Disc Tube™ Module System
Filtration Solutions for Landfill Leachate

Disc Tube™ Module System
A major advance in Reverse Osmosis Technology

Reverse Osmosis Process
Natural osmosis occurs when two fluids of different salinity are separated by a semi-permeable membrane. The fluid with the lower salinity will pass through the membrane until the salt solution becomes equal on both sides of the membrane.

If pressure is exerted on the higher salinity solution the membrane allows desalinated, de-mineralized water to pass into the pure solution whilst it rejects the dissolved impurities, a process known as ‘reverse osmosis’ (RO).

Advantages
The unique configuration of the Disc Tube module offers numerous advantages over traditional spiral or tubular membrane modules.

• Open channel configuration
• High turbulences of the feed stream
• Reduced risks of clogging or crystallization
• Evenly distributed and self-cleaning hydraulic circulation
• More effective cleanings
• Minimization of cross-flow rate
• Extended range of cut-off for nanofiltration membranes (500 g/mole, 270 g/mole) and for reverse osmosis (high flow rates, Standard 100 g/mole, high rejection)

Range of Applications
• Treatment of landfill leachate
• Cleaning of industrial waste waters
• Desalination of brackish water or sea water at ends of production of potable water
• Targeted molecular separation

The Pall Disc Tube (DT) module system is a membrane device designed to ensure molecular and ionic separation of the whole spectrum of pollutants in all aqueous environments: from suspended matter to the smallest ions, including colloids, bacteria, viruses and organic matter.

The Disc Tube module consists of a stack of molded ABS spacing discs separating membrane cushions which are formed from three octagonal layers which are welded to each other, ultrasonically at their periphery.
Why the Disc Tube™ RO Module has become the preferred module for leachate treatment?

Open Channel Technology
- Less susceptible to fouling and scaling
- Modules are easy to clean
- Suitable for silt density index (SDI) up to 5/15

Easy Maintenance
- Module can be opened
- Module and membranes can be investigated
- Single membranes can be tested for best cleaning procedure
- Single membranes can be investigated at lab (EDX, Microscope)

Pressure Range (bar): 75 90 120 160
Recovery Rate (%): 80 85 90 93-95

Features of Pall DT Reverse Osmosis Systems
- Modular expandable design with one or multiple stages
- Recovery rates achievable by DT modules with staged RO Pressure (Base 18mS/cm)

What are the main challenges in the leachate treatment process?
- COD in landfill leachate is partially not biodegradable (“Hard COD”)
- COD cannot be reduced sufficiently by classical Biological treatment, e.g. in public WWTP’s
- High ammonia and total nitrogen contents require utmost treatment efficiency
- Salt content and heavy metals cannot be eliminated by conventional treatment methods

Conclusion: Reverse Osmosis is the only technology, capable of reducing almost all parameters!

Characteristics of Pall’s DT RO Systems for Landfill leachate treatment
- Best quality of product water (permeate)
- Small footprint
- Reliable at variations of quantity and quality
- Switch On / Switch Off operation possible
- ‘Plug & Play’ installation
- Treated leachate (permeate) can be discharged back to the environment or can be utilized for irrigation or process water.
- Modular, flexible construction

More than 220 Pall installations for leachate treatment are in operation worldwide!
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Technical Specifications

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<th>Medium Pressure Modules</th>
<th>High Pressure Modules</th>
<th>Special Design</th>
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<tr>
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<td>DTSE</td>
<td>DTSE-MP</td>
<td>DTGE</td>
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<tr>
<td>Feed flow rate range (min. - max.)</td>
<td>l/h</td>
<td>250 - 1600</td>
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<tr>
<td>Feed flow in operation</td>
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<td>Maximum temperature (cleaning)</td>
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<tr>
<td>Maximum operating pressure</td>
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<tr>
<td>Operating pressure in filtration</td>
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<td>Test pressure</td>
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</tr>
<tr>
<td>Pressure vessel internal diameter</td>
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<tr>
<td>Number of discs per tube</td>
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<tr>
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<tr>
<td>Weight of a module (empty)</td>
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<td>58</td>
<td>74</td>
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<tr>
<td>Weight of a module (operation)</td>
<td>kg</td>
<td>64</td>
<td>80</td>
</tr>
</tbody>
</table>

Materials:

- Pressure Tube: FRP
- Watertight flange: Polyoxymethylene (POM)
- Pressure flange: Stainless Steel
- Spacing disc: ABS

In leachate treatment and most waste water applications as a rough design value, the average output per module is 3 m³/day of pure water with a mean conversion rate varying from 75 % at medium pressure to 90 - 95 % at high pressure.

Value for DTGE Modules with Raw water conductivity is 10 - 15 ms/cm @ 25 °C