



High quality compressed air for the food industry

aerospace
climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
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Filtration, purification and separation is our business

Parker domnick hunter is a world leader in the filtration, purification and separation of compressed air and gases.

Operating an efficient production facility allows increased volumes and better quality products to be manufactured at a lower cost. Downtime and unreliability are not acceptable.

Fundamental to most modern production environments is the compressed air network, often referred to as the 4th utility. This must be totally reliable and effective.

To guarantee maximum performance and reliability, Parker domnick hunter protects your entire compressed air network, providing the best quality compressed air, exactly where it is needed.

These world class compressed air treatment solutions will improve production performance and reliability whilst lowering energy consumption, CO₂ emissions and operational costs to deliver 100% manufacturing uptime and total peace of mind.

Compressed Air - The 4th Utility

Compressed air is a safe and reliable power source that is widely used throughout the food industry. Known as the 4th utility, approximately 90% of all companies use compressed air in some aspect of their operations. Unlike gas, water & electricity which is supplied to site by a utility supplier to strict tolerances and quality specifications, compressed air is generated on-site by the user. The quality of the compressed air and the cost of producing this powerful utility is therefore the responsibility of the user.



Compressed air contamination is a real problem for the food industry

In today's modern production facilities, the use of compressed air is often pivotal to manufacturing processes. Irrespective of whether the compressed air comes into direct contact with the product or is used to automate a process, provide motive power, package products, or even to generate other gases on-site, a clean, dry, reliable compressed air supply is essential to maintain efficient and cost effective production.

A tour of any modern food manufacturing facility will uncover the extensive use of compressed air, however production managers and quality managers are often unaware of the potential hazards associated with this powerful utility.

Untreated compressed air contains many potentially harmful or dangerous contaminants which must be removed or reduced to acceptable levels in order to protect the consumer and provide a safe and cost effective production facility. Contaminants that may be a potential hazard for human consumption need to be controlled, as a lack of control could potentially result in a prosecution.

World-wide Standards for Food Grade Compressed Air

In order to protect consumers against ill health (or worse), most industrialised countries have strict regulations and laws governing hygiene of food products which must be adhered to during:

Preparation
Processing
Manufacturing
Packaging
Storage
Transportation
Distribution
Handling
Sale or supply



Normally, hygiene regulations are strictly observed within the manufacturing and supply processes, however, through lack of awareness, they are not often applied to utilities

The most overlooked utility being the compressed air which powers many manufacturing processes

Food Manufacturers - Hygiene Legislation & Duty of Care

Most countries throughout the world have hygiene legislation in place (for example, in Europe this is European Regulation 852/2004) and food manufacturers have a duty of care to adhere to this legislation or face legal consequences.

Food Safety Management Systems

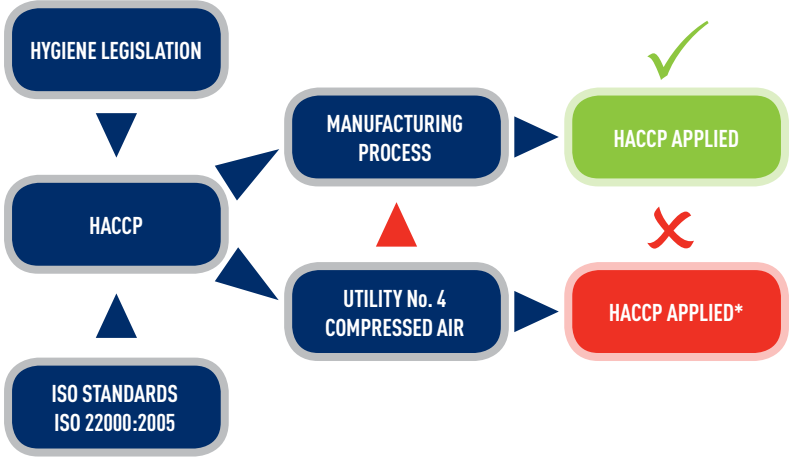
Typically, hygiene legislation requires manufacturers to instigate written food safety management systems (FSMS) based upon the principles of HACCP (Hazard Analysis Critical Control Point)

In order to provide a more auditable means of implementing HACCP procedures, many companies are adopting standards such as ISO22000:2005

The ISO standard ISO22000:2005 fully endorses the principles of the HACCP system. By means of auditable requirements, it combines the HACCP plan with prerequisite programs (PRPs). The standard states that hazard analysis is the key to an effective food safety management system. Conducting a hazard analysis will assist in organising the knowledge required to establish an effective combination of control measures.

ISO22000:2005 requires that all hazards that may be reasonably expected to occur in the production chain, including hazards that may be associated with the type of process and facilities used, are identified and assessed.

The interconnection between hygiene legislation, food safety management systems and compressed air



- * The HACCP principle is often applied to the main manufacturing facility but not utilities such as compressed air
- In most manufacturing scenarios, compressed air is viewed as a utility and for this reason is omitted from the Hazard Analysis (risk analysis)
- Additionally, many users are unaware of the contamination present in compressed air and the sources of that contamination, again leading to compressed air being omitted from the Hazard Analysis.

Applying the HACCP principle to compressed air

HACCP PRINCIPLE	HOW HACCP PRINCIPLE RELATES TO COMPRESSED AIR
ANALYSIS HAZARDS Identify potential hazards (contaminants) to foods safety	10 contaminants present in a typical compressed air system
IDENTIFICATION OF CCP'S Establish Critical Control Points throughout the production process where hazards (contaminants) can enter	Every point in the manufacturing process where compressed air is used
CCP PREVENTION MEASURES A prevention measure is established at all CCP's	Installation of Filtration & Drying (Purification) Equipment
MONITORING OF CCP PREVENTION MEASURES A system is established to monitor prevention measures at a CCP	Regular Air Purity Sampling of the compressed air system
CCP NOT MET Establish what must be done when the CCP prevention measures are not met	Documented process for staff to follow in the event of a quality incident
HACCP & CCP LOG Maintain a log system of all the CCP's, control methods and actions taken to correct potential problems	Details of Hazard Analysis, all CCP's and relevant sampling / testing recorded and available for inspection

Air Quality Standards for compressed air used in the food industry

Once hazards are identified, measures must be put in place to remove the hazards or reduce them to acceptable levels. So what level of compressed air contamination is deemed acceptable in the food industry.

Unlike compressed air that is used for breathing or medical purposes, **NO** standards or laws exist that define a minimum acceptable level of cleanliness (quality) when the compressed air is used for food manufacture. As food manufacturers have a duty of care to protect the consumer and compressed air systems are known to carry large quantities of contamination, what actions should be taken?

Introducing the Food Grade Compressed Air Code of Practice

In the United Kingdom, the British Compressed Air Society (BCAS) who are the governing body for compressed air and the British Retail Consortium (BRC) who represent the retail industry, have jointly developed a Code of Practice for Food Grade Compressed Air in order to assist food manufacturers. This Code of Practice evolved because of the absence of compressed air quality standards or legislation specific to the food manufacturing industries. The Code of Practice gives minimum purity (quality) standards for compressed air and defines allowable levels for dirt, water and oil, in line with air quality levels specified in ISO8573-1 the International Standard for compressed air quality.

Food Grade Compressed Air Code of Practice – Scope

- The code of practice references complimentary international standards for air purity, gives recommendations on installation, testing and maintenance of compressed air systems, but most importantly, defines a minimum acceptable purity (quality) for compressed air used in the food industry.
- The code of practice can be applied to the use of compressed air in all food manufacturing facilities, however it does not cover the quality of other gases used e.g. CO₂ or Nitrogen as these are often covered by other standards.
- Following the Code of Practice in the United Kingdom is not mandatory and not required by law; however following the code of practice allows a company to show due diligence should a 'quality incident' reach a court of law.
- Compliance with the code of practice is becoming a requirement of major UK retailers with food manufactures being asked to show compliance with the code of practice if they wish to remain a supplier or prior to being accepted as a supplier.
- The code of practice can also be applied to ingredient suppliers should they use compressed air in their manufacturing, transportation or packaging processes.
- Manufacturers and suppliers located outside of the United Kingdom may also be required to show compliance with the code of practice, should their produce be sold to retailers in the UK.
- The code of practice may also be adopted in other countries in the absence of any local standards or legislation. This will allow manufacturers to 'show duty of care' should a quality incident arise.





Sources and types of contamination in a compressed air system

Understanding the sources of compressed air contamination and the types of contaminants which must be reduced or eliminated is a key factor in planning an efficient compressed air system. In a typical compressed air system, there are ten major contaminants that have to be removed or reduced to protect the consumer and provide a safe and cost effective production facility. These contaminants come from four different sources.

Source 1 Atmospheric Air

Compressors draw in huge amounts of atmospheric air which continuously fills the system with invisible contaminants such as:

- **Water vapour**
- **Atmospheric dirt**
- **Oil vapour**
- **Micro-organisms**

Source 2 The Air Compressor

In addition to the contaminants drawn in from the atmosphere, oil lubricated compressors will contribute small amounts of oil from the compression process. The oil will be in the form of:

- **Liquid oil**
- **Oil aerosols**
- **Oil vapour**

After the compression stage, the after-cooler will cool the air, condensing water vapour and introducing it into the compressed air as:

- **Liquid water**
- **Water aerosols**

Sources 3 & 4 Compressed air storage devices & distribution piping

As the air leaves the compressor it now contains eight different contaminants. The air receiver (storage device) and the system piping that distribute the compressed air around the facility can store large amounts of this contamination. Additionally, they cool the warm, saturated compressed air which causes condensation on a large scale adding more liquid water into the system and promoting corrosion and microbiological growth:

- **Rust**
- **Pipescale**

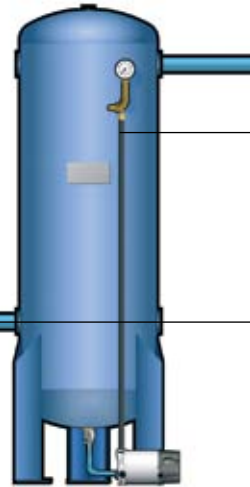


Contaminants and sources in a compressed air system



Atmospheric contamination entering the compressor

- Water Vapour
- Micro-organisms
- Atmospheric Dirt
- Oil Vapour



Contaminant Source
No. 1
Ambient Air

Contaminant Source
No. 2
The Air Compressor

Contaminant Source
No. 3
The Air Receiver



Water vapour

Water enters the compressed air system through the compressor intake as a vapour (or gas). The ability of air to hold water vapour is dependent upon its pressure and its temperature. The higher the temperature, the more water vapour that can be held by the

air, the higher the pressure, a greater amount of water vapour is squeezed out. As large volumes of air are drawn into the compressor and compressed, the temperature of the air increases significantly. This allows the heated air to easily retain the water vapour in the atmospheric air.



Condensed liquid water and water aerosols

After compression, compressed air is normally cooled to a usable temperature by an after-cooler. This cooling reduces the air's ability to retain water vapour, resulting in a proportion of the water vapour being condensed into liquid water. The liquid water is then removed by a condensate drain fitted to the after-cooler water separator.

The air leaving the after-cooler and entering the compressed air system is now 100% saturated with water vapour. Any further cooling of the compressed air will result in more water vapour condensing into liquid

water. Condensation occurs at various stages throughout the system as the air is cooled further by the air receiver, the distribution piping and the expansion of air in valves, cylinders, tools and machinery.

Saturated air, water aerosols and liquid water cause:

- Corrosion to the storage and distribution system
- Damage to valves, cylinders, tools and production equipment
- Damage to products and packaging in direct contact with the air
- Increased microbiological contamination
- Reduction in production efficiency
- Increased maintenance costs



Oil vapour

Atmospheric air also contains oil in a gaseous form (oil vapour) which comes from inefficient industrial processes and car exhausts. As with other contaminants, oil vapour is drawn into the compressor intake and passes through the intake filter. Typically concentrations can vary between 0.05 and 0.5mg per cubic metre, but these can increase significantly should the compressor

be sited near highways and heavy traffic. Additionally, lubricants used in the compression stage of a compressor can also be vaporised and carried into the compressed air system. This oil vapour will then cool and condense into a liquid. Oil vapour can also taint products and packaging with an oily smell and / or make workers feel unwell.

Compressor Room

Contamination introduced by the air receiver and distribution piping

- Rust
- Pipescale

Contamination introduced by the compressor

- Water Aerosols
- Condensed Liquid Water
- Liquid Oil
- Oil Aerosols

Total contamination entering the compressed air distribution system

- Water Vapour
- Microorganisms
- Atmospheric Dirt
- Oil Vapour
- Water Aerosols
- Condensed Liquid Water
- Liquid Oil
- Oil Aerosols
- Rust
- Pipescale

Contaminant Source
No. 4
The Distribution Piping



Liquid oil and oil aerosols

The majority of air compressors in use today still use oil in their compression stage for sealing, lubrication and cooling. The oil is in direct contact with the air as it is compressed, however due to the efficiency of modern air / oil separators built into the compressor, only a small proportion of this lubricating oil is carried over into the compressed

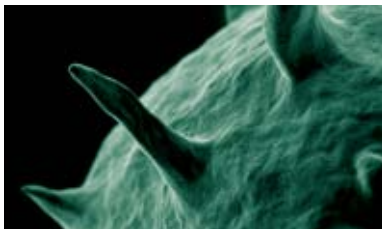
air system as a liquid, an aerosol (typically no more than 5mg/m³ for a well maintained screw compressor) or as oil vapour. Liquid and aerosols mix with water in the system to form a thick, acidic condensate. Compressor condensate causes damage to the compressed air storage and distribution system, production equipment, products and packaging.



Atmospheric dirt

Atmospheric air in industrial and urban environments will typically contain 140 - 150 million dirt particles in every cubic metre. As 80% of these particles are less than 2 microns in

size, they are therefore too small to be captured by the compressor air intake filter and will travel unrestricted into the compressed air system.



Micro-organisms

Atmospheric air can contain up to 100 million micro-organisms per cubic metre. Bacteria, viruses, fungi and spores are drawn into the intake of the air compressor and due to their size; will pass directly through the compressor intake filters and into the compressed air system. The warm, moist compressed air provides an ideal environment for their growth.

sterility and if contaminated compressed air can directly or indirectly contact products, packaging or production machinery, then sterility will be compromised.

Many critical applications require

Loss of sterility can cause enormous financial damage for a company as micro-organism can:

- Potentially harm the consumer
- Diminish product quality
- Render a product entirely unfit for use
- Lead to a product recall
- Cause legal action against a company



Rust and pipescale

Rust and pipescale can be directly attributed to the presence of water in the compressed air system and is usually found in air receivers and distribution piping. Over time, the rust and pipescale breaks away to cause damage or blockage in

production equipment which can also contaminate final product and processes. Rust and pipescale problems often increase for a period of time after the installation of dryers into older piping systems which were previously operated with inadequate or no purification equipment.

Contaminant removal

To operate a safe and cost effective compressed air system, contamination must be removed or reduced to acceptable limits.

Failure to remove contamination can cause numerous problems in the compressed air system, such as:

- Microbiological contamination
- Corrosion within storage vessels and the distribution system
- Damaged production equipment
- Blocked or frozen valves, cylinders air motors and tools
- Premature unplanned desiccant changes for adsorption dryers

In addition to problems associated with the compressed air system itself, allowing contamination such as water, particulate, oil and microorganisms to exhaust from valves, cylinders, air motors and tools, can lead to an unhealthy working environment with the potential for personal injury, staff absences and financial compensation claims.

Compressed air contamination will ultimately lead to:

- Inefficient production processes
- Spoiled, damaged or reworked products
- Reduced production efficiency
- Increased manufacturing costs

Compressed air contaminants

To many compressed air users, the realisation that there are ten major contaminants in a compressed air system is somewhat of a surprise. It is often thought that only three contaminants are present (Dirt / Water / Oil), however, upon closer examination, these three contaminants can be broken down further as:

Dirt

- Micro-organisms
- Atmospheric Dirt & Solid Particulate
- Rust
- Pipescale

Water

- Water vapour
- Condensed Liquid Water
- Water Aerosols

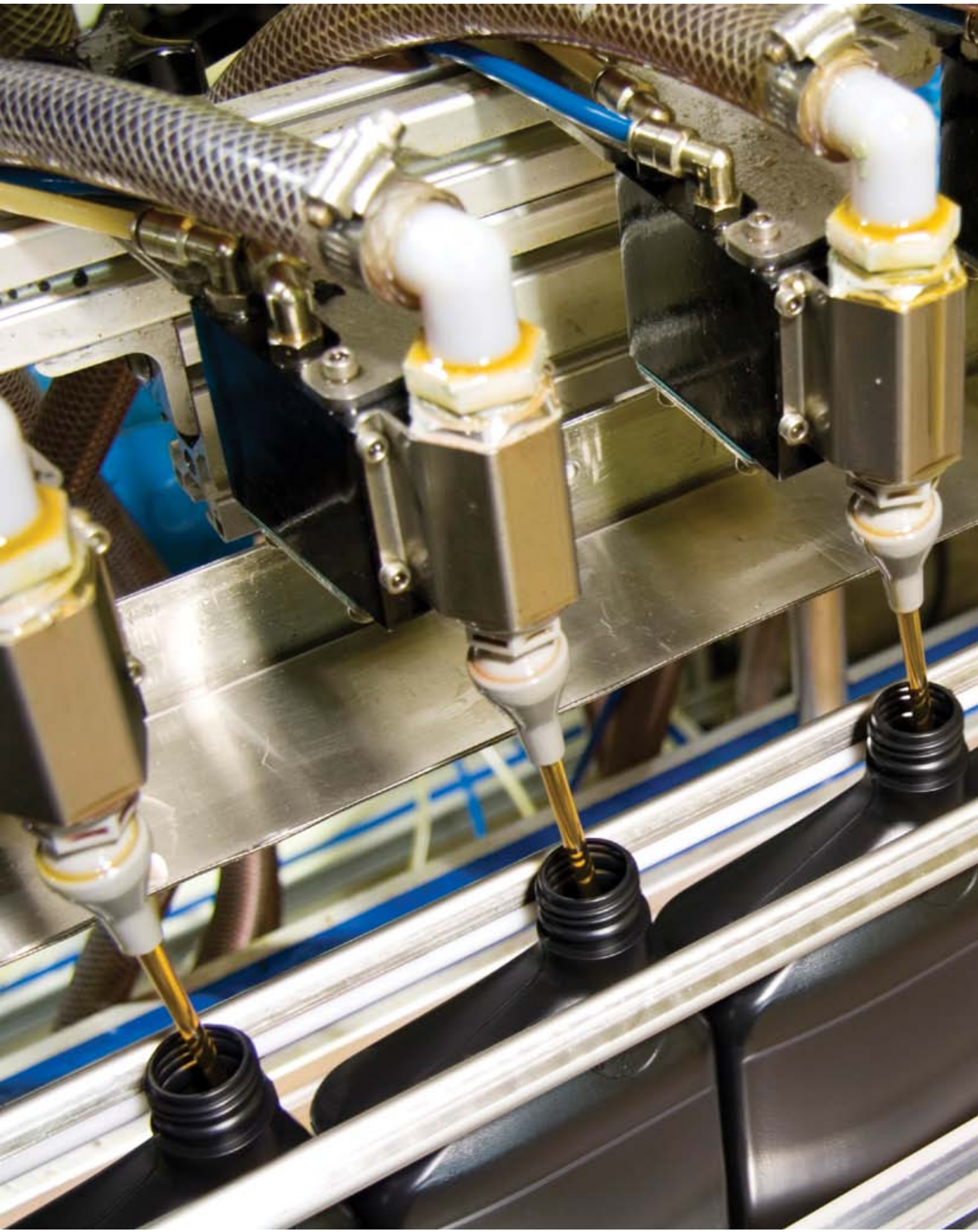
Oil

- Oil Vapour
- Liquid Oil
- Oil Aerosols

It is important to look at each contaminant in detail, as due to the diversity of the contamination present, a number of purification technologies must be employed for its removal.

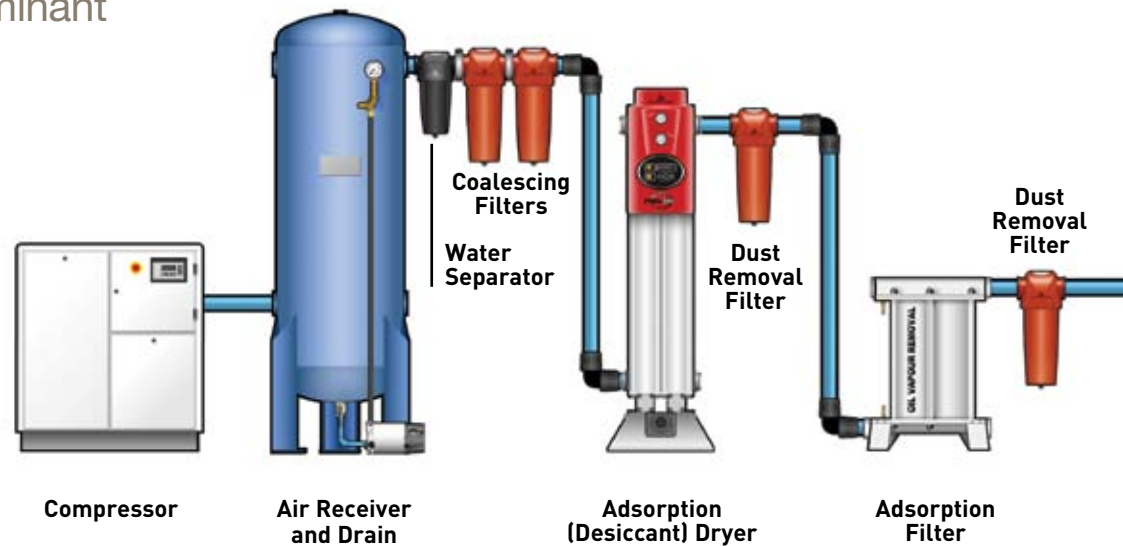
Contamination Reduction / Removal								
Purification Equipment Technologies	Bulk Condensed Water	Water Vapour	Water Aerosols	Atmospheric Dirt & Solid Particulate	Micro-organisms	Oil Vapour	Liquid Oil & Oil Aerosols	Rust & Pipescale
Water Separators	•							
Coalescing Filters			•	•	•		•	•
Adsorption Filters						•		
Adsorption Dryers		•						
Refrigeration Dryers		•						
Dust Removal Filters				•	•			•
Microbiological Filters*					•			

* To ensure the highest level of food safety and shelf life, Parker domnick hunter recommends that all contact and non-contact high risk air is treated with a sterilising grade filter to remove all microbial contamination.



A solution for
every contaminant

Compressor Room



Water separators

Water separators provide bulk condensed water and liquid oil removal and are used to protect coalescing filters against bulk liquid contamination (for example where excessive cooling takes place in air receivers and distribution piping installed prior to purification equipment).

Water separators will only remove liquids and will not remove water or oil in either an aerosol or vapour phase.

Designs using centrifugal action provide the most efficient method for bulk liquid removal as they use a combination of directional change and centrifugal action to optimise separation efficiency and reduce energy costs.

Coalescing filters

When considering purification equipment, coalescing filters are vital for the cost effective operation of any compressed air system, regardless of the type of compressor installed.

A purification system will normally consist of two coalescing filters installed in series to remove water aerosols, oil aerosols, atmospheric dirt, micro-organisms, rust and pipscale.

Suppliers of oil-free compressors will often state that one of the coalescing filters is a particulate filter and the other is an oil removal filter, therefore, in oil-free compressor installations, there is no need for the oil removal filter.

In reality, both filters remove exactly the same contaminants. The first filter is a 'general purpose filter' which protects the second, 'high efficiency filter' from bulk contamination.

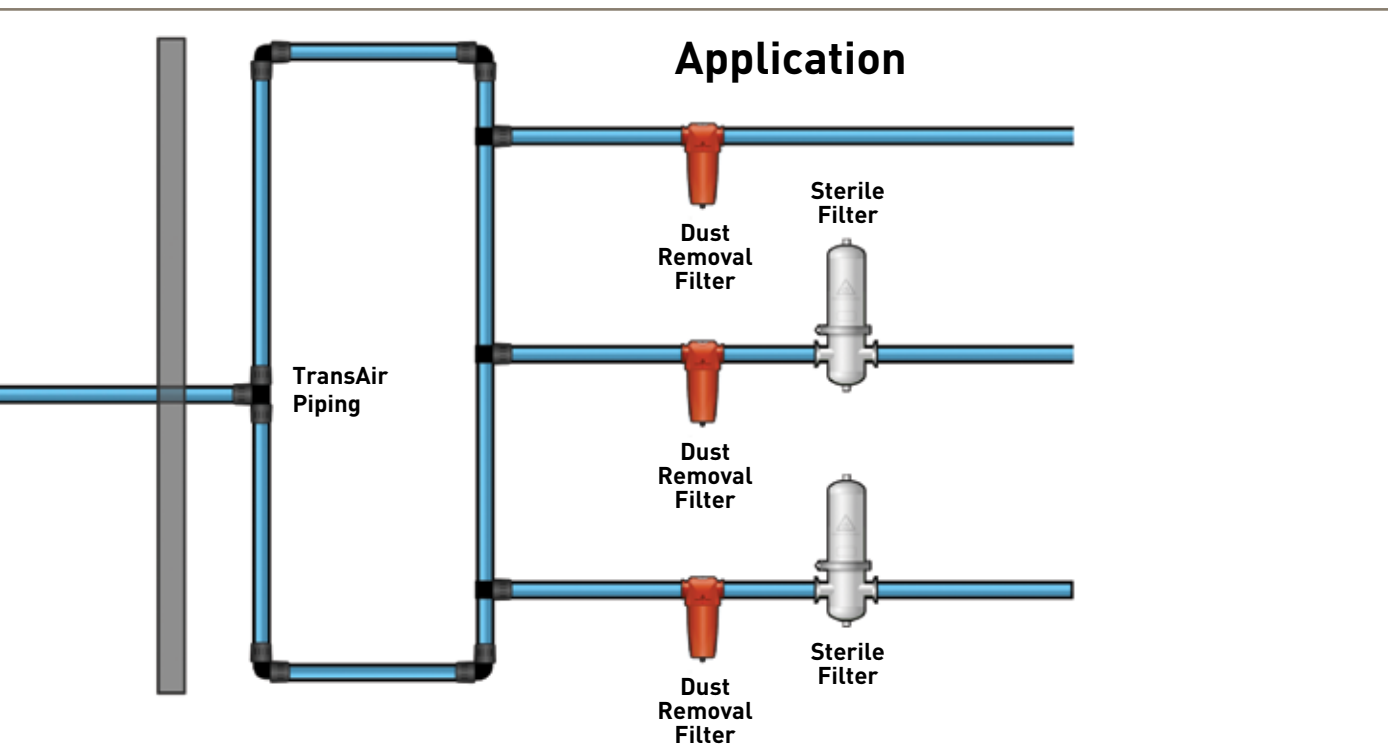
Omitting one of the filters in the belief that it is an oil removal filter will result in poor air quality due to contaminant bypass (carryover), high operational costs due to the pressure loss across the filter and more frequent filter element changes. Most importantly, omitting one of the filters will invalidate performance guarantees.

The dual coalescing filter installation ensures a continuous supply of high quality compressed air with the additional benefits of lower operational costs and minimal maintenance compared to a single high efficiency filter.

Compressed air dryers

Water vapour is water in a gaseous form and will pass through water separators and coalescing filters just as easily as the compressed air. Water vapour is therefore removed from compressed air using a dryer. The water vapour removal efficiency of a dryer (its performance) is expressed as a Pressure Dewpoint or PDP.

- **Dewpoint refers to the temperature at which condensation will occur.**
- **Pressure Dewpoint or PDP refers to the dewpoint of air above atmospheric pressure.**
- **Dewpoint is written as a temperature (but this is not the air's temperature).**
- **Compressed air with a PDP of -20°C , would need the temperature to drop below -20°C for any water vapour to condense into a liquid.**
- **A PDP of -40°C is recommended for all food applications where air is in direct or indirect contact with production equipment, ingredients, packaging or finished products because a PDP better than -26°C will not only stop corrosion, it will also inhibit the growth of micro-organisms.**



Adsorption dryers

Water vapour is removed from compressed air using an adsorption dryer. Adsorption dryers remove moisture by passing air over a regenerative desiccant material which strips the moisture from the air. This type of dryer is extremely efficient. A typical pressure dewpoint specified for an adsorption dryer is -40°C as it not only prevents corrosion, but it also inhibits the growth of micro-organisms. A pressure dewpoint of -70°C is often specified for critical applications.

Refrigeration dryers (not shown)

Refrigeration dryers work by cooling the air, so are limited to positive pressure dewpoints to prevent freezing of the condensed liquid. Typically used for general purpose applications, they provide pressure dewpoints of $+3^{\circ}\text{C}$, $+7^{\circ}\text{C}$ or $+10^{\circ}\text{C}$. Refrigeration dryers are not suitable for installations where piping is installed in ambient temperatures below the dryer dewpoint i.e. systems with external piping, or critical applications such as food, beverage or pharmaceuticals as they do not inhibit microbiological growth.

Adsorption (Activated Carbon) filters

Oil vapour is oil in a gaseous form and will pass through a coalescing filter just as easily as the compressed air. Therefore, oil vapour removal filters must be employed which provide a large bed of activated carbon adsorbent for the effective removal of oil vapour, providing the ultimate protection against oil contamination.

Dust removal filters

Dust removal filters are used for the removal of dry particulates. They provide identical particulate removal performance to the equivalent coalescing filter and use the same mechanical filtration techniques to provide up to 99.9999% particle removal efficiency.

Sterile filters

Absolute removal of solid particulates and micro-organisms is performed by a sieve retention or membrane filter. They are often referred to as sterile air filters as they also provide sterilised compressed air. Filter housings are manufactured from stainless steel to allow for in-situ steam sterilisation of both the filter housing and element. It is important to note that the piping between the sterile filter and the application must also be cleaned and sterilised on a regular basis.

Important Note:

As adsorption or refrigeration dryers are designed to remove only water vapour and not water in a liquid form, they require the use of coalescing filters to work efficiently.

Air Quality (Purity) Requirements of the Code of Practice

To comply with food hygiene legislation, the food manufacturer is required to follow the principles of HACCP (Hazard Analysis and Critical Control Point) and a risk analysis must be carried out on the entire manufacturing process.

As compressed air is seen as a utility, it is often missed as a potential source of contamination. To be fully compliant, the compressed air system must be included as part of the hazard analysis and anywhere compressed air is used, classified as a Critical Control Point and subject to the air purity (quality) recommendations highlighted in section 6 of the Code of Practice.

Section 6 states:

The outlet compressed air must be designated as one of the following:

- Air that comes into direct contact with the food (Contact).
- Air that will never come into contact with the food (Non-Contact).
- Where the HACCP Hazard Analysis shows a potential risk of the Non-Contact air indirectly contacting food or entering the food manufacturing area then the air shall be defined as Non-Contact High Risk.

Definitions

Contact

Air that comes into direct contact with ingredients, finished food, packaging materials, storage vessels or the manufacturing machinery.

Non-Contact

Air that will never come into contact with ingredients, finished food, packaging materials, storage vessels or the manufacturing machinery.

Non-Contact High Risk

Air that is not supposed to come into contact with ingredients, finished food, packaging materials, storage vessels or the manufacturing machinery, but may inadvertently do so.

Air Quality Recommendations	Dirt (Solid Particulate) Max Number of particles per m ³			Humidity (Water Vapour)	Total Oil (Aerosol + Vapour)	ISO8573-1:2001 Equivalent	ISO8573-1:2010 Equivalent
	0.1 - 0.5 micron	0.5 - 1 micron	1 - 5 micron				
Contact	100,000	1000	10	-40°C PDP	<0.01 mg/m ³	Class 2.2.1	Class 1.2.1
Non - Contact	100,000	1000	10	+3°C PDP	<0.01 mg/m ³	Class 2.4.1	Class 1.4.1
Non - Contact High Risk	100,000	1000	10	-40°C PDP	<0.01 mg/m ³	Class 2.2.1	Class 1.2.1

The contaminant values for dirt and oil are those at the 'Reference Conditions' in ISO8573-1 at a temperature of 20°C, absolute atmospheric pressure of 1 bar and relative water vapour pressure of zero. Humidity is to be measured at line pressure.

Dirt

The purity requirements for dirt are identical for Contact, Non Contact and Non Contact - High Risk. The same level of purification equipment will be required for each.

Water

The purity requirements for water vapour are identical for both Contact & Non Contact - High Risk. This requires the Installation of adsorption dryers that deliver a Pressure Dewpoint (PDP) better than -40°C. This requirement was introduced to combat the growth of micro-organisms as compressed air with a dewpoint of -26°C or better will inhibit microbiological growth. The purity requirements +3°C for Non-Contact will not inhibit microbiological growth.

Oil

The purity requirements for total oil are effectively identical for Contact, Non-Contact and Non-Contact - High Risk with the same level of purification equipment required for each.

Microbiological contaminants

The Code of Practice states: HACCP shall establish the risk of contamination by microbiological contaminants.

The level of viable microbiological contaminants in the compressed air shall not be detectable using the test method given in ISO8573-7.



Cost effective system design

To achieve the stringent air quality levels required for today’s modern food manufacturing facilities, a careful approach to system design, commissioning, installation and operation must be employed. Treatment at one point alone is not enough and it is highly recommended to treat compressed air prior to entry into the distribution system (usually in the compressor room or at point of generation) to a specification that will provide contaminant free air

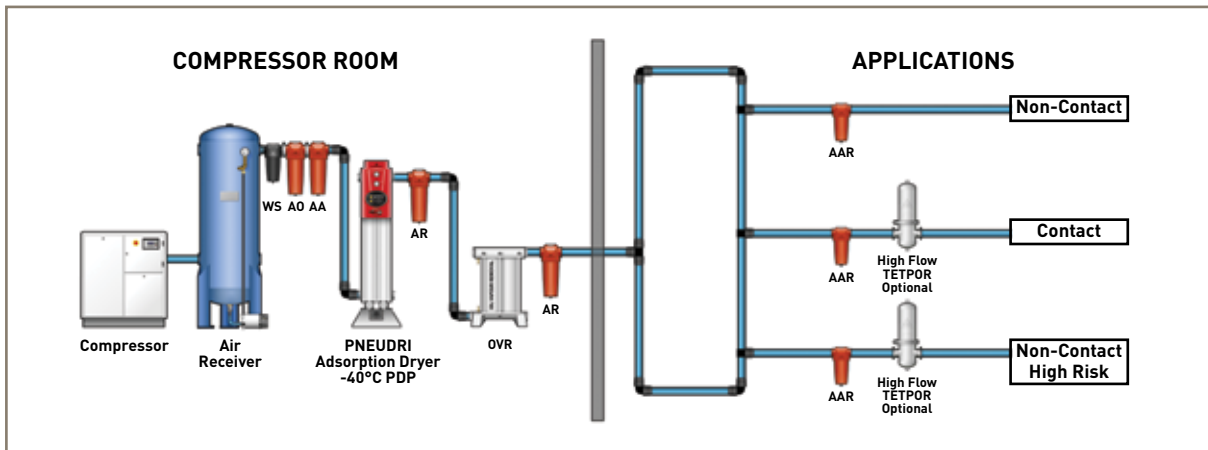
for general purpose applications and protect air receivers and distribution piping from corrosion and damage. Point of use purification should also be employed, with specific attention being focussed on the quality of air required by each application. This approach to system design ensures that air is not “over treated” and provides the most cost effective solution to high quality compressed air.

Recommended purification equipment for compliance with the Food Grade compressed air Code of Practice

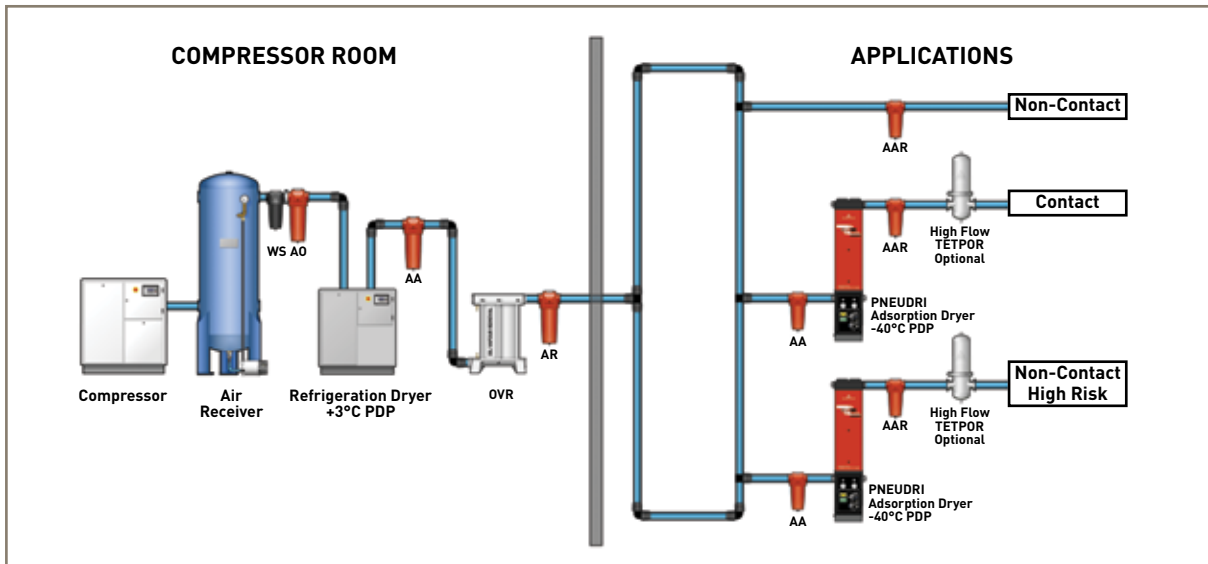
Air Quality Recommendations	Dirt (Solid Particulate)	Humidity (Water Vapour)	Total Oil (Aerosol + Vapour)
Contact	OIL-X EVOLUTION Grade AO + AA or OIL-X EVOLUTION Grade AR + AAR (for dry particulate*)	PNEUDRI -40°C PDP	OIL-X EVOLUTION Grades AO + AA + OVR
Non - Contact		+3°C PDP	
Non - Contact High Risk		PNEUDRI -40°C PDP	

For sterile applications or applications where 100% particle retention is required, an additional HIGH FLOW TETPOR II filter should be used. TETPOR II filters can be steam sterilised if required.

System Example 1



System Example 2



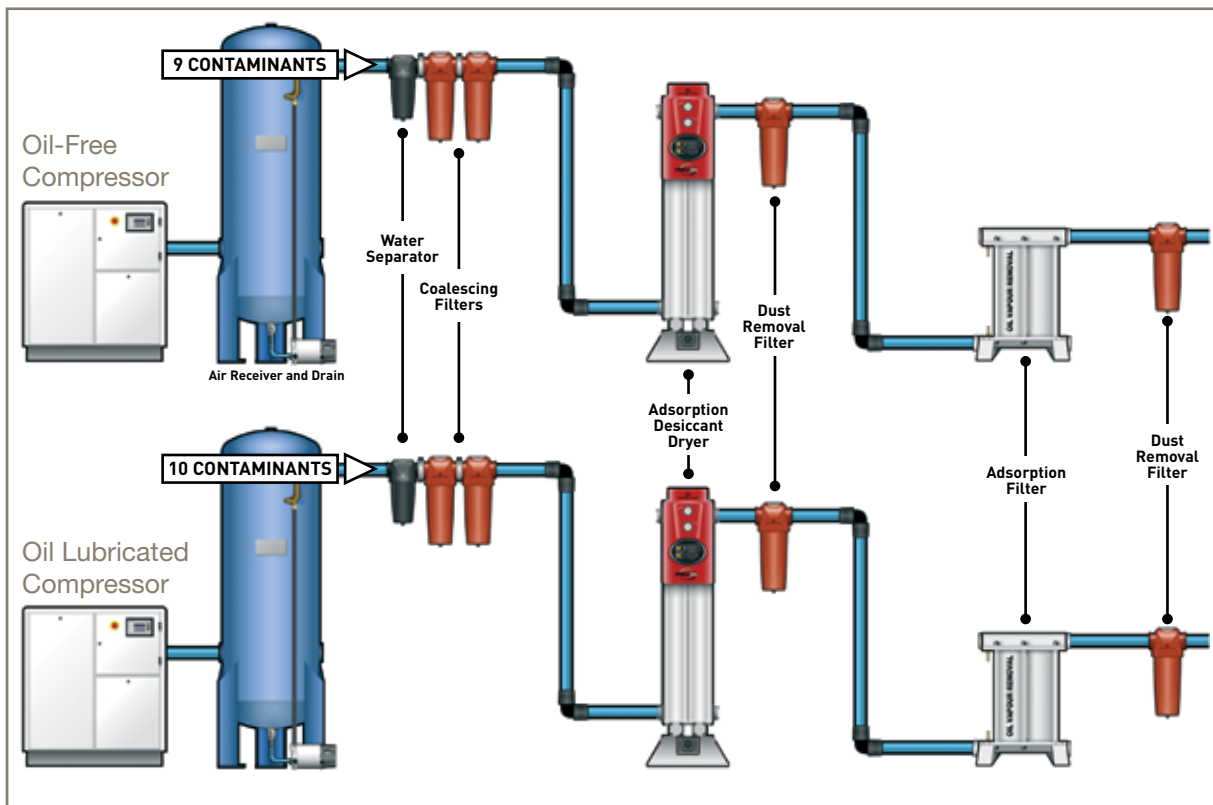


Compressors for the food industry

The Code of Practice does not make any specific recommendations regarding compressor type with both oil lubricated and oil-free compressors being acceptable choices.

Important Note:

Regardless of whether oil lubricated or oil-free compressors are installed, the purification equipment required to achieve the purity levels stated in the Food Grade Compressed Air Code of Practice is identical.



Compressor lubricants

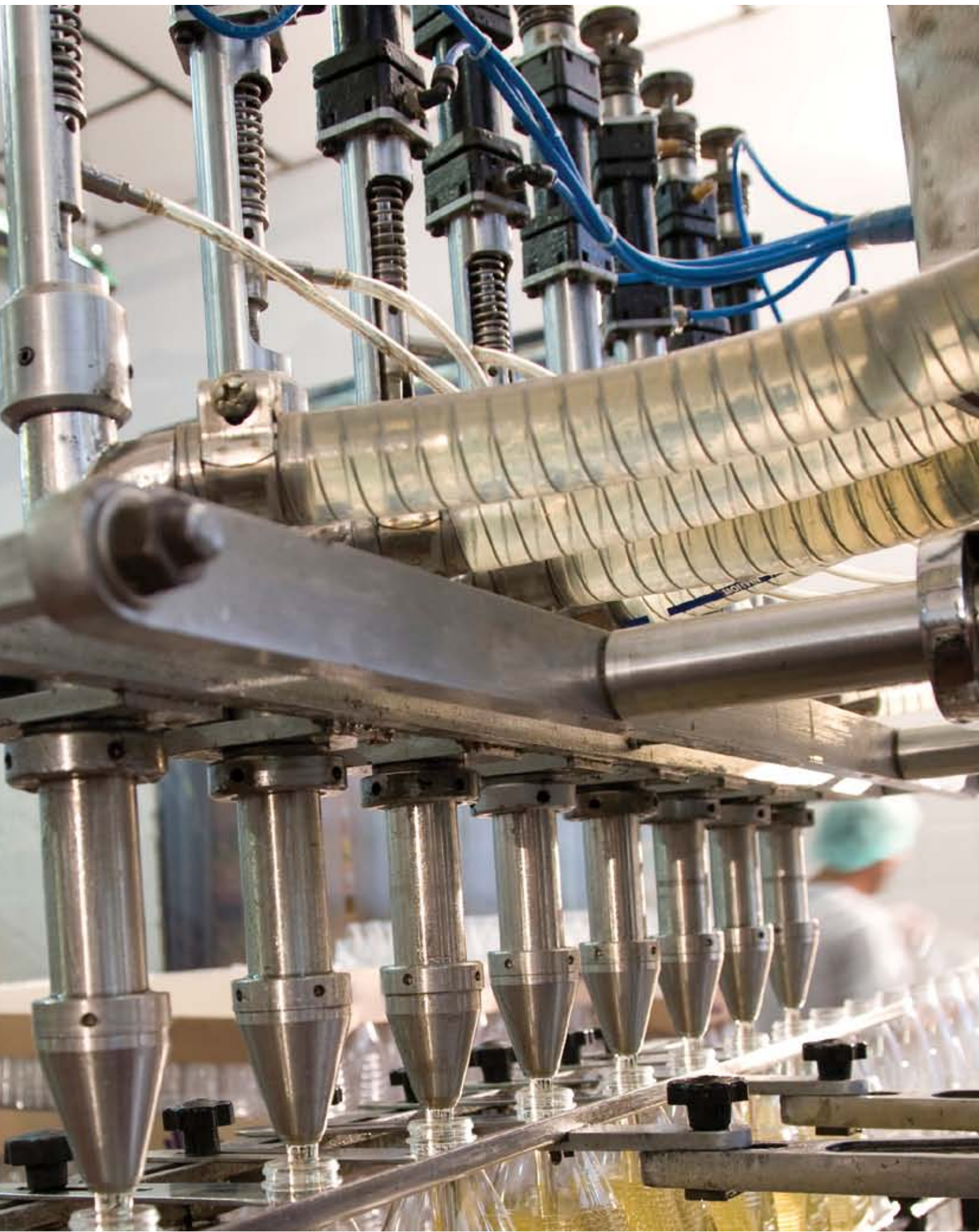
Oil lubricated compressors

The Code of Practice states: 'Where lubricated or oil injected compressors are in use and non-food grade oil is used and the HACCP process identifies a risk, then the oil shall be replaced with food grade oils in line with the procedures identified in the EHEDG (European Hygienic Engineering & Design Group) Document 23.'

Oil-free compressors

The Code of Practice states: 'Where oil-free compressors are used no lubricant is involved in the compression process therefore the procedures identified in the EHEDG Document 23 will not be required.'

The Code of Practice also states: 'Compressors that employ lubricants in those parts not involved in the actual compression of the air will be subject to the HACCP process to determine the risks if any to the food production process.' Therefore if the oil-free compressor uses oil for lubrication of bearings, gearboxes, etc. then it is still subject to a HACCP risk analysis. If the risk analysis shows a potential for contamination by vapours, aerosols or liquid oil, then the procedures identified in the EHEDG Document 23 will still apply.



Are all compressed air filters and dryers the same?

Compressed air purification equipment is essential to all modern production facilities. It must deliver uncompromising performance and reliability whilst providing the right balance of air quality with the lowest cost of operation. Many manufacturers offer products for the filtration and purification of contaminated compressed air, which are often selected only upon their

initial purchase cost, with little or no regard for the air quality they provide, the cost of operation throughout their life or their environmental impact. When selecting purification equipment, the required air quality, the overall cost of ownership and the equipment's environmental impact must always be considered.

The Parker domnick hunter design philosophy



Parker domnick hunter has been supplying industry with high efficiency filtration and purification products since 1963. Our philosophy "Designed for Air Quality & Energy

Efficiency" ensures products that not only provide the user with clean, high quality compressed air, but also with low lifetime costs and reduced carbon dioxide (CO₂) emissions.



Air Quality

Parker domnick hunter has been instrumental in the development of both ISO8573 and ISO12500, the international standards for compressed air quality and

compressed air filter testing respectively. All Parker domnick hunter products are designed to provide air quality in accordance with all editions of ISO8573-1, air quality standard.



Energy Efficiency

In these times of increasing energy costs, an efficient and cost effective manufacturing process is a major factor in maintaining the profitability and growth of your business. All Parker domnick hunter products are

designed to not only minimise the use of compressed air and electricity in their operation, but also to significantly reduce the operational costs of the compressor by minimising pressure loss.



Low Lifetime Costs

Equipment with a low purchase cost may turn out to be a poor investment in the long term. By guaranteeing air quality and ensuring energy consumption is kept to a minimum,

Parker domnick hunter purification products can reduce the total cost of ownership and help improve profitability through improved manufacturing efficiencies.



Reduced CO₂ Emissions

Many countries worldwide are looking closely at their manufacturing industries in an effort to reduce the amount of harmful greenhouse gases released into the atmosphere. The use of electricity has a direct impact on

the generation and release of CO₂. By significantly reducing the energy consumption of its products, Parker domnick hunter can help you to reduce your carbon footprint and protect the environment.

OIL-X EVOLUTION

performance validation

Parker domnick hunter OIL-X EVOLUTION filters have been designed to provide compressed air quality that meets or exceeds the levels shown in all editions of ISO8573-1 international air quality standard and the BCAS Food Grade Compressed Air Code of Practice.

OIL-X EVOLUTION filters are not only tried and tested by Parker domnick hunter, filtration performance has also been independently verified by Lloyds Register.

Coalescing filters

Coalescing filter performance has been tested in accordance with ISO12500-1, ISO8573-2 and ISO8573-4.

Oil vapour removal filters

Oil vapour removal filter performance has been tested in accordance with ISO8573-5.

Dry particulate filters

Dry particulate filter performance has been tested in accordance with ISO8573-4.

Materials of construction

The materials used in the construction of OIL-X EVOLUTION filters are also suitable for use in the food industry, and have been independently verified to comply with FDA Code of Federal Regulations, Title 21 'Food and Drug'.



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After sales service

Compressed air equipment users demand much more than the supply of high quality products in order to maintain a competitive edge.

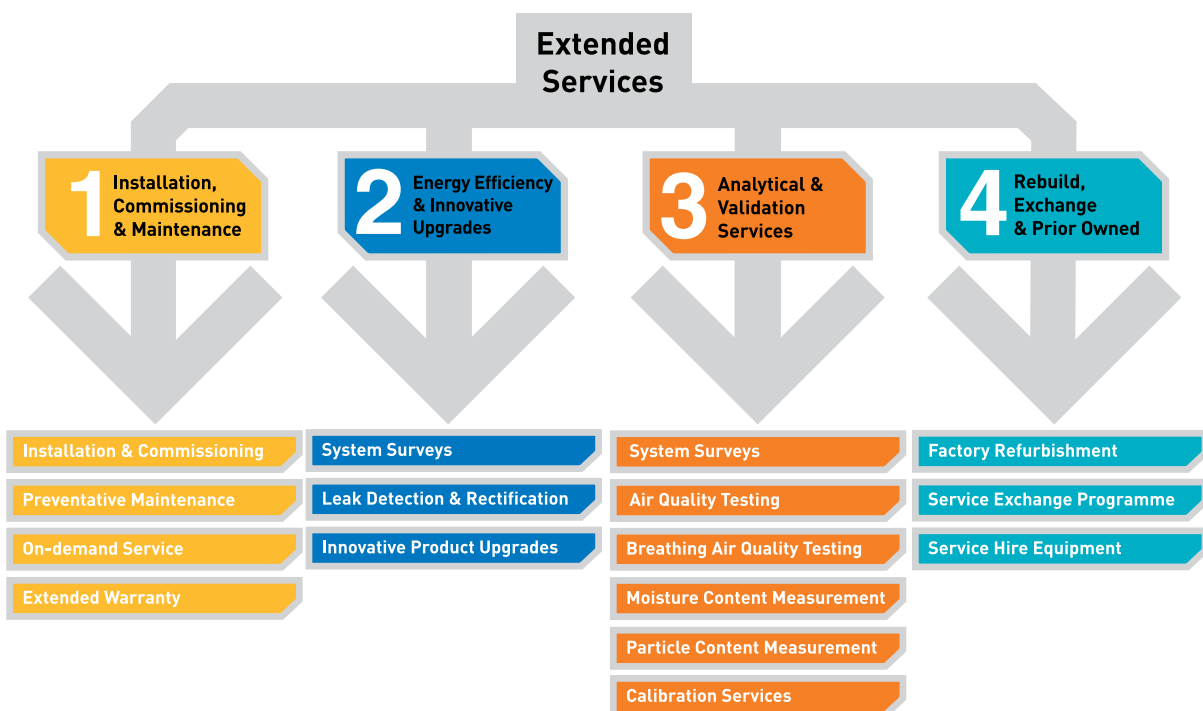
Modern production technologies are increasingly demanding the provision of a higher purity and more reliable compressed air supply. Products and solutions that are manufactured by Parker domnick hunter are designed to provide air quality that meets with and often exceeds international standards.

As well as the requirement for air purity and reliability, there are additional factors to consider when choosing the right service provider for your compressed air and gas purification system. For example, knowledge of the many regulations regarding the management of industrial waste, energy efficiency improvement programs and consideration of any environmental impact. It is anticipated that future legislations will demand further in-depth technical and knowledge based support from service providers.

Our commitment to industry does not stop with the supply of high quality products. We are also committed to ensuring that our equipment provides high performance by providing a trouble-free service from a bespoke maintenance and verification package – all tailored to your own specific requirements.

We offer a wide range of valuable services that will impact positively on your drive towards improved production efficiency and product quality with reduced production rejections and operational costs.

From initial selection to installation, commissioning, preventative maintenance and extended services, Parker domnick hunter is redefining customer service.



Parker's Motion & Control Technologies

At Parker, we're 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 info call 00800 27 27 5374.



AEROSPACE

Key Markets

- Aircraft engines
- Business & general aviation
- Commercial transports
- Land-based weapons systems
- Military aircraft
- Missiles & launch vehicles
- Regional transports
- Unmanned aerial vehicles

Key Products

- Flight control systems & components
- Fluid conveyance systems
- Fluid metering delivery & atomization devices
- Fuel systems & components
- Hydraulic systems & components
- Inert nitrogen generating systems
- Pneumatic systems & components
- Wheels & brakes



CLIMATE CONTROL

Key Markets

- Agriculture
- 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 science & 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
- Gantry robots
- 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
- Pharmaceutical
- Semiconductor & Electronics
- General manufacturing
- Industrial machinery
- Life sciences
- Oil, gas & Marine
- Mining
- Power generation
- Process
- Mobile equipment
- Transportation

Key Products

- Compressed air filtration
- Compressed air drying
- Condensate management
- Compressed gas filtration
- Compressed gas drying
- Condition monitoring
- Engine air, fuel & oil filtration & systems
- Hydraulic, lubrication & coolant filters
- Process, chemical, water & microfiltration filters
- Nitrogen, hydrogen & zero air generators (industrial & analytical)



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
- Hydraulic cylinders & accumulators
- Hydraulic motors & pumps
- Hydraulic systems
- Hydraulic valves & controls
- Power take-offs
- Rubber & thermoplastic hose & couplings
- Tube fittings & adapters
- Quick disconnects



PNEUMATICS

Key Markets

- Aerospace
- Conveyor & material handling
- Factory automation
- Food & beverage
- Life science & medical
- Machine tools
- Packaging machinery
- Transportation & automotive

Key Products

- Air preparation
- Compact cylinders
- Field bus valve systems
- Grippers
- Guided cylinders
- Manifolds
- Miniature fluidics
- Pneumatic accessories
- Pneumatic actuators & grippers
- Pneumatic valves and controls
- Rodless cylinders
- Rotary actuators
- Tie rod cylinders
- Vacuum generators, cups & sensors



PROCESS CONTROL

Key Markets

- Chemical & refining
- Food, beverage & dairy
- Medical & dental
- Microelectronics
- Oil & gas
- Power generation

Key Products

- Analytical sample conditioning products & systems
- Fluoropolymer chemical delivery fittings, valves & pumps
- High purity gas delivery fittings, valves & regulators
- Instrumentation fittings, valves & regulators
- Medium pressure fittings & valves
- Process control manifolds



SEALING & SHIELDING

Key Markets

- Aerospace
- Chemical processing
- Consumer
- Energy, oil & gas
- Fluid power
- General industrial
- Information technology
- Life sciences
- Military
- Semiconductor
- Telecommunications
- Transportation

Key Products

- Dynamic seals
- Elastomeric o-rings
- EMI shielding
- Extruded & precision-cut, fabricated elastomeric seals
- Homogeneous & inserted elastomeric shapes
- High temperature metal seals
- Metal & plastic retained composite seals
- Thermal management



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SE, SK, UK, ZA)