

## Success Story

# SUSTAINABLE AND COST-EFFECTIVE MLD SOLUTIONS FOR DYE MANUFACTURING

A Swiss-based global diversified provider of specialty chemicals and performance textiles, was in need of a sustainable and cost-effective solution to treat its dye wastewater. Gradiant answered with a Minimum Liquid Discharge (MLD) facility featuring the RO Infinity with CFRO and Free Radical Oxidation (FRO) technologies.

## The Challenge

The Swiss-based client is a global leader in dye manufacturing for the world's leading apparel brands. Their manufacturing plant in Thailand produces a dye wastewater with high levels of Total Dissolved Solids (TDS) and Chemical Oxygen Demand (COD). The primary challenge was identifying a solution to create a sustainable dye manufacturing process, maximize water reuse, and achieve MLD. With limited cost-effective options for brine minimization, the client looked to partner with Gradiant to achieve its sustainability goals.

## The Solution

To treat a variety of feedwater quality and to achieve MLD, Gradiant proposed a robust solution featuring 6 stages of RO Infinity with CFRO and FRO. The CFRO system demonstrated it could concentrate brine recoveries up to 97%. The wastewater was then treated by FRO to remove color by oxidizing the organics.

This solution also proved successful to remove high TDS and COD, allowing for the dye wastewater to be reused in the manufacturing process, while saving up to 40% CAPEX compared to Ultra-High Pressure RO (UHPRO).



Refining & Chemicals



Thailand

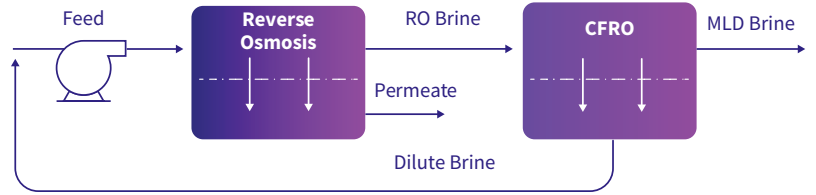
Location:	Mahachai, Thailand
End-User:	A Swiss-based Global Specialty Chemicals Company
Solution:	Zero Liquid Discharge
Industry:	Refining & Chemicals
Feedwater Source:	Dye Wastewater
Technology:	RO Infinity with CFRO, Free Radical Oxidation
System Configuration:	6 stages of RO Infinity CFRO and 1 train of FRO
System Capacity:	1,000 m <sup>3</sup> /day
Online Date:	November 2023
Delivery Model:	Design-Build (DB)



TDS is reduced by

# 24X-48X

After Treatment



PFD of RO Infinity for Brine Concentration and MLD

## The Benefits

Gradiant delivered a custom RO Infinity with CFRO system that achieves MLD, as well as beneficial reuse of the wastewater. The process produces fresh water that contains 24 to 48 times less TDS, and can be reused for dye manufacturing. The FRO technology achieves a colorless brine concentrate stream that can be processed as a by-product for salt preparation and resin regeneration. Gradiant's RO Infinity is used for the primary solution to reduce fouling and scaling.

**The primary benefits of Gradiant's RO Infinity system include:**



### Minimize Capital and Operating Costs

Recovers up to 99% final brine concentrations to the saturation limits of salt. This reduces the required capacity of downstream ZLD systems with cost savings of 60% versus thermal systems.



### Maximize Production and Recovery

Extract more fresh water, recover higher concentrations of valuable resources, and minimize waste disposal — all at lower pressures and energy usage which reduces the total water cost.



### Maximize System Availability

RO Infinity systems are intelligent, adjusting for varying conditions to tolerate highly variable feedwater quality, and experience less fouling and scaling than conventional systems.



# 0

Zero Liquid Discharge

# Up to 40%

CAPEX and OPEX Savings in comparison to UHPRO



# Up to 50%

Cost Savings with CFRO compared to other brine minimization technologies



Learn More at [gradiant.com/solutions/ml-d-and-zld](https://www.gradiant.com/solutions/ml-d-and-zld)

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