



# Nalco Water's PermaCare® application improved productivity of a Reverse Osmosis system and saved on membrane replacement costs for a leading chemical plant in India

**NALCO** Water  
An Ecolab Company

CASE STUDY - CHEMICALS

CH-2034



## SITUATION

The customer's chemical plant has an Ultrafiltration Reverse Osmosis-based water treatment facility in which incoming river water is treated for demineralized water generation and subsequent usage in boilers and process applications. While the incoming water quality (Total Dissolved Solid of 200 - 250 ppm and Total Suspended Solid of ~ 10 ppm during most parts of the year with ~ 50% variation during monsoon) is well within acceptable limits, the Reverse Osmosis system was struggling with severe performance-related concerns for the last several months and system throughput was reduced to almost 50% of design. In addition, due to prolonged operation with high feed pressure and differential pressure, almost 30% of the membrane had premature failure (within 9 - 12 months of installation).

## SOLUTION

The Nalco Water team conducted a detailed survey of the pre-treatment and the Ultrafiltration Reverse Osmosis plant; it was evident the system was struggling with severe bio-fouling issues based on the available data trends. While the microbial load in the incoming water was quite high, standard bio-management best practices were also not in place. Limitations with the cleaning pump existed as well (it was undersized to ensure sufficient scouring velocity during cleaning).

### ENVIRONMENTAL INDICATORS



### ECONOMIC RESULTS

Specific energy consumption reduced by 25%



Annual savings of \$1500 in terms of HP pump operating cost

Preventing pre-mature membrane failure optimized asset health



Membrane replacement cost reduced by \$5000 per year

50% less cleaning reduced handling of waste and other aggressive chemicals



Chemical handling and other associated cost by \$3800 per year

*eROI is our exponential value: the combined outcomes of improved performance, operational efficiency and sustainable impact delivered through our services and programs.*

The Nalco Water team proposed a two-step solution to the customer:

1. Recovery cleaning to restore the lost performance to maximum capacity
2. Implement industry standard best practices to sustain the performance

The proposed recovery cleaning helped to restore the critical system performance almost to design, and net-driving pressure (directly proportional to energy consumption) was also significantly reduced.

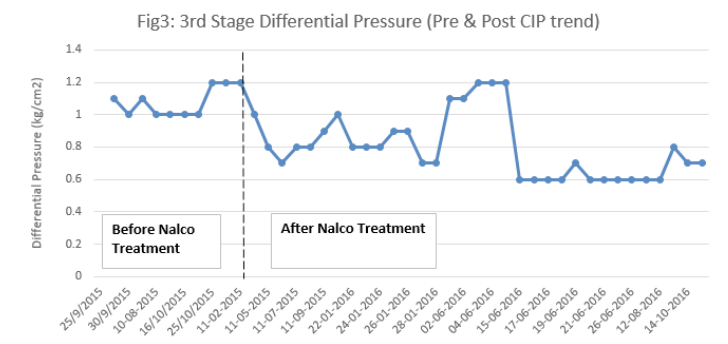
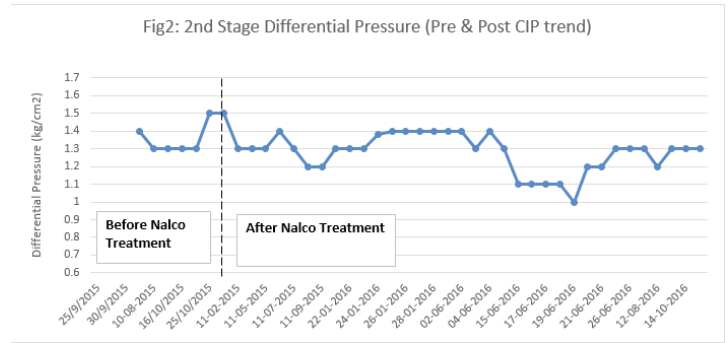
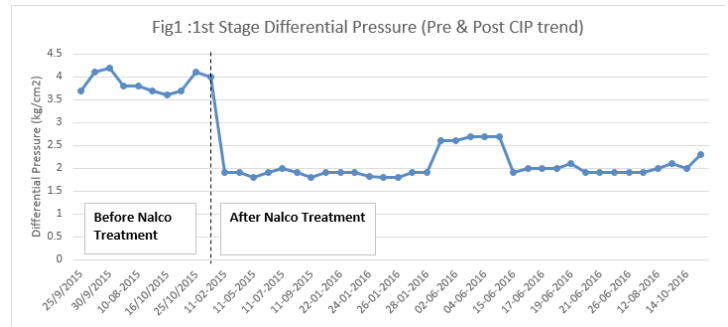
PARAMETER NAME	UOM	PRE-CIP VALUE	POST-CIP VALUE
Feed Pressure	kg/cm2	10.6	7.4
1st Stage DP	kg/cm2	4.2	1.9
2nd Stage DP	kg/cm2	1.3	1.2
3rd Stage DP	kg/cm2	1.2	0.8

## ENVIRONMENTAL/ECONOMIC RESULTS

With this significant reduction in feed pressure, energy consumption declined from 21.8 kWh to 16.5 kWh, which in full scale operation is equivalent to 14 MWh of power.

By operating the system at relatively lower feed pressure and normal differential pressure (as projected by the design files), Nalco Water successfully optimized the membrane life. As this system had history of premature membrane failure, increasing the membrane life led to a cost savings of more than \$5000 per year.

With the implementation of bio-management best practices and other protective measures, it was possible to reduce the cleaning requirement by 50% - this led to reduced chemical handling and other associated costs by \$3800 per year..



## CONCLUSION

A detailed best-practice gap analysis audit in combination with the Nalco Water PermaCare® range of membrane chemistry helped the customer restore the WTP plant efficiency and saved more than \$10,000 per year in operational costs.

### Nalco Water, an Ecolab Company

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