

# ISEP® for Perchlorate/Nitrate Removal Continuous Absorption Ion Exchange Systems

## Who Recommends ION Exchange...The EPA

"The ion exchange process is generally more suitable as a well site treatment for NO<sub>3</sub> removal than reverse osmosis or a combination of the two. Ion exchange requires lower capital cost and annual operating costs, has greater reliability, uses less energy, requires no additional well site storage, has higher water recovery, produces more concentrated waste brine and requires fewer automatic and electric controls. It can be operated on demand as required. Such on/off operation is more detrimental to a reverse osmosis system which operates best on continuous basis."

EPA-600/S2-82-042

## Eliminate Your Nitrate Problems

The ISEP® Continuous Ion Exchange System is the most efficient and cost effective method of ion exchange for Perchlorate/Nitrate removal. Relative to traditional fixed bed ion exchange systems the ISEP® provides:

- Up to 90% less waste
- Low capital and O&M costs
- Simple operation
- High efficiency and reliability
- Maximum NO<sub>3</sub> removal

## A Truly Continuous Ion Exchange System

The ISEP® Contractor utilizes a number of ion exchange beds (20 or 30) which are mounted on a slowly rotating carousel. The rotation of the carousel moves the beds slowly through the required sequence of operations which normally includes adsorption, regeneration, rinse, and displacement.

These operations are going on simultaneously as the carousel rotates. The different fluids are distributed through a 2-in-1 valve with 20 or 30 ports allowing for either concurrent or countercurrent flow through the resin beds depending on the requirement. This arrangement allows for continuous flows in all operations.

Rotation is provided by a fractional horsepower motor with low energy consumption. Essentially, there is only one moving part to the ISEP® which typically rotates 2-6 times a day. Valves are limited to 5 or 6 unlike fixed bed systems requiring 30 or more valves.

## Why ISEP® Is Your Best Solution To Perchlorate/Nitrate Problems

### Simple Reliable Continuous Operation

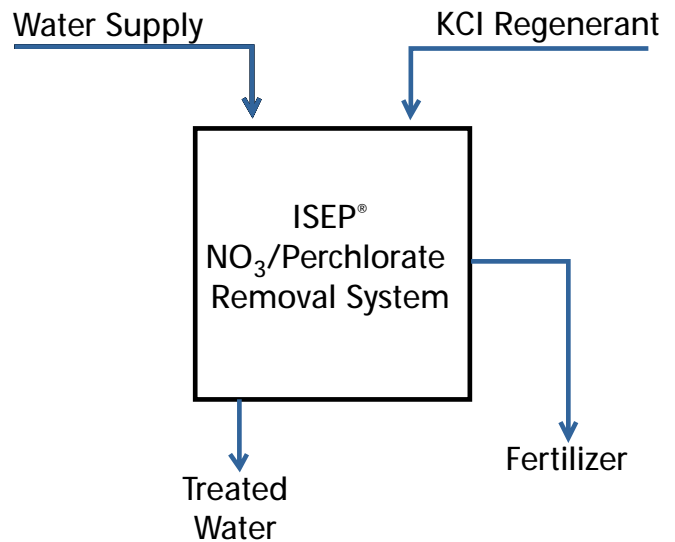
- Ideal for Start/Stop Operation
- Operates at Line Pressure

### Flexibility

- Handles Fluctuations in Flow and/or Nitrates by Adjusting the Rotation Rate
- Modular Design Allows for Future Expansion

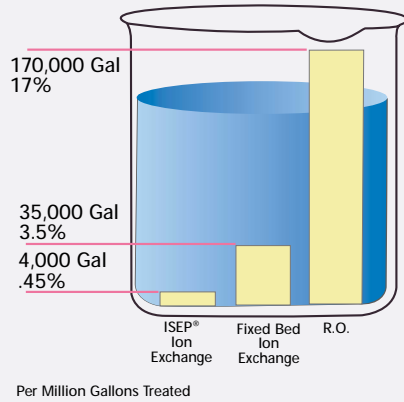
### ISEP® Turns Waste Into Fertilizer

By changing your regenerant from NaCl (salt) to KCl, the ISEP® is unique in producing a concentrated fertilizer solution that can be marketed to the agricultural community. The KCl replaces the salt on a 1:1 basis and can be alternated with salt depending on the growing season.



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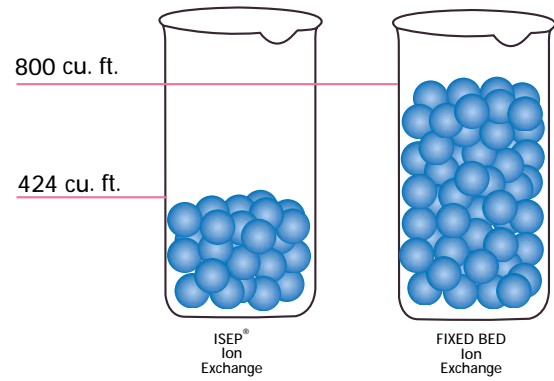
## Water Usage



## Maximum Water Utilization

- Up to 90% Reduction in Waste
- Increased Water Capacity
- ISEP® Can Turn Waste into Fertilizer

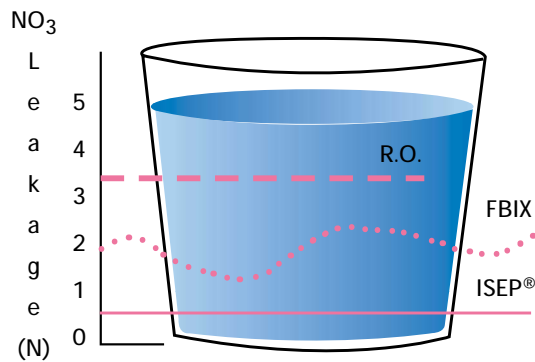
## Resin Usage



## Maximum Treatment Efficiency

- Up to 60% Less Resin
- Countercurrent Regeneration

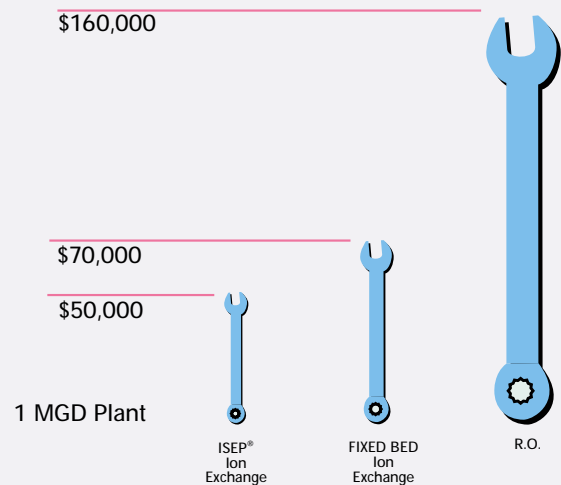
## NO<sub>3</sub> in Treated Water



## Consistent Water Quality

- Continuous Operation Eliminates Fluctuations in NO<sub>3</sub> levels

## Operation and Maintenance

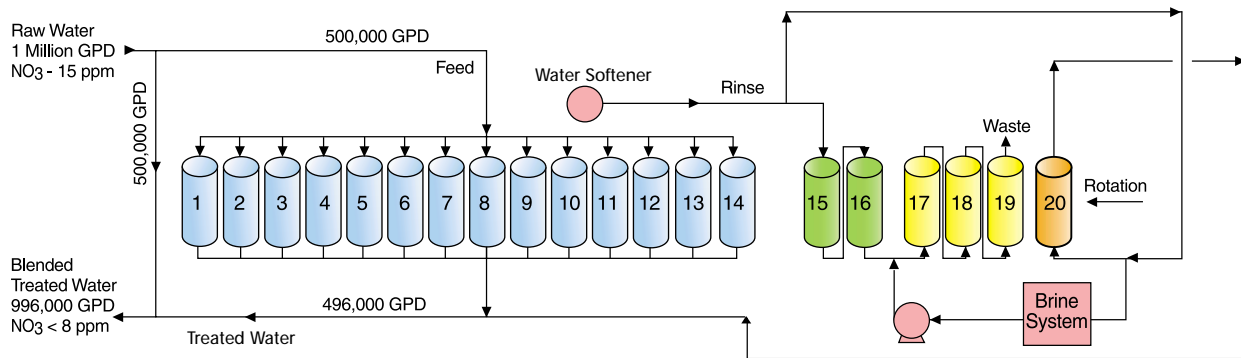
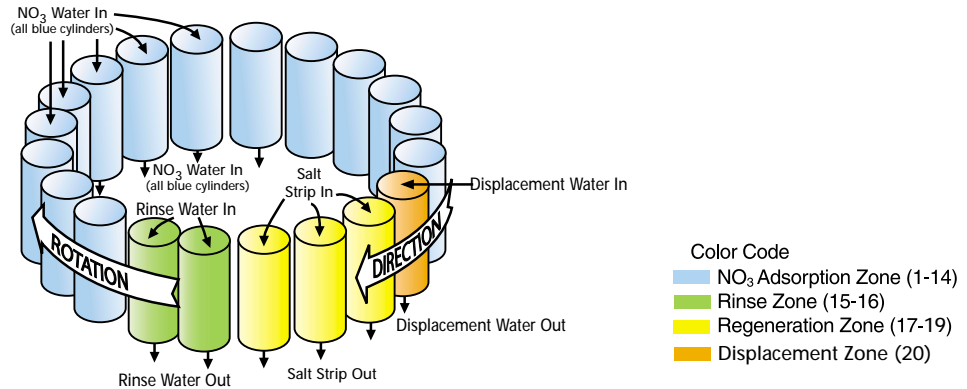


## Low Operation and Maintenance Costs

- ISEP® Operates on Fractional H.P. Motor
- 75% Fewer Valves
- Easy to Operate and Maintain

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## ISEP® Nitrate Removal System



### Process Description

Raw water will be divided into two flows, a by-pass flow and a treated flow, with the blend ratio based on an individual plant water analysis. The flow to be treated is passed through an ISEP® System where nitrates will be removed to below 2 ppm as nitrogen.

### Nitrate Adsorption Zone

For a 20 port system the adsorption zone (cells 1-14) has 14 ports in parallel for single pass flow where the nitrates will be removed.

The zone utilizes 70% of the total resin charge (80% for a 30 port system). In this zone the nitrates and other anions are adsorbed from the feed water onto the resin.

### Strip Wash Zone

A small amount of pre-softened feed water is used to strip wash cells 15 and 16. The effluent of these ports is then used to dilute the 26% brine solution used for regeneration. This countercurrent configuration is most effective in preventing salt from regeneration being transferred into the product water. The softening process prevents calcium sulfate precipitating in the resin bed.



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## Regeneration Zone

The combination brine and strip wash (5-10% NaCl) is directed through cells 17-19 for true countercurrent regeneration for maximum regeneration efficiency and solids removal from the resin bed.

## Displacement Zone

The displacement zone (cell 20) is set up to ensure that hard water from the feed is displaced using softened city water. This will prevent precipitates (CaCO<sub>3</sub>, etc.) from contaminating the regeneration zone, and forming a scaling layer.

## Process Control and Instrumentation

The ISEP® readily adapts to a fully automated system, the heart of which is a small Programmable Logic Controller (PLC) which controls the ISEP® blend ratio and operation of the booster pumps (if required). In most cases an automated perchlorate or nitrate monitoring system is installed at the inlet and outlet to record nitrate levels.

Calgon Carbon has supplied ISEP® systems that are removing perchlorate or nitrates from municipal drinking water in the States of California, Kansas, Minnesota, New York, and Wisconsin, as well as the United Kingdom. We are a leader in both the nitrate removal and perchlorate removal technology fields. Calgon Carbon Corporation continuously works to optimize our ion exchange technology.



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