

Reclamation of Municipal Wastewater for a Chinese Petrochemical Complex



System Summary:
Phase 1: 82 dizzer®5000 MB Modules in 2 Racks
Phase 2: 416 dizzer®5000plus Modules in 8 T-Rack® lines

Overview

The growth in Chinese industry has led to consideration of alternative water sources to meet demand. The CNPC Dalian Petrochemical Company Limited decided that their best supply option would be to reclaim treated secondary municipal wastewater for their refinery needs, which included an RO system. UF pre-treatment prior to RO is often specified for boiler feedwater projects in China due to its excellent technical performance and competitive economics.

This profile describes the phase 2 Dalian project by GWT, commissioned in May 2009 utilizing Inge watertechnologies Multibore® membranes with 416 dizzer®5000plus modules in 8 T-Rack® lines. The 82 dizzer®5000 MB modules in 2 Racks of phase 1 have been in successful operation since December 2005. The GWT system comprises a biological stage (MBBR = Moving Bed Biofilm Reactor), primarily for nitrification, followed by alum flocculation and a combined Dissolved Air Flotation (DAF), to provide feedwater to the UF-RO and also for the Cooling Tower make-up.

Treatment Objectives

For RO to treat a wastewater feed, it is particularly important to reduce turbidity, SDI, and TOC, in order to control fouling, and minimize chemical cleaning. At Dalian the secondary effluent feed from the local municipality is biologically treated, and flocculated with alum, prior to flotation and filtration, as shown in the Process Flow Diagram. This ensures that the UF-RO has a consistent feed quality, with reduced concentration of the dissolved organics and ammonia. The objective of the UF system was to achieve a treated water quality with an SDI < 3.0, to give stable RO operation.

The feed quality at Dalian is somewhat variable; however, the bioreactor and DAF/DMF provided a consistent low turbidity feed for the UF, with BOD < 5 ppm, and COD < 20 ppm.

Performance

The design flux of the UF is 66 l/(m²h), with typical operating pressure stable at 0.2 to 0.3 bar across the membrane (Transmembrane Pressure). Once a day a 5 ppm Cl2 CEB is conducted with a 5 minute soak time, to control bio-growth. A CIP system has been provided, but has not yet been required. It is expected that a CIP would only be needed on a 1 to 2 year interval.

Treated water quality has exceeded the treatment objectives, with a SDI of 0.5 to 3.0, with no fibre breaks or other integrity issues experienced since start up.

Location

Dalian, China

OEM/System Integrator

Dasmart (Beijing) Environmental Technology Co., LTD
 Consulting Co. Georgi Water Treatment

Enduser

CNPC Dalian Petrochemical Company Limited

Plant Capacity

Phase 1: 6,500 m³/day
 Phase 2: 30,000 m³/day

Market/Industry

Petrochemical/Refinery

Application

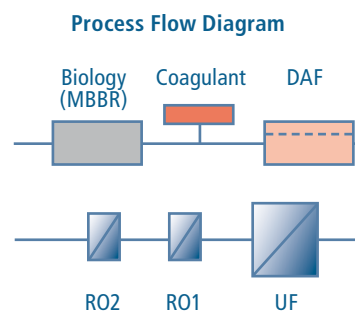
RO pre-treatment

Feed water source

Municipal effluent

Commissioning Date

Phase 1: December 2005
 Phase 2: May 2009



Customer Statement:

„The Inge watertechnologies membranes have shown that a challenging feed, such as municipal effluent, can successfully be treated by UF, with minimal chemical usage. This plant demonstrates that wastewater reclamation provides a feasible alternative for industrial water requirements.“

Joachim Georgi
 Managing Director, GWT