

Simply Safer . . .



Wahlco U₂A[®] Urea to Ammonia System

WAHLCO, Inc.

WAHLCO is a leading environmental equipment company specializing in the design and fabrication of flue gas conditioning (FGC), NOx 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 - The Hazards

Anhydrous ammonia is a liquified-gas typically stored in pressure vessels rated to 300 psig. There are significant risks and liability associated with its transport, unloading, and bulk storage.

Since several trucks or railcars must be unloaded each day, the potential risk is on-going. Bulk storage presents an even bigger hazard, as many systems require ammonia storage volumes in the range of several hundred-thousand gallons. In the event of a major storage tank failure, an ammonia aerosol cloud can form and travel several miles - with the potential to be immediately lethal.

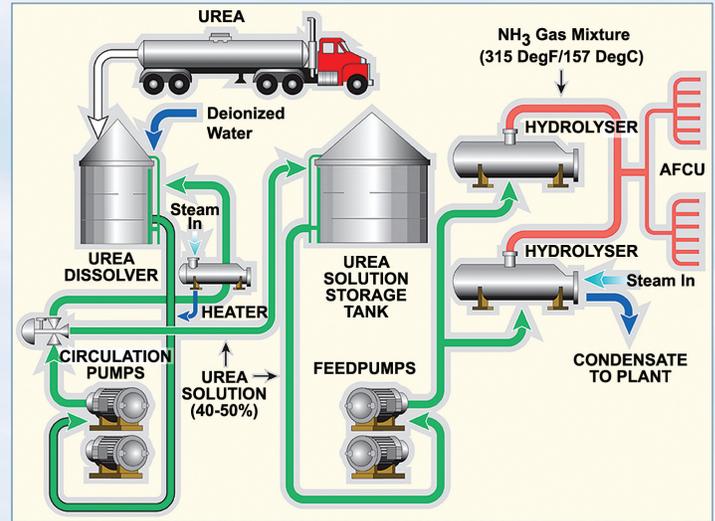
Anhydrous ammonia is a highly toxic chemical that is subject to restrictions by the Environmental Protection Agency (EPA), OSHA, and regulated by the Department of Homeland Security.

Aqueous ammonia, although less concentrated than anhydrous ammonia, poses similar risks and is increasingly subject to restrictions by local authorities.

Ammonia Exposure Effects	
Readily detectable odor	20 - 50 ppm
Severe irritation of eyes, ears, nose, and throat; No lasting effect with short-term exposure	400 - 700 ppm
Dangerous, less than 1/2 hour exposure may be fatal	2,000 - 3,000 ppm
Serious edema, strangulation, asphyxia, rapidly fatal	5,000 - 10,000 ppm
Immediately fatal	> 10,000 ppm

A Safe Alternative - The U₂A[®] Process

The patented U₂A[®] process converts safe and non-toxic urea to an ammonia product gas as needed to meet plant process demands - **the safe alternative to hazardous transport and bulk storage of anhydrous and aqueous ammonia.**



Typical U₂A[®] Process

The U₂A[®] System basically reverses the process used to make urea. A urea solution is fed into a reactor, where it is heated under pressure to decompose to a gas mixture of ammonia, carbon dioxide, and water vapor. This gas mixture is then piped in heat traced piping to the point of use.



Dry Urea (prilled)

Urea is readily available as a dry material (as shown above) or as a commercial solution (32% to 70% concentrations).

Applications and Markets

To date, WAHLCO has supplied over 35 U₂A® units with capacities ranging from 6 lb/hr to 3500 lb/hr of ammonia production. Most of these units are installed at coal fired power plants to supply ammonia to a Selective Catalytic Reduction system to reduce Nitrous Oxide emissions or for Selective Non Catalytic Reduction processes.

Other applications include SCRs at Refineries, Paper Plants, and other industries. The systems have also been installed to supply ammonia for Flue Gas Conditioning (FGC) and Acid Mist Mitigation (AMM).

APPLICATIONS

- SCR - SELECTIVE CATALYTIC REDUCTION
- SNCR - SELECTIVE NON-CATALYTIC REDUCTION
- FLUE GAS CONDITIONING
- SO₃ MITIGATION
- SCRUBBERS

MARKETS

- INDUSTRIAL APPLICATIONS
- POWER GENERATION
- COGEN FACILITIES
- UNIVERSITIES
- HOSPITALS
- REFINERIES
- WASTE TO ENERGY/ BIOMASS
- CEMENT PLANTS
- BOILERS - INCINERATORS
- PULP & PAPER
- MINING
- WASTE WATER



Power Generating Plant - operating since 2000



Electric U₂A® System



Steam headed AFCU Skid

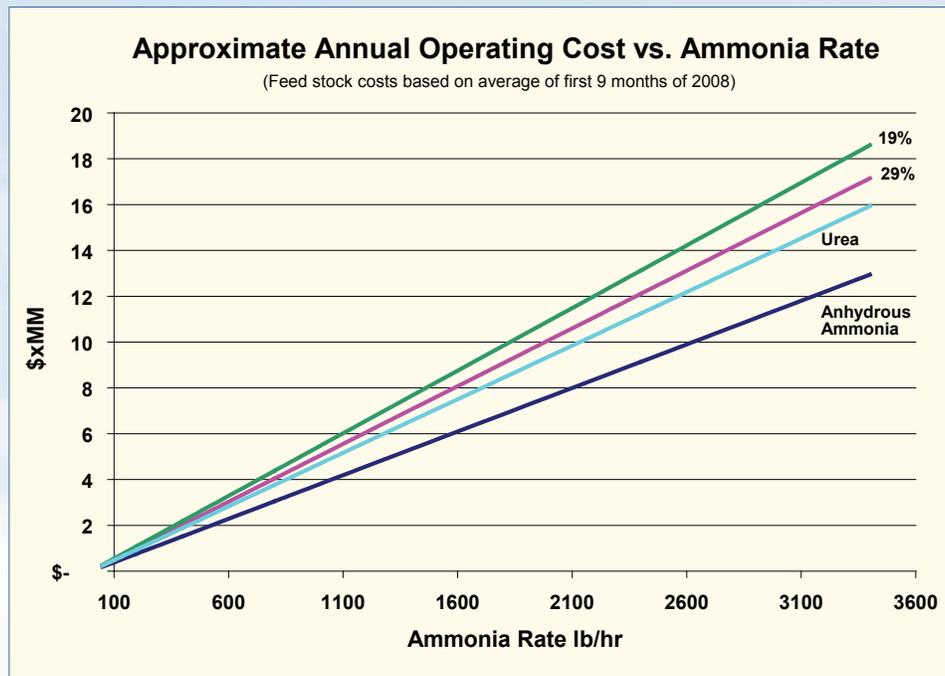
"Exceptional Design means Exceptional Quality"

The U₂A[®] Advantage

Wahlco's U₂A[®] Urea to Ammonia system offers a process driven supply of ammonia - eliminating the dangers and costs associated with the transport and bulk storage of ammonia on site. A readily available commodity, Urea is non-toxic, stable, non-flammable, and not subject to regulations governing toxic or hazardous materials.

- Urea based ammonia systems ELIMINATE the possibility of transportation related ammonia spills, liability, and costs.

- Aqueous ammonia is significantly more expensive to operate than a urea based ammonia system. Based on capital cost + 5 years operating life, 19% aqueous ammonia costs are nearly 20% higher than those of the equivalent urea based system.
- Urea-based ammonia systems are safe, reliable and cost effective.



U₂A[®] Design Features

- No Natural Gas Needed
- No Vaporizer Nozzles
- Electric and Steam Heated Models
- DCS Integration and Simple Process Control
- Skid Mounted - Modular Equipment
- High Reliability - Catalyst-free Operation
- Patented Process
- Complete Conversion of Urea
- Quick Response to Load Variations
- No Carryover to SCR
- No Catalyst Contamination
- Quick ROI and Lower Operating Costs (vs Aqueous Ammonia)



Steam Saturator Skid

"Choose a Safe System"

Typical U₂A[®] Installations

OWNER	STATION	LOCATION	Steam/ Electric	#/hr of NH ₃	APPLICATION
AES	Huntington Beach Units 1 & 2 Units 3 & 4	Huntington Beach, CA	Steam	364 380	SCR for Power Boilers
City of Spokane	Spokane, WA	Spokane, WA	Electric	240	SNCR for Waste to Energy
EPCR/Progress Energy Florida	Crystal River Unit 4 Unit 5	Crystal River Florida	Steam	2266 660	SCR for Boiler Acid Mist Mitigation
ESBI	Moneypoint Units 1, 2, 3	Ireland	Steam	2860	SCR for Boiler
HERA	ASA	Milan, Italy	Steam	143	Municipal Incinerator
HERA	Imola	Imola, Italy	Electric	71	Municipal Incinerator
Kawai Power Partners	Lihue	Lihue, HI	Electric	28	SCR for Simple Cycle Turbine
Korea Southern Power	Nam-Jeju Units 1 & 2	Korea	Steam	280	SCR for Boiler
Mirant	Morgantown Units 1 & 2	Morgantown, MD	Steam	2650	SCR for Power Boilers
Sinclair Oil	H2 Plant	Sinclair, WY	Electric	10	Reformer- Refinery
UCLA	Main Campus	Los Angeles, CA	Electric	21	SCR for Simple Cycle Turbine
White Mountain/ Great Lakes	Fraser Mills	Berlin, NH	Electric	90	Pulp Mill SCR for Boiler



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



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