

Successful Ammonia Removal from Wastewater Using 3M™ Liqui-Cel™ Membrane Contactors at a European Manufacturing Facility

Introduction

Ammonia is used as a cleaning and bleaching agent in the production of fertilizers, plastics, explosives, and many other products. Industries using ammonia have to treat their wastewater to remove ammonia so that it is not discharged back into the environment, where it may negatively affect human health, agricultural production, and natural ecosystems.

3M™ Liqui-Cel™ Membrane Contactors offer an alternative to conventional ammonia removal methods that often produce secondary waste streams that are difficult to treat. The large surface area of 3M Liqui-Cel Membrane Contactors facilitates fast separation of ammonia from wastewater. In addition, membrane contactors may provide cost savings by reducing the ammonia load on the wastewater treatment system.

3M Liqui-Cel Membrane Contactors have been used for over 20 years in many different industries and dissolved gas control applications.

System Process

For ammonia removal, wastewater flows through the shell side (outside of the hollow fibers), while an acid solution flows countercurrent through the lumen side (inside of the hollow fibers).

The composition of the ammonium salt at the end of the process depends on the acid used in the

stripping process.

For example, a sulfuric acid extractant will convert ammonia into ammonium sulfate, which is widely used as a fertilizer and could potentially be sold commercially.

Exceeding Goals

A full scale industrial TransMembrane ChemiSorption (TMCS) system using 3M™ Liqui-Cel™ EXF-14×28 Series Membrane Contactors was installed in 2004 at the Membrana GmbH site in Wuppertal, Germany to reduce ammonia discharge costs into the municipal water system.

The goal was to remove NH_3 by at least 90% using a sulfuric acid receiving phase, which produced ammonium sulfate. After a successful pilot, two 3M Liqui-Cel EXF-14×28 Series Membrane Contactors were installed to meet plant capacity of 5–10m³/hr (22–44 gpm). After an operating period of two years the system exhibited up to 95% NH_3 removal.

Process parameters such as wastewater pH, water temperature, acid concentration, and the wastewater/acid ratio all affect the system's ammonia removal efficiency. 3M Liqui-Cel Membrane Contactors are feasible for ammonia removal applications where the concentration of NH_3 is greater than 500 ppm and the temperature is above 35°C.



Figure 1. 3M™ Liqui-Cel™ Membrane Contactors treat ammonia wastewater in a European facility

The 3M™ Liqui-Cel™ Membrane Contactor System is capable of removing 95% or more of incoming ammonia in wastewater.

For more information and system sizing, please contact your 3M representative or visit 3M.com/Liqui-Cel.

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