

Cooling Fan Technology

Maximising efficiency, minimising noise

howden.com

Howden cooling fans achieve unprecedented heights of performance with the lowest noise levels available.

For more than 160 years, Howden, a Chart Industries Company, has been at the forefront of air and gas handling technology, with a proud reputation for innovative engineering of the highest quality and an absolute commitment to service and lifetime support.

Today, we are a global organisation with bases in 27 countries spread across every continent. Every project we undertake is focused on customer needs, and to each one we bring a unique combination of worldwide experience and expertise supported by an agile and responsive local presence.

We have been leading the world in the development of high efficiency, low-noise cooling fans for several decades by focusing on the fundamental issues. Our innovative Research and Development programme has been driven by a quest to eliminate noise and vibration, starting from first principles. Rather than develop ways of masking or attenuating noise, at Howden we set out to remove the sources. We succeeded.

Our fans can be found in industries ranging from power to petrochemicals, as well as many HVAC and refrigeration applications. Our pioneering developments allow the wide range of industries reliant on cooling fans to meet and exceed Ecodesign compliance requirements.

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Proven by results

- Advanced design and meticulous precision engineering pays great dividends for our customers. That's why, throughout the world, Howden fans are already installed in the majority of industrial cooling systems.
- For any duty point, our cooling fans offer greater aerodynamic efficiency and thus lower power consumption.
- We provide a sophisticated selection tool Howden Select for Cooling Fans that allow customers to make decisions on the basis of actual, deliverable fan performance for both variable and fixed pitch fans.
- Our production technology enables us to produce Fibreglass Reinforced Plastic (FRP) blades whose aerodynamically optimised blade profiles produce outstanding cooling performance and excellent damping and chemical resistance properties with the lowest achievable noise levels.
- We can provide a total turnkey design, installation and commissioning service.
- Our global local presence and unrivalled experience means we provide the most comprehensive, responsive and reliable technical support available.

Over the course of 60 years experience in cooling fan technology, our innovations have shaped customer expectations. **Today we're still well ahead of the competition.**



All Howden FRP cooling fans comply fully with the relevant national and international regulations, and we are fully accredited to ISO 9001 Quality Management, ISO 14001 Environmental Management and ISO 45001 Occupational Health and Safety standards.



Pushing the boundaries of fan performance

Our position at the leading edge of cooling fan design is the outcome of dedicated, focused long-term research.

Our expert in-house R&D department established working partnerships with a wide range of external authorities, including universities and other institutions, to explore the optimum blade profiles, materials and mechanical configurations. We have state-ofthe-art test facilities to investigate each permutation and evaluate each development. Our investment has brought impressive results. Our low noise and ultra-low noise fans offer previously unreachable levels of quietness. Howden cooling fans remove the need for, and the cost of, additional acoustic attenuation measures. These measures can themselves increase the static pressure difference across the cooling system and so raise the power consumption required to drive it.

Howden cooling fans are now well established as the preferred choice in air cooled condensers, field erected cooling towers, packaged cooling towers, climate control and ventilation systems throughout the world, in situations where low noise, high efficiency and absolute reliability are essential.







Howden Select

Because our fans have such a wide range of applications, ranging from power generating, petrochemicals, and large oil and gas processing plants to HVAC and building ventilation, we have developed Howden Select, a sophisticated software package to help customers find the right fan for their purposes quickly and easily.

Users are guided through a series of options to arrive at the right model, size and configuration for their requirements. The programme, available free on request, is so accurate that fans are normally delivered ready for straightforward installation. Our selection software package is highly intuitive. As long as users can provide basic information about the duties required of the fan, and the situation into which it will be installed, they will be guided toward the best fan type and a detailed specification.

The software contains many useful additional functionalities, including an option to request support from our experienced technical team.

For further information, visit: **howden.cloud/coolingfans**





For decades, we have been investing in a major programme of research and development.

D-Series and E-Series fans

Optimised aerofoil designs for maximum efficiency and low noise performance.



E-Series aerodynamic range



D-Series

Blade profiles

The D-Series covers a range of diameters from 26 to 38 feet (7,925mm to 11,582mm). Designed for horizontal operation, the fan can be fitted with up to 11 blades.

E-Series

The E-Series extends the size range, with a minimum diameter of 4 feet (1,219mm) and a maximum of 48 feet (14,630mm). The right choice for heavier duty situations, E-Series fans can be installed either horizontally or vertically.

Designed to offer the optimum balance of cost, efficiency and low-noise operation, the D-Series is available in a choice of three blade profiles.

The DNF/DNM blade is fitted with Howden Aerotip technology, an innovative design feature that enhances aerodynamic performance while significantly reducing the pressure pulse created by the blade and transmitted to the fan ring.

The DLF/DLM blade profile has been designed to give excellent cooling performance with low noise.

The greatest efficiencies are

isolation.

gained by designing a fan as an

rather than as a single device in

integral part of a cooling process

By considering the whole system,

we can design each fan for its

specific situation, and thus optimise overall performance and economy for the operator.

The DVF/DVM blade profile reduces the noise level still further, offering the best acoustic performance of any straight-bladed cooling fan available.

All three are suitable for a wide range of operating temperatures from -20°C to 65°C (-4°F to 149°F) as standard, and this temperature range can be extended on request.

All D-Series and E-Series fans have optimised aerofoil FRP blades, fitted to a polyurethane-coated steel hub. The blades are manufactured with an integral shaft as this eliminates concentrations of stress at the mechanical joints.

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D-Series aerodynamic range



Options for the D-Series and E-Series include leading edge protection to extend fan life in wet conditions, and coatings and materials that allow the fan to be used in sea water cooling towers.



400 600 800 1000 m³/s





SX and FPX Series fans

The new standard for applications with stringent noise limits.



FPXM fan

60 inches (1,524mm) to 92 inches (2,337mm)



SX Series

The SX range reduces noise by up to 20dB(A) compared with standard cooling fans. They are fitted with advanced adjustable pitch blades attached to a polyurethane-coated steel hub, and the blade and shaft are manufactured as a single integrated component, eliminating the joint stresses that can be a significant cause of fan failure.

Blade profiles

The SX-Series offers two blade profile designs with the optimum balance of cost, efficiency and low-noise operation.

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The SX blade profile will deliver the best acoustic performance and is the right choice for heavy duty cooling applications.

The SXT blade profile featuring the air seal is available in the diameter range of 3,048mm (10 feet) to 5,545mm and is the most economic, ultra-low noise solution available with up to six blades and suitable for a wide range of cooling applications.

FPX Series

The FPX range uses fixed-pitch blades, manufactured as a single impeller that offers straight forward assembly and minimal maintenance while eliminating sources of wear. It combines ultra-low noise operation with excellent damping and chemical resistance properties. We can also customize the fan build up to suit specific light-weight or heavy duty fan requirements.

The FPXM fans reduces noise up to 14 dB(A) compared with standard cooling fans and

Cooling fans are often identified as a significant source of industrial noise. Through intensive and focused research and development over the past 50 years, we have consistently reduced cooling fan noise.

One of the outcomes of our work is a series of curved aerofoil blade designs that reduce the causes of noise and remove the need for acoustic attenuation.

minimizes the size of fan casings and transport cost due to the reduced chord and low weight.

The FPX range is suitable for a broad spectrum of HVAC and refrigeration applications serve a diverse set of sectors from the energy industry in oil & gas facilities and power plants through to light industrial manufacturing plants, datacentres and commercial buildings.

Versatile installations

SX and FPX fans are suitable for either vertical or horizontal configurations. Where required, we can also supply either type of fan pre-assembled into a cooling units that include the drive, fan casing and suspension, delivered ready for fast, problem-free installation.

Options



All SX and FPX fans can be upgraded for safe use in higher temperature environments, and they can also be supplied in materials and coatings suitable for operation in wet cooling applications. In addition, the SX range can be manufactured with materials for sea water cooling tower applications.







3,048mm (10 feet) to 5,545mm

Featuring Air Seal Technology which significantly reduces backflow and increases fan efficiency.







The intelligent response to changing demands

Cooling system requirements change throughout the years and older installations may not match today's requirements in terms of capacity or noise.

Where the production capacity has increased, or increases are planned, an inadequate cooling system may cause a production bottleneck. System enhancement can deliver the desired combination of increased capacity and significant noise reductions, ready for the demands of today and the future.

We offer a free consultation to assess the increase in performance and reduction in noise that could be

Cooling system enhancements

Blade reconditioning

Howden cooling fans are designed to operate in challenging environments and these conditions can have a serious effect on the fan blades. Over time, the leading edges of the blades can become eroded and small cracks and other detrimental effects can appear in the blade surfaces. If these impairments are identified early, it is often possible to refurbish and renovate the fan, to bring it back to peak performance at a fraction of the cost of replacement. The procedure is normally done on our premises, but sometimes it is possible to carry it out on site.

Blade reconditioning is the fastest and most cost-effective way to extend fan life and improve deteriorating performance, and it can also prevent the more serious problems that might lead to unplanned downtime or outages.

Cooling fans services

achieved by exchanging a fan.

If the outcome is positive, we

can carry out a more detailed

From first assessment through

commissioning, all the work is

carried out by Howden's

supervisors.

experienced engineers and

a detailed proposal.

research programme and present

performance measurements to the

supply of parts, field erection and

As well as providing a lifetime guarantee to provide spares and maintenance for every fan, we offer a menu of cooling fan services. We are dedicated to extending the working life, and minimising the lifetime operating costs, of every fan we supply.

The services we provide include

- Aerodynamic and acoustic measurements.
- Maintenance inspections.
- Troubleshooting and commissioning.
- On-site FRP fan repair.
- Supervision and turnkey project execution



- Capacity can be quickly and easily increased
- No extra space is required
- The process can be arranged in stages so there is no need to shut down the whole cooling system
- The investment required is low
- A staged implementation makes it possible to accurately monitor the return on investment

Cooling system enhancement examples





Petroplus Ingolstadt

- Plant type: Refinery
- **Issue:** Requirement for improvement of cooling performance and noise reduction
- Solution: Replacement of air-cooler fans with ELFA fans
- Result: 30% more air. 21% increase in plant production, 13 dB(A) noise reduction

- Plant type: Power station
- Issue: Plant noise emission exceeding the permitted noise levels
- towers fans with SX fans
- Result: Decrease of water CO₂ reduction

A new cooling fan is the effective route to increased cooling capacity and reduced noise.

E.ON UK Connah's Quay

Solution: Replacement of cooling

temperature, Increase of turbine efficiency, 15,000 tonnes per year



Applications

Air Cooled Condensers (ACC)

A large number of thermal power plants, regardless of fuel type, will rely on an ACC within their cooling system.

A-frame ACCs are configured for either forced draft or induced draft. Fans required for such systems are typically in the diameter range of 26ft to 40ft. Howden offers both D and SX series fans for this application, which provides customers with a wide size range and ability to match efficiency and noise considerations.

Cooling towers

Some plants base their cooling system on mechanical draft cooling towers. These can be cross or counter flow, including plume abated wet/dry cooling towers. Some natural draft cooling towers may also be fan assisted.

The normal diameter range of fans is between 14ft to 34ft. Howden supplies cooling fans for field-erected cooling towers with the SX suitable for smaller CTs and the D series able to match a wider size range.

Air Cooled Heat Exchangers (ACHE)

Certain thermal power plants, such as waste-to-energy incineration plants, use an ACHE as the condenser within their cooling system.

ACHEs can be configured for forced or induced draft. Fans are typically in the diameter range of 9ft to 18ft. The SX series is suitable for this application with its lower diameter coverage.

Ventilation

Howden Cooling Fans are used in cooling and ventilation systems in various industries from heavy to light as part of HVAC-R applications.

Howden Experience

Howden Cooling Fans are used in cooling and ventilation systems in various industries from heavy to light as part of HVAC-R applications.

Sample projects

Golden Pass LNG, USA

The 3 liquefaction trains provide require substantial amounts of cooling along with the onsite power plant. As a result, the site incorporates a large number of coolers and condensers. Environmental interests around the site required noise levels to be kept within stringent boundaries.

Howden proposed multiple variants able to meet the design specification and was able to attend the performance tests in Korea for the system OEM as well as explain the performance of the fan to EPC technical managers.

The contract comprises more than 600 axial cooling fans. The fans selected are the SX model, which provide the ultra-low noise critical to minimising the impact of the LNG operation within the local environment.

Construction Cranes

A major crane manufacturer required fans to provide essential cooling of the radiator of the internal combustion engine that powers the crane. Keeping the coolant at the optimal temperature is critical for operational performance and economy.

identified for the selection of the best fan. Efficiency of the system within a defined footprint was a major driver of fan choice as well as keeping the noise to an acceptable level. As these machines have to operate in potentially harsh working conditions, the fans also need to be highly durable and shock resistant.

There were a number of criteria

The FPX was able to meet all the key criteria combining the necessary flow,

across the customers' global construction base.

Browns Ferry Nuclear Power Plant, USA

One of the largest power plants in the USA with a capacity of nearly 4GW from its three generating units.

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The plant technology is based on Boiling-Water Reactors (BWR) with a cooling water system drawing from the river and condensing via banks of cooling towers.

Over 100 Howden fans are used within the cooling towers. These are 8 bladed 34ft D series fans with double hub plates and stainless steel leading edges.



robust construction and ultra-low noise performance. As a result the FPX is integrated in multiple models for use



Aftermarket services

Howden has a well-established global aftermarket network providing a permanent presence across every continent

With access to specialist engineers, we can bring quick resolutions to unexpected issues minimizing downtime and ensuring reliable long-term performance through expert operation and maintenance (O&M) services.

Our services in support of our cooling fans range from servicing and parts supply through to performance upgrades and retrofits. The more advanced services can maximise the life of the fans in each system as well as keep their operation aligned to the latest technical parameters.

Services to maintain reliable operation

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- Maintenance and inspections
- Vibration analysis, alignment and balancing
- Spare part supply
- Troubleshooting and commissioning
- Service agreements
- In-house fan blade refurbishments
- On-site FRP fan repair
- Fan Scan

Services to improve performance



Aerodynamic/acoustic measurements, and performance tests



Upgrades and retrofit

Services related to projects



Turnkey installation works



Howden

Supervision and turnkey project execution



Howden Uptime

Howden Uptime gives our customers another option in optimising the performance of our fans throughout their lifetime of operation.

Howden Uptime provides a unique and innovative platform for gathering, interpreting and analysing fan data on a real time basis. The constant recording of operating parameters provides insight into the overall health status of the fans and prompts operational adjustments where beneficial to maximise performance.

Services are delivered either on-site or in our workshops depending on the nature of the service and customer requirement.





Howden, a Chart Industries Company

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