

CASE STUDY

RO | UF | MBR |

Industrial Water Vitoria,
Brazil



Toray's Integrated Membrane System Helps Contribute Sustainable Operation Management

OVERVIEW

The steel industry uses a large amount of water. Ensuring, recovering, and circulating high-quality water is essential for producing high-performance steel and is a significant challenge for steel manufacturers. ArcelorMittal, one of the world's largest steel manufacturers, began operating a plant in Vitoria, Brazil, in 2021, which uses seawater as its water source. This plant employs Toray UF and Toray RO's Integrated Membrane System (IMS) and the "TORAYWISE" system for operational forecasting and trouble analysis.

*** TORAYWISE™** : A system that automatically analyzes the operational data of water treatment membrane modules based on Toray's extensive experience and theory in water treatment membranes and processes. It predicts future operational behavior, automatically detects abnormalities in operational conditions, estimates potential trouble causes and countermeasures, and determines and suggests the optimal cleaning timing based on operational conditions, thereby strongly supporting stable operation.

BACKGROUND

In recent years, the region has experienced increased water stress due to factors such as reduced rainfall caused by climate change, agriculture expansion and population growth. Especially during the dry season, the supply of industrial water is restricted to secure water for daily life, creating a challenging environment for stable business operations. To ensure business stability, ArcelorMittal decided to install a seawater desalination plant using membrane technology at the plant to utilize the abundant seawater resources.

Toray RO and Toray UF were selected for adoption because of their support for designing an online UF-SWRO-BWRO system which allowed reducing CapEx and energy consumption. Toray also had the ability of issuing an extended warranty for the system due to their strong quality and experience in similar applications.

CHALLENGE

The treated water is mainly used as cooling water in the manufacturing process, but minimizing metal ions in the treated water is crucial for producing high-quality steel. Additionally, the introduction of TORAYWISE is desired for stable business operations, but building a new communication system to activate TORAYWISE functions while utilizing the client's monitoring system is necessary, requiring cooperation from both parties.



Figure 1: Image ArcelorMittal Tubarão

BASIC INFORMATION

- Client: ArcelorMittal
- Plant Scale: 12,000 m³/d (UF production water volume: 28,440 m³/d)
- Type of Raw water : Seawater
- Toray UF: HFU-2020N 7 trains×42 module
- Toray RO:
 - Pass1 TM820V-440 5 trains ×21 vessel×7 elements
 - Pass2 TMG20D-440 5 trains×10 vessel×7 elements
- Partner OEM Company : Fluence Corporation Limited

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Table 1 — Quick Fact

	Unit	UF Feed	UF Filtrate	RO Pass2 Permeate
Capacity	m ³ /d	30,500	28,440	12,000
TSS	mg/L	< 50	< 0.1	-
Turbidity	NTU	< 50	< 0.5	-
TOC	mg/L	< 20	-	-
COD _{Mn}	mg/L	< 20	-	-
TDS	mg/L	37,727	-	< 100
Water Temperature	°C	20 - 27	-	-
Total Hardness	mg/L	-	-	≤ 100
Fe	mg/L	-	-	≤ 0.3
Mn	mg/L	-	-	≤ 0.003
Alkalinity	mg/L	-	-	≤ 100
F	mg/L	-	-	≤ 2
Al	mg/L	-	-	≤ 0.2
Pb	mg/L	-	-	≤ 0.008
Cr	mg/L	-	-	≤ 0.01
Ni	mg/L	-	-	≤ 0.01
Zn	mg/L	-	-	≤ 0.05



Figure 3: UF skids



Figure 4: RO skids

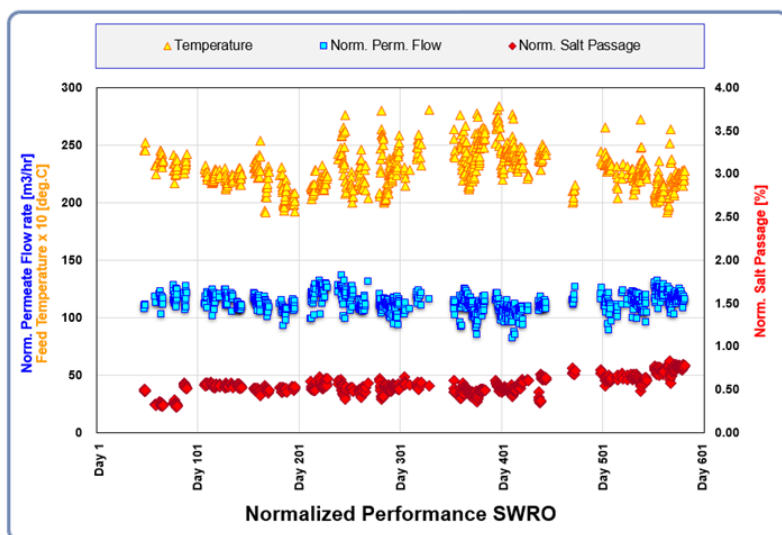


Figure 5: Plant Overview

PROCESS FLOW

Seawater → Bar screen → Disk filter (100μm) → Toray UF → Toray RO1 → Toray RO2 → Plant

CONCLUSION AND ACHIEVEMENTS

Initially, there were operational issues such as incorrect settings for backwash flow and hypochlorous acid injection, but with abnormality detection and countermeasure consideration by TORAYWISE™ and detailed technical support on-site, stable operation of both UF and RO has been achieved. Additionally, with the client's cooperation, a new communication system was successfully built to activate TORAYWISE™ functions while utilizing the client's monitoring system, contributing to process management

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