

Application Note: Landfill Leachate Treatment

V◇SEP Offers a Revolutionary Solution

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INTRODUCTION

One of the most important problems with designing and maintaining a landfill is managing the leachate that is generated when water passes through the waste. The leachate consists of many different organic and inorganic compounds that may be either dissolved or suspended. Regardless of the nature of the compounds, they pose a potential pollution problem for local ground and surface waters.

Many factors influence the production and composition of leachate. One major factor is the climate of the landfill. For example, where the climate is prone to higher levels of precipitation there will be more water entering the landfill and therefore more leachate generated. Another factor is the site topography of the landfill which influences the runoff patterns and again the water balance within the site.

VSEP and Landfill Leachate

Current leachate treatment options include recycling and re-injection, on-site treatment, discharge to a municipal water treatment facility or a combination. However, with stricter regulations regarding ground and surface water contamination, landfills are having to find new treatment alternatives. One treatment approach is to use V◇SEP™ (Vibratory Shear Enhanced Processing). Developed by New Logic International, Inc. of Emeryville, California, this advanced membrane technology has made it possible to filter streams containing a variety of components without the fouling problems exhibited by conventional membrane systems.

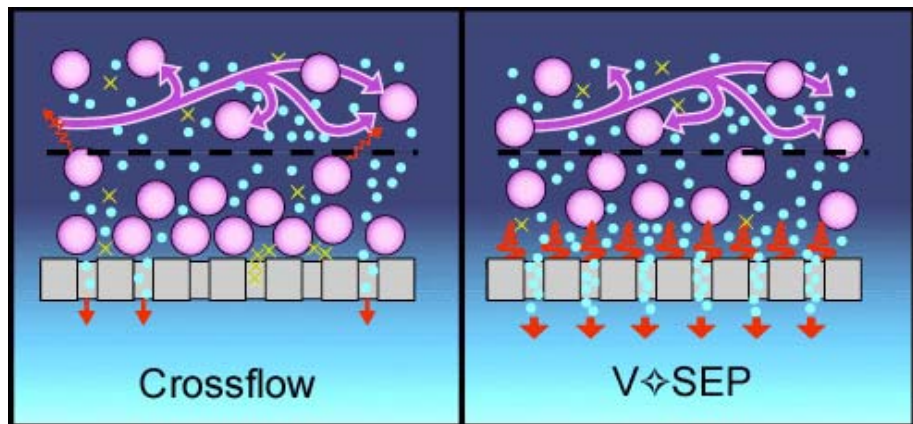


This new type of membrane system does not only filter the suspended solids but also reduces or eliminates dissolved organics and inorganics. The result is a crystal-clear water stream and a concentrated sludge.

The main difference between V◇SEP and traditional crossflow membrane filtration is the mechanism by which the foulants are prevented from accumulating on the membrane surface. A traditional crossflow system relies on the fluid velocity of the feed material to reduce fouling. The high feed velocity creates shear forces in the liquid which help maintain the motion of the solids and slow their deposition onto the membrane surface. However, a thin, stagnant boundary layer remains on the surface of the membrane which allows the solids to accumulate and eventually deteriorate the throughput rate. On the other hand, a V◇SEP system utilizes a patented vibratory drive mechanism which creates a high shear force on the surface of the membrane in order to repel foulants.



This mechanism enables the filter to maintain higher, sustained throughput rates and process larger volumes of material economically without the pretreatment costs of conventional crossflow systems. V◇SEP successfully eliminates diffusion polarization at the membrane surface.



CASE STUDY

Western Landfill Using VSEP for Nickel Reduction

Many tests have been performed on V◇SEP laboratory and pilot units with leachate from various landfills. Depending on the location of the landfill, the chemistry of the leachate and the discharge specifications have differed. The most extensive test work has been completed on leachate from a landfill located in the Western U.S. The discharge specification at that location requires the reduction of chelated nickel.

Membrane Selection and Testing

The initial testing was completed on a small laboratory V◇SEP unit, (Series L), and was used primarily to identify and select a membrane which would meet the discharge specifications. A thin-film nanofiltration membrane with a 50% sodium chloride rejection was selected. After membrane selection, a Series LP V◇SEP unit was used for long term testing under actual site conditions. The LP V◇SEP contains about 16 SF (1.5 m²) of membrane area. The pilot testing confirmed the information which was collected during the laboratory test work, including nickel rejections and flux data (see Figure 2, Flux vs. % Recovery).

The unique viratory shear movement of the membrane in the V◇SEP unit is able to produce stable flux of permeate through the membrane over time.

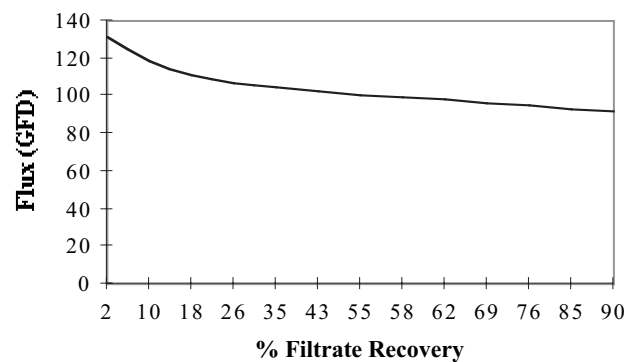
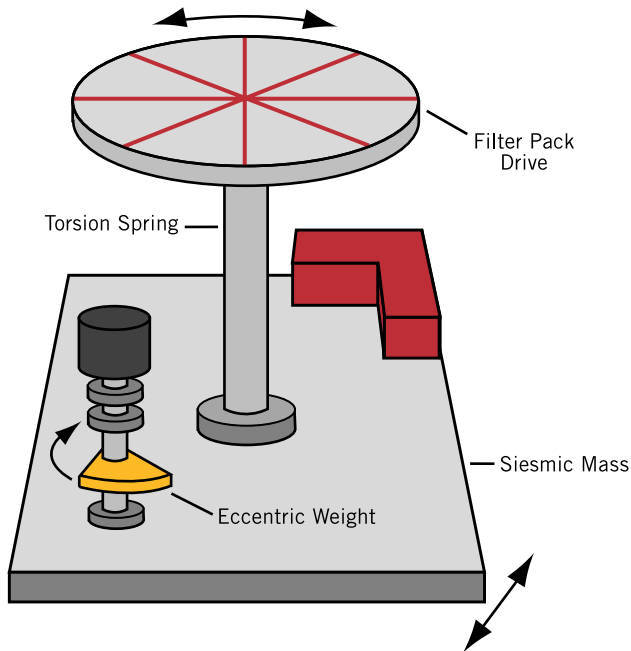


Figure 2. Pilot test data showing the relationship between flux and amount of filtrate which was recovered from the feed stream.

Full Scale Design and Processing

After both the preliminary test study and additional pilot testing, V◇SEP was selected as the appropriate treatment system for the leachate. The single V◇SEP unit will be filtering 113.6 l/m (30 gpm) of the leachate in order to reduce the nickel by 85-90%. The clean effluent stream from the VSEP will be discarded to the local POTW. The concentrated stream or sludge will remain on-site for further treatment, including volume reduction by evaporation and some chemical treatment. The site hopes to evaluate the possibility of reusing the clean water but at this time the goal was to meet the local discharge specifications.

V◇SEP Resonating Drive System



❖ V◇SEP offered many advantages compared to alternative treatment systems which included large amounts of chemical addition or required extensive space for installation. The vibrating membrane units are compact, cost effective and easy to maintain. VSEP units are flexible in that they can be manufactured with almost any membrane media. This feature enables the systems to be customized to fit the processing requirements for different leachates given the chemical composition of the stream. The membrane filter packs are modular and can be replaced to meet changing processing requirements.

Unlike other chemical treatment systems where chemical flocculants are added which substantially increase the volume of waste material, V◇SEP volume reduces the material to 10% of its original. Then with the following solidification by drying, the ending volume of dry solids is only 2% of the original volume. The dry solid can be sent back as landfill. The remaining 98% of the volume is disposed of or reused as clean clear filtrate.

The advantages of V◇SEP include:

- ❖ No chemical pre-treatment
- ❖ Simple single step processing
- ❖ Small footprint
- ❖ Automated and very energy efficient
- ❖ Precise molecular separation

In addition to these benefits, our customers take full advantage of the public relations aspects of the new treatment system. V◇SEP represents a brand new cutting edge technology for dealing with this wastewater problem.



36" Industrial V◇SEP Filtration Unit

CONCLUSIONS

Though membranes have experienced great advances in the past twenty years, their use in leachate treatment has only been explored recently. With more stringent regulations placing greater emphasis on leachate treatment, the industry is seeking new technologies to solve the problem. Offering economic and operating advantages, V◇SEP is a leading technology for treating landfill leachate and will continue to revolutionize the use of membranes in the industry.

References

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