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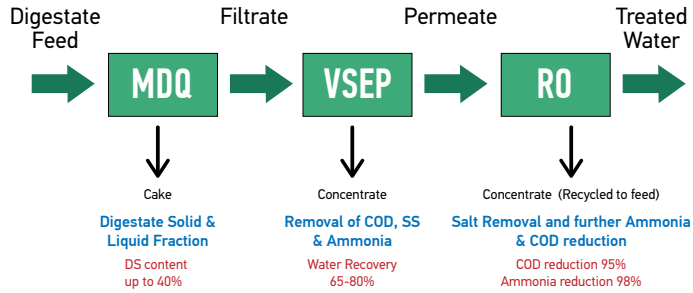
CASE HISTORY

DIGESTATE TREATMENT APPLICATION

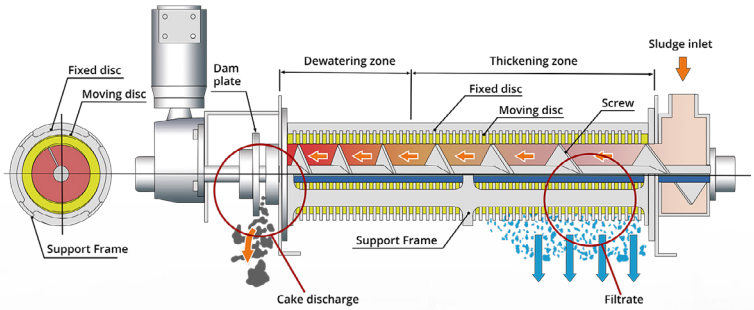
Esmil and our Partners have gained vast experience in the field of digestate treatment. From bench scale studies, right the way through to full scale size plant we strive to offer BAT (Best Available Technology) using **state of the art membrane separation and dewatering processes.**

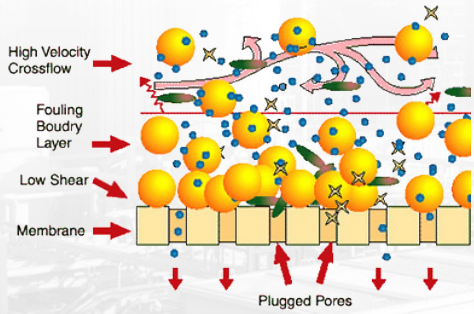


Process description

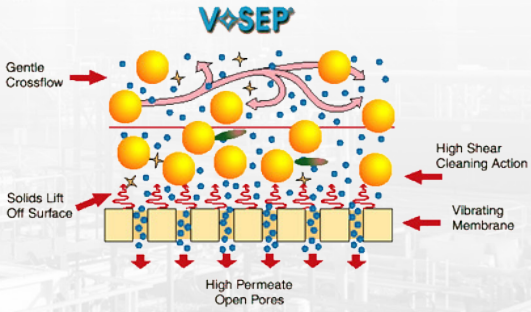
Our digestate treatment system consists of 3 major process units and is able to produce a dry solid cake and a highly quality treated water suitable for process reuse or disposal and a high nutrient concentrate.

The first stage in our digestate treatment process is the separation of the solid and liquid fraction, otherwise known as **digestate dewatering.** For this we employ our Partners highly effective **Multidisc Screw Dehydrator** which with the assistance of a small dose of flocculant is able to remove the majority of solids from the liquor (sludge volume reduction of 6-10 times) and produce a dry cake with a dry solids content up to 40%.





Traditional Approach



Innovative VSEP Solution

For the second stage, we use special vibratory membrane technology - **VSEP** (Vibratory Shear Enhanced Processing). This effectively works in the challenging feed conditions.

Although the MDQ is able to remove the majority of the dry solids, some will remain along with other soluble contaminants. The dry solids 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. Expected water recovery in this stage can be between 65-80%.

Our final stage of digestate 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. Results have shown that a 95% reduction in COD concentration and 98% reduction of Ammonia can be achieved over the 2 passes of membrane treatment.

Process efficiency

Parameters	Units	VSEP (Pass-I)			RO (Pass-II)		
		Feed	Conc.	Perm.	Feed	Conc.	Perm.
Total COD	mg/l	13,080	12,800	7,990	7,990	31,960	600
pH	-	5.68	5.6	5.7	5.7	6.1	5.9
Ammonia	mg/l	5,150	11,300	1,760	1,760	7,425	100
Conductivity	us/cm	40,400	-	15,400	15,400	73,100	1,389

Permeate/concentrate use:

- Anaerobic digester feed dilution;
- Plant washing/ cleaning operations;
- Boiler feed (may require additional polishing);
- Discharge to sewer at a very low cost;
- Low volume, high nutrient digestate product for soil conditioning.

Projected Operating Costs (for 15 m³/h)

MDQ - VSEP - RO	Cost £/m³
Power	£ 0.45
Water	£ 0.02
Chemicals	£ 1.00
Replacements	£ 1.00
TOTAL	**£ 2.47**

Digestate Treatment Design Philosophy

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

- Chemical testing to achieve best flocculation at lowest dose rate.
- Lab scale dewatering and 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.

References

2013 - Kurana UAB, Grain Bioethanol, Lithuania (VSEP, RO)
2018 - Quasar Energy Group LLC, Municipal Sludge, USA (MDQ)
2018 - Renergy Inc., Wastewater Treatment Plant, USA (MDQ)
2018 - KB BioEnergy Inc., Wastewater Treatment Plant, USA (MDQ)