



Customer Services



SAFETY



RELIABILITY & AVAILABILITY



LOWER COST OF OWNERSHIP

Dedicated to supporting you, your equipment and your business reputation





Peter Brotherhood takes great pride in how we support our clients. We are dedicated to ensuring the maximum possible reliability and availability of your equipment.

Our global reputation is built upon our high levels of responsiveness and trustworthiness.

We achieve this through:

- Delivering on our commitments
- Extensive experience in mobilising to locations throughout the world, both onshore and offshore
- Forward planning with our clients to understand their specific needs
- Remote technical support that enables us to start analysing and troubleshooting an issue before our Field Service Engineer or a spare part arrive

150

years experience
operating as an OEM



Peter Brotherhood

24/7

customer care and
servicing globally

1,500+

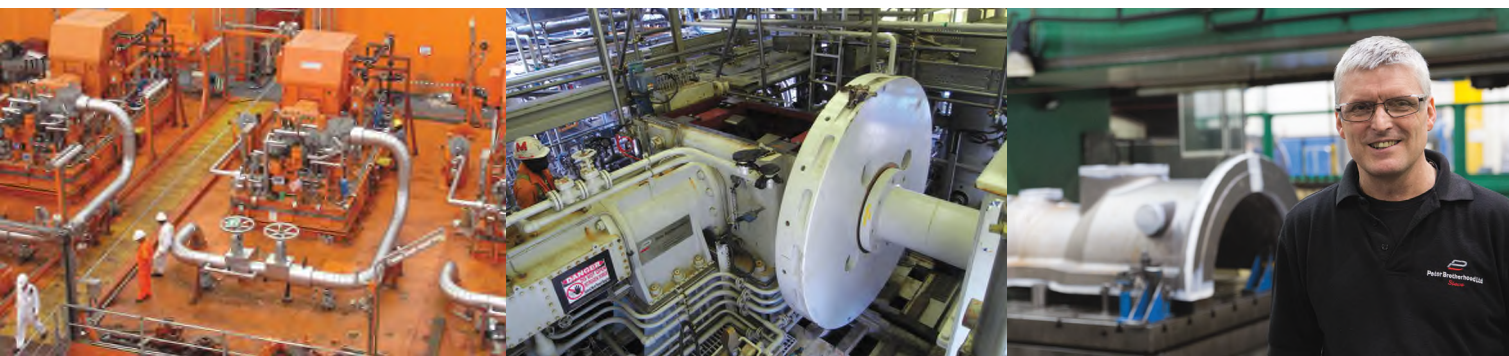
products supplied
worldwide

100

countries using our
products onshore
and offshore

30

specialists ready to
provide support

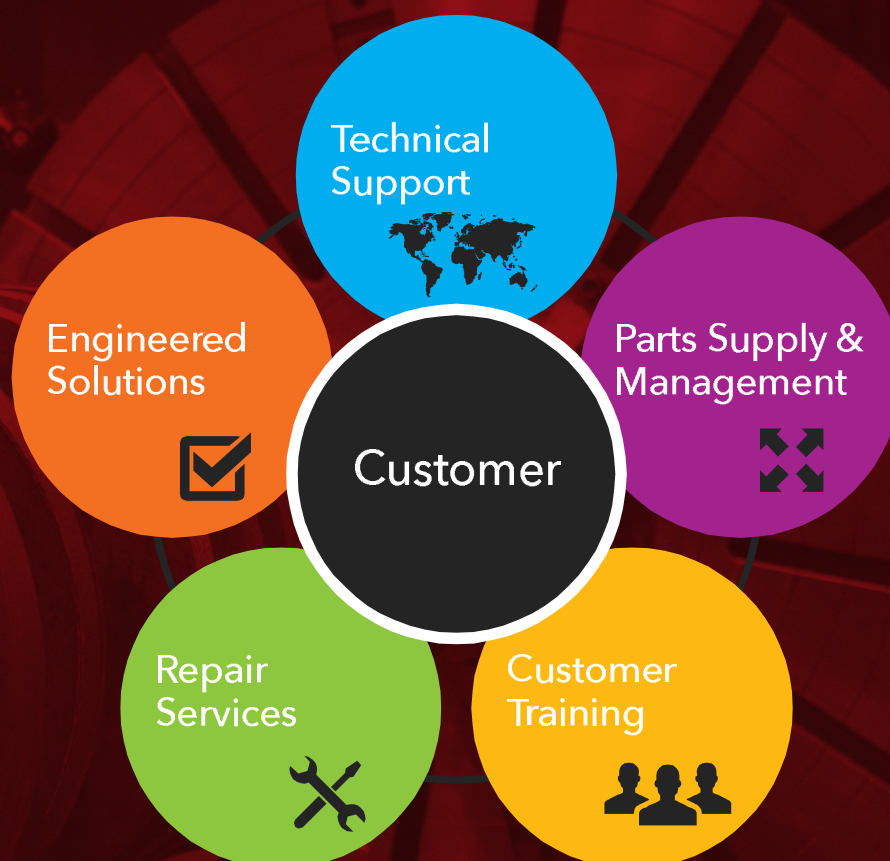


The Peter Brotherhood Five Dimensional (5D) Support Model - developed around your needs.

Our 5D Support Model is designed to be simple but comprehensive and covers all aspects of support that might be needed during the life cycle of owning, operating and maintaining complex rotating machinery.

5D brings the following benefits:

- Maximum reliability and availability of your equipment
- Lower and more predictable cost of ownership
- Support for the extended life of machinery
- Predictable machine operation and maintenance
- Correct spare parts, available at the right time
- The assurance that support will be available when needed



World-class products and support for **lower life cycle costs**

We deliver world-class support for all our products in order to offer maximum reliability and lower cost of ownership.

We are proud to be the trusted provider of on-going support for our customers, in a wide range of industries throughout the world.

Proud to serve our customers.
Proud to be Peter Brotherhood.

CUSTOMERS TRUST US FOR OUR:

- Focus on improving reliability and lowering operating costs
- Quality of service
- Superior technical expertise
- Fast response
- Ability to improve machine performance

Expertise & Support

We provide our customers with full equipment package support in one place. As well as supporting all products for which we are the OEM we can also offer a majority of the same services for non OEM products.

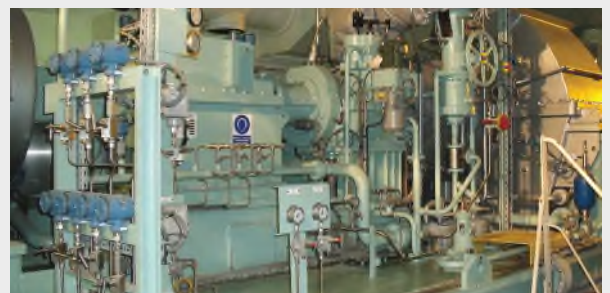
Our specialist areas of expertise are:

- Steam Turbines
- Reciprocating Compressors
- Screw Compressors
- Gearboxes
- Gas Reciprocating Engines

We can cover all mechanical and electrical / controls work on these items of rotating machinery and associated ancillary plant.

Through our partners, we can also provide support on:

- Generators
- Motors
- Condensers
- Control systems including: Panels, Human Machine Interface (HMI), Instrumentation and Machine Control Centres (MCCs)
- Pumps
- Valves



Customer Service Bulletins

Peter Brotherhood provides Service Bulletins that contain relevant safety and technical updates to our products. If you are unsure whether we have your correct email details please contact us on techsupport@peterbrotherhood.com so we can ensure you are included on our Service Bulletin mailing list.



DECADES OF EXPERIENCE ENABLE US TO PROVIDE WORLD-CLASS PRODUCT SUPPORT - HELPING TO PROTECT THE RETURN ON YOUR ORIGINAL INVESTMENT IN THE EQUIPMENT.

Our skilled and experienced staff can be an extension of your own team which you can call upon for reliable, expert support - whether discussing future plans or in the event of an emergency issue with plant operation.

Dedicated Support Team

Our dedicated team of 30 staff are ready and able to support you in maximising the reliability and availability of your equipment. To that end, our highly skilled engineers provide services around the clock and around the world. Often working in extreme conditions, they are committed to solving problems and reducing downtime.

Our engineers are supported by design and technical staff based at our head office in the UK. If required, these members of the team can also be mobilised to your facility. This responsive approach, together with an international network of partner companies offering local assistance, ensures we have the right personnel to provide solutions in the quickest time possible.

With an average 25 years of experience, the team are experts in their respective fields. These span technical support, maintenance, commissioning, repairs and replacement of parts.

Continuous Investment in People

We continually invest in the development of our people to ensure they are in the best position to support you.

We do this through the promotion of professional development in areas such as Health & Safety, engineering and project management. Our commitment is to both developing the individual and continual improvement of our customer service.

An example of this commitment is that we underpin our project management skills by ensuring our staff are trained and certified by the Association for Project Management (APM).

Certified Management Systems

Throughout the whole product life cycle, we work to the highest quality assurance standards, including ISO 9001:2015, ISO 14001:2015 Environmental Management Standard, ISO 45001:2018 Health & Safety Management and we are Cyber Essentials accredited.

Worldwide Support

Peter Brotherhood provides worldwide support and have equipment installed in approximately 100 countries with a team of internationally experienced Field Service Engineers and office-based staff.

We have a dedicated resource to plan ahead on all travel requirements enabling rapid immobilisation when needed.

We have a worldwide network of service partners and agents to help us provide localised support.

To discuss your support requirements please contact us on **+44 (0)1733 292292**.

ADVANTAGES OF CHOOSING PETER BROTHERHOOD SUPPORT:

- Decades of onshore and offshore knowledge
- Global reputation for trust and responsiveness
- Committed to maximising reliability and availability of our customers equipment
- Dedicated and professional support team
- Equipment installed in over 100 countries
- 24/7 worldwide support service
- Customer Care Agreements (CCA)



Improved product reliability and availability



Lower and more predictable cost of ownership



Supporting the extended life of machinery



Predictable machine operation and maintenance



Correct spare parts available at the right time



Assurance that support available when needed

Customer Care Agreements (CCA)

– customised to your needs

We understand that one size does not fit all. That is why our Customer Care Agreements (CCA) are individually designed to pull together combinations of our range of service products from our 5D Support Model. This way, we are able to give you the most suitable package for your specific needs.

Our CCA provide the following benefits:

- Improved reliability and availability
- Lower and more predictable cost of ownership
- Support for the extended life of machinery
- Predictable machine operation and maintenance
- Correct spare parts, available at the right time
- The assurance that support will be available when needed
- Fixed monthly fee

Packages to suit your requirements

We offer both standard and bespoke customised Customer Care Agreements. All customers taking a CCA receive discounted rates on any additional services they purchase during the term of the agreement. The level of discount increases based upon the service products selected.

Standard CCA package

We have three levels of standard CCA packages to cater for the most commonly requested requirements and operating budgets. However in the same way as your original equipment design was tailored to the application required these standard packages can be customised to suit specific needs.

Peter Brotherhood takes great pride in how we support our clients. We are dedicated to ensuring the maximum possible reliability and availability of all OEM and non OEM rotating equipment.



To discuss your CCA package please call **+44 (0)1733 292292** or email aftermarket@peterbrotherhood.com.



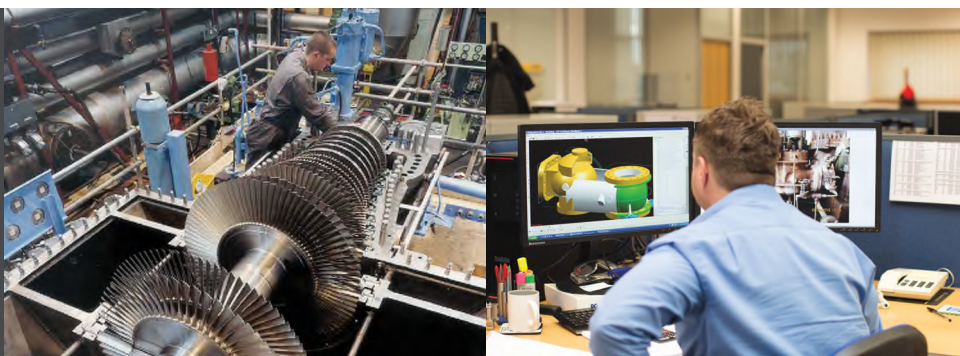
CUSTOMER CARE AGREEMENTS
DESIGNED TO GIVE YOU A PACKAGE
OF SERVICES BASED ON YOUR
SPECIFIC NEEDS.

5D Support Model

Customised CCA packages can be structured using any combination of services offered within the 5D Support Model.
To discuss your needs please call **+44 (0)1733 292292**
or email aftermarket@peterbrotherhood.com.



DEDICATED TO ENSURING THE RELIABILITY AND AVAILABILITY OF ALL OEM AND NON OEM ROTATING EQUIPMENT IN OVER 100 COUNTRIES.



Technical Support



TECHNICAL SUPPORT	WHY CHOOSE PETER BROTHERHOOD?
24/7 Technical Support	<ul style="list-style-type: none"> • We are a leading manufacturer of Steam Turbines and API618 Reciprocating Gas Compressors. • We understand the importance of technical support and are dedicated to supporting our customers. • As the OEM we know our machines better than anyone else. • A team of highly experienced engineers. • Priority Technical Support service available with a guaranteed same day response. • We track the status of every technical query we receive.
Monthly Equipment Status Report	<ul style="list-style-type: none"> • The assurance that the health of your equipment is being regularly monitored by experts. • Machine and operational performance becomes predictable. • Produced by one of our specialist engineers; looks at all critical machine operating parameters and associated relevant trend analysis. • Issues with the machine can be detected at an earlier stage - this helps avoid costly remedial work and supports preventative maintenance planning.
Equipment Life Extension	<ul style="list-style-type: none"> • Provides assurances related to safety and reliability when a decision is taken to operate beyond the original intended life of the plant. • We are best placed to support you in assessing this in a structured and assured manner. • Using a combination of desktop and onsite assessments we collaborate with you to understand how the machine has been operated in the past and what is the future operational intent. • Allows practical risk based decisions to be made, supported by a structured action plan.
Trouble Shooting	<ul style="list-style-type: none"> • Our experience as an OEM means we have seen and dealt with most faults that can occur. • Our skilled engineers work with clients to diagnose faults and isolate the root cause to prevent re-occurrence. • We normally start this process remotely, and will mobilise to site as required.
Planned Maintenance	<ul style="list-style-type: none"> • We actively encourage our customers to develop maintenance plans as part of a proactive maintenance regime. • We have comprehensive work scopes for all scheduled inspections and maintenance overhauls which we can customise to specific operational conditions. • We will give an estimated time to undertake the work so the downtime can be planned.
Outage Management	<ul style="list-style-type: none"> • Project management skills combined with engineering experience ensure that we apply the highest standards to manage quality of execution, schedule and cost. • Detailed and careful pre-planning activities and risk assessments. We start well in advance of the planned outage, to give all parties time to prepare for the execution phase. • Through our network of partners we are able to arrange all resources needed.
Emergency Breakdown Response	<ul style="list-style-type: none"> • When a failure occurs we respond quickly and start immediately to mitigate the impact of the situation. • We understand the operational impact of equipment failure and will therefore always strive to get the equipment back up and running in a safe manner in the shortest possible time. • We offer alternative solutions when the ideal option is not available. • We can support Business Continuity Plans to cover the response in the event of an emergency breakdown.

Contact us at techsupport@peterbrotherhood.com for all your technical support requirements.



REMOTE CONDITION MONITORING
ENABLES REAL TIME INTERROGATION
AND FAULT DIAGNOSIS TO AID
OPERATIONAL DECISIONS.

TECHNICAL SUPPORT

WHY CHOOSE PETER BROTHERHOOD?

Installation & Commissioning

- Extensive experience spanning the installation and commissioning of hundreds of units worldwide.
- Highly experienced and skilled Field Service Engineers lead the work supported by high quality project management.
- Comprehensive planning procedures that have been developed using our wealth of experience and technical expertise.
- Excellent communication with all stakeholders throughout the process.
- Flexible approach to working with you. Supervisor to work with your team, or a fully self-sufficient team
- Continuity of resources.

Decommissioning & Equipment Preservation

- We know what levels of preservation are required depending on the situation. Our knowledge and competency is based upon our OEM experience.
- When there is intent to relocate or resell the equipment we are able to put in place OEM standard preservation procedures to protect the asset and ensure maximum value is retained.
- We can support the safe removal of equipment from site.
- We have standard procedures to ensure equipment is correctly protected against potential issues such as rotor sagging and corrosion.

Equipment Relocation

- Experience of equipment relocation coupled with comprehensive services. This can save on the need to employ third party consultants and/or multiple sub-vendors.
- A full range of services to help relocate equipment from assessment on a change of duty and conditions, associated design modifications, project management and the physical relocation, installation and commissioning.
- We can help you find a buyer for your equipment and provide the technical support to facilitate the safe removal and relocation.

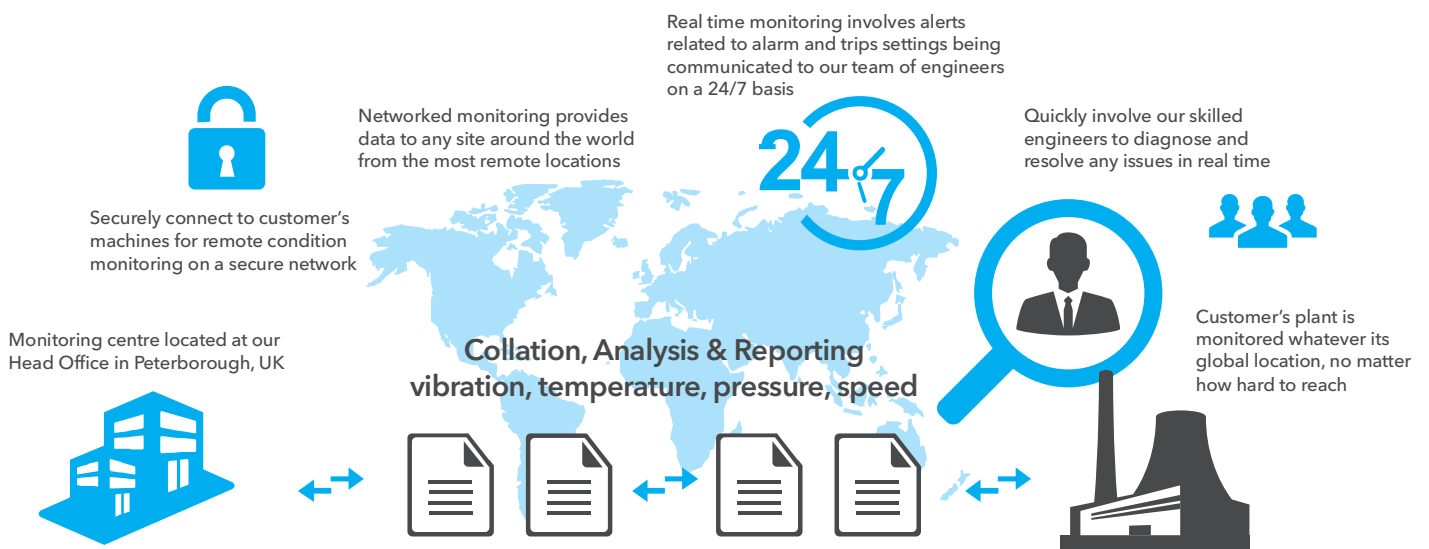
Remote Condition Monitoring

Stay informed, stay alert

Peter Brotherhood provides customised monitoring and control systems for all types of machines, processes, applications and industries. This includes retrofits to older machines. A unique, bespoke designed system can be fitted across the plant, to collate and report on all areas from vibration to temperature, and pressure to speed.

Benefits of Remote Condition Monitoring:

- Total information from one source
- Real time interrogation and fault diagnosis
- More informed operational decisions
- Saves cost and time when diagnosing and resolving issues



We are able to offer upgrades on existing systems to allow real time remote condition monitoring and fault analysis without the need to mobilise to site. Please contact us at techsupport@peterbrotherhood.com with your system details if you would like us to review whether this will be possible with your control system and provide a quotation.

WHEN YOU BUY A PART FROM PETER BROTHERHOOD YOU DO SO WITH THE ASSURANCE THERE IS NO COMPROMISE ON QUALITY TO ENSURE YOUR OPERATION IS NOT PUT AT RISK.



Parts Supply & Management



OEM Spares

Peter Brotherhood machinery is built to the highest quality standards to ensure maximum reliability and availability. When you buy a spare part from us you do so with the assurance there is no compromise on quality.

By providing individual items on both a crisis delivery basis and through Recommended Spare Parts Lists (RSPL), we cover the spectrum from reactive to preventative maintenance.

We are proud to conform to the stringent quality assurance standard ISO 9001:2008; the environmental management standard ISO 14001:2004 and the Occupational Health & Safety Management System OHSAS 18001:2007.

Non OEM Spares and Unobtainable Parts

Obsolete or unobtainable parts can often be a problem, but we provide a solution. As an OEM with 150 years of experience we can do far more than just replicate parts. Using our extensive experience and own technology we can offer improved components for enhanced performance and reliability.

Our extensive re-engineering facilities are backed by the highest level of design expertise. This enables us to offer repairs and re-rating of components on any make of steam turbine or reciprocating compressor.

Refurbished Parts

It can sometimes prove more economical to refurbish an existing component than replace it. In other situations, it may be that a part needs to be refurbished as a tactical solution for a limited period of time.

We can offer support in both cases; from helping to inform the decision through to carrying out the work and reinstalling the component. Knowing that a part has been refurbished to an OEM standard gives you confidence in its reliability.

Tooling

We can supply both special purpose and standard tooling for all your maintenance needs. This can also include the re-supply of special tooling if the original that was provided with our equipment has been lost or damaged.

We also offer other specialist tooling, such as that for specifically designed rotor lifting beams, as well as alignment tooling for machine rebuilds and purpose made jacks. If you have a bespoke tooling requirement we can help you with its design and production.

Contact us at aftermarket@peterbrotherhood.com for all your parts supply and management requirements.

Parts Management Services

SERVICE	SUMMARY	BENEFITS
Inventory Inspection	Annual physical inspection of customer held spare parts, which is carried out by one of our Field Service Engineers. Included as standard in our Level 2 and 3 CCA.	<ul style="list-style-type: none"> • Inspection carried out by a specialist • Mitigates against deterioration of parts • Ensures stock levels are as expected
Inventory Management	Monitors stock levels of customer held spares on an ongoing basis. Included as standard with our Level 3 CCA. This service is primarily a desk top exercise and can be provided as a remote service even where parts are held in a client's store. It normally includes a physical annual inventory inspection (as above) to check condition.	<ul style="list-style-type: none"> • Supports maximum machine availability by monitoring stock level • Ensures quicker replenishment of spares • Pre-agreed maximum and minimum stock level • Automatically gives a demand signal for replenishment of spares
Kitting	Our kitting services for spare parts and tooling are an effective way to manage the availability, consumption and replenishment of spares during and after planned maintenance activity. We use special kitting boxes to send to site.	<ul style="list-style-type: none"> • Better traceability of spares during and after maintenance activity • Reduces risk of abortive or return visits • Greater assurance of protection of components in transit • Easier identification of parts and tooling
Parts Storage & Stock Holding	The purchase of parts can often represent a significant investment that can sit in storage for many years depending on the nature of the item. It is therefore essential to ensure they are correctly stored. At our facility in the UK we provide storage of spare parts in a controlled, safe and secure environment.	<ul style="list-style-type: none"> • Avoids incorrect storage that can lead to deterioration of condition of parts • Access available to customers whenever required • Includes an annual inventory inspection report and inventory management • Through our specialist transport and shipping partner we can arrange urgent delivery of parts to site anywhere in the world



TRAINING THAT GIVES YOUR PEOPLE THE KNOWLEDGE AND UNDERSTANDING TO ENSURE THE LONG TERM RELIABILITY AND EFFICIENCY OF YOUR PRODUCTS.

Customer Training



World-Class Training

We actively promote and encourage customer training, particularly operator training. We know this is the first line of defence when it comes to ensuring correct and reliable operation of equipment.

To this end we offer you a range of training options. This includes one-day product overview training seminars in different locations worldwide, these are free to our customers.

Please contact us at techsupport@peterbrotherhood.com for details of upcoming events or request an event near to where you are located.

Benefits of training:

- Increased knowledge of equipment operation
- Improved equipment reliability
- Better maintenance planning
- Reduced down time
- Demonstrable staff competence

We provide training on:

- Steam Turbines
- Reciprocating Compressors
- Gearboxes
- Control Systems
- Auxiliary equipment and systems

We can also provide training on similar products by other manufacturers.

Standard or Customised

Our courses cater for all requirements – from a hands-on operator that needs to fully understand how to perform maintenance tasks, through to a manager that just wants an overview of equipment operation and maintenance.

We also provide training at all levels, for example for newcomers that need to start with the basics or experienced personnel who want to understand how to maximise the equipment performance.

We have a range of standard courses for our products but we can also create training programmes customised to your specific needs.

Training Facilities

All training is delivered by our experienced specialists, supported by professionals in various fields of expertise. A typical training course lasts between three to four days, depending on content.

At our main factory in Peterborough, UK, we have dedicated training room. Participants get the opportunity to tour our modern facility and see first-hand where we design, manufacture, assemble and test all our products.

We can also hold classes at your own offices, or off-site in a convenient conference centre or hotel, for example.

Our courses cover:

- Basic equipment overview
- Design features
- Advanced equipment overview
- Understanding of components
- Correct operation
- Start-up and shut down procedures
- Scheduled maintenance
- Troubleshooting
- Instrumentation and controls systems
- Auxiliary systems
- Overhauls
- Upgrades
- Documentation and maintenance records

Contact us on **+44 (0)1733 292292** and ask for Technical Support or email techsupport@peterbrotherhood.com to discuss your training requirements.



OUR RICH HERITAGE AS AN OEM OF STEAM TURBINES ENSURES SKILLED PEOPLE, EFFECTIVE WORK PROCESSES AND EXCELLENT FACILITIES.



Repair Services



Steam Turbines

We use our OEM experience to carry out single and multi-stage steam turbine repairs, employing proven processes and techniques to give you assured machine reliability.

Typical components we carry out repairs on include:

- Rotors
- Blades
- Diaphragms
- Steam Control Valves
- Casings

We inspect, repair and balance steam turbine rotors. Common issues on rotors are blade damage, corrosion and wet steam erosion.

Typical repairs we carry out include:

- Journal repairs
- Repair thrust faces
- Replace damaged blading / shrouding
- Burnish probe tracks

Rotor Blades and Diaphragms

Peter Brotherhood supply and fit rotor blades for many different makes of steam turbine. Our sophisticated machine tools enable us to manufacture straight or tapered and twisted blades. These are produced from solid billets (of quality assured material) to ensure integrity of the blades during operation. The materials are carefully selected by our design engineers to meet the demands of the unique operating conditions of each machine.

We can reproduce the profile of any blade and root section, making allowances for wear and damage. Component drawings can be automatically produced and the data transferred direct to the machine tools. We also manufacture the blades in-house. Our approach to the whole process significantly reduces manufacturing lead times and assures the quality of the finished component.

The quality of our blading meets the highest standards - we believe it is second to none. This is achieved by state of the art machining, measurement and quality control techniques.

The blading facility is backed up by a full fitting and balancing service to provide certification and meet safety and insurance requirements. Our Field Service Engineers can provide on-site reassembly and re-commissioning to ensure safe and efficient operation of the turbine.

Contact us at techsupport@peterbrotherhood.com to discuss your repair requirements.

Images showing Turbine Rotor as received from customer and after refurbishment



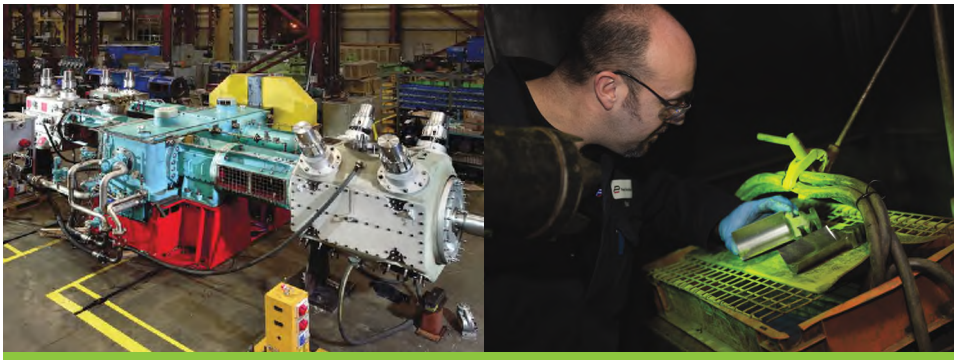
Steam Control Valves

We have the facilities and capabilities to inspect and repair Steam Control Valves manufactured not only by ourselves but also by others. A typical scope of work for inspection and repairing is:

- Clean and dismantle
- Inspect / non destructive testing
- Report and agree any remedial work
- Replace worn components
- Pressure test
- Rebuild and function test
- Preserve and pack
- Despatch

Images show Turbine Control Valve as received from customer and after overhaul





A COMPREHENSIVE RANGE OF SERVICES TO SUPPORT CUSTOMERS DURING THE LIFE CYCLE OF OWNING, OPERATING AND MAINTAINING COMPLEX ROTATING MACHINERY.

Reciprocating Compressors

Our ability to repair Reciprocating Gas Compressors is borne out of our OEM expertise. Using our services to inspect and where necessary repair compressor components can reduce the cost and downtime of procuring replacement components. The work we carry out is backed by our standard warranty to give you the reassurance that the returned component will give reliable service.

Typical repairs we are able to carry out include:

- Cylinder relining
- Connecting rod inspection and refurbishment
- Piston and piston rod inspection and refurbishment
- Wear part replacement

These repairs can sometimes be incorporated with upgrades to components to give improvements in performance and reliability. Please contact us at techsupport@peterbrotherhood.com to discuss options for your compressor.

Gearboxes

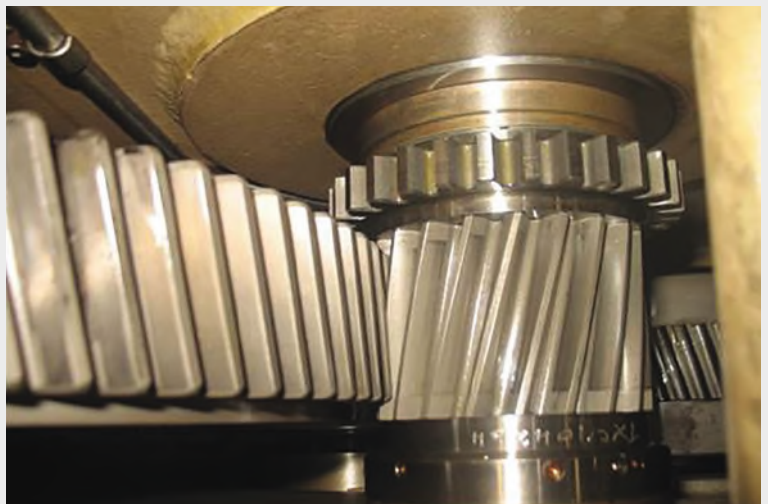
To repair and overhaul gearboxes we employ the same manufacturing, assembly and test facilities that we use for our new gearboxes. This includes full inspection and repair of complex gearbox internal components.

Non destructive testing, inspection and other services we provide:

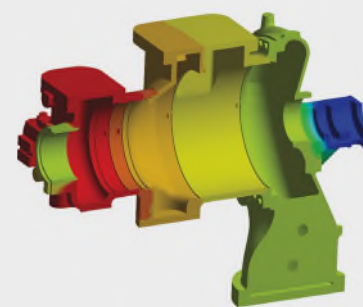
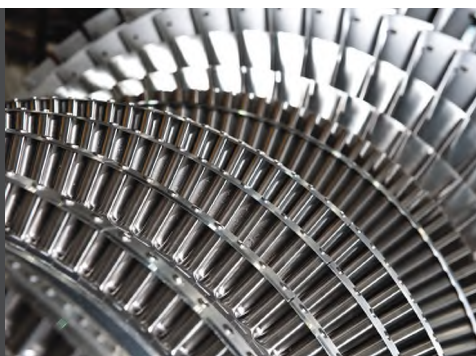
- Visual, dimensional and full Coordinate Measuring Machine (CMM) inspection
- Dye penetrant inspection
- Magnetic particle inspection
- Ultrasonic inspection
- X-Ray
- Low speed balancing to ISO 1940
- Hydrotest
- Steam raising plant for no load testing of steam turbines
- Shotblast and painting

All equipment sent to us for repair is fully inspected and a feasibility report is compiled giving detailed information on the condition and any damage. A fully priced schedule of repair is submitted to the customer for acceptance before any remedial work is undertaken.

Images showing gearbox as received, after overhaul and gearbox internals



WE HAVE A RANGE OF SOLUTIONS TO IMPROVE STEAM TURBINE OPERATION.



Engineered Solutions



Steam Turbines

We offer a number of improvements on Steam Turbines that can range from upgraded components to improve performance and extend service intervals through to complete revamps due to a change of operational conditions.

Environmental Improvements

We are able to offer improvements that help the environmental performance of your equipment that reduce oil consumption, noise and equipment surface temperatures.

Steam Turbine Engineered Solutions

	PROBLEM	SOLUTIONS	BENEFITS
Revamp	Change of operating conditions	Design survey Optimisation recommendations	<ul style="list-style-type: none"> Increased performance and efficiency Cost effective alternative to purchasing new equipment Avoids need to modify existing foundations and pipework
	Wet steam erosion of blades	Blade material coating/change	<ul style="list-style-type: none"> Longer operating life Improved efficiency
	Unplanned shutdowns and maintenance	Additional condition monitoring	<ul style="list-style-type: none"> Minimise downtime More predictable performance and cost of ownership
	Remote turbine starting required	Convert machine to auto start	<ul style="list-style-type: none"> Simplified operation reduces possibility of operator errors
Upgrade	Old/obsolete proprietary parts	Modern equivalent parts/solutions	<ul style="list-style-type: none"> Increased efficiency Reduced power consumption Availability of spare parts

MINOR UPGRADES WE CAN OFFER AS RETROFITS TO STEAM TURBINES:

- Control, Stop and Emergency Valve (CSEV) steam strainer design and material upgrade
- Upgrade mechanical governor with actuator and electric governor / speed control
- Addition or improvement to condition monitoring
- Two out of three voting for overspeed monitoring
- Oil system upgrades - modern duplex coolers and filters
- Addition of an oil mist eliminator to eradicate oil leaks that may have developed over time

Steam Turbines and Reciprocating Compressors Feasibility Studies and Support

Feasibility Studies

The major upgrades and revamps that we undertake start with a feasibility study. We work with you to understand the business need and then explain the options that are available. This carefully phased approach allows better management and understanding of cost and safety issues associated with the upgrade through the life cycle of the project. It also helps de-risk the project by applying proper planning from the outset.

Our feasibility studies cover:

- Suitability of existing design with new operating conditions to establish a safe operating envelope
- Confirm operating performance and financial savings that can be achieved
- Design calculations
- Extent of modifications and specifications
- Define site work required, including surveys
- Determine whether existing envelope can be maintained
- Estimated price and lead times

Project Management

We apply all our Project Management experience and processes during upgrades and revamps. By doing so, we ensure adherence to schedule and costs without compromising the quality of the product. Our 'gated' process starts with the feasibility study, moves through design, manufacture, site preparation, installation and commissioning, and finally closes with the handover to the customer.



OUR RECIPROCATING COMPRESSORS EXPERTISE DELIVERS INCREASED RELIABILITY AND AVAILABILITY, FOR LOWER LIFE CYCLE COSTS.

Reciprocating Compressors

We offer an extensive range of improvements to reciprocating gas compressors.

Ranging from upgrading components to extend service life and improve operating efficiency, through to reversed engineered revamps; tailored to suit the end-users change in operational conditions and/or gas composition, by offering a cost effective alternative to replacing existing capital equipment.

Significant cost savings can be obtained when revamping a compressor by putting in place measures to reduce machine capacity, rather than relying on the bypass valve; in some instances the payback for this engineering solution can be less than one year.

We support the full product life cycle of our own and other OEM equipment, and subsequently offer engineered solutions to resolve the root cause of unplanned compressor shutdowns to improve reliability and subsequently reduce maintenance/operating costs.

Reciprocating Gas Compressor Engineered Solutions

PROBLEM	SOLUTIONS	BENEFITS
Revamp Change in operating conditions e.g. Pressure and temperature Change in gas composition or additional gas to be considered Change of process flow requirement	<ul style="list-style-type: none"> • Modified or replaced cylinder and internal assemblies • Install fixed or variable clearance pockets • Install variable capacity control systems • Evaluate suitability of dampeners • Assess suitability of drive motor 	<ul style="list-style-type: none"> • Optimised performance and power consumption • Cost effective alternative to purchasing new equipment • Compliance to current safety and industry standards • Enhanced efficiency • Power savings for reduced capacity applications
Upgrade Part's availability i.e. obsolete cylinder patterns and difficult to machine parts, resulting in long lead times	Opportunity to upgrade cylinder and/or their associated components to incorporate the latest design features and compliance with current industry and safety standards	<ul style="list-style-type: none"> • Innovative designs in accordance with latest API 618 standard; increasing availability, improved safety, shorter lead times • Life-cycle cost advantage through improved efficiency gains and minimised downtime
Gas leaks	<ul style="list-style-type: none"> • Optimised valve cover designs • Upgrade inert buffer control system and gas packing design • Upgrade original components exposed to cyclic stress 	<ul style="list-style-type: none"> • Enhanced efficiency that encompasses the latest design features and technologies
Downtime due to excessive cylinder gas valve maintenance and/or failures	<ul style="list-style-type: none"> • Performance analysis to ensure valve is sized for current application • Upgrade valves and lubricator control systems • Resolve pulsation effects on cylinder 	<ul style="list-style-type: none"> • Increased performance and extended operation • Improved operational reliability and the availability of future spares
Short life cycle on wear parts e.g. Gas packing, piston and bearer rings	<ul style="list-style-type: none"> • Upgrade to a reliable and continuous lubrication control system • Upgrade piston rod to ensure sufficient wear resistance from gas service • Redesign piston to achieve recommended bearing load 	<ul style="list-style-type: none"> • Compliance to current industry and safety standards
MINOR UPGRADES WE CAN OFFER AS RETROFITS TO RECIPROCATING GAS COMPRESSORS:	<ul style="list-style-type: none"> • Comply with current safety and industry practices through the replacement of manually operated valve unloader and clearance pockets • Improve reliability and longer life with piston assembly upgrades reducing bearing loads and using the latest advancements in ring materials • Install condition monitoring equipment to better understand machine health 	<ul style="list-style-type: none"> • Improvements to tempered water systems for better cooling • Upgraded lubricators for extended piston and bearer ring life • Upgrade fixings and joint designs to prevent loosening and failures

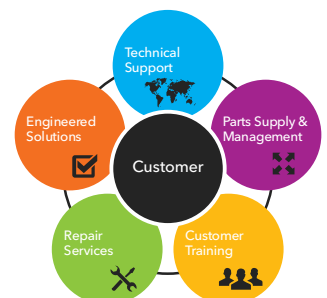
Peter Brotherhood – a proud history of steam turbine innovation

- 1838 ○ Peter Brotherhood born (1838-1902)
- 1861 ○ Peter Brotherhood supervises installation of new rudder post and paddle wheels on Isambard Kingdom Brunel's vessel The Great Eastern – the largest ship in the world at the time
- 1867 ○ Peter Brotherhood company founded
- 1872 ○ Invented the three cylinder radial steam engine – the first steam engine to be coupled directly to a dynamo
- 1875 ○ Installed steam driven generator sets on the French warship Richelieu – the first major vessel in the world to have electricity
- 1876 ○ Installed steam driven generator sets on HMS Invincible – the Royal Navy's first vessel to have electricity
- 1924 ○ Supplied 7,500 kW condensing machines to coal fired power stations in the UK
- 1954 ○ Supplied the first Peter Brotherhood steam turbine to the cane sugar industry
- 1958 ○ Supplied the world's first marine waste heat recovery steam turbine
- 1976 ○ Supplied 10,000 kW back pressure turbine generator set to the Australian sugar industry
- 1994 ○ Moved to existing location in Peterborough
- 2001 ○ Supplied 20,000 kW back pressure turbine generator set to a sugar factory in Zimbabwe – the largest in Africa
- 2003 ○ Installed two 12,000 kW turbine generators, the largest in the world on an FPSO
- 2005 ○ Installed two 24,000 kW turbine generators, the largest in the world on an FPSO
- 2006 ○ Supplied 8,500 kW turbine generator set to Emma Maersk, the world's largest container ship
- 2007 ○ Installed two 27,000 kW turbine generators, the largest in the world on an FPSO
- 2008 ○ Installed 17,650 kW turbine generator in a diesel engine combined cycle – the largest in the world at this time
Installed three 24,000 kW turbine generators on an FPSO, the largest amount of steam produced electrical power output at sea
- 2012 ○ Supplied two 16,000 kW extraction turbine generator sets to FPSO for the North Sea, the world's first extraction condensing machines on an FPSO, and the largest in the North Sea
- 2013 ○ Supplied 38,000 kW back pressure turbine generator set – the largest in the world to the Mexican sugar industry
- 2015 ○ Supplied two 33,000 kW turbine generator sets to the world's first converted FLNG vessel
- 2016 ○ Supplied steam turbine generator sets to the Royal Navy – 140 years of continuous supply to the same customer
- 2020 ○ Supplied two 26,370 kW turbine generator sets to our second FLNG Project

For worldwide 24/7 support ensuring operational availability and efficiency please contact our Customer Services Team on:
+44 (0)1733 292292 or techsupport@peterbrotherhood.com

Peter Brotherhood. Proud to give you more.

More expertise. More support. More reliability. More value.



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