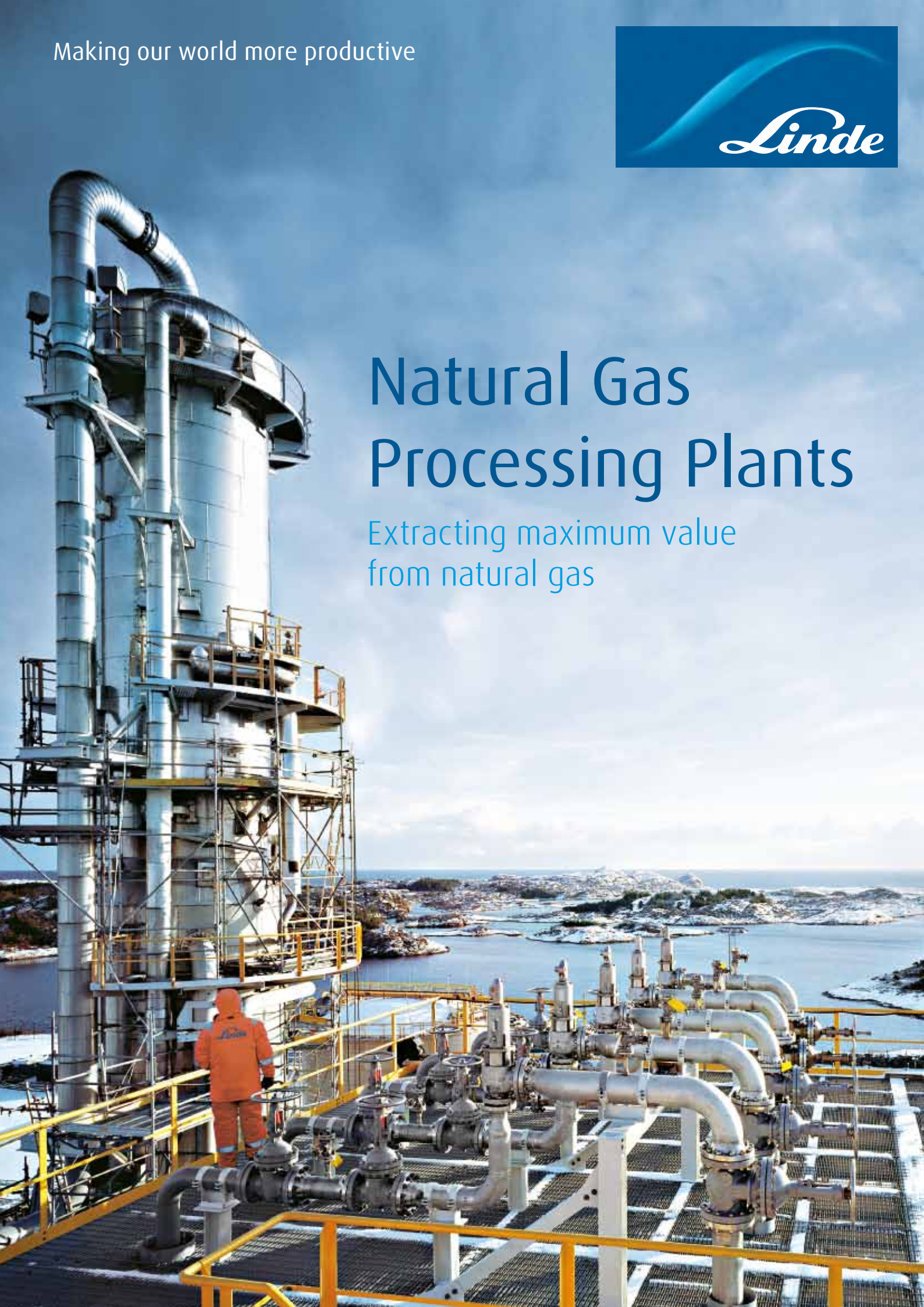
Making our world more productive



Natural Gas Processing Plants

Extracting maximum value from natural gas

Contents.

Introduction.

Natural gas is a valuable source of clean energy and a useful feedstock for many chemical processes. Before it can be used for these applications, however, it must be processed to separate and recover the valuable components contained in the gas and then transport it cost-effectively over long distances.

+4,000

plants have been delivered by Linde around the globe.

Extracting maximum value from natural gas

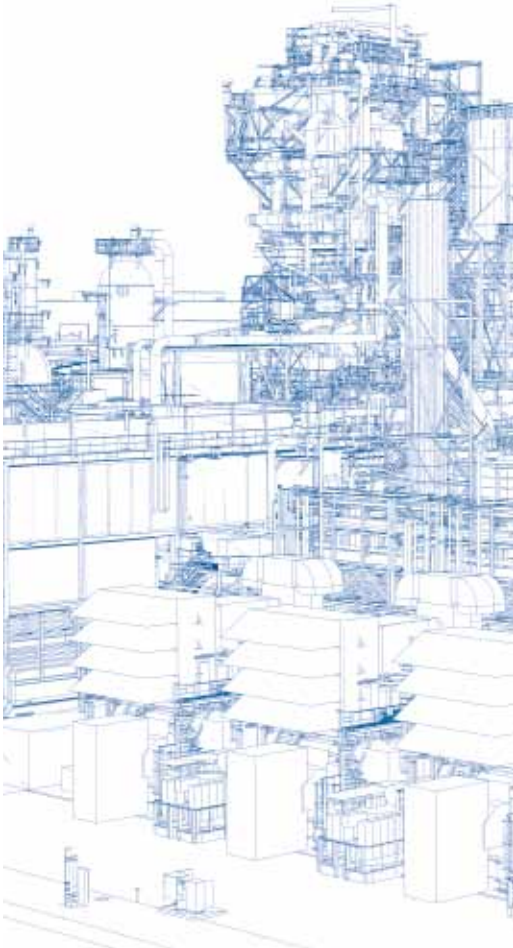
Natural gas contains various components, some of which have a higher value than the actual natural gas mixture. So it makes economic sense to extract and fractionate natural gas liquids (NGL), liquefied petroleum gas (LPG), condensate and pure components such as methane, ethane, propane and butane. This is typically done in cryogenic processing plants tailor-made or standardised in accordance with local market and customer requirements.

Proven expertise across the entire natural gas value chain

Linde Engineering has vast, proven experience in the project development, planning and execution of turnkey customised and standardised natural gas processing plants. In fact, our expertise extends along the entire natural gas processing chain, starting with feasibility studies through pre-FEED (front-end engineering design) and FEED services to detailed engineering and turnkey plant construction. The cryogenic equipment such as plate-fin heat exchangers, coil-wound heat exchangers or cryogenic expanders at the heart of these plants is manufactured at our specialised, in-house workshops.

Maximising customer value every step of the way

Having successfully built more than 4,000 plants worldwide, Linde Engineering combines a track record in engineering excellence with the latest digitalisation innovations to maximise efficiencies at all stages of your project lifecycle. Through this extended portfolio, Linde continues to add value to your operations long after we have completed construction of your gas processing plant.



Components and pretreatment of natural gas.

+70

sour gas removal units built by Linde Engineering over the last 25 years.

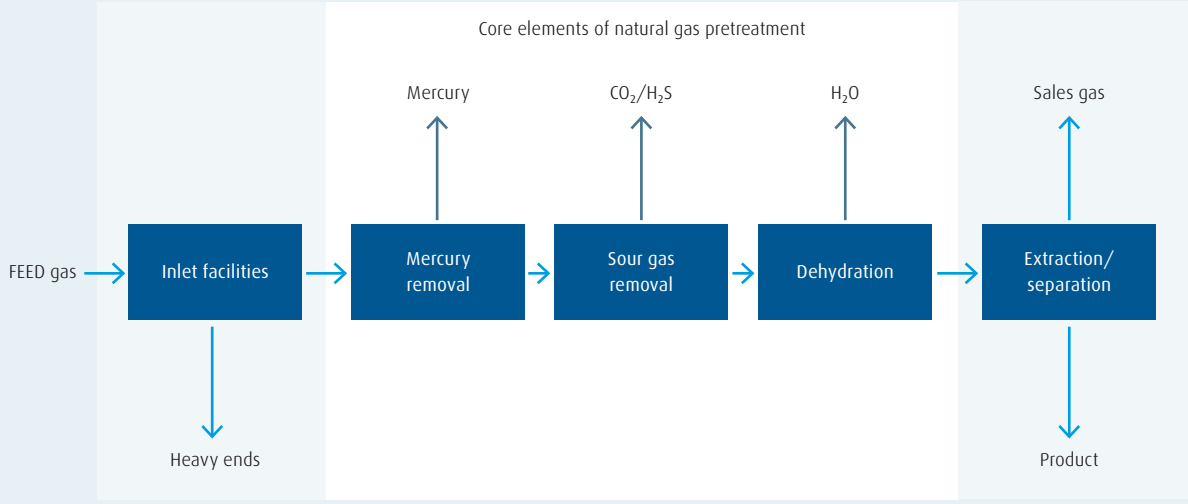
Composition and applications of natural gas

Natural gas is a mixture of gases, with hydrocarbons representing the largest share. It is colourless and odourless in its pure form. It is the cleanest of all fossil fuels, releasing less carbon dioxide when burnt. It is also an important feedstock for fertilisers and petrochemicals.

Natural gas pretreatment

Natural gas pretreatment typically consists of mercury removal, gas sweetening and drying. Drying of the wet natural gas is typically performed at the pretreatment stage in molecular adsorbers. Depending on the downstream processing steps and the concentration of the sour gas components, it may also be necessary to remove hydrogen sulfide (H_2S) (referred to as sour gas sweetening) and carbon dioxide (CO_2) from the natural gas. Scrubbing processes such as MDEA, Benfield or SULFINOL are used for this step. If the sour gas content is low, the sour components and water can be removed by means of adsorption. Mercury guard beds are recommended to protect people and equipment.

Pretreatment of natural gas



Natural gas processing

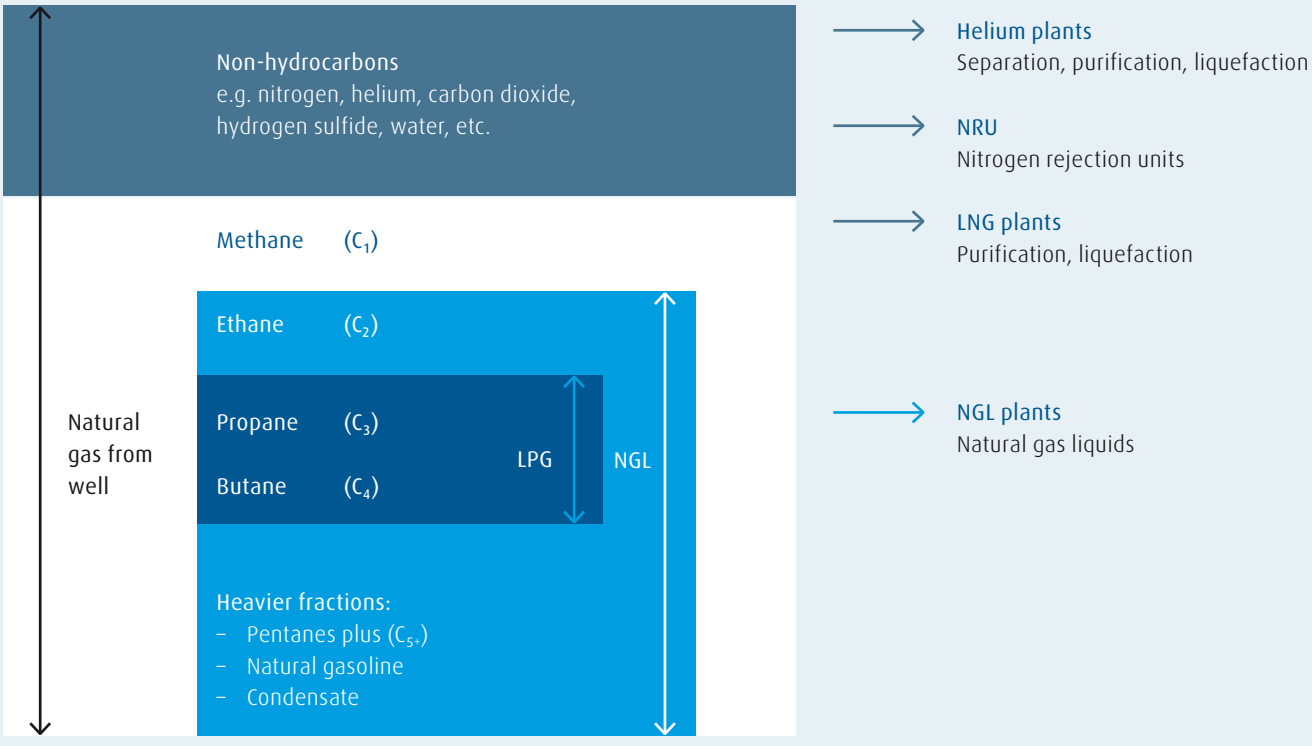
Cryogenic processes are the most economical method for breaking natural gas down into its constituent components. Nitrogen is removed from natural gas to reduce transportation volumes and to increase its heating value. If helium is present in the natural gas mixture, it is also removed at this stage. Cryogenic and pressure swing adsorption process steps are combined to recover high-purity helium.

Condensate, also known as the C_{5+} fraction, is the heaviest fraction in natural gas. It can be used, for instance, as gasoline or steam cracker feedstock. Often, it is necessary to remove this fraction from natural gas mixtures to meet the dew point specifications of pipeline gas.

Nitrogen removal can be combined with helium removal (assuming helium is present). High-purity helium is produced by the combination of cryogenic and pressure swing adsorption process steps.

NGL, LPG, condensate and pure components (methane, ethane, propane and butane) are extracted and fractionated in tailor-made processing plants. We have vast experience in the design and delivery of customised, turnkey plants for all pretreatment, separation and extraction steps.

Typical components of NG and related processing plants



World-scale, tailor-made LPG plants.

Linde offers adsorber process with guaranteed recovery rate of

99.9%

Extraction of hydrocarbons

Due to their added value, heavier hydrocarbons are often extracted from natural gas and fractionated by means of several processing steps.

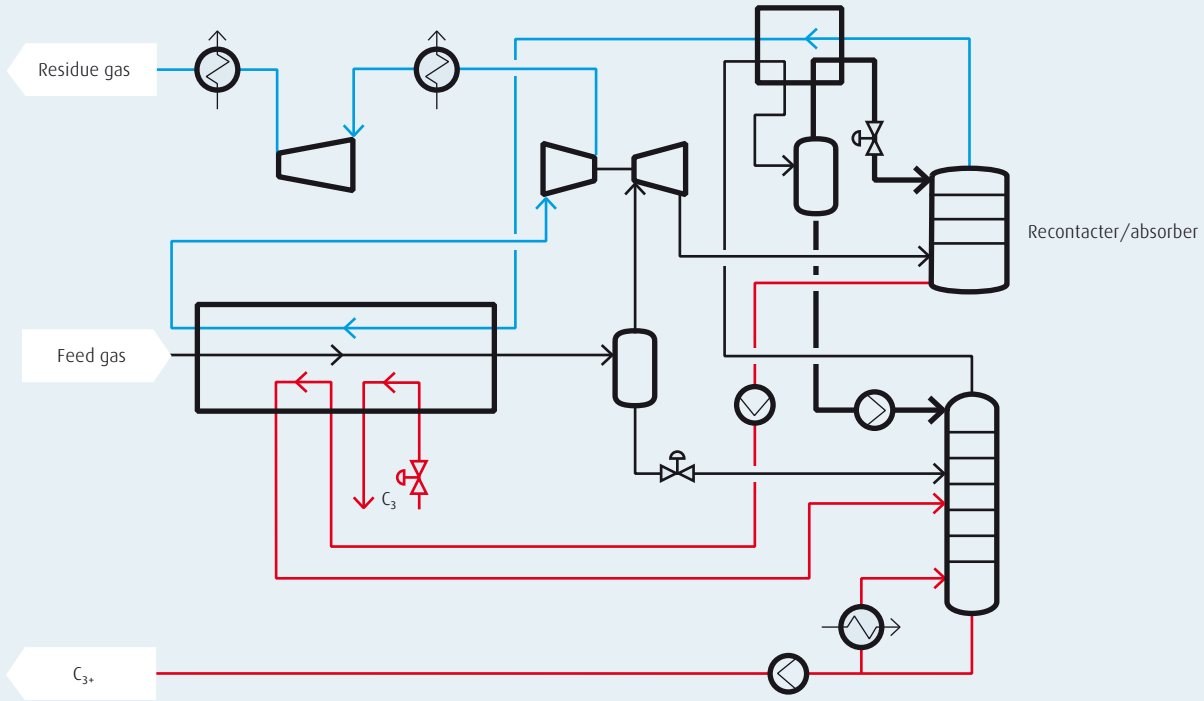
Maximising recovery rates

Liquefied Petroleum Gas (LPG) is widely used as an alternative fuel for cars or as a chemical feedstock. It consists of propane and butane (C_3/C_4).

Linde offers an absorber process enabling recovery rates as high as 99.9% for LPG/C_{3+}. Highlights include low specific energy consumption and a higher CO_2 tolerance in the feed gas compared with conventional expander processes, which reduces the effort for CO_2 separation.

To achieve these high C_3 recovery rates, we implement an absorber column upstream of the de-ethaniser. Here the feed gas is scrubbed with a light hydrocarbon reflux coming from the top of the de-ethaniser. LPG is separated from the heavier hydrocarbons downstream of the de-ethaniser using a distillation column.

LPR (Low-Pressure Recontacter) process for C_{3+} extraction



References for LPG/C_{3+} recovery plants.

Natural gas liquefaction plant in Constanta (Romania)

Client	Petrom S.A. (member of OMV Group)
Process	Cryogenic turbo expander process
Capacity	Feed gas 160,000 Nm^3/h
Scope of work	Basic and detailed engineering, procurement, construction, start-up supervision
Start-up	2009

Natural gas separation unit in Kollsnes (Norway)

Client	Troll Group
Process	Cryogenic turbo expander process
Capacity	Feed gas 1,061,700 Nm^3/h Sales gas 984,000 Nm^3/h C_{3+} 1,000,370 t/a
Scope of work	Basic and detailed engineering, procurement, construction, start-up supervision
Start-up	2004

World-scale, stick-built NGL plants.

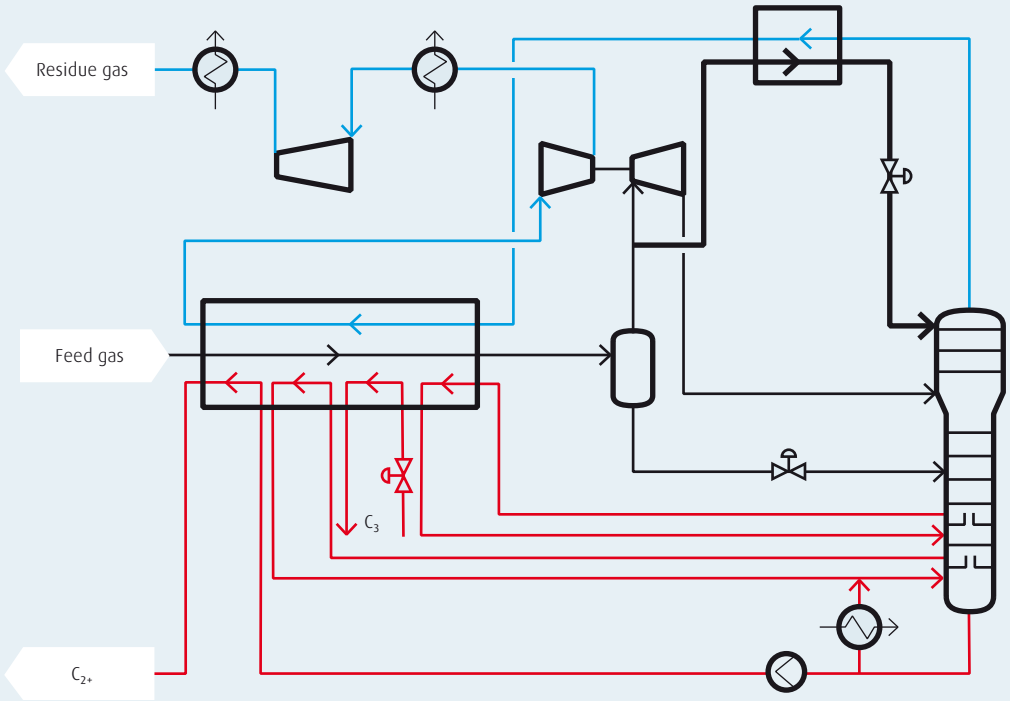
Minimising lifecycle costs

NGL consists of ethane and heavier hydrocarbons (C_{2+}) and constitutes an ideal feedstock for steam crackers producing olefins. It has a higher sales value than pipeline gas, making its extraction financially appealing.

Linde Engineering offers a proven expander process enabling recovery rates of up to 98% for NGL/C_{2+}. This cryogenic process utilises an expander to provide the refrigeration duty, which is necessary for the partial liquefaction of natural gas upstream of distillation.

Highlights include the use of internal refrigeration, using the high feed gas inlet pressure via turbo expander to the maximum extent possible in order to minimise or even eliminate the need for external refrigeration. Typically, leaner feed gases do not require external refrigeration. This lowers your investment and lifecycle costs to the greatest possible extent.

GSP (Gas Subcooled Process) for C_{2+} extraction



References for NGL/C_{2+} recovery plants.

C_{2+} recovery plant in Asaluyeh (Iran)

Client	Pars Petrochemical Company (PPT)	
Process	Propylene pre-cooled turbo expander process	
Capacity	Feed gas	3,000,000 Nm^3/h
	Sales gas	2,700,000 Nm^3/h
	Ethane	1,700,000 t/a
	Propane	980,000 t/a
	Butane	570,000 t/a
	Gasoline	86,000 t/a
Scope of work	Process design, basic & detailed engineering, procurement, commissioning, training	
Start-up	2005	

Marun ethylene plant in Bandar Imam (Iran)

Client	National Petrochemical Company	
Process	Propane pre-cooled turbo expander process	
Capacity	Feed gas	977,700 Nm^3/h
	Sales gas	813,000 Nm^3/h
	C_{2+}	1,909,000 t/a
Scope of work	Process design, basic & detailed engineering, procurement, commissioning, training	
Start-up	2005	

Gas processing plant in Svobodny (Russia)

Client	Gazprom	
Process	Combined NGL/ NRU and helium recovery	
Capacity	Feed gas	6 x 875,000 Nm^3/h
Scope of work	Engineering, procurement, start-up supervision	
Start-up	Expected 2020	

Amur gas processing plant.
Showcasing Linde's expertise.

Our proven experience across the entire natural gas processing chain inspired Gazprom, Russia's largest oil and gas company, and its general contractor NIPIgas to select Linde Engineering to help it build what will be one of the world's largest gas processing plant complexes. The complex is part of Gazprom's project to supply Russian gas from eastern Siberian gas fields to China via the 'Power of Siberia' pipeline. This Amur Gas Processing Plant (Amur GPP) is being constructed in five phases, scheduled for completion at the end of 2024.

Linde has been contracted to engineer and supply units for ethane and natural gas liquids (NGL) extraction, for nitrogen rejection, and for helium purification, liquefaction and storage. The NGL/NRU unit is designed for a feed gas processing capacity of 7 billion standard cubic metres per year (~875,000 Nm^3/h) and consists of four sections:

- NGL recovery unit
- Nitrogen/helium rejection unit
- Heat pump unit
- De-ethaniser unit

The helium purification and liquefaction unit is designed for an annual liquid helium production capacity of 20 million Nm^3.

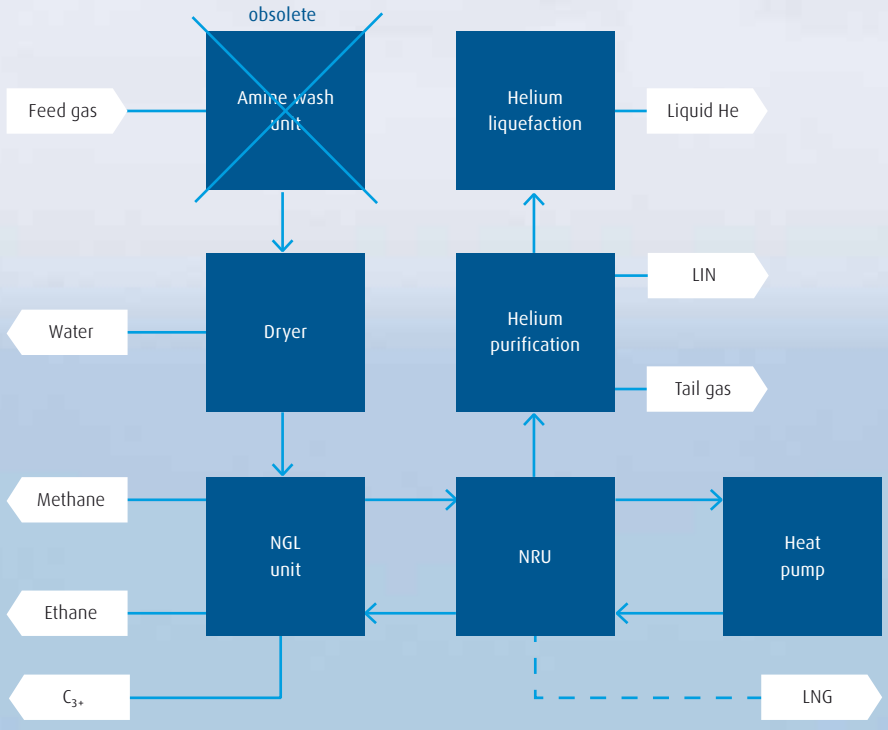
Engineering highlights include a CO_2-tolerant design plus an integrated NGL/NRU. In other words, concentrations of up to 0.5 percent of this otherwise problematic gas can now be tolerated in the natural gas stream without any risk of harmful solid deposits. The concept behind this new solution is ingeniously simple. The diluted CO_2 is maintained in a temperature range that is warm enough to prevent it from freezing. It may then remain within the final natural gas stream, where it is of no consequence in low concentrations.

In addition, the plant can handle feed gas with 8 mole% nitrogen. The treated gas is exported to China with a nitrogen content of less than 2 mole%. The plant also produces liquid helium with 99.9995 mole% purity, ethane and C_{3+}.

Design features:

- Feed gas with 8 mole% N_2 and 0.5 mole% CO_2
- Sales gas exported to China with N_2 content of less than 2 mole%
- Ethane and C_{3+} product
- Liquid helium grade 5.5 with 99.9995 mole% purity
- Integrated NGL/NRU
- CO_2-tolerant design

Simplified block diagram of CO_2-tolerant Amur gas processing plant



CRYO-PLUS™ proprietary technology for standardised mid-scale NGL plants.

Working with a number of refineries in a bid to solve their excess fuel gas problems, Linde Engineering North America developed the innovative CRYO-PLUS process in connection with a modular NGL plant concept. In contrast to the typically tailor-made world-scale plants like the Amur Gas Processing Plant, this concept applies standardised solutions which allow for low CAPEX and faster time to market. It is ideal for processing low-pressure refinery off-gas streams.

This patented process provides unparalleled recovery rates for ethylene, ethane, propylene and propane. The incremental recovery of olefins such as ethylene, propylene and butene means that more feedstock is available for alkylation and polymerisation.

CRYO-PLUS also improves the recovery of heavier hydrocarbon liquids such as C_{2+}, thus allowing gas processors to meet the heating value requirements for natural gas while boosting their bottom line. The ethane and heavier hydrocarbons recovered become valuable feeds for crackers producing olefins, and subsequently for polyethylene and polypropylene plants. CRYO-PLUS also results in an overall increase in the production of high-octane, low-sulfur gasoline.

Higher recovery with less energy

Designed to be used in natural gas or shale gas applications, the patented CRYO-PLUS process requires less energy to recover more ethane and heavier components than traditional liquid recovery processes. It operates with a lower inlet pressure while maintaining the same product discharge pressure.

Greater flexibility

CRYO-PLUS provides more robust and flexible performance over a wide pressure range and feed composition envelope. This feature is especially important for the treatment of wet shale gas, known for its marked compositional variability over time.

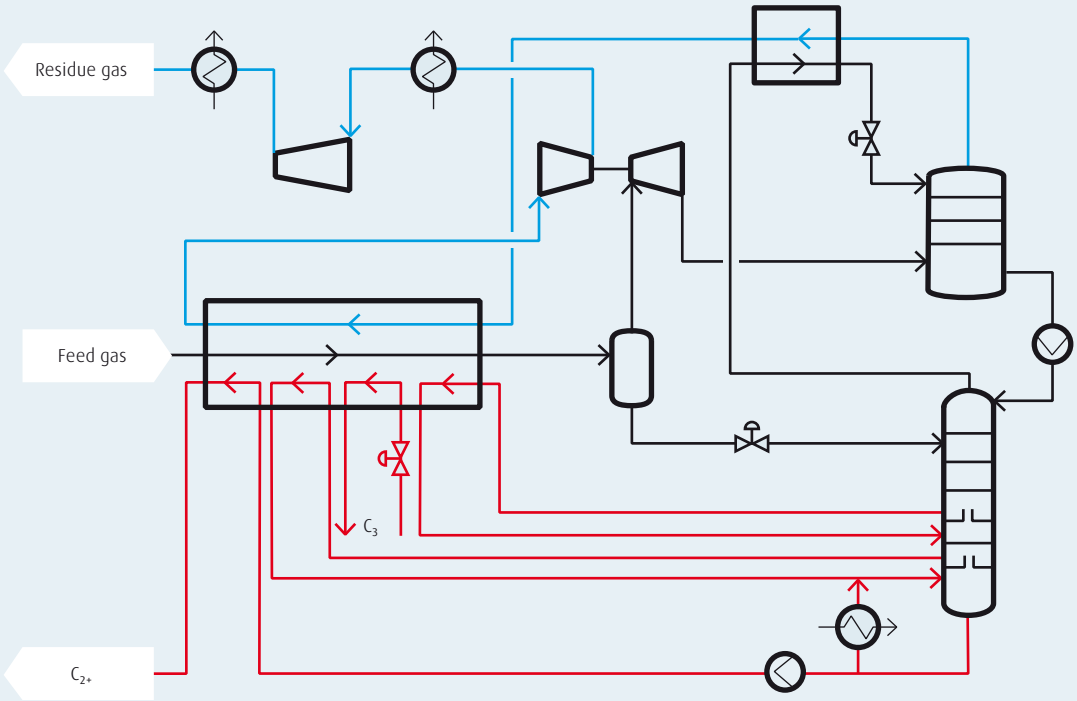
In addition, CRYO-PLUS provides a high level of ethane recovery in ethane recovery mode, and a high level of propane recovery in ethane rejection mode. The process can quickly and easily change between the two modes of operation.

Proven performance

To date, over twenty CRYO-PLUS recovery systems have been installed globally, offering return on investment within as little as one year in some instances. More than fifteen of these systems were designed for recovery of propylene, propane and heavier hydrocarbons. CRYO-PLUS has been successfully deployed for the recovery of ethylene, ethane, C_2 and C_{3+} hydrocarbons in both refineries and natural gas plants.

"CRYO-PLUS™ is a process to recover ethylene, ethane, propylene, propane and heavier components with less energy than traditional hydrocarbon liquid processes."

CRYO-PLUS™ recovery process for C_{2+} extraction



90%

of typical technical project requirements are covered by standard documents.

"Reducing costs and downtime by building units off-site."

Modular plant construction

On-site construction of gas processing plants presents a number of logistical and timeline challenges. To overcome these challenges, we have developed a range of modularised plant solutions – all designed to accelerate construction timelines and reduce cost.

Faster time-to-solution

Fabrication in the field means that workers are exposed to the elements. Adverse weather conditions can compromise quality and timelines. Linde's skilled and experienced engineering team can work in a controlled environment at one of the finest fabrication facilities in the US. This enables them to meet delivery deadlines – to ISO 9001 quality standards – regardless of the weather.

Greater safety and less downtime

On-site construction work in the vicinity of operational equipment carrying high-pressure hydrocarbons increases occupational safety risks. In addition, the cost of downtime to enable construction work to proceed can have a big impact on total project costs.

A controlled environment increases worker safety while also eliminating the risk of human error and unnecessary plant downtime. On completion, we transport the prefabricated and pre-assembled system to your site, where a small crew quickly and safely installs the equipment.

Module fabricated at Linde's workshop in Port of Catoosa, Oklahoma, USA.

References for CRYO-PLUS™ NGL plants.

Cryogenic natural gas plant

Client	Williams
Process	CRYO-PLUS™
Capacity	450 MMSCFD (~500,000 Nm^3/h)
Scope of work	Engineering, procurement, construction management (EPCM)
Start-up	2009

Cryogenic natural gas plant

Client	Williams
Process	CRYO-PLUS™
Capacity	350 MMSCFD (~400,000 Nm^3/h)
Scope of work	Engineering, procurement, construction (EPC); turnkey lump sum (TKLS)
Start-up	2000

Cryogenic natural gas plant

Client	Devon Energy
Process	CRYO-PLUS™
Capacity	200 MMSCFD (~220,000 Nm^3/h)
Scope of work	Engineering, procurement, construction (EPC); turnkey lump sum (TKLS)
Start-up	2002

StarLNGL™ – LNG co-production for NGL plants.

"Less capital expenditure compared with stand-alone LNG solutions."

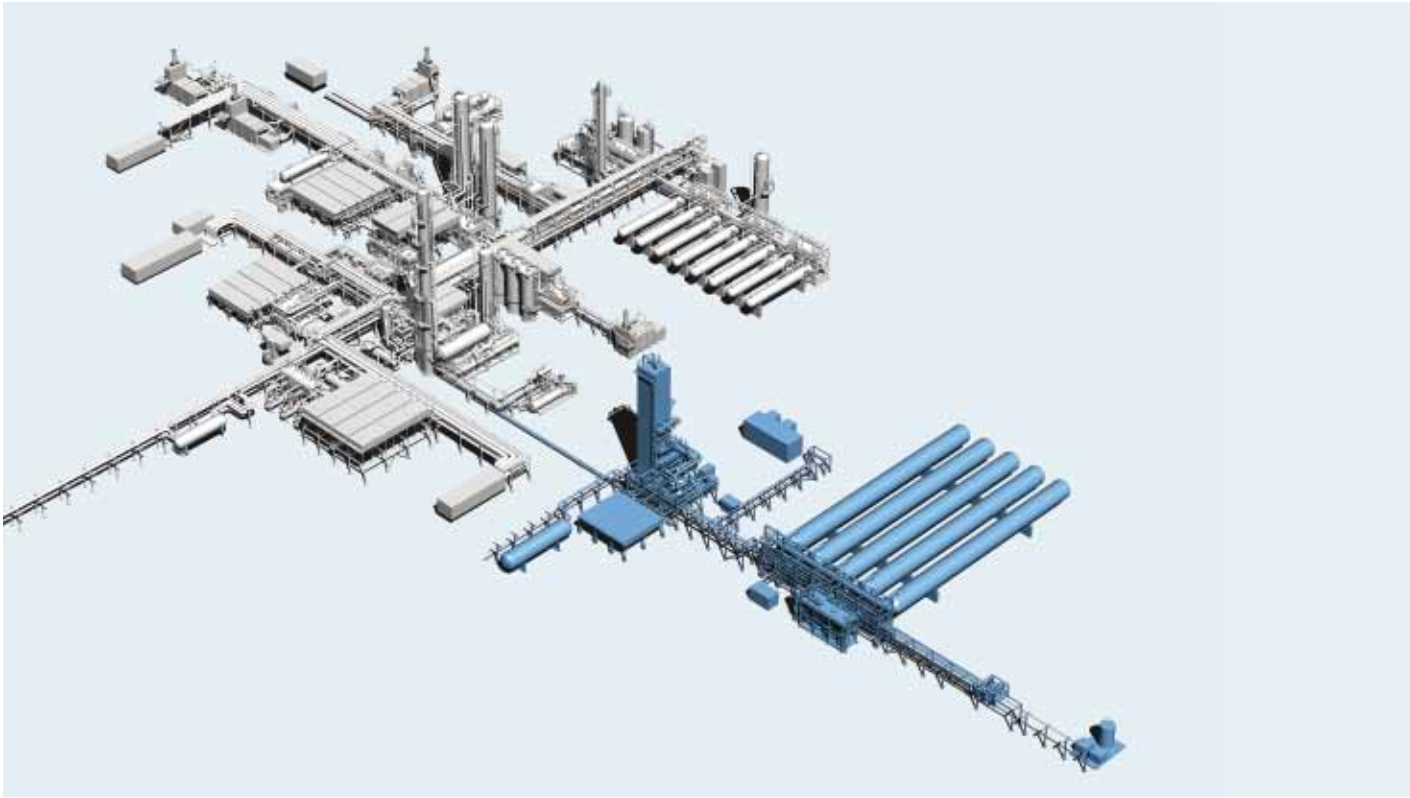
StarLNGL, our integrated Liquefied Natural Gas (LNG) and Natural Gas Liquids (NGL) technology, uses proven design concepts to enhance LNG production in existing and new mid-scale NGL recovery plants. As part of the StarLNG family, StarLNGL builds on our worldwide experience across the entire LNG value chain. StarLNGL can be used with a variety of NGL recovery technologies including CRYO-PLUS, GSP and RSV. Compared with a stand-alone LNG plant, the integrated StarLNGL solution provides the following benefits:

- No impact on availability or reliability of the NGL recovery plant
- Same or higher levels of ethane and propane recovery
- Less capital expenditure compared with stand-alone LNG solutions
- Highly efficient process
- Shared maintenance
- Lower operating cost

This concept utilises the heat integration of the NGL plant by taking a portion of the cold vapour stream from the recovery column, thus improving the efficiency of the LNG and NGL units.

Technology highlights include:

- Cold vapour feed to the StarLNGL unit
- Minimum tie-ins to existing NGL unit required
- On-spec LNG ethane and propane recovery
- Standard refrigeration technology
- Refrigeration options include no hydrocarbon storage
- Compact rotating equipment design



Natural gas liquefaction plant, Melkøya, Norway.

Complementary technologies and services.

Rounding out our offering of world-scale, tailor-made LPG plants, our stick-built NGL plants and our leading mid-scale modular NGL plants, we also offer a range of complementary technologies and services to meet all of our customers' processing needs and maximise efficiencies at all stages of the solution lifecycle.

Extraction of non-hydrocarbons

Natural gas is a mixture of gases, with hydrocarbons being the main component. However, raw natural gas also frequently contains the inert gas nitrogen. Nitrogen lowers the heating value of natural gas and increases transport volumes. Pipeline specifications for nitrogen vary. Typically, however, no more than 3–4% nitrogen is allowed in most specifications.

LNG should not contain more than 1% nitrogen to avoid storage problems. Some state-of-the-art, world-scale LNG plants thus feature a nitrogen rejection unit (NRU) for the safe and economical rejection of nitrogen. This is required, for instance, if surplus nitrogen cannot be sent to gas turbines. Not only does the rejection of nitrogen reduce transportation volumes, it also increases the heating value of LNG.

Alternatively, an NRU can be used to recover methane from tank return or end-flash gas. It is also considered economical to remove nitrogen from low-BTU (British Thermal Unit) gas to either allow for liquefaction or to avoid unnecessary flaring and resulting air pollution. Gas with a low heating value needs to be treated before it can be fed into the grid with the required Wobbe index.

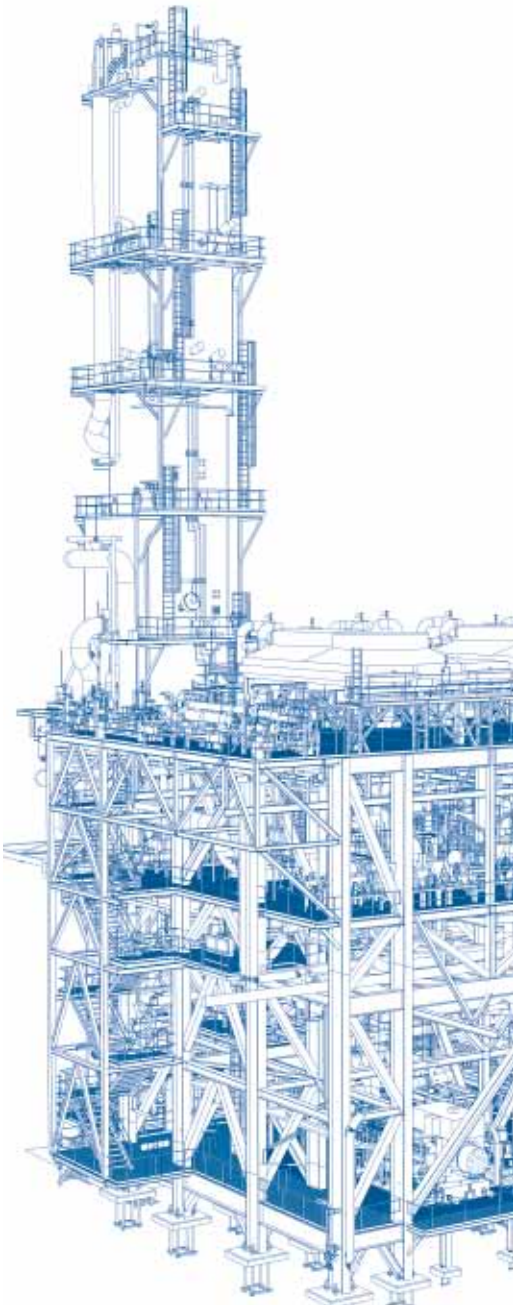
Tailored nitrogen rejection technology

We offer nitrogen rejection units with tailored process technology to ensure the highest levels of cost and operational efficiency. Our portfolio includes designs with single columns, single partitioned columns, double columns and double columns with enrichment processes, with configurations tailored to the individual composition of the gas.

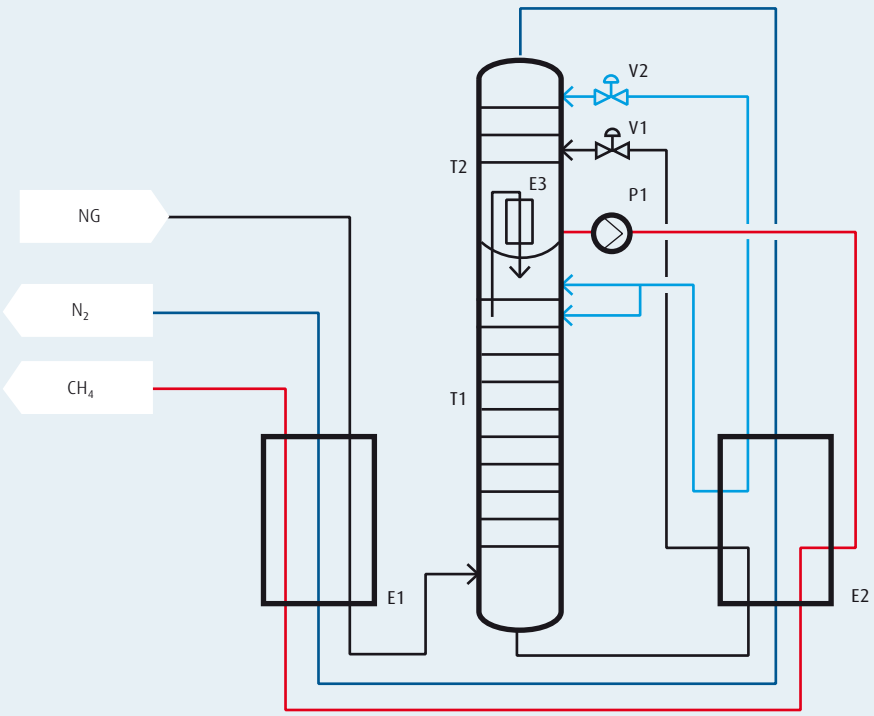
Typically, we recommend the double column process as this maximises heat integration. Depending on the nitrogen content of the feed gas, an additional enrichment column may be included upstream of the actual removal process to increase efficiency further.

< 1%

concentration of nitrogen in liquid natural gas for storage or transport.



NRU double-column process



Helium recovery and liquefaction plants

Helium is a rare gas and highly valued in the market, making its recovery – even in small amounts – from natural gas and subsequent liquefaction an attractive option. It is used, for example, in the space industry, MRI and NMR equipment (superconducting magnets), welding and shielding processes, lasers and optical fibre manufacturing.

So, if helium is also present in the natural gas stream, nitrogen rejection is typically combined with the recovery of helium.

We offer field-proven processes and plants for the cryogenic recovery of raw helium from natural gas, the purification of the raw helium in pressure swing adsorption (PSA) units, the liquefaction and production of high-purity helium (>99.999%) and its storage at temperatures of around –270°C. Our technologies cover each step in the helium value chain, enabling us to offer complete plants on a turnkey, lump-sum basis. Our wide range of process technologies is tailored to the capacity and helium concentration in the feed gas for optimum recovery results.

More information:
linde-engineering.com/nru

References for NRUs and helium plants.

NRU and helium recovery in Svobodny (Russia)

Client	Gazprom
Process	Combined NGL/NRU/He
Capacity	Feed gas 6 x 875,000 Nm^3/h
Scope of work	Engineering, procurement, start-up, supervision
Start-up	Expected 2020

NRU and helium recovery in Karratha (Australia)

Client	Woodside Burrup Pty. Ltd.
Process	Combined NGL/NRU/He
Capacity	Feed gas 78,000 Nm^3/h
Scope of work	Basic engineering, detail engineering, procurement, module construction, start-up assistance
Start-up	2010

N_2 removal in LNG plant in Hammerfest (Norway)

Client	Snøhvit Group
Process	N_2 expander with coldbox
Capacity	Feed gas 71,400 Nm^3/h
Scope of work	Basic engineering, detail engineering, procurement, construction, construction supervision, start-up, supervision
Start-up	2007

NRU integrated in a helium plant in Skikda (Algeria)

Client	Helison S.p.A., Skikda
Process	N_2 removal in He recovery plant
Capacity	Feed gas 47,000 Nm^3/h
Scope of work	Basic engineering, detail engineering, procurement, construction, construction supervision, start-up, supervision
Start-up	2005


Linde
Linde

Innovating service delivery through digitalisation.

We combine the experience and hands-on insights we have gained through our engineering and operational references with the latest digitalisation technologies to create truly innovative customer experiences.

We have been rolling out digital technologies across all business lines for a number of years now, as evidenced by the five Remote Operation Centres (ROC) tasked with the remote management of around 1,000 industrial plants around the world. We are using the huge trove of digital data that we already possess to accelerate the development and delivery of new products and services for our customers.

For example, thousands of sensors in hundreds of Linde plants across the globe have been gathering extremely detailed data on the status and health of components for many years now. We are using this information to develop predictive maintenance capabilities that allow us to accurately predict when a component is likely to fail so we can take appropriate action. This information can also be channelled into the optimisation of component design.

Virtual training platform

Our gold mine of digital data includes detailed CAD files for every project we have executed. We use this data to create impressively detailed 3D simulations of large-scale plants, known as "digital twins". A virtual reality application uses these "digital twins" to train operators before a plant has even been constructed. This VR application can also be used to visualise design changes during the planning phase. Operators of what will be one of the world's largest gas processing complexes can already take a virtual tour of the plant in Amur, for instance. All they need is a VR headset, a laptop and a hand-held controller, and they can explore all of the module's platforms and study its valves and compressors from every angle. They can even step inside process components such as heat exchangers and coldboxes – so they are thoroughly familiar with the plant's inner workings by the time it goes on stream.

This service means that plant operators can accelerate the start-up process on completion of the plant as the staff is ready to spring into action. It can also save operators millions by ensuring that staff are trained to deal with critical or dangerous situations before they even arise. In addition, virtual training avoids unnecessary travel expenses to attend classroom-based training courses. Looking beyond the logistical benefits, studies indicate that VR technology makes the learning process 15 times more effective than classroom-based training, with learning curves accelerating by 33 percent.

"Up to 15 times more effective than classroom training."

Emerson study

Top-to-bottom competence for your peace of mind.
LINDE PLANTSERV™

"All-round, full-lifecycle support for your plant – from training and parts management to repairs and revamps."

Performance you can trust

With our LINDE PLANTSERV™ portfolio, we deliver a broad range of services spanning every step in the plant lifecycle – from operational support through maintenance and repairs to modifications and revamps. You can even rely on LINDE PLANTSERV for complementary services such as training and spare parts management – delivered through innovative digital platforms for maximum convenience.

TCO optimisation

Not only does LINDE PLANTSERV give you a single point of contact for all your service, maintenance and modernisation needs, it also helps to minimise your total cost of ownership (TCO). Looking beyond the initial upfront investment, which our experienced engineers have already optimised through cost-effective technologies, modularisation and global sourcing capabilities, LINDE PLANTSERV focuses on also reducing your running costs.

Experience has shown that operating costs account for the lion's share of total outlay. Although energy costs play a large role here, so too do downtime, maintenance work, repairs and spare parts management. Regular maintenance, predictive repairs, timely modernisation and efficient spare parts management can reduce both the time and cost involved in maintaining smooth operations.

LINDE PLANTSERV portal

LINDE PLANTSERV portal is a key building block in our PLANTSERV portfolio. Designed to help you keep your plant up and running, this hub bundles all spare parts management processes in one, easy-to-use app. With this e-marketplace, you can find, check and order spare parts, plan turnarounds and manage maintenance activities and repairs more quickly, efficiently and easily than you ever imagined possible. Highlights include a parts verification service, which draws on the vast experience we have gained managing over 1,000 plants, and the ability to create a "digital twin", which documents every component that has ever been replaced, modified or updated throughout the entire lifecycle of your plant.

More information:
http://portal.linde-plantserv.com/

Execution excellence – every step of the way.

+1,000

coil-wound heat exchangers manufactured.

At Linde, we have a strong focus on and excellent track record in quality, health, safety and environmental (QSHE) protection. This has always been a top priority when planning and building our plants all over the world.

Long-standing experience in cryogenic plant design

We have a large engineering and project execution workforce for the implementation of engineering, procurement and construction (EPC) projects worldwide. Project managers with extensive experience in complex multinational/multi-partner projects supported by advanced tools and methods for project control are the best way to ensure the success of your project. We have gained vast experience with modularisation concepts during the many EPC turnkey, lump-sum contracts we have successfully executed.

Delivery of world's largest coldbox weighing 800 tonnes for Jamnagar, India.

Manufacturing excellence – made in-house

We design and manufacture all key and proprietary cryogenic components required for NG plants in our own fabrication workshops. The fact that the plant and process engineering as well as the manufacturing team are integral parts of one company ensures your project is seamlessly executed.

Our in-house manufacturing expertise brings a range of benefits to our customers around the world, including lowest total cost of ownership, timely deliveries, best-in-class fabrication expertise, strict quality control and ongoing optimisation through digital feedback.

Key components for NG plants manufactured in house include:

- Coil-wound heat exchangers (CWHEs) & plate-fin heat exchangers (PFHEs) Linde Engineering is the only manufacturer to specialise in both types of cryogenic heat exchanger typically deployed in industrial-scale LNG plants – coil-wound and plate-fin models – both produced at our Schalchen (Germany) plant
- Cryogenic pumps, manufactured by Linde Group member Cryostar; highlights include submerged cryogenic pumps to export LNG from storage tanks to regasification or filling stations
- Coldboxes
  Also manufactured at our Schalchen plant, our coldboxes scale from pre-packaged, pre-tested models that are ready to operate to customised equipment assembled on site
- Expanders
  Also manufactured by Linde Group member Cryostar – world quality leader in radial inflow expansion turbine technology, pumps and LNG boil-off gas compressors, having also developed a range of small-scale LNG or liquid biogas plants for on-shore natural gas or biogas liquefaction projects


Linde
making our world
more productive

Commissioning, training and customer service

Skilled commissioning teams on site ensure smooth start-up and hand-over of the plant to your team. And our support does not stop when your plant goes on stream. Our service specialists spanning every engineering discipline will readily answer any requests you may have. They also support plant modifications and revamps, maintenance and repair, spare parts, operational support such as troubleshooting, immediate repairs, expert reviews for plants as well as operator training over the entire lifecycle.

Global sourcing and localisation

Worldwide staffing and training, global procurement and fabrication capabilities and a broad partner ecosystem bring maximum flexibility to your project.

Profitability matters

Worldwide staffing and training, global procurement and fabrication capabilities and a broad partner ecosystem bring maximum flexibility and cost-efficiency to your project. At every stage of the project – from your very first query to turnkey handover – our service-focused engineers are there to support you. You can rely on our team to deliver the project development services you need to make the best investment in natural gas processing technology and maximise your return on that investment.

Talk to our experts today.

Global reach

100+

We are represented in over 100 countries worldwide.

Read more:
linde-engineering.com/nru

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Linde Aktiengesellschaft
Engineering Division, Dr.-Carl-von-Linde-Strasse 6–14
82049 Pullach, Germany
Phone +49 89 7445-0, Fax +49 89 7445-4908
info@linde-le.com, www.linde-engineering.com

Your partner for the production and processing of gases

Delivering reliable process plants for maximum capital efficiency

Linde has been optimizing gas processing technologies for 140 years, successfully delivering more than 4,000 plant engineering projects around the globe. Favoring trusted, lasting business relationships, the company collaborates closely with customers to enhance plant lifecycle productivity and innovate process flows. The company's proven gas processing expertise plays an indispensable role in the success of customers across multiple industries – from natural gas and oil refining through petrochemicals and fertilizers to electronics and metal processing.

Operational excellence along the entire plant lifecycle

We work closely with our customers to gain an in-depth understanding of individual needs. Building on the unique synergies of Linde as an integrated plant operator and engineering company, Linde offers innovative process technologies and services to exceed our customers' reliability and profitability expectations. This commitment to innovation extends along the entire plant lifecycle. The LINDE PLANTSERV® service team supports customers every step of the way – from maintenance and repairs to full revamps. Leveraging the latest digital technologies to offer on-site and remote operational and support services, we consistently take asset performance to the next level.

Making the impossible possible

From the desert to the Arctic, from small- to world-scale, from standardized to customized designs, Linde's engineering specialists develop solutions that operate under all conditions. The company covers every step in the design, project management and construction of gas processing plants and components. Customers can always rely on Linde to deliver the plants, components and services that fit their needs best – anywhere in the world.

Discover how we can contribute to your success at www.linde-engineering.com

Get in touch with our component manufacturing team:
Phone +49 89 7445-3434, inquiry: www.linde-engineering.com/contact

Core competencies at a glance

Plant engineering

- Air separation plants
- LNG and natural gas processing plants
- Petrochemical plants
- Hydrogen and synthesis gas plants
- Adsorption plants
- Cryogenic plants
- Carbon capture and utilization plants
- Furnaces, fired heaters, incinerators

Component manufacturing

- Coldboxes and modules
- Coil-wound heat exchangers
- Plate-fin heat exchangers
- Cryogenic columns
- Cryogenic storage tanks
- Liquefied helium tanks and containers
- Air-heated vaporizers
- Water bath vaporizers
- Spiral-welded aluminum pipes

Services

- Revamps and plant modifications
- Plant relocations
- Spare parts
- Operational support, troubleshooting and immediate repairs
- Long-term service contracts
- Expert reviews for plants, operations and spare part inventory
- Operator training

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