Plant operator trainings.
Expert know-how for your success.
Process excellence. Proven time and time again by Linde Engineering.

Process plants are among the largest and most complicated constructions. Only a few companies worldwide are able to master their design and realisation. In this area, Linde Engineering has proven its unique expertise many times over – for example by building air separation plants, hydrogen and syngas plants, olefin plants as well as plants for natural gas treatment.

With more than 1,000 process patents and 4,000 completed plants, Linde Engineering is one of the international technology leaders in plant engineering and can therefore rely on its own, extensive process know-how for the design, planning and construction of process plants as well as for the modification of existing plants.

This is why, for the construction of their plants, customers around the world rely on the extensive experience of Linde Engineering, profiting from our well-proven reliability, cost economy and adherence to delivery dates.

A strong partner in a strong group.
Linde Engineering is part of The Linde Group, a world-leading gases and engineering company, which is active in over 100 countries and serves customers from virtually all industries with approximately 63,500 employees.

The focus is on the targeted expansion of international business with future-oriented solutions and services. The Linde Group develops technologies and products that combine customer benefits with a contribution to sustainable development.

With a broad range of services, Linde Engineering supports you in the best possible way by minimising the total cost of ownership of your plant. This starts with reduced investment cost through the application of suitable technology, through modularisation of important components and by consolidating our strengths in a global network.

The bulk of the total cost of ownership, however, arises during the operating phase – typically about 70% in the case of air separation plants and even more than 80% for hydrogen plants. These are predominantly energy costs, but significant costs are also generated by downtimes, maintenance work, repairs and spare part management.

Linde Engineering Customer Services is dedicated to supporting you in the optimal operation of your plants by providing original spare parts in a fast, reliable and cost-efficient manner. Furthermore, we facilitate modifications of your plant, including all upfront assessments, and offer professional and fast repairs for critical equipment.

However, having high-quality and customised equipment is just one side of the equation for optimising the total cost of ownership. Operating the plant according to the latest standards and knowledge is equally important. Our Customer Services organisation is committed to supporting you with world-class expert solutions for your operations as well as professional training offerings. Our comprehensive training catalogue offers you the entire know-how of Linde Engineering directly from the source. Ranging from basic trainings for the plant process to expert trainings for senior operation engineers, our trainings are focused on providing your staff with direct access to the latest technology advances and on expanding their skill set for the success of your business.

Together, we can create a personal training package tailored to your specific requirements. Please get in touch with one of our Customer Services contacts listed on pages 5 and 55.
Your formula for success. Linde Engineering expert trainings.

With our global expertise in plant installation and operation, we truly understand the needs of your business and your staff. Thus, we are committed to sourcing the best instructors, delivering high training quality and ensuring that the content corresponds with the latest technological innovations.

For this purpose, Linde Engineering Customer Services has created a catalogue with around 60 different trainings to provide you with an overview of the various options you have. The length of the trainings can vary from half-day to 10-day courses. Some of them conclude with a final exam and a certificate from Linde Engineering. It is possible to select different trainings and then combine them into a customised package. To find out what your options are and to pick the most suitable training, please read the description below.

Selection

There are two types of trainings. First, there are general trainings available for every plant operator regardless of plant type. Second, these are trainings that vary by type of plant. More specifically, these trainings are distinguished by their focus on either adsorption, air separation, deep cryogenics, hydrogen and synthesis gases, natural gas, or petrochemical plant operations.

Once you have decided on the type of training, you can choose one or several training modules. The name of the module can be found next to the title of each training in the catalogue.

To make sure your choice is right for you, you can also refer to the more detailed training descriptions where the skill requirements for each training can be found. For an example of what a training summary looks like, see page 10.

Booking

In order to book the training, please call or e-mail us (contact information is given on pages 5 and 55). We can then support you with the right choice of training. If you have specific wishes for a training that is based on a particular area of your plant, or if your staff has different levels of knowledge, or if there are any other questions, please do not hesitate to ask.

At home all over the world. Our service locations.

Linde Engineering Customer Services ensures that you have an experienced partner for plant operation by your side during each phase of your Linde plant’s lifecycle – no matter where in the world you need our support.
Overview. Our trainings.

Trainings by type of plant

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Additional offers and customised trainings

Apart from general trainings and trainings by type of plant, Linde Engineering Customer Services also offers special events such as the Olefin Academy as well as customised trainings that meet your specific requirements. For more information and contact details, see pages 54/55.
General trainings.
T.GE.1 | Basics of static equipment

Content
Static equipment is a key component for all Linde process plants. This training gives a basic introduction to their function and design.

- Columns
- Separators
- Reactors
- Heat exchangers

Target audience
- (Junior) plant operators
- Process engineers

Test and certificate available

Location
- Pullach, Germany
- Customer site

Duration
1 day

Module
T.GE.1

T.GE.2 | Introduction to coil-wound heat exchangers

Content
Coil-wound heat exchangers are a key component for several Linde process plants. This training gives a basic introduction to their function and design and provides you with a better understanding of this special equipment.

- Areas of application
- Design
- Maintenance

Target audience
- (Junior) plant operators
- Process engineers

Test and certificate available

Location
- Pullach, Germany
- Customer site

Duration
0.5 days

Module
T.GE.2

T.GE.3 | Introduction to plate-fin heat exchangers

Content
Aluminium plate-fin heat exchangers are a key component for several Linde process plants. This training gives a basic introduction to their function and design and provides you with a better understanding of this special equipment.

- Areas of application
- Design
- Maintenance

Target audience
- (Junior) plant operators
- Process engineers

Test and certificate available

Location
- Pullach, Germany
- Customer site

Duration
0.5 days

Module
T.GE.3

S.GE.1 | Process safety

Content
Safe operations require that plant operators are familiar with the plant’s safety manual. To build and refresh their knowledge, this training offers a systematic walk through your safety manual, including the opportunity to ask all questions your operators may have in this regard.

- Systematic walk through existing plant’s safety manual
- Extensive Q&A with plant safety expert

Target audience
- Plant operators

Location
- Pullach, Germany
- Customer site

Duration
5 days

Module
S.GE.1
**S.GE.2 | Vibrations in process plants**

**Content**
Vibrations in process plants may cause severe failures if not controlled correctly. This training provides you with a professional insight into this topic to sharpen the awareness of your operational team.

- Physics/phenomenology
- Relevance for process plants
- Failure modes
- Real-life examples
- Awareness of critical symptoms

**Target audience**
- Operation engineers
- Plant operators

**Location**
- Pullach, Germany

**Duration**
- 1 day

**Module**
- S.GE.2

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**O.GE.3 | Gas chromatography**

**Content**
For chemical analyses in process plants, gas chromatography (GC) is an essential tool. This training explains basic principles, operation and troubleshooting of GC units.

- Principles of gas chromatography
- Column selection, detectors
- Operation and data evaluation
- Troubleshooting

**Target audience**
- Analytical staff
- Laboratory staff

**Location**
- Pullach, Germany

**Duration**
- 2 days

**Module**
- O.GE.3

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**O.GE.1 | Cooling water systems**

**Content**
Cooling water systems are an important yet sometimes underestimated part of process plants. This training provides you with a basic introduction to water treatment, solutions to typical challenges as well as best practices in water treatment based on the long experience of Linde in this area.

Depending on the previous experience of operators, this training is separated into three different levels (basic, advanced, expert), from which you can choose accordingly. Also, due to their high complexity, we offer a special training module for water treatment in air separation pre-cooling systems.

- Introduction to water treatment and cooling water systems
- Introduction to water management
- Water chemistry
- Water treatment chemistry (corrosion, scaling, biology)
- Interface management operation/water treatment company
- Legionella risk management
- Biocides
- Cooling water monitoring and reporting systems
- Cooling water and material technology
- Cooling water audits

**Target audience**
- Plant management
- Operation engineers
- Plant operators (all levels)
- Maintenance engineers

**Special training module: Chemical treatment of ASU pre-cooling systems (level: expert)**

**Location**
- Pullach, Germany

**Duration**
- 2 days

**Module**
- O.GE.1

---

**O.GE.4 | Plant automation**

**Content**
Plant automation and distributed control systems (DCS) are an important part of your Linde process plant. To train operators in this regard, Linde can facilitate training sessions with the manufacturer of the system.

- Operation of DCS
- Functionality

**Target audience**
- Plant operators (all levels)

**Location**
- Customer site

**Duration**
- 10 days

**Module**
- O.GE.4
0.GE.5 | Periodic assessment of SIL

Content
This training is intended to give basic insights into the assessment of safety integrity levels (SIL) and the safety management plan.

→ Calculation, design and test of SIL
→ Safety management plan

Target audience
→ Plant management
→ Operation engineers

Location
→ Pullach, Germany
→ Customer site

Duration 1 day

Module 0.GE.5

0.GE.6 | Lifetime estimation of brazed plate-fin heat exchangers

Content
Engineered by means of sophisticated calculation and simulation technologies, brazed plate-fin heat exchangers in process plants are designed for the lifetime of the plant. If operational parameters change (e.g. higher load) or if the plant has been operated outside the allowable operational window, these tools can also be used to assess implications. This training explains the Linde methodology, its applications and required data in order to assess the suitability of this method for your case.

→ Introduction and overview
→ Internal setup of a brazed plate-fin heat exchanger
→ Process-specific considerations on lifetime
→ Scenario definition
→ Mechanical aspects – stress analysis
→ Fatigue and lifetime
→ Event counting
→ HAZAN workflow
→ Summary

Test and certificate available

Target audience
→ Plant management
→ Plant operators (all levels)

Location
→ Pullach, Germany
→ Customer site

Duration 0.5 days

Module 0.GE.6

0.GE.7 | Sampling and analytics

Content
Safe and reliable operation of process plants requires sampling during operations. This training provides insights into different sampling devices, methods and processes.

→ Sample points
→ Safety aspects of sampling
→ Introduction to sampling devices and methods
→ Manual sampling schedule for relevant plant type
→ Process-specific analytic methods

Target audience
→ Plant operators (analytical staff)

Location
→ Pullach, Germany
→ Customer site

Duration 5 days

Module 0.GE.7

M.GE.1 | Cost-optimised procurement of spare parts

Content
Procurement of spare parts contributes significantly to the overall operational costs of your plant. This training will equip you with a general overview on the spare parts market, its stakeholders and their interests.

→ Market structure, relevant stakeholders and their respective interests
→ Spare part pricing
→ Best practices in spare part procurement

Target audience
→ Plant management
→ Plant maintenance
→ Procurement

Test and certificate available

Location
→ Pullach, Germany
→ Customer site

Duration 1 day

Module M.GE.1
### M.GE.2 | Spare part stock management

**Content**
A professional physical storage of spare parts is key to maintain the value of your stock. This expert training will provide insights into best practices for this important topic.

- Long-term protection measures for spare parts (e.g. capital spares)
- Options for spare part storage (e.g. conventional, air condition)
- Right setup and organisation of spare part warehouses

**Target audience**
- Plant maintenance
- Logistics

**Test and certificate available**

**Location**
- Pullach, Germany
- Customer site

**Duration**
1.5 days

**Module**
M.GE.2

### M.GE.3 | Documentation of spare parts (based on LE standards)

**Content**
The documentation of spare parts stocks is a very important – yet often underestimated – topic to avoid both over- and undersupplies. This training gives an overview of the sophisticated documentation system of LE spare parts to ensure that it can be fully utilised for your operations.

- Economic importance of spare part documentation
- Introduction to codes, tag numbers etc.
- How to read LE spare part documentation
- How to read material tags

**Target audience**
- Plant maintenance
- Logistics

**Test and certificate available**

**Location**
- Pullach, Germany
- Customer site

**Duration**
1 day

**Module**
M.GE.3

### M.GE.4 | Inspection of spare part storage

**Content**
A regular, professional check of the spare part storage of process plants ensures that all necessary parts are available and in good condition. For this, we offer a joint evaluation with one of our spare parts experts concluded by a status report and recommendations.

- Visit of Linde spare part inventory specialist
- Joint inspection of spare part storage
- Evaluation and suggestions for improvement

**Target audience**
- Logistics

**Location**
- Customer site

**Duration**
4 days

**Module**
M.GE.4

### M.GE.5 | Introduction to corrosion in process plants

**Content**
Corrosion in plants can be induced internally and externally, depending on conditions. This training deals with typical mechanisms for corrosion in process plants and strategies to avoid it.

- Fluid-induced corrosion risks
- Corrosion from outside
- Component-related evaluation of corrosion
- Strategies to avoid corrosion

Note: Contents partially dependent on plant type

**Target audience**
- Plant management
- Plant operators

**Location**
- Pullach, Germany
- Customer site

**Duration**
0.5 days

**Module**
M.GE.5
Trainings by type of plant. Adsorption plants.
0.AD.1 | Pressure swing adsorption plants: Basic operational aspects

Content
This basic training provides you with an introduction to PSA units and their operation.

→ Basics of the pressure swing adsorption process
→ Operation of PSA plant based on plant documentation
→ Basic introduction to process optimisation

Target audience
→ Plant operators (all levels)

Location
→ Pullach, Germany
→ Customer site

Duration
1 day

Module
0.AD.1

0.AD.2 | Maintenance of pressure swing adsorption plants

Content
Maintenance of PSA units is usually straightforward. Based on our experience, most questions arise from instrumentation and the control system. The most relevant issues – and how to cope with them – are introduced during this training.

→ Basic maintenance aspects for PSA plants with focus on instrumentation and control system
→ Troubleshooting

Target audience
→ Plant operators (all levels)

Location
→ Pullach, Germany
→ Customer site

Duration
0.5 days

Module
0.AD.2
Air separation plants.
T.AS.1 | Introduction to air separation technology

Content
This basic training delivers a sound and comprehensive overview on the air separation technology along the relevant process units.

→ Introduction to air separation technology
→ Basics of the separation process
→ Process unit details (pre-cooling, air compression, pre-purification, heat exchangers, cold production, rectification columns, condensers, internal compression, cryogenic pumps)
→ Argon production and rare gases

Target audience
→ Plant operators (all levels)

Test and certificate available

Location
→ Pullach, Germany

Duration
3 days

Module
T.AS.1

T.AS.2 | Basics of air separation plant technology: E&I

Content
The electrical systems and the instrumentation are important subsystems of your air separation plant. With this training, we provide you with a solid basis to understand control and automation as well as the electrical system of your plant.

→ Basic control concept
→ Electrical system
→ Automation

Target audience
→ Plant operators
→ Operation engineers

Location
→ Pullach, Germany

Duration
2 days

Module
T.AS.2

T.AS.3 | Introduction to LE’s advanced control philosophy for air separation plants

Content
Advanced control for air separation plants offers various options to improve operations in your plants. This training session introduces possibilities for advanced automation and helps you assess their benefits for your operations.

→ General overview of possibilities of advanced process control (advanced process control system, automatic load change, automatic start-up, linear model predictive control (LMPC), remote access)
→ Rationale/assessment of advanced process control based on current situation, benefit studies

Target audience
→ Management
→ Plant management
→ Operation engineers

Location
→ Pullach, Germany

Duration
1 day

Module
T.AS.3

T.AS.4 | Advanced process control systems (APCS): User training

Content
This training is intended for customers that already own a Linde APCS. It is customised and introduces the solution installed at your plant in order to use it to its full extent.

→ Using existing site-specific APCS solutions
→ Items according to customer wishes

Target audience
→ Operation engineers

Location
→ Pullach, Germany

Duration
1-3 days

Module
T.AS.4
T.AS.5 | Installation and maintenance of APCS on physical or virtual computers

Content
Installing and maintaining your Linde APCS is usually straightforward. This training delivers more background information and solutions to maintain the system.

→ APCS program installation
→ Data backup systems
→ Troubleshooting

Target audience
→ Senior operation engineers with automation background
→ Instrumentation engineers

Location
→ Pullach, Germany
→ Customer site

Duration
1 day

Module
T.AS.5

O.AS.1 | Air separation plants: Basic operational aspects

Content
Based on typical scenarios, this basic training explains operations of air separation plants to provide a sound background for the daily work of your operators. It also includes the opportunity to clarify questions in this regard.

→ Basic operational aspects (pressure drop, mass and heat transfer)
→ Introduction to process control philosophy
→ P&ID session with focus on operational aspects (e.g. start-up, normal operations)
→ Load change scenarios
→ Safety aspects
→ Maintenance

Target audience
→ Plant operators (all levels)

Location
→ Pullach, Germany
→ Customer site

Duration
3 days

Module
O.AS.1

S.AS.1 | Oxygen safety in air separation plants

Content
Operation of ASUs needs to take into account the specific risks of oxygen. This training session introduces your operations team to incidents, their root causes and measures to avoid them.

→ Oxygen incidents in air separation units
→ Influencing factors of reactivity of materials with oxygen
→ Strategies to avoid oxygen incidents
→ Measures including procurement maintenance, operator training

Target audience
→ Operation engineers
→ Plant operators
→ Maintenance team

Location
→ Pullach, Germany
→ Customer site

Duration
0.5 days

Module
S.AS.1
Deep cryogenic plants.
LKT.1 | Helium liquefiers and refrigerators

Content
Helium liquefiers and refrigerators are a very special plant type offered by our entity Linde Kryotechnik in Switzerland, which is specialised in deep cryogenics. This training provides you with an introduction to the technology and basic operational aspects of these special plants and can be conducted from two days to up to two weeks, depending on your requirements.

- Introduction and overview
- L-series
- Thermodynamics
- Control system
- Operator panel
- Visualisation
- Turbines
- Compressor/ORS
- Gas management panel (GMP, buffer)
- Analyser (MCD, cryo-adsorber, moisture analyser, air in helium)
- Process control (operation cases, control concept, A&T list, C&E)
- Coldbox design and components
- Regeneration of adsorbers/dryers
- Recovery system
- Purifier and Linde dryer
- Safety concept (HSE plan, ODD, HAZOP)
- Utilities, maintenance plan, spare parts
- Safety introduction to cryogenics

Target audience
- (Junior) plant operators
- Maintenance engineers

Location
- Pfungen, Switzerland
- Customer site

Duration
Workshop, min. 2 days, can be extended with "hands-on" training up to max. 2 weeks

Module
LKT.1

LKT.2 | Hydrogen liquefiers

Content
Hydrogen liquefiers are a very special plant type offered by our entity Linde Kryotechnik in Switzerland, which is specialised in deep cryogenics. This training provides you with an introduction to the technology and basic operational aspects of these special plants and can be conducted from two days to up to two weeks, depending on your requirements.

- Introduction and overview
- Thermodynamics
- Ortho-para conversion
- Control system
- Operator panel
- Visualisation
- Turbines
- Compressor (ORS only for helium refrigeration cycles)
- Gas management panel (GMP, buffer)
- Analyser (MCD, cryo-adsorber, moisture analyser, air in hydrogen/helium)
- Process control (operation cases, control concept, A&T list, C&E)
- Coldbox design and components
- Regeneration of adsorbers/dryers
- Safety concept (HSE plan, ODD, HAZOP)
- Utilities, maintenance plan, spare parts
- Safety introduction to cryogenics and hydrogen

Target audience
- (Junior) plant operators
- Maintenance engineers

Location
- Pfungen, Switzerland
- Customer site

Duration
Workshop, min. 2 days, can be extended with "hands-on" training up to max. 2 weeks

Module
LKT.2
Hydrogen and synthesis gas plants.
### G.HS.1 | Basics of hydrogen production

**Content**
- This basic training provides you with a general overview of the hydrogen industry, current and future applications and relevant supply schemes, and is designed as a general introduction to the topic.
- Properties of hydrogen
- Applications
- Market
- Production
- Supply schemes

**Target audience**
- (Junior) plant operators
- General management

**Location**
- Pullach, Germany
- Customer site

**Duration**
- 0.5 days

**Module**
- G.HS.1

### T.HS.1 | Basics of hydrogen and syngas plant technology: E&I

**Content**
- The electrical systems and the instrumentation are important subsystems of your hydrogen and syngas plant. With this training, we provide you with a solid basis to understand control and automation as well as the electrical system of your plant.
- Basic control concept
- Electrical system
- Automation

**Target audience**
- Plant operators
- Operation engineers

**Location**
- Pullach, Germany
- Customer site

**Duration**
- 2 days

**Module**
- T.HS.1

### T.HS.2 | Basics of hydrogen and syngas plant technology: Rotating equipment

**Content**
- This supplier-independent training module provides you with a general understanding of important rotating equipment within your Linde plant and is an ideal basis for further and specialised trainings from OEMs in this regard.
- Supplier-independent training on functionality, typical parts and systems of major rotating equipment in HyCO plants
- Focus: Integrally geared turbo compressors, reciprocating compressors and pumps

**Target audience**
- (Junior) plant operators

**Location**
- Pullach, Germany
- Customer site

**Duration**
- 0.5 days

**Module**
- T.HS.2

### T.HS.3 | Advanced control in HyCO plants (ALC)

**Content**
- Advanced control for hydrogen and syngas plants offers various options to improve operations of your plants. This training session introduces possibilities for advanced control and helps you to assess their benefits for your operations.
- Features
- Implementation
- Benefits

**Target audience**
- Plant management
- Operation engineers

**Location**
- Pullach, Germany
- Customer site

**Duration**
- 1 day

**Module**
- T.HS.3
### T.HS.4 | Maintenance of advanced control systems in HyCO plants

**Content**
Installing and maintaining of advanced control systems is usually straightforward. This training delivers more background information and typical measures to improve performance.

- Tuning (ALC functions and controller)
- Program modifications
- DCS implementation

**Target audience**
- Plant instrumentation/automation
- Operation engineers

**Location**
- Pullach, Germany
- Customer site

**Duration**
2 days

**Module**
T.HS.4

### S.HS.2 | Hydrogen and syngas plants: Plant and process safety

**Content**
This training provides you with a comprehensive introduction to the safety measures of Linde hydrogen and syngas plants. It is a good introduction to build further understanding and a valuable contribution to safe operations.

- Introduction to process and environmental safety
- Mechanical design and safeguarding philosophy
- Introduction to plant safety design (explosion protection, fire protection, fire and gas detection)
- Flare and blow-down system components design
- HAZOP
- Safety instrumented systems (SIL allocation)

**Target audience**
- Operation engineers
- Plant operators

**Test and certificate available**

**Location**
- Pullach, Germany
- Customer site

**Duration**
1 day

**Module**
S.HS.2

### S.HS.1 | RECTISOL® plants: Plant and process safety

**Content**
This training provides you with a comprehensive introduction to the safety measures of Linde RECTISOL® plants. It is a good introduction to build further understanding and a valuable contribution to safe operations.

- Introduction to process and environmental safety
- Mechanical design and safeguarding philosophy
- Introduction to plant safety design (explosion protection, fire protection, fire and gas detection)
- Flare and blow-down system components design
- HAZOP
- Safety instrumented systems (SIL allocation)

**Target audience**
- Operation engineers
- Plant operators

**Test and certificate available**

**Location**
- Pullach, Germany
- Customer site

**Duration**
1 day

**Module**
S.HS.2

### O.HS.1 | RECTISOL® plants: Basic operational aspects

**Content**
Based on typical scenarios, this basic training explains operations of RECTISOL® plants to provide a sound background for the daily work of your operators. It also includes the opportunity to clarify questions in this regard.

- Introduction to the process
- Basic operational aspects (control philosophy, product purity)
- PHBID session with focus on operational aspects (e.g. start-up, normal operation, shutdown)
- Safety aspects

**Target audience**
- Plant operators (all levels)

**Location**
- Pullach, Germany
- Customer site

**Duration**
2 days

**Module**
O.HS.1
0.HS.2 | Hydrogen and syngas plants (SMR, POX, NH₃): Basic operational aspects

Content
Based on typical scenarios, this basic training explains operations of hydrogen and syngas plants to provide a sound background for the daily work of your operators. It also includes the opportunity to clarify questions in this regard.

→ Introduction to the process
→ Basic operational aspects (control philosophy, product purity)
→ P&ID session with focus on operational aspects (e.g. start-up, normal operation, shutdown, hot standby and restart)
→ Advanced load control
→ Safety aspects
→ Basic maintenance operations

Target audience
→ Plant operators (all levels)

Location
→ Pullach, Germany
→ Customer site

Duration
2–5 days

Module
O.HS.2

0.GE.2 | Boiler feed water and boiler water chemistry

Content
Boiler feed water in hydrogen and syngas plants is a key component of equal importance as the feedstock. This training provides you with an introduction to systems, water treatment and potential issues as well as best practices in this regard.

→ Introduction to demineralised water treatment systems
→ Boiler water/steam chemistry
→ Water treatment chemistry (corrosion, scaling)
→ Interface management operation/water treatment company
→ Monitoring and reporting systems

Target audience
→ Operation engineers
→ Plant operators (all levels)

Location
→ Pullach, Germany
→ Customer site

Duration
1 day

Module
O.GE.2

0.HS.3 | Plant performance check

Content
From time to time, we recommend to review the way a plant is operated jointly with operational experts from the plant engineering company. This check comprises a joint review of operations and recommendations to improve operational efficiency.

→ Analysis of present operating conditions in joint customer/Linde team after 2–3 years of operation
→ Recommendation of improved process parameters for energy saving
→ Recommendation of improved start-up procedures

Target audience
→ Plant management
→ Operation engineers

Location
→ Customer site

Duration
5 days

Module
O.HS.3
Natural gas and LNG plants.
**T.NG.1 | CWHE as core equipment of natural gas liquefaction**

**Content**
Coil-wound heat exchangers (CWHE) are a key component for natural gas liquefaction plants. This training gives a basic introduction to their function in these plants as well as their design, maintenance and operational aspects.

- Process overview
- Design
- Maintenance
- Lessons learned

**Target audience**
- (Junior) plant operators
- Process engineers

**Test and certificate available**

**Location**
- Pullach, Germany
- Customer site

**Duration**
- 0.5 days

**Module**
- T.NG.1

**T.NG.2 | PFHE as core equipment of natural gas liquefaction**

**Content**
Plate-fin heat exchangers (PFHE) are a key component for natural gas liquefaction plants. This training gives a basic introduction to their function in these plants as well as their design, maintenance and operational aspects.

- Process overview
- Design
- Maintenance
- Lessons learned

**Target audience**
- (Junior) plant operators
- Process engineers

**Test and certificate available**

**Location**
- Pullach, Germany
- Customer site

**Duration**
- 0.5 days

**Module**
- T.NG.2

**S.NG.1 | LNG plants: Plant and process safety**

**Content**
This training provides you with a comprehensive introduction to the safety measures of Linde LNG plants. It is a good introduction to build further understanding and a valuable contribution to safe operations. The offered special trainings provide additional deep-dives into important topics of plant and process safety.

- Introduction to process and environmental safety (based on operating manual)
- Special trainings:
  - Emergency depressurising system
  - Flare and blow-down system components design (dynamic simulation)
  - Introduction to plant safety design (explosion protection, fire protection, fire and gas detection)
  - HAZOP/QRA
  - SIL allocation

**Target audience**
- Operation engineers
- Plant operators

**Test and certificate available**

**Location**
- Pullach, Germany
- Customer site

**Duration**
- Introduction: 3 days
- Special trainings: 0.5–1 day (each)

**Module**
- S.NG.1

**O.NG.1 | Nitrogen rejection units (NRU): Basic operational aspects**

**Content**
Based on typical scenarios, this basic training explains operations of nitrogen rejection units to provide you with a sound background for the daily work of your operators. It also includes the opportunity to clarify questions in this regard.

- Process and technology (double column)
- Basics of plant operation (optimisation in ongoing operations, control of purity, recommissioning after trip)

**Target audience**
- Plant operators

**Location**
- Pullach, Germany
- Customer site

**Duration**
- 2 days

**Module**
- O.NG.1
Petrochemical plants.
G.PC.1 | Basics of olefin production

Content
This basic training provides you with a general overview of the olefin market, current and future applications and relevant supply schemes, and is designed as a general introduction to the topic.

→ Introduction to olefin market
→ Overview of ethylene production
→ Integration of steam crackers
→ Alternative production routes
→ Economics of olefin production
→ Plant revamps
→ Energy and greenhouse gas emissions

Target audience
→ (Junior) plant operators
→ General management

Test and certificate available

Location
→ Pulchach, Germany
→ Customer site

Duration
1 day

Module
G.PC.1

T.PC.1 | Ethylene plants: Cracking furnace technology

Content
Cracking furnaces are the front-end part of an ethylene plant. This training is an extended introduction to the topic for plant operators that require a more detailed knowledge of the furnaces and their operations.

→ Cracking furnace overview
→ Cracking process
→ Radiant coils
→ Failure mechanisms
→ Firing system
→ Furnace equipment
→ Convection section
→ Emissions
→ Instrumentation and advanced process control (APC)
→ Operations (normal, S-dosing, decoking, checks)
→ Furnace incidents
→ Furnace safety

Target audience
→ Plant operators

Location
→ Pulchach, Germany

Duration
2.5 days

Module
T.PC.1

T.PC.2 | Basics of ethylene plant technology: Cracking furnace

Content
Cracking furnaces are the front-end part of an ethylene plant. This training is a basic introduction to the topic, which can be combined with other modules for a general introduction to ethylene plants.

→ Process
→ Furnace operations
→ Safety
→ Mechanical design

Target audience
→ (Junior) plant operators

Test and certificate available

Location
→ Pulchach, Germany
→ Customer site

Duration
1 day

Module
T.PC.2

T.PC.3 | Basics of ethylene plant technology: Recovery section

Content
After the cracking section, the raw gas needs to be split into its components within the recovery section. This training represents a basic introduction to the topic, which can be combined with other modules for a general introduction to ethylene plants.

→ Tasks
→ Hot section/cold section
→ C2 hydrogenation
→ C3+ processing
→ C4+ processing
→ Utilities and off-sites

Target audience
→ (Junior) plant operators

Test and certificate available

Location
→ Pulchach, Germany
→ Customer site

Duration
1 day

Module
T.PC.3
T.PC.4 | Basics of ethylene plant technology: Static equipment

Content
Static equipment is a key component for ethylene plants. This training gives a basic introduction to the function and design of relevant static equipment for ethylene plants.

- Adsorber
- Heat exchanger
- Columns
- Separator
- Material selection

Target audience
- (Junior) plant operators

Test and certificate available

Location
- Pullach, Germany
- Customer site

Duration
1 day

Module
T.PC.4

T.PC.5 | Basics of ethylene plant technology: Rotating equipment

Content
This supplier-independent training module provides you with a general understanding of important rotating equipment within your Linde plant and is an ideal basis for further and specialised trainings from OEMs in this regard.

- Supplier-independent training on functionality, typical parts and systems of major rotating equipment in ethylene plants
- Focus: Single-shaft turbo compressors and pumps

Target audience
- (Junior) plant operators

Test and certificate available

Location
- Pullach, Germany
- Customer site

Duration
0.5 days

Module
T.PC.5

T.PC.6 | Basics of ethylene plant technology: E&I

Content
The electrical systems and the instrumentation are important subsystems of your ethylene plant. With this training, we provide you with a solid basis to understand control and automation as well as the electrical system of your plant.

- Basic control concept
- Electrical system
- Automation
- APC and analysis

Target audience
- Plant operators
- Operation engineers

Test and certificate available

Location
- Pullach, Germany
- Customer site

Duration
2 days

Module
T.PC.6

S.PC.1 | Ethylene plants: Plant and process safety

Content
This training provides you with a comprehensive introduction to the safety measures of Linde ethylene plants. It is a good introduction to build further understanding and a valuable contribution to safe operations. The offered special trainings provide additional deep-dives into important topics of plant and process safety.

- Introduction to process and environmental safety (based on operating manual)
- Special trainings:
  - Emergency block-in and depressurising system
  - Introduction to plant safety design (explosion protection, fire protection, fire and gas detection)
  - Flare and blow-down system components design (dynamic simulation)
  - HAZID/QRA
  - SIL allocation

Target audience
- Operation engineers
- Plant operators

Test and certificate available

Location
- Pullach, Germany
- Customer site

Duration
Introduction: 3 days
Special trainings: 0.5–1 day (each)

Module
S.PC.1
0.PC.1 | Ethylene plants: Basic operational aspects

Content
Based on typical scenarios, this basic training explains operations of ethylene plants to provide a sound background for the daily work of your operators. It also includes the opportunity to clarify questions in this regard.

- Plant operation
- Plant maintenance
- HSE in plant operation
- Operator training
- Learning from incidents

Target audience
- (Junior) plant operators

Test and certificate available

Location
- Pullach, Germany
- Customer site

Duration
1 day

Module
O.PC.1

0.PC.3 | Flare-reduced commissioning of ethylene plants

Content
Flare-reduced commissioning of an ethylene plant is an important target to fulfill environmental requirements. This training session provides you with general methods and means to reduce flare activities followed by a plant-specific evaluation of possibilities.

- General introduction: Measures to reduce flare activities during commissioning
- Workshop
- First assessment of potential measures for existing plant

Target audience
- Plant management
- Operation engineers

Location
- Pullach, Germany
- Customer site

Duration
1 day

Module
O.PC.3

0.PC.2 | Operator audit

Content
Safe, efficient and reliable operation of a plant requires both: the right equipment and well-trained employees. To assess the training level of your operators, Linde offers a comprehensive check of your operational team’s abilities concluded by recommendations on potential improvements.

- Objective: Evaluation of knowledge of operating staff to assess training needs
- (Anonymous) written test for all operators
- One-on-one interviews with operators (1.5–2 hours)
- Evaluation report including training recommendations

Target audience
- Plant operators

Location
- Customer site

Duration
5–10 days

Module
O.PC.2

0.PC.4 | Lessons learned from incidents

Content
Safety is key in operations. To achieve this target, it is important to learn from past incidents. This training will introduce several incidents and present their key learnings.

- Presentation of key learnings from past incidents
- Questions and answers

Target audience
- Plant management
- Operation engineers

Location
- Pullach, Germany
- Customer site

Duration
0.5 days

Module
O.PC.4
0.PC.6 | Feedstock contaminants in petrochemical plants

Content
This training gives an overview of typical and relevant contaminants in feedstocks for petrochemical plants as well as general means to cope with this topic.

→ Survey on impurities
→ Impurity distribution
→ Purification methods and analytics
→ Product specification

Target audience
→ Plant management
→ Operation engineers

Location
→ Pullach, Germany
→ Customer site

Duration
0.5 days

Module
0.PC.6

0.GE.2 | Boiler feed water and boiler water chemistry

Content
The quality of the boiler feed water in ethylene plants is of utmost importance. This training provides you with an introduction to systems, water treatment and potential issues as well as best practices in this regard.

→ Introduction to demineralised water treatment systems
→ Boiler water/steam chemistry
→ Water treatment chemistry (corrosion, scaling)
→ Interface management operation/water treatment company
→ Monitoring and reporting systems

Target audience
→ Operation engineers
→ Plant operators (all levels)

Location
→ Pullach, Germany
→ Customer site

Duration
1 day

Module
0.GE.2
Special events and training offers from Linde Engineering Customer Services.

Customised trainings
In addition to the standard trainings listed in this catalogue, we also offer customised training programmes which can be created on the basis of existing modules and tailored exactly to your needs.

For this purpose, Linde organises academies and/or trainee programmes, in which the topics of your choice can be covered. You can decide on the length and content of the programmes.

Another possibility is to compose special trainings on the basis of a previous evaluation of what your company requires. Our experts can carry out both the evaluation and the corresponding trainings for you.

The Linde Olefin Academy
Every other year, we offer a two-week comprehensive industry event that covers all aspects of the production of olefins.

The conference is geared towards newcomers to the industry, operators and technicians of olefin plants as well as maintenance experts. The Academy offers a comprehensive overview of all areas of the production of ethylene and propylene, covering economics, technology, maintenance, HSE, operation, incidents, plant layout etc.

Additionally, the Linde Olefin Academy is an excellent platform to meet other members of the industry.

Language: English
(simultaneous translation to Russian can be organised)
Location: Pullach, Germany
Material: Handouts and summary

We are looking forward to finding the right solution for you.
For more information, please contact us directly by phone or e-mail.

Contact details
Air separation plants
Michael Weinschenk
Phone +49.89.7445-4277
Mobile +49.175.5873475
aftersales-asso@linde-le.com

Hydrogen and syngas plants
Michael Weinschenk
Phone +49.89.7445-4277
Mobile +49.175.5873475
aftersales-h2-syngas@linde-le.com

Natural gas and LNG plants
Michael Weinschenk
Phone +49.89.7445-4277
Mobile +49.175.5873475
aftersales-ng@linde-le.com

Petrochemical plants
Ulrich Wucherer
Phone +49.89.7445-3857
Mobile +49.174.2059707
aftersales-pc@linde-le.com

Adsorption plants
Thomas Jecke
Phone +49.89.7445-2786
Mobile +49.172.8624273
aftersales-psa@linde-le.com

Spare part management
Robert Vetter
Phone +49.89.7445-2763
aftersales-spare-parts@linde-le.com

LE Customer Services management
Dr Jan Nopper
Phone +49.89.7445-4264
aftersales@linde-le.com
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.