

AMMONIA STORAGE EXPERIENCE

When considering American Tank & Vessel's (AT&V's) experience with the design, fabrication, and erection of ammonia storage tanks and facilities it is important to categorize our experience under the following:

- Hydrocarbon liquid storage concepts and experience
- Refrigerated and cryogenic storage concepts and experience
- Ammonia as a product experience

LIQUID STORAGE CONCEPTS

AT&V has over forty (40) years of experience with storage of flammable and/or hazardous materials and ammonia. ([See 40 Year History](#)). Senior company members designed the first operating flat bottom LNG tank in the world, as well as other unique structures for hydrocarbon storage as a liquid or gas.

Starting thirty (30) years ago, AT&V pioneered advanced designs in the storage of LNG, CNG, LIN/LOX, butane, propane, ammonia, and hydrogen technology. AT&V realizes the importance of advancing the technology within our industry and supports committees associated with tanks and vessels under API-650, API-620 and other recognized codes. In addition, AT&V's staff has associations with API, NFPA, AWS, NACE, ASME, ASCE, and other leading organizations.



AT&V has pioneered technology since 1991. Dozens of designs have been developed as proprietary/patented technologies to improve hydrocarbon storage. These improvements optimize safety, emissions, life of structure improvements, process, and innovations in energy storage. A separate chart has been attached to this document showing the [technology history](#) developed at AT&V. Welding, fabrication, scaffolding, forming, and construction equipment technologies have also been developed at AT&V, but are not published within the timeline.

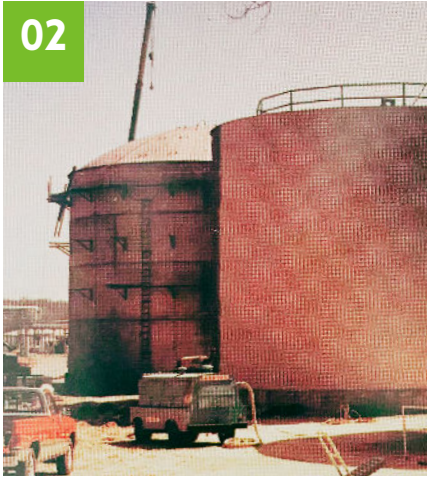
REFRIGERATED STORAGE EXPERIENCE

The second component to be

considered with the storage of AT&V's ammonia experience is our history with API-620 appendix R and refrigerated products. AT&V has been designing, fabricating, and constructing API-620 tanks for almost thirty (30) years with staff experience exceeding this timeline. AT&V's experience with API-620 tanks also includes design of the foundations, insulation, piping, venting, pumps, and painting. Engineering disciplines incorporate thermal performance, process inputs, seismic, as well as a variety of traditional operational parameters and customer required design impacts. Attached with this document is a list of some of the [API-620 projects](#) that have been designed, fabricated, and built by AT&V.

AT&V's API-620 storage of refrigerated projects includes

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single wall and double wall steel and concrete structures, as well as spheres. In addition to the base designs, AT&V's improvements in fabrication result in better quality and lower cost of construction.

THE AMMONIA EXPERIENCE

The third component of experience with ammonia is the ammonia product itself in reference to storage, as well as processing. AT&V's experience with ammonia starts more than 30 years ago and continues today. Specialized knowledge of storage tanks, boil-off compressors, flares, outbound vaporizers/heating systems, insulation systems, instrumentation, submerged pumps, process piping, and more is leveraged by AT&V project teams. AT&V supports over a dozen different storage tank designs, from single containment to full containment. Full containment designs can incorporate steel or concrete shells and even concrete roofs.

AT&V has experience with the reactivity and corrosive issues, welding technology and metallurgy, suppression and fire control, risk assessment, as well as innovative

technology to improve construction schedules of ammonia storage tanks and reduce cost. The general description of capacities and experience referenced above are supported by AT&V's corporate history of constructing 4,000+ projects in thirty (30) countries including turnkey terminals. For more information about AT&V and our experience with unique structures for the storage of hydrocarbons please refer to AT&V's [Global Services 2023 Renewable/Green Energy Presentation](#).

FOR MORE INFORMATION

This article was written by W.T. Cutts, Director at American Tank & Vessel.

Contact green@at-v.com or visit the American Tank & Vessel website, at-v.com, to learn more.

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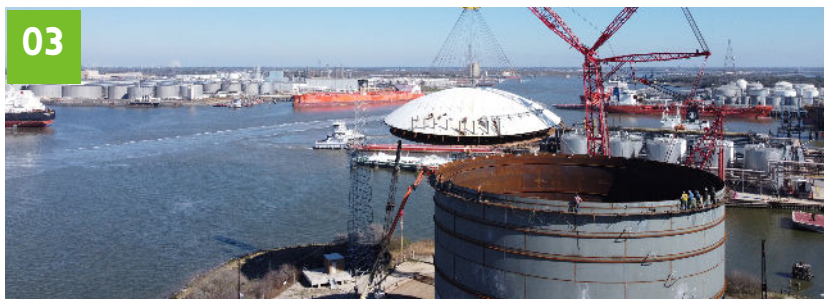
01 Full containment ammonia storage

02 (Left tank) Ammonia storage built for the Tennessee Valley Authority

03 Ammonia storage roof lift

04 Submerged ammonia pump system

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