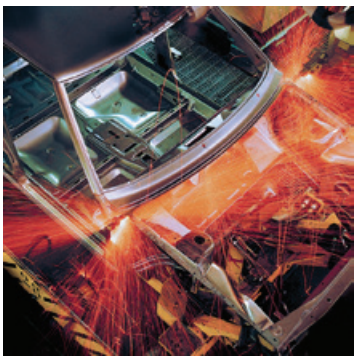
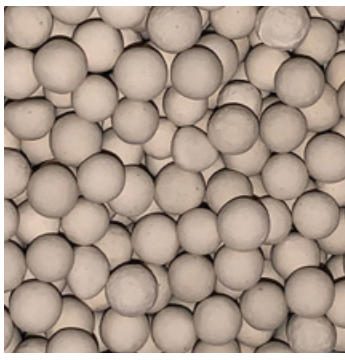


Heatless Modular

Compressed Air Dryers



Parker

ENGINEERING YOUR SUCCESS.

Compressed air contamination is a real problem for 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, or even to generate other gases on-site, a clean, dry, reliable compressed air supply is essential to maintain efficient and cost effective production.

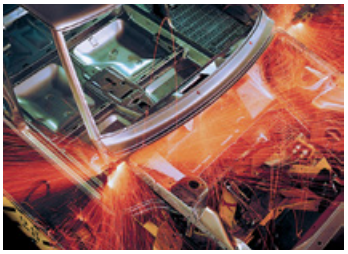
Parker provides complete compressed air treatment solutions to suit every industry, application & budget.

The benefits of using Parker compressed air treatment solutions:

- **Plant Reliability - trouble free operation from equipment and processes using compressed air**
- **Clean Dry Air available for all applications**
- **No contamination of products / processes / equipment**
- **Low Maintenance Costs – Reduce or eliminate unexpected / unplanned plant maintenance for better budget control**
- **Lower plant energy consumption**
- **Lower plant environmental impact**
- **Legislation compliance – e.g. assist in complying with hygiene legislation in the Food, Beverage & Pharmaceutical industries**

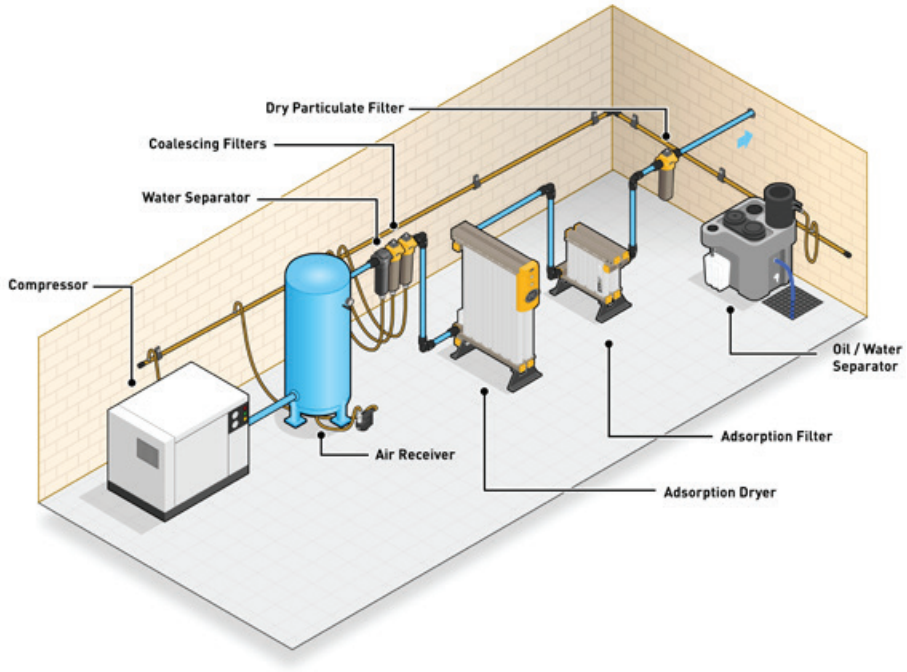




Compressed air dryers – The heart of the compressed air treatment solution

At the heart of any compressed air treatment solution is the dryer, it's purpose, to remove water vapour, stop condensation, corrosion and in the case of adsorption dryers, inhibit the growth of micro-organisms.



Heatless adsorption dryers (also known as PSA dryers) are the simplest type of adsorption dryer available and have long been the dryer of choice for many industries and applications. They are simple, reliable and cost effective and for small to medium flow systems, often the only viable technology available. Additionally, modular heatless dryers provide an even more reliable, smaller, more compact & lightweight dryer which can be installed in both the compressor room or at the point of use.

Benefits of Heatless Adsorption Dryers

- **Industry proven design**
- **Suitable for all industries and applications - some adsorption dryer regeneration methods prevent their use in certain industries / applications**
- **Lower capital investment compared to other adsorption dryer regeneration methods**
- **Reduced complexity compared to other adsorption dryer regeneration methods**
- **Robust & reliable**
- **Uses clean, dry compressed air for regeneration making them suitable for all industries and applications**
- **Lower maintenance costs compared to other adsorption dryer regeneration methods**
- **No heat / heaters / heat related issues**
- **No process air required for cooling**

RELIABILITY QUALITY EFFICIENCY

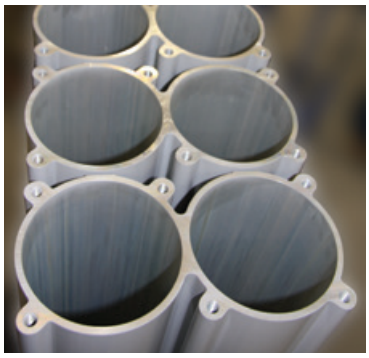
Parker Heatless Modular Dryers

Using advanced aluminium extrusions, Parker has developed a desiccant dryer ranges that are smaller, more compact and lightweight compared to conventional fabricated steel designs.

These advanced desiccant dryers include ranges of small flow, medium fow and large flow heatless modular dryers which provide one of the most simple and cost effective compressed air drying solutions.

Engineers at Parker have developed each range using innovative aluminium forming technology, resulting in units that are smaller, more compact and lightweight compared to conventional welded steel desiccant air dryers. Using high tensile extruded aluminium columns and manifolds, the modular design eliminates the need for complex valves or interconnecting piping.

Also, the length to diameter ratio of the internal voids and non-welded construction means that Parker modular aluminium dryers do not require periodic inspections for insurance purposes, unlike traditional welded steel dryers that need to be taken out of service for inspection, which can severely disrupt production schedules.



Drying Columns

Distribution Manifold

Greater flexibility with multi-banking

Multi-banking

Unlike traditional twin tower dryer designs, MX & MXLE models can be multi-banked to provide extra compressed air drying capacity. Should demand increase in the future, there is no need to replace the dryer with a larger unit, additional capacity can be covered by simply adding extra dryer modules (banks).

Flexibility

Multi-banking allows individual dryer banks to be easily isolated for routine service work, whilst maintaining your clean, dry air supply.

100% stand-by

Compared to traditional twin tower designs, 100% standby is available at a fraction of the cost as only one extra dryer bank is required.

Fits through a standard doorway

Unlike traditional twin tower designs, modular dryers will fit through a standard doorway, eliminating the need for special access or facility structural dismantling during installation.

Parker Heatless Modular Dryers - Four Key Features to Guarantee Air Quality

OIL-X Filtration

Adsorption dryers are designed only for the reduction of water vapour and not liquid water, liquid oil, water aerosols, oil aerosols, particulates or micro-organisms. Only by using Parker OIL-X pre and after filtration can the treatment of these contaminants be assured and air quality in accordance with all editions of ISO8573-1 be guaranteed.

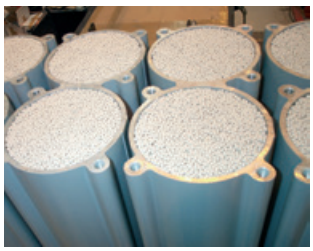
Modular aluminium design

Aluminium extrusions are used throughout for drying chambers and distribution manifolds. This design not only alows the dryer to be smaller, more compact and lightweight, it allows the adsorbent desiccant material to be filled using a speciallist technique called 'Snowstorm' filling which achieves maximum packing density of the deisccant material (more adsorbent in a smaller space).

Adsorbent desiccant material

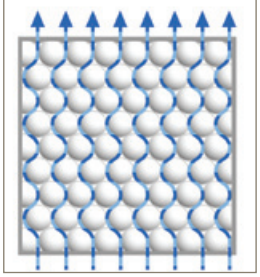
Specially selected desiccant materials provide:

- Optimum adsorption and regeneration capacity - to ensure consistent dewpoint
- Low dusting - to prevent blockage of downstream filtration
- High crush strength - to prevent breakdown of the desiccant during operation
- High resistance to aggressive and oil-free condensate - for compatibility with all types of air compressor, their lubricants and condensate



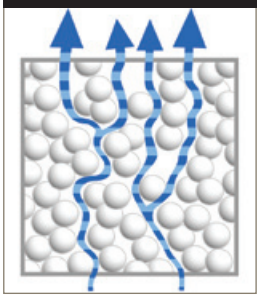
'Snowstorm' filling ensures consistent dewpoint performance

Snowstorm filled bed



Consistent drying with no desiccant attrition

Loose filled bed



Inconsistent drying and desiccant attrition

'Snowstorm' filling method

Parker modular dryers use the 'Snowstorm filling' method to fill the drying columns (or desiccant cartridges) with adsorbent desiccant material.

Snowstorm filling:

- Achieves maximum packing density for the desiccant material, fully utilising all of the available space envelope
- Prevents compressed air channelling through the desiccant as experienced with twin tower designs. Due to channelling, twin tower designs require more desiccant to achieve an identical dewpoint, increasing physical size, operational and maintenance costs
- Prevents desiccant attrition which can lead to dusting, blocked filters and loss of dewpoint
- Allows 100% of the available desiccant material to be used for drying, therefore reducing the amount of desiccant required and maintenance costs
- 100% of the desiccant is regenerated ensuring consistent dewpoint
- Provides a low, equal resistance to air flow allowing multiple drying chambers and multiple dryer banks to be used (MX & MXLE ranges)

Heatless modular compressed air dryers - a dedicated solution for every application

By combining the proven benefits of desiccant drying with modern design, Parker has produced an extremely compact and reliable purification system to totally dry and clean compressed air.

The Parker ranges of small, medium and large flow heatless modular dryers have proven to be the ideal solution for many thousands of compressed air users worldwide in a wide variety of industries.

Compressed air purification equipment must deliver uncompromising performance and reliability whilst providing the right balance of air quality with the lowest cost of operation.

Benefits:

- **Highest quality air**
  - Clean, dry, oil-free compressed air in accordance with all editions of ISO8573-1, the international standard for compressed air quality
- **Energy efficient**
  - Energy Saving Technologies fitted as standard to all medium and large flow models
  - Optional for small flow models
- **Dry air eliminates microbiological growth**
  - Preventing product spoilage, recall and litigation
- **Dry air means zero corrosion**
  - Preventing product spoilage and damage
- **Smaller, more compact and lightweight**
  - Modular construction means less than half the size of conventional dryers
- **Modular design**
  - 100% standby at a fraction of the cost of twin tower designs
  - 10 year guarantee on pressure envelope
  - Corrosion resistance due to alochroming and epoxy painting
  - Constant dewpoint performance thanks to snowstorm filling
- **Approvals to international standards**
  - PED, CE, CSA (US+Canada), CRN
- **Easy and flexible installation**
  - Minimal space required
- **Simple maintenance**
  - Giving reduced downtime
- **Reduced noise pollution**
  - Super quiet operation

Clean, dry compressed air improves production efficiency and reduces maintenance costs and downtime. Only an adsorption dryer can provide the highest levels of dry compressed air in accordance with ISO8573-1:2010, the International Standard for Compressed Air Purity (Quality).

Parker Heatless Modular Compressed Air Dryer Ranges

Small Flow Dryers

0.13 to 0.58 m³/min / 8 to 35 m³/hr / 5 to 21 cfm @ 7 bar g (102 psi g), 35°C (77°F)

K-MT 1-4

KA-MT 1-4

Medium Flow Dryers

0.92 to 5.01 m³/min / 55 to 300 m³/hr / 32 to 177 cfm @ 7 bar g (102 psi g), 35°C (77°F)

CDAS HL 050-085

OFAS HL 050-085

FBP HL 050-085

CDAS HL ATEX050-085

Large Flow Dryers

Single Banks 6.81 to 34 m³/min / 408 to 2040 m³/hr / 240 to 1200 cfm
Multi Banks >35 m³/min / >2041m³/hr / >1201cfm @ 7 bar g (102 psi g), 35°C (77°F)

MXS102CDS-MXS108DS

MXLE102C-MXLE108

MXP102C-MXP108

Heatless Modular Dryer - Operation

Adsorption dryers work on the principle of moisture always migrating to the driest medium possible. Therefore, water vapour is removed from compressed air by passing it over an adsorbent desiccant material.

As the compressed air contacts the adsorbent material, water vapour transfers from the wet air to the dry desiccant material. Adsorbent materials have a fixed adsorption capacity and once this capacity is reached, they must be regenerated or replaced.

Therefore, to provide a continuous supply of clean, dry compressed air, adsorbent dryers utilise two chambers of desiccant material.

At any one time, whilst one chamber is on-line, drying the incoming compressed air, the other is either off-line, being regenerated or is re-pressurised, ready to come on-line. All adsorption dryers treat water vapour in this manner.

The energy consumed by an adsorption dryer can be directly attributed to the method used to regenerate the adsorbent material.

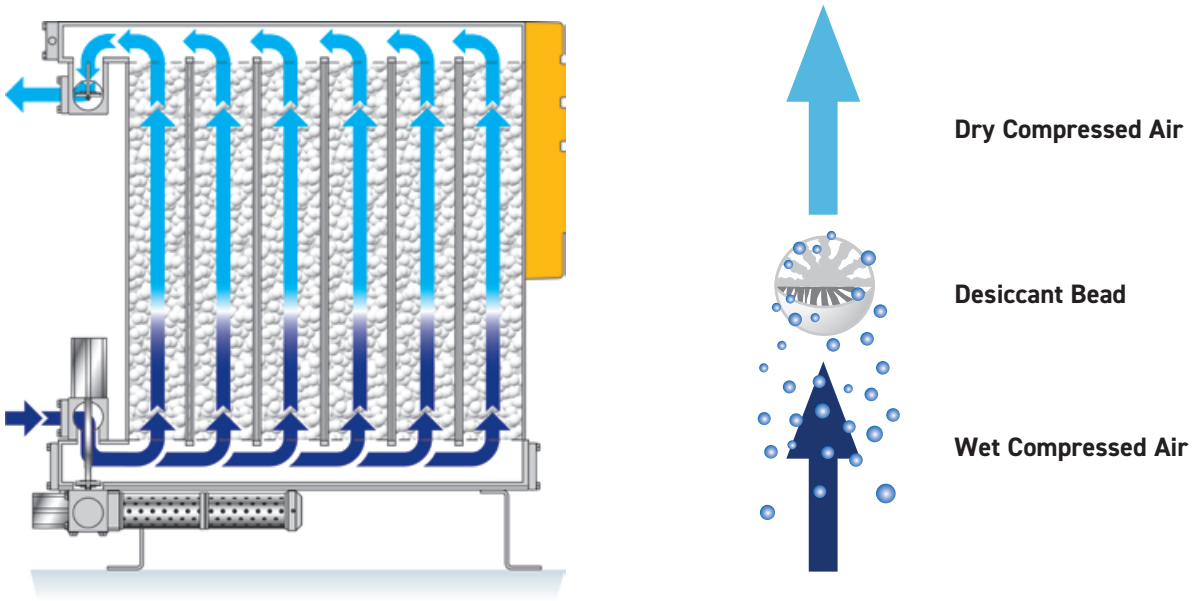
Heatless Modular Dryer Operation - Drying Cycle

The pre-filtered process air enters the dryer through the inlet and is directed into the on-line drying chamber via the inlet valves.

(Modular models can be made up of either single or multiple drying columns, depending upon the range)

The compressed air is evenly distributed through the drying columns and passes over the adsorbent desiccant material, reducing the water vapour content of the compressed air as it contacts the desiccant.

The dried process air then exits the dryer via the outlet check valves.



MX Dryer used for illustration purposes, all heatless adsorption dryers operate in an identical manner

Heatless Modular Operation - Regeneration Cycle

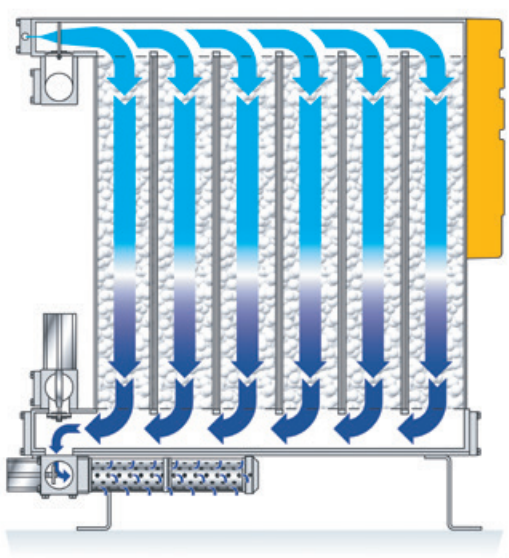
At the start of the regeneration cycle, the exhaust valve of the dryer is closed and the off-line chamber is at full line pressure. The air in the off-line chamber has a dewpoint equal to the air leaving the dryer.

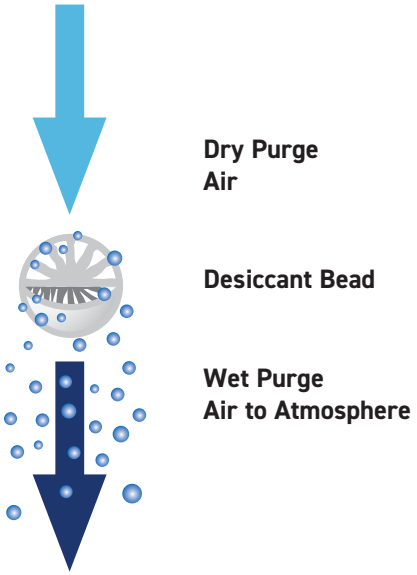
The exhaust valve is then opened and the dry air within the chamber expands rapidly as it leaves the dryer via the exhaust silencer, forcing water to be removed from the desiccant material.

Once the off-line chamber has depressurised, a continuous bleed of dried process air is directed into the off-line desiccant bed for regeneration purposes. This regeneration air is also known as purge air.

With the exhaust valve open, the purge air expands from line pressure to atmospheric pressure and flows downwards over the off-line desiccant material.

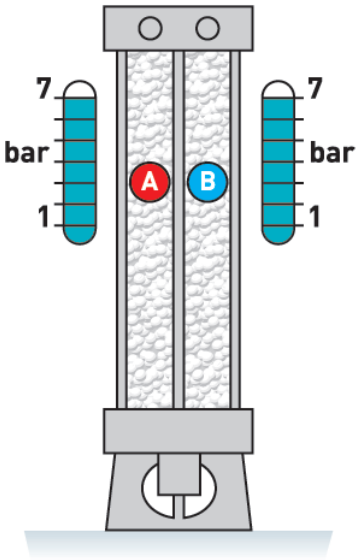
As the purge air at line pressure contains a fixed amount of water vapour, allowing it to expand means the purge air becomes even drier, increasing its capacity to remove water from the saturated desiccant bed.

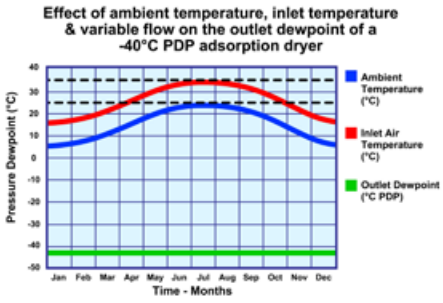


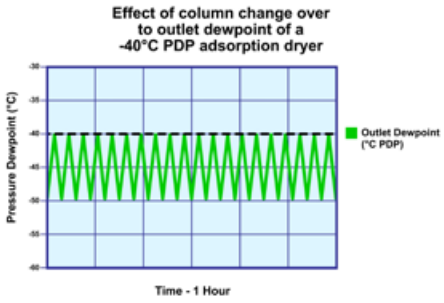


Heatless Modular Operation - Column Changeover

Before the on-line (drying) and off-line (regenerating) columns change over, the dryer exhaust valve, is closed, allowing the purge air to repressurise the off -line columns. This ensures a consistent downstream pressure and dewpoint when the drying chambers change over.







Time (minutes)	Standard Heatless Drying & Regeneration Cycle					
	0	2.5	3	changeover	0	2.5	3	changeover
Side A	Regeneration	Re-pressurisation			Drying			
Side B	Drying				Regeneration	Re-pressurisation		

Heatless Modular Dryers - EST & DS Energy Saving Technologies

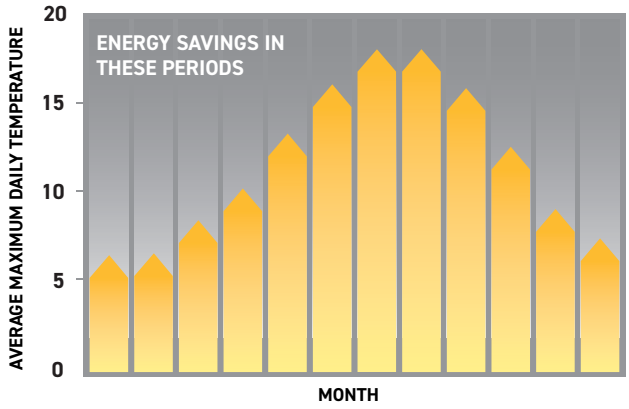
The energy required to regenerate the off-line desiccant bed in an absorption dryer is constant, and based upon the assumption that the dryer is operating at its full capacity and the desiccant bed requiring regeneration has been fully saturated.

In reality, a dryer is rarely operating at full capacity all of the time, for example during shift work and periods of low demand. Daily and seasonal fluctuations in ambient temperature and humidity also change the moisture loading placed upon the dryer.

Under such conditions, at the point in the drying cycle where the air flow is switched from one drying chamber to the other, there is the potential for drying capacity to remain in the desiccant material about to undergo regeneration. As the energy used to regenerate this partially saturated bed is based upon the assumption that the bed is fully saturated, more energy (purge air) is consumed than is actually necessary.

Proportional Energy Usage

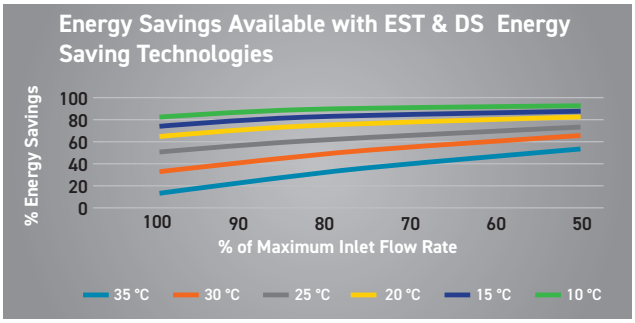
The Parker EST / DS - Energy Saving Technologies ensure the energy consumed by the dryer is directly proportional to the amount of water vapour present and not the dryers maximum rated capacity.



Example of % energy savings available with the EST / DS Technologies

The following example highlights the percentage energy savings available with EST / DS Energy Saving Technologies in operation.

	% Saving					
% Flow	35 °C	30 °C	25 °C	20 °C	15 °C	10 °C
100	14 %	35 %	52 %	65 %	74 %	81 %
90	23 %	42 %	57 %	68 %	77 %	83 %
80	31 %	48 %	62 %	72 %	79 %	85 %
70	40 %	55 %	66 %	75 %	82 %	87 %
60	49 %	61 %	71 %	79 %	85 %	89 %
50	57 %	68 %	76 %	82 %	87 %	91 %



Example based upon a CDAS HL 075 / OFAS HL 075 Purification System and referenced to a 3 Minute Standard Cycle. Energy savings are applicable to all CDAS / OFAS / FBP / MXS-DS / MXLE models.

Sizing Conditions : Min System pressure: 6.5 bar g / Max Inlet Temp: 35°C / Max System flow: 180 m^3/hr
Average Conditions : Inlet pressure: 7.5 bar g / Average Temp: 10°C - 35°C / Average Flow: 50% - 100%

EST & DS Energy Saving Technologies Operation

Parker CDAS / OFAS / FBP / MXS-DS / MXLE dryer ranges are all fitted as standard with either the EST or DS Energy Saving Technologies (optional for K-MT & KA-MT ranges). With these installed, the drying cycle remains unchanged, however as the drying chambers are about to change over, the EST / DS energy saving technology overrides normal operation to fully utilise the drying capacity of the on-line desiccant material.

EST & DS Energy Saving Drying Cycle Extension

At the end of the regeneration cycle, and prior to column changeover, the exhaust valve is closed to allow the purge air to re-pressurise the off-line column, thus ensuring no loss of system pressure on changeover.

After re-pressurisation, both drying chambers will be at full line pressure, no purge air is being used for regeneration and the dryer is in a state of **zero energy consumption**.

Under normal operation, the drying chambers would now proceed to change over automatically, however the EST / DS energy saving technologies incorporate a dewpoint sensor which is used to monitor the pressure dewpoint of the compressed air leaving the dryer.

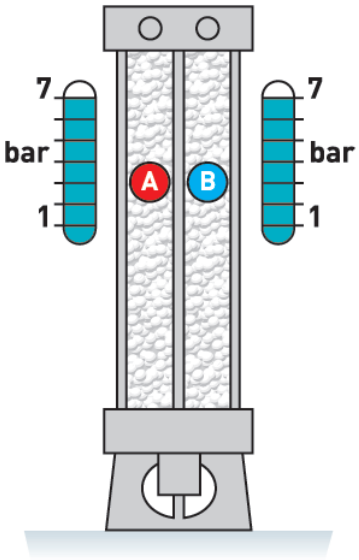
If the compressed air dewpoint is lower than the pre-set minimum dewpoint, the desiccant material is only partially saturated and has drying capacity remaining within it.

The EST / DS energy saving technology will therefore override the standard control cycle and the dryer will continue to dry on the same column with **zero energy consumption** for regeneration.

The dewpoint sensor constantly monitors the outlet pressure dewpoint until the minimum set dewpoint has been achieved, at which point, column change over will occur.

The drying and regenerating cycle will then continue normally until the next column changeover when the EST / DS energy saving technology may again extend the drying cycle as dictated by the outlet pressure dewpoint.

During the extension of the drying cycle, no purge air is consumed, saving compressed air, saving energy and saving money.



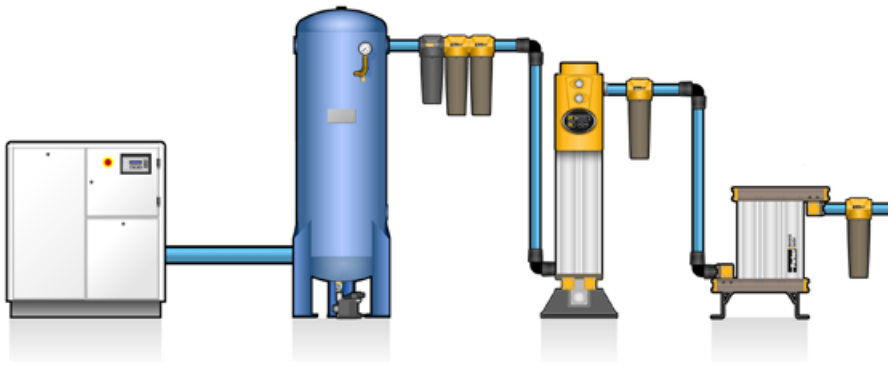
EST / DS Operation - Energy Saving Drying Cycle Extension

Time (minutes)	Heatless Dryer Fitted with EST or DS - Drying & Regeneration Cycle							
	0	2.5	3 changeover time dictated by outlet dewpoint	changeover	0	2.5	3 changeover time dictated by outlet dewpoint	changeover
Side A	Regeneration	Re-pressurisation	Energy Saving		Drying			
Side B	Drying				Regeneration	Re-pressurisation	Energy Saving	

Dryer Positioning

The preferred installation for any compressed air dryer is downstream of a wet air receiver as the air receiver not only stores compressed air, it actually reduces the temperature of the compressed air slightly and can help reduce “excessive peaks” in moisture loading should they inadvertently occur.

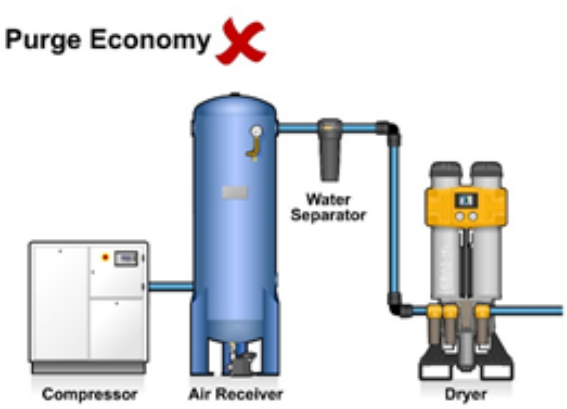
Installing downstream of the air receiver is not always possible or desired (for example some installations require a store of clean dry air) and Parker heatless modular dryers can also be installed prior to an air receiver.

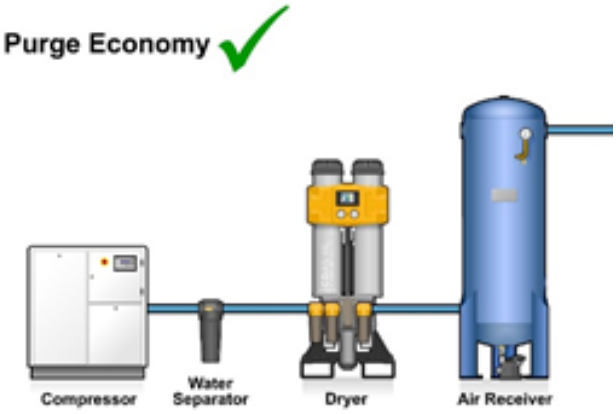


Additional Energy Savings

For installations where a Parker modular dryer is installed between the air compressor and the air reciever, an additional energy saving feature built into the controller can also be implemented.

Called Purge Economy, it is an energy saving feature for Parker heatless dryers where the dryer is placed directly after the compressor and before the air receiver

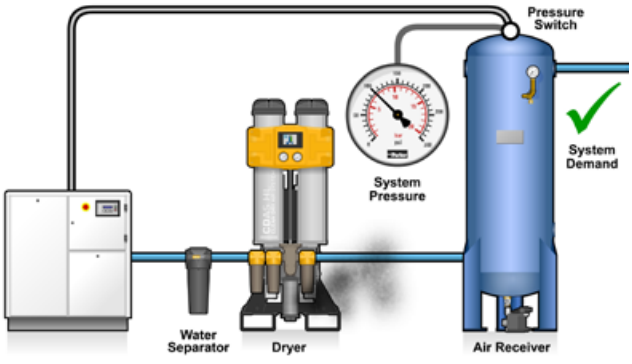




A Typical Installation

In a typical installation, the compressor will use a pressure switch connected to the air receiver to sense the system pressure.

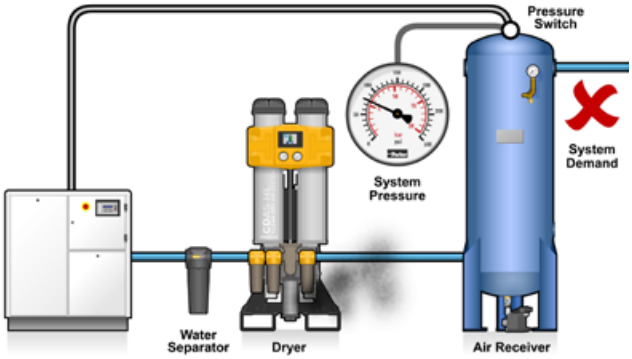
When system pressure is achieved, the compressor goes off load. If there is no system demand, i.e. evenings and weekends, in theory the compressor should remain off load, using no energy.



Air loss

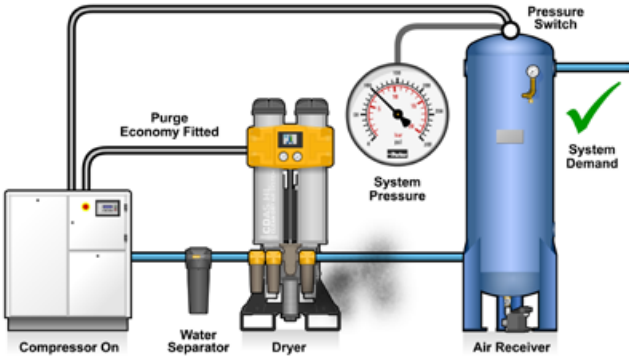
In this installation, even though there is no system demand and the compressor is off load, the dryer will continue to cycle, using purge air to regenerate the off-line column.

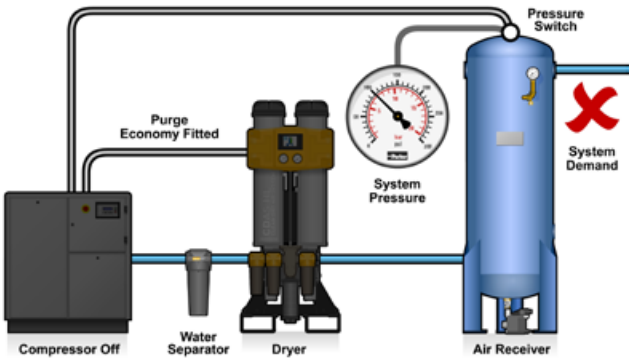
As the dryer purges the off-line column, it will slowly reduce the system pressure, eventually dropping to a point where the compressor will come back on-load to maintain pressure.



Purge Economy Operation

Purge economy is designed to stop the dryer regeneration cycle when the compressor goes off load. It uses a signal from the compressor to stop the dryer regeneration cycle and close the exhaust valve. This prevents unnecessary use of purge air, saving energy & money. Once the system pressure drops due to actual air demand, the compressor re-starts and the normal drying cycle will be resumed.





Built in Dewpoint Protection for EST or DS Equipped Dryers

In certain geographical locations, a dryer can be operated for extended periods with low amounts of water vapour in the inlet air (for example, some countries can have an ambient temperature up to +40 °C in summer and as low as -40 °C in winter).

As the dryer must be sized for summer conditions, during winter, months, the EST or DS – Energy Saving Technologies will save the user air, energy & money.

However, due to the way a desiccant bed adsorbs water vapour, during winter months with low levels of water vapour in the incoming air, the saturation profile of the desiccant bed changes and a condition may occur where the bed becomes too saturated to be regenerated by the standard purge regeneration cycle.

Therefore Parker EST & DS Energy Saving Technologies also incorporates a safety feature to protect the desiccant material. The safety feature, called Moisture Override activates after 30 minutes, interrupting the energy saving function and changing the drying columns over. This allows a full regeneration cycle of the desiccant material to take place before going back into energy saving mode. Now energy savings can be realised without causing the desiccant bed to become over saturated.

Compressed Air Treatment for Food, Beverage and Pharmaceutical Use

Parker OIL-X filter range and Parker modular adsorption dryer ranges have been designed to provide compressed air quality that meets or exceeds the levels shown in all editions of ISO8573-1, the international standard for compressed air quality and the BCAS Food and Beverage Grade Compressed Air Best Practice Guideline 102.

Filtration & dryer performance has also been independently verified by Lloyds Register.

Water Separators

Water separator performance has been tested in accordance with ISO12500-4 and ISO8573-9.

Coalescing Filters

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

Dry Particulate Filters

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

Oil Vapour Reduction Filters

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

Heatless Adsorption Dryers

FBP HL, MX & MXLE dryer performance has been tested in accordance with of ISO7183

In addition to performance validation, the materials used in the construction of the ranges recommended below for use in food, beverage & pharmaceutical manufacturing are FDA Title 21 Compliant and EC1935-2004 exempt. Certificates available on request.

Recommended Dryer Ranges for Food, Beverage & Pharmaceutical Grade Compressed Air

FBP Oil Free Air System

MX Adsorption Dryer

MXLE Low Energy Adsorption Dryer

Compressed Air Treatment for Hazardous Environments

Oil & Gas Drilling and Production Installations can be some of the most inhospitable working areas known to man. Apart from potentially explosive and corrosive areas, ambient temperatures can vary from -20°C to 50°C with wind speeds of up to 80mph and the constant battering from high waves, an oil rig is a demanding place for man or machine.

The highest equipment specifications are therefore required for Oil & Gas Drilling and Production Installations that dictate a quality of design and manufacture seldom required for conventional installations. Products must be rugged, reliable, high strength, compact and be able to withstand salt-water corrosion while still being able to function as specified.

Maintaining safe operations in a hazardous working environment means a reliance on motive and instrument quality compressed air. In a dirty, humid and corrosive atmosphere this must be consistently clean and dry in order that system quality and safety is not compromised.

Fully Pneumatic Operation & ATEX Compliant

In addition to providing air treatment products for standard industrial applications, Parker also specialises in the design and manufacture of compressed purification equipment for hazardous industries such as chemical/petrochemical and offshore oil & gas.

Parker can supply fully pneumatic ATEX versions of their medium flow compressed air dryes (CDAS HL ATEX) and high flow compressed air dryers (MXP ATEX) which are fully compliant with ATEX Directive 2104/34/EU Group II, Category 2 GD and 3rd Party Certified.

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