

Santo Domingo Landfill – Ecuador



VSEP is a vibrating membrane filtration system developed by New Logic Research of California. The VSEP systems can be manufactured with RO, NF, UF or MF membranes. The unique vibrating design of VSEP allows for membranes to be used efficiently to treat difficult slurries like landfill leachate. Attempts to use membranes for treating landfill leachate have been made for more than two decades, but only now can membranes be efficiently used for this purpose. New Logic has designed a patented system that allows membranes to be an effective solution to the common leachate problem. Landfill leachate

can vary a great deal depending on the age of the landfill, the waste received, the amount of rainfall, and many other factors. Because of this, other technologies such as digesters, chemical treatment, or engineered wetlands can have selective success, but none represent a complete treatment solution. Only RO membranes are able to remove nearly all contaminants in the leachate and only VSEP with its vibratory shear can achieve high flow rates and high volume reduction using RO membranes.

Case Study Background

Santo Domingo is the third most populous city in Ecuador and therefore the landfill is responsible for a large volume of waste. The climate in Santo Domingo is tropical and humid, which equals heavy rainfall and increased volumes of landfill leachate. Up until this point, the operators of the landfill have been storing the leachate in approximately four (4) large, covered ponds. However this solution is not a permanent one, as the population of the city continues to grow and rainfall continually stresses the storage system.

The landfill's operators have been searching for a way to effectively treat the leachate for many years. After installing a biological treatment system which included many steps and costly maintenance, they were introduced to VSEP via a representative of New Logic based in Ecuador. With their help, the landfill became aware of the success of the VSEP installation at the Inga landfill in Quito, Ecuador, which is 133 km east of Santo Domingo. After fully researching the application and VSEP's advantages, the landfill's operators decided to install a plant of their own. Because they were in a hurry, they started with the rental of a VSEP manual system while waiting for the automatic system to be fabricated. In addition to reducing the volume of leachate needing storage, they have also appreciated the added benefit of the production of clean water that can be used within the landfill and be safely discharged to the local river.



Photo: Covered Leachate Ponds

Process Description

A full-scale VSEP system was installed at this site utilizing one 84" VSEP module and a second stage spiral RO polishing unit. One pass through the VSEP system, followed by one pass through the spiral RO system creates a water clean enough to both be used within the landfill and to be discharged to the river. The spiral RO system has the capability for two passes if needed. The final permeate from the system can also be used for VSEP and spiral RO cleanings when necessary.

At this time, the operators are processing leachate out of one pond at a time. However, because they have multiple existing ponds, they will be able to change the configuration of their plumbing systems in order to accommodate the cascading treatment system like what is being done with VSEP at the Inga and Panama City landfills. Please refer to these case studies on our website for more information. The cascading arrangement allows for higher overall recovery, higher flux rates of clean water, and less cleanings.

The leachate is pumped from the surface of the chosen pond (to avoid settled solids) to a small EQ/batch tank that feeds the VSEP system. After VSEP has treated the leachate, the permeate is collected in a tank for the spiral RO system. Once this tank is full, the spiral RO system begins its treatment cycle and the final permeate is collected in a tank for use on the landfill, as cleaning water for VSEP and the spiral RO, or as discharge water to the local river. The concentrate from both the VSEP and the spiral RO system is sent back to the leachate storage pond.

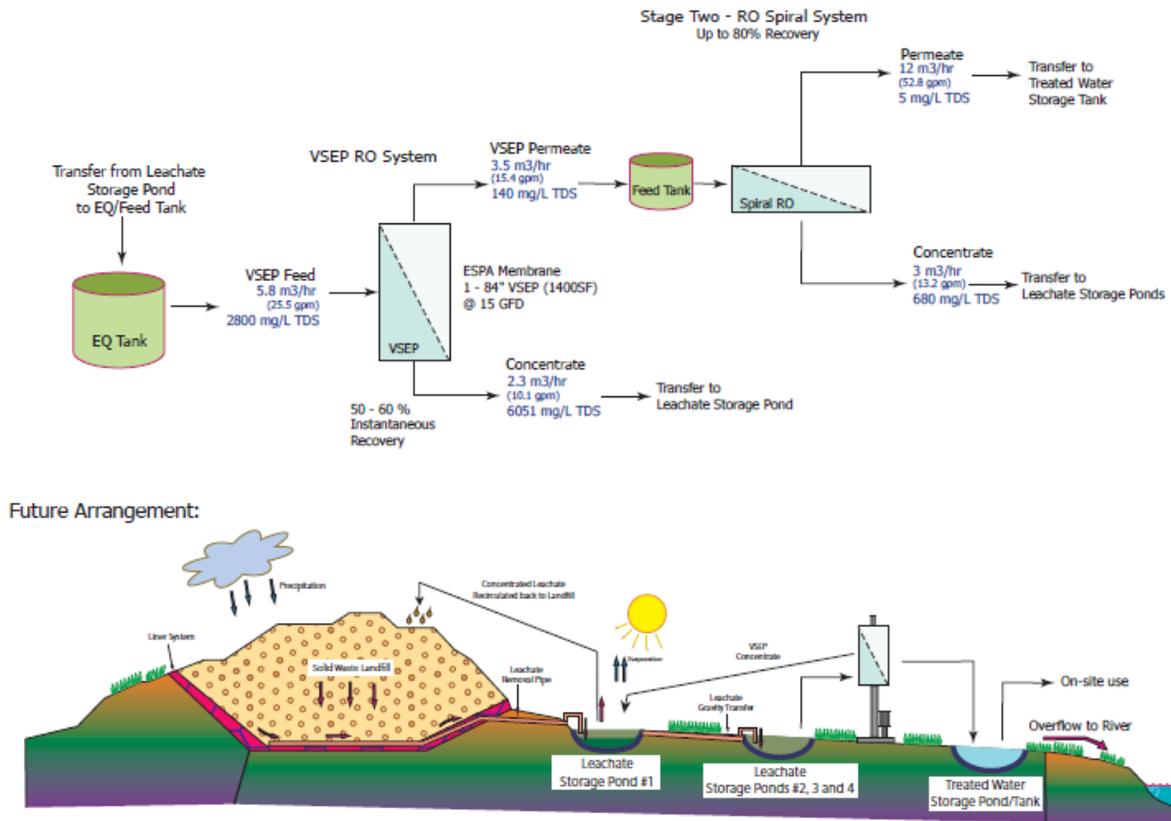
The main function of the VSEP is to volume reduce the amount of leachate stored onsite. In this way, more trash can be handled with more leachate produced, but with smaller volumes of stored leachate.



The VSEP system is currently treating approximately 140 m³/day of leachate from their storage ponds. VSEP systems are modular, so expansion is easy at any time. This will allow for plenty of storage capacity and will allow for time to select the best disposal method for the concentrated leachate that remains.

Photo: VSEP system installed on-site

Flow Diagram and Mass Balance of VSEP operations at Santo Domingo Landfill



Separation Quality

The RO VSEP system installed is producing filtrate with TDS reduced by 90 to 95%. The system is producing water that meets both on-site use and river discharge standards. The membrane is removing more than 98% of heavy metals including Cadmium, Zinc, Cobalt, Chrome, Iron, Nickel, and Lead. The VSEP is also removing 100% of suspended solids, and fecal and other coliform bacteria. The above mass balance shows the process conditions at the time of start-up. Within the next month or so, we expect the TDS in the leachate to increase to 4100 - 4900 mg/L. Rejection across the membranes will remain the same.



Photo: On-site samples of VSEP feed, VSEP concentrate, and VSEP Permeate

Summary

With the purchase of VSEP, the landfill's operators are now able to comply with local requirements and are able to reduce the volume of stored leachate, which gives them the option to expand their capacity. When needed, perhaps in the dry months of the year, they can use the recovered water from treatment for on-site use and membrane cleaning.

The installation of the VSEP system allows the existing landfill to continue to grow and has extended the useful life of this landfill by a significant amount. Extending the life of an existing landfill is much less expensive and intrusive to the environment than construction of a new landfill.

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