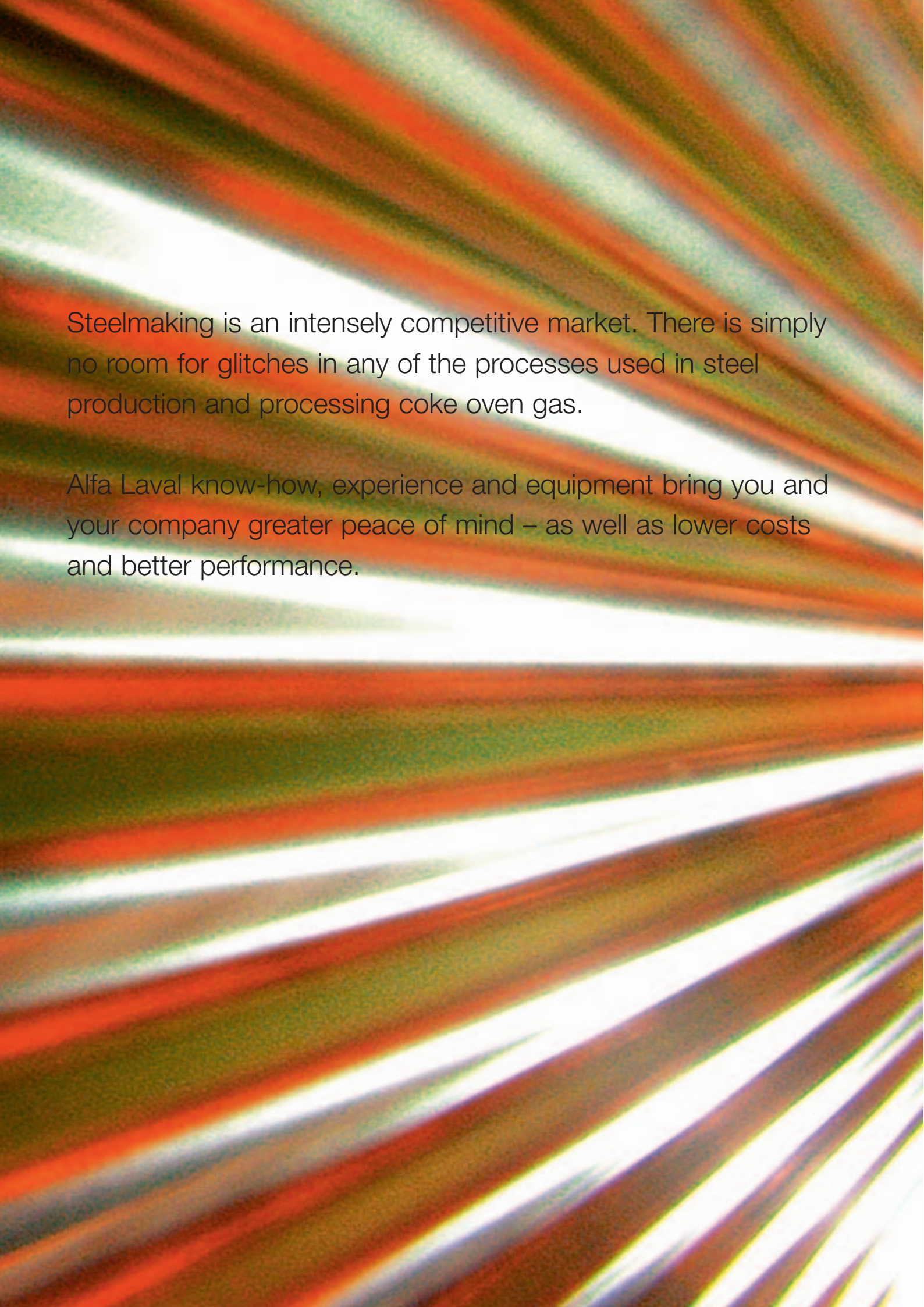
Serious steel

Alfa Laval solutions in steel production and processing coke oven gas



Steelmaking is an intensely competitive market. There is simply no room for glitches in any of the processes used in steel production and processing coke oven gas.

Alfa Laval know-how, experience and equipment bring you and your company greater peace of mind – as well as lower costs and better performance.

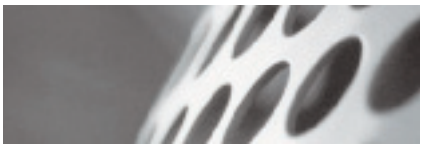
Close to the heart of the steel industry

A serious business
From the railway era to the space age, steel has been the backbone of the industrial world.

Alfa Laval plays an important role in building and extending this crucial infrastructure. We design, develop and constantly improve equipment and solutions used throughout steelworks and ironworks, from the coke oven gas plant to the surface coating.

In these complex operations, the margins for error are small. It is essential to avoid any unscheduled downtime – loss of production is expensive and any equipment malfunctions have serious repercussions for other installations in the process.

There is quite simply no room for mistakes. Our customers know this full well, just as they know the value of peace of mind.



… deserves serious solutions
Alfa Laval provides virtually all kinds of compact heat exchangers, featuring both plate and spiral types, as well as air coolers, filters, and separation equipment that includes both decanter centrifuges and disc stack centrifuges.

We also provide continual improvements and technical innovation that help you keep ahead in a fiercely competitive world market, and deal with many of the important environmental considerations involved.

Alfa Laval equipment has a strong reputation for reliability, efficiency and technical innovation in this demanding business.

The Alfa Laval advantage
Incorporating Alfa Laval technologies and solutions into your steel and coke oven gas processing systems enables you to

- cut down on installation and operating costs
- boost uptime, reliability and overall plant performance
- keep maintenance, service, and repair costs to budgetable minimum levels.

Focus on cost-effectiveness

Alfa Laval equipment used in steelmaking and processing coke oven gas enables you to achieve new levels in your cost/performance ratios.

Alfa Laval separation and heat exchanger equipment is designed to

- save you money
- save on space
- reduce fouling
- reduce maintenance
- provide greater operational flexibility.

Save money

The greater thermal efficiency that results from counter-current flow and crossing temperatures means that you need fewer Alfa Laval plate or spiral heat exchangers for any given task – as well as using smaller amounts of cooling or heating media – than with the shell-and-tube alternative.

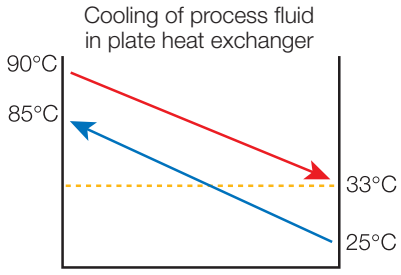
Save space

You can easily retrofit Alfa Laval plate and spiral heat exchangers into your existing installations because of their small footprint. The small size and low weight of these units also result in lower installation costs.

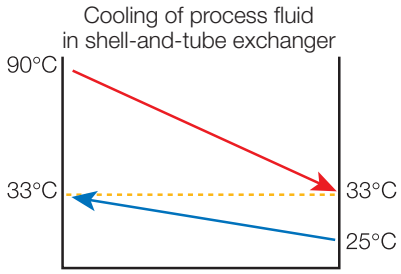
Their small size also makes it financially viable to build these Alfa Laval heat exchangers in exotic materials such as titanium or special alloys. This is of particular benefit in the corrosive environment in a coke oven gas plant.

One of the most compact plate heat exchanger installations currently available is the Alfa Laval Compabloc. This only takes up about 20% of the space needed for a traditional installation.

Comparison between amounts of cooling water needed for same duty (plate heat exchanger/shell-and-tube heat exchanger)

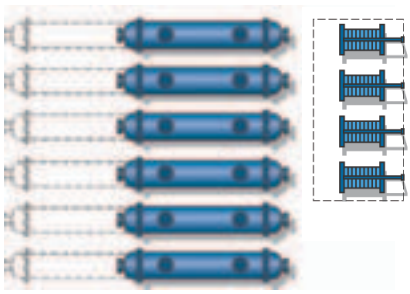


- Temperature cross possible
- Outlet cooling water 85 C, (i.e. useful heat)
- 33,250 kg/h cooling water necessary



- Temperature cross impossible
- Outlet cooling water max. 33°C, (i.e. waste heat)
- 250,000 kg/h cooling water necessary

Comparison between amounts of space needed for same duty (plate heat exchanger/shell-and-tube heat exchanger). Plate heat exchangers require significantly less space for both installation and maintenance than is the case for shell-and-tube heat exchangers. The dotted line represents the extra space needed for maintenance of the bulky, conventional heat exchangers.



Cut down on fouling
Alfa Laval plate and spiral heat exchangers are designed to achieve high turbulence, which reduces the risk of fouling during operation and makes subsequent chemical cleaning very effective. In these heat exchangers, the large majority of the heat transfer surfaces can be reached for mechanical cleaning simply by opening the unit.

Reduce maintenance
The dusts and sludges present in steelworks applications are among the most abrasive constituents normally encountered in conjunction with centrifugal separation. The availability of hard surfacing materials capable of combating wear and corrosion is therefore crucial for decanter centrifuge reliability.

Alfa Laval decanter centrifuges incorporate advanced protection against the harsh operating environments often present in steelworks.

Benefit from greater flexibility
Alfa Laval plate heat exchangers are all based on a design that is inherently versatile. You simply adjust the number and specifications of the plates to match variations in your plant capacity, only adding more when production demands require it.

Photo: © DanSteel A/S

One of China's largest steel producers depends on Alfa Laval
When the Anshan Iron & Steel Group Corporation (AISC) selected Alfa Laval as its preferred supplier of decanter centrifuges, management cited three particular reasons – cost, efficiency and durability.

AISC saw that the life cycle costs of the Alfa Laval decanter centrifuges were lower than competing technologies. The AISC workshop director noted, "Yes, we save money because the running cost of the decanter is lower than other wastewater equipment."

He continued, "The Alfa Laval decanter is easy to use and maintain – although steelworks duties are of course very abrasive. Most routine repairs are carried out with ease, and there are none of the blinding and blockage problems normally associated with equipment like filter presses."

The sum of many parts

With over fifty years of experience with both separation and heat transfer, Alfa Laval solutions are renowned for their extreme reliability.

Steelmaking

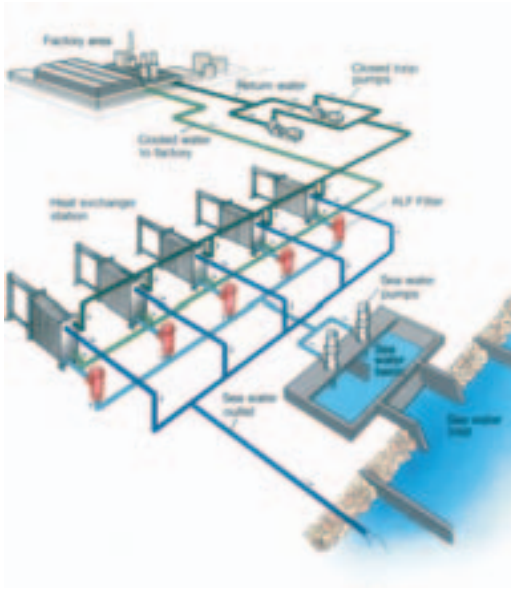
The ability to efficiently dissipate and recycle the enormous amounts of heat consumed in the steel industry is crucial for economical operation and product quality.

This is why Alfa Laval equipment is used in virtually every stage of steelmaking.

Closed loop cooling systems

Well-designed cooling systems are essential under the operating conditions encountered in conjunction with

- blast furnaces
- direct reduction plants
- basic oxygen furnaces
- electric arc furnaces
- continuous casting machinery.



A closed loop cooling system incorporates good-quality water that circulates through the process equipment. This loop water is cooled in a secondary cooling system that consists of a battery of plate heat exchangers cooled by sea water, river water, a cooling tower or some other suitable source available near the plant. This arrangement provides you with significant benefits

- Any problems associated with fouling are moved from the process equipment to the plate heat exchangers. The only place where fouling could present a problem is on the surfaces in the heat exchanger, and you can easily hold this in check using chemical cleaning systems or by mechanical cleaning.
- Your pumping costs are reduced. A closed loop cooling system only requires pumps that can overcome the static height of the process equipment, rather than the entire height of a cooling tower.
- The system is environmentally friendly because the water in the closed loop system only circulate within the factory, while the cooling water is returned unpolluted to the sea or river.

Air cooling

A very effective alternative to cooling towers for the closed loop cooling is Alfa Laval air coolers. These dispense with all the problems and costs associated with water treatment and make-up water because an air cooler system consists of a closed circuit. In addition to providing maximum reliability, Alfa Laval air coolers combine high efficiency with low electricity consumption and noise levels.

Oil cooling

Alfa Laval plate heat exchangers provide you with efficient replacements for the traditional shell-and-tube heat exchangers often used for cooling oils such as transformer oil, morg oil, lubricating oil and gear oil.

To prevent oil or lubricating liquids and cooling media getting mixed together, with very costly consequences, Alfa Laval has developed double-wall plate heat exchangers that exclude such risks.

Dust and sludge dewatering
Decanter centrifuges are widely used for dealing with dust arising from blast furnaces, basic oxygen furnaces, sintering plants and other molten metal operations. Removing water from the wet scrubbing slurries, and recovering and recycling the resultant solids make it possible for you to generate important additional revenue flows.

Alfa Laval decanter centrifuges are also used extensively for dewatering the sludges that result from wastewater treatment operations prior to disposal, so that the water can be reused for other processes within the plant.

Cleaning contaminated oils
The industrial oils used in steelmaking often end up polluted and containing substantial numbers of particles. Such oils are expensive to buy, but sometimes disposal of them is even more expensive.

Alfa Laval disc stack centrifuges are ideal for cleaning such oils because they remove both particles and water from your oil in one single operation.

Ensuring that the oils you use in your processes are always clean means substantial savings due to
- lower purchasing and disposal costs
- reduced production downtime
- reduced wear and corrosion on the equipment served.

This means that with Alfa Laval disc stack centrifuges you get a rapid return on investment – in many cases less than one year.

Pickling line heat exchangers
The highly corrosive environment in pickling baths makes graphite virtually the only material suitable for the heat exchangers needed here.

Alfa Laval has therefore developed the DIABON® plate heat exchanger, with plates made of special graphite-based material capable of withstanding both stainless steel and carbon steel pickling fluids.

Largest graphite plate installation in Europe

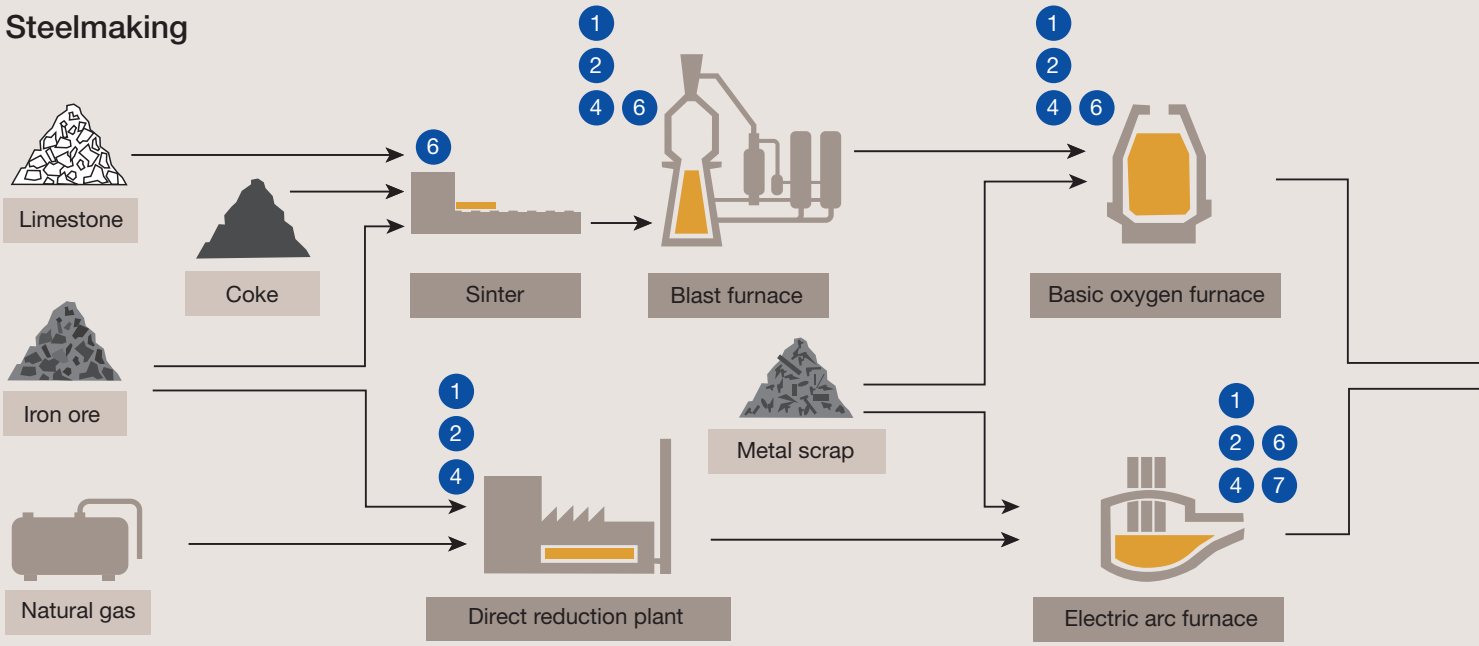
13 Alfa Laval DIABON® NS1 graphite plate heat exchangers were installed in the modernized tandem cold-rolling mill of ThyssenKrupp Stahl AG in Dortmund, Germany. This constitutes the largest installation of steam-heated graphite heat exchangers in Europe.

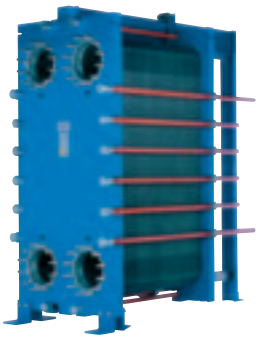
Mr Seynsche, planning engineer for the modernization of the pickling line, noted that “Maintenance costs have been halved in relation to the previous generation of block heat exchangers. With our CIP plant and the use of plates, we are now able to optimize the maintenance process still further.

We are also very pleased with the rate of heat transfer. Another important feature is that we can add or remove plates at any time, which gives us a flexible installation. This is important because the heating needs of the individual heating zones in the pickling bath can change over the life span of the rolling mill.”

The best technology in the right place

Steelmaking





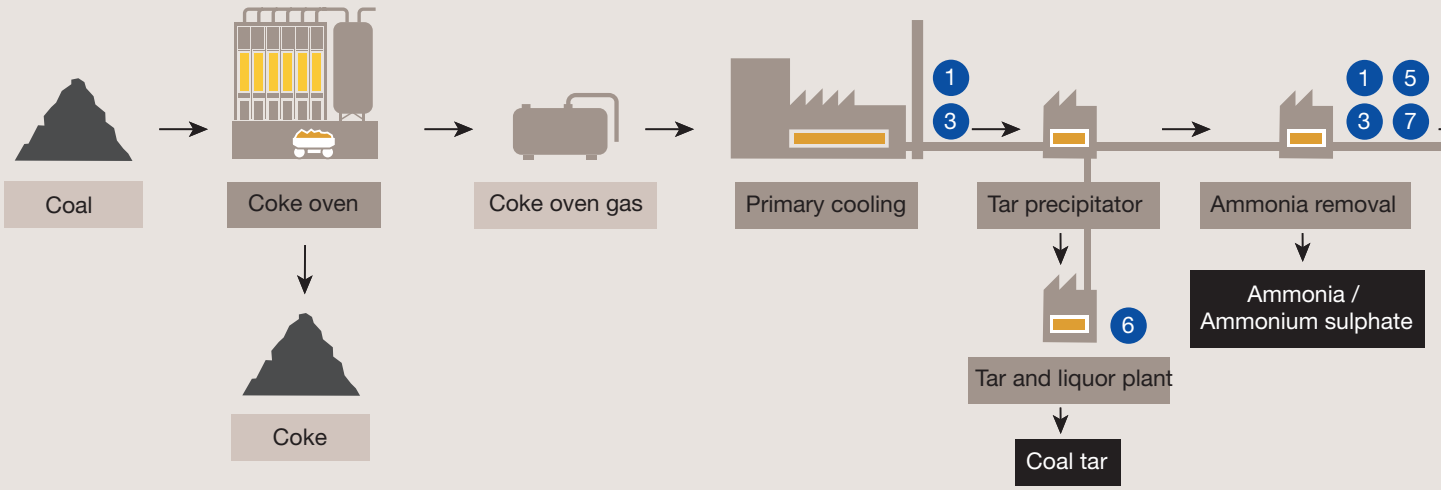
1 Plate heat exchanger

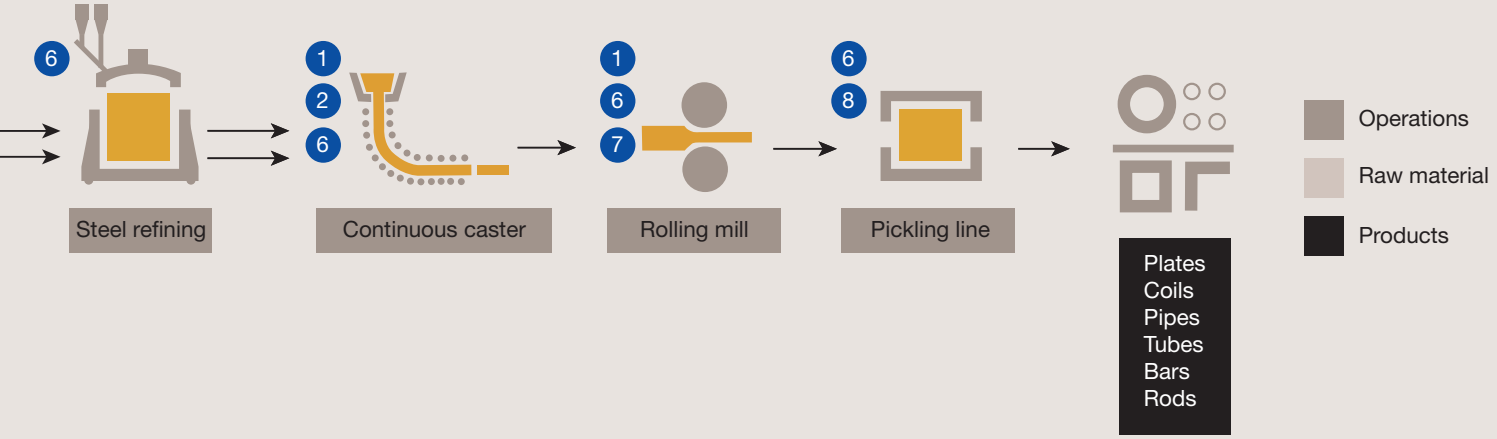
2 Air cooler

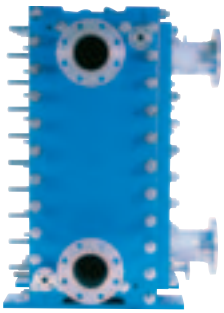
3 Spiral heat exchanger

4 Filter

Coke oven gas processing



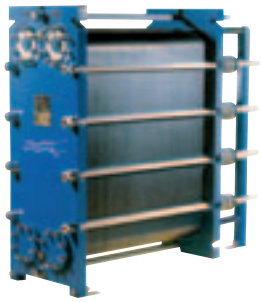




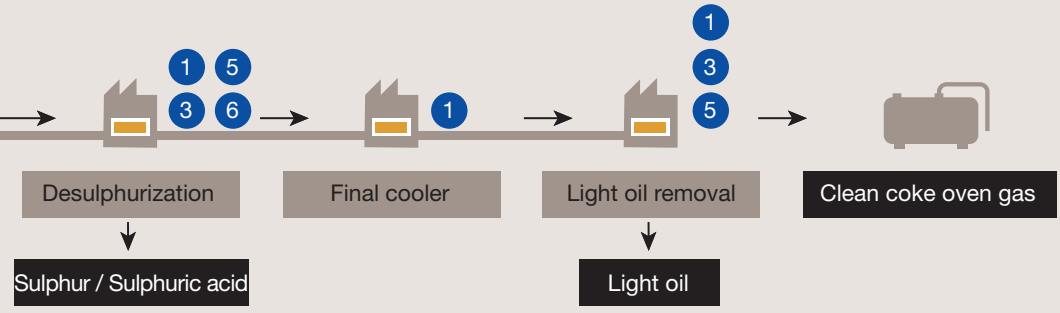
5 Compabloc

6 Decanter centrifuge

7 Disc stack centrifuge



8 DIABON® Plate heat exchanger



The sum of many parts

With over fifty years of experience with both separation and heat transfer, Alfa Laval solutions are renowned for their extreme reliability.

Coke oven gas processing

Coke oven gas is the by-product from converting coal into coke, which is then used in steel production and other industrial processes. The volatile substances in the coal are vaporized and then cooled to produce a liquid condensate and a gas stream. This gas then has to be processed so that it can be used as an environmentally friendly fuel gas.

Such processes involve aggressive, highly corrosive and fouling environments that place considerable demands on the resilience of the equipment. From the self-cleaning spiral heat exchanger in the direct primary cooler to coal tar clarification and condensing of benzene, Alfa Laval provides highly efficient, reliable solutions for virtually every stage in the processing of coke oven gas.

Primary cooling
Regardless of whether you use a direct or an indirect primary cooling system, Alfa Laval can provide the most efficient solution for your needs.

One of the most common solutions is the direct primary cooler (spray cooler). The cooling water in a direct cooler is “dirty” and therefore has a natural tendency to give fouling problems. Such water can easily be handled in Alfa Laval spiral heat exchangers, where the single-channel construction makes the unit self-cleaning. This ensures that operation remains efficient and reliable at all times.

A frequently used alternative is the indirect primary cooler (horizontal tube cooler). Such a system can use Alfa Laval gasketed plate heat exchangers or air coolers, or a combination of these, in a closed loop cooling system. This keeps your process equipment away from the cooling flow, yet still ensures maximum efficiency.

Tar and liquor plant
You can make an important contribution to the overall economics of your plant by extracting high-quality distillate tar as a by-product from your coke oven gas processing operations. However, the crude tar from the coke oven gas purification plant contains both solids and ammoniacal water that must be removed. The three-phase design of Alfa Laval decanter centrifuges makes it possible for you to do this with maximum efficiency.

High endurance
BaoSteel Co. Ltd is the largest, most modern iron and steel complex in China, and one of the most competitive steel enterprises in the world.

In two of the gas processing lines at the company’s coal chemical plant, no fewer than 47 Alfa Laval spiral heat exchangers have been serving as ammonia liquor coolers for periods as long as 10–20 years. They operate in a highly aggressive environment where there is a considerable risk of fouling.

By comparison, a small number of spiral heat exchangers from another manufacturer were installed in the third line in 2000. These had already failed three years later, due to poor welding quality. The company then decided to replace them with four Alfa Laval spiral heat exchangers, identical to those that have been in problem-free operation elsewhere in the plant ever since 1985.

Removing ammonia and sulphur
Both ammonia and hydrogen sulphide are very corrosive. Their removal is therefore a high priority in coke oven gas plants.

The ammonia (NH_3) and hydrogen sulphide (H_2S) recovery parts of a process line can be designed in different ways.

Whichever configuration you choose, Alfa Laval has an effective solution that is resilient enough to cope with the corrosive nature of your processing operations, including a number of different all-welded heat exchanger designs to remove such NH_3 and H_2S, including spiral heat exchangers and the unique Compabloc.

Both these types of heat exchanger feature a much greater thermal efficiency than the traditional shell-and-tube alternative, making them the preferred choice in virtually all situations.

Removing light oil
Light oil is a general term for a mixture of chemicals consisting mainly of benzene, toluene and xylene. Light oil is removed from the coke oven gas using wash oil in a gas scrubber. The light oil is then stripped out using steam.

Alfa Laval Compabloc heat exchanger units are ideal for use here to provide an extremely compact scrubber/stripper system with high thermal efficiency compared with traditional installations.

Space-saving solution
The Avdeevka plant in the Ukraine is one of the largest coke-producing installations in Europe. Plant management selected one compact Compabloc heat exchanger to serve as a condenser for light oil recovery (BTX), replacing two large shell-and-tube units that took up more than 400 m^2 of space.

“We needed to reduce the pressure drop over the heat exchanger, and we wanted to avoid having to subsequently heat the oil. A single Compabloc made this possible, saving 100 m^3 of coke gas per day. Benzene extraction from the oil is also much more efficient,” explained Mr Kaufman Semyon, Avdeevka coke oven plant chief engineer.

The best tools for the job

Alfa Laval provides you with an exceptional range of separation and heat transfer equipment tailored to specialist industry requirements.

Cooling, heating, condensing and reboiling
Alfa Laval heat exchangers are available with plates made from virtually any metallic materials that can be welded and/or pressed. There are many different designs.

Spiral heat exchangers
Alfa Laval spiral heat exchangers are exceptionally compact and feature a self-cleaning design that makes them particularly suitable in applications where one or both of the process liquids is dirty and causes fouling.

Spiral heat exchangers are also ideal for condensing operations, particularly at very low-pressure and/or high-volume flow.

Fully welded Compabloc heat exchangers
Compact Alfa Laval Compabloc units are fully welded and therefore have no gaskets between the plates. This means they are ideally suited for operation in chemically aggressive environments and for handling high temperatures and pressures, both for liquid/liquid duties and for use as condensers, reboilers and steam heaters.

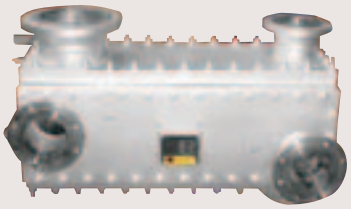
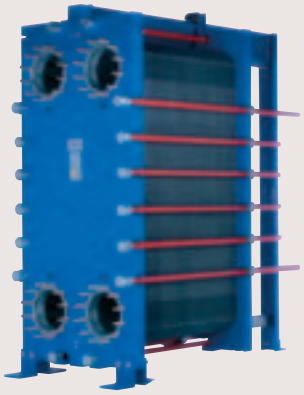


Plate heat exchangers
Alfa Laval provides a full range of plate heat exchangers for virtually any capacity and practically every requirement within this field. The main types are

- gasketed
- semi-welded
- double-wall.



Graphite plate heat exchangers, DIABON®
These special types of Alfa Laval plate heat exchangers feature plates made of non-metallic materials such as graphite, which ensures excellent resistance to corrosive substances and oxidizing media.

Air coolers
In cases where water sources are scarce or an open cooling system is not the most efficient solution, Alfa Laval also provides air coolers to ensure process cooling water of top quality. Alfa Laval air coolers are very compact and feature extremely low power consumption, high heat transfer and low noise levels.

Korean steel manufacturer gears up

Dongkuk Steel, a pioneer in Korean steel plate production, has installed three Alfa Laval disc stack centrifuges to purify the lube oil in the roller straightener. Dongkuk Steel operates two plate mills located in Pohang, with a combined annual production capacity of 2.5 million tons. Alfa Laval disc stack centrifuges had been previously used in the plant for cleaning the lubricating oil in the mill. These were of the solids retaining type and had served well over the years.

However, they have now been replaced by the new generation of Alfa Laval self-cleaning units. Using Alfa Laval disc stack centrifuges saves the company large sums of money due to reductions in waste of expensive oil, lower disposal costs and reduced wear on equipment.

Mechanical separation and filtration

When it comes to separation and filtration, you need results that are both rapid and under stringent control. By using Alfa Laval separation equipment, you can ensure that all your separation needs in steel and coke oven gas plants can be met on a rapid, continuous basis.

Disc stack centrifuges

Disc stack centrifuges are ideal for a wide range of separation tasks that involve lower solids concentrations and smaller particle and droplet sizes. They are therefore ideal for a wide range of separation duties in steelmaking operations involving

- lubricating oils
- morg oil
- water-based coolants
- rolling oil
- oily water.

Decanter centrifuges

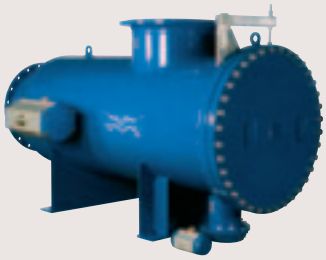
Decanter centrifuges can be used to dewater the wide range of sludges that arise in steelmaking and coke oven gas production processes. They are generally used when there is a need to separate the components of liquids with greater solids concentrations and with larger particle sizes involving

- tar and liquor plants
- blast furnaces
- basic oxygen furnaces
- sintering plants.

Filters

In any closed loop cooling system that uses poor-quality water from the sea, rivers or other sources, there is a risk of growth or clogging in the heat exchangers. This always reduces the heat transfer efficiency.

Alfa Laval automatic back flushing filters protect your heat exchangers against clogging and fouling, and thus prevent blockages in the cooling system.



Serious service

In industrial projects where much is at stake, it is crucial to have working partners that deliver results as specified – anywhere in the world.

Partnership is judged by results
With our worldwide reach and incomparable technical capacity, Alfa Laval is therefore the ideal partner when you are looking for results beyond the ordinary. We

- focus on cost-effectiveness and low life cycle costs
- provide innovative solutions that will probably exceed your expectations
- provide you with practical, experienced guidance and advice at all stages
- ensure local representation that is on the spot to provide system recommendations and to monitor and help with installation and commissioning
- provide efficient service and maintenance support throughout the service life of your system
- minimize downtime by having Alfa Laval parts and service available when and where you need them.

Nonstop Performance
Alfa Laval works on the basis of a concept we call Nonstop Performance. For you, this means less downtime, better quality and greater profitability. Nonstop Performance stems from a 100% commitment to our customers and their needs, and is the basis for our whole approach to service, whether we are delivering a single spare part or creating a complete service plan.

Experience and expertise
The key to Nonstop Performance is know-how and experience built up over many years, listening to and learning from our customers in every major market around the world and focusing not just on our own products but also on the processes in which they are used. It is that core of expertise and experience that enables us to tailor each service plan specifically to your needs.

Genuine spare parts
Any service plan can only be as good as the parts on which it is based. Non-genuine spares may be cheaper initially but can well end up costing you money in the long run. That is why we supply only original Alfa Laval spares; to keep your equipment running longer, reduce maintenance costs and reduce downtime.

On-site services
Our service lines are open to support you with

- supervision and problem-solving
- start-up
- upgrades and retrofits
- cleaning-in-place service
- field balancing
- re-gasketing and repairs
- advisory services
- hands-on training of your staff
- site audits.

Alfa Laval in brief

Alfa Laval is a leading global provider of specialized products and engineered solutions.

Our equipment, systems and services are dedicated to helping customers to optimize the performance of their processes. Time and time again.

We help our customers to heat, cool, separate and transport products such as oil, water, chemicals, beverages, foodstuffs, starch and pharmaceuticals.

Our worldwide organization works closely with customers in almost 100 countries to help them stay ahead.

How to contact Alfa Laval

Up-to-date Alfa Laval contact details for all countries are always available on our website at www.alfalaval.com

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