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PRODUCT CATALOGUE

TWIN TOWER DRYER RANGE WVM 45-750

GSFE Division

CONTAMINANTS IN COMPRESSED AIR

For over 100 years, compressed air has been recognised as a safe and reliable power source and is widely used throughout industry. Known as the 4th utility, around 90% of all manufacturing companies use compressed air in some aspect of their operations.

Unlike other utilities such as gas, water and electricity which is supplied to site by a utility supplier and to strict tolerances and quality specifications, compressed air is generated on-site. The quality of the compressed air and the cost of producing this powerful utility is therefore the responsibility of the user.

The Problem with Compressed Air

Compressed air systems inherently suffer from performance and reliability issues and almost all of the problems associated with the compressed air system and many manufacturing related quality issues can be directly attributed to contamination found in the compressed air.

Compressed Air Contamination and its Sources

Unknown to many compressed air users, the compressed air system contains a large array of both visible and invisible contamination which actually originate from four different sources.

To provide clean, dry, oil-free compressed air there are a minimum of **TEN** contaminants originating from **FOUR** different sources that must be treated.

1

AMBIENT AIR CONTAMINANTS
- Microorganisms
- Water Vapour
- Atmospheric Particulate
- Oil Vapour (from the atmosphere)

2

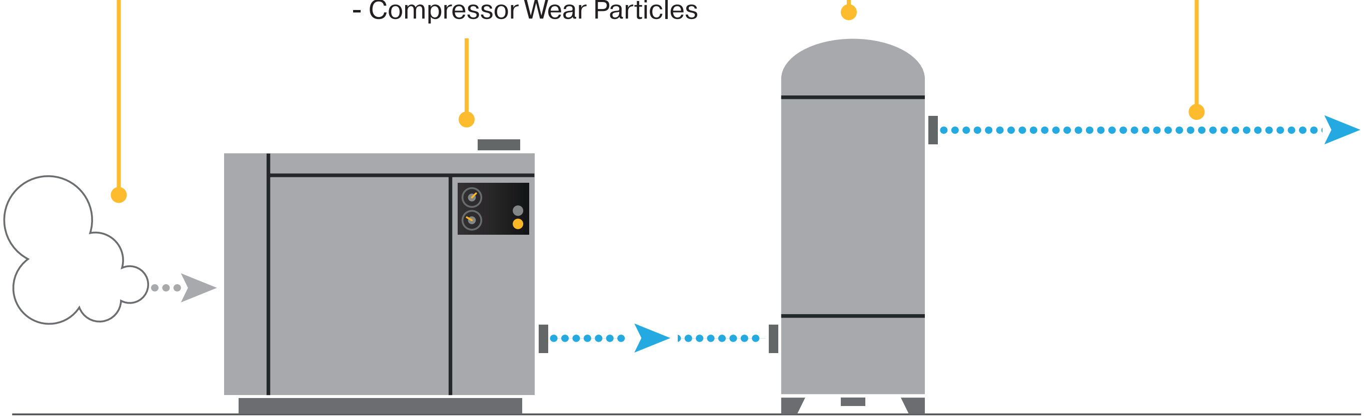
THE AIR COMPRESSOR CONTAMINANTS
- Liquid Oil
- Oil Aerosols
- Liquid Water
- Water Aerosols
- Oil Vapour (from the compressor oil)
- Compressor Wear Particles

3

THE AIR RECEIVER CONTAMINANTS
- Rust
- Pipescale

4

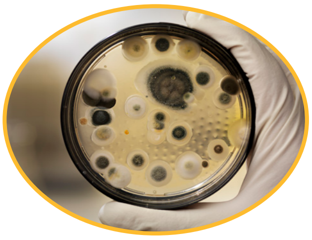
DISTRIBUTION PIPING CONTAMINANTS
- Rust
- Pipescale



Contaminant Type	The Ten Main Contaminants in Compressed Air		
Biological	Microorganisms (Viable and Non-Viable Particles)		
Chemical	Oil Vapour	Liquid Oil	Oil Aerosols
Physical	Water Vapour	Liquid Water	Water Aerosols
	Atmospheric Particles	Compressor Wear Particles	Rust and Pipescale

In order to supply the manufacturing facility with compressed air, the air compressor must constantly move and compress large volumes of ambient air.

Microorganisms



Ambient air can contain up to 100 million microorganisms per cubic metre. Due to their small size, bacteria, viruses, fungi, yeasts, moulds and spores will pass through the intake filter and into the compressed air system. Tests carried out by the Danish Technological Institute proved that microorganisms can survive in compressed air systems up to 400 bar, where the warm moist environment inside the air receiver and distribution piping provides an ideal environment for their rapid growth.

Water Vapour

Water enters the compressed air system as a vapour (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 ambient air is compressed, the temperature of the air increases significantly allowing the heated air to easily retain all of the water vapour entering the compressor.

Oil Vapour

Vehicle emissions and inefficient industrial processes lead to oil vapour contamination in the ambient air. Typical concentrations in ambient air can seem low (between 0.05 and 0.5mg per cubic metre), however values measured in compressed air increase significantly after compression when contaminants become concentrated. Once in a compressed air system, oil vapour can taint ingredients, finished products and packaging with an oily smell. Cooling also causes oil vapour to condense into liquid oil and form oil aerosols.

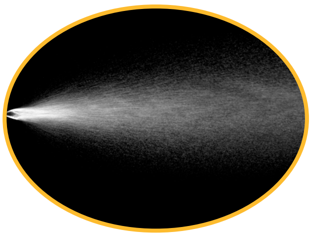
Atmospheric Particulate

Ambient air in industrial and urban environments will typically contain between
140 and 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.

Once in the compressed air system, many of the contaminants found in ambient air change phase, leading to the creation of additional contaminants. The air compressor, air receiver and distribution also add to the problem.

Liquid Water and Water Aerosols



After compression, compressed air is cooled to a usable temperature by an aftercooler. This cooling reduces the air's ability to retain water vapour, resulting in condensation of water vapour into liquid water. The presence of liquid water also causes aerosols to be formed.

Aftercoolers typically incorporate a water separator to reduce the amount of liquid entering the compressed air system (these do not remove 100% of the condensed liquid and have no effect on aerosols).

The air leaving the aftercooler 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 and the generation of more aerosols.

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, production equipment.

Liquid Oil and Oil Aerosols

As with water, oil vapour drawn in with the ambient air is cooled and condensed within the after-cooler leading to the formation of liquid oil and oil aerosols (even with oil-free compressors) which carry downstream. The majority of air compressors in use today use oil in their compression stage for sealing, lubrication and cooling. Even though the oil is in direct contact with the air as it is compressed, 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 or aerosol (typically no more than 5mg/m^3 for a well maintained screw compressor) or as oil vapour.

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.

POOR QUALITY COMPRESSED AIR

To operate any compressed air system safely and cost effectively, contamination must be reduced to acceptable limits. The importance of reducing contamination is increased significantly when compressed air is used for critical parts of the manufacturing process.

Poor compressed air quality and failure to control contamination can cause numerous problems for a manufacturer, many of which are not immediately associated with contaminated compressed air.

Product
- Contaminated products or packaging.
- Reworked products.
- Spoiled or damaged products.

Manufacturer
- Potential for brand damage.
- Financial loss.
- Reputation for poor quality.

Manufacturing Process
- Inefficient production processes.
- Reduced production efficiency.
- Increased manufacturing costs.

Compressed Air System
- Corrosion within storage vessels and the distribution system.
- Contaminated / damaged production equipment.
- Blocked or frozen valves and cylinders.
- Premature unplanned desiccant changes for adsorption dryers.
- High operational and maintenance costs.

COMPRESSED AIR MUST BE TREATED

Compressed air contamination must be treated to ensure the safe, reliable operation of the compressed air system. Correctly treated compressed air not only protects the manufacturing equipment using the compressed air, it also protects products or processes contacted by the compressed air.

Ensuring effective control of compressed air contamination, requires a number of purification technologies.

It is often stated that only three contaminants are present in compressed air (dirt/water/oil), however as those contaminants can be found in different phases, they require a specific purification technology for efficient reduction.

The table below highlights the individual filtration and drying technologies that are required to treat each contaminant.

Purification Technologies	Contaminants								
	Atmospheric Particles	Rust and Pipescale	Micro-organisms	Liquid Water	Water Aerosol	Water Vapour	Liquid Oil	Oil Aerosol	Oil Vapour
Liquid Separator				●			●		
Coalescing Filters	●	●	●		●			●	
Adsorption Filter									●
Dryer						●			
Dry Particulate Filters		●	●						
Sterile Filter			●						

CLEAN, DRY AND OIL-FREE COMPRESSED AIR

For general industrial manufacturing, the uses of compressed air differ greatly, and therefore so does the purity (quality) of compressed air required.

ISO 8573-1 is the international standard for compressed air purity (quality). It provides an easy to use classification method that allows a manufacturing facility to specify the compressed air purity (quality) they require.

Unfortunately, the ISO 8573-1 standard does not provide any guidance as to which air purity classifications are recommended for a particular industry or application.

To assist in the selection of a suitable compressed air purity classification, Parker have produced a number of industry specific documents which provide a recommended air purity (quality) for specific industries and applications, plus suitable compressed air treatment technologies to meet or exceed those air purity recommendations.

Compressed Air Purity Recommendations by Industry Sector

	General Industrial Manufacturing (Inc Automotive)	Electronics Manufacturing and Semiconductor Production	Food and Beverage Manufacturing	Pharmaceutical Manufacturing	Oil and Gas
Typical Applications	General Industrial Compressed Air (Internal Piping System)	CDA (Clean Dry Air) Semiconductor	Food and Beverage Grade Air Direct Contact Applications (Control over Microbial Growth)	Pharmaceutical Grade Air Direct Contact Applications (Control over Microbial Growth)	General Air (Safe Areas)
	General Industrial Compressed Air (External Piping System)	Instrument Air	Food and Beverage Grade Air In-direct Contact Applications (Control over Microbial Growth)	Pharmaceutical Grade Air In-direct Contact Applications (Control over Microbial Growth)	General Air (Zoned Areas)
	General Industrial 'Technically' Oil-Free Compressed Air	General Air	General Air Non-Contact Applications	General Air Non-Contact Applications	Instrument Air (Safe Areas)
	Spray Painting	Respiratory Protection		Respiratory Protection	Instrument Air (Zoned Areas)
	Respiratory Protection				Respiratory Protection
Parker Reference Documents					
	This Document and Parker BAS	Parker EMS and Parker BAS	Parker FBP	Parker FBP and Parker BAS	Parker OAG and Parker BAS

Recommended Minimum Air Quality Classifications

General Industrial Manufacturing (Inc. Automotive)

Application	Recommended ISO 8573-1:2010 Purity (Quality) Classifications	Pressure Dewpoint (PDP) Band
General Industrial Compressed Air (Internal Piping System)	ISO 8573-1:2010 Class 2:5:2	+4°C to +7°C
General Industrial Compressed Air (External Piping System)	ISO 8573-1:2010 Class 2:2:2 ISO 8573-1:2010 Class 2:1:2 ISO 8573-1:2010 Class 2:3:2	-69°C to -40°C -80°C to -70°C -39°C to -20°C
General Industrial 'Technically' Oil-Free Compressed Air	ISO 8573-1:2010 Class 2:2:1 ISO 8573-1:2010 Class 2:1:1	-69°C to -40°C -80°C to -70°C
Spray Painting	ISO 8573-1:2010 Class 2:2:1	-69°C to -40°C
Respiratory Protection	EN 12021	⩽-40°C PDP

PARKER TWIN TOWER CARBON STEEL ADSORPTION DRYER RANGES FOR COMPRESSED AIR UP TO 16 BAR G

The Parker WVM series of adsorption dryers are of twin tower, carbon steel construction.

WVM series use the vacuum regeneration method for desiccant regeneration.

WVM 45

WVM 210

WVM 750

- Parker WVM series dryers provide a constant outlet dewpoint in accordance with ISO 8573-1:2010 classes 1, 2 or 3 for water vapour
- WVM series dryers do not use process air during regeneration & cooling of the desiccant material, reducing energy consumption
- Regeneration under vacuum further improves energy efficiency
- WVM series dryers can utilise existing heat sources (eliminating need for electrical heater) to further reduce energy consumption by using the following options:
  - Steam Regeneration, Steam / Electric regeneration or Hot Water / Electric Regeneration
- Thermal insulation for reduction of heat loss and touch protection fitted as standard
- Full feature electronic control with dewpoint display and Energy Saving Technology as standard
- Large air flow capacities
- Air purity is complemented by installing Parker OIL-X General Purpose & High Efficiency Coalescing pre-filtration and General Purpose Dry Particulate post filtration

	Filtration (Order Separately)				
Dryer	OIL-X WS Die-cast or SFH Fabricated Water Separator	OIL-X Filter Grade AO General Purpose Coalescing Filter	OIL-X Filter Grade AA High Efficiency Coalescing Filter	AKM Adsorption Filter	OIL-X Filter Grade AO(M) General Purpose Dry Particulate Filter
WVM 45 - 750	Optional	**Required**	**Required**	Not Required	**Required**

PARKER TWIN TOWER CARBON STEEL DRYERS

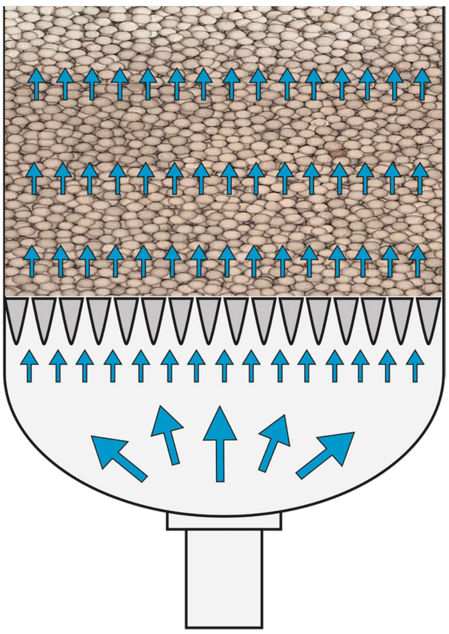
Manufactured from welded carbon steel, Parker WVM series adsorption dryer ranges may look similar to other dryer ranges, however they include many innovative features.

High Quality Wedge Wire Desiccant Support Screen

- Manufactured from 304 Stainless Steel
- Supports desiccant in drying columns
- Extremely robust design
- Self-cleaning function via triangular cross sectional design
- Eliminates desiccant saturation (wet spots) caused by jetting of compressed air
- Provides even flow distribution of compressed air into the desiccant bed
- Maximises contact with all of the desiccant material in the vessel
- Lower pressure drop compared to the more traditional mesh cartridge designs used on alternative twin tower dryers

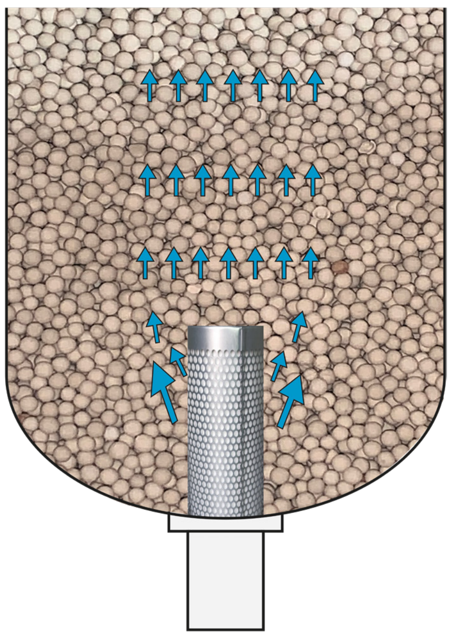
Parker Twin Tower Dryer with Wedge Wire

Even Flow Distribution of Compressed Air



Alternative Dryer WITHOUT Wedge Wire

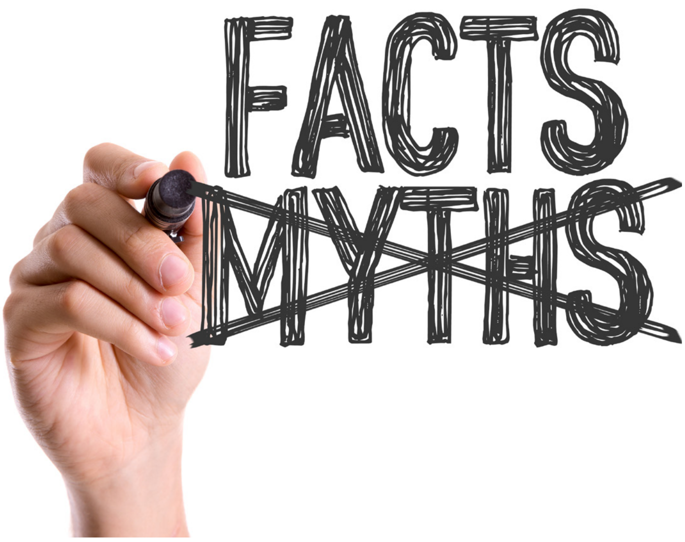
Jetting of Compressed Air bypassing Desiccant



COMPARISON OF LARGE FLOW, LOW ENERGY, HEAT REGENERATED COMPRESSED AIR DRYERS

Facts:

- All adsorption dryers need to regenerate the adsorbent desiccant material used to remove water vapour from compressed air.
- Regenerating the desiccant material consumes energy
- For adsorption dryers, there are currently 10 common regeneration methods in use by major manufacturers
- The regeneration method of a dryer has a direct impact on the outlet dewpoint
- An adsorption dryer will either deliver a Constant Outlet Dewpoint or provide Dewpoint Suppression
- Almost all regeneration methods use process air in one form or another
- After regeneration, a heated dryer must cool the adsorbent desiccant material before it can adsorb water vapour



Understanding Dewpoint - What is the difference between Constant Outlet Dewpoint and Dewpoint Suppression?

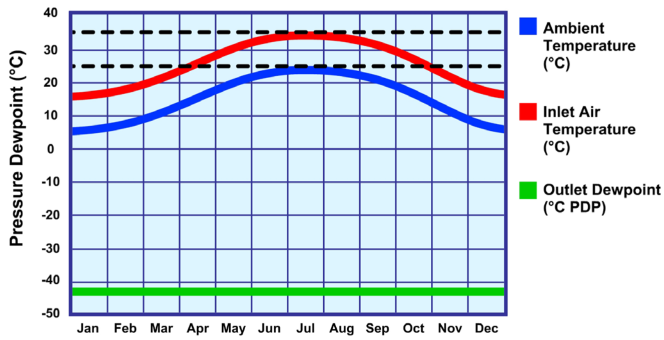
Constant Outlet Dewpoint

A constant outlet dewpoint dryer is first 'sized' to match worst case inlet and ambient conditions of the user's site. This ensures the dryer has enough drying capacity (usually adsorbent material) to handle the maximum water vapour loading of the system, whilst being able to deliver a consistent outlet dewpoint.

A dryer delivering a constant outlet dewpoint will see small fluctuations, but always deliver the minimum pressure dewpoint it was sized for.

For example, if an adsorption dryer is sized to deliver a ≤-40°C PDP, then -40°C PDP will be the worst dewpoint delivered. Typically, the outlet dewpoint will fluctuate between say -50°C & -40°C due to the way the adsorption dryer operates.

Effect of ambient temperature, inlet temperature & variable flow on the outlet dewpoint of a -40°C PDP adsorption dryer



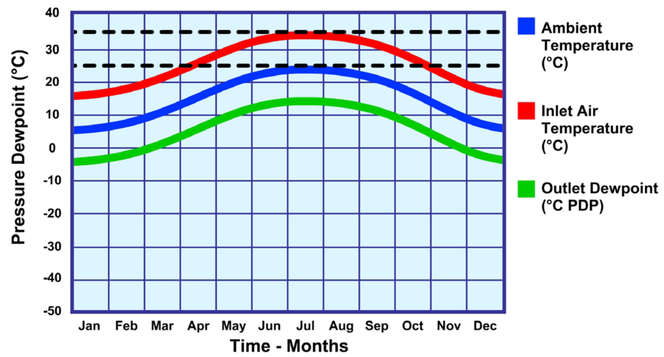
Dewpoint Suppression

Dryers designed to provide dewpoint suppression are not sized to match ambient conditions resulting in a smaller amount of adsorption material available for drying.

The disadvantage is that the outlet dewpoint delivered by a suppression dryer can vary significantly.

Dewpoint suppression dryers are affected by changes in ambient air temperature and inlet temperature. If a dryer is designed to provide a dewpoint suppression of -20°C, then it will reduce the dewpoint to 20 degrees below the compressed air temperature (this figure of -20°C should not be confused as a constant outlet dewpoint as it often is).

Effect of ambient and inlet temperature on the outlet dewpoint of a 20°C dewpoint suppression dryer



USING HEAT FOR REGENERATION

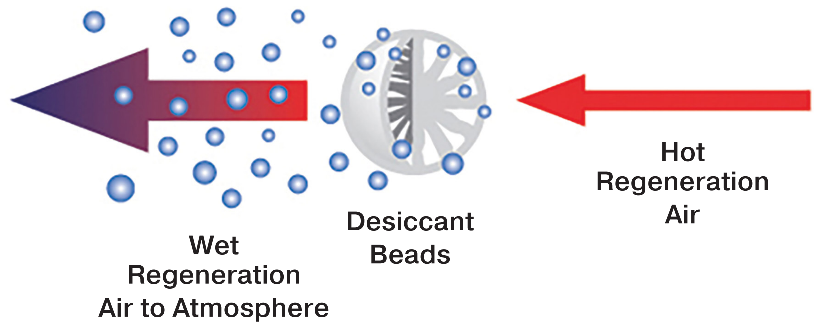
The simplest method of regenerating an adsorbent bed is using the Pressure Swing Adsorption (PSA) or heatless regeneration method. This method uses a small bleed of dry process air, known as purge air and is a simple and reliable way to regenerate a dryer.

For small and medium flow adsorption dryers, the heatless method is the only method used, however, as compressed air flow rates increase, the cost associated with generating the purge air also increases, therefore alternative methods of regeneration are used.

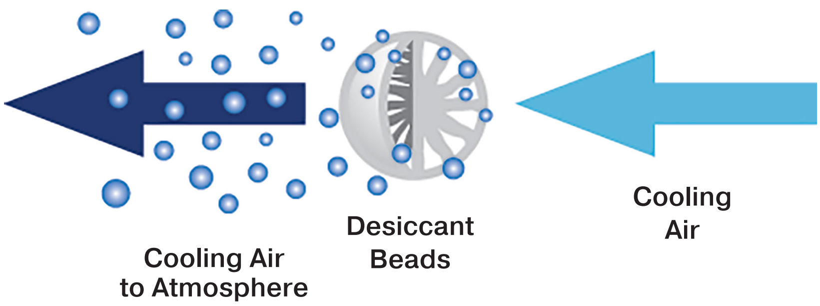
One way to reduce the air usage is to use heat as part of the regeneration process (Thermal Swing Adsorption or TSA), however, using heat is not without its drawbacks as heat needs to be kept in the bed when regenerating and needs to rapidly be removed from the desiccant (which is an excellent retainer of heat) prior to adsorption.

Failure to remove sufficient heat from the desiccant material before use will directly affect the outlet dewpoint of the dryer, therefore cooling is required.

TSA REGENERATION HEATING PHASE



TSA REGENERATION COOLING PHASE



The Relationship between Reducing Energy, Cooling the Desiccant Material and Outlet Dewpoint

Most Thermal Swing Adsorption (TSA) dryer technologies will use process air for regeneration or cooling, however some do not cool the adsorption bed at all.

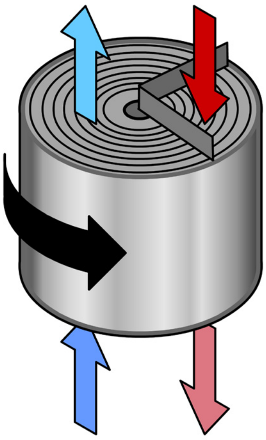
Inefficient cooling or lack of cooling directly impacts the outlet dewpoint provided by a TSA heated dryer.

Instantaneous Air Loss Comparison of TSA Adsorption Drying Technologies

Dryer Technology (Regeneration Method)	Typical % Air Loss (at 7 bar g, 35°C)	Reason for Air Loss	Efficient Cooling
Vacuum Regeneration	0%	No Air Loss	✔
Blower Regeneration Ambient Air Cooled (Zero purge)	0%	No Air Loss	✕
HOC Drum	0%	No Air Loss	✕
HOC Twin Tower	0%	No Air Loss	✕
Hybrid (Tandem Technology)	5%	Regeneration (Purge) Air / Cooling	✔
Internally Heated Purge	7.5%	Regeneration (Purge) Air / Cooling	✔
Externally Heated Purge	10%	Regeneration (Purge) Air / Cooling	✔
Blower Regeneration (with purge)	10% - 20%	Cooling Air	✔

HEAT OF COMPRESSION (HOC) DRYERS

Heat of Compression or HOC dryers utilise the high compression temperatures of an oil-free compressor and use a proportion of the hot compressed air taken prior to the aftercooler to regenerate the adsorption material.



HOC dryers require the compressor to be operating close to or at maximum capacity to ensure there is enough heat to regenerate the adsorbent material. As compressors rarely operate at 100% capacity, 100% of the time, the outlet dewpoint can fluctuate widely.

HOC Drum dryers are the most common type of HOC dryer in use. One of their primary sales arguments is that they typically only use 5% of the adsorbent material compared to a traditional constant outlet dewpoint dryer.

The dewpoint (dryness) of compressed air delivered by a dryer is directly related to the volume of adsorbent material within the dryer and the contact time between the compressed air and the adsorbent.

If a drum dryer has 95% less adsorbent than a traditional dryer, then the outlet dewpoint it will deliver will be significantly less than the dewpoint provided by a traditional constant outlet dewpoint dryer.

Additionally, drum dryers provide no direct cooling of the hot adsorbent material (only the regeneration air is cooled before it is recombined with the process air flow for drying).

As the adsorbent drum rotates, the hot adsorbent material passes from the regeneration quadrant into the drying quadrant without any cooling.

As this recently regenerated adsorbent material is too hot to adsorb any water vapour from the compressed air, this has a direct impact on the outlet dewpoint of the dryer.

ISO 8573-1:2010

ISO 8573-1:2010 is the International Standard relating to compressed air purity and includes 6 dewpoint classifications in bands from -70°C to +10°C.

To comply with an ISO 8573-1:2010 classification, a dryer must always deliver the outlet dewpoint within the band of one classification.

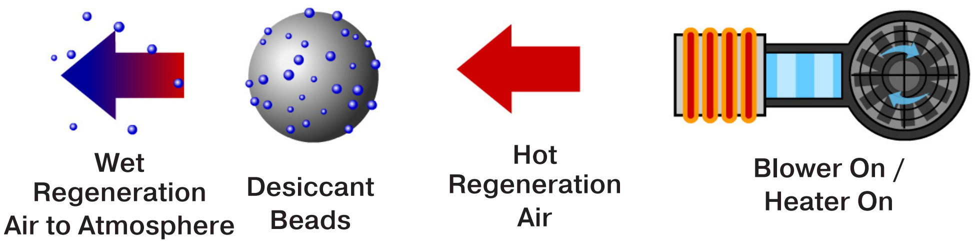
ISO 8573-1:2010 Classification	°C PDP	Dewpoint Band
Class 1	⩽-70°C PDP	-80°C to -70°C
Class 2	⩽-40°C PDP	-69°C to -40°C
Class 3	⩽-20°C PDP	-39°C to -20°C
Class 4	⩽+3°C PDP	-19°C to +3°C
Class 5	⩽+7°C PDP	+4°C to +7°C
Class 6	⩽+10°C PDP	+8°C to +10°C

HOC adsorption dryers or heat regenerated dryers with inefficient cooling typically fall under the classification of dewpoint suppression dryers as the outlet dewpoint varies too greatly and falls into two or more ISO 8573-1 classification bands.

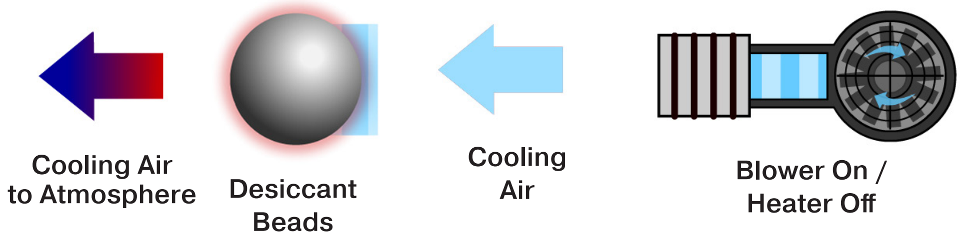
"ZERO PURGE" BLOWER DRYERS

Blower regeneration dryers are typically offered in two variations, those that use ambient air for regeneration and cooling (often marketed as "zero purge" dryers) and those that use ambient air for regeneration and process air for cooling (blower with purge).

BLOWER REGENERATION AMBIENT AIR COOLED (ZERO PURGE) HEATING PHASE



BLOWER REGENERATION AMBIENT AIR COOLED (ZERO PURGE) COOLING PHASE



THE PROBLEM WITH ZERO PURGE BLOWER DRYERS

Whilst the benefits of a so called “Zero Purge” blower dryers are often vigorously promoted (no purge air = 100% air flow for applications and reduced energy consumption), the disadvantages are often overlooked.

Using ambient air for regeneration and cooling is not effective with a blower dryer.

The blower pulls in large volumes of wet, ambient air and heats it up before passing it over the desiccant material.

For cooling, the heater is simply turned off, however this is the major problem.

The ambient air is still passing through the blower before entering the desiccant bed.

During operation, the blower generates heat which is added to the heat of the ambient air (+25°C increase is not uncommon).

So, if the ambient air temp is 25°C and the blower adds another 25°C, the temperature of the cooling air (50°C) is too high to efficiently cool the desiccant.

Therefore, on changeover, the adsorbent bed temperature is higher than the inlet air temperature and the adsorption capacity of the desiccant is reduced, the outlet dewpoint fluctuates greatly, mirroring the ambient and making the outlet dewpoint a dewpoint suppression rather than a fixed minimum outlet dewpoint (as on a constant outlet dewpoint dryer).

WHEN ZERO PURGE IS NOT ZERO AIR LOSS

To overcome this problem, the alternative variant of the so called “Zero Purge” blower dryer is modified to use purge air.

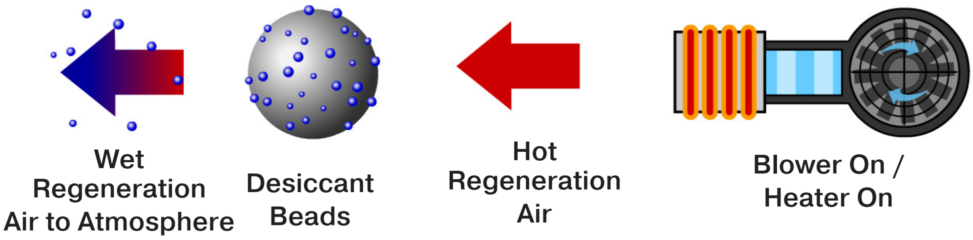
So once the heated ambient air used for regeneration is turned off, dry process air is used to cool the desiccant material to a usable temperature.

Some manufacturers refer to this as purge air, many refer to it as cooling air.

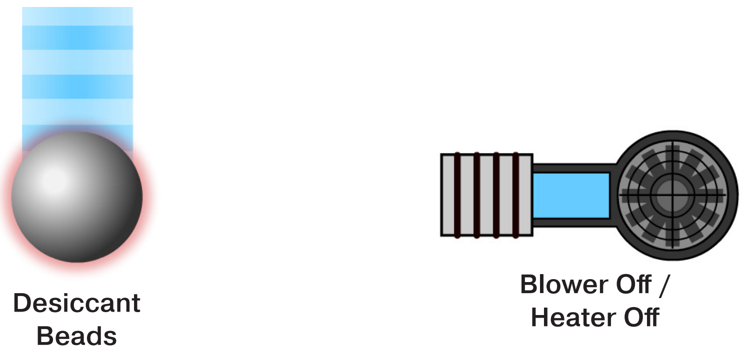
So, although the dryer may not use purge air for regeneration, it is certainly not a “Zero Purge” dryer nor is a “Zero Air Loss” dryer.

The amount of cooling air used is also misleading, often “averaged” over the long drying cycle and stated as only 1 or 2% to look favourable, at the time of cooling the instantaneous air loss can be anywhere between 10 and 20% of the dryers rated capacity.

BLOWER REGENERATION PROCESS AIR COOLED (WITH PURGE) HEATING PHASE



BLOWER REGENERATION PROCESS AIR COOLED (WITH PURGE) COOLING PHASE



PARKER WVM SERIES DRYERS ZERO AIR LOSS & CONSTANT OUTLET DEWPOINT

Parker WVM Series dryers uses the Vacuum Regeneration method for the regeneration of the desiccant material.

Visually similar to the more common blower regeneration dryers, it functions quite differently to ensure low energy consumption, true zero air loss and a constant outlet dewpoint.

Vacuum Regeneration – The Clear Winner

Comparison of Drying Technologies

Dryer Technology	Heat Used for Regeneration	Process Air Required for Regeneration (Purge Air)	Ambient Air Required for Cooling	Process Air Required for Cooling	Able to Provide A Constant Outlet Dewpoint	Only Provides Dewpoint Suppression
WVM Vacuum Regeneration	●		●		●	
Blower Regeneration Ambient Air Cooled (Zero Purge)	●		●			●
Blower Regeneration Process Air Cooled (with Purge)	●			●	●	
HOC Drum Dryer	●		●			●

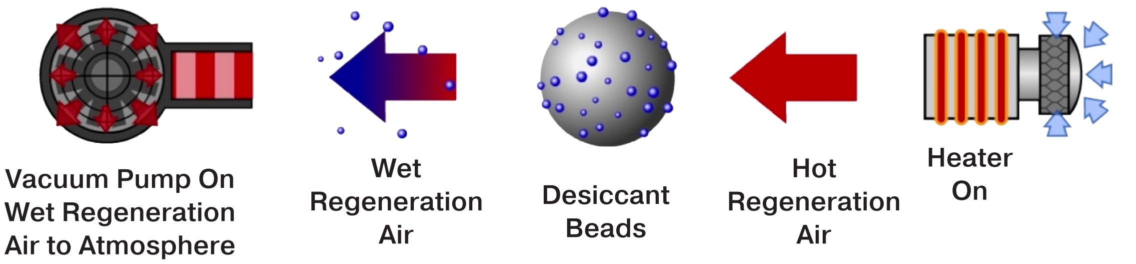
Vacuum regeneration dryers seek to overcome both of the major issues associated with blower regeneration dryers.

The vacuum pump operates in reverse to the pump of a blower dryer.

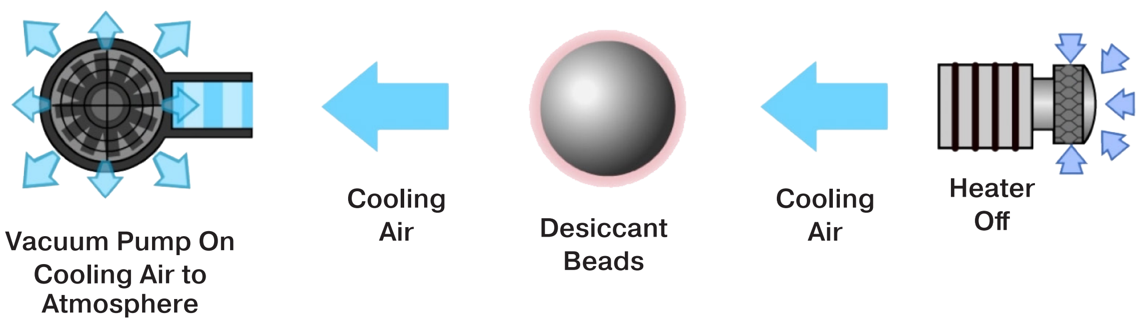
During the regeneration phase, the vacuum pump is used to pull ambient air through the heating element and then over the desiccant material to remove the adsorbed water vapour.

During the cooling phase, no heat is added to the cooling air by the vacuum pump.

VACUUM REGENERATION HEATING PHASE



VACUUM REGENERATION COOLING PHASE



CLEAN, DRY, COMPRESSED AIR FOR GENERAL INDUSTRIAL MANUFACTURING & AUTOMOTIVE APPLICATIONS

WVM 45 - 750 Consisting of 4 stages of purification, treating 7 contaminants* found in a compressed air system

1

General Purpose Coalescing Filter

REDUCES:
Particulate down to 1 micron
Water & Oil Aerosols down to 0.5 mg/m³

2

High Efficiency Coalescing Filter

REDUCES:
Particulate down to 0.01 micron
Water & Oil Aerosols down to 0.01 mg/m³

3

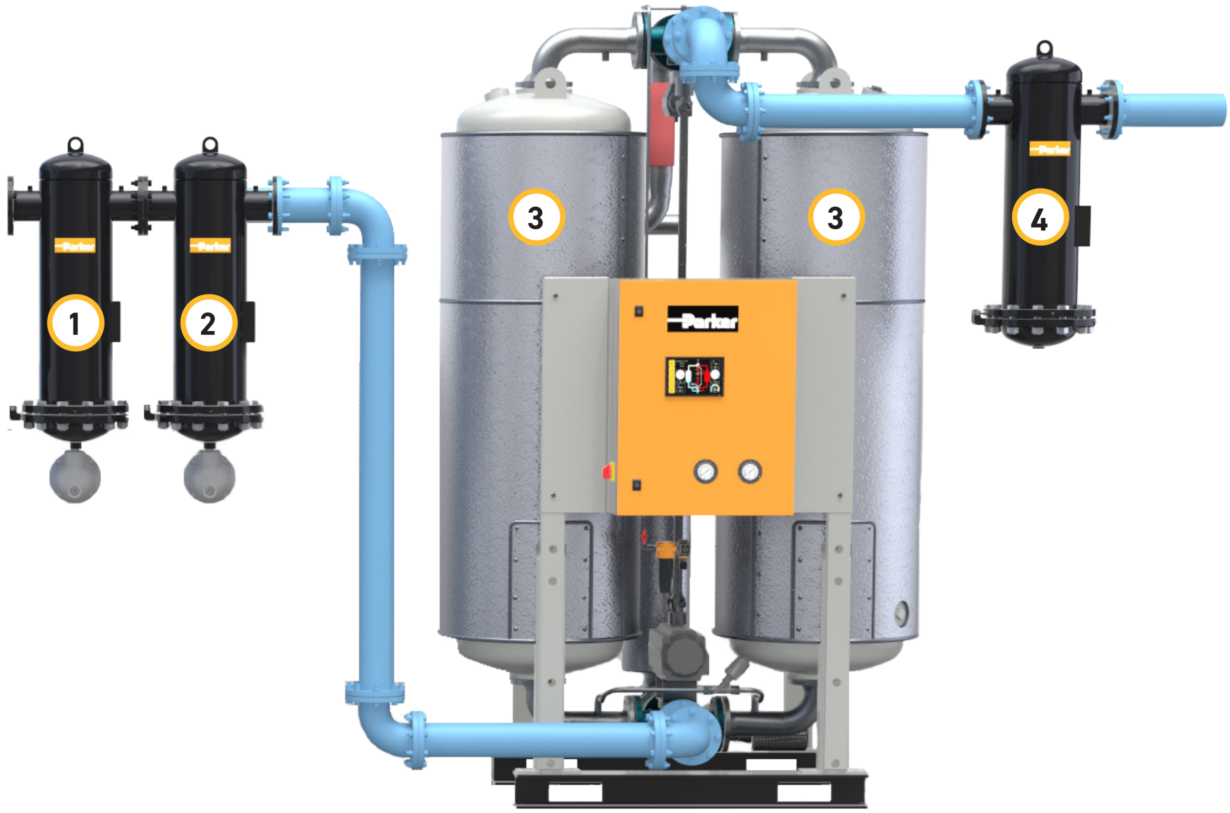
Adsorption Dryer

REDUCES:
Water Vapour - PDP ⩽-40°C

4

General Purpose Dry Particulate Filter

REDUCES:
Particulate down to 1 micron



Representative of WVM 45 - 750 dryer and minimum recommended filtration for the treatment of 7 contaminants

***Important Note:**

Should there be liquid water or liquid oil present at the inlet of the Treatment System, an additional Water Separator can be installed, increasing the number of contaminants treated from 7 to 9.

HOW IT WORKS - WVM VACUUM REGENERATION

The standard WVM series dryer is a heated vacuum regeneration, zero air loss dryer that utilises an electrical heater and a high temperature side channel vacuum pump for regeneration of the desiccant material. If an alternative source of heat is already available on site, for example steam, WVM series can also be supplied with a heat exchanger in lieu of the electric heater to reduce energy costs further. Operation of the standard models (described below) and the models with alternative heat exchangers are almost identical.

WVM - Vacuum Regeneration Dryer Operation

Drying Cycle (6 Hours)

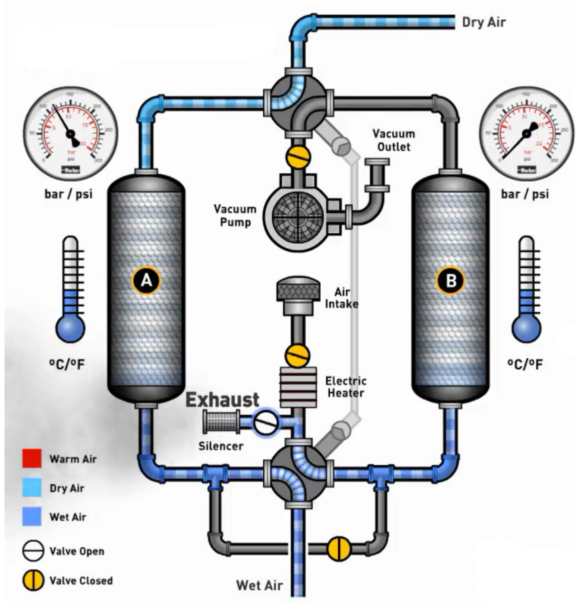
The pre-filtered process air enters the dryer through the inlet and is directed into the online drying column via the inlet valve. The compressed air passes over the adsorbent desiccant material, reducing the water vapour content of the compressed air as it contacts the desiccant. The dried process air then exits the dryer via the outlet valve.

WVM - Vacuum Regeneration Dryer Operation

Depressurisation Cycle (15 minutes)

At the start of the regeneration cycle, the exhaust valve of the dryer is closed and the offline column is at full line pressure.

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



WVM - Vacuum Regeneration Dryer Operation

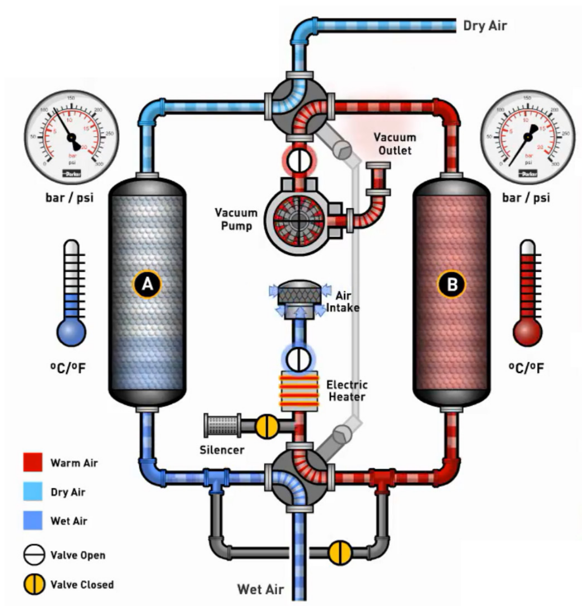
Regeneration Cycle- Heater On (4 Hours)

Once the offline column has depressurised, the exhaust valve is closed and the vacuum pump and heater are turned on.

The vacuum pump draws in ambient air from around the dryer, through an intake filter and across the electrical heater where it is heated up to 160°C.

The hot ambient air (regeneration air) is then pulled across the off-line desiccant bed by the vacuum pump where it regenerates the saturated desiccant material.

The now saturated regeneration air is then exhausted from the dryer via the vacuum pump exhaust.



HOW IT WORKS - WVM VACUUM REGENERATION

WVM - Vacuum Regeneration Dryer Operation

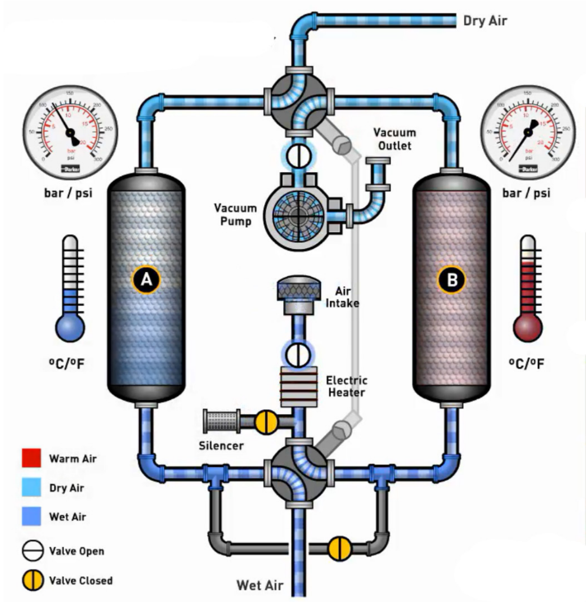
Regeneration Cycle- Heater off (1 Hour)

When the desiccant material has been fully regenerated by the heated regeneration air, it must be cooled prior to column changeover.

Failure to cool the adsorbent desiccant material will result in reduced adsorption capacity and loss of outlet dewpoint.

After 4 hours of regeneration with the heated regeneration air, the electrical heater is switch off.

The vacuum pump continues to draw in ambient air from around the dryer which is used to cool the desiccant material for a period of 1 hour.



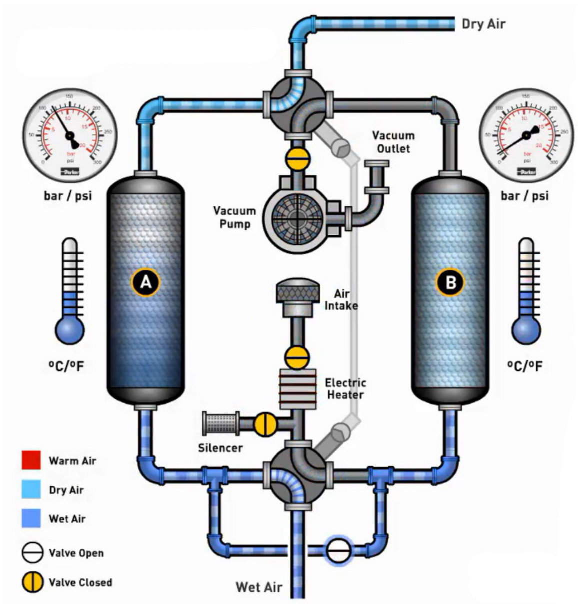
WVM - Vacuum Regeneration Dryer Operation

Repressurisation & Standby (45 Minutes)

Before the on-line (drying) and offline (regenerating) columns change over, the off-line vessel must be repressurised. This ensures a consistent downstream pressure and dewpoint when the drying columns change over.

Following the cool down phase, the repressurisation valve is opened to allow the off-line column to reach system operating pressure.

Once repressurised, the dryer will remain in standby until column changeover (total time for repressurisation & standby is 45 minutes).

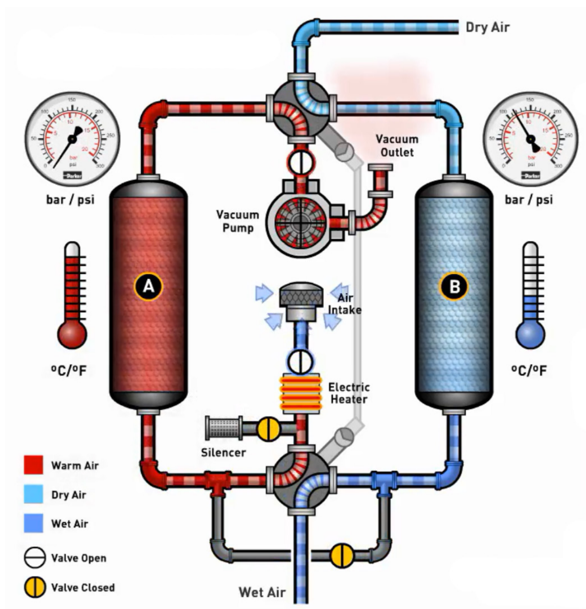


WVM - Vacuum Regeneration Dryer Operation

Column Changeover

When operating on a fixed timing cycle, the drying columns will proceed to changeover after the 45 minute repressurisation & standby period.

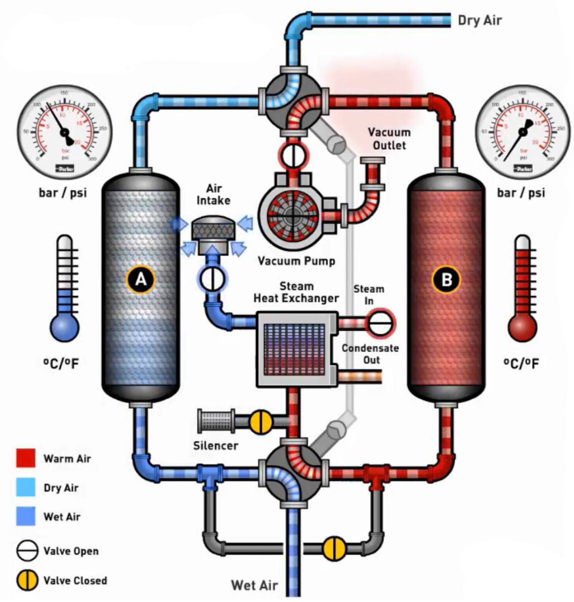
The recently regenerated column is brought online to dry the incoming compressed air and the opposite column (now saturated, will undergo the full regeneration cycle).



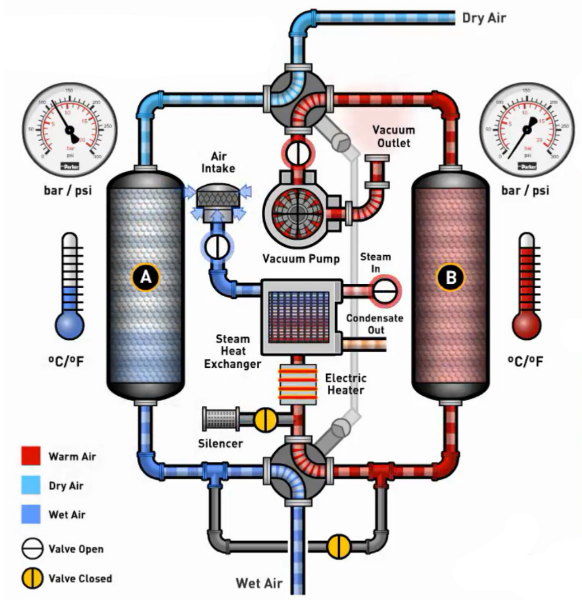
WVM EFFICIENCY - OPTIONAL HEAT EXCHANGERS

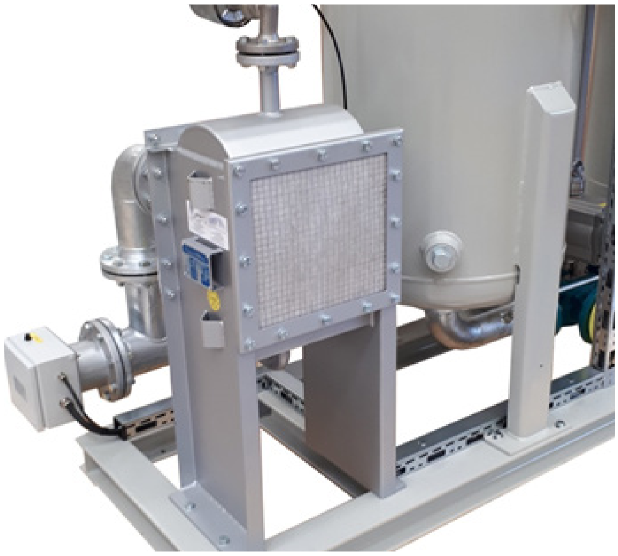
WVM models 45-750 are also available with the option of using a steam only heat exchanger in place of the electric heater or a combination of steam + electric heater.

Steam Heat Exchanger



Steam Heat Exchanger + Electric Heater





If an existing steam supply is available on site, the electrical heater can be replaced with a steam heat exchanger.

This reduces the energy consumption of the dryer by eliminating the running costs of the electrical heater.

The steam heat exchanger is supplied with a steam shut off valve to allow the heat source to be removed during the cool down phase.

The Steam + Electric option allows for three operating modes.

- **Pure Steam Operation** is used when there is an adequate steam supply available.
- **Pure Electric Operation** is used when the steam supply is not available.
- **Combination Operation** is used when steam is available, but is not sufficient to reach and maintain the required operational temperature.

The combination function uses steam as the primary heat source with the electrical heater only switched on to top up the temperature when required.

DESIGNED FOR AIR QUALITY AND ENERGY EFFICIENCY

All Parker WVM Series dryers have been designed to deliver compressed air purity in accordance with international standards, whilst having a low energy consumption and low environmental impact.

Designed for air quality and energy efficiency

Dewpoint Switching - Energy Saving Technology (DS)

The energy required to regenerate the off-line desiccant bed of an absorption dryer is constant, and based upon the assumption that the dryer is operating at 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.

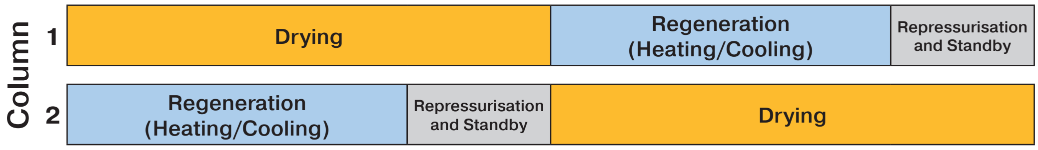
As the energy used to regenerate this partially saturated bed is based upon the assumption that the bed is fully saturated, more energy (purge air) is consumed than is actually necessary.

With the Dewpoint Switching function activated, the drying cycle remains unchanged, however as the drying chambers are about to change over, the Dewpoint Switching function overrides normal operation to fully utilise the drying capacity of the on-line desiccant material.

Standard Operation (Fixed Cycle)

At the end of the regeneration cycle, and prior to column changeover, the fully regenerated offline column is repressurised, thus ensuring no loss of system pressure on changeover.

After re-pressurisation, all drying columns will be at full line pressure, and no electrical energy is being used for regeneration and the dryer is in a state of zero energy consumption.



Dewpoint Switching Operation (Cycle Extension)

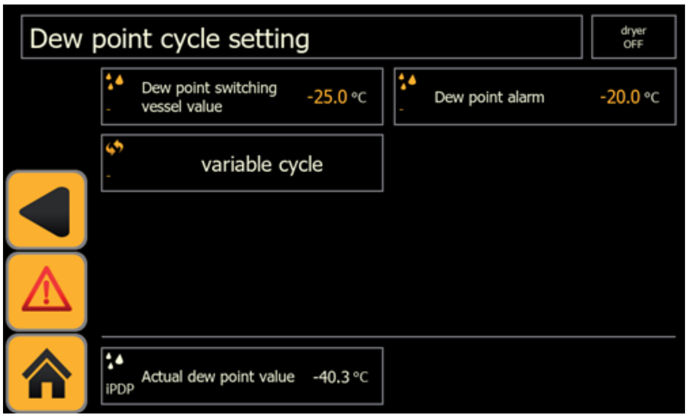
Under standard operation, the drying chambers would now proceed to change over automatically, however WVM series dryers incorporates a dewpoint hygrometer sensor which is used to monitor the pressure dewpoint of the compressed air leaving the dryer.

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

The Dewpoint Switching function will therefore override the standard control cycle and the dryer will continue to dry on the same column with zero energy consumption.

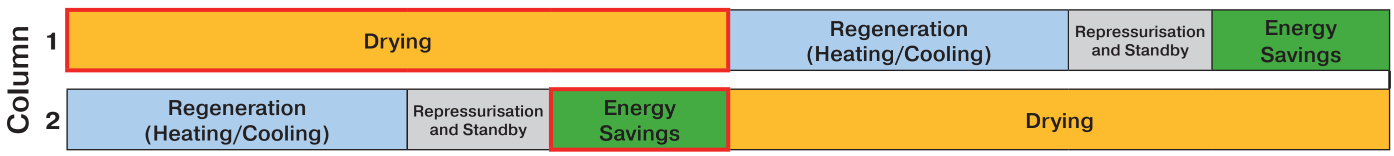
The dewpoint sensor constantly monitors the outlet pressure dewpoint until the minimum set dewpoint has been achieved, at which point, column change over will occur.

The drying and regenerating cycle will then continue normally until the next column changeover when the



Dewpoint Switching function may again extend the drying cycle as dictated by the outlet pressure dewpoint.

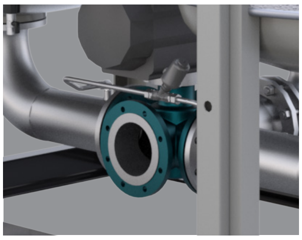
During the extension of the drying cycle (up to 48 hours), the electrical heater and vacuum pump are switched off saving energy and saving money.

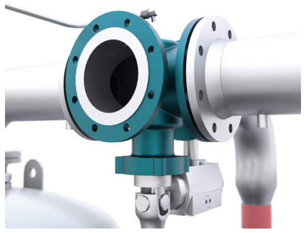


PARKER TWIN TOWER CARBON STEEL DRYERS - KEY FEATURES AND BENEFITS OF WVM SERIES

Robust, directly connected Inlet and Outlet Valves

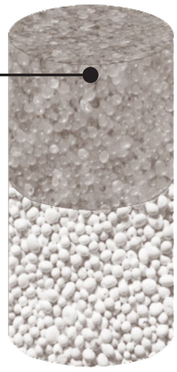
- The main inlet and outlet valves of WVM series are synchronised via a universal shaft
- This ensures valves are always in the correct positions during the operational cycle
- Should a fault occur on non synchronised valves such as individually controlled butterfly-valves then airflow may be blocked, or even exhausted to atmosphere





High quality two-layered desiccant filling

- High quality, water resistant silica-gel for pressure dewpoint down to -70°C
- Wedge wire desiccant support screen for optimal air flow distribution

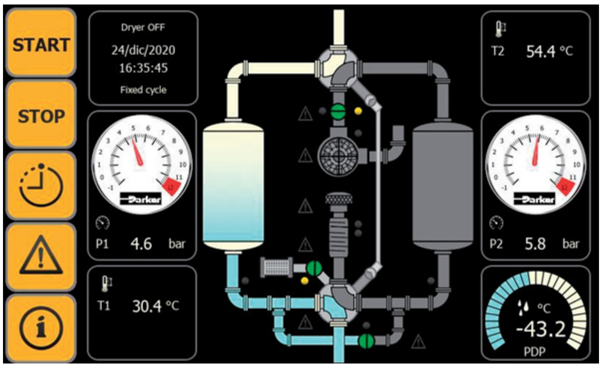


Insulation as standard

- WVM series dryers are supplied as standard with a thermal protective insulation layer for the reduction of heat loss and touch protection during the heated regeneration cycle

HCDC Hyper Connected Dryer Controller - Full feature electronic control system

- PLC + 7" colour touch screen display is included to show dryer status and allow full control of the dryer
- Dewpoint display and Dewpoint Switching - Energy Saving Technology fitted as standard
- Web server function for remote monitoring
- External monitoring & control via MODBUS TCP/IP on RJ45 (Standard)
- Optional protocols include Profi bus (DPVO; Profi net) & Modbus RTU on RS485
- Remote volt free alarm contact (standard)
- Analogue outputs x 2 (standard)
- On-board sensors include Outlet dewpoint sensor, Column Pressure Sensors & Column Temperature Sensors
- Data logging of on board sensors and dryer alarms with USB download



Dewpoint Switching - Proportional Energy Usage

- Dewpoint Switching energy saving technology ensures the energy consumed by the dryer is directly proportional to the amount of water vapour present and not the dryers maximum rated capacity
- The following example highlights the percentage energy savings available with the Dewpoint Switching function in operation

	% Energy 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%

PARKER WVM SERIES VACUUM REGENERATION

Designed for air quality and energy efficiency

- The required regeneration temperature for the desiccant material is 6°C lower when regenerating under vacuum compared to dryers regenerating with an ambient air blower that operates above atmospheric pressure
- Using a vacuum pump instead of a blower ensures no additional heat is added to the cooling air
- The cooling air temperature is therefore equivalent to the ambient temperature, quickly achieving an efficient cooling of the desiccant material without the need to use process (purge/cooling) air
- Efficient cooling of the desiccant material eliminates loss of dewpoint after changeover (common on ambient air cooled dryers in a blower configuration)
- Shorter cooling time = reduced vacuum pump operation = lower energy costs
- No requirement to use process air for cooling significantly reduces energy costs and eliminates compressed air loss
- Pressure dewpoints of -70°C can be reliably achieved without the need for purge air
- WVM Series dryers provide a constant outlet dewpoint in accordance with ISO 8573-1:2010 Classes 1, 2 or 3
- WVM Series - True Zero Purge / Zero Air loss

Large Flow Capacities

- Extensive range of flow capacities from 450 m^3/hr (7.5 m^3/min) to 7300 m^3/hr (121.9 m^3/min) with larger flows on request

HCDC - HYPER CONNECTED DRYER CONTROLLER

Modern industry is currently in the midst of change, increased connectivity between devices is becoming common place. This connectivity allows equipment to share data via remote monitoring providing significant improvements in operational efficiency.

HCDC utilises IoT technology,and cloud connectivity, to share performance data.

This provides the basis for continuous, location independent monitoring, optimised maintenance and customised compressed air usage.

All this leads to a significant reduction in service, maintenance and energy costs.

Features

PLC + HMI Touch screen 7" 16:9 (TFT, 64k colour)
Integrated P&I flow chart
Data recording in 1 minute steps Memory capacity: several years Recording frequency can be set from 1 second up to 1 hour
Software upgraded via USB memory stick
Log download via USB (without opening the control cabinet)
Log file ready for reading (.csv)

Advantages

User friendly interface
Detailed performance graphs, easily viewed in the field (in HMI page)
Detailed operational history of the dryer, easily viewed in the field (in HMI page)
Log recoverable by an operator without training and with no need to open electrical panels.
Log files in .csv format (no Parker software required)
Fewer opportunities for error

Controller Connectivity

Dewpoint Hygrometer with 4-20 mA Dewpoint Retransmission	●
Fault Alarm Relay	●
Webserver via Ethernet RJ45	●
Modbus TCP/IP via Ethernet RJ45	●
Modbus RTU via 2 wire RS485	●
Profibus / Profinet via gateway	(Option)

Options

Fieldbus 1. Profibus DP V0 (or in alternative V1) with gateway (installed inside control cabinet) 2. Profinet with gateway (installed inside control cabinet) 3. Ethercat with gateway (installed inside control cabinet) 4. Other protocols on request
Remote connection and monitoring (internet connection required) VPN connection to WVM via web cloud
Modem 3G and SIM card, if internet connection is not available on-site (installed inside control cabinet)

HCDC - HYPER CONNECTED DRYER CONTROLLER DISPLAY FEATURES AND CONNECTIVITY

The WVM controller has a number of connectivity options available which allow a user to monitor and manage the dryer. The table below highlights the different connectivity options available and the monitoring capabilities for a particular connection type.

Available via Controller Screen	Webserver via Ethernet RJ45	Modbus TCP/IP via Ethernet RJ45	Modbus RTU via 2 wire RS485	4-20 mA retransmission (x2)	Alarm Relay (x1)	Volt Free Operating Signal (x 1)	OPTIONAL ProfiNet Protocol Accessible via additional gateway	OPTIONAL Profibus Protocol Accessible via additional gateway
Indication of Dryer Operating	•	•	•			•		
Integrated P&ID Flow Chart	•							
Pressure P1	• (Vessel 1 pressure)	• (Vessel 1 pressure)	• (Vessel 1 pressure)	• (Online vessel only)			• (Vessel 1 pressure)	• (Vessel 1 pressure)
Pressure P2	• (Vessel 2 pressure)	• (Vessel 2 pressure)	• (Vessel 2 pressure)	• (Vessel 2 pressure)			• (Vessel 2 pressure)	• (Vessel 2 pressure))
Temp T1 (Heater temp)	•	•	•				•	•
Temp T2 (Regen temp)	•	•	•				•	•
Outlet PDP	•	•	•	•			•	•
Cycle (fixed or energy saving?)	•	•	•				•	•
Start function	•	•	•				•	•
Stop function	•	•	•				•	•
Machine status	•	•	•				•	•
Current Alarms	•	•	•				•	•
Alarms (history)	•							
System Information	•	•	•				•	•
Serial Number	•	•	•				•	•
Operation hours and cycle	•	•	•				•	•
Operation hours and counter	•	•	•				•	•
Logs	•							
Charts	•							
Alarm warnings that activate relays	•	•	•		•		•	•

Technical Specifications

Dryer Performance

Dryer Models	Dewpoint (Standard)		ISO8573-1:2010 Classification (Standard)	Dewpoint (Option 1)		ISO8573-1:2010 Classification (Option 1)	Dewpoint (Option 2)		ISO8573-1:2010 Classification (Option 2)
	°C	°F		°C	°F		°C	°F	
WVM 45 -750	-40	-40	Class 2:2:2	-70	-100	Class 2:1:2	-20	-4	Class 2:3:2

ISO8573-1 Classifications when used with OIL-X pre/post filtration.

Technical Data

Dryer Models	Minimum Operating Pressure		Maximum Operating Pressure*		Minimum Operating Temperature		Maximum Operating Temperature		Maximum Ambient Temperature		Electrical Supply (Standard)	Electrical Supply (Optional)	Connection	Noise Level
	bar g	psi g	bar g	psi g	°C	°F	°C	°F	°C	°F				dB(A)
WVM 45 -750	4	58	11	145	5	41	40	104	40	104	400V 3ph 50Hz	On request	Flange	80-85

*For higher operating pressure please contact Parker GSFE Division.

Flow Rates

Model	Pipe Size	Inlet Flow Rate				Average Power kW
		L/s	m^3/min	m^3/hr	cfm	
WVM 45	DN 50	125	7.5	450	265	3.6
WVM 60	DN 50	169	10.2	610	359	5.3
WVM 80	DN 50	222	13.4	800	471	6.8
WVM 125	DN 80	325	19.5	1170	689	9.5
WVM 155	DN 80	408	24.5	1470	865	12.8
WVM 210	DN 80	569	34.2	2050	1207	16.8
WVM 310	DN 100	847	50.9	3050	1795	25.4
WVM 370	DN 100	1028	61.8	3700	2178	30.8
WVM 520	DN 150	1403	84.3	5050	2972	41.8
WVM 615	DN 150	1681	101.0	6050	3561	52.6
WVM 750	DN 150	2028	121.9	7300	4297	59.5

Inlet flow rate relating to 1 bar(a) and 20°C; relating to the suction performance of the compressor, compression at 7 bar(g) and 35°C dryer inlet temperature, at 25°C ambient temperature, 60% relative humidity.

Product Selection & Correction Factors

For correct operation, compressed air dryers must be sized using for the maximum inlet temperature, maximum ambient temperature, minimum inlet pressure, required outlet dewpoint and maximum flow rate of the installation.

To select a dryer, first calculate the MDC (Minimum Drying Capacity) using the formula below then select a dryer from the flow rate table above with a flow rate equal to or above the MDC.

Minimum Drying Capacity = System Flow x CFMIT x CFMAT x CFMIP x CFOD

CFMIT - Correction Factor Maximum Inlet Temperature

Maximum Inlet Temperature	°C	25	30	35	40
	°F	77	86	95	104
Correction Factor		0.80	0.91	1.00	1.80

CFMAT - Correction Factor Maximum Ambient Temperature

Maximum Ambient Temperature	°C	20	25	30	35	40
	°F	68	77	86	95	104
Correction Factor		1.00	1.00	1.00	1.00	1.00

25% rel. hum. at 40°C; 37% rel. hum. at 35°C; 50% rel. hum. at 30°C; 70% rel. hum. at 25°C; 90% rel. hum. at 20°C.

For higher ambient temperature and/or higher relative humidity please contact Parker GSFE Division.

CFMIP - Correction Factor Minimum Inlet Pressure

Minimum Inlet Pressure	bar g	4	5	6	7	8	9	10	11
	psi g	58	73	87	100	116	131	145	160
Correction Factor		2.00	1.39	1.18	1.00	0.99	0.87	0.79	0.56

CFOD - Correction Factor Outlet Dewpoint

Outlet Dewpoint	°C	-20	-25	-40	-70
	°F	-4	-13	-40	-100
Correction Factor		0.95	0.95	1.00	*

*Selection for Dewpoint -70°C - Please contact Parker GSFE Division.

Controller Functions

Dryer Models	Controller Function							
	Power On Indication	Visual Fault Indication	Dewpoint Display	Dewpoint Switching Energy Saving Technology	Filter Service Indicator	Dryer Service Indicator	Fault Relay	4-20mA Dewpoint Re-transmission
WVM 45 - WVM 750	●	●	●	●		●	●	●

Filter Grades Included / Required / Optional

Included / Required	Required - To be ordered separately	Included with Dryer	Optional
OIL-X Grade WS or SFH Water Separator (installation dependent)			●
OIL-X Grade AO General Purpose Coalescing Filter	●		
OIL-X Grade AA High Efficiency Coalescing Filter	●		
WVM Adsorption Dryer		●	
Special AK_W on request - Contact Parker			●
OIL-X Grade AO General Purpose Dry Particulate Filter	●		

Filter Models Required* / Included / Optional

Model	Filter Connections BSPP / DN	Dryer Inlet			Dryer Outlet	
		Required		Optional	Required	Optional
		General Purpose Coalescing Filter	High Efficiency Coalescing Filter	Oil Vapour Reduction Filter	General Purpose Dry Particulate Filter	High Efficiency Dry Particulate Filter
WVM 45	2"	AOPX040H	AAPX040H	Special AK_W on request Contact Parker	AOPX040H	AAPX040H
WVM 60	2"	AOPX040H	AAPX040H		AOPX040H	AAPX040H
WVM 80	2"	AOPX040H	AAPX040H		AOPX040H	AAPX040H
WVM 125	DN 80	AO065N	AA065N		AO065N	AA065N
WVM 155	DN 80	AO065N	AA065N		AO065N	AA065N
WVM 210	DN 80	AO065N	AA065N		AO065N	AA065N
WVM 310	DN 100	AO070O	AA070O		AO070O	AA070O
WVM 370	DN 100	AO070O	AA070O		AO070O	AA070O
WVM 520	DN 150	AO075P	AA075P		AO075P	AA075P
WVM 615	DN 150	AO075P	AA075P		AO075P	AA075P
WVM 750	DN 150	AO080P	AA080P		AO080P	AA080P

*WVM Dryers do not include filtration. AO/AA Coalescing filters and AO Dry Particulate filters are mandatory and must be ordered separately.

Filtration Performance

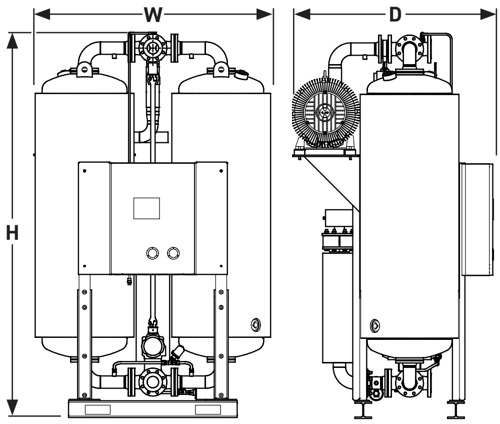
	General Purpose Coalescing Filter	High Efficiency Coalescing Filter	Oil Vapour Reduction Filter	General Purpose Dry Particulate Filter	High Efficiency Dry Particulate Filter
Filtration Grade	Grade AO	Grade AA	Special AK_W on request Contact Parker	Grade AO	Grade AA
Filtration Type	Coalescing	Coalescing		Dry Particulate	Dry Particulate
Particle Reduction (inc water & oil aerosols)	Down to 1 micron	Down to 0.01 micron		Down to 1 micron	Down to 0.01 micron
Maximum Remaining Oil Aerosol Content at 21°C	⩽0.5 mg/m³ (⩽0.5 ppm(w))	⩽0.01 mg/m³ (⩽0.01 ppm(w))		N/A	N/A
Maximum Remaining Oil Vapour Content at System Temperature	N/A	N/A		N/A	N/A
Filtration Efficiency	99.925%	99.9999%		99.925%	99.9999%

Required in addition to dryer above - To be ordered separately

	WVM 45 - WVM 750
OIL-X Grade WS or SFH Water Separator (installation dependent)	●
OIL-X Grade AO General Purpose Coalescing Filter (Required - to meet ISO 8573-1:2010 Classifications Stated)	●
OIL-X Grade AA High Efficiency Coalescing Filter (Required - to meet ISO 8573-1:2010 Classifications Stated)	●
OIL-X Grade AO General Purpose Dry Particulate Filter (Required - to meet ISO 8573-1:2010 Classifications Stated)	●
Inlet / Outlet Piping (Parker Transair aluminium piping recommended)	●

Weights & Dimensions - WVM 45-750

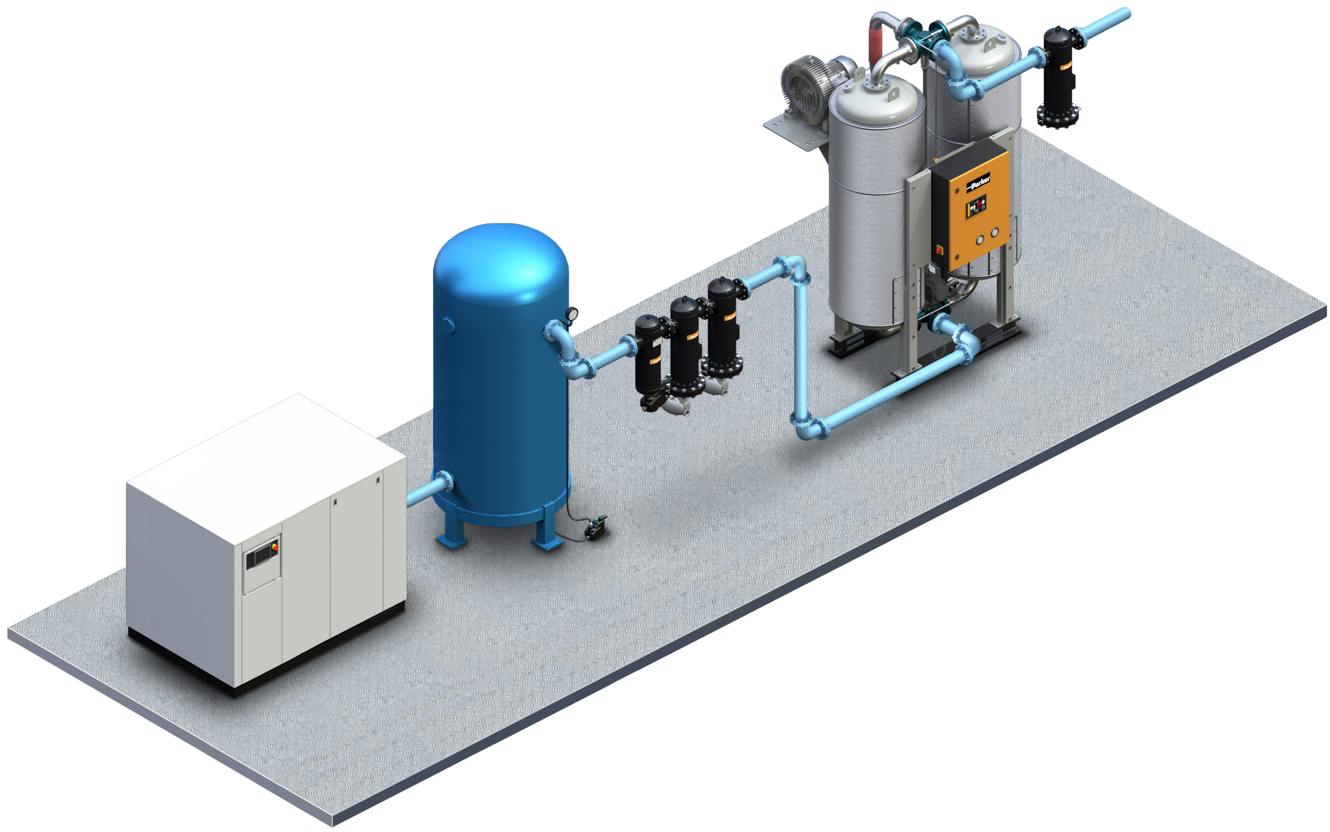
Model	Pipe Size	Dimensions (Dryer Only)						Weight (Dryer Only)	
		Height (H)		Width (W)		Depth (D)			
		mm	ins	mm	ins	mm	ins	kg	lbs
WVM 45	DN 50	2029	80	1222	48	1219	48	770	1698
WVM 60	DN 50	2029	80	1222	48	1219	48	800	1764
WVM 80	DN 50	2379	94	1222	48	1219	48	900	1985
WVM 125	DN 80	2151	85	1692	67	1412	56	1350	2977
WVM 155	DN 80	2301	91	1692	67	1412	56	1460	3219
WVM 210	DN 80	2751	108	1692	67	1462	58	1870	4123
WVM 310	DN 100	2692	106	2115	83	1702	67	2610	5755
WVM 370	DN 100	2992	118	2115	83	1702	67	2900	6395
WVM 520	DN 150	3210	126	2582	102	1910	75	4275	9426
WVM 615	DN 150	3460	136	2582	102	1910	75	4735	10441
WVM 750	DN 150	3450	137	2782	110	2010	79	5380	11863



Quality Assurance / IP Rating / Pressure Vessel Approvals - WVM 45-750

Development / Manufacture	ISO 9001 / ISO 14001
Ingress Protection Rating	IP54 Indoor Use Only
EU/UK	Pressure vessel approved for fluid group 2 in accordance with the Pressure Equipment Directive 2014/68/EU
USA	Approval to ASME VIII Div. 1 on request
AUS	Approval to AS1210 on request
For use with Compressed Air Only	

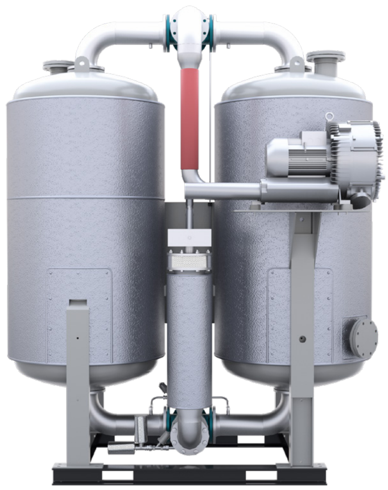
Example of a Typical WVM Installation



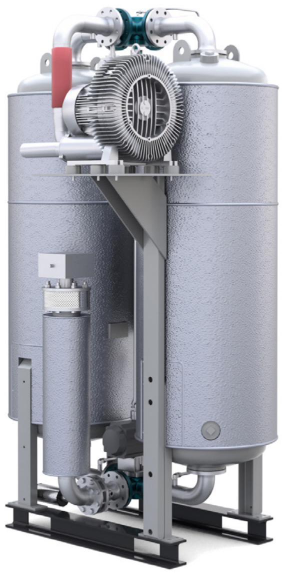
WVM Front View



WVM Rear View


WVM Heat Exchanger Options



Standard : WVM with Electric Heater

Option: WVM with Steam Heat Exchanger

Option: WVM with Steam Heat Exchanger & Electric Heater

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US Product Information Centre
Toll-free number: 1-800-27 27 537

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