

CRYOGENIC



Nitrogen Rejection Units



Brazed aluminum heat exchangers (BAHX) are at the heart of cryogenic NRU plants and fundamental to nitrogen removal and all the associated integrated processes of NGL and helium recovery and LIN and LNG production. Chart's proven BAHX design and manufacturing experience and vertically integrated structure provide unequalled expertise in the application of BAHX systems and NRU processing requirements.

Principle BAHX features

- Aluminum construction for maximum heat transfer performance and thermal conductivity
- Custom design for optimized thermal and hydraulic performance
- Multi-stream capability
- Reduced temperature approach
- Incorporated as packaged flange to flange cold box solutions

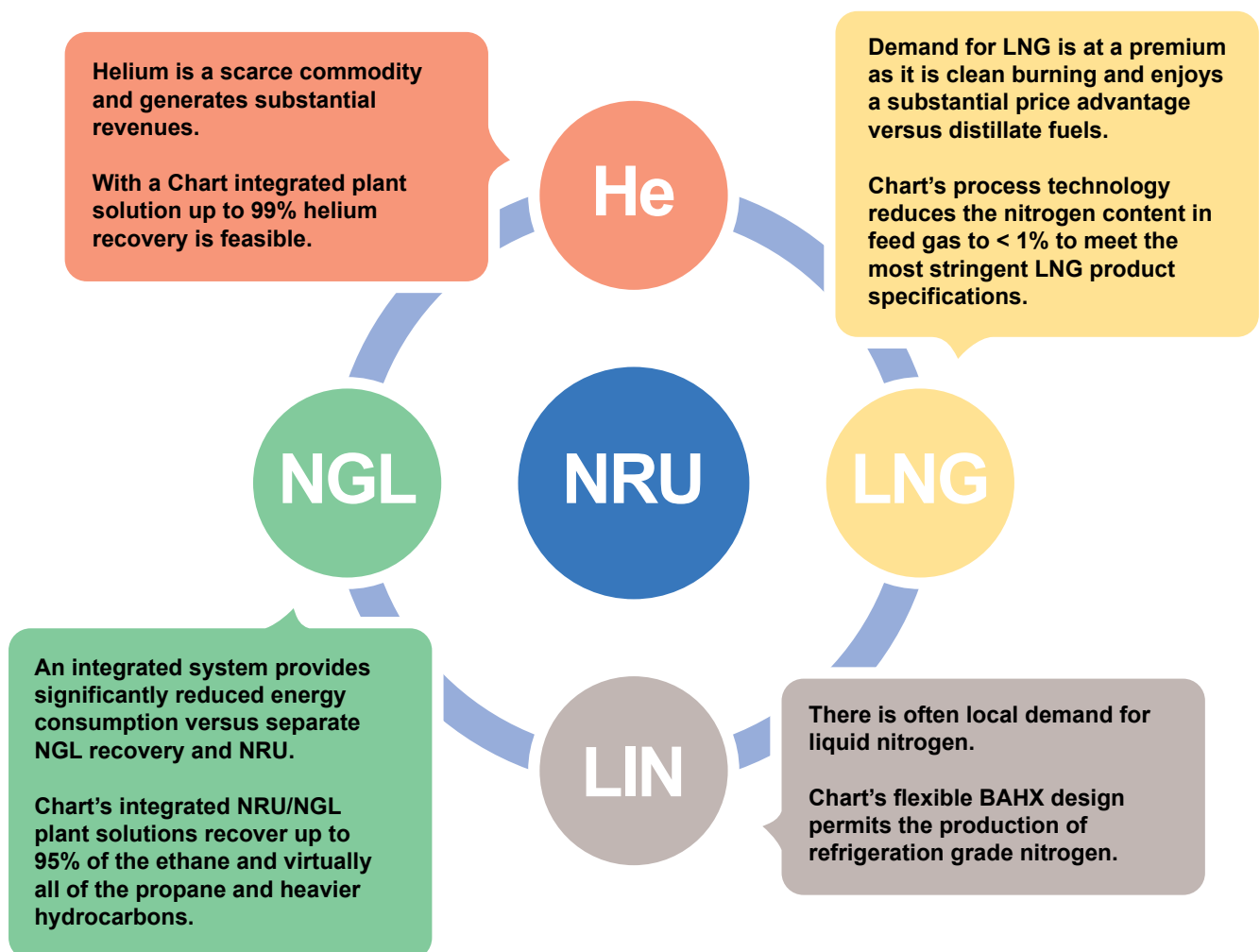
Chart's principal BAHX engineering and manufacturing facility is in La Crosse, WI and the cold box manufacturing facility in New Iberia, LA has waterside access.



Cryogenic Nitrogen Rejection Units

Chart's proprietary nitrogen rejection units (NRU) enable monetization of low btu gas reserves. Our technology solutions facilitate increased revenues through systems that integrate helium, cost effective production of nitrogen rejection with natural gas liquids (NGL) recovery and the potential production of liquid natural gas (LNG) and/or liquid nitrogen (LIN). Chart has over 40 years experience in cryogenic gas processing for plants in service from 15MM SCFD to the world's largest integrated NRU with NGL extraction capability with a nameplate capacity of 900MM SCFD. Chart's cryogenic NRU solution is applicable for nitrogen contents as small as 1% and greater than 70%.

- Flange to flange cryogenic NRU – complete cold box solutions for your project application
- Vertically integrated around Chart's brazed aluminum heat exchanger (BAHX)
- Integrated process technology – maximized revenue opportunities via helium recovery, NGL extraction, LNG and/or LIN production



Why Chart?

- Extensive, proven and demonstrative worldwide NRU experience
- Vertically integrated design and manufacture of integral BAHX exchangers
- Process design, detailing and shop fabrication of flange-to-flange cold box solutions
- Gas monetization opportunities via integrated process design
- NRU solutions from 15MMSCFD to >900MMSCFD of feed gas
- Inlet nitrogen concentrations from 1% to >70% processed to monetize low btu gas

Single low pressure column NRU

- Generally applicable to an inlet nitrogen concentration >40%

Single high pressure column NRU

- Generally applicable to inlet flows <30 MMSCFD and without integrated helium recovery

Two (or more) Column NRU

Where inlet nitrogen concentrations are <40% and/or integrated helium recovery is required Chart's patented and proven pre-fractionator NRU technology is the optimum processing solution. The resultant two column design features a pre-fractionator followed by a low pressure NRU fractionator and offers the following:

- Conditions very low nitrogen concentration inlet gases for efficient separation and minimized methane losses
- Recovery of a substantial fraction of methane at elevated pressure reduces recompression horsepower
- Permits higher concentrations of CO₂ and C₄⁺ hydrocarbons in the inlet feed
- Permits high recovery of crude helium



Chart NRU - Proven Experience

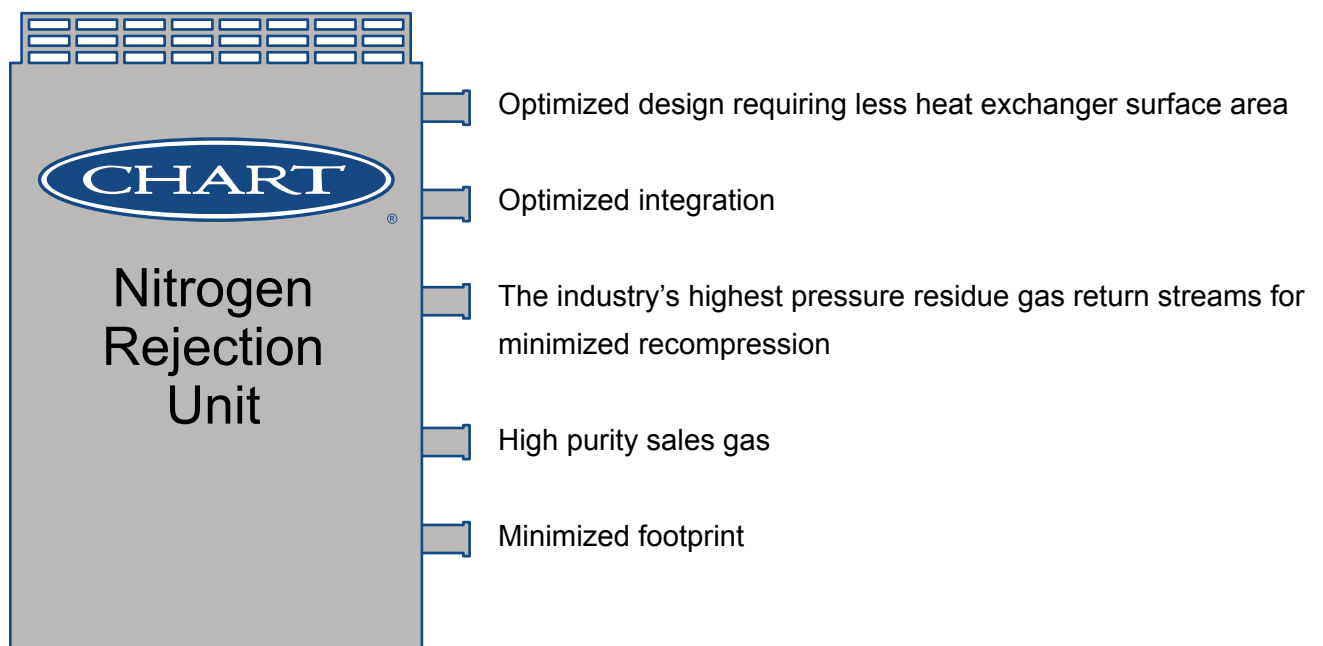
Represent approx. 25% of the world's installed base

Represent approx. 50% of the world's nameplate processing capacity

The world's largest integrated NRU with NGL extraction

Nitrogen has no calorific value and its removal is often required to meet product specifications. Naturally occurring nitrogen is the most common cause of high nitrogen content in natural gas* and Chart's NRU technology is the most economical cryogenic method for separating it. Of all the NRU technologies cryogenic plants have the highest methane recovery rate and are standard practice for plants >15MMSCFD. As the nameplate capacity increases so do the economies of scale.

**According to the Gas Research Institute (GRI), about 17% of the natural gas reserves in the United States cannot be used without nitrogen removal*



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