Selas Linde.
The furnace experts.
Our company.

Selas Linde has a long tradition in furnace design, dating back to the early 1940s in the United States. Originally the Fluid Processing Division of Selas Corporation of America, the company was involved in the technology of fired process furnaces with the onset of the petrochemical and refining industries. Over the years, we’ve continued to invest in technology innovation, broadening our products and services portfolio to support our growing global customer base – the petrochemical, chemical, refining, gas processing, utility, steel, environmental engineering industries.

Our industry leading technology portfolio – fired process heaters and pyrolysis furnaces – is a combination of three merged companies, shaping who we are today. Beginning with Selas Corporation of America, where we retain the name “Selas”, secondly with the 1948 acquisition of the Ernst Kirchner company based in Hamburg, Germany, and finally with the 1973 signing of a license agreement between Selas Corporation of America and Linde AG Process Engineering and Contracting Division (LPEC) for planning, manufacturing and erection of olefins pyrolysis furnaces. This move combined Selas, Kirchner and Linde technologies for furnace based plants, and its success led LPEC to acquire further shares of Selas Corporation of America and Selas-Kirchner GmbH, resulting in 100% ownership of these entities in 1985. With over 80 years of heritage, organic growth, strategic acquisitions and innovation, this is how we became who we are today – Selas Linde.

With full integration of the companies in 1985, the US and European business units operated as Selas Fluid Processing Corporation and Selas Linde GmbH respectively. Expansion of the product portfolio in 1992 with the strategic acquisition of I-Thermal complemented our process heater product line with environmental engineering technology and extensive know-how in thermal oxidation of gaseous and liquid wastes. Acquisition of Thermatrix in 2002 further strengthened our environmental portfolio with flameless thermal oxidizers (FTOs). Selas Linde also designs, supplies and constructs plants for the vaporization of cryogenic liquids for LNG and gas utility peak shaving markets. Today, Selas Linde is recognized as a leading global contractor specializing in various process technologies across a wide range of industries.
Our experience.

Selas Linde has extensive experience in the conceptual and detailed design and construction of turnkey process furnaces. We also offer a wide range of aftermarket industrial services ranging from engineering studies to on site retrofits and capacity expansions. Close ties between our North American and European entities position us to support projects around the world with the backing and organizational depth of our parent company, the Linde Engineering Division.

With our global network, diversified engineering centers, and state-of-the-art technologies we cost effectively execute projects around the world. In today’s competitive markets, companies need strategies that set them apart. For Selas Linde, this means continued investment in thermal process technologies, depth of expertise in applying those technologies, and decades of experience in executing thousands of projects in some of the most remote locations in the world.

Selas Linde has long experience as a general contractor, managing the complex logistics of plant procurement and construction. Taking on small projects as well as some of the biggest in the industry our project management and control systems guarantee strict adherence to cost, schedule and quality. Contracts are executed in compliance with all relevant international standards and rules, accompanied by continuous quality-assurance activities. We are certified under ISO 9001, ISO 14001 and OHSAS 18001. After project completion, we’re a reliable partner for our customers through flexible, efficient after-sales service. Proof of our capabilities lies in the successful completion and commissioning of over 2,000 plants.

Our value to our customers is measured through the success of their plant operations. Our leading edge technology, process expertise and cumulative project execution experience set us apart in the industry – delivering tangible value for some of the biggest names in the petrochemical, chemical, refining and gas utility industries.
Our portfolio.

Process furnaces for the chemical and petrochemical industries
- Cracking furnaces for ethylene production
- EDC cracking furnaces
- Specialty chemical furnaces, such as acetic acid, titanium dioxide, titanium chloride, carbon bisulfide and others

Reformers
- Steam reformer for hydrogen and synthesis gas production

Fired heaters for refineries
- Crude oil heaters
- Vacuum oil heaters
- Visbreakers
- Platformers
- HDS heaters
- Reboilers
- Superheaters

Special-purpose furnaces
- Direct reduction of iron (DRI)
- Steam superheaters
- CO boilers

Environmental technology
Selas Linde is a leader in the design and construction of plants for oxidizing gaseous and liquid waste, including waste heat recovery, flue gas treatment and by-product recovery in the handling of
- Halogenated hydrocarbons
- PCBs – polychlorinated biphenyls
- Pesticides
- Dioxins
- Pharmaceutical waste
- Aqueous salt-laden waste
- Nitrogen-bound organics

Vaporization of cryogenic fluids
Submerged combustion vaporizer systems (Sub-X®) for
- LNG
- LPG
- Nitrogen
- Propane
- Others

Range of services
- Studies
- Project management
- Basic and detail engineering
- Procurement of services and materials
- Construction, revamps and commissioning
- Supervision of fabrication and construction
- Start-up supervision
- After-sales service

Extensive know-how and leading technology

Ethylene cracking furnaces, Al-Jubail, Saudi Arabia.
Pyrolysis or ethylene cracking furnaces are key building blocks in the production of basic chemicals such as ethylene, propylene, butadiene, etc. for the plastics industry.

Based on Linde’s PYROCRACK® technology, Selas Linde has constructed more than 450 cracking furnaces.

Depending on available feedstocks and product distribution plans, Selas Linde recommends an appropriate PYROCRACK cracking coil system. Highlights of these furnaces include vertically arranged coils for high product output, long furnace run times and robust mechanical design.

Firing is achieved via a pure bottom/sidewall or combined bottom/sidewall burner arrangement. Integrated flue-gas heat recovery provides furnace efficiency rates of over 92%.

Over 92% furnace efficiency rates achieved
Vinyl chloride monomer (VCM) is one of the most important monomers for producing a wide range of polymers. VCM is produced by thermally cracking ethylene dichloride (EDC) in a box-type furnace at temperatures of around 930°F and pressures of up to 450 psig.

Selas Linde has designed and built EDC cracking furnaces for various processes, including Goodrich, Stauffer, DOW, EVC, PPG, Hoechst and Atochem.

The coils and fire box are designed with a special reaction kinetics computer model. This allows optimization of the furnace design with respect to temperature/heat flux profile, residence time and pressure loss. Main and secondary reactions are taken into account. Utilization of our unique offset convection section with a dynamic radiant tube support system offers features that improve performance, operation, maintenance, tube life and runtime. Furnaces are fired by natural-draft or forced-draft sidewall burners.

The residual heat of the flue gases is utilized for steam generation or air preheating to achieve efficiency rates of over 90%.

We have 80+ EDC furnaces installed worldwide with capacities up to 225 kta.
Steam reformers.

Many processes in the refining and chemical industries utilize hydrogen or synthesis gas. The most important industrial method of generating hydrogen and synthesis gas is by steam reforming of hydrocarbons. Selas Linde carries this out with top-fired primary reformers.

Our experience in designing and building reforming furnaces dates back to 1957.

Capacities range from 15 MM SCFD to 175 MM SCFD in a single reformer.

Selas Linde has developed a special reaction model of the reforming process to support reformer design. This computer program calculates the composition of the reformed gas, and the firebox is dimensioned for a wide feedstock envelope.

The design of the waste-heat recovery system for the flue and process gases considers the customer’s specific requirements and allows furnace efficiency rates of over 92%.

Our reformers are modularized to the greatest extent to reduce construction and installation costs and risks.
Refinery heaters.

All major processes in refineries require the heating and sometimes vaporization of hydrocarbons in direct fired heaters.

Selas Linde has over sixty years of experience designing and building refinery heaters, constructing more than 450 around the world.

Refinery heaters are designed according to process requirements, with pressures ranging from 1 to 2200 psig and temperatures from 390°F to 1650°F.

Selas Linde heaters cover fired duties from 10 MM Btu/hr to more than 400 MM Btu/hr.

These heaters come in single-cell, double-cell box or cylindrical designs, fired by natural-draft, forced-draft bottom or sidewall burners. Efficiency rates of over 90% are achieved through preheated air, hot oil and steam generation.

+450 refinery heaters designed and installed
The demand for sponge iron (DRI = direct-reduced iron) as the feedstock for steel production in electric melting furnaces is growing. Selas Linde supplies DRI gas heaters tailored to specific processes for the newly developed methods of direct reduction (Finmet, Circored, Midrex plant using COREX gas, Danarex, Hysamex).

Circored
DRI is produced in a circulating and a stationary fluidized bed using nearly pure hydrogen. Selas Linde supplied the reducing gas heaters for the first industrial scale plant using this technology.

Finmet
DRI is produced in four stationary fluidized bed reactors using a mixture of hydrogen and carbon monoxide. The reducing gas is heated from a minimum of 120°F to a maximum of 1715°F.

HYL, Danieli
DRI is produced in a reactor. Reduction gas consists of a mixture of hydrogen and carbon monoxide, heated up to 1705°F in a reduction process gas heater.

To generate reduction gas, a syngas reformer including a waste heat recovery section is used; Selas Linde also supplies the complete reformer and waste heat recovery unit.

Midrex plant using COREX gas
DRI is produced in a conventional Midrex shaft, but uses purified COREX gas as the reducing gas, which is a mixture of hydrogen and carbon monoxide heated with a 2-stage heater. Tail gas from another part of the plant with an extremely low heat value, which would otherwise have to be flared off, can be used to preheat the reducing gas, providing a considerable increase in overall process efficiency.
Heaters at a polymer plant
Specialty chemical furnaces.

Steam superheaters for styrene plants
When dehydrogenating ethylbenzene to styrene, process steam is superheated to about 1500°F in a furnace before being fed into the dehydrogenation reactor with ethyl benzene.

The furnace is based on a double-cell design with a common convection section to utilize waste heat.

The tube system is gas fired from both sides via natural-draft or forced-draft floor burners.

Other specialty chemical heaters
Selas Linde also has expertise with specialty heaters for chemicals used in numerous manufacturing processes:

- Superheating oxygen and/or titanium tetrachloride (TiCl₄) for titanium dioxide (TiO₂) facilities
- Carbon disulfide (CS₂)
- Ketene and acetic anhydride
Environmental Technologies.

A pollution-free environment
Selas Linde is committed to providing the equipment, service and technical support required to resolve complex disposal problems. Using our T-HERMAL and THERMATRIX technologies, our systems dispose of nearly all types of gaseous and liquid pollutants, particularly halogenated hydrocarbons and salt-laden aqueous waste.

In a technology where experience and expertise are critical, Selas Linde is an acknowledged world leader.

Since building our first thermal waste oxidation system in 1949, we have over 1,000 installations worldwide at leading process and manufacturing companies in these industries:
- Pharmaceutical
- Chemical
- Refinery
- Pesticides
- Plastics

Our T-Thermal systems consist of vertically or horizontally arranged combustion sections with proprietary burner technology and Sub-X® quench systems, plus sections for heat recovery, flue-gas treatment and by-product recovery, depending on the application.

Guaranteed destruction efficiencies
Destruction efficiencies of our waste oxidation systems are guaranteed to meet and exceed the most demanding regulatory requirements anywhere in the world. We have successfully dealt with virtually every kind of hazardous and toxic waste. One example of many:
A specially designed system was selected for the US Army’s program to destroy the nation’s stockpile of obsolete chemical weapons, including nerve agents. A destruction efficiency of 99.999999% was achieved.

Thermal oxidation unit for aqueous waste, pharmaceutical industry, Portugal.
Selas Linde’s patented THERMATRIX® flameless thermal oxidizers (FTOs) are field-proven, high performance and cost-effective solutions for the destruction and removal of a wide range of volatile organic compounds (VOCs) and hazardous air pollutants (HAPs). We provide a full range of FTOs to handle flows from 1 to 100,000 scfm (1-160,700 Nm³/hr). Our portfolio ranges from stand-alone emissions control devices to large-scale process treatment systems and process-integrated, turnkey pollution control systems.

FTO technology is an attractive alternative to flaring systems.

Among many other applications, FTOs are well-suited for purge vent VOC abatement in polyethylene, polypropylene, vinyl chloride monomer (VCM) and ethylene dichloride (EDC) plants, with our customers exceeding regulatory compliance requirements and benefitting from emissions credits.

Our FTOs deliver a host of benefits including:

- Guaranteed greater than 99.99% destruction removal efficiency (DRE), including halogenated organics
- Ultra-low NOx (less than 2 ppm)
- No secondary organic waste stream
- Energy efficient operation (sustaining down to 80 Btu/cf in fume)
- Approved for classified areas for flexible positioning directly at the source of emissions
- Stable operation when responding to variable organic loading
- Completely inert matrix with no catalysts to foul or regenerate
- Superior turndown capability to better address minimum base load conditions and reduce operating costs
- The potential for emissions credits for VOCs and NOx
Submerged combustion Sub-X vaporizer systems.

T-Thermal invented and patented the submerged combustion vaporizer (Sub-X®), installing the first unit at Alabama Gas in 1965. Since the acquisition of T-Thermal in 1992, Selas Linde has continued to develop and supply a range of specialized units for heating and vaporizing cryogenic fluids such as LNG, LPG, liquid nitrogen and propane. The technology has been applied in LNG terminals worldwide, for both base-load and peak-shaving duties. We are the global market leader in the supply of submerged combustion vaporizer systems.

The Sub-X vaporizer assembly consists of the following major components:

- Vaporizer tank constructed in epoxy-coated carbon steel, stainless steel or concrete
- Sub-X burner complete with distribution duct and sparging system
- Heat exchanger coil
- Weir assembly
- Combustion air fan, motor, inlet and outlet silencer and acoustic housing as required
- Control panel and instrumentation package for hazardous area classification
- Optional cogeneration hot water distribution system

Operational safety
The process tubes are submerged in a water bath and the tube wall temperature therefore does not exceed 130°F. There is no risk of flame impingement with LNG contact.

High thermal efficiency
With high heat flux and narrow temperature approach, high gross thermal efficiency rates approaching 100% can be achieved.

Fast response
Rapid start-up and shut-down without process disruptions.

Heat transfer rate
Bubble formation by direct contact heating and the use of a patented weir arrangement provides a high level of turbulence and excellent recirculation over tubes containing the cryogenic fluid, thus maintaining temperature uniformity. Observations of unit operations have indicated no ice build-up, even when operating with low bath temperatures.

High operational reliability
With the exception of facilities that have closed, all Sub-X LNG vaporizers installed since 1965 are still in operation.

Environmental impact
These units are designed to meet regulatory standards with very low NOx emission values.

Multi-burner units for peak shaving
To meet peak shaving demand, our multi-burner vaporizers offer superior flexibility for turn up and turn down.
Dedicated to ease of business.

At Selas Linde, we offer a lot more than the design and delivery of state-of-the-art plant components and process technologies. Our ultimate aim is to make doing business with us as easy as possible.

As a world-leading engineering contractor for steam reformers, cracking furnaces, fired heaters, LNG vaporizers and incinerators, we offer our customers a streamlined, single interface for all technology, engineering, procurement and construction (T-EPC) services. We work collaboratively with our clients to fulfill their project needs and agreed timelines – always considering operability, maintenance and regulatory requirements.

Whether revamp or greenfield projects, customers can rely on us for one-stop, hassle-free project management that covers every step in the solution lifecycle – from initial feasibility studies through basic and detail engineering to procurement and supervision of assembly, construction and start-up.
Collaborate. Innovate. Deliver.

Selas Linde is a world-leading engineering contractor for process furnaces, fired heaters, vaporizers and incinerators for the chemical and petrochemical industries. These furnaces are used for ethylene and EDC cracking and for hydrogen and synthesis gas reforming. Fired heaters support petroleum refining and special chemical processing. Traditional and flameless thermal oxidation systems offer the most flexible, efficient, reliable and, in some cases, the only means of destroying hazardous and toxic chemical waste. And Selas Linde vaporizers sets the standard for low emission vaporization of liquefied natural gas (LNG).

The company offers its customers a single point of accountability for technology, engineering, procurement and construction (T-EPC) projects, backed up by extensive after-sales service.

Selas Linde is part of the Linde Engineering Division – a leading player in the international plant engineering business. Across the globe, Linde Engineering has delivered more than 2,000 plants worldwide and covers every step in the design, project management and construction of turnkey industrial facilities.

Discover how we can contribute to your success at www.leamericas.com/en/selas-linde

Get in touch with our furnace and heater team:
Phone: +61.0.834-0300  e-mail: sales@leamericas.com

Core competencies at a glance

Process technologies
→ Cracking furnaces for ethylene production
→ Steam reformer furnaces
→ Fired heaters and waste heat recovery units
→ DRI heaters and special crackers
→ Incinerators and thermal oxidizers
→ Cryogenic vaporizers

Services
→ Feasibility studies
→ Project management
→ Basic and detail engineering
→ Procurement of services and materials
→ Construction, revamps and commissioning
→ Supervision of fabrication and construction
→ Start-up supervision
→ After-sales service