Filtration, purification and separation of air and gases for military applications
Parker domnick hunter specialises in purification and separation technologies where compressed air and gas purity, product quality, technological excellence and global support are paramount. It designs and manufactures compressed air treatment products, breathing air purifiers, CBRN protection, gas generators and ancillary equipment for key military applications where ease of integration, reliability, low cost of ownership and energy savings can make a real difference.

Using the latest cutting edge technology, its products are designed to eliminate problems associated with contamination in sensitive air and gas systems.

Working closely with defence organisations, the extensive Parker domnick hunter research and development laboratories are staffed by specialists in all aspects of filtration, drying, gas separation and related technologies to ensure that every product is developed fully for its intended use.

A world-wide support service includes a full on-site installation, commissioning, testing service and personnel training for purification and separation equipment to provide optimum performance.

Parker domnick hunter, a division of Parker Hannifin ltd, has been providing leading edge compressed air and gas solutions to an ever changing tri-service defence market for more than 40 years. A diverse range of solutions is available for applications including CO₂ reduction, contamination removal from low and high pressure compressed air systems, waveguide pressurisation and breathing quality air. Parker domnick hunter purification systems are not only in service with the British Royal Navy, Army and Royal Air Force, but also with NATO and other allied countries world-wide.

- Specialists in Defence applications
- Design, development and manufacture
- Quality approved to ISO9001
- Products deployed throughout the world
- Fully supported
Airborne contamination is a real problem for military applications

Whether the application is CBRN protection, breathing air purification, compressed air motive power or gas generation, understanding the sources and types of airborne contaminants is fundamental to achieving effective purification methods.

**Atmospheric dirt**
Atmospheric air in industrial and urban environments typically contain 140 million dirt particles for every cubic metre of air. 80% of these particles are less than 2 microns in size and are therefore, too small to be captured by the compressor air intake filter and pass directly into the compressed air system.

**Water vapour**
Large volumes of atmospheric air enter the compressed air system through the compressor intake. As the air is compressed, the temperature increases significantly, causing it to become fully saturated with water vapour. The ability of air to retain water vapour is dependent upon its temperature and pressure. The higher the pressure, the greater the amount of condensed water that will be released.

**Condensed liquid water and water aerosols**
After the compression stage, the saturated air is normally cooled to a usable temperature by an aftercooler, causing the retained water vapour to be condensed into liquid water which can now be removed by a condensate drain. The air leaving the aftercooler is now 100% saturated with water vapour and any further cooling of the air will result in more water vapour condensing into liquid. Condensation occurs at various stages throughout the system as the air is cooled further by the air receiver, piping and the expansion of air in valves and cylinders. The condensed water and water aerosols will cause corrosion to the storage and distribution system and increase maintenance costs. Water in any form must be removed to enable the system to function correctly and perform efficiently.
**Rust and pipescale**

Water contamination will cause rust and pipescale to form in air receivers and the system piping which will eventually break away to cause blockage or damage to the process or application.

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**Carbon dioxide**

Carbon dioxide is a colourless, odourless gas occurring naturally in the atmosphere and formed by respiration. In large concentrations, it is an asphyxiant.

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**Carbon monoxide**

Carbon monoxide is a colourless, odourless toxic gas formed by the incomplete burning of carbon eg exhaust fumes from power plant and internal combustion engines. Known as the “silent killer”, this gas will be absorbed into the bloodstream very easily if inhaled.

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**CBRN contaminants**

Potentially introduced into the atmosphere in a military conflict, these airborne contaminants could include nerve agents, choking / blood agents, nuclear particles, viruses, bacteria, Toxic Industrial Chemicals (TIC’s) and Toxic Industrial Materials (TIM’s).

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**Oil**

Most air compressors use oil in the compression stage for sealing, lubrication and cooling. During operation and especially at elevated operating temperatures, as much as 50% of the degraded compressor oil, in liquid, aerosol and vapour form can be carried over into the compressed air system.

Additionally, unburned hydrocarbons drawn into the compressor intake will carryover into the compressed air system where it will cool and condense.

All this acidic oil mixes with water vapour in the compressed air causing damage to air receivers, the air distribution systems and valve/cylinder seals.

It should also be noted that oil-free compressors do not supply contaminant free air. Regardless of which compressor type is selected, whether oil-free or oil lubricated, adequate filtration and separation equipment will be required to remove the large volume of dirty contaminated water in addition to unburned hydrocarbons, dirt, rust and pipescale contamination from entering the system.
A dedicated solution for every application

Parker domnick hunter offers maximum protection, from a dedicated range of air purification and separation systems, designed specifically to combat the problems experienced with today’s military applications.

**Regenerative CBRN protection**
- CBRN regenerative filtration systems. Unique patented designs, providing full protection and fully regenerative across a broad CW threat, including TIC’s and TIM’s.

**Compressed air purification**
- Compressed air filters. Contamination removal down to 0.01 micron particles and 0.003 mg/m³ oil. High pressure (HP) and low pressure (LP) filters available.
- High pressure filter combination units.
- Waveguide air pressure units.
- Compressed air dryers (HP and LP). Pressure dewpoint down to -70°C pdp.

**Breathing air**
- Breathing air purifiers (HP and LP).
- Regenerative CO₂ reduction system for submarines.
- Air purity test kits.

**Gas generation**
- Nitrogen gas generators.
- Laboratory gas generators.
Regenerative CBRN filtration systems provide continuous protection

Given the current global situation and an escalation of the terror threat, the need to protect our armed forces and security personnel against Chemical, Biological, Radiological and Nuclear (CBRN) attack must be considered the highest priority. The greatest concern expressed by military authorities worldwide is the threat posed by biological and chemical agents that are easy and cheap to manufacture, deadly in minute quantities, easily concealed and delivered.

Consequently, Parker domnick hunter has developed regenerative filtration systems that offer effective broad band spectrum protection against chemical and biological weapon agents, new technology that will obsolete and replace single pass activated carbon filters.

The capability of this technology has been successfully demonstrated through our participation:

- As a project leader of a tri-nation consortium to develop and prove the technology
- In a UK MOD technology demonstrator programme
- With ECBC in the US under a co-operative research and development agreement

The proven benefits of applying the Parker domnick hunter regenerative CBRN technology are well known:

- Meets protection requirements for all known CW agents and Toxic Industrial Chemicals
- Regenerative operation provides continuous protection
- Wherever protection from battlefield contaminants is needed, the Parker domnick hunter regenerative CBRN filtration system has the modularity and capacity to be integrated into virtually all COLPRO facilities, including AFV’s
- Eliminates difficult and costly logistical support issues
- Environmental benefits - no disposal of contaminated filters

Comprehensive models ranging from large units suitable for buildings, shelters and barracks to compact units for vehicles are now available. Following testing, the Parker domnick hunter regenerative CBRN filtration system has equipped British Army Titan and Trojan ETS vehicles, the first ever to include CBRN protection as standard.
Compressed Air Purification

Whether considering HP or LP compressed air applications, the same airborne contamination will be present in the system and must be removed.

- Dirt
- Rust
- Pipescale
- Micro-organisms
- Water
- Water aerosols
- Water vapour
- Oil
- Oil aerosols
- Oil vapour
- Pipescale
- Water vapour
- Oil vapour
- Micro-organisms
- Dirt
- Rust
- Pipescale
- Micro-organisms
- Water
- Water aerosols
- Water vapour
- Oil
- Oil aerosols
- Oil vapour

More and more users recognise the problems associated with poor filtration and the need for better quality compressed air in terms of contamination removal and the improved lifetime of all applications and systems which rely upon it.

Compressed air purification equipment must deliver uncompromising performance and reliability, whilst providing the highest air quality.

In addition to its extensive ranges of compressed air purification equipment, Parker domnick hunter also manufacturers LP and HP compressed air treatment packages specifically designed to military specifications.

- Delivered air quality in accordance with all editions of ISO8573-1, the international standard for compressed air quality
- Integrated solutions to military specifications
- Fully packaged water separator / filtration / drying systems
- Complies with military standards
- Bulkhead, wall or floor mounting arrangements
- Suitable for all compressed air applications and all compressor types
- 30G shock tested
- Derivatives of existing designs can be manufactured to suit specific applications
- Proven in service with the Royal Navy

Waveguide air pressure unit prevents “arcing” damage

Clean, dry compressed air is essential to prevent radio frequency energy from "arcing" which can damage the waveguide and power amplifier of radar systems.

The waveguide air pressure unit from Parker domnick hunter has an integral primary compressor that delivers compressed air to the purification stages comprising of pre and after filtration as well as an adsorption dryer.

A secondary compressor maintains pressure in the event of primary compressor failure.

Various configurations are possible to suit operational requirements.
Breathing Air

Parker domnick hunter breathing air purifiers provide air 1,000,000 times cleaner than the air we normally breathe.

A number of international breathing air standards exist which define the quality of breathing air that must be provided to operators working in contaminated environments or applications that require breathing quality air, e.g. Europe EN12021, UK BS4275: 1997 etc.

Contaminants frequently present in compressed air that threaten the well being of breathing air users are:

- **Fumes**
- **Vapours**
- **Solid particles**
- **Oil**
- **Gases (CO and CO₂)**
- **Micro-organisms**

For compressed air to be suitable for breathing air applications, it must be properly purified to ensure that it meets the relevant Breathing Air Standard. Parker domnick hunter LP and HP breathing air purifiers are designed to offer the user protection against some or all of the contaminants that may be present in a compressed air fed breathing air system or SCUBA equipment.

As the world leader in filtration and purification of compressed air, Parker domnick hunter offers unrivalled experience in the design and manufacture of air treatment equipment.

**Regenerative Breathing Air**

The Parker domnick hunter AIRPACK 2000 is a lightweight and portable regenerative breathing air purifier that provides breathable air for up to four users. Effective respiratory protection of this type enables personnel to concentrate on the job in hand and work productively while preventing long term health problems.

**High Pressure Breathing Air Purifiers**

The Parker domnick hunter range of high pressure breathing air purifiers can be used with most high pressure compressed air systems up to 350 bar g (5075 psi g).

The HPBA units offer complete protection against carbon monoxide (CO) and carbon dioxide (CO₂) when filling diving bottles.

**Submarine Diving Air**

During extended periods of undersea operations, high concentrations of CO₂ can build up in a submarine’s internal environment.

Using this contaminated air to fill diving bottles poses serious health and safety issues for divers.

A compact system from Parker domnick hunter effectively reduces CO₂ to a safe level of typically less than 500 ppm. Fully regenerative technology enables the system to operate continuously, while an integrated air quality detection system and safety features provide operational integrity. This proven system has been in service with the Royal Navy since 2000.
Nitrogen Gas Generation

Nitrogen gas is now used extensively for tyre inflation and inert gas suppression. Unlike compressed air, nitrogen, due to its inert nature, will not support combustion if it comes into contact with extremely hot aircraft brake units i.e. tyre bursts.

Other related applications include aircraft oleo strut maintenance (nitrogen prevents ‘oil foaming’ under heavy compression) and aircraft escape slide inflation systems.

Nitrogen is also widely used as an inerting gas for fuel tank “top space” and other flammable liquid and chemical inerting.

Aircraft Tyre Inflation

Many regulatory agencies require the use of nitrogen when inflating tyres.

Nitrogen provides a stable, inert inflation gas, whilst also eliminating the introduction of moisture into the tyre cavity. Nitrogen will not sustain combustion and limits degradation of the tyre material and wheel due to oxidation.

The majority of in-flight tyre bursts have been attributed to the tyres being weakened by foreign object damage or scuffing, creating a rapid release of pressure. Such failures are usually experienced after the undercarriage has been retracted for some time combining the effects of brake heat transfer, internal tyre temperature and differential pressure.

It is also possible for a tyre to fail explosively during flight without any significant prior degradation. A tyre inflated with air when subjected to excessive heating, can trigger a chemical reaction resulting in the release of volatile gases. This chemical reaction in the presence of the oxygen may result in an in-flight fire or a tyre explosion in the landing gear bay. This is due to the fact that conventional pressure relief devices are unable to respond adequately to rapid increases in gas pressure and temperature which can occur with auto ignition.

Testing shows that the risk of auto ignition can be reduced by using an inert gas during servicing for tyre inflation.

Using nitrogen can deliver other potential benefits as it will tend to reduce wheel corrosion, tyre fatigue and the risk of fire from fusible plugs melting due to brakes overheating. Nitrogen is both used airside during aircraft turnaround as well as in the wheel and brake shop during maintenance overhaul.

Scientific Laboratory Gases

Parker domnick hunter has a complete range of gas generators for laboratory use. The ultra high purity hydrogen, nitrogen, CO₂ free and zero air generators are cost effective, robust and offer a convenient gas solution for applications requiring higher gas flows.

The generators utilise fully regenerative and proven pressure swing adsorption technology to provide a continuous gas supply without the need for secondary purification. They are fully compatible with all know APCI and ESI interfaces.

Some models feature integral oil-free compressors to give increased security of supply that completely removes reliance on external air supplies.

Single or multiple instruments can be supplied to drastically reduce ongoing laboratory gas costs.
The Parker domnick hunter design philosophy

**Air quality**

Improved air and gas quality is the main reason for installing filtration, purification and separation equipment in the first instance. All Parker domnick hunter purification equipment has been designed to provide compressed air quality in accordance with the recommendations described in ISO8573-1:2010, the latest edition of the international air quality standard. Additionally, Parker domnick hunter product performance has been independently verified by Lloyds Register and is backed up by a 12 month performance guarantee, which can be extended simply by conducting annual maintenance in accordance with the Parker domnick hunter recommendations.

**Energy efficiency**

During the development of Parker domnick hunter filtration, purification and separation products, our engineers strive to provide the lowest operating costs whilst achieving the required air and gas quality. Pressure loss is the major contributor to operational costs of filtration products. Parker domnick hunter filters have been designed using aerospace technology to ensure both pressure loss and energy consumption are kept to an absolute minimum.

**Low lifetime costs**

Equipment with a low purchase price may turn out to be a more costly investment in the longer term. The operational and maintenance costs of the purification equipment also needs to be considered. Users should always consider the real cost of poor quality compressed air or gas impacting on their applications or systems.

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**Aftermarket support**

Many military applications require much more than simply supplying high quality compressed air and gas products in order to maintain operational effectiveness.

Equipment manufacturers must not only comply with ever increasing military standards, they must also provide maximum utilisation and optimum efficiency from their products to ensure total reliability and a minimum lifetime cost of ownership.

Our commitment goes much further than simply supplying high quality products. Our aim is to maximise benefits to your application and systems by providing you with an unparalleled service.

From product design and selection through to installation, validation, training and maintenance, Parker domnick hunter can support you every step of the way.

For further information please email: psgsales@parker.com or visit: www.parker.com/dhfns
Parker’s Motion & Control Technologies

Parker is guided by a relentless drive to help our customers become more productive and achieve higher levels of profitability by engineering the best systems for their requirements. It means looking at customer applications from many angles to find new ways to create value. Whatever the motion and control technology need, Parker has the experience, breadth of product and global reach to consistently deliver. No company knows more about motion and control technology than Parker. For further information call 0800 27 27 5374.

FLUID & GAS HANDLING

Key Markets
- Aerospace
- Agriculture
- Bulk chemical handling
- Construction machinery
- Food & beverage
- Fuel & gas delivery
- Industrial machinery
- Mobile
- Oil & gas
- Transportation
- Welding

Key Products
- Brass fittings & valves
- Diagnostic equipment
- Fluid conveyance systems
- Industrial hose
- PTFE & PFA hose, tubing & plastic fittings
- Rubber & thermoplastic hose & couplings
- Tube fittings & adapters
- Quick disconnects

HYDRAULICS

Key Markets
- Aerospace
- Aerial lift
- Agriculture
- Construction machinery
- Forestry
- Industrial machinery
- Mining
- Oil & gas
- Power generation & energy
- Truck hydraulics

Key Products
- Diagnostic equipment
- Hydraulic cylinders
- & accumulators
- Hydraulic motors & pumps
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CLIMATE CONTROL

Key Markets
- Aerospace
- Air conditioning
- Food, beverage & dairy
- Life sciences & medical
- Precision cooling
- Processing
- Transportation

Key Products
- CO2 controls
- Electronic controllers
- Filter driers
- Hand shut-off valves
- Hose & fittings
- Pressure regulating valves
- Refrigerant distributors
- Safety relief valves
- Solenoid valves
- Thermostatic expansion valves

ELECTROMECHANICAL

Key Markets
- Aerospace
- Factory automation
- Food & beverage
- Life sciences & medical
- Machine tools
- Packaging machinery
- Paper machinery
- Plastics machinery & converting
- Primary metals
- Semiconductor & electronics
- Textile
- Wire & cable

Key Products
- AC/DC drives & systems
- Electric actuators
- Controllers
- Gearbox & gearheads
- Human machine interfaces
- Industrial PCs
- Inverters
- Linear motors, slides and stages
- Precision stages
- Stepper motors
- Servo motors, drives & controls
- Structural extrusions

Filtration

Key Markets
- Food & beverage
- Industrial machinery
- Life sciences
- Marine
- Mobile equipment
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- Power generation
- Process
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Key Products
- Compressed air & gas filters
- Engine air, fuel & oil filtration & systems
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- Process, chemical, water & microfiltration filters
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