



Let ASI show you how well Eco-Safe™ can work for you.

To make your evaluation, choose between several options:

- 1) Request an Eco-Safe™ video and observe the process in operation in a large power plant.
- 2) Schedule an in-plant run of our tabletop Eco-Safe™ model. We bring a small model unit to your plant, and you provide the subject water (usually 2 to 4 gallons).

We then process your water in the tabletop model. You collect the samples and analyze them.

- 3) Schedule an in-plant trial run of our pilot system. The Eco-Safe™ pilot system processes from 5 to 20 gallons, and simulates a full scale treatment model.

Once you see the Eco-Safe™ system at work, you will be convinced that ASI can solve your water problems and save you money. Questions? Please let us know. ASI's web site, appliedspecialties.com, provides updated monthly reports on facilities utilizing the Eco-Safe™ system, as well as other environmentally orientated water technologies.

To receive updates and information on Eco-Safe™ technology please feel free to make request through any of the addresses listed below and you will be added to our mailing list. Make sure to include your name and address.

Eco-Safe™ has been issued US Patent No.s 6,059,974 and 6,296,761 plus a Mexican Patent and Patent pending in Canada.

The ASI Eco-Safe™ System
the only inexpensive and effective way to make bad water good.

The reagent cost is a function of influent water to the unit. Auxiliary power requirement on a 100 gpm unit would be no greater than 5 hp.

The operating cost for the equipment will vary depending on the final water quality desired, and the total flowrate. To provide a better idea of both capital and operating costs, a 20 gpm mobile pilot unit for on-line, in-plant evaluation of your water is available from Applied Specialties Inc.

Eco-Safe™ is a partnership of

WESTECH

and



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BRIDGING

the GAP

in Zero Discharge and Water Re-use



Announcing
a Patented
Technological
Breakthrough in
Water Recycle

The
Eco-Safe™
System

Unlike other current technologies, **Eco-Safe™** is economical, energy efficient, and generates no hazardous wastes.

The **Eco-Safe™** System offers you

- Zero Blowdown or No Liquid Discharge (NLD)
- Maximum Water Recycle and Water Reuse
- Minimal Environmental Wastes

The **Eco-Safe™** System reduces

- Hardness
- Heavy Metals
- Suspended Solids
- Chlorides
- Sulfates
- Nitrates
- Phosphates
- Many other contaminants degrade water quality



How **Eco-Safe™** Works

Eco-Safe™ is a breakthrough technology that uses a well-established approach to solve recycle and wastewater discharge problems as well as to reduce makeup water requirements.

The key element classifying **Eco-Safe™** as a breakthrough is the use of a fluidized ion exchange process. The system is continuously regenerated while using up over 99% of the available regenerant while the resin

bed moves counter to the process flow. Undesirable elements are removed as a near solid material and are marketable as recycled stock for use by various industries.

The process reduces silica to 1 ppm or less (from values in excess of 150 ppm). Silica removal occurs through two actions: 1) co-precipitation with magnesium hydroxide, and 2) silica adhesion within the unit (silica removal is not a true ion exchange).

Magnesium is reduced to levels below 5 ppm, as CaCO_3 , and can be reduced further if desired. Calcium is reduced to levels below 40 ppm as CaCO_3 . Iron, copper and other heavy metals that precipitate at an elevated pH will also be removed.

Metals that form anion species such as selenium, arsenic, etc. are removed in the unit proper. A portion of the water to be treated (perhaps 25-35%) is pumped into the **Eco-Safe™** cascading counter-current fluidized ion exchange bed. The train is typically designed for three (3) stages to five (5) stages depending on the chemistry of the water being treated. The water flows by gravity through the unit. Once the water is pumped into the first stage tank, no further pumping or energy is required.

Anions in water to be treated are exchanged for hydroxide ions. As a result, sulfate, chloride, nitrate, phosphate, etc. are removed and replaced with hydroxide ions. The pH rises and precipitates magnesium, as magnesium hydroxide, and converts bicarbonate to carbonate, which in turn, precipitates the calcium. Through this action, all cations subject to hydroxide precipitation also precipitate.



The water from the last stage of the **Eco-Safe™** system is low in heavy metals, hardness, and all anions except hydroxide by design. The amount of hydroxide present in the water will depend on the influent sodium content of your initial water.

The 65-75% portion of the water to be treated that bypassed the exchange train earlier, now blends with the water from the final stage of the **Eco-Safe™** train. The excess hydroxide ions of the **Eco-Safe™** train precipitate magnesium hardness from the by-passed water and convert bicarbonate to carbonate, which in turn precipitates additional calcium from the water. The blended water flows or is pumped into the center well of a clarifier where it is sparged with carbon dioxide. The carbon dioxide reacts with free hydroxide ions to form additional carbonate, which precipitates more calcium. All of the precipitates then settle to the bottom of the clarifier.

In effect, **Eco-Safe™** employs the principle of lime soda softening using sodium hydroxide, carbon dioxide and ion exchange on the cooling tower blowdown resulting in *several major benefits:*

- 1) No sodium is added to the finished water
- 2) Anion content of water is reduced by removal as a recyclable material.
- 3) Toxic metals such as selenium and arsenic are removed.
- 4) Sludge volume is significantly reduced by as much as 70%.
- 5) Costly and cumbersome equipment needed for conventional softening like lime slakers, soda ash feeders, and silos are eliminated. Dust emissions from the silos are also eliminated.
- 6) Highly efficient use of the sodium hydroxide lowers overall operating costs making it more than competitive with normal lime-soda softening.

The use of caustic soda provides the hydroxyl ions necessary to create calcium carbonate, magnesium hydroxide and other hydroxide precipitable cations which are removed through settling. Some sodium and potassium losses occur due to co-precipitation with the magnesium and calcium flocculation.

If greater anion and sodium removal is required, a portion of the total effluent water from the **Eco-Safe™** system is by-passed into a hydrogen cycle counter current fluidized bed unit that replaces sodium with hydrogen ions. The low pH water causes excess alkalinity to evolve CO_2 gas, thus removing excess alkalinity. The Hydrogen cycle effluent then blends with the remaining high pH **Eco-Safe™** effluent and yields a slightly alkaline, or near neutral water with reduced sodium, near zero hardness, and greatly reduced anion content.

The advantage is that the water may be recycled to the cooling tower as make up, lowering the cycles of concentration and permitting lower blowdown.



Bridging the GAP...