

Cerro Patacón Landfill – Panama City, Panama



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

Cerro Patacón is the only official repository for Panama City's garbage. Up until this point, Urbalia, the operators of the landfill, has been storing the leachate in three very large ponds. However as this solution is not a permanent one, especially with the growing population of Panama City and local governmental regulations tightening, the need for a longer-term solution that will increase the life of the landfill became apparent. The storage ponds in use were quickly running out of room for leachate and thus treatment solutions were researched.

The landfill's operators were introduced to VSEP via a representative of New Logic based in Colombia. With their help, Urbalia grew aware of the success of the VSEP installation at the landfill in Buga, Colombia. After fully researching the application and VSEP's advantages, Urbalia decided to install a plant of their own. They 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 waterways.



Photo: Panama City Landfill

Process Description

A full-scale VSEP system was installed at this site utilizing two of the large 84" VSEP modules. Since the filtrate would be both discharged to the river and used as industrial water around the landfill, two passes with RO were required. Therefore, a second stage RO spiral polishing system was added to the design. The Panamanian governmental requirements for water discharged to a river is 1500 mg/L of total dissolved solids (used as an indication of the presence of a broad array of chemical contaminants) and 250 mg/L chemical oxygen demand (indirectly measures the amount of organic compounds in water - typically high in landfill leachate), among other requirements for common water pollutants.

There were originally three leachate holding ponds at the landfill. All of them are located below the landfill, at different elevation levels and thus product is able to flow via gravity from pond to pond. Pond # 1 receives the actively produced leachate from the landfill and is located at the highest elevation of the three ponds. From pond #1, a transfer pipe installed near the surface of the pond (to avoid the transfer of heavy solids) allows the flow of leachate into pond #2. The leachate is then pumped from the surface of this pond (again to avoid remaining heavy solids) to a small equalization (EQ) tank that feeds the VSEP system. Originally, leachate would continue from pond #2 to pond #3, via the same method of transfer, however now that the VSEP has been installed in between, pond #3 has a new use. After the initial few days of operation, VSEP had treated the majority of the leachate that was housed in pond #3, and now this pond has been cleaned out and is being used as the treated water collection pond.



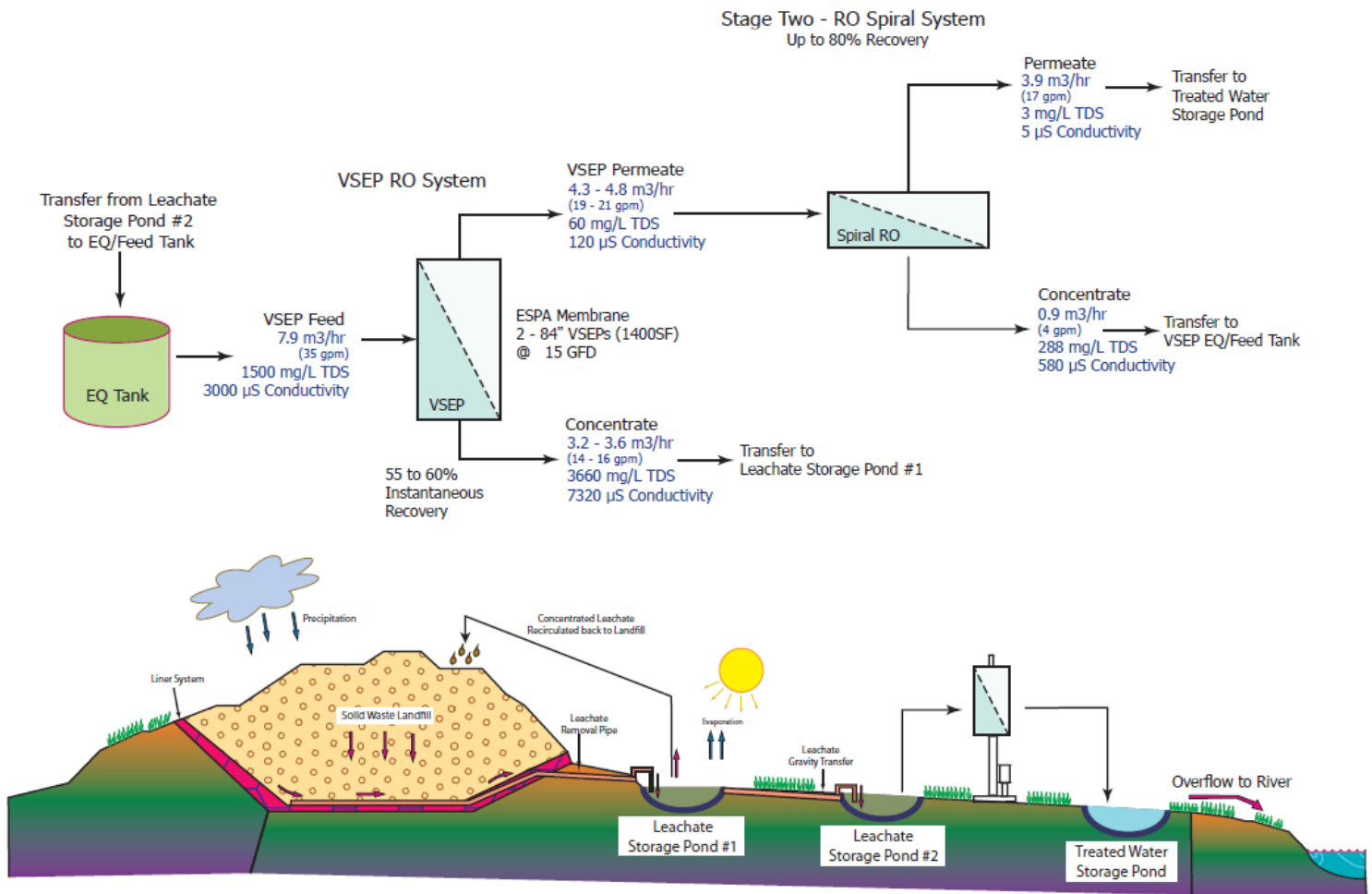
The treatment process is as follows: the permeate produced from VSEP RO goes to a permeate collection tank and is then treated with the second stage spiral RO system. Upon complete treatment, the permeate flows into pond #3. It is mainly used as industrial water around the landfill, including as irrigation water. Any overflow from pond #3 goes into the adjacent stream. 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.

Photo: VSEP system installed on-site

The concentrated leachate generated by the VSEP system is sent back to pond #1, while the concentrate from the spiral RO system is sent to the VSEP EQ tank, which helps to slightly dilute the feed water to the VSEP, while increasing the overall system recovery. When pond #1 reaches a certain volume level, leachate is pumped from the bottom of this pond back to the top of the solid waste landfill, creating a full recirculation with a high clean water output.

The VSEP system is treating approximately 175 m³/day of leachate from the storage ponds. Possible future expansions can double this amount. VSEP systems are modules, 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.

Table 1: Flow Diagram and Mass Balance of VSEP operations at Panama City Landfill



Separation Quality

The RO VSEP system installed is generally producing filtrate with TDS reduced by more than 90 to 95% and is producing water that meets both irrigation and river discharge standards. The membrane is also removing more than 98% of heavy metals including Cadmium, Zinc, Cobalt, Chrome, Iron, Nickel, and Lead. The VSEP is also removing 100% of Fecal and other Coliform bacteria.

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



Summary

The VSEP system was sold to a company that operates this landfill as well as many others. This landfill service company now has a competitive advantage when it comes to the services it can provide. Its experience with the VSEP system and the treatment of the leachate can be used at its other landfill operations and may also give it the advantage needed to secure other operation contracts in the region.

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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