

Energy Recovery

Sustainable thermal solutions
that support our customers in
their energy transition



Air and gas handling solutions to support our customers in their energy transition

A leader in air and gas handling equipment since 1854, Howden's founder, James Howden, developed and patented forced draught fans and air preheating. This improved marine and land boiler efficiency and radically reduced fuel consumption. Howden's steam turbine product brand Kühnle, Kopp & Kausch now has over 100 years of application experience, and creates expanders that efficiently transfer energy from heat to electricity.

The world's energy system is changing profoundly. We are experiencing a shift towards electrification, and to generating that electricity from sustainable sources. The intermittent nature of wind and solar requires power system flexibility through alternative carbon neutral energy sources like biomass and biogas. It can also be achieved through energy storage and sector couplings. Industries that are hard to electrify require an alternative carbon free energy source, like green hydrogen, bioenergy or an application of carbon capture technologies.

As a global leader in air and gas handling solutions, we support our customers with innovative solutions that make this energy transition possible. Our solutions range from hydrogen processing, sustainable thermal energy, demand side efficiency improvements through to carbon capture and storage.



We can support you in any sustainable thermal process

Air and gas handling equipment is at the heart of any sustainable thermal process. Steam is often used to drive an expander, which in turn drives a generator for the production of electricity. The alternative route is through the production of biofuels from organic material. These are either used for direct combustion or for blending with fossil fuels, which is useful for transportation purposes and other industries that are hard to electrify.

Howden, a Chart Industries Company, supplies all the major equipment for sustainable thermal plants which includes expanders, fans, compressors and heat exchangers to enable an efficient and reliable process. Additionally, we engineer and supply essential equipment like:

- Generators
- Condensers
- Dryers
- Bypass stations
- Pre-heaters
- Steam valves
- Control systems
- Protection systems

We also work with strategic business partners to develop a complete thermal energy solution.

Reducing your environmental footprint

Howden is a major contributor to the decarbonisation of key industries around the world. We have worked with customers and process developers to design equipment for demand site efficiency improvements, flexible solutions to optimise the plants heat balance and core equipment to generate electricity from waste.

We have extensive experience in carbon capture, utilisation and storage projects (CCUS) and the supply of equipment for the production of bio-ethanol from industrial waste gases. This development remains ongoing, with new solutions to capture low temperature waste heat, and turning this into electricity in an ongoing pursuit to improve plant efficiency and reduce plant environmental footprint.

Howden is further active in developing environmental applications for flue gas treatment to minimise emissions of dust and NOx.



Howden product and service brands in sustainable thermal process

- Kühnle, Kopp & Kausch
- Turblex
- Peter Brotherhood
- Rothemühle
- Howden



The world's energy system is changing profoundly, with a shift towards electrification, and to generating it from sustainable sources

Sustainable thermal energy expertise

Tough, reliable solutions to handle air and gas for energy recovery



Waste heat recovery

Waste heat recovery is the use of surplus heat that is produced in most industrial processes to improve the overall efficiency of energy use. Some waste heat can be directly recuperated and utilised elsewhere in the process. Alternatively, the waste heat can be used to power a steam turbine, which in turn drives a generator to produce electricity. Low temperature waste heat can be transferred into electricity through our patented steam expander and controlled phase cycle technology.

Howden has different technologies to help you with efficiency enhancements. Our rotary heat exchangers take up heat from exhaust gases and reintroduce it to heat the boiler or aid environmental processes. Howden has a range of steam expanders available to transfer heat into electricity, and turbo fan is an excellent product for efficient mechanical vapour recompression (MVR) processes, upgrading waste steam for reuse in the process.

Biomass and waste to energy (WtE)

In a biomass and WtE plant, centrifugal fans play an important role in the combustion process. Forced draught fans supply fresh air for the combustion of biomass or waste, and induced draught fans draw the flue gases through a dust collection system.

The steam generated in the boiler can be utilised as process steam for district heating or to drive a steam turbine for the production of electricity. In an attempt to improve the total efficiency, it often concerns a combination of the aforementioned utilisations, i.e. combined heat and power (CHP) plants.

Howden's Kühnle, Kopp & Kausch (KK&K) and Turblex turbine brands are renowned for handling load variations, and thus switching between the different outputs. Howden's Peter Brotherhood range is also capable of generating higher electricity outputs - up to 40MWe.

Biogas and biomethane

Biogas is an environmentally-friendly, sustainable energy source. It's produced when organic matter, like food or animal waste, is broken down by microorganisms in the absence of oxygen, in a process called anaerobic digestion.

The raw biogas produced in this process is treated to turn it into 'clean biogas'. This involves removal of any sulphur and siloxanes. Howden's centrifugal, or rotary, lobe blowers are generally used to transport the biogas along a pipework to its destination. This is then subsequently boosted in pressure to use the biogas CHP engines, which provide both heating and electricity. Howden screw compressors are utilised when raw biogas is further refined through the removal of CO₂ and turned into biomethane. For liquefaction into CNG / LNG or for injection into the national grid, Howden reciprocating compressors come into play to further boost the pressure.

Our experience and responsive nature provides our customers with competitive solutions in the evolving bio-fuels market

Bio-fuels

The term bio-fuels refers to gaseous or liquid fuels produced from organic material and is generally used for energy storage and transportation. Bio-liquid fuels are more easily and safely transported but importantly have far higher energy density. Various sources of biomass are used as feedstock and initially treated / processed via hydrolysis, pyrolysis or gasification to produce sugars, pyrolysis oil or syn-gas respectively. These intermediates are then converted and upgrade into bio-fuels by various means of fermentation, hydrogenation and Fischer-Tropsch and catalytic refining. The resultant bio-fuels are typically ethanol, butanol and methanol, diesel jet fuel and gasoline. In turn these can further processed to provide plastics, polymers and other synthetic materials. The scale of production plants is smaller than traditional refineries but will become far more numerous due to transportation logistics of the Biomass feedstock.
















Solar thermal and geothermal

In concentrated solar power plants (CSP) high temperature collectors concentrate sunlight using mirrors or lenses to generate steam for electric power generation and geothermal energy plants are utilising thermal energy in the earth's crust. Howden has mainly been active in the supply of cooling fans for the steam condensers as well as the supply of steam turbines to generate electricity.

The right technology for every challenge

The right technology for every challenge

			Fans			Compressors					Heaters	Steam turbines				Screw expanders	Filters		
																			
			Axial fan	Axial cooling fan	Centrifugal fan	Turbo fan	Turbo compressor	Blowers	Reciprocating compressor	Centrifugal compressor	Screw compressor	Air preheaters / gas gas heaters	Overhang turbo generator steam turbine	Between bearings turbo generator steam turbine	Overhang mechanical drive steam turbine	Between bearings mechanical drive steam turbine	Screw expander	Fabric filter plant / ESP's	
Biofuels (Food and Refinery)	Ethanol production / blending	Air, CO ² and MVR associated with fermentation and distillation			●				●	●	●								
	Biodiesel / Green diesel production	Air & Gas handling plus MVR associated with purification, reactors, evaporators and distillation			●				●	●	●								
	Water / Effluent treatment	Mechanical vapor recompression (MVR)				●	●												
	Drying	Dryer fan			●	●													
		Superheated steam drying			●	●													
All Industries / commercial buildings / Marine	Waste Heat Recovery	Power Generating Low Grade Heat															●		
		Power Generating Low Capacity											●						
		Power Generating Medium Capacity												●					
		Upgrading waste heat flow				●					●								
		Air Cooled Condenser / Air Cooled Heat Exchange		●															
	Mechanical Drive (from WHR / Bio Energy)	MD low capacity expander													●				
		MD medium capacity expander														●			
	Energy Storage	Electro-Thermal Energy Storage (ETES)				●	●	●	●	●	●		●	●					
		Liquid air energy storage (LAES)							●	●									
		Compressed air energy storage (CAES)						●	●	●									
		Molten salt energy storage (MOSAS)				●	●				●	●		●	●				
Solar (CSP)	Steam Generation	Power Generating Condensing steam expander											●	●					
	Steam Condensation / Cooling	Air Cooled Condenser		●															
Geo-thermal	Steam Generation	Power Generating Condensing steam expander											●	●					
	Steam Condensation / Cooling	Air Cooled Condenser		●															

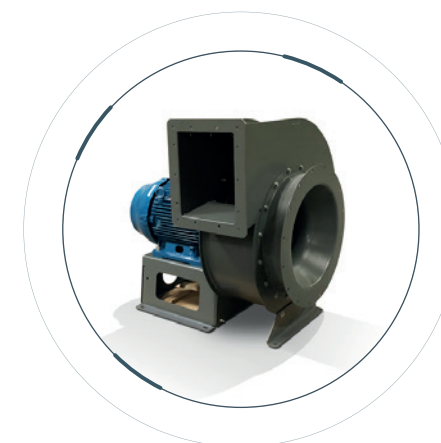


Equipment

Howden incorporates many of the most celebrated and reliable names in fan innovation and engineering. As a leading manufacturer of fans, compressors and related equipment, we can offer advice about matching product technologies to demands and duties to enable energy recovery and generation from a sustainable source.

Engineering proven over decades of robust operation

Ventilation



Axial / centrifugal fans
Low to medium duty fans

Diverse sustainable thermal energy plants require fans for the supply of oxygen to enable the combustion of biomass or waste. They also remove exhaust or waste gases from the process. Each fan needs to be designed to fit the customer's specific circumstances in terms of air flow, pressure and efficiency.

Key features

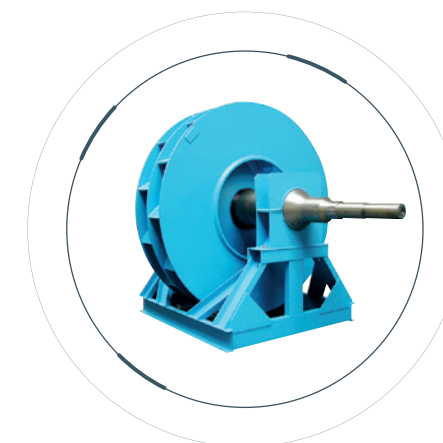
- Cost-efficient design
- High quality build
- Localised manufacturing

Benefits

- Low energy consumption
- Outstanding reliability
- Market driven lead times

Typical plants / application

- Biomass plant <~50MW
- Combined heat and power (CHP) plant <~50MW
- Waste incineration plant <~50MW



Centrifugal fans
Medium duty fans

The larger the plant capacity, the more critical the fan efficiency and reliability must be. Each fan is custom designed to best fit process requirements. The off gas fans need to be able to handle large volumes of hot abrasive waste gases from the process.

Large machines like these represent a considerable capital investment for the plant, and long impeller life is an important factor for return on investment. While high efficiency is important in minimising running costs, reliability is an even more critical factor to prevent unplanned downtime.

Key features

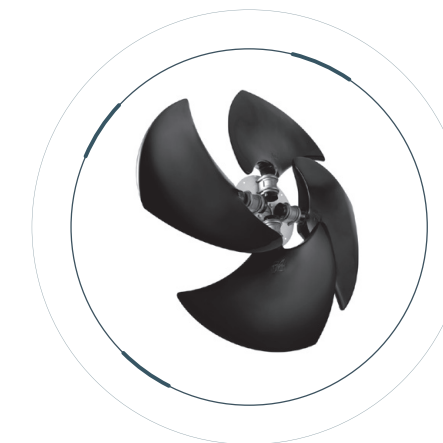
- High quality build
- Customised for the application
- Erosion protection

Benefits

- Optimised operating expenses
- High availability / low downtime
- Low maintenance cost
- High temperature resistance

Typical plants / application

- Biomass plant >~50MW
- CHP plant >~50MW
- Waste incineration plant >~50MW



Cooling fans

Cooling fans are typically used in a cooling tower, air cooled condenser or air cooled heat exchanger. Within thermal sustainable energy, you can find cooling fans in air cooled heat exchangers of the biogas treatment or upgrading process. They are also often in air cooled condensers to condensate waste steam from the expanders to water, and maximising the pressure differential across the expander. Howden offers cooling fans in a variety of blade designs to ensure maximum efficiency, and we specialise in ensuring ultra-low-noise performance.

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

- Biomass plant
- CHP plant
- Waste incineration plant
- Geothermal plant
- Concentrated solar power plant (CSP)
- Biogas treatment / upgrading plant
- All industries / commercial buildings



Overhang design Steam turbines

In most industries, 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, CO₂ emissions and increase energy efficiency at the same time.

Howden offers a comprehensive range of single stage steam turbines up to 24 MW, which have a simple modular design. This enables performance optimisation in a variety of applications, from waste heat recovery and electricity generation from biomass or waste, through to driving rotating equipment. The turbines offer a flexible solution, enabling an easy switch between electricity generation, process steam production or heat to make your plant run as efficiently as possible.

Key features

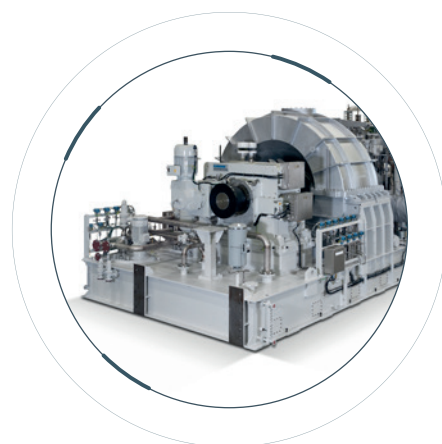
- Condensing or backpressure turbines with up to 3 controlled pressure extractions
- Compact and tailor-made design
- Light and small rotor
- Operation with saturated and superheated steam possible

Benefits

- High flexibility with very good part load efficiency (10%-100%)
- Low cost and efforts for maintenance
- Quick start without preheating
- No gland steam condenser required

Typical plants / application

- Waste heat recovery
- Biomass power plant
- Waste to energy plant
- CHP



Multi-stage Steam turbines

These custom-designed turbine generator sets are engineered to meet specific requirements. We have considerable experience in the design and manufacture of turbine systems for a number of different applications where efficiency and reliability are key.

For power generation applications, Howden provides a complete package comprising the turbine, gearbox, generator, instrumentation, control and monitoring systems and associated auxiliary equipment. These units are normally mounted on a fabricated base plate, so that they can be transported to site in their assembled form, thereby reducing site installation time.

Key features

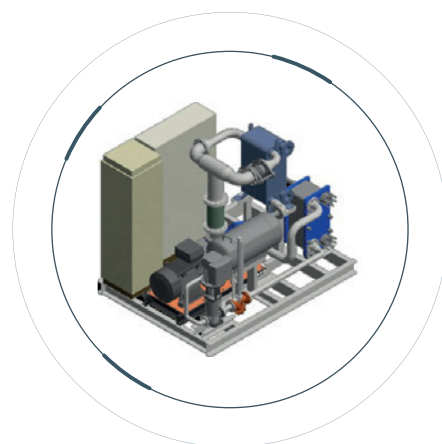
- Back-pressure or condensing type
- Steam turbine generators up to 40MW
- Economically engineered solutions
- Complete package

Benefits

- Maximized power output and profitability
- Rapid return on capital investment
- Unbeaten delivery times

Typical plants / application

- Waste to energy plant
- Biomass power plant
- Waste heat recovery
- CHP



Screw expander Controlled phase cycle (CPC)

Howden, in cooperation with Spirax, has developed a solution to transfer low temperature waste heat into electricity via a screw expander. Energy that has previously been wasted in cooling systems can now be used to improve plant efficiency.

Key features

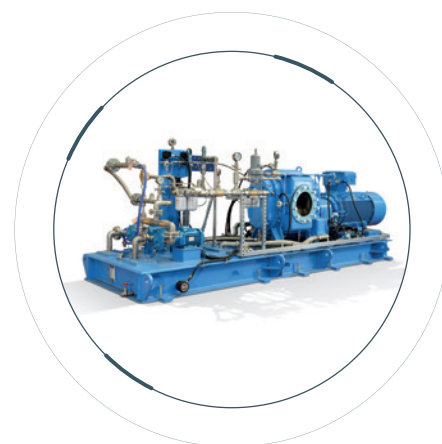
- Screw expander design
- Complete plug and play skid solution

Benefits

- Electrical energy recovered from low grade waste heat
- Largely maintenance free
- Payback within 2 to 3 years

Typical plants / application

- CHP systems
- General waste heat utilisation
- Cooling systems
- Steel works, etc



Biogas blowers

Centrifugal - or rotary - lobe blowers are generally used to transport the biogas along a pipework to its destination. In some cases, blowers are used to initially gather biogas from multiple sources and discharge to a common biogas treatment plant. Here, they are then boosted in pressure. The initial cleaning is very often to remove solids and hydrogen sulphides (H₂S), followed by gas conditioning. Untreated biogas can create problems with burners, and more so combustion engines for power generation and CHP processes.

Key features

- Optional stainless steel construction, Electroless nickel coating
- Armoloy coating
- Seal purging, Extensive direct drive solutions

Benefits

- Low maintenance
- Very resilient to pressure changes / fluctuations
- Fixed volume flow

Typical plants / application

- Biogas treatment / transportation from anaerobic digestion plants
- Landfill gas sites



Screw compressors

To generate bio-methane (green gas) from various waste streams like municipal solid waste (MSW), manure, grass, vegetable waste and sewage through anaerobic digestion, the biogas needs to be upgraded. Biogas consists of 55-56% methane, and the rest is CO₂. Compressors upgrade the biogas and filter out the CO₂, leaving 90-97% methane.

Bio-methane is then injected into the gas distribution pipelines, compressed for local storage, or liquefied to CNG / LNG to be used as vehicle fuel. To maximise efficiency, heat exchangers are used and CO₂ is stored as a sellable by-product. When compressing gas, safety is our number one priority.

Key features

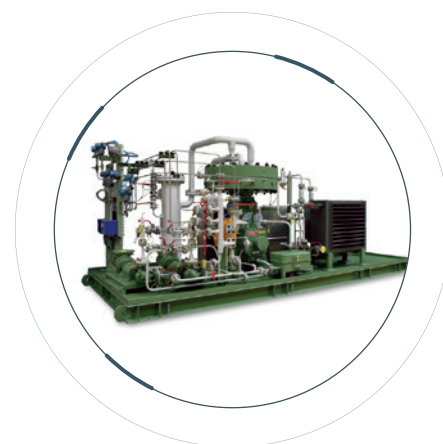
- Equipment designed for safety
- Oil free, and oil lubricated compressors
- Wide range of shaft seal offerings
- Hydrodynamic radial and tilting pad thrust bearings
- Proximity probes for rotor radial and axial movement sensing
- Bearing resistance temperature detectors (RTDs)
- Accelerometers on compressor casing

Benefits

- Safe operations
- Low maintenance requirement
- Low cost of ownership / efficient operations
- Easy product configuration for best in class running hours
- Easy continuous compressor condition prediction

Typical plants / application

- Anaerobic digestion plants
- Biogas upgrading plants
- Landfill biogas capture and treatment
- Waste water treatment plants



Reciprocating compressors

Pressure boosts are often required for a bio-methane injection into regional or national gas pipelines, or for producing CNG / LNG. Howden's reciprocating compressors are designed to raise the pressure as much as required.

Key features

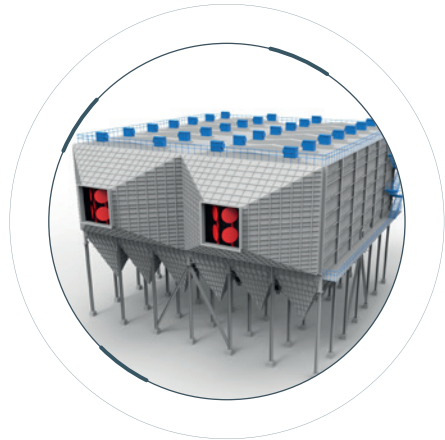
- Wide range of compressor frame sizes and cylinder configurations available
- Various options for capacity control (valve unloading, hydraulically operated variable clearance pocket, variable speed drive, stepless reverse flow)
- Capable of handling corrosive and sour gases

Benefits

- Tailored configuration meeting exact application needs ensuring optimum total cost of ownership and lowest power consumption
- High flexibility, high efficiency and very good part load efficiency (50%-100%)
- Ability to operate at different pressures and varying gas compositions, improving mean time between maintenance (MTBM) in non-lubricated applications

Typical plants / application

- Fuel-gas boosting



Electrostatic precipitator

Combustion of all solid fuels (including biomass and MSW) leads to the formation of particulates such as fly ash. This can be addressed by the use of an electrostatic precipitator (ESP) which enables particles within the off gas to be captured. Howden's expertise in ESP technology comes from our Rothemuehle brand with over 1000 installations worldwide. Howden can apply this knowledge to upgrade and refurbish ESPs with the potential also to include our Delta Wings static gas mixers for optimised performance.

Key features

- Renewal of internals to full unit replacement
- Performance upgrades with unit / field extensions
- Performance upgrades with Delta Wings addition

Benefits

- Improved separation efficiency
- Higher plant availability
- Lower emissions

Typical plants / application

- Environmental control systems within biomass and waste energy plants



Air pre-heaters

Howden's air preheaters significantly enhance efficiency of thermal plants by recuperating waste heat from the combustion process. The problem of fouling is greatly increased in biomass plants. It can be caused by condensation, where particulate matter sticks together, resulting in plugging. Combustion of straw also creates large quantities of ash and some may form solid deposits on surfaces. Downstream of a selective catalytic reactor, ammonia slip often contributes to the fouling, creating a pressure drop across the heater.

Howden's HC Element™ combines straight and specially shaped corrugations into a herringbone pattern, which not only reduces fouling and plugging, but also offers greater cleanability with steam or high-pressure water.

Key features

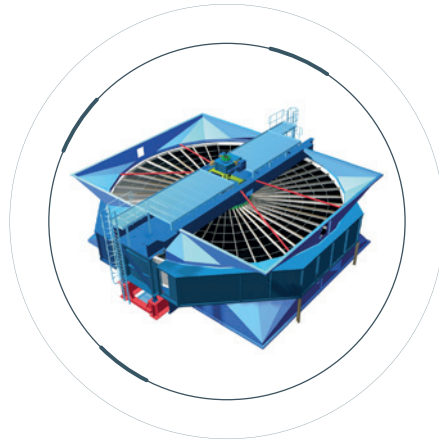
- Great resistance to fouling and plugging
- Reduced size and cost
- Heating elements with high thermal efficiency
- Advanced low leakage sealing
- Online high pressure water cleaning system

Benefits

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

Typical plants / application

- Combustion boilers within waste to energy plant, and biomass plant



Gas gas-heaters

Off gas composition from sustainable fuels will vary, but nitrogen oxide (NOx) is a common by-product of the combustion process. Selective catalytic reduction is deployed to clean the gas to the required level. A gas gas heater can be installed to recover heat from the off gas and use this to reach the catalytic reduction temperature (~250–427°C) for the conversion of NOx. Gas heaters are exposed to high temperature gases which can contain corrosive elements. The heater element materials and design are unique to Howden and maximise thermal efficiency while combatting the effects of fouling.

Key features

- Great resistance to fouling and plugging
- Heating elements with high thermal efficiency
- Compact design
- Advanced low leakage sealing

Benefits

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

Typical plants / application

- Environmental control systems (SCR, FGD), within biomass and waste energy plants



Turbo fans

In many cases, Howden's ExVel® turbo fans are used in a mechanical vapour recompression (MVR) application. MVR is essentially an evaporation process used for water treatment: either recovering clean water from effluent or pulling water out of the product. When MVR is used, the turbo fan will upgrade waste heat from the evaporation process by adding energy to the vapour. MVR based drying technology, based on self-heat recuperation (SHR), could reduce the required energy consumption for biomass drying to about two thirds.

Key features

- Complete isolation of the process gas
- Robust ability to handle corrosive gases
- Anti-friction and hydrodynamic bearing options
- High pressure differentials

Benefits

- Up to 85% efficiency
- Less CapEx than turbo compressor
- More efficient than rotary blower
- Low lifetime cost
- Excellent reliability and durability in tough applications
- Wide potential flow range

Typical plants / application

- Biomass and biofuels
- Waste water treatment MVR and aeration
- Gas processing
- Drying
- Combustion air

Mechanical vapour recompression based drying technology could reduce the required energy consumption for biomass drying to about two thirds



Tailored solutions

Howden's priority is to ensure the solutions we deliver are tailored to your needs, specifications and applications.

By optimising critical equipment to the operating conditions, we can keep your process running in as safe and cost effective manner as

possible, while maintaining high efficiency levels throughout the product's lifetime.

For larger fan installations, a drop of even half a percent in efficiency may cost more than 10 million kW/hrs of electricity over the life of a fan.

The tailored design of a steam turbine offers a flexible solution when one needs to switch between electricity generation, process steam production, or heat, to optimise the overall efficiency of the plant.

Full scale project management

New, upgraded equipment or repairs to existing equipment is often on a critical path - especially when executed as part of an outage or in a very short timeframe. Howden will work collaboratively with you to ensure safe execution and a satisfactory end result.

Due to the time critical nature of these projects, our team will offer the knowledge and expertise, supported by extensive planning and communication, in order to get the job done on time and to specification.

Configured solutions providing peace of mind

Howden will often collaborate with the system designer in order to overcome process issues, especially in the case of pilot plants.

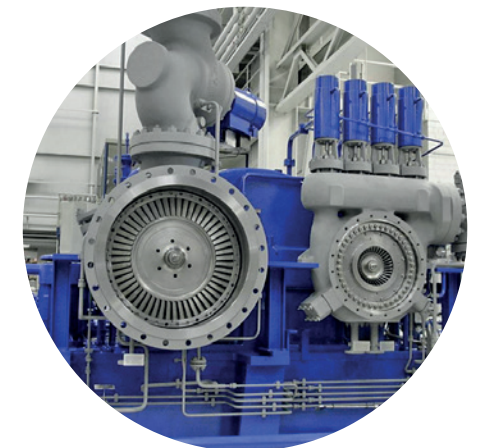
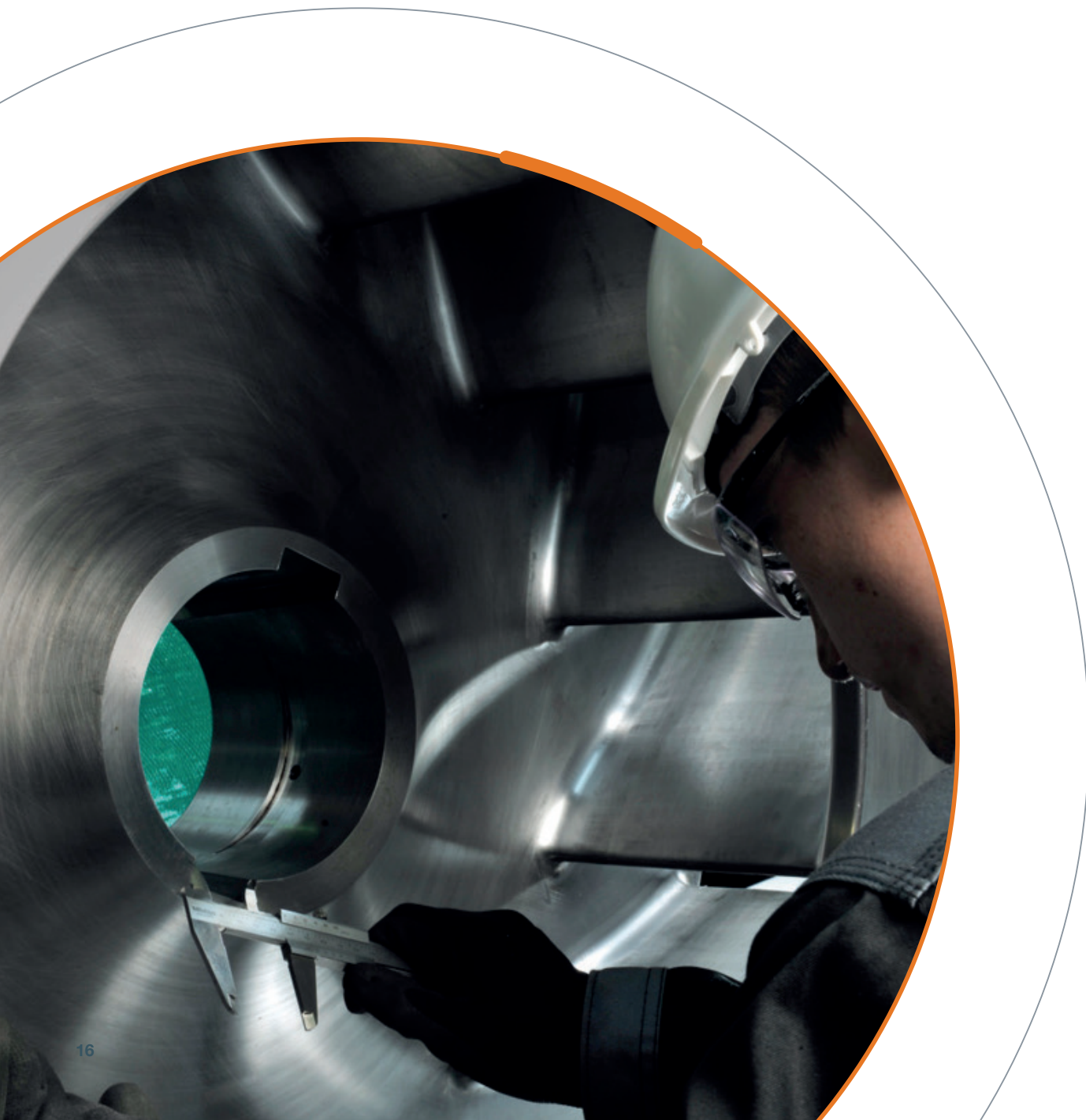
For example, the integration of a steam turbine is particularly suited for solutions of individual stages to be optimised, controlled and combined to facilitate plant integration, facilitating extracting between stages to feed other process requirements, whilst maintaining delivery of maximum power to the generator from the available steam.

Turnkey solutions

When the scope of a project involves additional specialist input, Howden can undertake the entire job as a turnkey project. This could involve ductwork, electrical infrastructure, connections to control and monitoring systems, as well as civil engineering work like 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 focus on their normal duties.

We take responsibility for the work itself and crucially, the planning, scheduling and logistics



Case studies

Whether you are 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.

Centrifugal fans

Singapore Tuas Nexus
Integrated waste and water treatment facility

IWMF and the Tuas Water Reclamation Plant (Tuas WRP) – collectively known as Tuas Nexus, will be the world’s first integrated waste and water treatment facility.

The challenge
Help to reduce environmental footprint, and simultaneously support Singapore with power in the future. Upon completion, it will be the country’s first integrated facility to treat incinerable waste, source segregated food waste and dewatered sludge at a single facility of 5,800 tonnes per day - making it one of the largest in the world.

The solution
Our customer Andritz is responsible for the efficiency of the flue gas cleaning who should meet the highest standards available. For this reason, the flue gas temperature is below the dew point and we must protect the fan with a special coating. We selected for this application 4 centrifugal fans

running at 1255 rpm with a main motor of about 2 MW and an auxiliary motor with 300 kW. With this installed power, we can transport 106 m³/s of flue gases at 13,000Pa.

The outcome
Due to cost and site requirements, we developed a new pedestal design. With the new design, we chose small concrete pedestals so

that the motor pedestal, bearing pedestal and frame weigh about 15% less than the traditional design, with a complete high steel pedestal.

Due to technical requirements, the casing and inlet box stiffeners are an integral part of the base frame, which secures the system’s rigidity. The project was designed in Howden’s site in Germany, in close cooperation with Howden in Singapore.



Photo courtesy of NEA

Air preheater retrofit

Sangüesa (Spain)
30MW Biomass plant

The challenge
Sangüesa is a biomass power plant, fuelled by burning straw. This process tends to leave a high proportion of unburned residue and ash that settles and mixes at the bottom of the boiler. Inevitably, some of this mixture is drawn into the air preheater, which can clog the air channels and reduce plant availability. With Sangüesa’s problem becoming steadily worse, we were invited to find a way to remedy the situation.

The solution
We found that the air preheater was fitted with DU heating elements in both the hot and cold layers. While this design offers excellent thermal exchange, it can be prone to clogging if used with high-residue fuels. We carried out a full investigation of the conditions and demands at the plant, which included a full assessment of the combustion processes, and undertook a modelling exercise using our specially created simulation software.

The outcome
The analysis demonstrated that by replacing all of the DU profile elements with our HC Element™ design, the cleanability of the heater was enhanced and fouling reduced. With the new profile configuration, the targeted increase in gas outlet temperature and improved pressure drop was successful. Most importantly, it had a marked effect on availability, which allowed the plant to stay operating for much longer periods and deliver the outcomes that the operators sought.

Combined heat and power solution

GETEC heat & power GmbH / PRÜM-Türenwerk GmbH (Germany)
Energy from wood residues

GETEC heat & power GmbH received an order for the supply of an energy plant for PRÜM-Türenwerk GmbH, and turned to Howden for a combined heat and power solution. GETEC heat & power supplies climate-neutral and economical energy solutions for the industry.

The challenge
PRÜM-Türenwerk needed to create a new plant using energy from wood residues. As a manufacturer of residential interior doors, the company prioritises a conscious use of resources. They want to utilise production residues as a source of energy, but constructing a new plant would seize capital and require the ability to supply to the grid, involving legal and contractual aspects.

Hence, they turned to GETEC heat & power to build, own, and operate the plant on their premises.

The solution
GETEC heat & power designed an energy solution, and Howden will supply a steam turbine and equipment to balance between electricity and thermal heat. This will warm the production halls, office buildings and hot water supply for the production process to press doors made from chipboard. GETEC heat & power will construct and operate the plant, supply excess electricity to the grid, take care of biomass supply and carry out plant maintenance.

The outcome
Howden will supply a CA46 twin steam turbine with extractor, generator and steam condenser, capable of producing 3.2 MWe (electric power), and 8 MWt (thermal

energy). In addition to efficiently balancing the output between electricity and thermal energy, the unit is designed to operate at 50-60% lower capacity during weekends to match reduced fuel supply, maximising overall plant efficiency. A new contract was signed to construct a similar solution for “Garant Türen”, a second manufacturing location of PRÜM-Türenwerk.



Air cooled condenser upgrade

Twence (The Netherlands) Waste to energy plant

Twence operates a waste incineration plant in The Netherlands, that generates energy from mixed (municipal) waste and biomass that have been stripped of all reusable materials.

The challenge

The reason for this ACC upgrade is to increase the performance and output of the turbine during the hot summer periods which is realised by increasing the water-steam cycle efficiency.

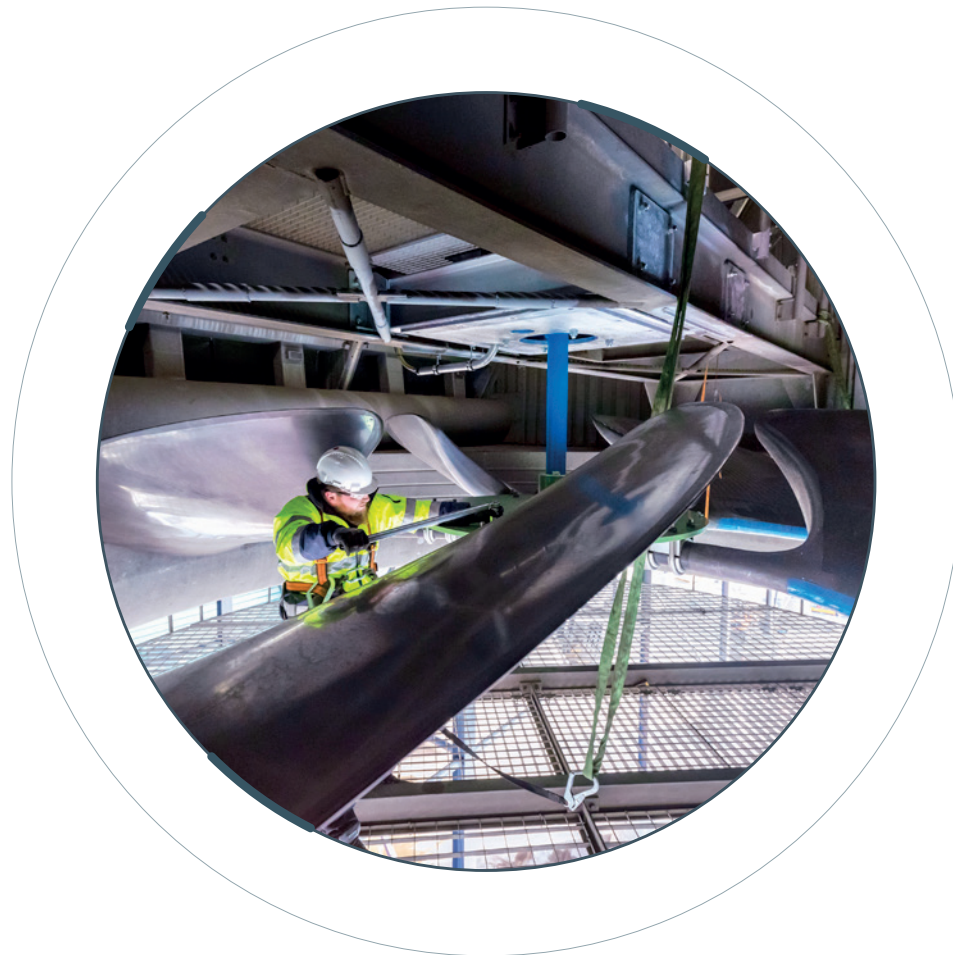
The solution

The principle of the improved efficiency is to simply increase the airflow along the existing finned tubes and this is exactly where the Howden cooling fan technology specialises in. Naturally an increased air flow and sound level go hand in hand but the customer's objective was to keep this noise level increase to a minimum. For this reason our SXT ultra-low noise fan has been selected and will be replacing the existing Howden extra low noise fans. Another advantage of this SXT fan is that the existing Fan Casing can be re-used which means a considerable saving with regards to Capex and installation time.

The outcome

This contract comprises disassembly of the existing fans, transmission train and motors and supply and installation of 10 new fans, gear reducers, e-motors, VFD and also the installation of new cabling due to

the increased power rating of the e-motors and to accommodate the additional instruments. Also the control and speed philosophy of the VFD driven fans is part of the contract.



The principle of the improved efficiency is to simply increase the airflow along the existing finned tubes – this is exactly what the Howden cooling fan technology specialises in

Heat balance upgrade

Industrias Alimenticias El Trebol SA (Colombia) Biomass heat balance retrofit

Industrias Alimenticias El Trebol SA, a sugar manufacturer of Panela, is located in Andalucía, in the department Valle del Cauca, Colombia.

The challenge

When a weather phenomenon called El Nino occurs (a prolonged dry period of extremely hot temperatures) the capacity of hydroelectric plants is reduced. To reduce the impact on energy resources, the government supports the development of alternative sustainable energy projects - including solar, wind and biomass. Howden visited customers to understand, identify and discuss the potential to generate electricity from their own resources to drive demand for their own operations.

Operating at a normal output will save the customer almost \$36,000/month

The solution

Panela production requires thermal energy for multiple evaporation systems, with steam demand at different pressures. Bagasse (sugar cane waste) is used as a fuel source to produce process steam. To feed the middle pressure evaporation stage, live steam from the boiler at 8 bar was directly reduced at a pressure reduction valve (PRV) to the low pressure demand at 2.4 bar. We presented a solution to replace this PRV with a Howden BASE AFA 4 turbine. This controls steam flow and produces electric energy.

The outcome

The Howden BASE AFA 4 turbine will control the back pressure to meet the process steam demand. Moreover, it will also transform the energy previously wasted at the PRV, into electricity required to operate the factory. Operating at a normal output will save the customer almost \$36,000/month, with energy generated and an estimated break even time of two years.



Waste heat recovery

Slibverwerking Noord-Brabant (SNB) (The Netherlands) Sewage sludge incineration

The challenge

The world's largest sewage sludge incineration plant wanted to use the exhaust heat much more efficiently in an effort to become energy-neutral. Built in 1997, the plant only generated low-pressure steam from the waste heat. The steam is used in various processes and to a limited extent, for power generation. They had to replace the boilers with high-pressure boilers, and design them so they could fit into the plant. The boilers had to be installed as quickly as possible while the plant was in partial operation, so as not to disrupt the sewage sludge processing.

The solution

Sewage sludge contains many different chemical elements, some of which corrode metal at very high temperatures. Therefore, steam temperature was limited to 450 degrees celsius, despite the capacity of the boilers and turbine to operate at higher temperatures. The steam drives a Howden TWIN industrial steam turbine, which has two modules connected in parallel.

The outcome

By retrofitting with high-pressure boilers, we could eliminate the steam motor operated with low-pressure steam which had previously been used to generate electricity with a 450-kilowatt generator. Now, the plant uses a 3.5-megawatt generator, and is generating at least 95 percent of its power requirements from the waste heat of the incineration process itself.

SNB processes approximately 450,000 tons of dewatered sewage sludge every year

Lifetime performance management

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

Genuine OEM spare parts

Spare parts are vital assets for maintaining productivity. Knowing that they will always be available is a crucial factor in deciding 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.

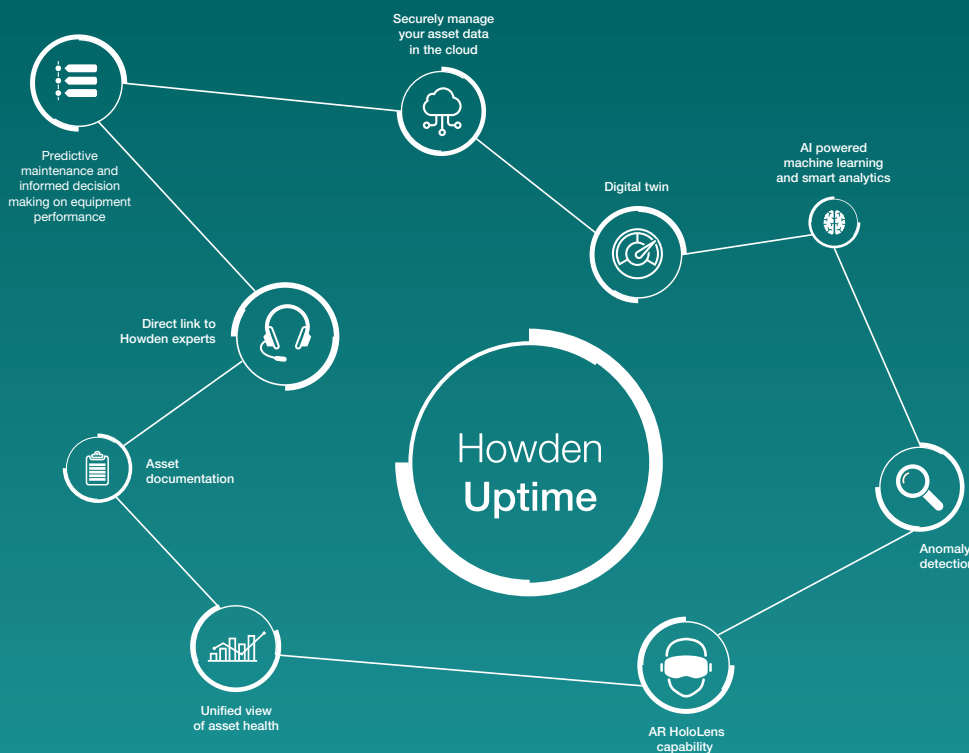
On-site and remote technical support

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 audits 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.

Performance upgrades and retrofits

Our performance upgrade offerings help you to 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 is firmly founded on communication and flexibility. We talk through every requirement thoroughly, in advance, to make sure we know exactly what is needed.



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.

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.

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 to any unusual activity and provide prescriptive advice on what action is required before a breakdown occurs.

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 its journey.

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