WAHLCO Aqueous Ammonia Delivery Systems use two types of Vaporizers to generate ammonia: Electric Hot Air and Steam Heated.

The Electric Hot Air type uses an evaporative-type vaporizer with internal air atomizing nozzles. In operation, aqueous ammonia is pumped into the atomizing nozzle at a fixed pressure. Within the nozzle, the liquid is mixed with atomizing air and dispersed into the vaporizing chamber as a fine mist. Heated air is forced into the chamber, which evaporates the mist. The resulting air, ammonia vapor, and water vapor mixture is piped to the ammonia injection grid.

The Steam Heated Vaporizer type uses a shell and tube heat exchanger. In operation, the vaporizer produces ammonia vapor, which is mixed (in a static mixer) with a fixed flow of heated dilution air. The resulting air, ammonia vapor, and water vapor is piped to the ammonia injection grid.

Standardized Design - Reduced Time and Costs

WAHLCO Aqueous Ammonia Delivery Systems are available in standardized models or custom designed systems. Standardized models offer pre-engineered, documented designs based on proven technology and high quality components.

Standardized design packages reduce overall project time and costs since all P&IDs, Process Flow Diagrams, General Arrangement Drawings, component specifications, and standard calculations are already reviewed and completed. This means:

- Reduced Proposal Preparation Time
- Standardized Documentation available immediately
- Shorter Delivery Schedule
- Less Cost Uncertainty
- Pre-engineered (fixed set of skid variations)
- Pre-selected Components (no research time)

Typically, SCR installations use commercial grade anhydrous or aqueous ammonia reagents. Anhydrous ammonia is more often used because it is more economical. However, anhydrous ammonia is classified as an extremely hazardous material — subject to strict regulations and risk management procedures regarding transport, storage, and handling. This results in additional costs, complications in permitting, and may generate local community concerns over the transport of hazardous materials. In fact, in some locations, the use of anhydrous ammonia is not permitted.

While the safest supply method is WAHLCO’s U2A® Urea to Ammonia System, WAHLCO’s Aqueous Ammonia Delivery System is a safer alternative to anhydrous ammonia.
Standardized Electric Hot Air Vaporizer System

**Electric Hot Air Vaporizer**
- 20 to 350 lbs/hr of Aqueous Ammonia
- Blower, Vaporizer, & AFCU on one skid
- For Industrial and Gas Turbine Applications
- 60 psig aqua ammonia supply to vaporizer
- Maximum Air Heater Output Temp. of 650 deg F
- Dilution air volume based on vaporizer heat requirement (maximum of 2.5% ammonia concentration by volume after mixing)
- Dilution air heater inlet minimum temperature of -20 deg F and 250 deg F outlet temperature
- Dual fluid atomizing nozzle

---

### Aqueous Ammonia Delivery System

<table>
<thead>
<tr>
<th>Aqua Ammonia (lb/hr)</th>
<th>35</th>
<th>85</th>
<th>175</th>
<th>350</th>
<th>550</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>Pump Skid</td>
<td>Vaporizer Skid</td>
<td>Dilution Air Blower Skid</td>
<td>Dilution Air Heater and Mixing Skid</td>
<td></td>
</tr>
<tr>
<td>AAP-9-xx (xx=pump, y=motor)</td>
<td>EAV-35</td>
<td>EAV-85</td>
<td>EAV-175</td>
<td>EAV-350</td>
<td>EAV-550</td>
</tr>
</tbody>
</table>

---

Electric Hot Air Vaporizer Skid - Front View

Electric Hot Air Vaporizer Skid - Rear View

"Serving the Environmental Community for Over 35 Years"
Standardized Steam Heated Vaporizer System

Steam Heated Vaporizer
- 500 to 6,000 lbs/hr of Aqueous Ammonia
- Steam Vaporizer and Air Heater
- Multiple Skids for installation flexibility
- For Large Utility Applications
- 60 psig aqua ammonia supply to vaporizer
- Vaporizer discharge to have 15 deg F superheat
- 150 psig saturated steam for vaporizer and air heater
- Dilution air volume based on 5% ammonia concentration by volume after mixing
- Dilution air heater inlet minimum temperature of -20 deg F and 250 deg F outlet temperature

Aqueous Ammonia Delivery System

<table>
<thead>
<tr>
<th>Aqua Ammonia (lb/hr)</th>
<th>500</th>
<th>750</th>
<th>1000</th>
<th>1250</th>
<th>1500</th>
<th>1750</th>
<th>2000</th>
<th>2250</th>
<th>2500</th>
<th>2750</th>
<th>3000</th>
<th>3250</th>
<th>3500</th>
<th>3750</th>
<th>4000</th>
<th>4500</th>
<th>5000</th>
<th>5500</th>
<th>6000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump Skid AAP-9-xx-y (xx=pump, y=motor)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AAP-15-xx-y (xx=pump, y=motor)</td>
<td></td>
</tr>
<tr>
<td>Vaporizer Skid AAV-1000</td>
<td>AAV-2000</td>
<td>AAV-3000</td>
<td>AAV-4000</td>
<td>AAV-6000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dilution Air Blower Skid DAB-1000</td>
<td>DAB-2750</td>
<td>DAB-5000</td>
<td>DAB-6000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dilution Air Heater and Mixing Skid AFCU-1000</td>
<td>AFCU-2250</td>
<td>AFCU-3250</td>
<td>AFCU-5000</td>
<td>AFCU-6000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

AFCU Skid

Steam Air Heater

Steam Vaporizer Skid

"Modular Designs for Fast Track Delivery"
## A few of WAHLCO's Aqueous Ammonia Installations

<table>
<thead>
<tr>
<th>OWNER</th>
<th>STATION</th>
<th>LOCATION</th>
<th>Steam/Electric/Flue Gas</th>
<th>#/hr of Aqueous NH₃</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Recovery International</td>
<td>St. Agnes Medical</td>
<td>California</td>
<td>Electric</td>
<td>34</td>
<td>Cogen Independent Power Producer</td>
</tr>
<tr>
<td>HRC/PRAXAIR</td>
<td>Texas City</td>
<td>Texas</td>
<td>Electric</td>
<td>137</td>
<td>Refinery</td>
</tr>
<tr>
<td>HRC/PRAXAIR</td>
<td>Port Arthur</td>
<td>Texas</td>
<td>Electric</td>
<td>90</td>
<td>Refinery</td>
</tr>
<tr>
<td>Inland Paperboard &amp; Packaging</td>
<td>Ontario</td>
<td>California</td>
<td>Electric</td>
<td>585</td>
<td>Cogen Independent Power Producer</td>
</tr>
<tr>
<td>Mitsubishi Power</td>
<td>Xcel, NSP, AS King Station</td>
<td>Minnesota</td>
<td>Steam</td>
<td>7680</td>
<td>Utility</td>
</tr>
<tr>
<td>PSEG</td>
<td>Mercer</td>
<td>New Jersey</td>
<td>Steam</td>
<td>8980</td>
<td>Utility</td>
</tr>
<tr>
<td>PSEG</td>
<td>Hudson</td>
<td>New Jersey</td>
<td>Steam</td>
<td>3598</td>
<td>Utility</td>
</tr>
<tr>
<td>Reliant Energy</td>
<td>Cedar Bayou</td>
<td>Texas</td>
<td>Flue Gas</td>
<td>794</td>
<td>Utility</td>
</tr>
<tr>
<td>Reliant Energy</td>
<td>Parish</td>
<td>Texas</td>
<td>Flue Gas</td>
<td>1482</td>
<td>Utility</td>
</tr>
<tr>
<td>Reliant Energy</td>
<td>P.H. Robinson</td>
<td>Texas</td>
<td>Flue Gas</td>
<td>1281</td>
<td>Utility</td>
</tr>
<tr>
<td>Selas/Praxair</td>
<td>Texas City</td>
<td>Texas</td>
<td>Electric</td>
<td>90</td>
<td>Refinery</td>
</tr>
<tr>
<td>URS/Duke Energy</td>
<td>South Bay</td>
<td>California</td>
<td>Electric</td>
<td>590</td>
<td>Utility</td>
</tr>
</tbody>
</table>

### Environmental Systems for Air Pollution Control:
- Ammonia Systems
- NOx Systems
- Flue Gas Conditioning
- Thermocouple Arrays
- Tubular Electric Heaters
- Industrial Equipment

---

WAHLCO Headquarters in Santa Ana, Ca - corporate offices, engineering, fabrication, testing, and field service.

© Copyright 2008, WAHLCO, Inc. All rights reserved. 
2722 S. Fairview Street
Santa Ana, CA 92704
(714) 979-7300
www.wahlco.com