



Science.
Applied to Life.™

Separation and Purification
Sciences Division

Filtration solutions for distilleries.

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That's the spirit

From the purest single malt whisky to a perfectly curated brandy, many spirits are aged for decades and some can be worth in excess of thousands of pounds per bottle. As the value of a spirit is often much more than any other beverage per litre, reducing waste and loss can vastly improve economics within the distilling process.

The answer to reducing loss can be found in moving away from traditional filter presses to fully enclosed depth filters, as well as by utilising high solid loading filter cartridges with superior throughput performance and low hold up. In fact, with the correct filtration choices, not only can waste be reduced but the service life of filters can be dramatically increased; lowering the total cost of production.

Consumer perceptions of quality also often demand a spirit free of haze and particulate, but how do distillers ensure that the clarity and longevity of their pride and joy withstands the time taken to create?

By properly analysing the clarification and final filtration processes, distillers can polish the spirit and reduce visible haze. There are also options to drive costs down by filtering spirits before tanker loading, delivering a cleaner spirit to the bottling hall.

Distilleries around the world use 3M because of:

Performance

3M systems help to deliver economical answers to the filtration needs of the distillery.

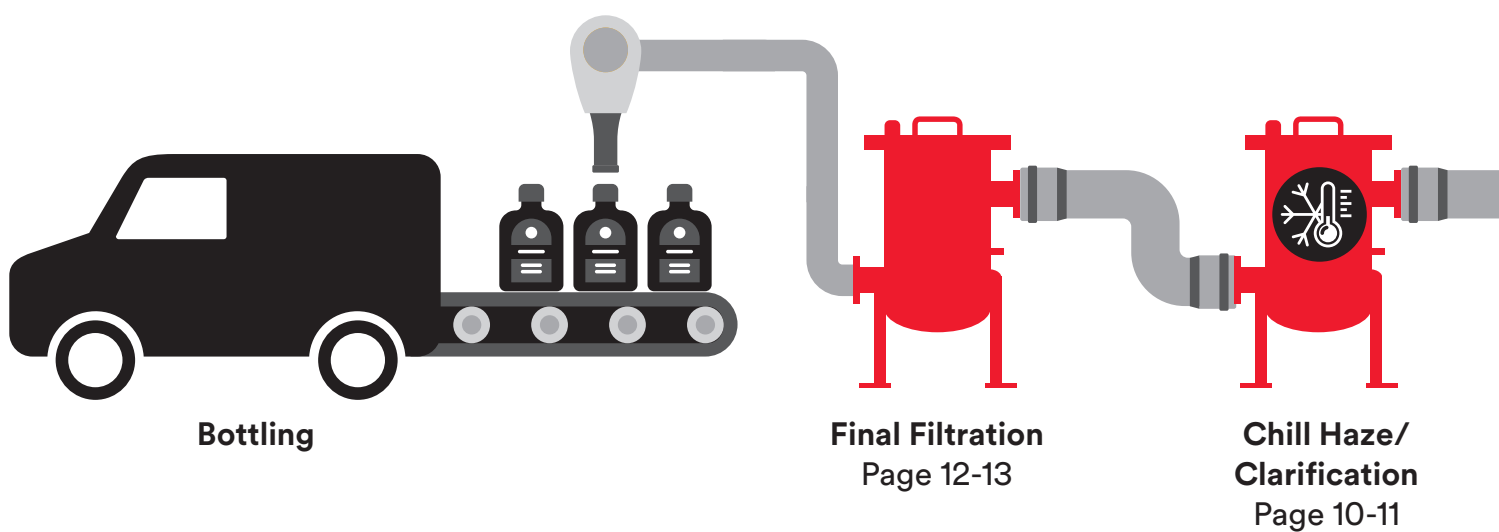
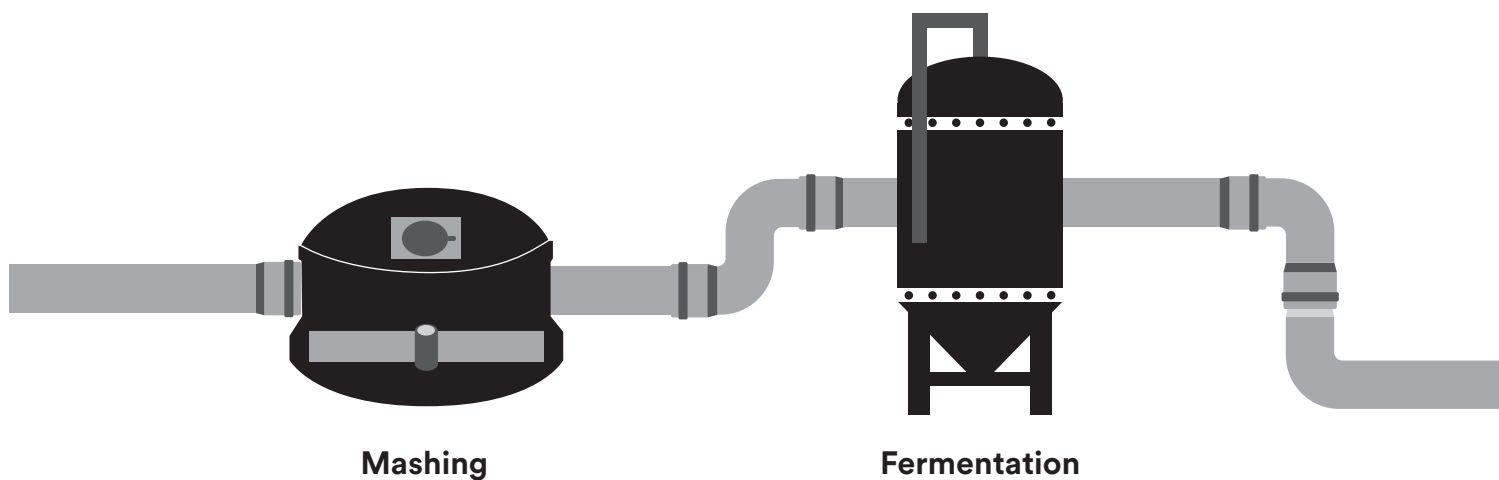
Convenience

3M filter systems offer convenience and ease-of-use.

Quality

3M filter systems help to deliver worldwide quality for consistent operations.

Process map



Barrel Char Removal

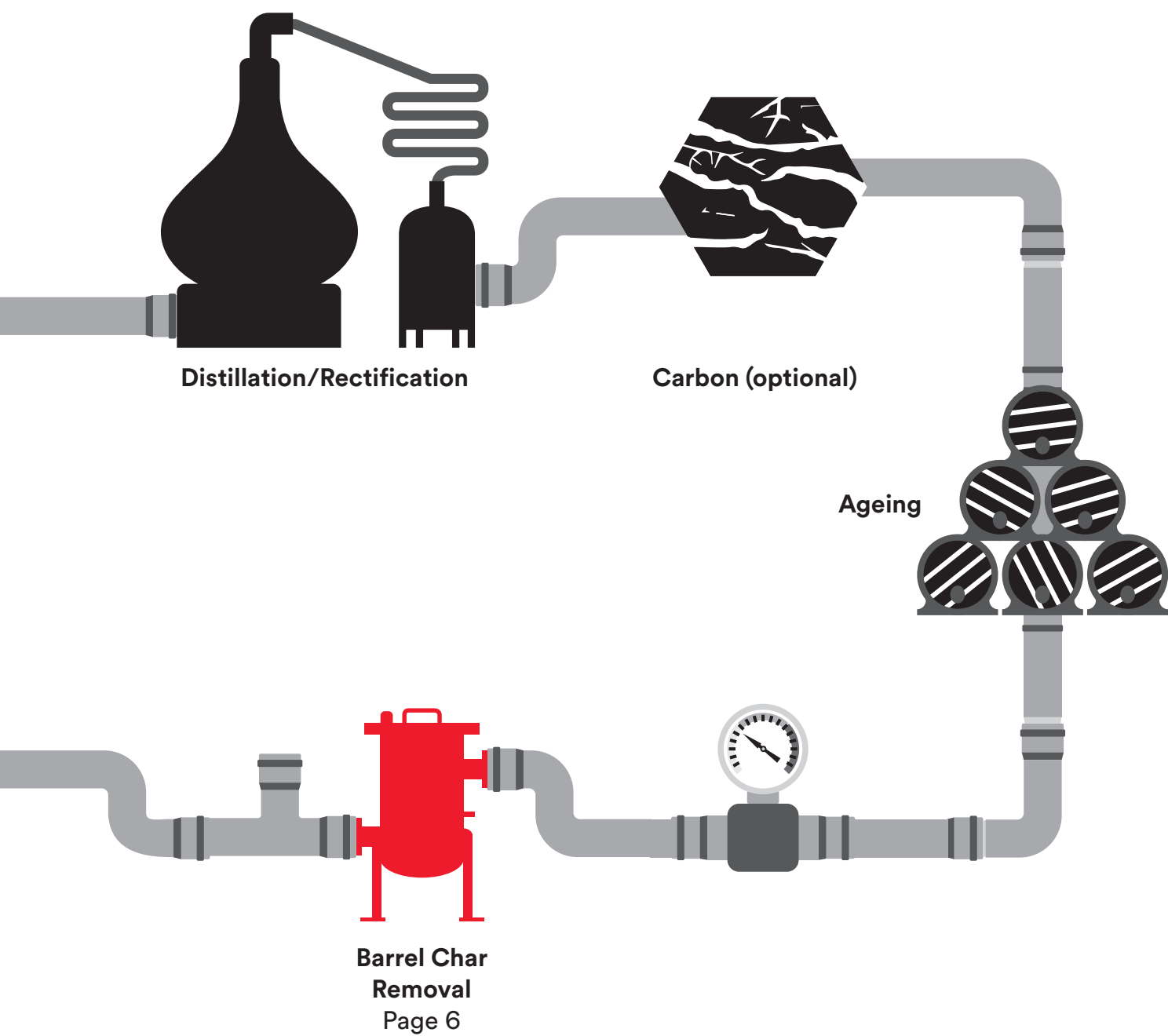
Page 6 (High Flow/DF/Bags)

Chill Haze and Clarification

Page 10-11 (High Flow/3M™ Zeta Plus™ HT)

Final Filtration

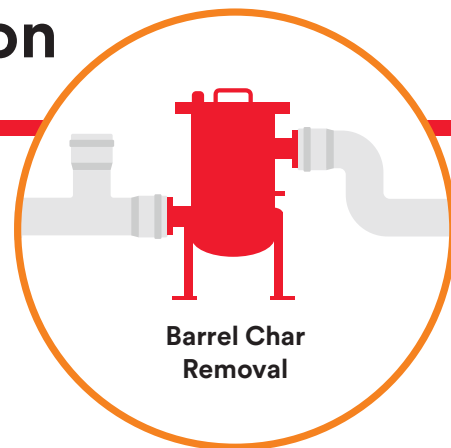
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Barrel char/particulate reduction

Contaminants can detract from the appearance, taste and perceived value of the finished product. Many spirits, most commonly with whisky (whiskey), are matured in a barrel which is charred on the inside. This helps maturation as the carbon created from the ash acts as a filter for the harsher elements of the spirit, whilst creating important flavour compounds such as vanillin, tannins and spices.

However charring and the maturation stage in general can lead to visible particulates in the spirit, so it is vital to include char removal/particulate reduction in your process to ensure a cleaner spirit.



3M™ DF Series Filters

An advanced alternative to standard bag filters. 3M DF Series incorporate both a filter element and support basket that provide 100% downstream support of the DF media.

- ▶ 60% more filter surface area providing up to 3-5 times more service life and 2-3 times more dirt holding capacity compared to most commonly used standard bag filters
- ▶ Support basket helps to eliminate the potential for filter rupture and downstream contamination
- ▶ 3M DF Series elements can be used in existing bag housings with specially designed baskets
- ▶ True graded porosity structure to help increase holding capacity
- ▶ Inside-outside flow configuration results in capturing particles within the filter element, reducing mess upon changeout



3M™ High Flow Series Filters

For distillers with higher volume and solids loading requirements or space restrictions, we suggest using a High Flow filter cartridge, details of which can be found on page 9.



3M™ NB Series Bags

For some applications, liquid bags represent the best filtration option.

- ▶ Inside-outside flow configuration
- ▶ Unique sealing welded collar for easy removal
- ▶ High performance media (Polypropylene)
- ▶ Improved process economics







3M™ High Flow Filter System

High flow capability; compact design. The 3M™ High Flow Filter System is a result of 3M's extensive filtration experience applied to delivering high flow filter technology in a compact design.

3M™ High Flow Filter System benefits:

High flow capability

- ▶ Flow rates up to 113 m³/hr per absolute rated 60" length filter cartridge
- ▶ Available in 10", 40" and 60" cartridge lengths

Compact design

- ▶ Reduces system footprint by 33-50%

Easy to use

- ▶ 'Twist-to-Lock' design facilitates faster filter changeouts
- ▶ No special tools or hardware required for filter change-outs

Economical

- ▶ Can be gravity fed by installing vertically; this lowers pump power requirements and carbon footprint/energy costs
- ▶ Requires up to 90% fewer cartridges than conventional 2.5" outer diameter cartridge systems for a given flow rate
- ▶ Fewer cartridges reduce waste meaning filter change-outs are quicker, easier and help save on labour & disposal costs
- ▶ High filter loading capacity enables a long service life

Applications

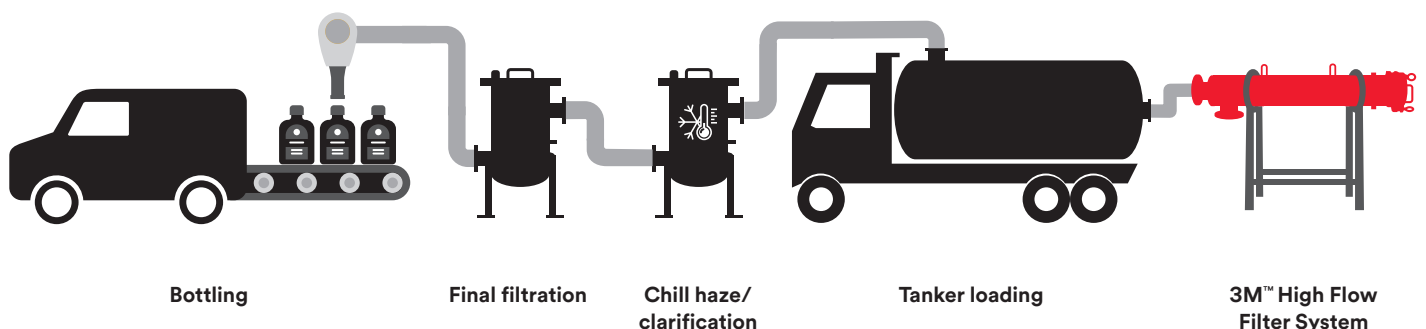
- ▶ Barrel char removal
- ▶ Sanitation water
- ▶ Chill haze and clarification
- ▶ Bottling



Barrel char removal pre-tanker loading

3M recommend that comprehensive barrel char removal should be administered before the tanker loading stage. This way, cost savings can be gained by using 3M™ High Flow Filter Systems before the tanker loading stage at disgorgement. By doing this, a cleaner spirit is transported to the bottling hall where more expensive clarifying filters and final filters are less likely to blind prematurely. This can increase the service life/throughput and consumables cost, reducing the likelihood of production interruptions and downtime.

See the process below.



Chill haze and clarification

The same barrels that impart a great taste to whisky, brandy and rum can also be responsible for a hazy appearance. Our lenticular-style depth filter cartridges provide turbidity reduction – by removing suspended long-chain fatty acids that can give spirits a hazy appearance at lower temperatures; whilst helping to eliminate spirit leakage, reducing alcohol fume emission.



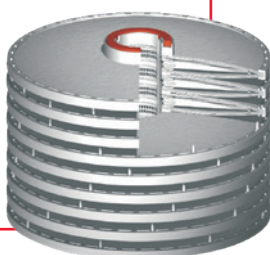
3M™ Zeta Plus™ HT Series Filters

3M™ Zeta Plus™ HT Series Filters are charge modified depth filters, constructed with high tensile strength media.

The HT Series media formulation is optimised to withstand repetitive hot water sanitation cycles.

This media formulation, combined with the rugged cartridge structure results in superior filter life and optimum process economies.

Zeta Plus HT Filters are available in 8", 12" and 16" diameter cartridges, with the 12" and 16" providing the additional benefit of lifting handles for ease of handling.



3M™ Zeta Plus™ 'Dual-Zone' MHT Series Filters

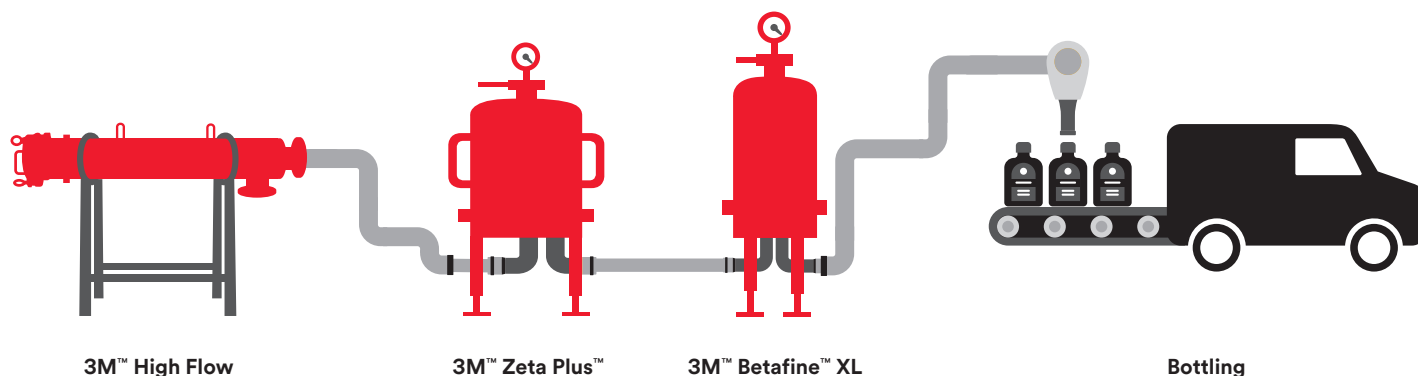
3M™ Zeta Plus™ Dual-Zone MHT Series Filters are an advanced dual zone depth filter designed to provide optimal prefiltration where clarity is imperative.

The construction consists of two distinct layers, or "zones" of durable HT series filter media, with the upstream zone more open than the downstream zone. This enhances the contaminant holding capacity by trapping larger particles and hazes in the upstream layer and the smaller ones in the downstream layer.



Solutions for limited/premium runs

For where runs are limited or encompass a premium spirit, reducing waste and hold-up has a direct impact on your bottom line. To minimise loss, we recommend the following process. Begin with the 3M™ High Flow Filter System to remove heavy charring and/or particulate matter, whilst also reducing holdup. Followed by 3M™ Zeta Plus™ Series Filters, removing haze and the need for a cumbersome filter press. Lastly, we recommend running the spirit through 3M™ Betafine™ XL Series Filters, that utilise our Advanced Pleat Technology. This patented staggered pleat innovation increases the useable surface area of the filter by up to 33%, whilst ensuring the longevity and clarity of the spirit for years to come.



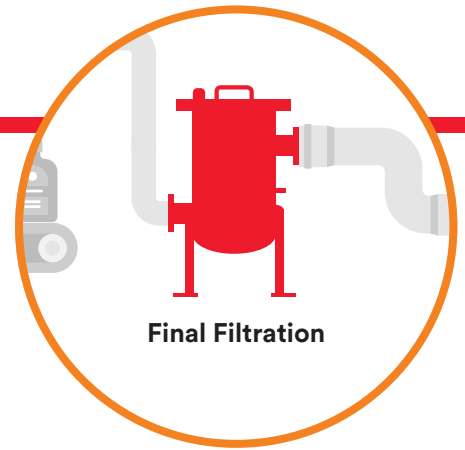
The Benefits of the 3M™ Zeta Plus™ Series Filters

Filter press	3M™ Zeta Plus™ Series Filters
Leakage and spirit loss <ul style="list-style-type: none"> ▶ Can be as high as 1-2% of volume filtered 	Zero leakage <ul style="list-style-type: none"> ▶ No loss of valuable spirits to leakage
Labour <ul style="list-style-type: none"> ▶ It can take 2 to 4 hours to change a small filter press ▶ When a filter press is repacked, it is not operating, reducing productivity 	Greatly reduced labour <ul style="list-style-type: none"> ▶ 3M Zeta Plus series filters can be changed in 15 minutes
Filter change-outs <ul style="list-style-type: none"> ▶ Filter sheets are changed on a timely basis, not when filtration capacity has been achieved ▶ Risk of throwing away a percentage of unused filters 	Fewer change-outs <ul style="list-style-type: none"> ▶ Since cartridges are used completely, fewer filter changeouts are needed per year
Capital costs <ul style="list-style-type: none"> ▶ Filter presses are large, expensive pieces of equipment 	Decreased capital costs <ul style="list-style-type: none"> ▶ 3M Zeta Plus series filter housings are typically 25-50% the capital cost of a stainless-steel filter press
Maintenance <ul style="list-style-type: none"> ▶ Presses typically have dozens of O-rings and gaskets to maintain ▶ Plates are heavy and cumbersome to remove and the surfaces must be cleaned regularly 	Low maintenance <ul style="list-style-type: none"> ▶ 3M Zeta Plus housing systems have 3 O-rings to maintain ▶ Easy to clean, easy to maintain
Disposal <ul style="list-style-type: none"> ▶ Filter sheets are discarded on a timed basis, additional disposal costs could be incurred as a result. 	Reduced disposal <ul style="list-style-type: none"> ▶ Fewer change-outs a year results in less filters to dispose, reducing disposal costs
Floor space <ul style="list-style-type: none"> ▶ A 60cm² press requires up to 100ft of floor space 	Minimal floor space <ul style="list-style-type: none"> ▶ Very small footprint ▶ Frees up space for other operations
Energy <ul style="list-style-type: none"> ▶ Filter presses have a great deal of steel to heat ▶ A filter press typically takes 30-90 minutes to reach sanitation temperature ▶ Filter presses have many dead legs which are hard to clean properly 	Low energy consumption <ul style="list-style-type: none"> ▶ The compact design allows the housing to reach sanitation temperature in approximately 15 minutes ▶ Reduced energy/water operation time



Final filtration

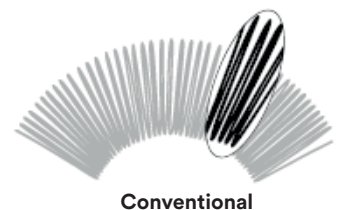
Your finely distilled spirit is a product of history, tradition and pride. Often with years being dedicated to the ageing process. Therefore, before being bottled, spirits must run through a final filtration process. This stage ensures that the clarity and longevity of the spirit succeeds the time taken to create, be it months, years or decades after bottling. The bottles must also be rinsed with particle free water prior to filling to avoid contamination.



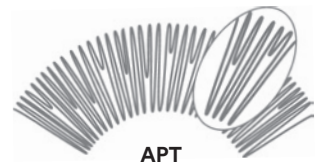
3M™ Betafine™ XL Series Filters

The 3M™ Betafine™ XL Series Filter is an all-polypropylene filter constructed with our patented Advanced Pleat Technology (APT). This staggered pleat convention allows for greater contaminant loading between pleats at the inside diameter, while the reduced length pleats take advantage of existing open space closer to the cartridges outer diameter, creating an innovative flow pattern in the process.

The result is a fully used surface area that enhances the dirt holding capacity and service life, whilst reducing flow restrictions and long-term costs.



Conventional



APT

3M™ Betafine™ XL Series Filter benefits

- ▶ Up to 4 times greater service life compared to conventional pleated filters of like published reduction ratings
- ▶ Greater surface area compared to a conventional depth filter
- ▶ Faster flow rates per filter compared to a conventional depth filter
- ▶ Absolute rated
- ▶ Retrofit capabilities







Application Engineering

The cornerstone of 3M's philosophy is service to customers, not only in product quality and prompt delivery, but also in validation, application support and in the sharing of scientific information.

By using 3M products, distilleries have access to 3M Application Engineering support, a global team of market focused scientists and engineers who excel in supporting collaborative efforts between customers and 3M.

Our Application Engineers can work with your distillery from start to finish to suggest the most effective and economical filters, to achieve the clearest results.

Application Engineers routinely provide end-users with:

- ▶ Validation and regulatory support
- ▶ Extractable and compatibility analysis
- ▶ Filter system optimisation studies
- ▶ Product training



3M™ Filter Housings and Systems

3M offer an extensive range of filter housings designed to handle even the most critical applications found in distilleries.

Process flow rates from 0.2 m³/hr to 450 m³/hr

3M filter housings can meet virtually any process flow requirements found in distilleries. From the lab to pilot plant to full production, 3M filter housings are available to grow with the needs of the distillery.

User friendly designs

3M filter housings are specifically designed with the end user in mind, to make installing and removing filter cartridges quick and easy. Fast action swing bolts, quick release clamps and convenient cartridge hold-down devices allow for rapid filter change-outs, low labour requirements and reduced downtime.

Bespoke housings

We routinely produce housings in accordance the requirements of Regulation (EC) 1935/2004 for Food Contact applications, and can produce special designs to meet a customer's specific needs including all ATEX requirements and customer specific construction codes.



For more information about 3M filtration solutions for distilleries please visit our website at www.3M.co.uk/foodandbeverage or www.3Mireland.ie/foodandbeverage

Your 3M representative can provide you with the current version of the food contact compliance certificates for the products listed in this brochure. More information on the scope of the certification and on the conditions of use will be included.

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