

Making our world more productive



OXYGON[®]

Maximizing efficiency in ladle preheating.



The continuous search for more efficiency.



Globally, the metals industry is facing severe challenges. Intense competition has put the industry's margins under pressure, while government initiatives are increasingly forcing metal producers to reduce emissions significantly. In order to succeed against the backdrop of these challenges, metal companies have to continuously look for ways to optimize their operations. On the following pages, Linde shows how its OXYGON® family can help you achieve your targets.

The situation today

In the metal production industry, a large number of vessels and runners are used to transfer hot liquid metal between melting and casting operations. Although this is a well-known, established process in the metal production industry, it still offers a lot of potential for optimization, especially in the following areas:

- **Reduce energy consumption**

Using air/fuel-based combustion to preheat and dry ladles is a relatively inefficient process. Large quantities of heat are lost through flue gases, and in many cases, this heat is not recovered.

- **Reach temperature set-point**

Sometimes, conventional equipment cannot heat ladles to the required temperature within the set period of time. These ladles still have to be used to ensure production processes do not grind to a halt. This creates issues downstream as additional heating has to be applied at other points in the production process.

- **Ensured and consistent ladle temperature**

Ladles are often preheated inconsistently. As a result, other processes have to adapt to these fluctuations to ensure production continues without any interruptions.

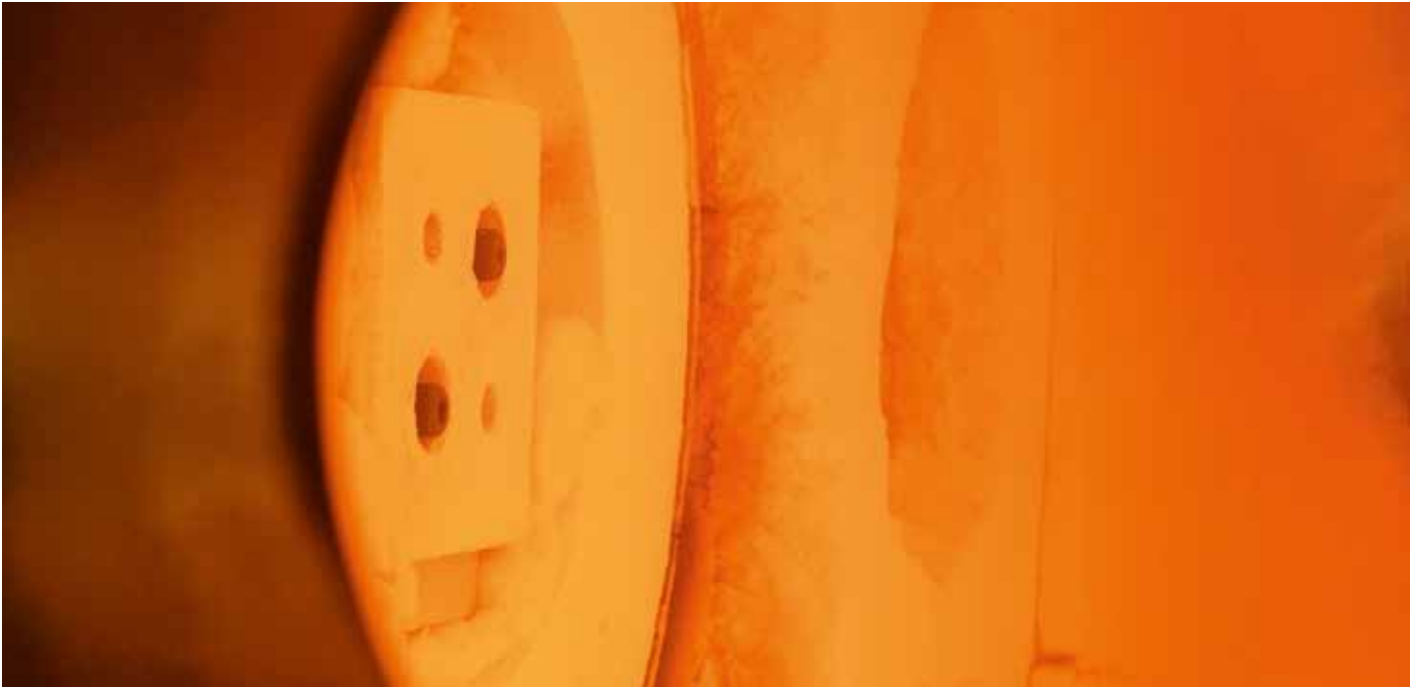
- **Maximize refractory lifetime**

With conventional heating processes, it can be difficult to control the temperature, flame shape, heating window and stoichiometric ratio. The resulting unfavorable conditions can shorten the lifespan of refractory materials.

- **Reduce emissions**

Using uncontrolled combustion processes to dry modern refractories can generate lots of smoke and pollute working environments. Steelmakers are also coming under increasing pressure from legislation to minimize NOx emissions.

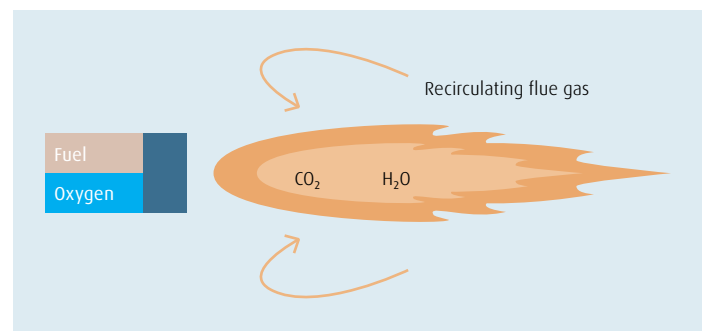
Mastering today's challenges with flameless oxyfuel.



With its powerful OXYGON solution, Linde now offers an effective means of optimizing vessel preheating processes. This technology moves beyond conventional burner designs to harness highly efficient flameless oxyfuel combustion.

The principle of flameless oxyfuel

- During combustion, flue gases are mixed into the combustion reaction zone to dilute the reactants. This distributes the combustion, delays the release of heat and lowers the peak flame temperatures – all of which reduce NO_x emissions.
- Mixing flue gases into the flame also disperses energy throughout the entire vessel, ensuring faster, more uniform heating. The dispersed flame contains the same amount of energy but distributes it much more effectively throughout the vessel.



Maximize your efficiencies in ladle preheating with OXYGON.

Our OXYGON preheating system is available in two versions for different vessel sizes and different levels of flexibility. Safety is a top priority at Linde, so we make sure that all of our products and solutions comply with the relevant safety standards.



OXYGON 400

OXYGON 400 for vessels with capacities from 1 to 20 tonnes

For whom?

OXYGON 400 is an oxyfuel system with a nominal power of 400 kW. It is ideal for customers looking for a simple, efficient method of preheating typical foundry vessels with capacities from 1 to 20 tonnes.

Features

- Integrated burner pilot and UV cell
- Leak testing to ensure safety at all times
- Simpler, more compact and lighter installation than air/fuel systems with recuperative/regenerative technologies
- Flowtrains for fuel and oxygen
- Semi-flameless combustion
- Compliance with local safety standards
- Programmable heating curves for drying and reheating
- Based on on/off operation



OXYGON XL

OXYGON XL for vessels with capacities from 30 to 150 tonnes

For whom?

OXYGON XL is based on the same technology as OXYGON 400, but comes with a more advanced control system as well as a 1.5 MW burner suitable for vessels with capacities from 30 to 150 tonnes.

Features

- Integrated burner pilot and UV cell
- Leak testing to ensure safety at all times
- Simpler, more compact and lighter installation than air/fuel systems with recuperative/regenerative technologies
- Flowtrains for fuel and oxygen
- Compliance with local safety standards

Additional features

- Seamless switching between semi-flameless and flameless combustion
- Variable combustion ratio for modern refractory materials
- Continuous power and ratio control
- Programmable heating curves for drying and reheating
- App for remote monitoring and scheduling (for iPhones, iPads and other mobile devices)
- Integration of advanced burner control into existing process systems

We can tailor our systems to individual customer needs – supporting, for example, higher-power designs or the use of alternative fuels.

Your benefits with OXYGON.

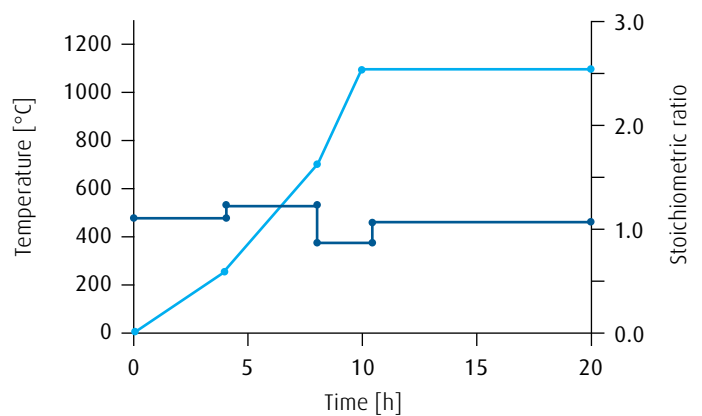
Ensured and consistent ladle temperature

- Reduced overheating in EAF and BOF, which reduces wear and tear on refractory materials, as well as electrode consumption and electricity
- Reduced additional heating in the ladle furnace

Maximizing refractory lifetime through controlled combustion

- Advanced ratio control minimizes sooty fumes and is suitable for drying modern refractories
- Advanced combustion programmes ensure optimized heating curves

Advanced combustion control for OXYGON XL



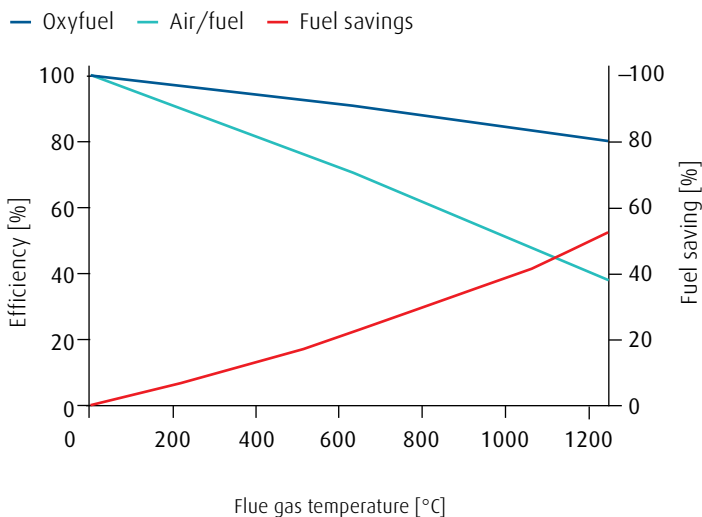
Increased energy efficiency and lower emissions

- Up to 55 percent fuel savings due to removal of nitrogen ballast
- Integration of combustion control system in the process chain to avoid unnecessary heating
- Additional energy savings due to lower tap temperatures in melting or metal treatment process
- Reduced NOx emissions and fuel-based SOx and CO₂ emissions

Reduced number of ladles in operation

- Shorter preheating times enable the same output with fewer ladles
- Reference projects have proven that OXYGON helps to reduce the ladle reheating time from 90 min to 40 min, enabling the number of ladles to be cut from five to four (see table below)

Fuel savings and efficiency



Ladles in operation – air/fuel vs. OXYGON

	Air/fuel	OXYGON
	Five-ladle operation	Four-ladle operation
	Time (min)	Time (min)
Ladle heating	90	40
Tapping*	10	10
Ladle station & casting*	100	100
Maintenance of empty ladles	50	50
Total cycle time	250	200
		Time saved: 50

* Including transport

Linde – your partner for the future.

Many customers trust in Linde, not only as a leading supplier of gases and gas production facilities, but also as a provider of innovative application technologies.



Reasons to partner with Linde

Dedicated to innovation

Our R&D centres in Europe, North America and China ensure a steady pipeline of new application innovations. With OXYGON, we have created a state-of-the-art solution that fully aligns with existing safety standards. This allows you to maximize preheating efficiency.

Excellent support

As your technology partner, we deliver a lot more than industrial gases. You can also rely on us for innovative application technologies and equipment. Your operational efficiency matters to us, and so we ensure that OXYGON is installed properly and that your processes run smoothly afterwards. With Linde, you are guaranteed the highest reliability and safety standards.

Proven performance – trusted worldwide

We have successfully installed many OXYGON reference projects around the world, confirming the compelling benefits offered by our state-of-the-art technology. What is more, we have developed simulation tools which enable us to estimate your individual savings. This makes it easier for you to invest.

Cross-industry expertise

We are a trusted partner to a variety of industries. Our OXYGON solutions generate quantifiable results in industries as varied as steel, aluminium, iron and ferroalloys.

Reliable and safe gas supply combined with smart services.

At Linde, we offer a choice of supply modes to suit your individual volume and reliability needs. We complement the delivery of gases and process technologies with a range of services to make life easier for you. We can help you manage your gas inventory, for instance, and automate your deliveries for uninterrupted operations.

Our supply solutions

We can supply the oxygen you need either by bulk deliveries in liquid form for on-site storage, from on-site production facilities or by pipeline. Our supply solutions are engineered to the highest reliability and safety standards.

Our service offers

ACCURA® gas management

Our ACCURA cylinder and bulk gas management service is an online tracking utility that gives you all the information and tools you need to take complete control of Linde gas assets at your facilities. ACCURA lets you view and analyze gas consumption levels and track cylinder movements online at all times.

SECCURA® automatic gas supply

With SECCURA, we remotely monitor cylinder and tank pressure at your site, and automatically deliver gas when you need it, relieving you of checking and ordering tasks.

LIPROTECT® services for quality and safety

At Linde, handling industrial gases safely is part of our daily business. Our LIPROTECT offering allows you to benefit from our expertise, offering a host of proactive services that focus on preempting and preventing accidents.



Getting ahead through innovation.

With its innovative concepts, Linde is playing a pioneering role in the global market. As a technology leader, it is our task to constantly raise the bar. Traditionally driven by entrepreneurship, we are working steadily on new high-quality products and innovative processes.

Linde offers more. We create added value, clearly discernible competitive advantages, and greater profitability. Each concept is tailored specifically to meet our customers' requirements – offering standardized as well as customized solutions. This applies to all industries and all companies regardless of their size.

If you want to keep pace with tomorrow's competition, you need a partner by your side for whom top quality, process optimization, and enhanced productivity are part of daily business. However, we define partnership not merely as being there for you but being with you. After all, joint activities form the core of commercial success.

Linde – ideas become solutions.

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