

High Efficiency, Lower Total Cost of Ownership



Trane chiller-based refrigeration systems vs. ammonia systems



Are the costs and challenges of operating an ammonia refrigeration system too high?

With more than 40 years experience in both ammonia and halocarbon systems, Trane Industrial Refrigeration can provide insight into the implications of system technology choices. Ammonia systems—the dominant large-scale refrigeration technology for more than a century—are increasingly costly to operate, prompting owners to seek other solutions. A Trane CenTraVac® liquid chiller-based system offers performance and reliability without the safety or compliance concerns inherent to ammonia refrigeration systems.

Considerations in Choosing a Refrigeration System

The regulatory burden

Because of toxicity and flammability concerns, ammonia is subject to regulation by multiple federal and state agencies. The costs to establish and maintain compliance programs often exceed \$100,000 per year and fines for noncompliance can be in the millions. In contrast, most synthetic refrigerants are non-toxic. While regulated by the EPA, they are not subject to the extensive operational and safety regulations of ammonia.

Facility code compliance

Facility requirements for ammonia plants are unique—fire protection, ventilation, leak detection, eyewash and showers. Mechanical rooms have special requirements for construction, ventilation and security. Alarming for evacuation is required for a release exceeding 25 ppm, but even routine maintenance is likely to exceed this level. Disruptions to operations can be frequent and costly.

First cost vs. life cycle cost

First cost, where ammonia is usually a viable option, represents less than 10% of lifetime system cost. Energy expense, regulatory compliance, safety, emergency planning, liability risk and service soon overtake the initial investment. Alternatives include CenTraVac low-pressure centrifugal chiller systems using low-GWP (global warming potential) refrigerants, which have lower operating cost plus longer equipment life.

Human resources

Certification can be required for operating personnel of an ammonia plant. Multiple certified operating engineers are required for larger installations. Ammonia service work is highly specialized and requires ongoing training. Recruitment and retention of qualified operators can be a challenge.



Trane CenTraVac Chiller-based System vs. Ammonia

Chiller-based	Ammonia
Lower life cycle cost	Lower first cost
Less toxic	More toxic
Minimal regulation	Extensive regulation
Low financial risk	High financial risk
Ease of operation	Complexity
Tested and certified (AHRI 550/590) prior to shipping	No certification
Leak-Tight Warranty	No warranty for leaks
Low-pressure system	High-pressure system
Refrigerant availability warranty	N/A

Service and maintenance requirements

Ammonia systems have higher maintenance and service costs over the life of the system. Many compliance programs require two operators to be present whenever the system is “opened”—chiller-based systems do not.

Energy efficiency

Ammonia is one of many efficient refrigerants. The type of system and specific equipment are as important as the choice of refrigerant. For instance, a water-cooled system typically provides higher efficiencies than an air cooled system, regardless of the refrigerant used. Trane is a leader in both energy efficiency and the development of advanced low-GWP refrigerants. Trane offers several low-GWP alternatives for larger tonnage certified, energy-efficient chillers.

Financial risk and liability

Risks include liability for noncompliance, which is reflected in insurance rates paid by ammonia plant owners. Losses due to product contamination—food and pharmaceuticals, for example—can result from an accidental release of ammonia.

To learn more, contact your local Trane office,
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