

Process solutions for the metals industry



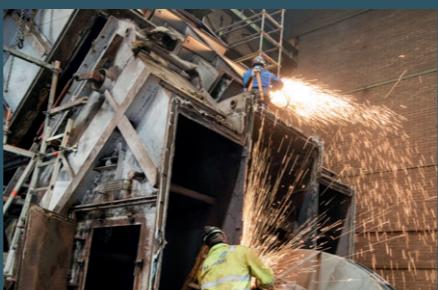
Howden offers a wide portfolio of air and gas handling solutions in the metals industry, for reliable, efficient and future-compliant operations.

Pioneering air and gas handling since the company's inception in 1854, founder James Howden developed and patented the forced draught fan system and air preheating, which resulted in improved marine and land boiler efficiency. This radically reduced fuel consumption, and ships that incorporated Howden air and gas handling systems became capable of carrying more cargo over longer distances, enabling our customers to succeed over their competition.

Today, Howden continues to collaborate and evolve as world leader in the technology, design and manufacture of air and gas handling equipment.

Our involvement in the metals industry has grown steadily over the years after Howden initially provided centrifugal fans for arduous applications such as ID sinter fans, and centrifugal and axial fans for cooling air.

With our customers at the forefront, Howden is constantly developing equipment for improved efficiencies including Roots blowers for vacuum de-gassing and in the drive to reduce emissions from steel plants, and the supply of large rotary gas-gas heaters (GGH) integral to SOx and NOx reduction systems. Howden also provide large fabric filters and fans in de-dusting applications in order to minimise the release of harmful particulate matter, and we are increasingly involved in the decarbonisation of the industry, to advance a more sustainable world.



Why Howden?

If air and gas need to be moved, or compressed, at any process location within a metals plant Howden have a solution for you, ranging from fans, turbo-blowers and compressors that can all be tailored to your application.

Howden also offers regenerative heaters which can be adapted to simultaneously transfer energy from and to a gas flow source, when air and gases need to be heated or cooled for plant efficiency or emissions reductions reasons.

Supporting the core processes, Howden also supplies utility equipment that plays an integral role in most metal processing plants including flue gas treatment, wastewater treatment, process cooling, waste heat recovery systems and more.

For example, a GGH is utilised in the Tail End Selective Catalytic Reduction (SCR) NOx reduction system that can reduce the gas burn required by the system to about 15% of that without a GGH.

Find out more about the range of products we supply across the diverse processes in the metals industry on pages 3-6.

We are customer centric

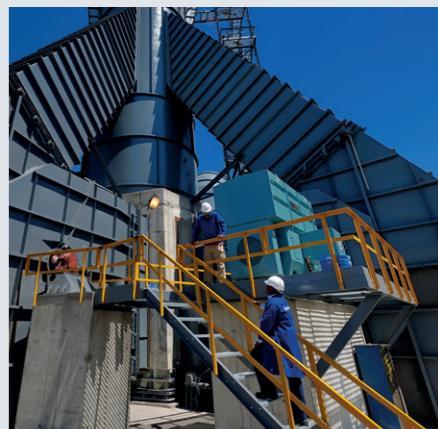
Howden has been a major contributor to the development of modern steel making processes, having worked with customers and process developers to design fans specifically to satisfy the many different operating conditions encountered.

We continue to innovate and evolve with new solutions being developed to satisfy the ever increasing demand for higher availability, better efficiency and long product life, with current developments focussed on technologies to reduce plant environmental emissions.

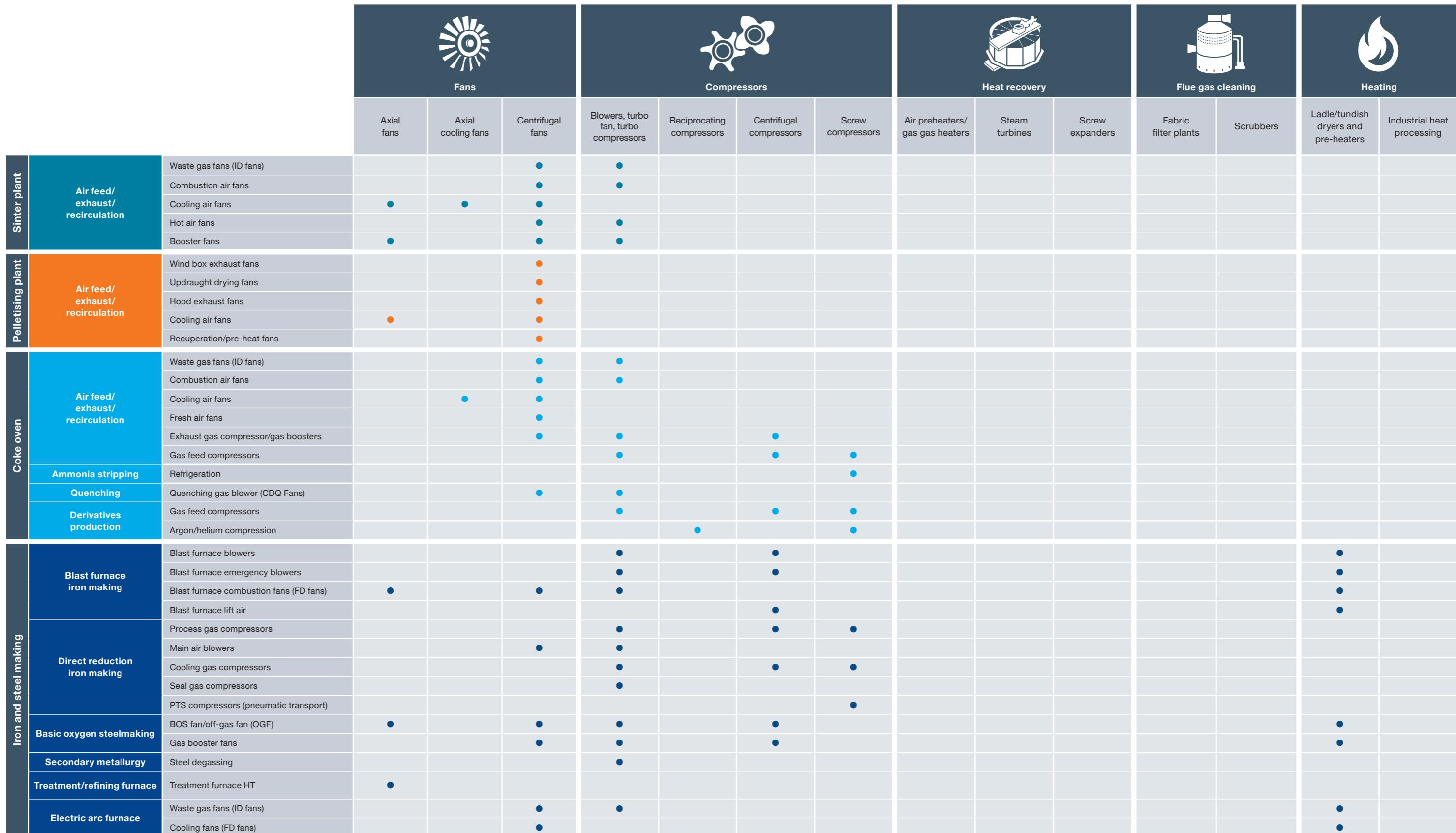
Howden has been active in developing environmental applications for flue gas treatment, having supplied over 300 Tail End SCR Gas-Gas heaters throughout SE Asia and China since 2009, when the first heaters were supplied and installed on a sinter strand in South Korea.

We are very active in developing technologies that focus on improving overall plant efficiency. Our KK&K branded steam turbines help turn high temperature waste heat into electric power, and we are currently working to develop technologies for waste heat recovery from lower temperature sources through the utilisation of screw expanders.

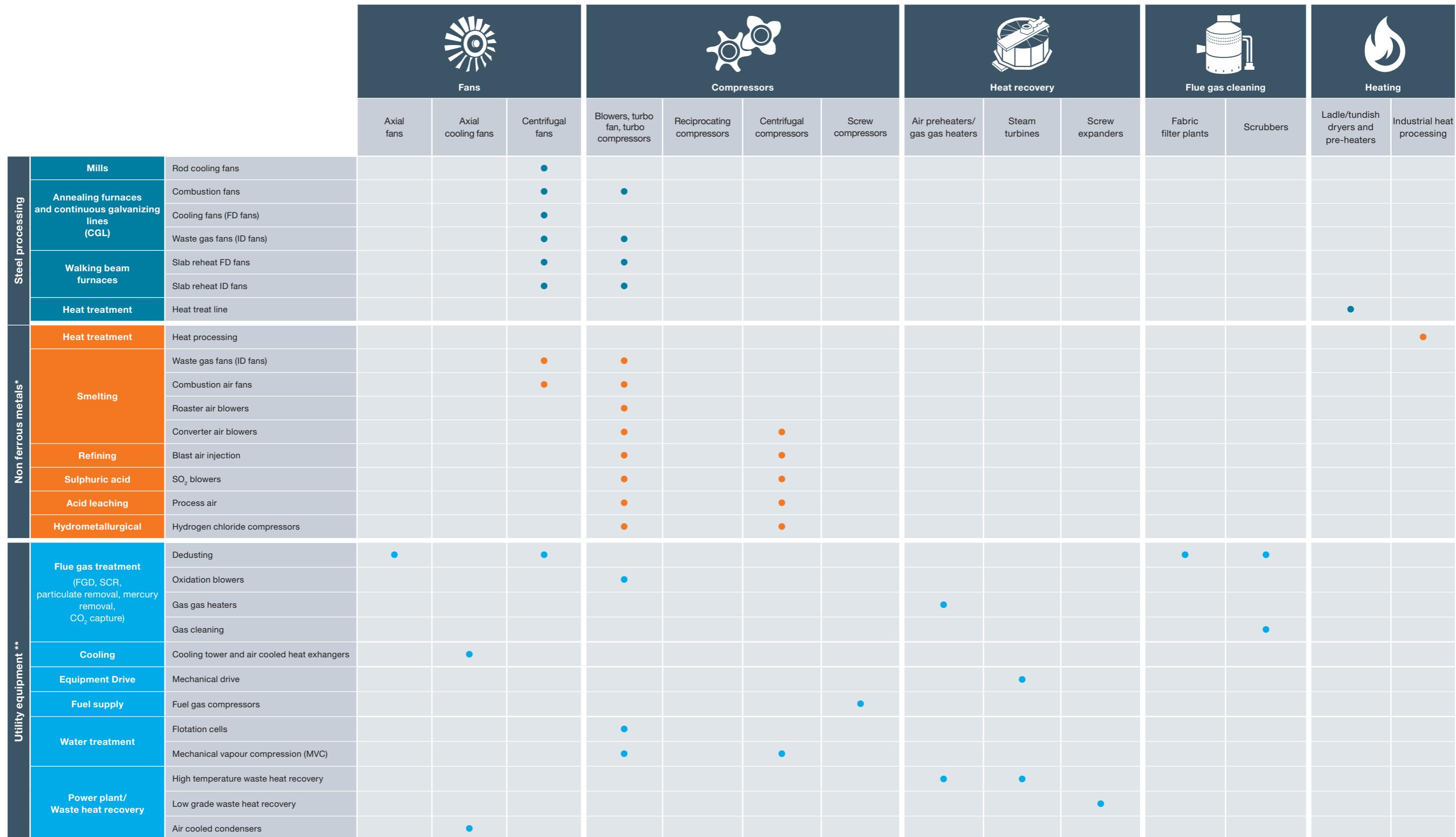
Howden also supports customers in the pursuit of carbon neutrality, through industry decarbonisation. As an expert in hydrogen compression for refineries, we are channelling our knowledge and experience in order to introduce hydrogen technology in the metals industry, with further involvement in carbon capture, utilisation, storage projects (CCUS), and the production of bio-ethanol from industrial waste gases.



The right technology for every challenge



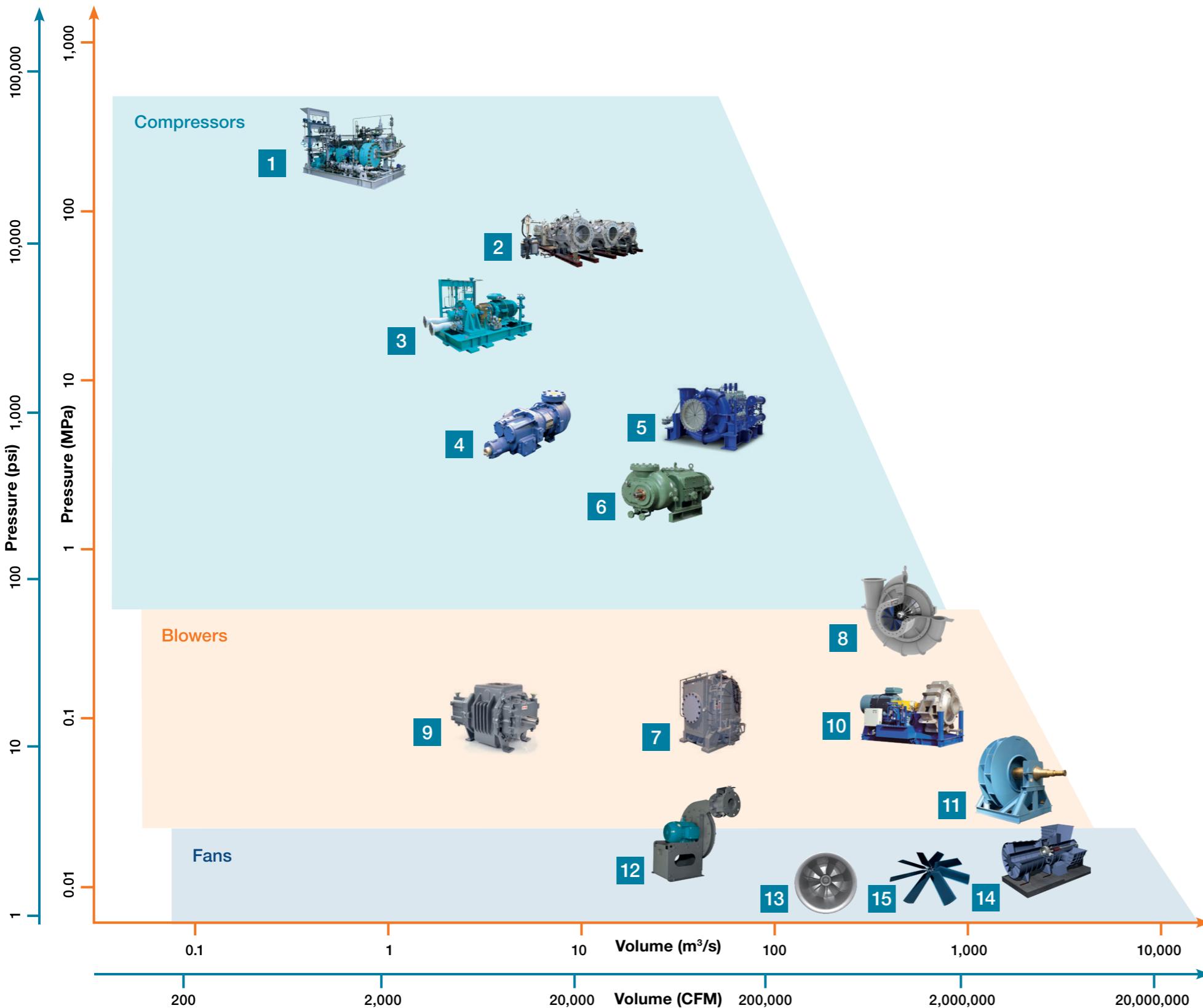
The right technology for every challenge



* Aluminium, Copper, Heavy Metals, Precious & Noble Metals ** Applicable to most metal processing plants

Howden product range pressure/volume chart

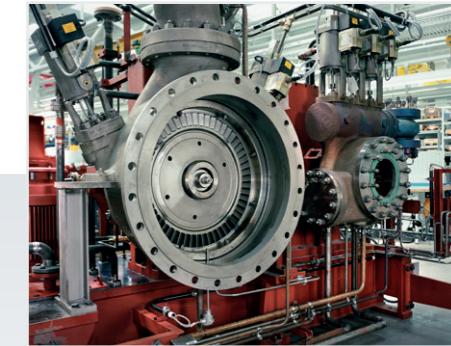
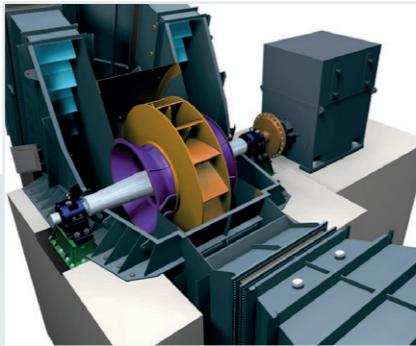
Howden provides the industry's widest range of fans, compressors and blowers to help solve customers' toughest application engineering challenges.



- 1 **Diaphragm compressor:** Delivery pressure max 300 MPa (43,500 psi). Flow max 1,200 m³/h (706 CFM).
- 2 **Reciprocating compressor:** Delivery pressure max 60 MPa (8,700 psi). Flow max 34,000 m³/h (20,000 CFM).
- 3 **Peripheral compressor:** Delivery pressure max 35 MPa (5,075 psi). Flow max 20,000 m³/h (11,800 CFM).
- 4 **Oil injected screw compressor:** Delivery pressure max 7.5 MPa (1,087 psi). Flow max 29,000 m³/h (17,000 CFM).
- 5 **Centrifugal compressor:** Max 2.5 MPa (362 psi): flow max 180,000 m³/h (106,000 CFM). Max 5 MPa (725 psi): flow max 72,000 m³/h (42,400 CFM).
- 6 **Oil free screw compressor:** Delivery pressure max 4.5 MPa (652 psi). Flow max 92,000 m³/h (54,000 CFM).
- 7 **Large Roots industrial blower:** Up to 1 barG (15 psiG) pressure increase. 2.4 bar (35 psi) max. Down to 950 mbarG (28" HgG) vacuum. Up to 119,000 m³/h (70,000 CFM).
- 8 **Single stage turbo blower:** Delivery pressure max 0.3 MPa. Flow max 720,000 m³/h (424,000 CFM).
- 9 **Small Roots blower:** Up to 1 barG (15 psiG) increase. Down to 950 mbarG (28" HgG) vacuum. Flow up to 8,500 m³/h (5,000 CFM).
- 10 **Turbo fan:** 2:1 compression ratio for a single stage (1 bar 14.5psi standard air conditions). Multiple stages. Flows up to 165 m³/s (350,000 CFM).
- 11 **Heavy-duty centrifugal fan:** Low 700 m³/s (1,500,000 CFM). Max wheel dia 175 inches. Max temperature 800°F (425°C) to 2000°F (1,100°C) for high temperature designs.
- 12 **Low to medium duty centrifugal fan:** Flow 94 m³/s (200,000 CFM). Max temperature 1000°F (540°C). Max wheel diameter 66 inches.
- 13 **Axial fan:** Flow max 400 m³/s (850,000 CFM).
- 14 **VP axial fan:** Flow max 2,600 m³/s (5,500,000 CFM).
- 15 **Cooling fan:** Flow max 710 m³/s (1,505,000 CFM). 250Pa.

Engineering proven over decades of robust operation

Howden incorporates many of the most celebrated names in fan innovation and engineering. As manufacturers of a range of fans, compressors, and other key related equipment we can offer unbiased advice about matching product technologies to demands and duties in the metals industry.



Centrifugal fans

Heavy-duty fans

Steel plants use a significant number of large centrifugal fans, which include the converter Off-Gas fan (OGF), the Coke Dry Quenching (CDQ) fans, or the Electric Arc Furnace (EAF) ID fans.

Great care is required throughout the selection and design of the fans, particularly for the Basic Oxygen Steelmaking (BOS) ID process as the fan is handling a gas which is erosive, corrosive, highly flammable and poisonous.

Key features

- Fatigue resistance
- Erosion protection
- Aerodynamic performance
- Sealing performance

Benefits

- Optimised operating expenses
- No unplanned production stoppage

Typical plants/application

- Coke oven
- Blast furnace
- Basic oxygen furnace
- EAF furnace

Centrifugal fans

Sinter and pellet fans

Some of the most arduous erosive fan applications encountered in any industry are in steel manufacture and in particular on Sintering or Pellet processes, where fans have to move large quantities of hot gas which contains highly abrasive dust particles that can erode the impeller surfaces.

Howden methodically assesses the level of protection required on the impeller to ensure a balance between capital investment cost, wear life and availability is provided. One of the limiting factors for the application is the availability of large, high efficiency fans capable of extracting very large volumes of extremely hot, abrasive waste gases from the process.

Key features

- Erosion protection
- High efficiency

Benefits

- High temperature resistance
- Low chance for unexpected downtime

Benefits

- Optimised operating expenses
- High availability/low downtime

Typical plants/application

- Long product life cycle
- Low maintenance cost

Typical plants/application

- Sinter plant
- Direct Iron Reduction (DRI)
- Pellet plant

Axial/centrifugal fans

Low to medium duty fans

Diverse metal processing plants require a wide variety of fans for the supply of oxygen in order to combust fuels. This includes hot air fans and recuperation fans which reintroduce process heat in order to improve process efficiency, fans to cool or dry the product, and fans to remove exhaust/ waste gases from the process.

Each fan needs to be designed to fit the specific circumstances in terms of air flow, pressure, and efficiency, but also to withstand the most demanding operating conditions.

Key features

- Low energy consumption
- Reliability

Benefits

- Localised manufacturing
- Best in class efficiencies
- Low chance for unexpected downtime

Typical plants/application

- Coke Oven
- Sinter plant
- Pellet plant
- Blast furnace
- Direct Iron Reduction (DRI)

Gas gas heaters

NOx reduction

Nitrogen Oxide (NOx) is a by-product of many iron and steel plant processes from the furnaces and coke ovens through to the sinter plants and finishing units due to their need for high temperatures and typical involvement of fossil fuel combustion.

As environmental standards tighten, reducing emissions by treating the off gas is a critical part of plant operations and Selective Catalytic Reduction is deployed to clean the gas to the required level.

Howden's regenerative heaters can increase the efficiency of the system by reducing additional heating required to reach the catalytic reduction temperature (~250–427°C), for the conversion of NOx plus NH₃ to N₂ plus H₂O.

Key features

- Heating elements with high thermal efficiency
- Online high pressure water cleaning system
- Advanced low leakage sealing

Benefits

- Maximised energy recovery and cost savings
- Better fit for space constrained locations
- High availability with low impact of fouling

Typical plants/application

- Low maintenance

Gas gas heaters

SOx reduction

Sulphur Oxides (SOx) is emitted by multiple processes within a metals plant. To reduce sulphurous emissions to an acceptable level, flue gas from the combustion units is treated within a Flue Gas Desulphurisation plant.

Many FGD systems are designed with gas reheat to produce a 'dry' stack. This ensures sufficient plume buoyancy, prevents stack liquid discharge and keeps ground level SOx2 and NOx concentrations rising above specified limits.

Howden's regenerative gas-gas heaters recover energy from the untreated gas as it enters the FGD scrubber by absorbing the waste heat in thin metal heat transfer elements.

Key features

- Heating elements with high thermal efficiency
- Online high pressure water cleaning system
- Advanced low leakage sealing

Benefits

- Maximised energy recovery and cost savings
- Better fit for space constrained locations
- High availability with low impact of fouling

Typical plants/application

- Low maintenance/low footprint

Steam turbines

Within the metals industry, steam turbines can transfer excess heat from process outputs to mechanical energy, and produce electricity through a generator.

By reusing heat energy that would otherwise be disposed of, plants can reduce energy costs and CO₂ emissions, while simultaneously increasing energy efficiency.

Howden offers a comprehensive range of steam turbines up to 24 MW. These innovative and economical machines have a simple modular design enabling performance optimisation in a variety of applications.

Key features

- Back-pressure or condensing type

Benefits

- Only minimal foundation work required

Benefits

- Largely maintenance free
- Resilient and proven technology
- Quick start without preheating
- Quick installation and commissioning

Typical plants/application

- Captive (CHP) power plants
- Utility waste heat recovery

VENTILATION

RECOVERY

Engineering proven over decades of robust operation

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Roots blowers

During the steelmaking process, while the molten steel is still in the ladle and before it is poured the steel must be refined to achieve desired properties in the finished product.

A vacuum degassing process will be used to create a higher quality, lower carbon steel with minimal oxygen, hydrogen and nitrogen contamination. Roots blowers are also applied extensively in the Direct Reduced Iron production process.

Key features

Variation in flow capacity to be able to achieve direct connect speeds

Sealing and coating options

Wide operating envelope and turndown capabilities by reducing speed

Benefits

Reliable equipment with low maintenance requirements

Proven technology and design

Lower required power needed with varying process conditions

Typical plants/application

Vacuum degassing

Direct reduced iron

Various conveying process

Air/gas separation

Screw compressors

Screw compressors can be found in several areas of the metals industry, either handling coke oven gases or being part of the direct iron reduction process, but can also be used for fuel gas supply to a captive gas turbine based power plant.

Howden has the in-house expertise to provide the refrigerant compressor for cooling processes and, if required, even the entire refrigeration system.

Key features

Wide operating range

Flexible design and control philosophy

Standardised as well as customised packages

Benefits

High tolerance to particulate, liquids and dirty gases

Integral capacity control for part load and power savings

Proven and reliable technology

Long service intervals

Typical plants/application

Direct iron reduction (DRI)

Coke oven gas

Captive gas turbine based power plants

Utility refrigeration system

Centrifugal compressors

During the coke-making process, a large amount of crude coke oven gas is produced, that needs to be processed to form clean fuel gas. The extracted by-products crude tar, crude benzene, sulphur and ammonia are refined further and used primarily in the chemical industry.

Howden's KK&K coke gas exhausters form an integral part of this process. Blast furnaces need a constant and reliable supply of compressed air to ensure the required level of oxygen for the burning process, as well as enough lift to maintain proper circulation of the hot steel metal load. Another important application concerns converter main blowers.

Key features

Handling of gases with sticky content

High performance range

Benefits

Lower running expenses

Reliable and safe operation

Environmental protection

Typical plants/application

Coke oven

Steel mill process

Direct reduced iron

Smelters

Ladle/tundish dryers and pre-heaters

Ladle and tundish preheating and drying equipment is required in virtually all steel making facilities. Ladles transport molten metal from the main arc furnace to the caster where the tundish equipment resides.

ACI (Advanced Combustion Inc.) ladle and tundish pre-heaters are used to quickly and efficiently preheat the interior of ladles and tundish prior to their receipt of molten metal. Dryers, while appearing similar are used to dry out the castable lining of 'green' ladles and tundish prior to entering into a campaign.

Key features

Robust, time-proven and customisable

Environmentally friendly

Multi-fuel capable

Usage of best-available-technologies

Benefits

Easy to maintain and service

Reliable with quick heat up times

Programmable for numerous drying campaigns

Typical plants/application

All steel making facilities

Industrial heat processing equipment

Since 1952, Howden has been designing and supplying custom industrial heat processing equipment to the metals industry.

Howden specialises in aluminium and copper heat treatment processes, including:

Batch Homogenizing Systems, Aging Ovens, Melting and Holding, Continuous Solution Heat Treatment, Copper Tube Annealing and Copper Shaft Melting.

Every piece of equipment is custom engineered to suit our customer's needs and application.

Key features

Complies with heat treatment standard (AMS2750E)

Temperature uniformity to +/-10°C (+/-5°F)

Cooling rates in excess of 370°C (700°F) per hour

Benefits

Protective atmospheres

Efficient combustion systems

State-of-the-art automation systems

Typical plants/application

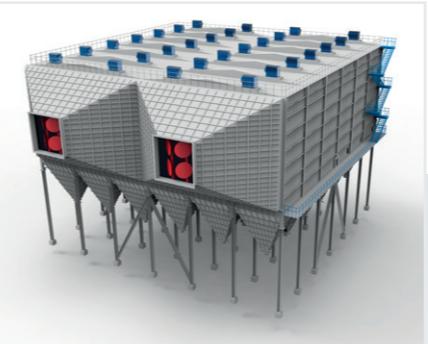
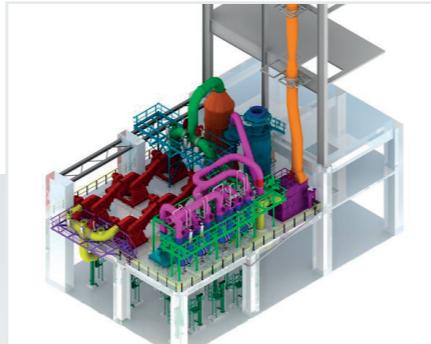
Wide array of metal processing plants

COMPRESSION

HEATING

Engineering proven over decades of robust operation

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Pulse jet fabric filters

Low pressure high volume

Low pressure, high volume particulate emissions to atmosphere from combustion processes (typically coal fired boilers) can be controlled in a variety of ways, but the most effective is the Pulse Jet Fabric Filter (PJFF).

Howden is licensed as an OEM of the Carter Day type PJFF, which have been successfully supplied to customers on a turnkey basis.

Key features

Low pressure, high volume pulse cleaning air

Rotating cleaning air delivery manifold

Benefits

Ideal in retrofit applications where existing space is used, and a high filtration area vs. casing volume is needed

Low maintenance, easy access to the clean gas plenum and cell plate, ensuring quick bag replacement

Typical plants/application

Utility and industrial boilers

Pulse jet fabric filters

High pressure low volume

High pressure, low volume particulate emissions to the immediate work environment from iron and steel making processes are extremely hazardous to the health of workers.

Howden offers bespoke Pulse Jet Fabric Filters coupled to dust extraction ducting networks, ensuring a clean work environment with greatly reduced emissions to the atmosphere.

Key features

Bespoke design for each application

High pressure low volume cleaning pulse

Benefits

Effectively collects sub-micron particles as well as coarser particles at lower pressure drop

Works without spray nozzles or jets that can cause clogging

Adjustable throat dampers maintain constant removal efficiency at fluctuating gas volumes

Operate reliably with a proven record of minimal maintenance year after year

Typical plants/application

Steel making

Metals smelting

Coke oven fume extraction

Scrubbers

Venturi scrubbers use high energy impaction of liquid droplets to remove particulate from contaminated air streams.

Key features

Boiler with double-bladed throat damper for constant efficiency in fluctuating gas flows

High temperature application

Can be mounted on top of lime slakers, using green slaker feed for scrubbing

Very high gas volumes (up to 1,000,000 acfm) and dust loadings

Benefits

Effectively collects sub-micron particles as well as coarser particles at lower pressure drop

Works without spray nozzles or jets that can cause clogging

Adjustable throat dampers maintain constant removal efficiency at fluctuating gas volumes

Operate reliably with a proven record of minimal maintenance year after year

Typical plants/application

Diverse metal processing plant

Electrostatic precipitators and delta wings

Howden offers Rothermühle ESP's and ESP Upgrades together with Delta Wings for superior Dust separation.

With the Howden Delta Wing technology we are able to support you to reach the needed absorption standards and beyond. Howden is able to optimise your flue gas stream to get the highest levels of efficiency from your ESP. This will prepare your equipment for the upcoming stricter regulations concerning environmental protection.

Key features

Suitable for almost all types of fuels like Black Coal, Brown Coal, Peat, Waste Wood, Sludge, Oil and more

Benefits

Significant reduction of emissions

Low Investment costs

Low maintenance

Typical plants/application

Diverse metal processing plant

Cooling fans

Metals production uses a range of high temperature processes which necessitate cooling systems as a result. Onsite power is commonly provided by a power plant, which also requires a cooling capability.

These cooling systems typically circulate water in order to transfer heat away from the process and incorporate cooling towers, air cooled condensers (ACC) or air cooled heat exchangers (ACHE) acting as condensers.

Howden's fans are used to ensure adequate volumes of air are passed through the cooling tower, ACC or ACHE.

Key features

Fiberglass Reinforced Polyester blades

Wide operating range -20C to +85C

Low to ultra-low noise performance

Benefits

Outstanding durability

High aerodynamic efficiency

Minimal vibration levels

Lowest noise levels available

Typical plants/application

Utility cooling

Power plants

Turbo fans

Howden's ExVel® turbo fans are a unique centrifugal fan and blower technology which provides substantially higher compression for air and process gas compared to a traditional centrifugal fan.

Pressure differentials can be as much as 4 times that of a traditional centrifugal fan, with a wide potential flow range, and excellent operating efficiency, allowing for greater processing production with less and more efficient equipment.

Key features

From 2.5 to 175 m³/s (5,000 to 350,000 acfm) volumetric flow rates

Up to 85% efficiency

Anti-friction and hydrodynamic bearing options

Benefits

Exceptional flow and pressure performance range at high efficiencies at substantially lower cost than other compressor technologies

Highly durable, reliable, and flexible in a variety of applications

Typical plants/application

Wide array of industries and applications

Process air supply/process gas/off-gas

MVR (Mechanical Vapor Recompression)

ENVIRONMENTAL

UTILITY

Metals industry experience

Tough, reliable solutions for air and gas handling in the metal processing industry.



Coking

In a coke oven plant our oven fans extract the raw Coke Oven Gas (COG), a by-product of the coke production, and provides a very important source of high calorific gas which is then used as a fuel gas in other parts of the steelmaking process.

The raw COG is highly contaminated and needs to be cleaned prior to its use as a fuel, however some of these contamination elements such as tar, sulphur, phenol and ammonia have a significant commercial value as products in their own right and can be recovered from the cleaning process. The cleaning process is also used to improve environmental emissions.

Various processes used for extraction of the by-products during cleaning is facilitated by the use of Howden centrifugal compressors.

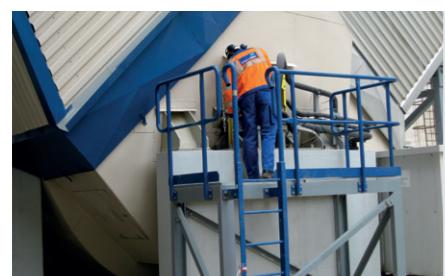


Sintering

Our rotary gas-gas heaters are being used in the emissions reduction systems of sinter plants and coke plants to efficiently transfer heat between the untreated and treated gases. In the sinter plant our forced draught combustion air fans support the combustion process before our cooling fans are used to cool the product. Hot air is recovered and returned to the process and dust is controlled using specialist Howden fans.

Pelletising

Whether using the straight grate process or adding a rotary kiln to make the grate-kiln process, our products play a key role. To dry and heat the ore pellets, a number of fans are used to recycle heat from the kiln. After indurating in the kiln, cooling fans are used to cool the pellets for handling downstream, and fans are used to facilitate dust handling. Our Tail End SCR rotary gas-gas heaters are being used in the emissions reduction systems of pelletising plants to efficiently transfer heat between the treated and untreated gases.



Blast furnace iron

The blast furnace is designed to reduce iron oxides and to separate the resulting iron from the large quantities of impurities in the ore.

Blast furnace fans are essential in driving heated air into the furnace and our ID fans are then used to draw the furnace gases. Where a cooling tower exists, our cooling fans are an important way to remove heat.



Direct reduced iron

Shaft furnace:

Rotary blowers and centrifugal compressors are used in the process to supply combustion air into the reformers and a process gas compressor, seal gas compressor, and a cooling gas compressor are required to help circulate the process gas in the system.

Rotary kiln furnace:

In a rotary kiln furnace, combustion air is supplied into the combustion chamber by a forced draught fan. The waste gases are utilised to heat a boiler, and a waste gas induced draught fan draws the hot gases through the waste gas boiler and electrostatic particulator before releasing them to the atmosphere.

Some of today's most arduous applications for fans and compressors are to be found in the metal processing industry. The need to move large volumes of air or gas, in many cases at high pressures and high dust burdens, places stringent demands on the mechanical design of the equipment.



Steel making

In the basic oxygen furnace, dust control is provided by an induced draught waste-gas fan or a basic oxygen steelmaking (BOS) fan. The gases need to be cleaned by drawing the gases through a dust removal system and wet scrubber.

In the electric arc furnace (EAF), oxygen injection or an ore charge may be used as the principal source for refining oxygen. The off gases are cooled in a primary cooler helped by cooler exhaust fans, and then cleaned in a dust removal system by utilising the main induced draught waste gas fans.

While the molten steel is still in the ladle and before the molten steel is poured the steel must be refined to achieve desired properties in the finished product. Users will employ a vacuum degassing process to create a higher quality, lower carbon steel with minimal oxygen, hydrogen and nitrogen contamination. Roots blowers and vacuum boosters are used in producing this vacuum.



Non-ferrous smelting, leaching etc.

Gas/fumes treatment:

In aluminium smelting, a gas treatment centre treats fluorinated gas and dust emissions, through the application of several induced draft fans, operating in parallel, to draw air from the filters and exhaust to a common stack. Induced draft fans are also applied at the fume treatment centre, treating gases from the anode backing furnaces.

Converter air blowers:

As part of the copper refining process, impurities of the molten copper are separated from the impurities by blast air injection in various converter types (Pierce-Smith, Isa-smelt or Ausmelt). This application requires the highest reliability and control range at demanding pressure rises and process fluctuations which are served by Howden's integrally geared compressors.

Sulphuric acid plants:

During the smelting/roasting process in non-ferrous smelters SO₂-gases are set free and collected for conversion to commercially tradeable sulphuric acid. The main SO₂-Blower is located downstream of the gas cleaning section and drying tower, driving the gas through the sulphuric acid plant.

In spite of demanding process conditions (erosion, corrosion and build-ups) the KK&K compressors SF type have proven their reliability and premium efficiency in hundreds of projects. This is of critical importance for the lowest operating expenses, as the main blower consumes the most electrical power.

Acid leaching processes:

In case of acid leaching processes (e.g. for Nickel production), the required sulphuric acid is produced in a sulphur burning plant. The process air is pushed by the KK&K compressor into the sulphur burner, then pushing the resulting SO₂-gases through the sulphuric acid plant.

Hydrometallurgical processes:

In the magnesium production industry, hydrogen chloride compressors are applied, as part of the hydrometallurgical process to produce magnesium metal.

Tailored solutions

Howden understands the process requirements and ensuring the solutions we deliver are tailored to your needs, specifications and applications is our priority.

By optimising critical equipment to the actual operating conditions, we can keep your process running in a safe and cost effective manner, while at the same time maintaining high efficiency levels throughout the product's lifetime. For larger fan installations, a drop of even half of one percent in efficiency may cost more than 10 million kW/hrs of electricity over the life of a fan.

The design of Howden impeller blades is another example where a stable volume characteristic is achieved, with a self-limiting power curve and the cut-away centre-plate design reduces erosion effects.

Turnkey solutions

New, upgraded equipment, or repairs to existing equipment, is often on a critical path. Especially when executed as part of an outage, it is often essential to execute the job during a very short timeframe.

Howden will work collaboratively with you, in such situations, to ensure both safe execution and a satisfactory end-result. Due to the time critical nature of these projects, the Howden team will offer the knowledge and expertise, supported by extensive planning and communication in order to get the job done on-time and to spec.

Configured solutions

Howden will often collaborate with the system designer in order to overcome process issues, especially in the case of pilot plants. An example includes collaboration with the coke oven system designer to overcome the intermittent, untreated gas supply to the heater. We did this by recirculating some flue gas and inducing air and dry quenching gas before and after the heater, in order to overcome challenges and deliver a solution to best suit the customer needs.

Different areas of the impeller blade will experience different degrees of attack, therefore we can provide different forms of protection in order to balance effectiveness and cost. The design and manufacture of equipment on this scale requires the highest quality of heavy engineering and the electrical systems needed to start, run and monitor large fans are extremely complex. Due to systems like demanding high levels of electrical power, an focussed approach on optimising efficiency is vitally important.

Full scale project management

Where the scope of an aftermarket project involves additional specialist input we can undertake the entire job as a turnkey project. This could involve ductwork, electrical infrastructure, connections to control and monitoring systems, and even civil engineering work such as building foundations or plinths.

We take responsibility for the work itself and, crucially, the planning, scheduling and logistics. Once the details and the commissioning date have been agreed, we remove all the worry and problem-solving from your on-site staff, allowing them to dedicate themselves fully to their normal duties.



References | Case studies

Our case studies highlight our customer-centric approach, from customers looking to improve efficiency, perform an environmental upgrade to comply with changing regulations or reduce maintenance costs. Howden engineers will work with you to design the optimum solution for your plant or process.

voestalpine Donawitz: Sinter waste gas fan energy savings

voestalpine Stahl Donawitz GmbH

A steel producer in Austria with over 140 years of technical experience.

The challenge

The sinter-waste-gas-fan suffered from strong erosion, and voestalpine Stahl Donawitz consulted Howden to evaluate potential improvements on the wear protection.

Based on temperatures, we assumed low efficiencies, and investigated potential energy savings, while simultaneously trying to reduce the impeller speed to reduce erosion. Initial calculations revealed potential energy savings of 900 kW, making the project pay for itself in approx. 2.5 years (excl. CO₂ savings).

The solution

To strengthen our argument, we performed on-site aerodynamic measurements to confirm the potential energy savings and optimise the fan selection and design, while keeping in mind a potential future capacity increase.

CFD analysis then formed the basis for stringent performance guarantees, and continuous performance measurements over several months. This confirmed that we did not need a flow control device, while collecting reliable data about the operating range over time.



The outcome

A complete turnkey retrofit, including a new fan, e-motor with frequency converter, control system, removal of the old fan, and commissioning of the new fan. We compiled a large team of experienced Howden personnel from Germany and the UK, and managed the subcontracted site work. The job was completed on time within 10 days, and an independent party concluded that the fan over-performed at 3 duty points, and that it was "right on target" for a 4th one. This eventually lead to 1052 actual kW savings, additional CO₂ savings, and reduced erosion.

DeSOx and DeNOx gas-gas heaters (GGHs) for sinter plant

Rotary GGHs for Tail-End SCR applications on sinter strands.

The challenge

Modern industrial plants, such as sinter strands in the iron and steel industry, have to comply with increasingly strict gaseous pollutant emission standards requiring the retrofit of flue gas treatment equipment, such as Tail-End Selective Catalytic Reduction (TESCR) for the mitigation of NOx emissions. TESCR provides the most cost-effective, high-performance NOx removal capability on sinter strands.

The solution

In such applications, high-performance rotary GGHs play a vital role in dramatically improving fuel efficiency while being much more compact than tubular heat exchangers. New heat transfer elements (NCU, HC7b and HC8b) were developed for this new "clean" gas application. These are the highest thermal performance elements, resulting in lighter, smaller and more cost-effective heaters. With regard to leakage control, multi-labyrinth seals are applied and if required, leakage levels of less than 1% are achievable with fan assisted active leakage control.



The outcome

Since our first sinter GGH in 2009, Howden have supplied over 300 of such heaters to the iron & steel industry throughout South East Asia and China. The international market for TESCR systems for NOx removal will inevitably continue to expand in the future and the use of rotary SCR GGHs for heat recovery plays a vital part in maximising the thermal efficiency of these TESCRs. As the clear global leader in this application of SCR GGH technology and being able to draw upon an increasingly unparalleled amount of process application experience, Howden can be considered the supplier of choice for such equipment.

Tang steel: Vacuum pump in steel degassing application

HBIS Group Tangsteel Company China's super large steel enterprise with 18 million tons annual capacity.



The challenge

In the steelmaking process, while the molten steel is still in the ladle and before the molten steel is poured the steel must be purified to achieve desired properties in the finished product. To purify the molten steel users will employ a vacuum degassing process to create a higher quality, lower carbon steel with minimal oxygen, hydrogen and nitrogen contamination. Traditionally this vacuum process would have used steam injector pumps to achieve the desired vacuum levels. However, these steam injectors are very energy intense, fixed capacity and require significant maintenance.

The solution

Utilising a multi-stage vacuum pumping system EPC and System Integrators we were able to achieve the desired results. Howden was successful in securing the first stage boosters (72 units) in the largest steel degassing application using mechanical pumps (Shan Steel). While the boosters performance was as anticipated the EPC and customers desire was to move away from a booster that required pressure lubrication. Equipped with this knowledge Howden set-off to design and build our next generation of vacuum booster tailored specifically to the service and duty required in steel degassing applications.

The outcome

In 2019 Howden was successful in supplying its second generation of vacuum booster to the steel degassing market. Howden was awarded a second contract with this EPC and customer Tang Steel for the supply of 53 first stage boosters. Positive feedback was received from the customer on the performance of these second generation vacuum boosters.

Strategic and precious metals processing: Environmental systems

Modern metallurgical plant established in 2015 for the production of high purity Antimony Trioxide (Sb₂O₃), Gold doré, and gypsum as by-products.



The challenge

A first of its kind, industrial size, production plant utilising furnaces instead of a leaching process.

The challenge

The project gained environmental approval with a list of stringent conditions from Oman's Ministry of Environmental and Climate Affairs. The engineering and design had to conform to these conditions, as well as EU and World Bank Environmental Regulations.

The solution

Howden designed and implemented two systems to achieve the environmental requirements: dry-gas and off-gas train. The dry-gas train consisted of two separate, identical systems for 100% redundancy comprising a primary cyclone, primary forced draft cooler (FDC), secondary cyclone, secondary FDC, carbon feeder, and bag filter, and three Induced Draught (ID) fans to a common stack. The off-gas trains consisted of three separate purification systems with the whole system including duct routing, duct sizing as well as the stack designed by Howden.

The outcome

Due to the design of the system, as well as the redundancy of critical pieces of equipment, the plant has managed to achieve and exceed its requirements for high purity antimony on an industrial level, and has allowed the customer to become a world leader in this field.

The project has led to ground breaking techniques, as well as improvements being implemented to streamline the process of antimony extraction. Howden is continuously involved in this project's ongoing expansion and improvement.

References | Case studies

Our case studies highlight our customer-centric approach, from customers looking to improve efficiency, perform an environmental upgrade to comply with changing regulations or reduce maintenance costs. Howden engineers will work with you to design the optimum solution for your plant or process.

Satka SHPZ:

Steam turbines for new blast furnace gas fired CHP in order to improve efficiency, plant availability, and sustainability.

JSC "Satkinskiy Chugunoplavilny Zavod" (SHPZ) is one of the oldest metallurgical plants in Russia.



The challenge

The project was set to benefit both the local environment and the local economy and the customer wanted an extremely robust and efficient condensing steam turbine with controlled heating extraction and a condenser, resulting in blast furnace gas as a low-cost by-product of primary production.

A key challenge was the stability of the grid in the region, resulting in the need for the turbines to be able to function in "island mode" in case of network connection problems.

The solution

Howden produced two steam turbine generator units (TWIN CK57) with an electrical capacity of approximately 6MW each, and supplied a complete solution together with condensers and control system.

Such turbines have an overhung design and can start in full operation mode within 3 minutes without pre-heating. It can work for at least 3 years without any revisions, and by using our new 3-stage condensing module, very good turbine efficiency could be achieved.

The outcome

By using our latest turbine design, we increased the efficiency of the turbine and the customer netted 5% more electricity, as specified per contractual stipulations.

Howden helped SHPZ to reduce electricity consumption by the use of a turbocompressor with a steam turbine drive. Electricity production was also improved by the use of steam turbine generator units, which receive steam resulting to blast furnace gas incineration. It also improved the availability and sustainability of the entire plant.

Salzgitter Flachstahl:

Low noise cooling fans for improved performance of slag granulation application.

Salzgitter Flachstahl is a major German steel company producing more than 4.6 million tons of steel per year.



The challenge

Slag granulation plays an important role in blast furnace operations, managing and commercialising waste from the process.

The process involves a water cooling system in which cooling towers reduce the temperature of the recycled water and eliminate fines. The standard design approach within the towers was to use cooling fans with sound barriers to meet noise regulations. This however did not deliver the required performance sought by the customer who was looking for an alternative for a newly designed cooling tower.

The solution

As specialists in the design of low noise fans, Howden was able to supply a fan that can achieve up to 20 dB(A) reduced noise compared with standard fans. The SX fan is also able to meet a very high air output. The construction of the fan enables it to perform against high static pressure, which was necessary due to the special design of the concrete cooling tower.

The outcome

The SX fan was successfully integrated into the cooling tower design resulting in a more elegant solution with superior noise performance, eliminating sound barriers. The success of the project led to the concept being taken up by other metals technology providers for use within their own slag granulation processes. This approach is now used across many steel plants worldwide.

Howden enables lithium production at Ioneers's Rhyolite Ridge

Rhyolite Ridge is owned by Ioneer USA Corporation (a subsidiary of Ioneer Ltd, an Australian, ASX-listed company).



The challenge

Lithium has recently been listed as one of the 35 minerals deemed critical to U.S. national security and the economy. As (hybrid) electric vehicle sales are projected to rapidly increase using lithium batteries, both lithium and boron are in high demand but with very little domestic supply.

Economic deposits containing borates are scarce, and two major companies produce over 80% of the world's borate supply.

The solution

No mines in the world currently produce both borates and lithium, which is why the proposed Rhyolite Ridge lithium-boron project, located within the Silver Peak Mountain range in Nevada, represents a unique opportunity to fulfil a U.S. source of both critical raw materials. Rhyolite Ridge is a unique sedimentary deposit where lithium and boron can be readily leached from the host rock (Searlesite) using dilute sulphuric acid. SNC-Lavalin will design and engineer Rhyolite's sulphuric acid plant, which will produce 3,500 tonnes per day of sulphuric acid for the leaching process.

The outcome

The Howden SF 18.0 single-stage industrial turbo compressor, with its high aerodynamic efficiency and wide performance envelope, will be used to support the 3,500 MTPD sulfuric acid plant's leach process. With an impeller diameter of 1.8m, Howden is the only manufacturer with the capability and experience to deliver the largest centrifugal compressor in the sulphuric acid main blower market. Howden's longstanding experience in the sulphuric acid industry and its reliable, quality equipment will enable the project to move forward quickly. The compressor will be produced in Germany and packaged in Howden's Springfield manufacturing facility in the USA.

ArcelorMittal Group:

CO₂ reduction through bio-ethanol production.

Howden will support ArcelorMittal Group to significantly reduce their CO₂ emissions, through the supply of turbo fans.



The challenge

While the steel industry is one of the biggest sources of carbon emissions, the world's leading integrated steel and mining company ArcelorMittal is actively engaged in delivering carbon-neutral steel. The company has developed a global CO₂ technology strategy that will enable them to deliver green steel by 2020. It will scale-up this offering in coming years, in order to deliver its 30% CO₂ emission target by 2030 and achieve net zero by 2050.

The solution

A Steelanol plant which will recycle carbon into sustainable, advanced bio-ethanol. Steelanol transforms carbon-rich industrial waste gases into bio-ethanol for use in the transport sector by way of a novel gasfermentation technology. This technology provides the unique opportunity to recycle the carbon from industrial exhaust gases that would otherwise be emitted into the atmosphere.

The outcome

Sulzer Chemtec, that provide the distillation equipment, has appointed Howden for the supply of 4 pcs of ATEXtex certified ExVel® turbo fans including main drive motors, lubrication units, inlet boxes, acoustic blankets and surge monitoring system. This equipment will be operating in deep vacuum, compressing a mixture of ethanol and water vapours. The fans will be arranged in 3-stages, with the first stage consisting of two fans running in parallel.

Life time performance management

Howden aftermarket services consistently minimise costs and downtime whilst improving the performance of your operations.

Collaborating with Howden is key to continuous, efficient equipment performance with minimum downtime over its lifetime. We provide a multi-platform aftercare service built on three key requirements for maximising performance and longevity.

Our maintenance philosophy is a combination of genuine OEM spare parts, ongoing maintenance by experts, and periodic improvements and upgrades that will keep your equipment in the best condition.

Trust Howden to deliver on all three.



Onsite and remote technical support

With Howden's presence near you, we ensure quick response in delivering support for needs like start-up installation and commissioning, on-site maintenance, troubleshooting, performance audit and training.

We can work alongside your own personnel, training your staff and building a partnership that lasts throughout the lifetime of the equipment. Alternatively, we can mobilise a team to support your needs from start to finish.

Genuine OEM spare parts

Spare parts are vital assets for maintaining productivity. The knowledge that spare parts will always be available is of paramount importance in making a decision to invest capital and time in new equipment.

Howden supplies genuine OEM spare parts that are made to the same high performance standards and specification as our products. This means that each part will fit perfectly and maintain the high quality standards your process equipment needs to operate reliably and efficiently.

To ensure that replacement parts are accurate in every respect, they are produced using the original production drawing and specifications, whilst incorporating the latest technological developments. They are also covered by full warranties.

Because Howden equipment is subject to continual improvement, however, we may recommend an upgraded replacement in order to improve reliability or efficiency.

Performance upgrades and retrofit

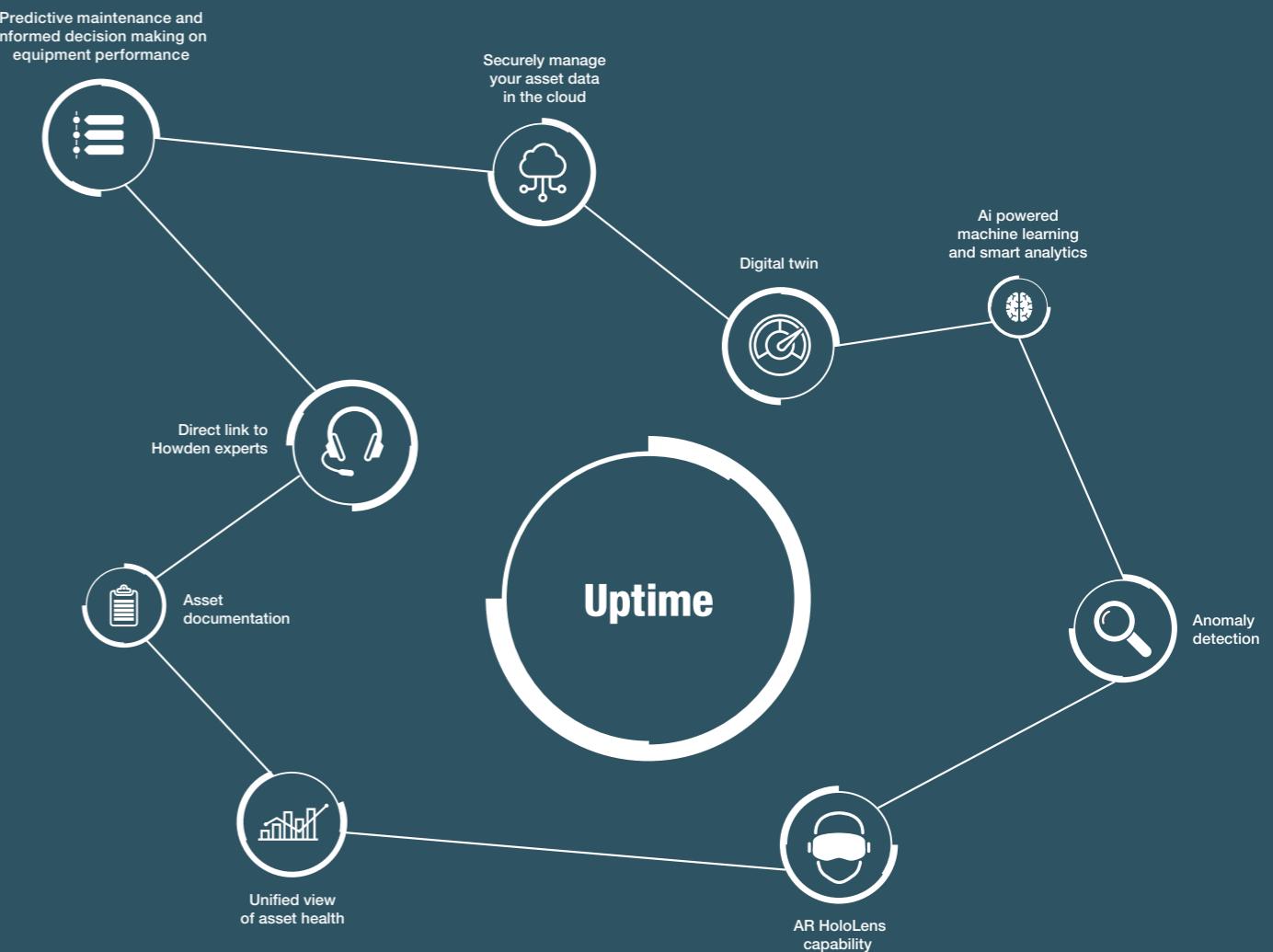
Our performance upgrade offerings help you keep pace with changing process needs like increasing capacity, reducing emissions, and improving energy consumption. Our wide range of upgrade and retrofit solutions ensure that your rotating equipment features the latest technology and continues to meet changing requirements while enhancing its useful life.

That is how we deliver the best possible results, every time.

Our success in constantly meeting, and usually exceeding, the expectations of our customers and is firmly founded on communication and flexibility. We talk through every job need thoroughly, in advance, to make sure we know exactly what is required.

Howden Uptime

Increasing the reliability and availability of process critical assets.



Howden Uptime is a unique digital solution that gathers the physical sensor data from any kind of rotating equipment, and analyses how it operates and responds to the environment.

This solution is designed to provide invaluable insight into asset performance that can increase the availability of the equipment, while significantly reducing costs.

Extend maintenance intervals

The continuous operation of rotating equipment is essential for the overall plant performance. The Howden Uptime solution enables smart and predictive maintenance scheduling to allow you to safely extend maintenance intervals with peace of mind that the equipment will continue to operate efficiently.

Avoid unplanned downtime

We understand that downtime of your critical assets can be costly and disruptive. That is why we have developed a data driven solution that will alert you of any unusual activity and provide prescriptive advice on what action is required before a breakdown occurs.

Expert advice close at hand

Howden Uptime provides a real-time view of the critical data for your equipment, through intuitive and customisable dashboards. Our data driven solution enhances our aftermarket services by bringing you closer to the Howden experts and providing you with instant access to your equipment documentation and service history.

Secure data solutions

The Howden Uptime solution has highly robust and verified security in place to safely manage the transmission of data at every stage in the data journey.



At the heart of your operations

Howden people live to improve our products and services and for over 165 years our world has revolved around our customers. This dedication means our air and gas handling equipment adds maximum value to your operations. We have innovation in our hearts and every day we focus on providing you with the best solutions for your vital operations.



Howden

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Revolving Around You™