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 LPI 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

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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’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
- Minimized footprint
- High purity sales gas
- Optimized design requiring less heat exchanger surface area
- Optimized integration
- The industry’s highest pressure residue gas return streams for minimized recompression
- High purity sales gas
- Minimized footprint

Why Chart?
- Extensive, proven and demonstrated 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 10MMSCFD to >900MMSCFD of feed gas
- Inlet nitrogen concentrations from 2% 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 fracionator 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 C₃+ hydrocarbons in the inlet feed.
- Permits high recovery of crude helium

Helium is a scarce commodity and generates substantial revenue.
With a Chart Integrated plant solution up to 90% helium recovery is feasible.
Gas monetization opportunities arise via helium recovery in NGL extraction, LNG and/or LIN production

An integrated system provides significantly reduced energy consumption versus separate NGL recovery and NRU.
Chart’s integrated NRU/NGL plant solutions recover up to 85% of the ethane and virtually all of the propane and heavier hydrocarbons.

There is often local demand for liquid nitrogen.
Chart’s flexible BAHX design permits the production of refrigeration grade nitrogen.

Dissolved for LNG is at a premium as it is clean burning and enjoys a substantial price advantage versus distillate fuels.
Chart’s process technology reduces the nitrogen content in feed gas to <2% to meet the most stringent LNG product specifications.

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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- Permits high recovery of crude helium
- Permits higher concentrations of CO2 and C4 and lower pressures
- Permits higher concentrations of CO2 and C4 hydrocarbons in the inlet feed
- Optimum process technology for separating helium from natural gas*

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**NRU**

- There is often local demand for liquid nitrogen.
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**NGL**

- There is often local demand for liquid natural gas.

**LIN**

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**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

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