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# SPECIFYING A SELF-CLEANING FILTER - WHICH TYPE IS BEST FOR YOU?

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Whilst achieving the basic objective of accurately removing contamination from liquids, modern self-cleaning filtration systems offer a wealth of benefits over traditional bag or cartridge filters. With a range of designs available, which is best for your application?

## IS A SELF-CLEANING FILTER RIGHT FOR YOU?

***A wide range of self-cleaning filters***

Self-cleaning filters are replacing traditional bag or cartridge filters in coatings, adhesives, water, resins, food processing and various other liquid processing plants around the world. They offer substantial benefits in terms of **productivity, product quality, cost savings and operator health & safety.** If these factors are important to you and your company you should read on...

There are several varieties of self-cleaning filter, each employing a different cleaning method. The various cleaning mechanisms are often grouped into two categories; contact and non-contact.

Non-contact filters employ a back-flushing system which unblocks the filter apertures, normally using a reverse flow of filtered liquid. This article focuses on contact type filters which use physical contact between the filter media and a cleaning mechanism to keep the filter element clear of debris.

This self-cleaning action ensures that the screen remains clear of blockages, which in turn gives consistent throughput rates and prevents a build up of differential pressure. Without a self-cleaning mechanism, traditional bag or cartridge filters can only operate at maximum throughput for a limited time. Oversize material quickly builds up inside the bag or cartridge, blocking the apertures.

This blinding effect reduces the porosity of the filter, causing a reduction in filtration area and quite often a reduction in aperture size, resulting in a fall in throughput rates. Differential pressure subsequently builds up leading to the possibility of the filter bag apertures deforming and allowing some oversize particles through. In extreme cases the bag may burst, causing catastrophic downstream contamination and potentially ruining an entire batch of product.

### Increased Productivity

Unlike bag filters, self-cleaning units do not require regular processing interruptions to replace the filter element. This increase in uptime improves productivity and reduces operator involvement. Bag replacement is traditionally a messy process, which inevitably results in some product loss and a great deal of operator time.

Well designed self-cleaning filters also offer the benefit of simple assembly and dis-assembly. Some manufacturers state that screen changes, product changeovers or cleaning procedures are one man, tool-free operations that can be completed in minutes.

In addition to the cost of regular downtime and product loss, conventional bag or cartridge filters incur high costs in terms of media replacement and disposal. Self-cleaning filter elements are reusable as they can be cleaned rather than thrown away as landfill like a disposable bag or cartridge.

Historically, self-cleaning filters have failed to penetrate some areas of the filter market as their initial cost can be higher than bag or cartridge systems. Over time however, self-cleaning filters can achieve a similar level of cost effectiveness when

***Eco Filters can be mounted horizontally to provide total installation flexibility.***

safety, convenience and ongoing operational savings are taken into account. Although replacement bags and cartridges are relatively inexpensive, the cost of regular replacement soon begins to add up. Process managers are now beginning to realise that by eliminating the need to stock and dispose of consumables, self-cleaning filters can offer a short payback period.

### Improved Product Quality

A range of filter elements are available to meet the specific demands of various applications. Traditionally the filter elements are made from slotted wedge wire which provides excellent screening capacity. Alternatively, defined hole screens are available which have individual circular holes, allowing greater screening accuracy down to 10 microns.

### Operator Health & Safety

Self-cleaning filters offer screening in a totally enclosed system, there is no chance of splashing the local environment or operators with potentially toxic or hot liquids. This simultaneously prevents external contaminants from entering the product. As the units do not need to be opened to change filter media when they block, they also eliminate fumes entering the atmosphere when processing solvent based materials.

Changing a bag filter in a molten resin process, for example, requires operators to wear protective face shields and high temperature gloves. They also wear respirators to eliminate the potential risks from exposure to dangerous resin fumes. Bags and cartridges can also become cumbersome and difficult to handle when full. Totally enclosed self-cleaning filters eliminate the need for this safety equipment and create a safer working environment for operators.

Totally enclosed self-cleaning filter systems eliminate all of these risks to health & safety and also offer substantial environmental advantages. The Russell Finex Eco Filter recently won an IchemE award, which recognises outstanding contributions to safety, the environment and sustainable development of the process industries. The elimination of bag disposal and spillage were recognised as critical advantages in liquid processing.

## WHICH DESIGN SHOULD YOU CHOOSE?

There are two common designs of contact filters: Disc cleaning filters and Blade type filters. Each has its own set of advantages and disadvantages...

### Disc Filters

Disc cleaning filters operate with the flow of material starting inside the cylindrical filter element. Good product passes through the apertures to the outside and oversize contamination is trapped within.

A circular cleaning disc is plunged up and down within the filter element, wiping it clean and pushing oversize material to the bottom of the filter. The debris is removed via a valve in the sump section.

The disc can be set to plunge continuously, however, as the plunger moves up and down, fluctuations in differential pressure and product flow can take place. The plunger can therefore be activated on a timed or pressure basis. An additional control unit is needed to monitor the pressure or time the intervals between plunges.

A common problem with disc filters is caused by the reciprocating shaft. As the shaft withdraws from the filter body it can draw product through the seal, exposing it to the working environment. Long term product leakage in this area is not uncommon.

Disc filters can only be mounted vertically and require headroom equivalent to the length of the filter for disassembly as access can only be achieved through the top section. On some of the larger units special lifting devices may be needed to aid disassembly due to the weight of some components. Disc filters also traditionally have the inlet (top) and outlet (bottom) on the same side making it more difficult to be piped in-line.

### Blade Filters

Traditionally blade type filters operate in the opposite direction with the flow of material starting on the outside of the filter element. Good product flows through the apertures to the inside of the cylindrical element, trapping oversize particles outside. This design normally incorporates a static wiper which cleans the outside of a rotating filter element. As apertures become blocked by oversize particles, differential pressure builds up. The element can, therefore, be set to rotate when pressure reaches a set level.

These blade filters do not positively move oversize material to the sump section. When combined with an inlet and outlet at the top of the unit a 'dead' area can be created at the bottom of the filter where there is no product flow. In viscous materials the solids may not settle into the sump section and can lead to blockage of the whole system.

### Eco Filters

***The Finex Self-Cleaning Eco Filter***

A third type of filter is offered by Russell Finex, who believe that their Eco Filter combines the advantages of blade and disc filters. The flow of material in the Eco Filter goes from the inside to the outside of the filter element, much like the disc filter.

The screen is cleaned using a wiper similar to a blade filter. This design differs further from the blade filters as it employs a static screen and a continually rotating wiper inside the element.

The Eco Filter can be specified with a straight wiper or a unique SpiroKlene™ wiper. The SpiroKlene™ continuously wipes the inside of the filter element and positively moves oversize material into the sump section with a corkscrew action. This method requires no control unit to monitor the filter's performance.

The seals on a spiral wiper filter rotate internally on a shaft, allowing them to work under greater pressure and in various processes without the leakages that are common on disc filters.

***Self-Cleaning Eco Filters can meet individual capacity requirements.***

The design of the SpiroKlene™ means that the movement of oversize material to the sump section is not reliant on gravity. This allows the Eco Filter to be mounted horizontally as well as vertically, providing a greater amount of flexibility when fitting into a process line. The Eco Filter range also includes in-line and on-line designs, giving total installation flexibility.

The horizontal filter is even simpler to dis-assemble than the vertical model as the sump section is supported by a swing arm, meaning operators do not have to bear the weight of this section during strip-down.

All styles of self-cleaning filter collect oversize material in the sump section.

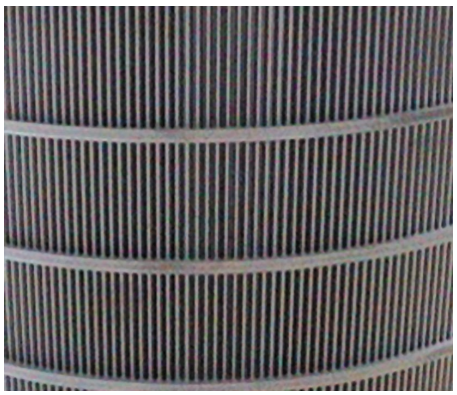
This material can congeal and solidify, preventing it from being discharged when the valve is opened. To overcome this problem the Eco Filter has an agitator fixed to the end of the rotating shaft. As it turns along with the wiper it effectively keeps the oversize material moving in the sump, preventing it from solidifying.

## SPECIFYING YOUR FILTER

Once you have chosen a filter design and sized it to suit your process, there are several other options to consider when tailoring it specifically for your application.

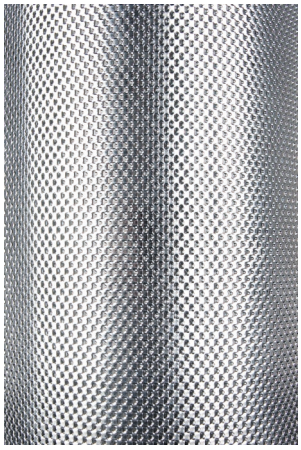
### Selecting a filter element

Selecting a filter element involves choosing the correct aperture size and method of construction. If your application necessitates high capacities, a wedge wire screen is most suitable. Its slotted design offers continuous slot openings allowing good material to pass through with ease. Its long, narrow apertures do, however, allow elongated oversize particles to pass though as good product.



***Wedge Wire filter screens allow high capacity filtration.***

If you require a greater amount of accuracy to ensure your product is beyond criticism, a defined hole microscreen may be more appropriate, for example in the Russell Filter range, the stainless steel microscreen has an aperture size which is precisely defined in two dimensions, giving far greater accuracy down to 10 microns. This ensures that oversize material is accurately removed, allowing your product to meet your stringent quality requirements. Magnetically detectable stainless steel screens are also available specifically for the food industry.



***Defined hole screens have apertures which are defined in two dimensions, giving greater screening accuracy.***

## Filter Management Systems

***A Filter Management System (FMS)***

A Filter Management System (FMS) is also offered by manufacturers such as Russell Finex to completely automate your filtration process. This system continuously monitors the filter's performance, releasing the discharge valve at timed or pressure monitored intervals. This enables the filter to be efficiently run without operator involvement, further reducing labour costs and increasing productivity.

Once the FMS has been installed it also eliminates the possibility of inefficient dumping of oversize material that occurs when conducted manually. If the valve is released too frequently some good product is removed which would have otherwise passed through the filter media. Infrequent release can lead to the build-up of oversize material inside the filter, causing differential pressure to rise, reducing the capacity of the filter.

## Specialist options

Jacketed options are available for filtration of products such as chocolate which need to be kept above ambient temperature.

***Jacketed options are available for high temperature filtration.***

The jacket allows heated water or oil to circulate around the body of the filter. This helps to maintain a constant temperature for the product and prevents it solidifying. High temperature units are also available, capable of handling liquids such as cooking oils and resins up to temperatures of 250°C.

A self-contained mobile filtration system is also available where the filter and a pump are mounted on a wheeled skid. This option is ideal for multiple filling lines or where quick product changes are required to minimise downtime.

## Conclusion

The cost savings achievable through increased uptime and the elimination of bag or cartridge stocking/disposal means that a self-cleaning filter can achieve rapid return on investment. Over a comparatively short period of time it can become more cost effective than a bag or cartridge system as running costs are substantially reduced.

The benefits of self-cleaning filters over traditional bag or cartridge filters are significant. With an ever increasing focus on productivity, efficiency and health & safety there is no reason to continue using messy, disruptive and often dangerous traditional filtration methods.

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