



***The Use of Ammonia and Other Natural Refrigerants  
in the U.S.***

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# Ammonia and Natural Refrigerants in the U.S.

## Ammonia Refrigeration is Evolving

- Advances in Equipment and Controls
- Tightened Security and Safety
- Focus on Environmental Sustainability



# Ammonia and Natural Refrigerants in the U.S.



## Two Events Shaping Regulations in the U.S.

### Event 1: Explosion in West, Texas

- Resulted in presidential Executive Order to audit regulatory programs
- OSHA: the Occupational Safety and Health Administration
- EPA: the Environmental Protection Agency
- DHS: the Department of Homeland Security

# Ammonia and Natural Refrigerants in the U.S.



## Two Events Shaping Regulations in the U.S.

### Event 1: Explosion in West, Texas

- Resulted in presidential Executive Order to audit regulatory programs
- Industry response: reduce ammonia charge

# **Ammonia and Natural Refrigerants in the U.S.**



## **Two Events Shaping Regulations in the U.S.**

### **Event 2: U.S. Joins Montreal Protocol**

- Resulted in U.S. program to phase down HFC consumption

# Ammonia and Natural Refrigerants in the U.S.



## Two Events Shaping Regulations in the U.S.

### Event 2: U.S. Joins Montreal Protocol

- Resulted in U.S. program to phase down HFC consumption
- Opened door to new applications for ammonia

# Ammonia and Natural Refrigerants in the U.S.



## HFC Phase Out in the U.S.

### As a Result of the Montreal Protocol Agreement:

- U.S. must accelerate the use of non-ozone depleting substances
- The EPA has identified ammonia, CO<sub>2</sub> and propane as substances with zero ODP

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## HFC Phase Out in the U.S.

- Rapid decrease in the supply of high GWP and ODP refrigerants
- Increase in price of high GWP and ODP refrigerants
- Effective termination date of usage of high GWP and ODP refrigerants sooner than mandated



# **Ammonia and Natural Refrigerants in the U.S.**



## **HFC Phase Out in the U.S.**

### **Industry Faces a Unique Challenge:**

1. Choice 1: New “drop in” refrigerant blends

# Ammonia and Natural Refrigerants in the U.S.



## HFC Phase Out in the U.S.

### Options Available:

1. Choice 1: New “drop in” refrigerant blends
2. Choice 2: Existing HFC refrigerants
3. Choice 3: Ammonia and CO<sub>2</sub>

# **Ammonia and Natural Refrigerants in the U.S.**

## **HFC Phase Out in the U.S.**

### **Transition: the Challenges are in the Details**

**Existing plant design**

**Refrigerant glide**

**Oil management**

**Cooling capacity**

**Leak rates**

**Material compatibility**

**Energy usage**

**Down time**

**Operating pressures**

# **Ammonia and Natural Refrigerants in the U.S.**



## **HFC Phase Out in the U.S.**

### **Leak Rates and Cost Make Synthetics Prohibitive**

- Average leak rate estimated at over 28%

# Ammonia and Natural Refrigerants in the U.S.



## HFC Phase Out in the U.S.

### Leak Rates Make Synthetics Prohibitive

- Average leak rate estimated at over 28%
- Conclusion: New refrigerant blends are much more expensive, less efficient and leak, making them an economically impractical solution

# **Ammonia and Natural Refrigerants in the U.S.**



## **HFC Phase Out in the U.S.**

Question:

**What is a practical solution?**

Answer:

**Ammonia and other natural refrigerants.**

# Ammonia and Natural Refrigerants in the U.S.

## HFC Phase Out in the U.S.

New systems provide safer, more efficient alternatives to synthetics

- Secondary cascade technologies
- Evaporator surface designs
- Sophisticated expansion valve and computer control systems
- Factory assembled low charge ammonia systems

**New technologies will continue to transform systems**

# **Ammonia and Natural Refrigerants in the U.S.**



## **HFC Phase Out in the U.S.**

### **New Commercial Applications**

- Supermarkets
- Light commercial installations
- Comfort cooling

**The landscape for applying natural refrigerants is changing dramatically.**



# **Ammonia and Natural Refrigerants in the U.S.**



## **HFC Phase Out in the U.S.**

### **Safety Concerns are Being Addressed**

- Advanced controls
- Communication technologies
- Reliable automated monitoring

# **Ammonia and Natural Refrigerants in the U.S.**

## **Regulatory Changes: Safety and Security**

### **Three “Requests for Information”**

- Occupational Safety and Health Administration
- Environmental Protection Agency
- Department of Homeland Security

**RFI’s are attempts by regulatory agencies to inform changes in the programs that govern our operations.**

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## Regulatory Changes: Safety and Security

### Industry is Responding

- Potential changes could impact industrial refrigeration in the U.S.
- Industry is working with regulatory agencies to inform changes
- Many in U.S. now looking for ways to reduce ammonia charge

# Ammonia and Natural Refrigerants in the U.S.

## Growth of Natural Refrigerants

### Industry is Responding

- Political and regulatory factors are contributing to a shift towards natural refrigerants
- There is an opportunity for the growth of low-charge ammonia systems in the U.S.
- The U.S. is following worldwide trends

# Ammonia and Natural Refrigerants in the U.S.

- Ammonia refrigeration continues to expand
- New partnerships between industry leaders, end users and government agencies are forming
- Ammonia, a highly effective and efficient technology, will answer the demands of a global supply chain