

# ATCO Muskeg River Cogeneration Project

**Application:** Boiler feedwater

**Capacity:** 850 to 1,800 USgpm (232 to 490 m<sup>3</sup>/h)

**Location:** Fort McMurray, Alberta, Canada

**Commissioned:** February 2002

## The Problem

The Muskeg River Mine, located north of Fort McMurray, Alberta is owned by Shell and operated by Albion Sands. The ATCO Power Muskeg River Cogeneration (MRCG) Project is a 170-megawatt (MW) natural-gas-fuelled combustion turbine-generator and heat recovery steam generator plant located at the Shell Albion Sands site. The MRCG is needed to provide power and heat to the Mine. Excess power is sold to the provincial power grid.

In order to produce steam, a boiler water treatment system was required to treat Athabasca River water and supply the boilers with high quality demineralized water. This presented a challenge in finding water treatment technology that could handle the tremendous seasonal fluctuations of the Athabasca River and that could produce a significant range of treated water (850 to 1,800 USgpm). The treated water also had to have a TSS of < 1 mg/L, a turbidity of < 0.1 NTU, and a total hardness of < 0.1 mg CaCO<sub>3</sub>/L.

## The Solution

In February 2002, ZENON Membrane Solutions, part of GE Water & Process Technologies, provided a boiler feedwater treatment plant complete with ZeeWeed\* ultrafiltration (UF) membranes with enhanced coagulation pre-treatment followed by Reverse Osmosis (RO) and softeners to meet the challenging requirements. The system takes water directly from the Athabasca River and utilizes ZeeWeed UF to remove suspended solids, turbidity

and organics that can foul the downstream RO units. The ZeeWeed permeate is directed to a single pass RO and the RO permeate is then further treated by softeners. The plant continues to make high quality boiler feedwater and consistently meets stated requirements as well as the particularly low total hardness level.

In August of 2003, in order to meet increased water demands due to operational problems, two self-contained rapid response mobile trailers, each containing two RO systems, were shipped and installed. These units are still operational with each system delivering up to 250 gpm (1,362 m<sup>3</sup>/d).

## Process Overview

ZeeWeed membranes are immersed directly inside a rectangular process tank. The membrane consists of a hollow fiber structure with the feed entering the outside of the membrane. A low-pressure suction of -1 to -10 psi (-6.9 to -69 kPa) is applied to the fibers, gently drawing water into the lumen. The permeate is then extracted from the membrane by a conventional centrifugal pump.

Periodically, the flow of permeate is reversed to backwash any foulants from the outside of the fiber. Contaminants are simply back-washed off the membranes into the free volume of the process tank.

The surface of the membrane is also scoured by air introduced through a diffuser at the base of the membrane module. The air carries with it a high velocity stream of water that passes upward through the fiber bundle, sweeping away highly concentrated solids from the membrane surfaces. The ZeeWeed process typically operates at an overall recovery of > 95%, with recoveries as high as 99%.



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