Introduction
The stabilization of ale is of critical importance for the shelf-life of bottled beers. As producers target new and faraway emerging markets it is critical that the beer reaches end users with its intended characteristics.

It has been shown that beer which has been filtered to achieve cold stabilization retains its unique and desirable characteristics more efficiently than beer stabilized through flash pasteurization. Cold stabilization also demonstrated a beneficial effect on taste characteristics throughout the duration of the beer’s shelf-life.

Parker domnick hunter’s BEVPOR microfiltration range not only ensures the microbial stabilization of beer, it also protects the unique sensory characteristics of your beer.

The BEVPOR membrane filtration range, utilizing PES membrane, minimizes the adsorption of beer components when compared to polyamide membranes.

Through a structured application led approach, Parker domnick hunter can provide added value solutions focused on increased process control allowing greater consistency, quality and efficiency.

Key filtration benefits:

- Cold stabilization protects the unique characteristics of your beer preventing significant flavour change.
- Parker domnick hunter’s range of membrane filters produce a crisp, fresh and natural taste in comparison to flash pasteurization.
- Cold stabilization will protect the unique characteristics of the beer throughout the product shelf-life.
- BEVPOR filters can be easily integrity tested to verify the performance prior to production.
- Low adsorption properties of PES membrane minimizes adsorption of desirable beer components and protects head retention.
- Microfiltration will remove all micro-organisms and is effective against heat resistant stages such as spores and cysts.
- BEVPOR membrane filters can be repeatedly cleaned in-situ for extended service-life.
Introduction

When the decision is taken to bottle real ale, the microbiological stability of the beer leaving the brewery needs to be guaranteed to provide adequate shelf-life. As new faraway markets emerge and off-trade consumption increases, the shelf-life of bottled beer becomes increasingly more important.

Brewers of ale, carefully select and balance the ingredients to generate the unique and distinctive characteristics of their brand. These unique characteristics which include colour, brightness and taste such as bitterness and sweetness should remain unaffected by any microbiological stabilization treatment prior to bottling.

Cold stabilization refers to the final microbial filtration of beer using a microporous membrane to remove yeast and typical spoilage organisms to provide extended shelf-life. An alternative method of stabilizing beer, flash pasteurization does not remove the yeast or micro-organisms as with microfiltration but deactivates them by heat. Flash pasteurization also demands higher relative water and energy consumption, therefore making cold stabilization a more appealing process to the micro-brewer and leading global brewers alike.

Flash pasteurization was the primary method of stabilizing beer, however, due to the heating, cooling and chemical additives used, the flavours can be altered thus changing the unique characteristics of the beer which have been so carefully selected.

Parker domnick hunter’s range of microfiltration products can guarantee the microbiological stabilization of beer, whilst also protecting its unique characteristics.

Comparison of cold stabilization and flash pasteurization

The final stabilization of beer by microfiltration has commonly been accepted as a more gentle method of stabilization, generating a ‘cleaner, fresher, more natural flavour’ when compared to flash pasteurization.

A number of independent tests have investigated the effect on taste of both flash pasteurization and cold stabilization by Parker domnick hunter’s BEVPOR microfiltration range.

A trial conducted by a leading UK brewery indicated that beer packaged after cold stabilization produced a beer which protected the desirable, crisp and bitter taste profiles when compared to pasteurization in a triangular taste test. (Figure 1.)

The test, carried out with an experienced taste panel, tested the same batch of beer after cold stabilization and flash pasteurization to identify if the method of stabilization impacted upon the finished product characteristics of the beer. In this case, the data generated helped the brewery to select cold stabilization as their preferred method of microbial stabilization.

The results generated through the triangular taste test identified the difference in the flavour profiles between pasteurization and cold stabilization, however, the number of tasters that identified the two differing methods of stabilization correctly, means the results can not be deemed significant.
The studies performed not only established the immediate characteristic changes of the beer that had been pasteurized, they also identified that the method of stabilization had an effect on the beer’s characteristics for the duration of the product’s shelf-life (figure 2 & 3).

The work identified that cold stabilization through BEVPOR filtration increased the time taken for the beer to display a stale / oxidized characteristic. Not only did the oxidized characteristics take longer to develop in the microfiltered beer, but it was far less pronounced over the 12 month trial.

A second brewery in the South of England conducted a trial looking at flash pasteurization and cold stabilization to determine which method would be used in the bottling of a leading premium ale. The same batch of beer was sent to two different contract packagers, one packaged the beer after flash pasteurization and the other after cold stabilization.

The brewing team commented that microfiltration appeared to be a gentle process which protected the late hoppy characteristic of the ale. As a result of this process the brewery installed an integral cold stabilization unit from Moravek engineering utilizing Parker domnick hunter BEVPOR microfiltration cartridges and fabricated housings as seen in figure 4.
Does cold stabilization alter the characteristics of beer?

Cold stabilization will affect the finished product characteristics of the beer, however, with the correct choice of filter materials this can be minimized to protect the unique characteristics of your beer.

The BEVPOR microfiltration range utilizes a polyethersulphone (PES) membrane which has been carefully selected due to its excellent performance characteristics in beer stabilizing applications. One of the key performance requirements of the PES membrane was making sure the unique characteristics of the beer were protected whilst guaranteeing the removal of yeast and typical spoilage organisms.

Microfiltration elements are designed to remove spoilage organisms through size, however, they will also remove other material such as suspended solids, proteins, polysaccharides and colour through adsorption. Depending on the extent of the adsorption, changes to the final characteristics of the beer may be possible.

Studies into the adsorption of head retention protein components during membrane microfiltration were conducted using two commonly used membrane materials, polyethersulphone (PES) and Polyamide (PA) for both 0.45 micron and 0.65 micron ratings. Results showed that membrane material had an effect on the protein content of the filtrate. PES reduced the protein content to a lesser degree than the PA membrane. Micron rating was also shown to affect the adsorption of proteins with 0.65 micron filters having a lesser effect than 0.45 micron filters.

A further study was carried out in order to demonstrate the low levels of protein adsorption expected with PES membrane compared to other materials used or beer filtration and serves to demonstrate the functional benefits of using PES on a number of levels (figure 5). Firstly, due to the lower protein adsorption characteristics of PES, the filtration has a negligible effect on the physical and sensory properties of the first run brew, so qualities such as head retention, colour and taste remain unaffected. Secondly, due to the low adsorption affinity, the PES membrane does not foul as readily as PA and is easily cleaned by CIP processes so the system can be regenerated and used again. Both of these qualities have been observed by multiple brewers who have reported the associated functional benefits of using BEVPOR filters.

Parker domnick hunter’s team of specialists can help determine the correct filtration system through a series of trials and investigations. Through understanding the application and business critical issues, Parker domnick hunter can help provide a filtration solution which adds value to your business.

References:

Conclusion

- Final stabilization of beer is shown to protect the unique characteristics of the beer throughout the product shelf-life when compared to flash pasteurization.
- Cold stabilization protects the unique characteristics of your beer. The gentle effects of final stabilization and low adsorption properties of the PES membrane prevent significant flavour change.
- BEVPOR final stabilization filtration elements can be routinely integrity tested in-situ to guarantee the microbial stabilization of your bottled beer.
## Products

### Trap filtration

**PEPLYN HD**
- 5, 10, 15 micron
- Polypropylene
  - Graded density and increased depth resulting in high dirt holding capacity
  - Ideally suited to high volume, forward flow processes

PEPLYN HD has been developed using graded pore density polypropylene media for clarification of beer. The PEPLYN HD has outstanding particulate holding capacity through its multi-layer depth construction providing optimized filtration for beer with high particulate loading and size distribution.

**PEPLYN TF**
- 5, 10, 15 micron
- Polypropylene
  - Graded density results in high dirt holding capacity
  - Optimized pleat configuration maximizes backwash efficiency

PEPLYN TF filters have been specially designed to capture particles on the surface of the media so that they can be easily removed through backwash, therefore allowing easy regeneration and long service lifetimes. The high area filter media will return high beer flow, whilst providing an absolute retention to solid particulate.

### Pre-stabilization - membrane protection and BBT protection

**PREPOR PP**
- 0.6 - 1.0 micron
- Polypropylene
  - Yeast and bacterial reduction
  - Strong, pleated polypropylene construction for backwash and chemical CIP

PREPOR PP filter cartridges will significantly reduce the numbers of yeast and spoilage organisms from beverage products, to provide extremely cost effective microbial stabilization.

**PREPOR NG**
- 0.5 - 1.0 micron
- Polypropylene
  - Validated yeast removal and bacterial reduction
  - Graded density construction for increased retention and throughput
  - Strong, pleated polypropylene construction for backwash and chemical CIP

Combining a superior level of microbial retention with a strong and robust construction to withstand frequent CIP and backwash, PREPOR NG filters represent the optimum choice for pre-stabilization applications such as membrane protection and tank transfer operations.

### Cold stabilization

**BEVPOR PS**
- 0.45, 0.65 micron
- Polyethersulphone
  - Validated microbial retention for effective stabilization
  - 0.6m² filtration area

BEVPOR PS filters have been validated against typical beer spoilage organisms. Combined with easy integrity testing, the filters ensure the effective microbial stabilization of beer. The advanced polyethersulphone membrane has been configured to provide high flow and cost effective performance throughout the range of grades.

**BEVPOR PW**
- 0.45, 0.65 micron
- Polyethersulphone
  - Validated microbial retention for effective stabilization
  - 0.6m² filtration area
  - Integral prefilter layer

BEVPOR PW filters have been validated against typical beer spoilage organisms. Combined with easy integrity testing, the filters ensure the effective microbial stabilization of beer. The advanced polyethersulphone membrane in conjunction with the integral prefilter layer provides extended service life to blockage and improved filtration economics.

**BEVPOR PH**
- 0.45, 0.65 micron
- Polyethersulphone
  - Validated microbial retention for effective stabilization
  - High filtration area – 0.8m²
  - Integral prefilter layer

BEVPOR PH filters have been validated against typical beer spoilage organisms. Combined with easy integrity testing, the filters ensure the effective microbial stabilization of beer. The advanced, high area polyethersulphone membrane in conjunction with the integral prefilter layer will provide maximum service life to blockage and the optimum solution for beer stabilization.

### Air / Gas filtration

**HIGH FLOW BIO-X**
- 0.01 micron sterilising
- PTFE Impregnated Glass Fibre
  - 94% voids volume PTFE impregnated glass fibre
  - Exceptional flow rates with low pressure drops
  - Integrity testable by aerosol challenge

HIGH FLOW BIO-X combines proven depth filter technology and a pleated construction to provide retention down to 0.01 micron in gas. Flow rates typically 2-3 times that of membrane filters make HIGH FLOW BIO-X the filter that can dramatically reduce cartridge usage and installation size within the fermentation, food and beverage industries.

**HIGH FLOW TETPOR II**
- 0.01 - 0.2 micron
- Polypropylene Expanded PTFE
  - Assured biosecurity with absolute rated filtration
  - High flow rates with low pressure drops
  - High voids volume PTFE membrane

HIGH FLOW TETPOR II sterilisation filter cartridges offer exceptional filtration performance whilst providing the highest levels of biosecurity throughout the process industry. Operating at ambient temperature conditions, HIGH FLOW TETPOR II filter cartridges provide a cost-effective filtration solution.
Water treatment

**PROPLEAT**

1.0 – 10 micron Polypropylene

- Economical solution to particle removal

PROPLEAT filters have been developed to bridge the gap between meltblown depth filters and absolute pleated media filters. The all polypropylene construction exhibit 99% efficiency at their given retention rating, providing consistent and economical clarification in a diverse range of applications.

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**PARMAX**

1 – 20 microns Polypropylene

- Large diameter filtration for high flow rates and high capacity
- Absolute retention ratings for critical filtration

PARMAX filters offer the optimum solution to bulk water treatment where costs of equipment space are at a high premium. The use of PARMAX large diameter cartridge and housing offers a smaller footprint which is advantageous. The cartridges are available in absolute micron ratings from 1 to 20 microns.

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**BEVPOR WG**

0.2 micron Polyethersulphone

- Validated microbial removal against waterborne bacteria
- High quality crevice free construction

BEVPOR WG filters utilize a pleated PES membrane to remove bacterial contamination from water, ensuring the water supply entering the facility is of a safe standard to reduce the risk of biofilm formation / product spoilage.

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**BEVPOR MS**

0.2 micron Polyethersulphone

- Validated microbial removal against waterborne bacteria
- Integrity testable

BEVPOR MS filters utilize a pleated PES membrane to remove bacterial contamination from water, ensuring the water supply entering the facility is of a safe standard to reduce the risk of biofilm formation / product spoilage. Added security is ensured through ease of repeat integrity testing.

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**PEPLYN PLUS**

0.6 – 25 micron Polypropylene

- Absolute particle retention at a range of micron grades
- Strong, pleated polypropylene construction designed for chemical CIP

PEPLYN PLUS filters are utilized for the clarification and pre-stabilization of a wide range of liquids for the food and beverage industry.

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### Housings

**VSH**

- Multi-element sanitary liquid housing
- Designed specifically for the food and beverage industry
- Available for 3 to 30 round filters

**HBA**

- Flow efficient range of air / gas housing
- Designed to maximize flow and minimize pressure drop

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**HSL**

- Single-element sanitary liquid housing
- Designed specifically for the food and beverage industry
- Sanitary tri-clamp body closure as standard

**HIL**

- Industrial single-element liquid housing
- BSPP inlet / outlet standard connections
- Suitable replacement for plastic housings

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**VIS**

- High efficiency steam filter housing
- Compatible with JUMBO element to maximize steam capacity

**HBAHP**

- Air / gas and steam housing
- For pressures up to 15 barg (223.06 psig) @ 205 °C (401 °F)
- Suitable for cartridge types DOE or 222 and 226

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**HSV**

- Industrial vent housing
- Direct connection to tank boss allows housing to be self supported
- Corrosion resistant 316L stainless steel
- Easy assembly and maintenance

**HSA**

- Flow efficient sanitary range of air / gas housing
- Designed specifically for the food and beverage industry
- Sanitary tri-clamp, vent and drain connections as standard
- Sanitary tri-clamp body closure as standard
Integrity testing equipment

VALAIRDATA 3
- Aerosol challenge testing
- Integrity testing of gas filters

BEVCHECK
- Pressure decay and diffusional flow testing
- Hand held portability with rechargeable battery option
- Flexible: suitable for use with compressed air or nitrogen

BEVCHECK PLUS
- Pressure decay and diffusional flow testing
- Convenient built-in printer provides printed test report
- Flexible: suitable for use with compressed air or nitrogen

Compressed air pre-treatment

OIL-X
- The most energy efficient filters available
- High quality ISO8573.1:2001 compressed air
- Running costs that start low and stay low

PCO₂
- Ensures compliance with quality guidelines published by the International Society for Beverage Technologies (ISBT)
- Protects drinks manufacturing processes from vapour impurities

MAXIGAS
- Low life-cycle ownership cost and elimination of costs associated with a cylinder supply
- On-demand functionality limits waste
- Energy efficient: operates from a small compressor