



Case Study: Improving Reverse Osmosis Performance with the Zeta Rod™

Soft Drink Bottling Company



INTRODUCTION Reverse Osmosis ("RO") machines are now widely used to produce high-purity water for beverage, semiconductor, and other products and processes that require particle- and bacteria-free water. Water is pumped into the machine at high pressure, where it is forced through the membranes, leaving behind particles such as bacterial cells and suspended materials.

Some of the suspended materials than cannot pass through the membrane become trapped at the membrane surface, reducing its efficiency, and eventually requiring that the membranes be cleaned or replaced.

This Case Study reports results obtained when a soft drink manufacturer installed a Zeta Rod™ system on an RO machine used in the production of pure water used in beverage production.

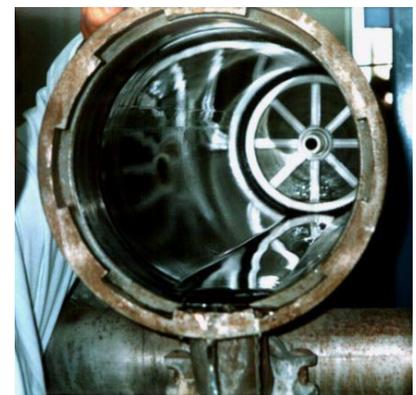
DATA COLLECTION Plant quality control personnel monitor the performance of the Reverse Osmosis unit on a daily basis. Important measurements of the performance of the RO system include:

1. Permeate recovery: the amount of water produced as permeate as a percentage of feed water to the system (filtered water). The greater the permeate recovery, the better.
2. Rejection: the amount of salt rejected from the system in the concentrate stream. The greater the salt rejection, the better.

The RO unit was cleaned in January 1997. The Zeta Rod™ was installed during the last week of March 1997. The RO unit operates from Monday through Thursday each week; and data is recorded each day of operation, therefore there are 4 observations per week. The data set utilized for the performance evaluation is comprised of readings from 1 October 1996 through 29 October 1997, for a total of 216 observations: 98 prior to the Zeta Rod™ installation and 118 after the installation.

RESULTS The Zeta Rod™ was installed in the feed line of the Reverse Osmosis unit. During the first three weeks, the removal of biofilm from the membrane was evidenced by a significant increase in the rate of permeate recovery. The recovery rate before the Zeta Rod™ installation was of 77.26%, and after the installation it increased to 81.11%, representing an increase in recovery of 4.98% (see chart on next page).

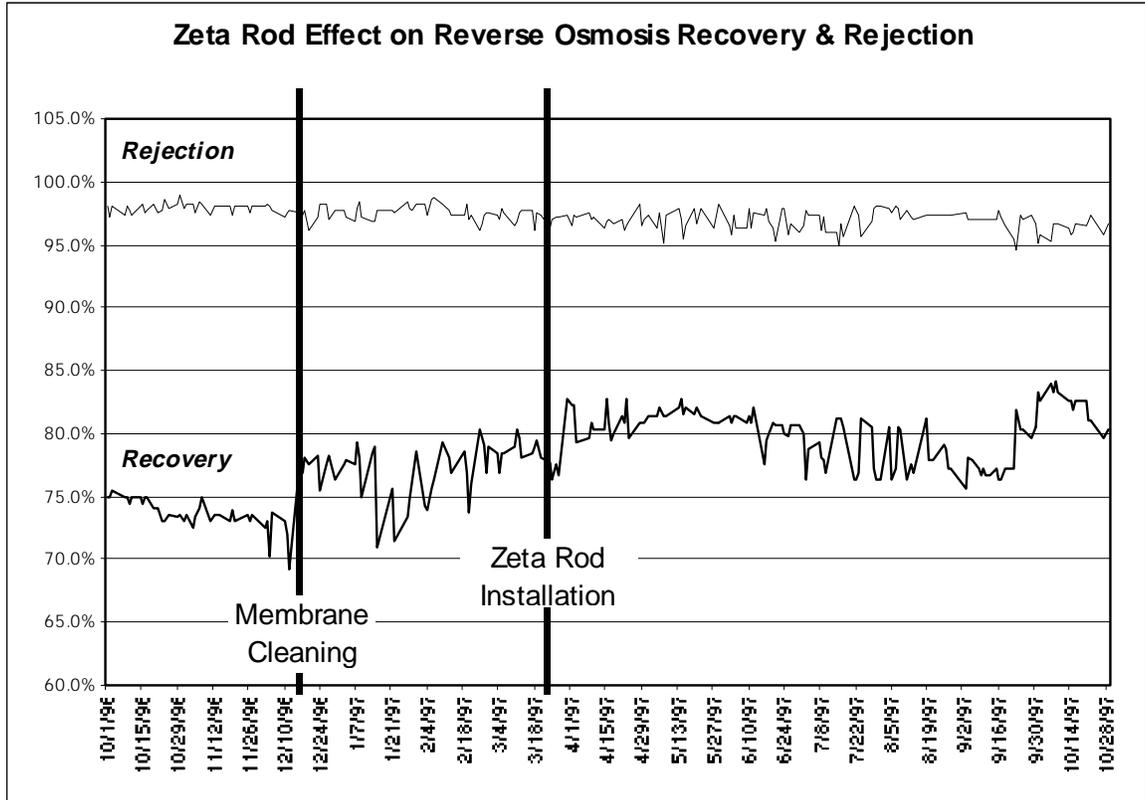
At the end of the initial three-month test period, one of the vessels was opened for a visual inspection. When the first membrane was removed, the vessel was seen to be completely clean with no sign of any biological deposits (see photo at right). The membrane body, like the vessel surface, was completely free of bio-film.



Presented below are six months of RO system permeate recovery salt rejection data recorded prior to the installation of the Zeta Rod™, and six months recorded after the installation.

The presence of a Zeta Rod™ in the feed water line supplying the RO machine elevates the surface charge of suspended materials, preventing them from sticking together, and decreasing the likelihood that they become attached to membrane surfaces.

Case Study: Reverse Osmosis



REVERSE OSMOSIS AND PRE-TREATMENT SYSTEM Reverse Osmosis System: OSMONICS Model 43CHF-PR216KY/DLX
 Permeate Rate: 120 gpm
 Concentrate Rate: 35.6 gpm
 Max/Min Pressure: 400 psi (primary) / 250 psi (final)
 RO Configuration: Two-stage 3-2, each vessel houses 5 FILMTEC model BW-30-8040 membranes.
 Feed Water Pretreatment: Sand filtration - carbon filtration - sodium softening - Zeta Rod™.

ZETA ROD™ EQUIPMENT ZR24P (24" electrode)
 ZRPC power supply

FEED WATER PARAMETERS Feed Water Permeate Water:
 TDS: 111 - 500ms (avg: 298 ms) TDS: 5 - 14 ms
 Flow Rate: 116 - 158 gpm Flow Rate: 90 -130 gpm
 Pressure: 230 - 290 psi
 Temperature: 76 - 86× F

NOTES The raw data was normalized to 77° F by using NORMPRO 2.0 from Fluid Systems, 10054 Old Grove Rd., San Diego CA 92131. NORMPRO 2.0 software was developed for the evaluation of operating data in RO units. The Bureau of Reclamation developed the equations for this program.



ZETA CORPORATION
 Electronic Deposit and Corrosion Control for Water Systems

4565 S. Palo Verde Rd. • Suite 213 • Tucson, AZ 85714 • USA
 520.747.4550 • 888.785.9660 • Fax: 520.747.4454 • Email: info@zetacorp.com • http://www.zetacorp.com

©1997 Zeta Corporation. All rights reserved. This document is for information purposes only. Zeta Corporation makes no warranties, express or implied, in this document. Content subject to change without notice. Zeta Rod is a trademark of Zeta Corporation, Tucson, Arizona.