

THE LANDFILL LEACHATE TREATMENT BY MEMBRANE PROCESSES

Removing of landfill leachate is the one of the main environmental and technical complications which landfill operators usually have. Landfill leachate contains very high concentrations of organic and inorganic pollutants. The composition of the leachate can be varied and concentration of different contaminants depends on the age of the landfill, the ongoing chemical and microbial processes and the current environmental conditions. The most dangerous of them (toxic and carcinogenic matters) are salts of heavy metals, phenols, quaternary ammonium compounds, some surfactants, products of metabolite and toxins produced by putrefactive microorganisms, and many other specific compounds which could get to the landfill. Very dangerous could be a microbiological situation in landfills. In the warm season, the landfill is an ideal place for active growing of various bacteria, fungi and algae, and most of them are pathogenic.

TECHNOLOGY CONCEPT

The MemBrain Company developed the new technological concept with combined membrane technology, which could help to the landfill operators to solve the problem with landfill leachate. The main concept of the landfill leachate treatment plant for solid-waste landfills was based on laboratory analyzes and long-term monitoring of wastewater quality in the landfill. The landfill leachate treatment plant was experimentally validated in the laboratory and in the real solid-waste landfill. The technology includes a pressure membrane process - reverse osmosis, electromembrane process - electrodialysis and two-stages pretreatment.

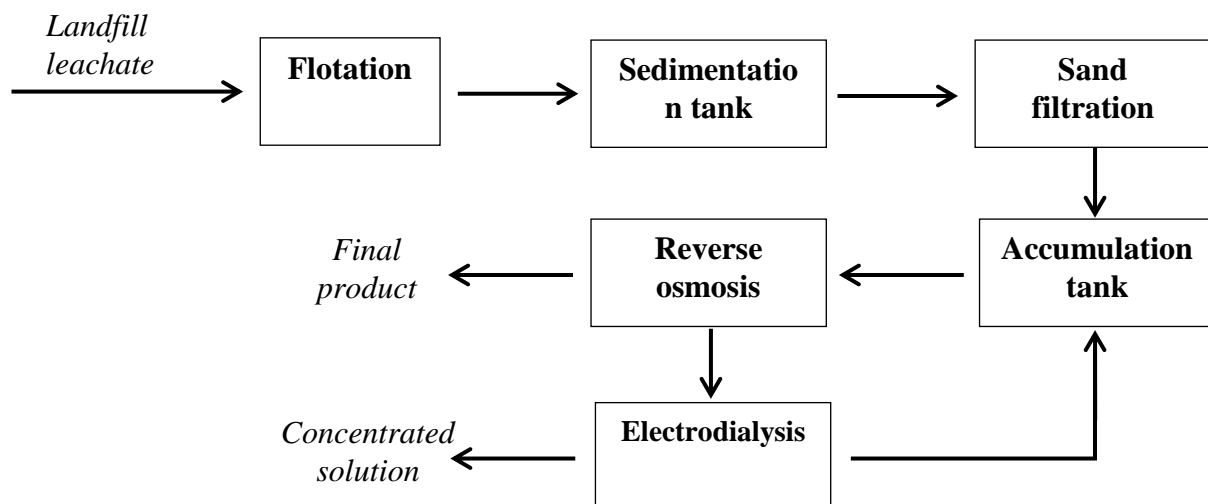


Figure 1: The technology concept of landfill leachate treatment plant

In technology designing we were focused on the quality of treated water and on waste minimization. Reverse osmosis is provide to be one of the most effective and low-power nowadays technology for treatment of the contaminated water. Another membrane process – electrodialysis, which is including to the landfill leachate treatment plant, allows to minimizing of the waste stream - approximately 20 – 25% of the original volume of reverse osmotic retentate or 5 – 10 % of feed waste water.

The purified water contains nearly 3% of TDS in feed water and it's almost reaches the quality of demineralized water. This water could be used like the technical water for the needs of the landfill or nearest factories or farms. Also this water could be used for watering plants or gardens. Purified water usually meets the limits for surface water recipients, and could be discharged to the nearest river.

The quality of concentrate is very depends on quality of feed water, but usually have to be storage in the landfill for hazardous waste. In some cases, if the final concentrate meets the limits, it could be treated in the chemical-biological waste water treatment plants.

The basic technological line was designed in a container arrangement for better mobility and for easier servicing.

OVERALL BALANCE

The overall balance of landfill leachate treatment plant for one cubic meter of feed waste water:

- amount of retentate (purified water): 780-890 liters
- amount of waste:
 - flotation foam: 50-100 l
 - solid waste from the sedimentation tank capacity: max 20 liters
 - concentrates of electrodialysis: 50-100 l

The total energy consumption for one cubic meter of feed waste water is nearly 5,5 kWh. The real energy consumption would depend on technology capacity and waste water quality.

THE PRODUCT LINE

Nowadays we offer the small-capacity technology lines in 3 sizes:

- Capacity of feed waste water: 1 – 1,3 m³/h
- Capacity of feed waste water: 2 – 2,3 m³/h
- Capacity of feed waste water: 3,7 – 4 m³/h



Figure 2: The container with MemBrain technology line for the landfill leachate treatment