domnick hunter

OIL-X EVOLUTION

Making Compressed Air Filters More Efficient

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The all new range of domnick hunter OIL-X EVOLUTION aerosol and particulate removal filters redefine the standards in compressed air filter performance. All aspects of cartridge filter design have been considered with the sole purpose of providing compressed air to international quality standards while reducing the cost of ownership and the space envelope required for installation.

OIL-X EVOLUTION has been designed from the ground up with the key design focus concentrated in critical areas such as air flow management, filtration media selection & construction and the efficient removal of coalesced liquid.

OIL-X EVOLUTION has also been designed to be fully compliant with the forthcoming changes to the international standard detailing the method for filter testing.

Air Flow Management for Low Energy Consumption

The design of a compressed air filter housing is critical as it can directly affect system pressure losses, which in turn result in higher operating costs for the user. The pressure loss or pressure drop of a filter housing is a fixed ownership cost. Only through careful design, can this fixed cost be kept to an absolute minimum.

The Inefficient Corner

Due to installation restrictions and for ease of maintenance, compressed air filters are designed to be installed vertically 90 degrees to the piping system. This design restriction therefore requires the air stream to turn a corner and, in a typical compressed air filter, the air is turned sharply through 90°.

In aerodynamic terms, this sharp turn is known as an inefficient corner. In a compressed air filter, an inefficient corner leads to turbulence, system pressure loss and high running costs. ***(see figure 1)***

What Causes the Turbulence?

The core of the approaching air stream is projected against the outside wall of the turn. Part of the flow is reversed and a vortex pair produced, the remaining air continues downstream in a slightly more uniform manner. The vortex pair have the effect of narrowing the flow path through the corner, throttling the air flow and increasing pressure losses.

Making the Inefficient Corner Efficient

To improve air flow and reduce turbulence, the sharp corner should be made rounded and smooth. The rounded corner produces a different type of flow as the air stream lines diverge near the outside wall of the turn and converge on the inside wall.

Compressed air filters using this design offer improvements over those using a sharp corner to turn the air stream as turbulence induced pressure losses are reduced.
(see figure 2)

It has been found that through the use of partitions (turning vanes) in the air flow, inefficient corners are greatly improved as they are separated into a number of more efficient corners.
(see figure 3)

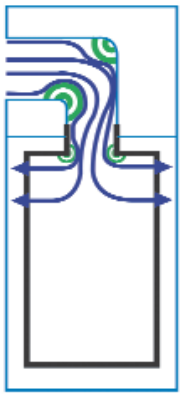

figure 1
Traditional method of air flow

figure 2
Uneven air flow distribution

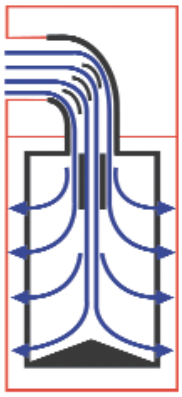

figure 3
Air flow management for low energy consumption

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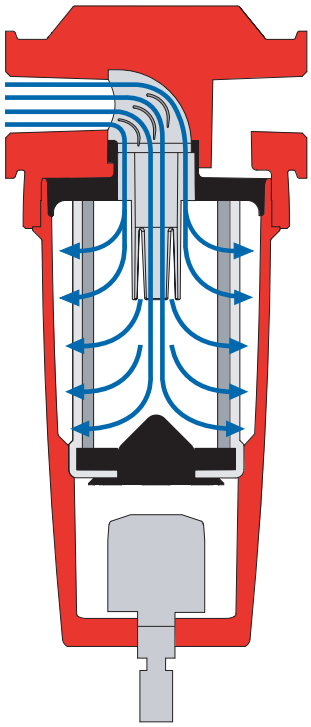
The OIL-X EVOLUTION Design

The OIL-X EVOLUTION filter range has been designed to eliminate all unnecessary pressure losses. As the air stream enters the housing, a "bell mouth" inside the inlet port reduces the level of turbulent flow entering the vessel.

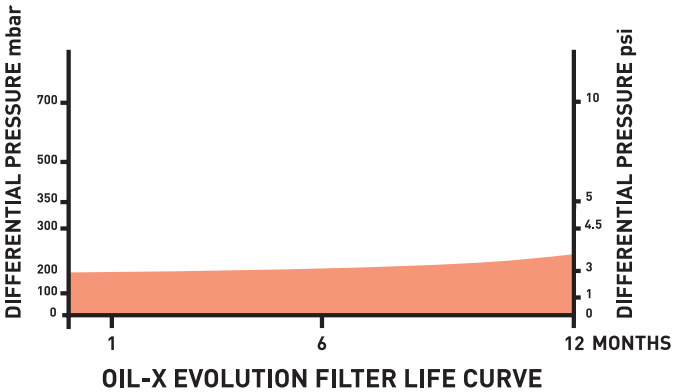
The air stream then enters the full flow inlet conduit of the filter element top endcap where it is turned through 90 degree using a full radius blended bend.

Turning vanes within the inlet conduit split the 90 degree corner into a number of smaller, more efficient corners. The air stream is therefore channeled, reducing turbulence and pressure losses.



Terminating the conduit directly after the 90 degree change in direction can cause additional areas of turbulence, resulting in increased energy consumption and uneven usage of the filter media. The OIL-X EVOLUTION filter element employs a flow distributor to ensure the air stream is evenly distributed throughout the filter element for maximum filtration performance and energy efficiency.

To prevent additional turbulence from air hitting the lower element endcap, a conical flow diffuser is employed to ensure smooth and efficient air flow.



OIL-X EVOLUTION FILTER LIFE CURVE

Filtration Performance & Operational Costs

Correct filtration media selection and construction is key to achieving compressed air to the highest quality and also ensures system operating costs are kept to a minimum. The pressure loss and thus the operating costs of a filter housing is fixed, however the operating costs incurred from the filter element are incremental.
A poorly selected filter media could not only result in contamination being carried downstream, but also a filter element which requires frequent maintenance and has a high cost of ownership.

Filtration Media Selection & Construction

OIL-X EVOLUTION filter elements have been designed to provide the highest air quality to international standards while keeping incremental operating costs to a minimum.

Typical compressed air filters 'soak up' oil and water and are said to run in a saturated state. The saturated media temporarily blocks the path of compressed air through the normally open filter structure and increases the pressure loss as the air flow has to force liquids through the fine matrix of the filtration media. This pressure loss increases throughout the life of the element as the filter media becomes blocked with particulate and this directly relates to the operating cost of the filter.

OIL-X EVOLUTION filter elements have been designed to provide a very low initial saturated pressure loss which stays low throughout the 12 month guaranteed life of the element.

To achieve this, the filter media selected for OIL-X EVOLUTION is a borosilicate glass nanofiber with 96% open area or voids volume, providing an extremely high dirt holding capacity. A special oleophobic coating is also employed to actively repel oil and water, ensuring the open area is kept to a maximum for dirt entrapment.

Additionally, the surface area of the cartridge has also been maximized by using 'deep pleat' media beds, a first for the industry. Deep pleating provides surface areas up to 5 times greater than filter elements using a standard wrapped construction. This allows the overall filter size to be reduced and ensures that the pressure loss of the filter, starts low and stays low throughout it's life.

High efficiency grade filter elements also use a graded density media pack. This consists of two grades of filter media within the pleat pack. A course pre-filter layer protects the fine layer from premature blockage, improves air flow and, therefore, helps keep the operating costs lower for longer.

aerospace technology

Efficient Removal of Coalesced Liquids

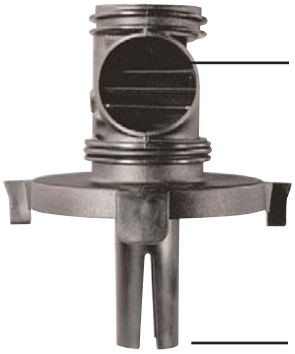
Once liquids are removed from the air flow, they must be prevented from being re-entrained back into the clean air and carried downstream. It can be said that a coalescing filter is only as good as its liquid drainage mechanisms. OIL-X EVOLUTION filters incorporate many advanced design features to ensure that all coalesced liquids are effectively and efficiently removed.

The anti re-entrainment systems incorporated into the OIL-X EVOLUTION filter range provide high liquid removal properties, low pressure loss and excellent temperature and chemical compatibility.

Typically, the liquid coalesced by a filter forms a wet band around the bottom of the filter element from where it eventually drops into the filter bowl and is discharged by the drain. Because of this wet band, designers would usually incorporate a quiet zone into their filter housings to ensure that air does not flow through this area and cause re-entrainment.

The anti re-entrainment barrier employed by OIL-X EVOLUTION not only ensures that liquid contaminants are rapidly removed before they can be carried downstream, but are also re-located under the filter element away from direct air flow. This eliminates the potential for re-entrainment. It has also allowed the removal of the quiet zone, thus resulting in a more compact and lightweight product.

Additional liquid removal is also provided by surface tension breakers in the lower element endcap and drainage ribs cast into the filter housing. The drainage ribs compress the anti re-entrainment barrier ensuring the speedy removal of the liquid through capillary action.



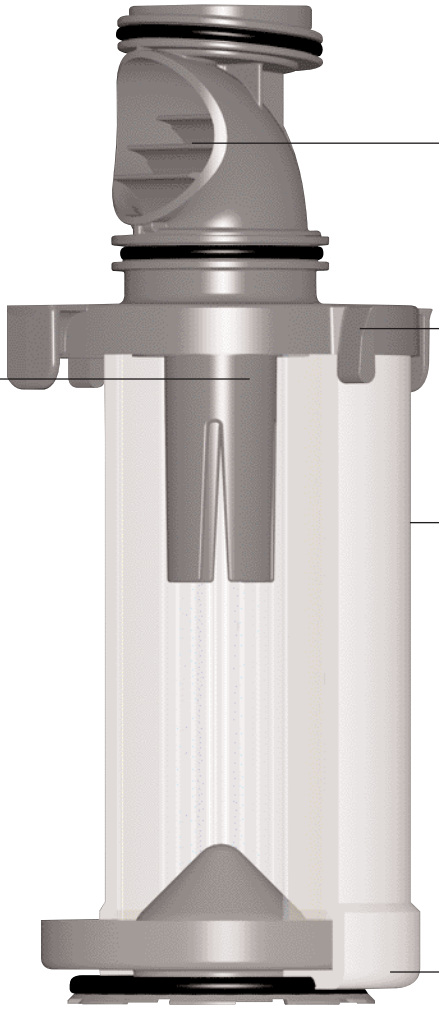
Full Flow Inlet
Inlet conduit matches inlet diameter, reducing pressure drop and running costs.

Even Flow Distribution
Air flow is distributed evenly throughout the filter element using a flow distributor.

Deep Bed Pleating
For particle and aerosol removal, deep bed pleating provides 4.5 x more filter media than an ordinary element, giving a larger filtration area, increased dirt holding capacity, lower running costs and a more compact filter element. Graded density further improves life and overall performance.

Special Filter Media
Oleophobic filter media actively repels oil and water to reduce pressure drop and keep running costs to a minimum.

Conical Air Diffuser
Air flow distribution is further improved by elimination of turbulence.



Aerospace Turning Vanes
Turning vanes effectively direct air flow into the filter element.

Air Stabilizers
Smooth outlet air flow.

High Efficiency Drainage Layer
Ensures coalesced liquids are removed quickly and efficiently.

Drainage Ribs
Filter housing and element integrate to provide capillary action which greatly improves liquid drainage.

No Wet Band Formation
Allows 40% more air flow through a smaller filter element.

OIL-X EVOLUTION

The Most Energy Efficient Compressed Air Filters in the World

An OIL-X EVOLUTION filter installed in a compressed air system using a 185KW compressor, could annually save the user up to 60% per filter in energy consumption when compared to a traditional filter. (Reference : traditional filter initial saturated dp 4.5 psi, pressure 100 psi g, 6000 hours operation)

This radical design exercise not only includes modern and useful technology, but incorporates 40 years of filtration know-how. domnick hunter invented the compressed air filter in 1963 and this all new high efficiency filter range is truly an evolution resulting in the most energy efficient filter of its type in the world.

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