

WAHLCO Aqueous Ammonia Systems for DeNOx Applications



WAHLCO, Inc.

WAHLCO is a leading environmental equipment company specializing in the design and fabrication of flue gas conditioning (FGC), NO_x control, and ammonia handling equipment for utilities, independent power producers, oil & gas refineries, pulp and paper mills, cement plants, and steel mills. For over thirty-five years, WAHLCO has been supplying innovative air pollution control solutions to meet the needs of utility and industrial customers worldwide.

With over 500 installed systems in more than 17 countries — WAHLCO has become a world leading supplier of environmental equipment.

Ammonia Reagent

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.

Aqueous NH₃ Systems

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.

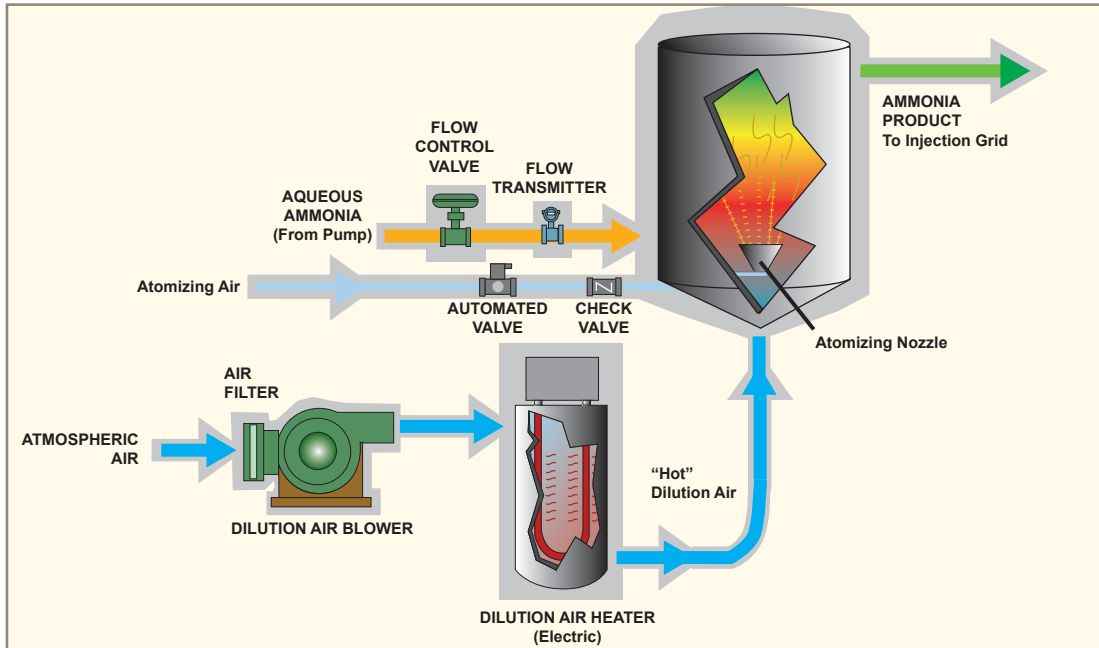
Standardized Design - Reduced Time and Costs

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)

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 Electric Hot Air Vaporizer - Model Selection						
Aqua Ammonia (lb/hr)		35	85	175	350	550
Model	Pump Skid	AAP-9-xyy (xx=pump, y=motor)				
	Vaporizer Skid	EAV-35	EAV-85	EAV-175	EAV-350	EAV-550
	Dilution Air Blower Skid	Part of Vaporizer Skid				
	Dilution Air Heater and Mixing Skid	Part of Vaporizer Skid				



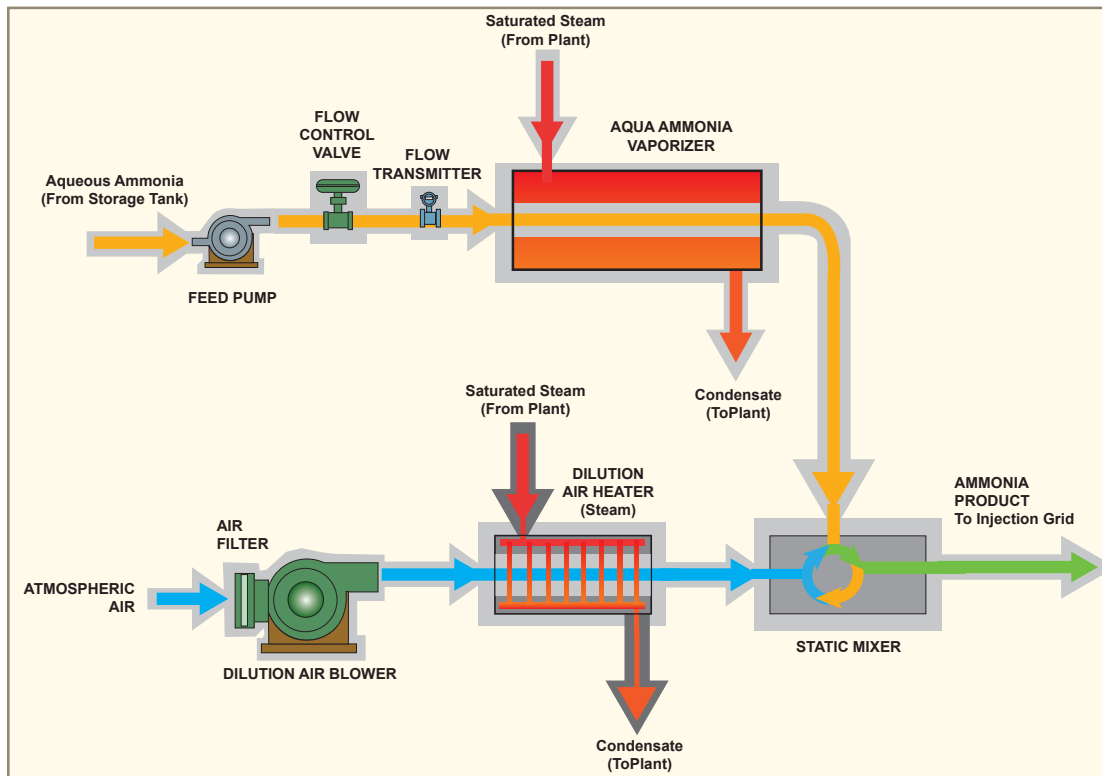
Electric Hot Air Vaporizer Skid - Front View



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



AFCU Skid



Steam Vaporizer Skid



Steam Air Heater

"Modular Designs for Fast Track Delivery"

A few of WAHLCO's Aqueous Ammonia Installations

OWNER	STATION	LOCATION	Steam/ Electric/ Flue Gas	#/hr of Aqueous NH ₃	APPLICATION
Energy Recovery International	St. Agnes Medical	California	Electric	34	Cogen Independent Power Producer
HRC/PRAXAIR	Texas City	Texas	Electric	137	Refinery
HRC/PRAXAIR	Port Arthur	Texas	Electric	90	Refinery
Inland Paperboard & Packaging	Ontario	California	Electric	585	Cogen Independent Power Producer
Mitsubishi Power	Xcel, NSP, AS King Station	Minnesota	Steam	7680	Utility
PSEG	Mercer	New Jersey	Steam	8980	Utility
PSEG	Hudson	New Jersey	Steam	3598	Utility
Reliant Energy	Cedar Bayou	Texas	Flue Gas	794	Utility
Reliant Energy	Parish	Texas	Flue Gas	1482	Utility
Reliant Energy	P.H. Robinson	Texas	Flue Gas	1281	Utility
Selas/Praxair	Texas City	Texas	Electric	90	Refinery
URS/Duke Energy	South Bay	California	Electric	590	Utility



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

Environmental Systems for Air Pollution Control:

- Ammonia Systems
- NOx Systems
- Flue Gas Conditioning
- Thermocouple Arrays
- Tubular Electric Heaters
- Industrial Equipment



2722 S. Fairview Street
 Santa Ana, CA 92704
 (714) 979-7300
www.wahlco.com