LANDFILL LEACHATE TREATMENT

Various Treatment Requirements

The treatment requirements for leachate from landfills can vary, depending on the discharge requirements, and the contaminants present. Leachate from sanitary landfills is generally characterized by high TDS (dissolved solids), heavy metals, high BOD and/or COD (some very resistant to treatment), high ammonia, and color. Discharge options include discharge to a POTW or, where no access to sewer is available, discharge to ground or surface water. In the case of the latter, the treatment requirements are more stringent.

In general, when discharging to a POTW, treatment requirements may include removal of heavy metals and ammonia. Further requirements may include removal of Metals, BOD and COD if maximum discharge limits are in place. Some discharge permits may also include color removal requirements, and occasionally, removal of some TDS, although these requirements are not typical.

In the case of ground or surface water discharge, removal of heavy metals, color, BOD/COD, ammonia and color, and also perhaps TDS will all be required.

Treatment Options

Dynatec can provide the MBR (membrane bioreactor) option, which is an aerated biological mixed liquor process operating at very high solids concentrations. Some of the advantages are:

- Very long sludge age produces a well acclimated biomass, which because of the high concentration (typically 12,000 to 20,000 mg/l), provides very high rates of reaction
- Excellent nitrification and de-nitrification
- Smaller footprint than conventional aerated systems
- Very high quality effluent due to the use of membranes for final clarification
- Lower sludge production than conventional systems
Typical results from an MBR operation at a sanitary landfill are as follows:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>BOD</th>
<th>COD</th>
<th>TSS</th>
<th>Ammonia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influent</td>
<td>500</td>
<td>4000</td>
<td>150</td>
<td>1000</td>
</tr>
<tr>
<td>Effluent</td>
<td>&lt;5</td>
<td>800</td>
<td>&lt;5</td>
<td>&lt;1</td>
</tr>
<tr>
<td>% Removal</td>
<td>&gt;99%</td>
<td>80%</td>
<td>&gt;96%</td>
<td>&gt;99%</td>
</tr>
</tbody>
</table>

**System Effluent**

The effluent from this process is characterized by very low BOD, ammonia, and heavy metals, some remaining color and high TDS. The system also produces bio-sludge, which depending on the requirements, can be dewatered for disposal, or disposed of as a liquid sludge.

**Other Treatment Methods**

Alternative treatment options are also available and may include:

- Chemical precipitation of metals before MBR treatment
- Reverse osmosis after MBR treatment which removes organic and inorganic contaminants, as well as color
- Ultrafiltration followed by reverse osmosis

**Effluent**

The two effluent streams from a Reverse Osmosis system are RO permeate, as noted above, and a concentrate (or reject) stream that represents between 10% and 30% of the feed flow. This can normally be re-injected into the landfill, but its long term effects on leachate concentrations should be considered.

**Conclusion**

The MBR process provides the highest possible levels of organic removal, with essentially zero suspended solids in the effluent. This is the ideal feed system for Reverse Osmosis treatment. The RO permeate can then be used for other non-potable purposes, such as irrigation, truck washing or dust control. Dynatec membrane treatment systems have successfully provided outstanding performance in many landfill applications. Considerations for this technology include:

- Membrane treatment offers reliable and consistent treatment of landfill leachate
- Both in the US and abroad, membrane treatment is broadly applied, and is well proven
- Systems are highly cost effective, and require low levels of operator interface
- The best membrane system configuration for each application should be individually evaluated