

CASE STUDY: Landfill Leachate

At a Glance

Industry:

Landfill / Solid Waste Management

Wastewater:

Leachate with TDS, organics, ammonia.

Treatment

Requirements:

Sewer or surface discharge of treated water; >90% recovery and solids production.

Product:

SaltMaker

Results:

Reliably treated leachate to meet discharge limits and produced solids.

Economics:

Total cost of ownership starting at \$8/m³ (\$0.03/gal) leachate treated.

Challenge

A North American landfill required landfill leachate treatment for surface discharge as it is far from sewer lines. To meet regulatory requirements for surface discharge, the concentrations of key parameters, such as total dissolved solids (TDS), ammonia, and metals, required treatment to low levels. In addition, the landfill wanted to demonstrate solids production and reliable, cost effective operation.

Landfill leachate forms when precipitation percolates through a landfill collecting contaminants as it contacts solid waste. The resulting leachate is collected by the landfill's water management systems but may require treatment prior to discharge. Landfill leachate can have high organics, nitrogen, and dissolved solids making treatment challenging.

Solution

Saltworks recommended a pilot test using its SaltMaker system which produces high quality fresh water and a small volume of solids. The SaltMaker has proven reliable in directly treating landfill leachate to produce solids, for low-volume waste discharge, and freshwater, for on-site reuse or sewer discharge. The SaltMaker can also treat the discharge of existing leachate treatment plants, such as those using reverse osmosis, to reduce the volume of liquids recycled back into the landfill.

The SaltMaker is a robust, non-membrane, humidification-dehumidification (HDH) system incorporating automated self-cleaning and solids extraction. The SaltMaker concentrates salt water and produces freshwater with a novel multiple effect arrangement using 25% of the thermal energy of traditional landfill evaporators. The SaltMaker incorporates a patented, modular design based around ISO shipping containers with modules built from engineering plastics. Landfill gas, natural gas, propane, or low grade waste-heat provide the thermal energy source (85°C; 0.75 GJ/m³ water).

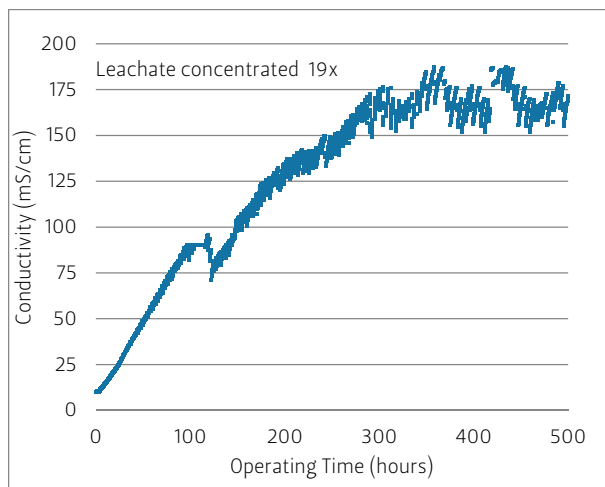
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Results

The pilot operated at greater than 90% recovery with successful solids production. This project demonstrated that the SaltMaker can treat landfill leachate to produce freshwater meeting the surface discharge requirements for TDS, ammonia, metals, and organics:

- Ammonia in freshwater at 0.9 mg/L
- Concentrated brine at 189,000 mg/L TDS with solids produced
- 99% recovery (freshwater produced)
- Reliable operation with optimized automated self-cleaning.



Parameter (mg/L)	Discharge Limits	Freshwater Produced	Untreated Leachate	Concentrated Brine
pH	6.5 - 9.0	6.51	7.43	4.82
Electrical Conductivity (mS/cm)	0.7	0.03	18.4	302
Total Dissolved Solids	500	7	12,120	189,000
Total Hardness (as CaCO ₃)	80	<0.9	3,840	43,600
Total Organic Carbon	4	1.9	160	1,130
Hydrogen Sulphide	0.05	0.002	0.165	0.11
Ammonia-N	1.2	0.49	45.8	166
Antimony	0.006	<0.0002	0.006	0.11
Arsenic	0.005	<0.0002	0.034	0.43
Boron	5	0.102	8.95	195
Chloride	250	2.2	5,844	112,000
Iron	0.3	<0.05	1.6	6.4
Magnesium	100	0.37	240	4,050
Manganese	0.05	0.024	2.06	21.8
Silver	0.0001	0.00003	0.0005	<0.001
Sodium	200	4.5	2,928	58,900
Sulphate	500	<0.9	1,172	3,920

Summary

Saltworks has completed additional SaltMaker pilot projects to treat leachate from different North American landfills. Leachates had the following characteristics: TDS: 8,500 to 25,000 mg/L; TOC: 150 to 3,500 mg/L; and ammonia: 25 to 1,500 mg/L (as N). The total cost of ownership (CAPEX and OPEX included) for a 100 m³/day (26,500 GPD) SaltMaker plant is \$8/m³ to \$12/m³ (\$0.03/gal to \$0.05/gal) leachate treated.



Freshwater produced



Slurry produced

Saltworks would be pleased to complete a SaltMaker performance and economic assessment of your landfill leachate treatment project. Please contact projects@saltworkstech.com. Lease and pilot plants are available.