

Compressed Air Filters

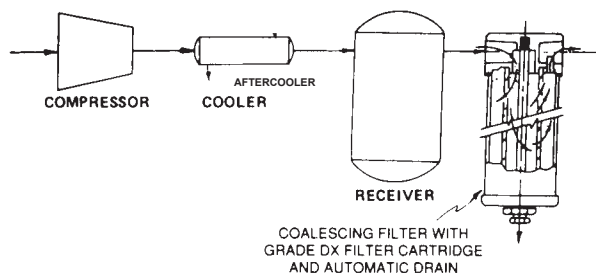
Filter Installation Recommendations

Recommendations for Typical Filter Installations

Selecting the proper location for a filter in a compressed air line is as important as selecting the proper filter. In most cases you will probably be able to base your own installation on these recommendations for typical installations.

Placing the Filter at the Compressor

The standard compressor installation consists of a prefilter (mounted on the compressor), a compressor, aftercooler, and a receiver. The Balston filter should be installed downstream from the receiver. In a system with an efficient aftercooler, the distance from the receiver to the filter is not important. Since the filter is usually maintained by the personnel responsible for the compressor, it is often convenient to install the filter downstream from the receiver. If there is no aftercooler, or the aftercooler is not efficient, coalescing filter be installed as close to the point(s) of use as possible.



Compressor Filter Specifications

Microfibre Filter Cartridge	Grade DX
Filter Housing	Determine filter size from flow chart on page 3, but port size must be equal to or larger than the line size
Automatic Drain	Recommended
Differential Pressure Indicator	Recommended

Some compressor installations do not have an aftercooler (this is an undesirable situation). Air saturated with water vapor leaves a compressor at 240°F to 400°F (116°C to 204°C). Without an aftercooler, the air cools close to room temperature in the distribution lines and water condenses throughout the air distribution system. About two-thirds of the total water content of the air

will be condensed when the air has cooled to 100°F (38°C). A filter located just before the main air line branches into smaller distribution lines will remove most of the water load from the system. The filter requirements for the main line are described above; they are the same as for a system with an aftercooler. However, since the air will continue to cool in the distribution system, additional filters located at end-use points will be required to remove water condensed downstream from the main line filter.

How to Obtain a Trouble-Free Coalescer

The mechanism of coalescing leads to three important considerations in selecting and installing a coalescing filter:

- 1 The filter should be large enough to ensure that the air exits the filter at low velocity and does not carry over coalesced liquid. Proper sizing of a Balston coalescing filter is easily done by using the recommendations or the maximum flow rate data. There is no danger on oversizing the filter. A Balston coalescing filter is even more efficient at extremely low flow rates than at its maximum rated flow capacity.
- 2 To avoid liquid carryover, the coalesced liquid should not be allowed to build up in the filter housing above the level of the bottom of the filter tube.

Rather than relying on operator attention to this easily-overlooked job, Parker Hannifin Corp. recommends automatic drains with all coalescing filters.
- 3 The flow direction through the Microfibre filter tube must be inside-to-outside to permit the liquid to drip from the outside of the tube to the drain in the filter housing. If installed outside-to-inside, the filter will at first function as a coalescing filter, but liquid will collect on the inside of the filter tube. Since there is no way of draining the liquid, the level will build up rapidly until it begins to be carried downstream by the air flow. The filter will work at removing liquids for a short time, and then not work at all. If the Balston coalescing filter exhibits these symptoms, reversing the flow direction will solve the problem.

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Removing Oil from Compressed Air

The source of oil in compressed air is the compressor lubricant. The common plant problems resulting from oil in the air are caused by liquid oil depositing in valves, instrument control surfaces, and other critical points in the air distribution system.

Balston often receives inquiries from users of compressed air about removing oil vapor from the air, yet the only reason for concern about oil vapor in most applications is that it may condense to liquid oil. Just like water vapor, oil vapor will condense to liquid when the temperature is reduced or the air pressure is increased at constant temperature. However, the table below shows that while in theory, condensation of oil vapor and water vapor are similar, in practice the effect of condensation of the two vapors is quite different.

Concentration of vapor, parts per million by weight (ppm) in air at 100 psig, at indicated temperature

	Petroleum Base Oil	Synthetic Oil	Water
80°F	0.012	0.002	2,743.
100°F	0.05	0.01	5,137.
125°F	0.2	0.06	10,508.
150°F	0.7	0.2	20,119.
200°F	3.5	2.4	62,371.

From the above figures, one can calculate that if 100 SCFM of air is filtered at 125°F to remove all liquids, and is subsequently cooled to 80°F, condensed liquids would consist of: water 3.6 lbs per hour, and either petroleum base oil 0.001 lbs. per hour, or synthetic oil 0.0003 lbs per hour. Condensed water is potentially a serious problem, but the quantity of condensed oil vapor is extremely small.

Field tests show that the liquid oil in air from a well-maintained reciprocating compressor is typically in the range of 15 to 30 ppm. With an oil-sealed rotary screw compressor, liquid oil content in the compressed air can vary from 10 to more than 100 ppm, depending upon the efficiency of the bulk oil separator. Compared to these figures, the approximate 0.2 ppm of liquid oil which could result from oil vapor condensation is for practical purposes negligible.

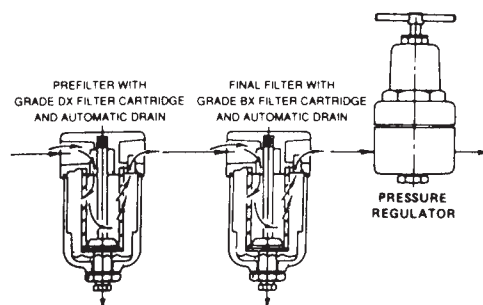
Therefore, removing the liquid oil from compressed air with a Balston coalescing filter, even at temperatures as high as 125°F, will eliminate the chance of oil-caused problems downstream in virtually all installations.

There are rare instances in which even 0.2 ppm oil vapor in the air or gas can cause a problem; for example, in contact with a sensitive catalyst or other highly reactive material.

In those cases, the trace quantity of oil vapor can be reduced using an adsorbent-loaded cartridge, following coalescing filter to remove the liquid oil.

Placing the Filter at the Point-Of-Use

Whether or not the system has an aftercooler, Balston strongly recommends a filter at each critical end-use point, even if a main line Grade DX filter has been used. The point-of-use filters will remove dirt and oil which may have been in the distribution lines, as well as water that has condensed downstream from the main filter. If there is a pressure regulator at the end-use point, the filter should be installed immediately upstream from the regulator. Alternatively, replace the existing regulator with a combination Balston filter-regulator.



Point-of-Use Filter Recommendations

Microfibre Filter Cartridge	Grade BX
Filter Housing	Size from flow chart or by line size
Automatic Drain	Recommended (refer to Page 18)

If there is no Grade DX filter upstream from the final filter, or if a significant amount of water or oil is expected, then a two-stage system, Grade DX followed by Grade BX, is required at each use point. The housing and automatic drain for the Grade DX prefilter should be the same as for the Grade BX final filter (if the flow capacities permit).

Even if the application is not particularly sensitive to impurities in the air - for example, an air-driven tool - it is still good practice to remove condensed water with a filter at the end of the line. Parker recommends a single-stage Grade DX filter with automatic drain.

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Using Filters With Air Dryers

Properly specified filters are relatively inexpensive protection for air dryers. Both refrigerated and desiccant dryers benefit from filter protection.

Refrigerated Dryers

A Grade DX prefilter with automatic drain should be installed upstream from a refrigerated dryer to prevent oil and condensed water from entering the dryer. Oil entering a dryer coats the cooling coil and reduces its efficiency; condensed water increases the cooling load and reduces dryer capacity. A dryer that was in operation before a Balston filter was installed may already have oil inside it. Therefore a second filter, a Grade BX filter with automatic drain, must be installed downstream from the dryer if oil-free air is required.

Desiccant Dryers

Desiccant dryers are very sensitive to water and oil droplets. Water can saturate the desiccant and reduce its drying efficiency or even destroy it. Oil can coat the desiccant, rendering it ineffective, or the oil can accumulate on the desiccant and create a combustion hazard when the desiccant is heated for regeneration.

For maximum protection of the desiccant dryer, a two-stage filter (Grade DX followed by Grade BX) system with automatic drains should be installed upstream from the dryer. To protect downstream delivery points from abrasive desiccant particles, a high efficiency filter with high solids holding capacity should be installed downstream from the dryer. The Balston Grade DX filter cartridge is recommended for this downstream installation location. (Note: All Balston desiccant dryers are equipped with prefilters and final filters, as recommended above).

Membrane Dryers

Membrane air dryers are sensitive to water and oil droplets. Oil can permanently damage the hollow fiber core. Balston Membrane Air Dryers are assembled with maximum protection, two stage coalescing filters (Grade DX followed by BX) designed to remove all contaminants down to 0.01 microns. Most all other membrane dryers are not assembled with adequate prefiltration protection and should be protected with a two stage Balston Filter System (Grade DX, Grade BX).

Maintaining The Filters

In a typical compressed air delivery system, a properly specified Balston filter cartridge can be expected to last for one year. The filter cartridge can continue to coalesce indefinitely, but solids loading in the depth of the cartridge will cause a pressure drop through the housing. The filter should be changed when the pressure drop reaches 10 psi. At pressure drops higher than 10 psig, the cartridge will continue to perform at its rated efficiency, but downstream instrumentation may be affected by the pressure drop.

To monitor the condition of the filters, install Balston Differential Pressure Indicators (DPI) on the filters or across a multi-filter installation. The DPI gives a visual indication of differential pressure through the filter cartridge. The Balston Differential Pressure Indicator is factory-installed on 1/4" and larger line size Balston Compressed Air Filter Assemblies. To use a DPI with a smaller Balston Compressed Air Filter, pressure taps must be provided with "tees" on the line upstream and downstream from the filter.