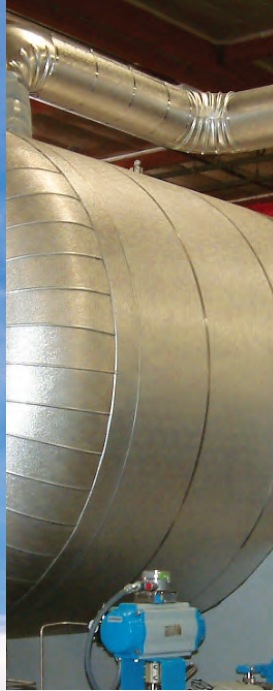


# Simply Safer . . .



## Wahlco U2A<sup>®</sup> Urea to Ammonia System



## WAHLCO, Inc.

For over 40 years, WAHLCO has been designing and fabricating equipment for flue gas conditioning (FGC), NO<sub>x</sub> control, and ammonia supply in power generation and other industries.

With over 600 systems installed in more than 25 countries — WAHLCO has become a leading supplier of environmental equipment.

## Ammonia - The Hazards

Ammonia is typically used as a chemical agent for the reduction of nitrous oxide emissions (NO<sub>x</sub>).

Anhydrous ammonia is a highly toxic chemical (subject to EPA, DOT, OSHA, and Dept. of Homeland Security regulations), which is typically stored in pressure vessels (rated to 300 psig) as a liquified-gas. There are significant risks and liability associated with its transport, unloading, and bulk storage.

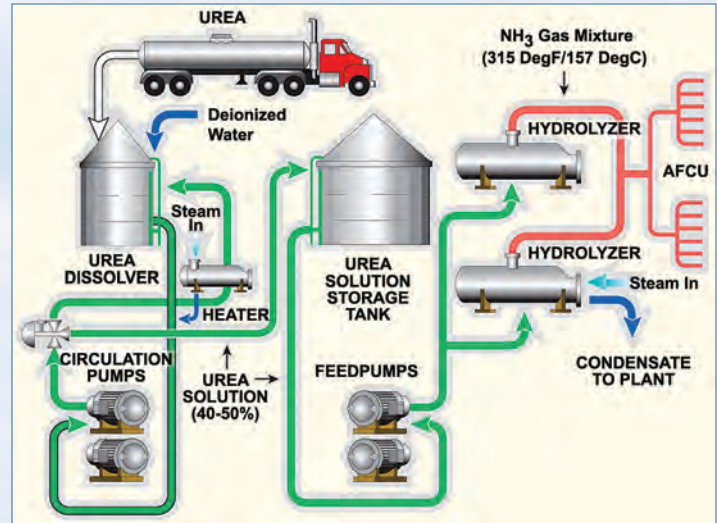
For example, several trucks or railcars must be unloaded each day, so the potential risk is on-going. The resulting bulk storage requirement presents a significant hazard. In the event of a major storage tank failure, an ammonia aerosol cloud will form and travel several miles - with the potential to be immediately lethal.

*It should be noted - aqueous ammonia, although less concentrated than anhydrous ammonia, poses similar risks and is increasingly subject to stricter regulations 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

## The 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 Large 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 produce a gas mixture of ammonia, carbon dioxide, and water vapor. This gas mixture is then delivered to the point of use.



Dry Urea

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 75 U2A® units with capacities ranging from 6 lb/hr to 3500 lb/hr of ammonia production. Most of these units are installed at power plants to supply ammonia to a Selective Catalytic Reduction (SCR) system to reduce Nitrous Oxide emissions or for Selective Non Catalytic Reduction (SNCR) processes.

Other applications include SCRs at refineries, cogen and chemical facilities, paper plants, and other industries. The systems have also been installed to supply ammonia for various other applications including flue gas conditioning and acid mist mitigation.

## APPLICATIONS

- ▶ Selective Catalytic Reduction (SCR)
- ▶ Selective Non-Catalytic Reduction (SNCR)
- ▶ Flue Gas Conditioning
- ▶ Acid Mist 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



U2A® Power Generating Plant - operating since 2000



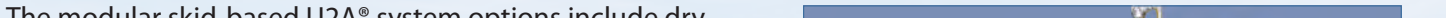
Electric U2A® System



Steam-heated U2A® Metering Unit (MU) Skid

*"Exceptional Design means Exceptional Quality"*

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1. **Dissolver Tank** - Dry Urea Only
2. **Circulation Pump/Heat Exchanger** - Dry Urea Only
3. **Urea Solution Storage Tank**
4. **Feed Pump**
5. **U2A® Hydrolyzer Vessel**
6. **Blowdown Tank**
7. **U2A® MU** - All Models
8. **Steam Saturator** - Steam Heated Systems Only
9. **Condensate Recovery** - Steam Heated Systems Only



## U2A® Hydrolyzer Standard Model Sizes

**Model Number Description (HBC-XXXX)**  
**H** = Hydrolyzer  
**B** = E (electric), S (steam)  
**C** = V (vertical), H (horizontal)  
**XXXX** = Maximum Ammonia Capacity (Lb/Hr)

## "Modular Designs for Fast Track Delivery"

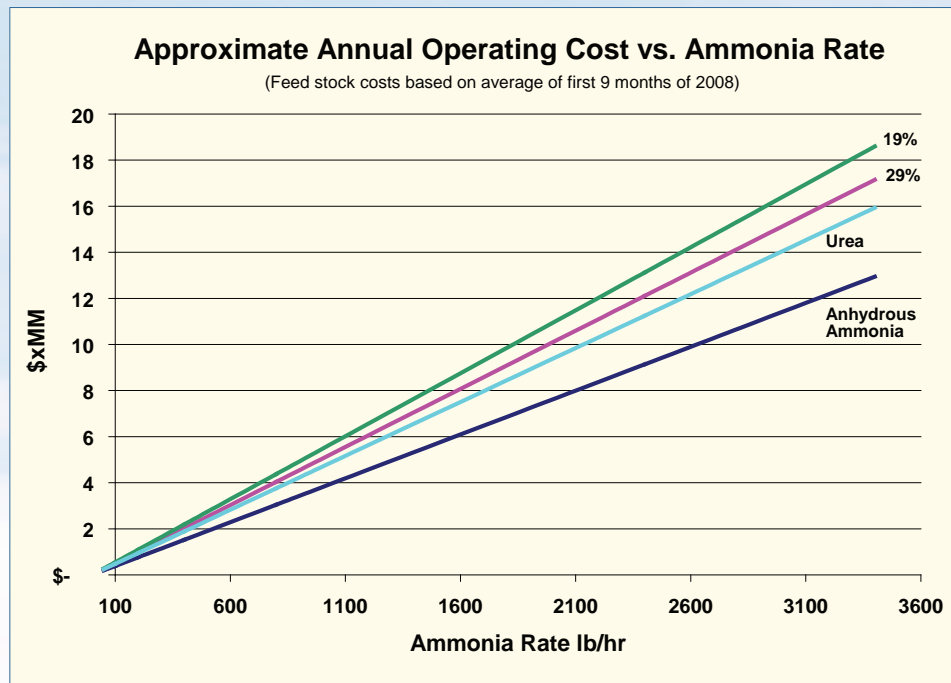


# The U2A<sup>®</sup> Advantage

Wahlco's U2A<sup>®</sup> 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.

- ▶ Eliminates deadly environmental impact of spills
- ▶ Eliminates health hazards

- ▶ Reduces liability insurance premiums
- ▶ Eliminates increased transportation costs associated with the handling of hazardous material
- ▶ Eliminates a potential terrorist target
- ▶ Minimize site permit requirements



## U2A<sup>®</sup> Design Features

- ▶ Complete Conversion of Urea to Ammonia
- ▶ Catalyst-free Operation
- ▶ No Natural Gas Needed
- ▶ No Vaporizer Nozzles to avoid plugging
- ▶ DCS Integration and Simple Process Control
- ▶ Skid Mounted - Modular Equipment
- ▶ High Reliability
- ▶ Quick Response to Load Variations
- ▶ No SCR Catalyst Contamination
- ▶ Lower Operating Costs (vs Aqueous Ammonia)
- ▶ Single hydrolyzer serving multiple points of use



Steam Saturator Skid

*"Choose a Safe System"*

# Typical U2A® Installations

OWNER	STATION	LOCATION	Steam/ Electric	#/hr of NH <sub>3</sub>	APPLICATION
AES	Huntington Beach Units 1 & 2 Units 3 & 4	Huntington Beach, CA	Steam	364 380	SCR for Power Boilers
Beijing Guodian Longyuan	Guodian Qingshan	China	Steam	440	SCR for Power Boiler
Enel	Torrevaldaliga Nord Power Plant	Italy	Steam	2,200	SCR for Power Boiler
EPCR/Progress Energy Florida	Crystal River Unit 4 Unit 5	Crystal River Florida	Steam	2,266 660	SCR for Boiler Acid Mist Mitigation
ESBI	Moneypoint Units 1, 2, 3	Ireland	Steam	2,860	SCR for Power Boiler
HERA	Imola	Imola, Italy	Electric	71	Municipal Incinerator
Jubail & Yanbu Power & Water Co.	Marafiq Power Plant	Saudia Arabia	Steam	396	SCR for Boiler
Kauai 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	2,650	SCR for Power Boilers
SCS - Astoria	Astoria II	Queens, NY	Electric	300	SCR for Boiler
S.E.C.I	Seminole Units 1 & 2	Palatka, FL	Steam	2,176	SCR for Power Boilers
Sinclair Oil	H2 Plant	Sinclair, WY	Electric	10	Reformer- Refinery



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

## Wahlco Products:

- ▶ Anhydrous & Aqueous Ammonia Systems
- ▶ Urea to Ammonia Conversion (U2A®)
- ▶ AOD® Urea Hydrolysis Systems
- ▶ Flue Gas Conditioning
- ▶ Fuel Control Valve Trains
- ▶ Custom Industrial Equipment
- ▶ Thermocouple Arrays
- ▶ Tubular & Duct Immersion Electric Heaters
- ▶ Rental Units / Aftermarket
- ▶ Formaldehyde-free Urea



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