

Landfill Leachate Treatment
Synder NFW Nanofiltration Membrane

Background

A landfill in China's Jiangsu Province needed an efficient and cost effective method for reducing the Chemical Oxygen Demand (COD), Total Organic Carbon (TOC), and color in their leachate in order to meet discharge regulations. Synder's NFW Nanofiltration membrane was employed as a post-treatment to an MBR process which treated the discharge from power plants burning the landfill materials.



Feed Solution, Membrane, and Operation Parameters

(Table 1)

| Feed Solution Material | | Membrane | | Operating Parameters | |
|------------------------|------------------------|-----------------------|--------------|------------------------------|-------|
| COD (mg/L) | 463* | Element | NFW-2-2540HF | Element Inlet Pressure (PSI) | 220 |
| TOC (mg/L) | 131.1 | Spacer Size (mil) | 31 | Temperature (°F) | 68-77 |
| Conductivity (µs/cm) | 2.35 X 10 ⁴ | Surface Area (sq. ft) | 28 | Concentration Factor (VCR) | 5 |
| Color | Brown | Approx. MWCO | 300-500 | Starting Volume (Gal) | 19.8 |
| | | | | Feed Flow Rate (GPM) | 5 |
| | | | | pH | 7.87 |

*The COD level is lower than the third level discharge standard (500 mg/L) in China

Test Summary

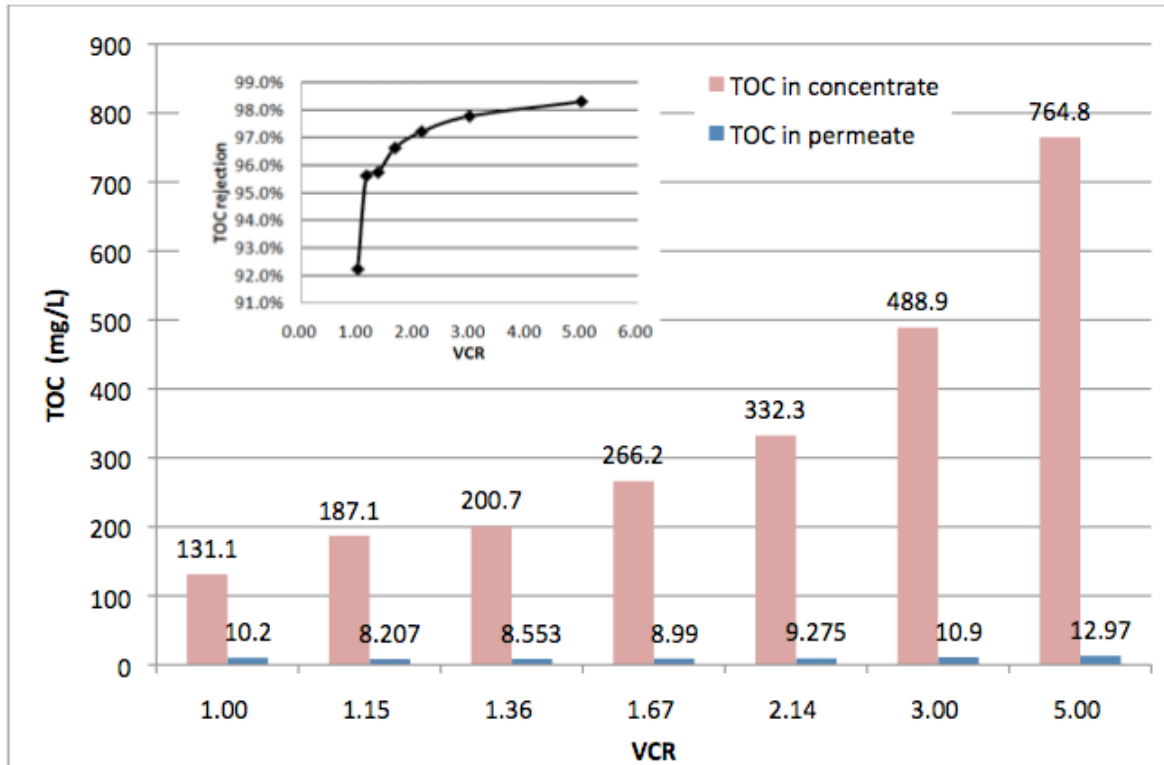
The separation performance is summarized in table 2. The initial permeate flux was 68 GFD and decreased to 51 GFD when the concentration factor (VCR) was increased to 3. Initially, the TOC rejection was 92% and increased to 98% when VCR became 5 (Fig. 1). The level of COD was reduced significantly and resulted in 98.4% rejection at the end of separation. The COD in the permeate is only 42 mg/L, which meets the requirement of first level discharge standard (<60 mg/L) in China. The rejection of inorganic salt increased roughly 2.5x during the whole process (15.9% to 40.3%).

| Table 2 | Concentrated Feed* | Permeate | Rejection (%) |
|--------------------------|-----------------------|------------------------|---------------|
| TOC Concentration (mg/L) | 764.8 | 12.97 | 98.3 |
| COD Concentration (mg/L) | 2673 | 42** | 98.4 |
| Conductivity (µs/cm) | 3.6 x 10 ⁴ | 2.15 x 10 ⁴ | 40.3 |

*The water quality of the concentrated feed was measured when VCR became 5

**The COD level is lower than the first level discharge standard (60 mg/L) in China

The change in pH, TOC and conductivity in the concentrated feed and permeate were monitored over the filtration process. Six samples were taken at different VCRs. The TOC in the concentrate increased from 131.1 mg/L to 764.8 mg/L while the TOC in the permeate kept relatively stable in the range of 8.2 – 12.97 mg/L (Fig. 1). The TOC rejection increased from 92% to 98% over the whole process (Fig. 1). There was little change in pH.



(Figure 1)

Results

Resulting liquid is a colorless and clean liquid. A side-by-side color comparison displays the effectiveness of the separation.

Conclusion

The NFW membrane showed to be very effective in removing color, COD and TOC from the landfill wastewater. The COD level of permeate meets first level COD discharge standard in China as well as the customer’s expectation.

