OIL-X Grade OVR

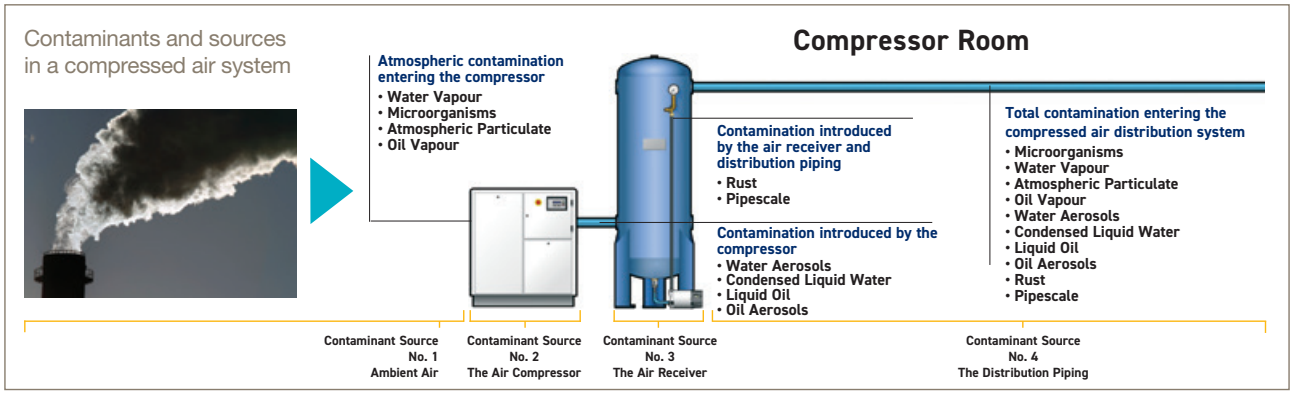
Oil Vapour Reduction Filter

Sizing & Selection

ENGINEERING YOUR SUCCESS.

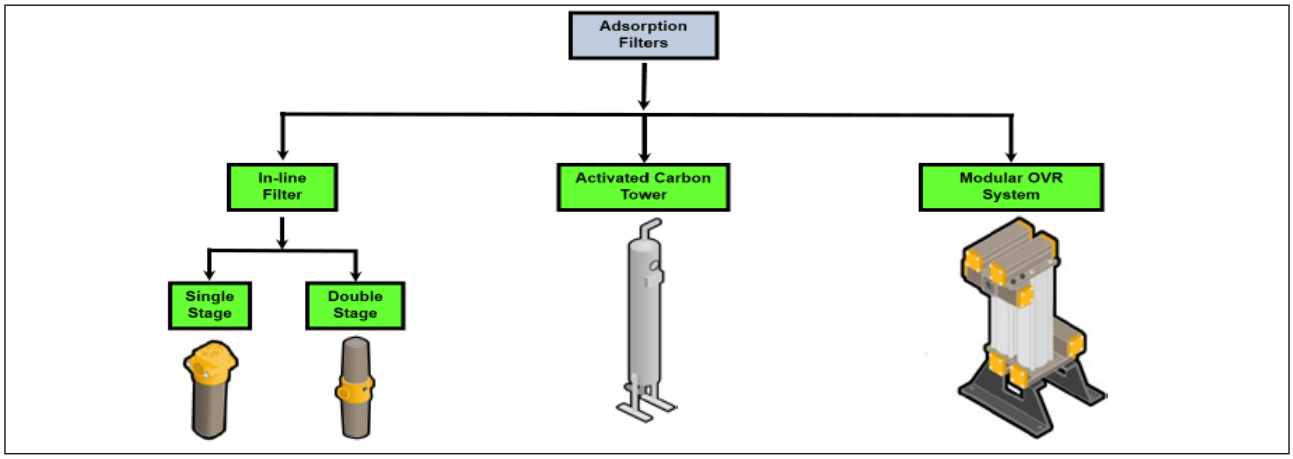
Oil vapour reduction

Oil vapour is oil in a gaseous form which enters the compressed air system in the atmospheric air drawn into the compressor intake. Oil vapours in the atmospheric air are unburned hydrocarbons from industrial manufacturing processes and vehicle exhausts. Air compressors also introduce oil vapour when operating (even oil-free designs can introduce vapour from crank case vents). Oil vapour in compressed air is reduced using an adsorption (activated carbon) filter. Activated carbon filters are only designed to reduce oil vapour and must be installed downstream of water separators (if liquid oil is present) and coalescing filters (which reduce oil aerosols). It is important that they are installed in the system in that order.



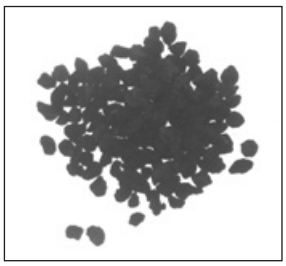
Oil vapour reduction technologies

Adsorption (activated carbon) filters come in a number of different designs. The following technologies are available from Parker.



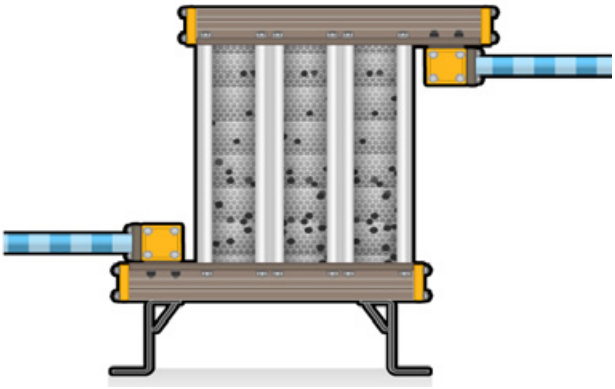
Adsorbent Materials

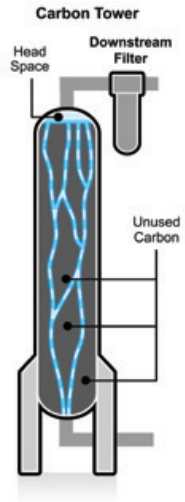
Typically, activated carbon filters employ one of 3 types of adsorbent. These are activated carbon cloth (100% carbon), paper or cloth impregnated with activated carbon (typically only 25-30% carbon) or granules of activated carbon. Parker utilise activated carbon cloth for grade ACS and granular activated carbon for grade OVR. In order to guarantee filtration performance, impregnated paper or cloth is not used as it does not offer sufficient adsorption capacity.



Operation of an Oil Vapour Reduction Filter

Oil Vapour reduction filters are adsorption filters and their operation is simple in comparison to coalescing filters used for oil aerosol reduction. Compressed air is passed over an adsorbent material (activated carbon) where the oil vapour content is reduced. The longer the contact time between the air and the adsorbent, the cleaner the compressed air becomes and the larger the adsorbent bed, the longer the lifetime. There are many different factors that affect the performance of an oil vapour reduction filter.



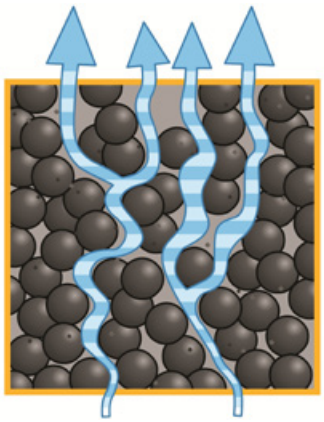


Loose Filled Carbon Tower

Oil vapour reduction requires a minimum contact time between the air and carbon to provide technically oil free air.

Loose filled designs suffer from movement of the carbon bed, bypassing much of the carbon material; therefore vessels are oversized and filled with excess carbon to give contact time. As the carbon can move, attrition takes place, creating dust which blocks downstream filters and leading to more attrition, reduced contact time and poor air quality.

Loose Filled Carbon

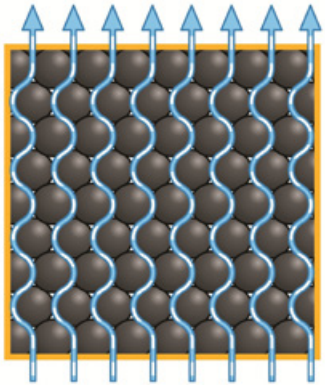


Contact Time = Air Quality

Snowstorm Filled Cartridges

OVR's unique technique for filling the carbon cartridges ensures maximum packing density is achieved. As the carbon is retained within the cartridge, no movement can occur; reducing the size of the carbon bed. Dusting is all but eliminated, leading to fewer element changes. The cartridge design & filling technique leads to 100% utilisation of the carbon material, consistent contact time and guaranteed oil vapour reduction performance.

Snowstorm Filled Carbon



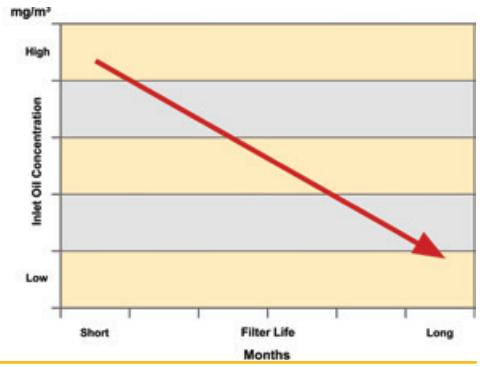
What factors affect the life of oil vapour reduction filters?

Unlike coalescing filter elements (oil aerosol reduction) which are changed on an annual basis, the life of the oil vapour reduction filter is dictated by a number of system parameters, these are:

- **The inlet concentration of oil vapour**
- **The presence of bulk oil**
- **The temperature of the compressed air**
- **The relative humidity or dewpoint of the compressed air**
- **Compressor oil changes**
- **Position of the filter in the system**

Inlet concentration of oil vapour

The inlet concentration of oil vapour will have an effect on the lifetime of the oil vapour reduction filter and the higher the inlet concentration of oil vapour, the quicker the capacity of the activated carbon is used up. As standard, OVR filters are sized based upon a maximum inlet concentration of oil vapour of 0.05mg/m^3 which should be suitable for most standard compressed air systems. If the inlet concentration is known to be higher, the OVR should be sized accordingly using the correction factors provided.

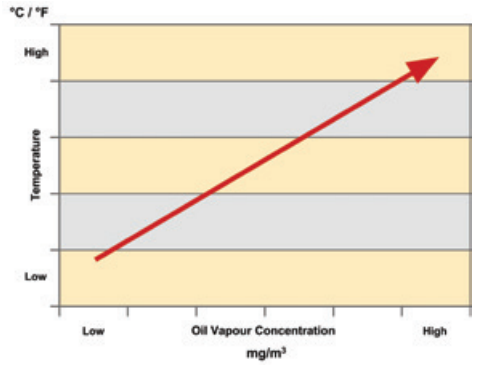


Bulk oil

Oil vapour reduction filters are designed only for the reduction of vapour, not liquid or aerosol. Poorly maintained or non-existent pre-filtration will rapidly use up the adsorption capacity of the oil vapour reduction filter. OVR should always be installed downstream of Grade AO & Grade AA coalescing filters.

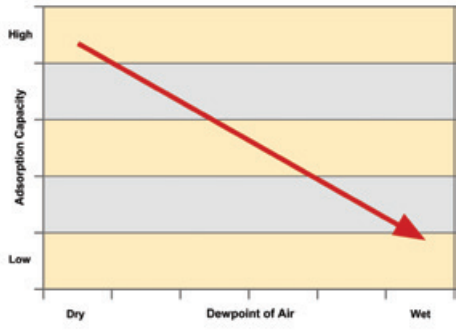
Temperature

The operating temperature of the compressed air will also have an effect on the life of the oil vapour reduction filter. Firstly, as air temperature increases, the adsorption capacity of the activated carbon will decrease. Secondly, due to the fact that different oil types vaporise at different temperatures, as the inlet temperature increases, so does the amount of oil vapour present in the air. OVR should always be sized using the correction factor which corresponds to the highest (summer) temperature reached by the compressed air.



Relative humidity or dewpoint

The relative humidity or dewpoint of the compressed air will also have an effect on the lifetime of the oil vapour reduction filter. Wet air reduces the adsorption capacity of the carbon by as much as 75%. It is recommended that the oil vapour reduction filter is fitted downstream of a compressed air dryer if possible, if not the OVR should be sized using the correction factor for wet air.



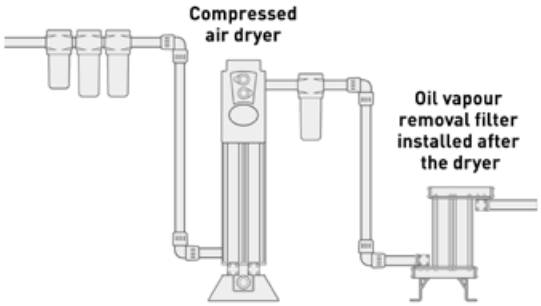
Compressor oil changes

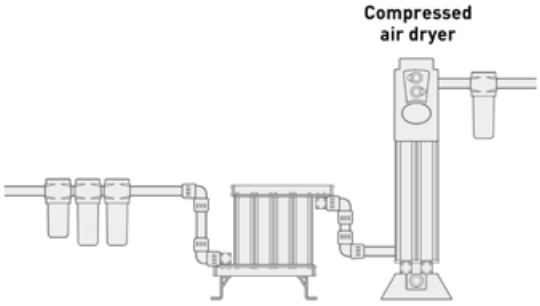
As the compressor oil is changed, the new lubricant contains hydrocarbons in the form of 'light ends'. For the first week or two following the oil change, the light ends will burn off which increases the oil vapour present in the air stream. This increase in oil content is adsorbed by the oil vapour reduction filter, using up its adsorption capacity and reducing its effective lifetime.

Position of the filter in the system

The position of the adsorption filter in the system will affect cartridge lifetime. Oil vapour reduction filters can be installed:

- **Downstream of coalescing filters and before a compressed air dryer**
- **Downstream of coalescing filters and after a compressed air dryer**

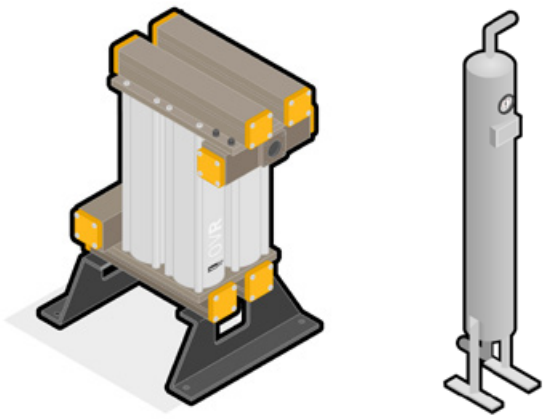




Activated carbon will preferentially adsorb water vapour over oil vapour, therefore if an activated carbon filter is installed before a dryer, the filter will need to be larger than a filter model fitted after the dryer. If fitted downstream of a heat regenerated adosrption dryer, the activated carbon filter should be sized for any increase in outlet temperature.

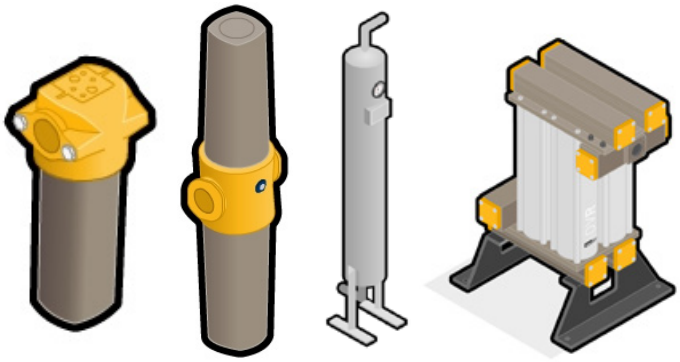
Which filter should I use?

- **Plant scale protection (compressor room installation)**
  - **Modular OVR system**
  - **Activated carbon tower**
- **Long maintenance periods**
  - **Modular OVR system (recommended)**
- **Installation**
  - **Before dryer**
  - **After dryer (recommended)**



Point of use protection

- **Modular OVR system**
  - **Activated carbon tower**
  - **Single stage in-line filter**
  - **Double stage in-line filter**
- **Long maintenance periods**
  - **Modular OVR system (recommended)**
- **Installation**
  - **After dryer (recommended)**



OIL-X Grade OVR

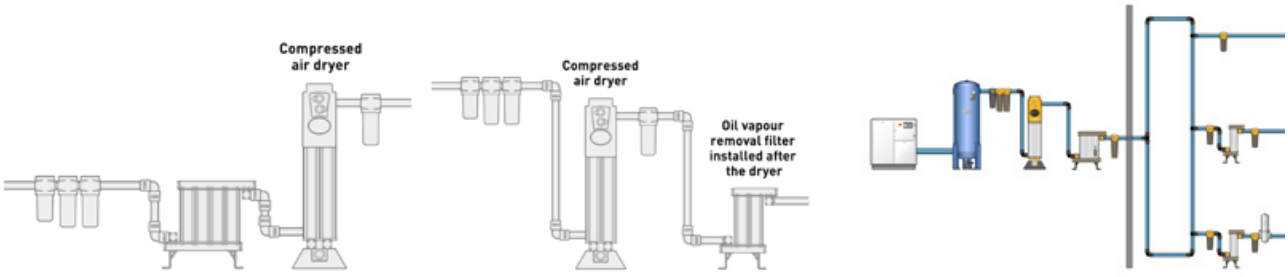
Unlike in-line adsorption filters or activated carbon towers, OIL-X Grade OVR adsorption filters are sized and selected to not only provide consistent air quality but to also provide 12 months of cartridge life and are the preferred Parker oil vapour reduction filter.

Where to position OVR
The adsorption filter is unique in that as long as it is downstream of the water separator and coalescing filters it can be installed in a number of different locations.

- **Before the dryer or after the dryer**
- **In the compressor room or at each point of use**

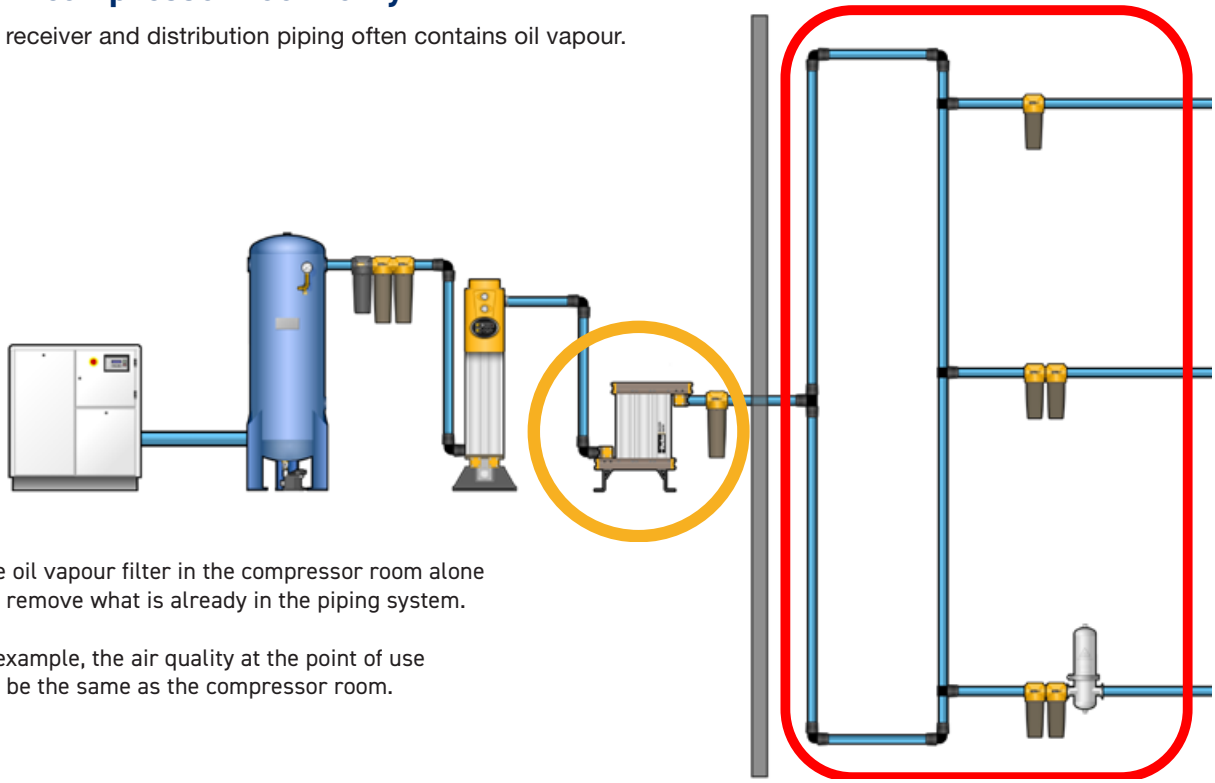
The best place to site a carbon filter is at the point of use as the air is cooler. Here the carbon adsorption capacity is increased and oil vapour content reduced.

Important Note: Knowing the intended position of the OVR prior to selection is important as this will have an impact on the size of the installed unit.



OVR in compressor room only

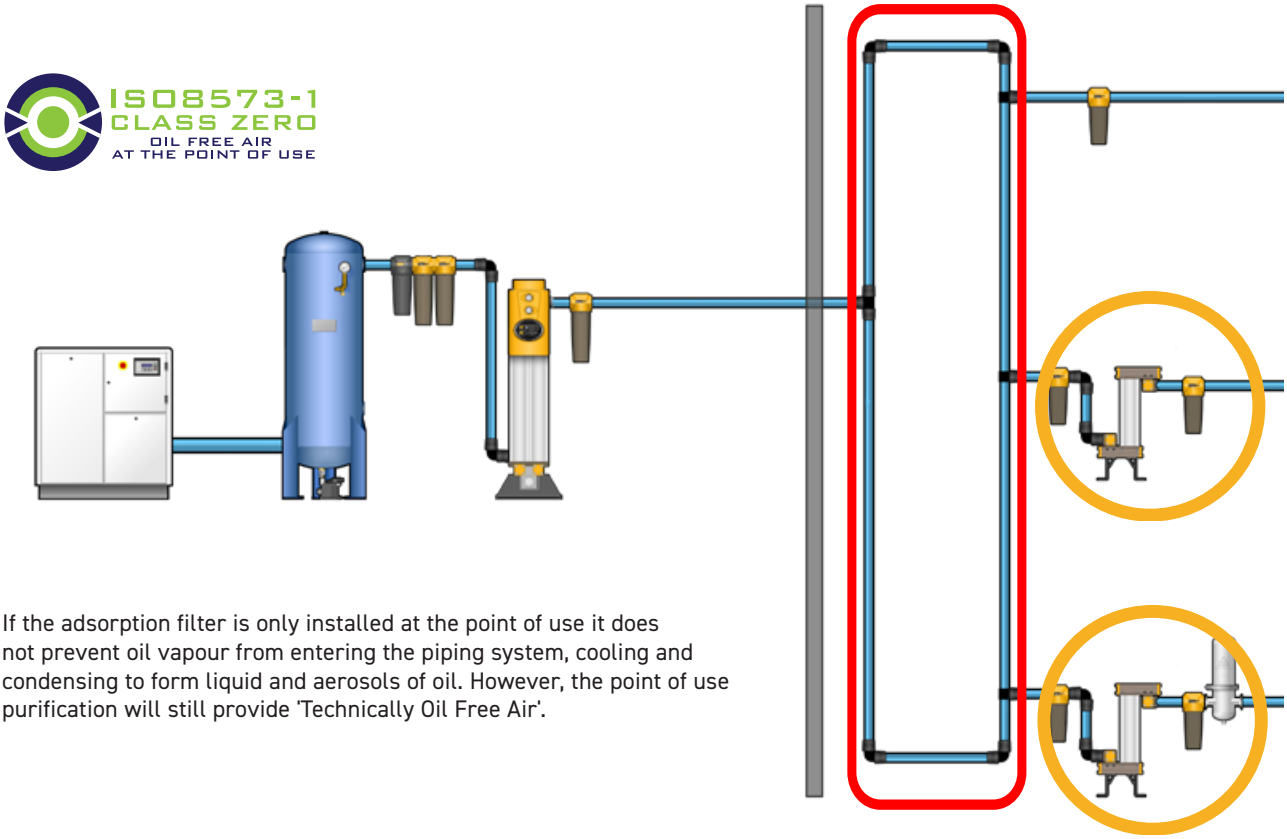
The air receiver and distribution piping often contains oil vapour.



A single oil vapour filter in the compressor room alone will not remove what is already in the piping system.

In this example, the air quality at the point of use will not be the same as the compressor room.

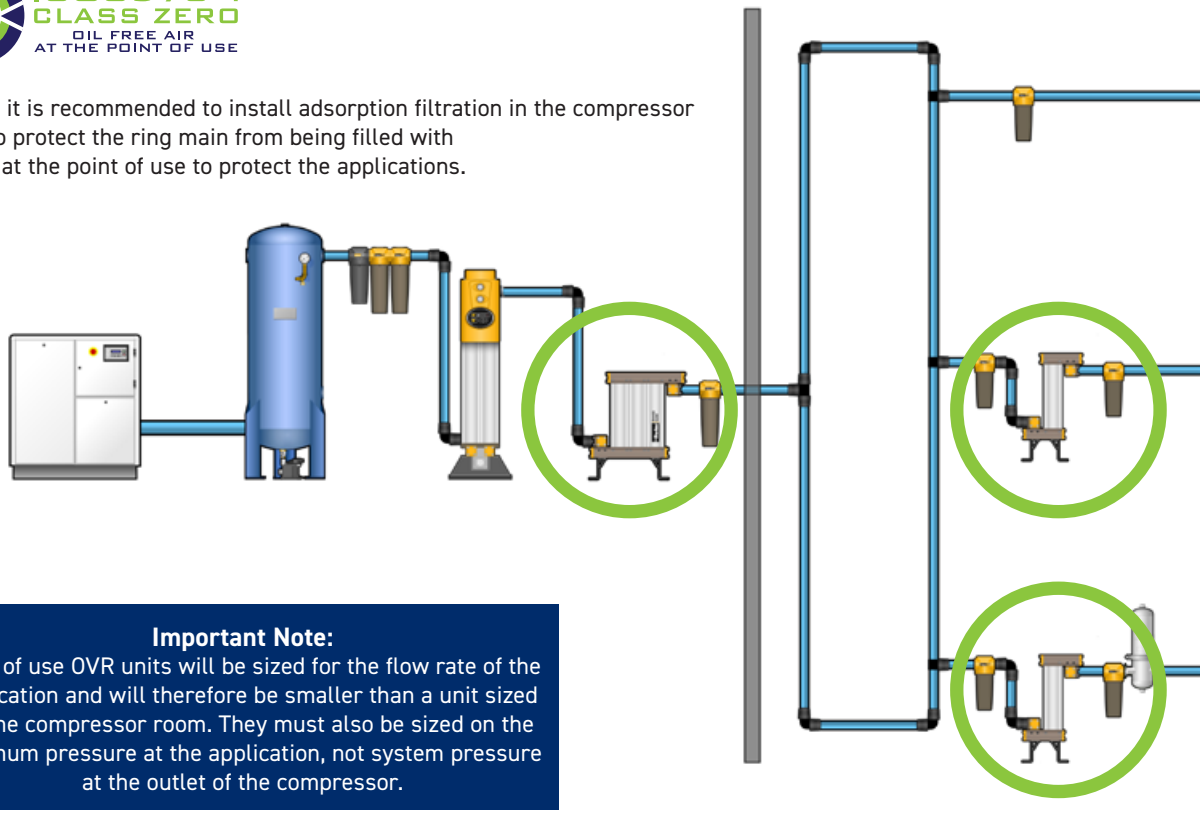
'Technically Oil Free Air' - OVR at point of use only



If the adsorption filter is only installed at the point of use it does not prevent oil vapour from entering the piping system, cooling and condensing to form liquid and aerosols of oil. However, the point of use purification will still provide 'Technically Oil Free Air'.

'Technically Oil Free Air' - OVR in compressor room and at point of use

Ideally, it is recommended to install adsorption filtration in the compressor room to protect the ring main from being filled with oil and at the point of use to protect the applications.



Important Note:
Point of use OVR units will be sized for the flow rate of the application and will therefore be smaller than a unit sized for the compressor room. They must also be sized on the minimum pressure at the application, not system pressure at the outlet of the compressor.

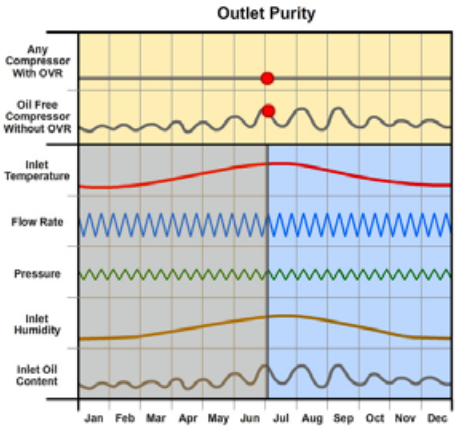
OVR product selection

To ensure correct air quality, OIL-X Grade OVR filters must always be installed downstream of OIL-X Grade AO General Purpose and Grade AA High Efficiency coalescing filters to ensure the reduction of oil aerosols.

Correctly selecting an OIL-X Grade OVR filter ensures both consistent air quality and 12 months lifetime from the activated carbon cartridges.

Product selection requires the literature flow rate of the unit to be adjusted to match the actual operating pressure and maximum (summer) temperature of the compressed air system, location of the unit within the compressed air system (before or after a dryer) and for the type of air compressor used (oil lubricated or oil free).

Typically, the inlet oil vapour concentration of a standard compressed air system does not exceed 0.05 mg/m^3, therefore the standard OVR literature correction factors do not include factors for inlet concentration. There are circumstances where by the inlet concentration of oil vapour is known to be higher. In such instances, the additional correction factors shown on page 8 should be applied.



ISO8573-1 CLASS ZERO
OIL FREE AIR AT THE POINT OF USE

1 System Information Required for OVR Sizing & Selection

- **Minimum pressure at the inlet of the OVR**
- **Compressor type (oil lubricated or oil free)**
- **Maximum inlet temperature at the inlet of the OVR (highest summer inlet temp)**
- **Maximum compressed air flow rate**
- **Dewpoint of the compressed air (i.e. is the proposed location of the unit before or after a compressed air dryer)**
- **Oil vapour concentration expected at the inlet of the OVR**

2 Select correction factors

- **For minimum inlet pressure, select a correction factor from the CFIP table that corresponds to the minimum inlet pressure of the compressed air system, remembering to always round down e.g. for 5.3 barg use the 5 barg correction factor.**
- **For maximum inlet temperature there are two tables, one for use with an oil lubricated compressor, the other for oil free compressor. Select a correction factor from the CFIT table for the relevant compressor type, remembering to always round up e.g. for 37°C use the 40°C correction factor.**
- **For pressure dewpoint, select a correction factor from the CFID table.**
- **For oil vapour concentration, select a correction factor from the CFIV table, remembering to always round up e.g. for 3.25g/m^3 use the correction factor for 4mg/m^3.**

3 Calculate minimum filtration capacity

Minimum filtration Capacity = Compressed Air Flow x CFMIT x CFMIP x CFID x CFIV

- **Using the minimum filtration capacity, select an OVR model from the flow rate tables.**
- **The OVR model selected must have a flow rate equal to or greater than the minimum filtration capacity.**
- **If the minimum filtration capacity exceeds the maximum values of the models shown within the tables, please contact Parker for advice regarding larger multi-banked units.**

Grade OVR Plant Scale / Point of Use Oil Vapour Reduction Filters

Filtration Performance

Filtration Grade	Filter Type	Particle Reduction (inc Water & Oil Aerosols)	Max Remaining Oil Content*	Filtration Efficiency	Initial Dry Differential Pressure	Initial Saturated Differential Pressure	Adsorbent Life	Precede with Grade
OVR	Oil Vapour Reduction	N/A	≤ 0.003 mg/m³ ≤ 0.003 ppm (w)	N/A	<350 mbar <5 psi	N/A	*12 months	AO + AA

*At system operating temperature and when corrected to match systems conditions.

Filtration Tested In Accordance With

Filtration Grade	**OVR**
Filter Type	Oil Vapour Reduction
Test Methods Used	ISO8573-5:2001
Oil Vapour Inlet Challenge Concentration	0.05 mg of oil vapour per cubic metre of compressed air

Flow Rates

Stated flows are for operation at 7 bar (g) (102 psi g) with reference to 20°C, 1 bar (a), 0% relative water vapour pressure.

Model	Pipe Size	L/s	m³/min	m³/hr	cfm	Replacement Cartridge	No.
OVRP300H G XX	2	80	4.8	289	170	P300OVR	1
OVRP350H G XX	2	163	9.8	586	345	P350OVR	1
OVRP400I G XX	2 ½"	326	19.6	1172	690	P400OVR	1
OVRP450I G XX	2 ½"	488	29.4	1758	1035	P450OVR	1
OVRP500I G XX	2 ½"	651	39.2	2345	1380	P500OVR	1
OVRP550I G XX	2 ½"	814	48.9	2931	1725	P550OVR	1
2 x OVRP550I G XX	2 ½"	1629	97.9	5862	3451	P550OVR	2
3 x OVRP550I G XX	2 ½"	2443	146.8	8793	5176	P550OVR	3
4 x OVRP550I G XX	2 ½"	3257	195.8	11724	6901	P550OVR	4
5 x OVRP550I G XX	2 ½"	4071	244.7	14656	8626	P550OVR	5

Select G for BSPP Threads / Select N for NPT Threads

Correction Factors Inlet Temperature (CFMIT)

Oil lubricated compressors		
°C	°F	Correction Factor
25	77	1.00
30	86	1.00
35	95	1.00
40	104	1.25
45	113	1.55
50	122	1.90

Correction Factors Inlet Temperature (CFMIT)

Oil free compressors		
°C	°F	Correction Factor
25	77	1.00
30	86	1.00
35	95	1.00
40	104	1.02
45	113	1.04
50	122	1.05

Correction Factor Minimum Inlet Pressure (CFMIP)

Minimum Inlet Pressure	bar g	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	psi g	44	58	73	87	100	116	131	145	160	174	189	203	218	232
Correction Factor		2.00	1.60	1.33	1.14	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Correction Factor - Dewpoint (CFID)

Installation	Correction Factor
After Dryer	1.00
Before Dryer	4.00

Correction Factor Inlet Vapour Content (CFIV)

Inlet Vapour Concentration mg/m³	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	2.0	3.0	4.0	5.0
Correction Factor	1	2	4	6	8	10	12	14	16	18	20	40	60	80	100

Notes

Notes

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