

CUF Retrofit: Rapid Results in Quality, Performance & Savings

ZHEJIANG HENGYANG THERMAL POWER COMPANY

Power Plant Boiler Feed Ceramic UF Membrane Retrofit



CHALLENGE



Issues with the plant's existing UF system compromised its ability to reliably meet demand for steam generation – particularly during peak season, when demand was higher and more variable

- **The fouling of polymeric UF (PUF) membranes resulted in cleaning one-to-two times a month**, each requiring 12 hours offline and significant labor. The damage from such extensive fouling was often irreversible.
- **Fiber breakage started within one year of PUF installation**, leading to frequent system shutdowns, with each labor-intensive repair requiring a full week offline.
- **Permeate quality did not meet reverse osmosis (RO) system requirements**, which necessitated monthly cleanings and shortened the RO membranes' life.

SOLUTION

The Nanostone CUF membranes are operating at twice the capacity of PUF. The plant has achieved a 95% water recovery rate and can go six months between CIP reliably.

Implementation of a Nanostone CM-151 Ceramic Ultrafiltration Membrane System quickly allowed the plant to:

- **Run consistently at 90m³/h**, twice the capacity of the PUF in the same footprint.
- **Achieve reliable permeate quality** with SDI values < 2.
- **Increase overall water recovery rate to > 95 percent**, which was achieved by reducing cleanings to once every six months.
- **Reduce the need for feedwater chemicals**, simplifying the pretreatment process.



Power Plant Boiler Feed Ceramic UF Membrane Retrofit Project Background

Zhejiang Hengyang Thermal Power Company, located in China's Zhejiang province, operates a coal-fired central steam and power plant producing 60 MW of power and 200 tons/hr of steam. Located along the Haiyangtang River, the plant uses the river water — first treated with a clarifier and a sand filtration step — as a source for both cooling and boiler feed makeup water. The clarification system typically functions well, but during high turbidity excursions, the downstream MMF/UF and RO systems both experienced significant problems.

Nanostone Water (Nanostone) determined that both the MMF and polymeric UF system could be replaced with its CM-151 technology, streamlining operations for the customer. Due to a high flux rating for CM-151 in this application (260 LMH), Nanostone determined that only 50% of the 112 polymeric UF modules would be required across four treatment trains to meet current and peak capacity. With minor mechanical modifications, the piping connections were retrofitted to accommodate the ceramic UF membranes, then connected to the existing common pipe and valve set for each membrane train. All of the remaining parts of the existing polymeric UF system were reused including the feed pumps, feed strainers, backwash pumps and chemically enhanced backwash (CEB) system.

	With Original Polymeric UF Membranes	With Nanostone CM-151 Ceramic Membranes
Gross Filtrate Flow	353 m ³ /hr (1,554 gpm)	353 m ³ /hr (1,554 gpm)
Number of UF Membrane Operating Units (Trains)	4	4
Membrane Modules Per Train	28	14
Gross Flux Rate	60 LMH (35 GFD)	260 LMH (153 GFD)
Backwash Flow Rate Per Train	200 m ³ /hr	200 m ³ /hr
Backwash Sequence Length	3 minutes	1.25 minutes
Volumetric Recovery Rate	90%	> 95%
Filtrate Water Quality	SDI > 3 NTU ~ 1	SDI < 2 NTU < 0.1

Implementing CM-151 into the treatment process also reduced the need for the polymer program as the ceramic membrane system was able to create SDI < 2 consistently and reliably. In addition to significant chemical cost savings, an increase in recovery rates for the RO pre-treatment solution helped reduce backwash water generation by 50%. Furthermore, a reduced CEB frequency of 50% helped reduce additional operating expenses for the plant.

Nanostone's CM-151 technology is operating with consistent pressure and dependably delivering high-quality water to the RO system with SDI values < 2 (typically < 1) and turbidity

readings < 0.1 NTU. Delivering this water quality is critical to ensuring reliable operation in the downstream RO system — requiring less maintenance and cleaning events.

The Zhejiang Hengyang Thermal Power Company has been able to achieve lower operating costs with the more reliable and robust Nanostone CM-151 ceramic UF membranes in place. The additional benefits of guaranteed longer membrane life, higher recovery rates, lower CEB chemical usage, and reduction of a polymer chemical addition all contribute to a significant operating cost reduction, as well as consistent and reliable operations for the thermal power plant.

FOR MORE INFORMATION
CONTACT US TODAY:

(781) 209.6900
info@nanostone.com
www.nanostone.com

