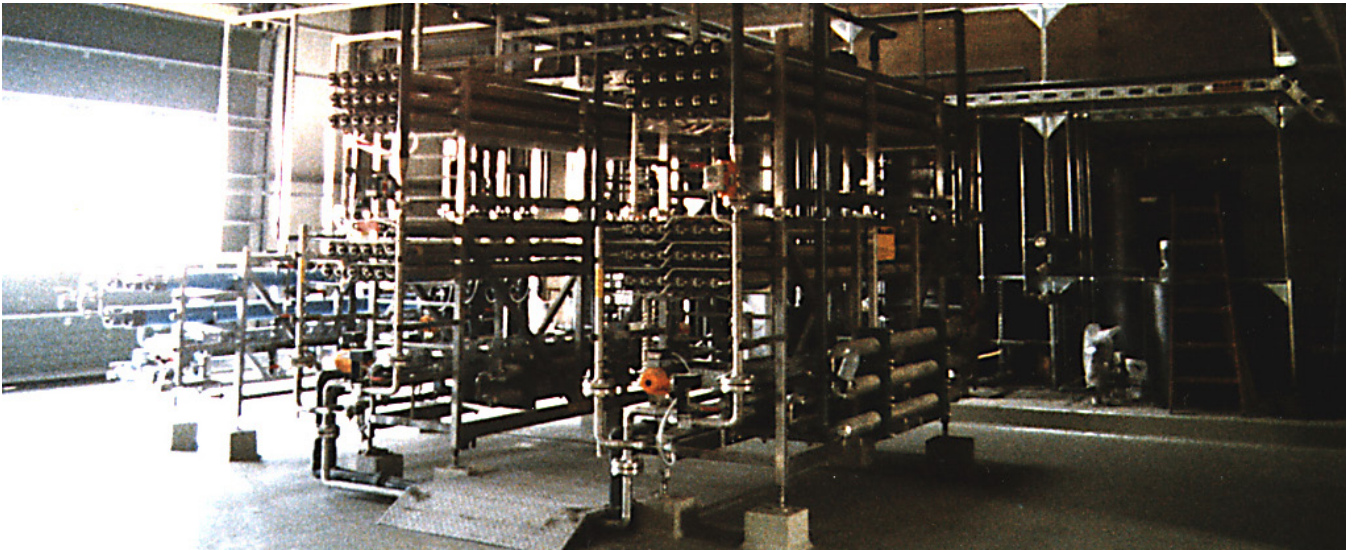


## PCI Membranes

Wastewater Treatment



## Multi-stage Treatment of Landfill Leachate. B1 and A19 Modules with AFC99 and FPA20

### Damsdorf Landfill, Germany

## BACKGROUND

At Damsdorf in Germany, the existing 15-hectare landfill site, which had no bottom sealing or leachate collection system was approaching capacity. A new site was constructed in 2 sections, each of 6 hectares, with a total refuse capacity of 3 million cubic metres. This new site had bottom and top-sealing systems, and a leachate treatment system incorporating biological pretreatment using ultrafiltration and reverse osmosis for leachate concentration.

## FILLING & LEACHATE COLLECTION

When the site was new, a special filling leachate collection method minimized the time taken to achieve methanogenesis. The main sections of the landfill were compartmentalized. The first compartment had compact and loose refuse comprising materials from the old site mixed with new. This reduced the time taken to achieve methanogenesis from the standard two years to about nine months.

When compartment 1 was full, the other compartments were used. Leachate from all compartments is taken through compartment 1 (which is in the methanogenic phase) before collection. This ensured that the quality the leachate changed only gradually after the first year of operation.

## BIOLOGICAL PRETREATMENT/ ULTRAFILTRATION

Biological pretreatment uses the Activated Sludge Process, which comprises prefiltration, denitrification in a 125m<sup>3</sup> stirred tank, and two 125m<sup>3</sup> aeration tanks. The tubular ultrafiltration (UF) system recovers the biomass post-nitrification. A 10-fold concentration of biomass is achieved, and the concentrated biomass is recycled to the denitrification stage. Approximately 3% of the UF permeate (biologically-pretreated leachate) is recycled to the aeration tanks for foam control.

**“Reverse osmosis (RO) is a membrane filtration method that removes many types of large molecules and ions from solutions by applying pressure to the solution when it is on one side of a selective membrane. The result is that the solute is retained on the pressurised side of the membrane and the pure solvent is allowed to pass to the other side. To be “selective,” this membrane should not allow large molecules or ions through the pores (holes), but should allow smaller components of the solution (such as the solvent) to pass freely.”**

## CASE STUDY

### PCI Membranes

Wastewater Treatment

## REVERSE OSMOSIS

The UF permeate is concentrated by 2-stage RO. The first stage uses PCI's tubular membrane system, and achieves a concentration factor of up to 5. The permeate from the first stage is then concentrated in the second stage, which uses PCI's spiral wound membrane system and achieves a concentration factor of 4. Both stages operate at 40-50 bar as well as ambient temperature, and chemically cleaned on a weekly basis. The cleaning solution is returned to the biological pretreatment process. The concentrate from the second stage is returned to the first stage.

Design Criteria	
RO I	187m <sup>2</sup> membrane area, 5m <sup>3</sup> /h feed
RO II	97.5m <sup>2</sup> membrane area, 3.4m <sup>3</sup> /h feed
Evaporator	2-effect, 10m <sup>3</sup> /h
Drier	1.0m <sup>3</sup> /h

## CROSSFLOW MEMBRANE TECHNOLOGY

- Reduces pollutants and contaminants
- Meets local water discharge legislation
- Increases efficiency & effectiveness of biological treatment systems
- Provides a cost-effective means of treating leachate with minimum space requirements
- Treats a variety of leachate types
- Designed to meet specific site demands e.g., fluctuations in volumes and composition

### Evaporation

The installation comprises a 2-effect evaporator which achieves a 10-fold concentration.

### Raw Leachate Quality

- Leachate volume – average 80 m<sup>3</sup>/d
- COD 5,000 mg/l
- BOD 500 mg/l
- Ammonia 1,500 mg/l
- AOX 3.5 mg/l
- Conductivity 18 mS/cm

