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The Linde Engineering Division is a leading international manufacturer of capital goods and equipment.

Linde’s areas of activity cover design and construction of turnkey industrial plants together with a full range of engineering work for process plants. To date, the Engineering Division has built nearly 4,000 plants and has numerous patents in the Linde name. Extensive engineering know-how accompanied by many years of experience in project management and as a general contractor qualify the Engineering Division as an expert partner in international plant construction. A variety of over-the-fence supply schemes are offered by the Linde Gases Division.
Global engineering and fabrication facilities.

The Linde Engineering Division is a global company that develops technology and plant concepts. The Division’s global engineering and fabrication centres operate under the leadership of the centres of competence in Pullach and Schalchen.
Linde Engineering Division, Pullach, Germany
Headquarters of the Linde Engineering Division, located in Pullach, 10 km south of Munich, approx. 1,900 engineers and other specialists. Global competence centre for air separation plants.
→ Corporate research and development
→ Global product management
→ Sales
→ Basic and detailed engineering
→ Site services

Linde Engineering Dresden GmbH, Germany
Engineering centre for Eastern Europe and CIS with 480 engineers and other specialists.
→ Sales
→ Detailed engineering
→ Site services

Linde Engineering (Hangzhou) Co., Ltd., China
Engineering centre for China and South-East Asia, located 120 km south of Shanghai, approx. 230 engineers and other specialists.
→ Sales
→ Detailed engineering
→ Site services

Linde Engineering Schalchen Plant, Germany
Global competence centre for fabrication, approx. 700 skilled craftsmen and engineers. 80,000 m² floor space. Fabrication of:
→ Coldboxes
→ Rectification columns
→ Structured packing
→ Plate-fin heat exchangers
→ Coil-wound heat exchangers
→ Other plant components

Linde Engineering (Dalian) Co., Ltd., China
Fabrication centre for China, approx. 230 skilled craftsmen and engineers. Total area of 87,000 m² (30,000 m² sheltered). Fabrication of:
→ Coldboxes
→ Rectification columns/condensers
→ Direct contact/evaporation coolers
→ Molecular sieve adsorbers
→ Coil-wound heat exchangers

Linde Engineering India Pvt., Ltd.
Global detail engineering centre, engineering centre for India. Approx. 740 engineers and other specialists.
→ Detailed engineering
→ Site services

Linde Engineering North America, Blue Bell, Pennsylvania, USA
Engineering centre for US and NAFTA, approx. 30 engineers and other specialists.
→ Sales
→ Detailed engineering

Linde Process Plants, Inc., Tulsa, Oklahoma, USA
Engineering centre for US and NAFTA, approx. 240 engineers and other specialists.
→ Sales
→ Detailed engineering
→ Site services

Linde Process Plants, Inc., Catoosa, Oklahoma, USA
Fabrication centre for NAFTA area, approx. 160 skilled craftsmen and engineers. Workshop area with about 15,000 m² (3,250 m² sheltered). Fabrication of packaged air separation plants.
General products.

For production of oxygen, nitrogen, argon and – in some special cases – other rare gases (krypton, xenon, helium, neon) through cryogenic rectification of air. The products can be produced in gaseous form for pipeline supply or as cryogenic liquid for storage and distribution by truck.

Linde has built approx. 3,000 cryogenic air separation plants in more than 80 countries and has the leading market position for air separation plants. This position results from the outstanding technology of our plants together with very reliable and effective contract execution.

**Packaged air separation plants**

are modularly designed cryogenic plants with a production capacity of up to 850 t/d (approx. 25,000 Nm³/h) of oxygen (G0X and LOX) and up to 2,000 t/d (approx. 66,000 Nm³/h) of nitrogen (GAN and LIN). If required these plants can also produce argon. Within the last 20 years, Linde has built approx. 500 packaged air separation plants. For a detailed description please refer to the respective product information.

**LINEX™ air separation plants**

represent a new product line, which transfers the benefits of the successful modular concept from the packaged air separation plant range to the tonnage plant sizes. They have a significant economical advantage compared to fully “tailor-made” plants. The delivery times are substantially shorter and together with a flawless construction, commissioning and start-up very attractive on-stream times can be achieved.

**Tonnage air separation plants**

are plants that are individually designed for the specific demands of our customers. These plants can produce oxygen, nitrogen, argon, krypton, xenon, helium and neon. Daily oxygen production capacities are between 450 tons (13,000 Nm³/h) and 7,000 tons (200,000 Nm³/h). Within the last 20 years, Linde has built approx. 100 tonnage air separation plants.
Longest track record in air separation.

**Superior plants availability**

→ Use of robust plant and component concepts with proven reliability in many Linde plants
→ Highly developed and proven control and redundancy philosophy to guarantee continuous production
→ Long established relationship with well-known and reliable sub-vendors, especially for rotating equipment
→ Design of cryogenic core components by Linde with fabrication in Linde’s own work-shops incorporating Linde’s high standards of quality (certified acc. ISO 9000 and ISO 9001)
Key features.

Maximum efficiency

- Use Advanced engineering tools and methods for process design and optimization
- Optimized efficiency for static and rotating equipment
- Linde advanced process control system for continuous optimization of plant production adjusted to consumer requirements or power costs

Smooth plant operation and maintenance

- Design of plant for robust operation and easy maintenance
- State-of-the-art plant automation system to ensure smooth plant operation and equipment protection automatically without intervention of the operating personnel
- Highly sophisticated advanced process control functions that allow automatic start-up of the plant and fast and easy adjustment of plant production without operator interaction
- Global remote support with direct access to plant control systems by Linde specialists

Protection of health and environment

- Design of all Linde plants worldwide acc. to international safety regulations and recommendations (IEC, OSHA, EIGA, CGA), German safety rules (UVV) and Linde’s own stringent safety standards
- Controlled process with continuous review of plant design to ensure safety of personnel and the environment
- Numerous safety awards received from international authorities
References.

Air separation plant supplying the major industrial complexes in Saudi Arabia.

Customer
Saudi Basic Industrial Corporation (SABIC)

<table>
<thead>
<tr>
<th>Plant</th>
<th>Status</th>
<th>Oxygen [tpd]</th>
<th>Nitrogen [tpd]</th>
<th>Other products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al Jubail 3</td>
<td>in operation since 1993 (turnkey)</td>
<td>1,200</td>
<td>900</td>
<td>argon</td>
</tr>
<tr>
<td>Yanbu</td>
<td>in operation since 1999 (turnkey)</td>
<td>1,200</td>
<td>1,500</td>
<td>argon</td>
</tr>
<tr>
<td>Al Jubail 5</td>
<td>in operation since 2004 (turnkey)</td>
<td>3,200</td>
<td>1,740</td>
<td>argon, krypton, xenon</td>
</tr>
<tr>
<td>Al Jubail 6</td>
<td>contract in 2005 (FOB)</td>
<td>3,600</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Al Jubail 7</td>
<td>contract in 2005 (turnkey)</td>
<td>3,200</td>
<td>1,860</td>
<td>–</td>
</tr>
<tr>
<td>Yanbu 3</td>
<td>contract in 2005 (turnkey)</td>
<td>3,200</td>
<td>1,860</td>
<td>–</td>
</tr>
</tbody>
</table>
The largest multi-train air separation plant in the world supplying nitrogen for enhanced oil recovery in Mexico.

**Customer**

Pemex

- Turnkey project
- 5 trains in operation
- Product capacity of 63,000 t/d nitrogen (17,500 t/d oxygen equivalent)
- Commissioned in 2000
One of the largest steelworks in China supplied with oxygen, nitrogen and argon from Linde air separation plants.

Customer
Wuhan Iron and Steel Company

<table>
<thead>
<tr>
<th>Plant</th>
<th>Status</th>
<th>Oxygen [tpd]</th>
<th>Nitrogen [tpd]</th>
<th>Other products</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/B</td>
<td>commissioned in 1975</td>
<td>690</td>
<td>600</td>
<td>argon, krypton, xenon</td>
</tr>
<tr>
<td>C/D</td>
<td>commissioned in 1982</td>
<td>690</td>
<td>605</td>
<td>argon</td>
</tr>
<tr>
<td>E/F</td>
<td>commissioned in 1992</td>
<td>2,100</td>
<td>1,860</td>
<td>argon, krypton, xenon, helium, neon</td>
</tr>
<tr>
<td>G/H</td>
<td>commissioned in 2004</td>
<td>4,190</td>
<td>4,860</td>
<td>argon, krypton, xenon, helium, neon</td>
</tr>
<tr>
<td>I/J</td>
<td>commissioned in 2006</td>
<td>4,190</td>
<td>4,860</td>
<td>argon, krypton, xenon, helium, neon</td>
</tr>
</tbody>
</table>
Air separation plants for the Pearl GTL project in Ras Laffan, Qatar

Customer
Qatar Shell GTL Ltd. (QSGTL Ltd.)

Design features
Cryogenic air separation, front-end air purification with MS, elevated process pressure, double-column system, internal compression of oxygen

Capacity
Total 30,000 MTD oxygen, 860,000 Nm³/h (eight trains)

Scope of work
Turnkey lumpsum, basic and detail design, manufacture, delivery, construction, erection, commissioning and start-up

Commissioning
in 2010
Shell “Pearl” GTL project 140,000 bpd
The Engineering Division has extensive experience in executing large complex multinational turnkey projects particularly for large petrochemical and LNG plants (e.g. Hammerfest LNG plant: 1.6 million engineering hours, 9 construction sites, 120 suppliers, 19 main subcontractors).

The Engineering Division is the only company that has comprehensive experience in the execution of turnkey contracts for air separation plants in China and in the Middle East.

**Basic engineering**

Process design and optimization with advanced process simulation software OPTISIM (developed by Linde). The process design incorporates features of numerous in-house patents.

Design of plant operation and control using Linde’s own extensive operating experience.

Specification of rotating equipment in cooperation with world renowned subvendors.

**Detail engineering**

Mechanical design using 3D CAD software to establish a complete model of the plant.

Specification of the electrical equipment and design of the power supply networks with specific expertise in large drives (up to 60 MW).

Specification of control system hardware from well-known international automation companies. Programming of control functions using pre-engineered and pre-tested basic control functions.

Implementation of advanced control functions (automatic load change, automatic start-up, automatic product adaptation) using the Linde advanced process control system.
Project management

→ Project managers with extensive experience of complex multi-national/multi-partner projects
→ Advanced tools and methods for project control (scheduling, cost control)
→ Reliable tools, methods and procedures for global sourcing and material logistics

Construction

→ Extensive experience of turnkey projects for large plants (including Middle East and China)
→ Methods and experience in controlling complex pre-fabrication and construction activities as well as material flow

Commissioning and training

→ Skilled experienced commissioning teams ensure smooth start-up and handover of the plant to the customer
→ Remote support for the commissioning team on site by specialists of every discipline (e.g. process, control, machinery) makes the whole Linde expertise available on site
→ Extensive safety procedures and safety training ensure safe commissioning and operation of the plant

After sales service

→ Prompt response to any customer request by qualified specialists
→ Global remote on-site support to optimize operation and minimize plant downtimes
→ Plant optimization services to improve plant efficiency
→ Remote support for the on-site commissioning team by specialists of every discipline (e.g. process, control, machinery) giving access to the total Linde expertise
→ Extensive safety procedures and safety training ensuring safe plant commissioning and operation
Engineering excellence – every step of the way.

Linde’s Engineering Division, a leading player in the international plant engineering business, covers every step in the design, project management and construction of turnkey industrial plants. Drawing on our extensive, proven process know-how, we set the standards for innovation, flexibility and reliability with ground-breaking concepts and a dedication to engineering excellence.

The success of our customers and partners around the globe is of primary importance. With a clear focus on efficiency, sustainability and growth, we develop customised solutions for projects of all sizes and degrees of complexity. We have already delivered more than 4,000 plants worldwide and always aim to find the best technical and economic solution for our customers.

Core competencies in plant engineering:
- Air separation plants
- LNG and natural gas processing plants
- Petrochemical plants
- Hydrogen and synthesis gas plants
- Chemical plants
- Adsorption plants
- Cryogenic plants
- Biotechnology plants
- Carbon capture and utilisation plants
- Furnaces, fired heaters, incinerators

Core competencies in component manufacturing:
- Packaged units and coldboxes
- Coil-wound heat exchangers
- Plate-fin heat exchangers
- Cryogenic columns
- Cryogenic tanks
- Air-heated vaporisers
- Water bath vaporisers
- Spiral-welded aluminium pipes

Get in touch – find the best solution.

Air separation plants
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