

# eNPure... Your Single Source Solution for: **ReFlex™ Reverse Osmosis Closed Circuit Desalination with Enhanced Recovery**



## **ReFlex™ Reverse Osmosis Closed Circuit Desalination is an Innovative Solution to Low Recovery Rates & the High Operating and Capital Costs of Conventional RO Systems**

Increase RO Recovery Rates as much as 95% and Achieve Exceptional Payback in Industrial Applications

A REFLEX™ REVERSE OSMOSIS SYSTEM COMBINES MEDIA FILTRATION WITH REVERSE OSMOSIS TO ACHIEVE MAXIMUM RECOVERY RATES AND LOWER OPERATING COSTS.

#### **APPLICATIONS:**

- All applications suitable for conventional RO
- Surface waters with variable turbidity
- Ground waters with high fouling tendencies

ReFlex™ RO utilizing CCD (Closed Circuit Desalination) is a leading edge innovative solution to low recovery rates and high operating and capital costs of the outdated conventional RO systems.

A ReFlex™ RO system is a reverse osmosis system comprised of off-the-shelf equipment including membranes, featuring advanced and proprietary process design and engineering.

As an authorized OEM (Original Equipment Manufacturer) for the CCD technology, eNPure's water treatment experts can design and install a custom ReFlex™ RO system to meet our client's specific needs with a guaranteed maximum recovery rate.

#### **BENEFITS**

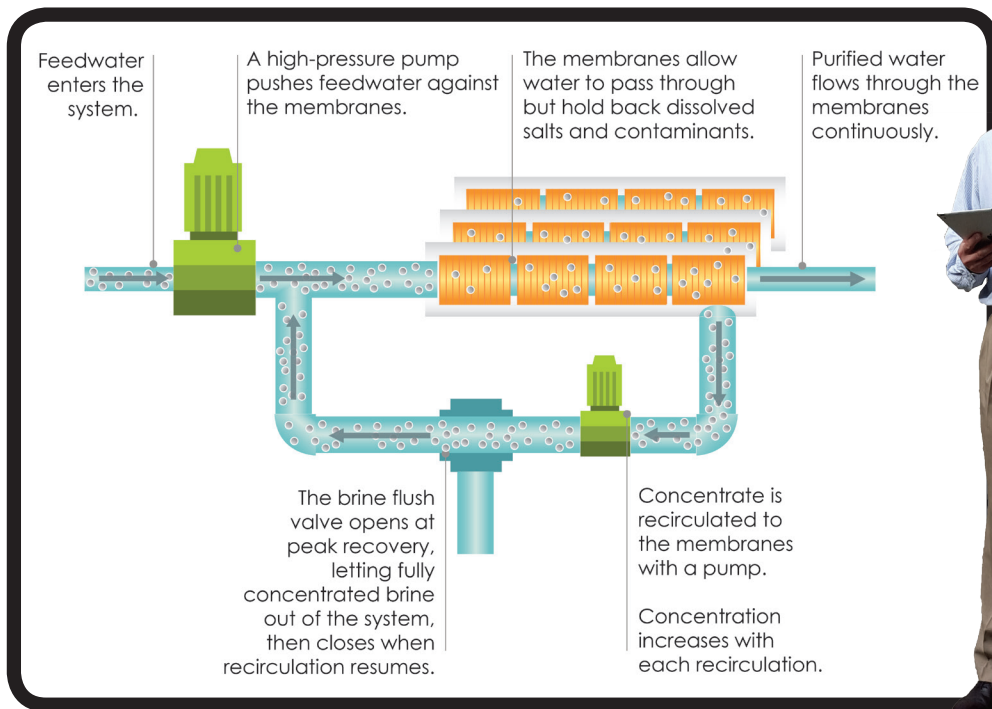
- QUICK PAYBACK, GENERALLY BETWEEN 18 TO 36 MONTHS
- HIGHER RELIABILITY AND UPTIME COMPARED TO CONVENTIONAL REVERSE OSMOSIS
- REDUCED MEMBRANE REPLACEMENT COSTS: REFLEX RO TYPICALLY REQUIRES 20% FEWER MEMBRANES FOR A GIVEN FEED FLOW AND WATER CHEMISTRY THAN CONVENTIONAL RO
- UP TO 75% LESS BRINE WASTE
- REDUCED FEED WATER REQUIREMENT FOR A GIVEN PERMEATE FLOW, RESULTING IN REDUCED CAPITAL AND OPERATING EXPENDITURES FOR PRE-TREATMENT
- INCREASED UPTIME WITH LONGER RUNS BETWEEN MEMBRANE CLEANINGS, REDUCING OPERATING COSTS AND EXTENDS MEMBRANE LIFE
- DECREASED POWER CONSUMPTION BY UP TO 35%
- EXCELLENT TURN DOWN CAPABILITY OF UP TO 50%

Call eNPure for an evaluation today. 281-900-3842



eNPure  
3019 Greenwood Glen Drive, Kingwood, TX 77345  
Tel: 281-900-3842 Fax: 866-697-6563  
email: sales@eNPureUSA.com www.eNPureUSA.com

*eNPure's water treatment experts can retrofit your conventional RO System and save you operating and capital expenses utilizing advanced and proprietary process design and engineering*



Schematic Flow Diagram

**Obtain recovery rates as high as 95% for a given water chemistry, for industrial applications:**

A ReFlex™ RO system combines media filtration with reverse osmosis to achieve recovery rates up to 95%. Like conventional RO, ReFlex RO uses crossflow but it uses internal circulation to provide higher better distributed crossflow which removes dissolved species from the membranes. Like media filtration the feed flow equals the permeate flow and the concentrate is purged periodically. ReFlex RO works in a batch wise fashion in two modes, closed circulation desalination and plug flow desalination. When in closed circuit desalination, the feed water flow equals the permeate flow. While brine is circulated in a closed loop to provide cross flow, dissolved salts accumulate in the system volume. As the salt concentration gradually increases, the pump pressure automatically increases to give a constant permeate flow. When the desired recovery rate is achieved a brine valve opens to release the concentrate and the fresh feed water pushes it out with plug flow while flushing the membrane surfaces. When the concentrate is fully rejected the brine valve closes and a new cycle begins again.

Conventional RO typically achieves up to 75% recovery rates and requires 3-4 stages to get recovery rates

higher than 85%. ReFlex™ RO systems achieve recovery by recirculation, not with multiple membrane elements and stages in series, and can therefore reach any desired recovery up to 95%. Over 98% has been demonstrated, limited only by the scaling characteristics of the pretreated feed water. ReFlex™ RO uses shorter membrane arrays than those in conventional systems, which eliminates low flux tail elements and minimizes lead element flux and can accommodate a higher average flux minimizing scaling. High recovery in a single stage is a novel capability of ReFlex™ RO that lowers cost and makes design and operation simple. ReFlex™ RO also avoids scaling that occurs in high recovery conventional RO systems by flushing membranes frequently with feed water during the plug flow mode part of the cycle. In addition, the short introduction time the membranes are exposed to high salinity as the salt concentration gradually increases, disrupts and greatly reduces scaling and fouling. Since the cycle time or time the membranes are exposed to the gradually increasing brine, is shorter than the time it takes for scale to precipitate and build up, frequent brine rejection can stop and even reverse precipitation. All of these features enables ReFlex™ RO to achieve up to 95% recovery even from difficult source waters.



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