RO Water Treatment Systems
Asahi/America, Inc.
Water Treatment Process
Water Treatment Process

- RO Pretreatment
- Disinfection
  - Sodium Hypochlorite
  - Chloromination
- Micron Filtration
- Post-Treatment
  - Degasification & Stabilization
  - pH Adjustment with NaOH
- Material Recommendations
Water Treatment Process

- RO Pretreatment
  Chemical is injected to remove iron and bacteria

  Water then enters sand filter utilizing the water pressure provided by the supply wells. This multi-layer filter filters out all irons and chemicals.

  All water entering the plant passes through this process.
A Typical System Set-up

Sulfuric Acid Storage and Injection into incoming Water Supply
Water Treatment Process

-Sulfuric Acid and Antiscalant Injection

Scaling prevents passage of water through the membrane.

Sulfuric acid is added to lower the pH of the water and prevent build up on the membrane.
Water Treatment Process

Disinfection Methods

- Sodium Hypochlorite (NaOCl):
- Chlorine Gas: Old
- New Methods
  - Chloroamines: NaOCl plus Ammonia (NH₄OH)
  - Ozone
  - Chlorine Dioxide
  - UV
Valves for Sodium Hypochlorite

**Ball Valves**

**Specification:** Vented Ball required on all Ball Valves in Sodium Hypochlorite Service

Vented Ball for Safety
Valves for Sodium Hypochlorite

**Diaphragm Valves**

PVDF Gas Barrier prevents Permeation of Chlorine gas. Avoids Chemical attack on Rubber Backing Cushions, providing long term Valve Service.

**Specifications:** PVDF Gas barrier required on all diaphragm valves
Water Treatment Process

-Micron Filtration

The water passes through a series 5 filter that removes any silt or debris larger than 5 micron.

This is the last step in pre-treatment. The water is then termed Pre-treated feedwater.
- **Stabilization**

The product water from the RO membrane is very unstable & aggressive.

Filtered raw water is blended with R/O product water. This provides a stability to the water.

- **Degasification**

Degasification is performed by mixing air with water to remove hydrogen sulfide and carbon dioxide gasses.

The blended water is filtered through the sand filter to ensure quality.

The water then enters the clearwell.
Additional Water Treatment Processes-based on water source

- **pH Adjustment** Small amount of sodium hydroxide is added to increase the pH
- **Chlorination** As water enters the clear well, chlorine is added for disinfection. The clearwell is designed for maximum contact between chlorine and water for complete disinfection.
- **Fluoridation** Fluoride may be added to the water to reduce dental caries
- **Ammonia Injection** Ammonia may also be injected as a disinfectant

The water is now pumped from the clearwell into storage tanks where it is available to be pumped to the consumer.
pH: Basic System Setup

Bulk Storage

50% NaOH

water

15% NaOH

Metering Pumps

To Injection

Single Wall

Double Containment
Case Study: City of Valdosta Fl

- **Application**
  - 50% NaOH, low pressure, ambient temp
  - 15% NaOH, P = 75 psi, ambient temp

- **Material Specified**
  - CPVC Pipe/Fittings and Ball Valves
  - Clear PVC Dual Containment

- **Outcome**: *FAILURE!!!*
Photos

Originally Clear PVC
NaOH Recommendations

- **Single Wall Pipe**: Polypropylene
- **Double Containment**: Polypropylene
- **Valves**: Ball Valve, PP Body, EPDM Seals
Common Chemicals and Recommendations

Water Treatment Systems
### Recommended Products for Chemical Transport

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Valve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium Hypochlorite NaOCl</td>
<td>Diaphragm Valve: PVC with PTFE diaphragm and PVDF Gas Barrier</td>
</tr>
<tr>
<td>Aqueous Ammonium NH$_4$OH</td>
<td>Polypropylene Ball Valve</td>
</tr>
<tr>
<td>Typically 19% Conc.</td>
<td></td>
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</tbody>
</table>
# Common Water Treatment Applications

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Valve Type</th>
<th>Valve Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfuric Acid: 93-97%</td>
<td>Ball Valve</td>
<td>PVDF/FKM</td>
</tr>
<tr>
<td></td>
<td>Butterfly</td>
<td>PVC/FKM/PVDF Disk</td>
</tr>
<tr>
<td>Sulfuric Acid 98+% with SO3</td>
<td>Type 342 Diaphragm Vlv</td>
<td>Halar / PTFE</td>
</tr>
<tr>
<td></td>
<td>Type 55 Butterfly</td>
<td>PTFE</td>
</tr>
<tr>
<td>Sodium Hypochlorite</td>
<td>Ball Valve, Vented</td>
<td>PVC</td>
</tr>
<tr>
<td></td>
<td>Diaphragm Valve</td>
<td>PVC, PTFE diaphragm with Gas Barrier</td>
</tr>
<tr>
<td>Aqueous Ammonia 19% common</td>
<td>Ball Valve</td>
<td>PP/EPDM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Polyethylene</td>
</tr>
<tr>
<td>Sodium Bisulfite Ferric Chloride</td>
<td>Ball Valve</td>
<td>PVC/PP/EPDM</td>
</tr>
<tr>
<td>Hydrochloric Acid</td>
<td>Ball Valve Diaphragm Valve</td>
<td>PP/PVDF/FKM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PVDF/PTFE/PVDF gas barrier</td>
</tr>
<tr>
<td>Sodium Hydroxide</td>
<td>Ball Valve</td>
<td>PP/EPDM</td>
</tr>
<tr>
<td></td>
<td>Butterfly Valve</td>
<td>PVC/EPDM/PP Disk</td>
</tr>
<tr>
<td>Compressed Air</td>
<td>Air-Pro Ball valve</td>
<td>Air-Pro</td>
</tr>
</tbody>
</table>

*All dependent on concentration and temp. Consult A/A for exact recommendation on application*