleaning operations, boiler feed;
- Discharge to sewer at low cost;
- Discharge to the environment.

Each option will have specific requirements for the water quality and therefore specific technological solutions to achieve this.

## LEACHATE TREATMENT DESIGN PHILOSOPHY

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

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

- Lab scale membrane trial and selection to ensure process feasibility
- Long term site pilot trial to allow for feed variation and data gathering
- Extensive plant design and operating expense calculations
- Build, Installation and Commissioning
- Comprehensive service support including maintenance and system upgrades.

## LEACHATE REFERENCE PLANTS

2002 - Niersverband Düsseldorf - GERMANY (MBR, UF, AC)	2015 - El Bordo Poniente – MEXICO (VSEP, RO)
2004 – Artigas Bilbao – SPAIN (MBR, UF)	2002 - Solius Girona-SPAIN (MBR, UF, RO)
2007 – Virginia (VSEP)	2015 - Panama City (VSEP, RO)