

CASE STUDY

MICRODYN SpiraSep™ 960 UF

Zero Liquid Discharge: Cooling Tower Blowdown



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Project Goal

Using spiral-wound polymeric UF membrane modules to treat cooling tower blowdown water prior to RO for boiler feed water make-up.

Feed

- Cooling Tower Blowdown
- Feed TSS: 2,900 mg/L

Membranes

- MICRODYN SpiraSep™ 960-PES UF modules

Parameters Measured

- Operating flux: 17-20.4 l/mh (25 gfd)
- TSS Removal

Objective

A power plant in Southwest Texas was faced with the difficult challenge of drastically reducing the amount of cooling tower blowdown water discharged to their evaporation ponds without implementing expensive brine concentrating systems such as evaporators or crystallizers. However, the high total dissolved solid (TDS) content and scaling potential limited the maximum achievable recovery through a conventional reverse osmosis system.

Materials & Methods

The solution was to implement an innovative treatment approach that utilizes electric coagulation (EC) followed by ultrafiltration (UF) and reverse osmosis (RO). The EC process precipitates sparingly soluble salts, particularly silica, alkalinity and hardness. A submerged UF membrane system utilizing MICRODYN SpiraSep™ 960 UF modules, downstream of the EC removes all total suspended solids prior to RO treatment. This treatment approach enabled the power plant to recover close to 90% of the cooling tower blowdown water.

Results

The SpiraSep UF modules operated at a steady flux of 17-20.4 l/mh (10-12 gfd) on a feed stream highly contaminated with total suspended solids (TSS). Even though the feed stream was highly concentrated with suspended solids (up to 2,900 mg/L), the SpiraSep UF modules produced effluent with turbidity consistently less than 0.1 NTU. The effluent was fit to send directly to an RO system for further treatment.

Conclusion

A low-fouling, durable UF design able to handle the high particulate loading and aggressive wastewater source was a critical component of the project. The power plant selected SpiraSep 960 UF elements as it was best suited for the project and harsh application.



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