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Beer filtration

Professional filters not only for big breweries

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The Bílek Filtry company covers all your needs for the filtering and sanitizing process

Filtration, stabilization and sanitation processes are key pillars for beer making in breweries. They are decisive for the qualitative factors such as taste, clarity, microbiological and colloidal stability, and shelf life of beer.

We produce and provide a comprehensive range of filters, covering all the needs of the filtration process, from the primary filtration of beer through water to the sterile filtration of technological gases.

We supply CIP units and systems for sanitation and regenerative processes.

Various methods of beer making and its strategic focus on the specific market require different methods of filtration and microbial stabilization. The best breweries today utilise several types of filters in the filtration of top beers to achieve the highest quality at the lowest possible financial cost.

We use three types of filters for the primary filtration. You can choose between a traditional sheet (frame) filter with cellulose cartons.

An FKS kieselguhr filter with steel candles of coiled wire (with a trapezoidal profile) is a more effective solution. This provides a high filtration efficiency and capacity at moderate costs. It also allows dosing of aids (loss type) for colloidal stabilization.

The crossflow membrane filter FCB is the most advanced solution. Its filtration efficiency is high and operating costs are the lowest. It works with a permanent filter media - membrane modules, which can be regenerated. Thus, there are no demands on the filtering waste.

Crossflow filters can be used also for filtration of product and process water. By regeneration and recycling of water, the breweries are able to achieve significant economic savings in its purchase and disposal process. We install FTR safety trap filters on the outlets of the primary and colloidal filtration.

The original expressive characteristics of the finished beer is an essential argument for the business success. The characteristics are largely influenced by an established thermal pasteurization. It forms negative flavour tones and reduces the oxidation resistance of beer.

Production assortment of Bílek Filtry:

- FKS kieselguhr filters of candle type
- FTR safety - trap filters
- FD, FKL sheet and cloth filters
- FCB membrane crossflow filters (hydrodynamic)
- FMS membrane cartridge filters (cartridge - hydrostatic)
- FTS stabilisation filters – modules (colloids)
- Gas filters
- CIP systems

A secondary microfiltration using microbial membrane filters is an advanced solution, which guarantee an absolute detection of yeast and bacteria. This guarantees the microbiological stability and storage life. Thus there is no need for pasteurization. An excelling taste originality of beer is created and the energy costs are significantly reduced.

We install the FMS membrane candle filters in the pipeline for microbiological water filtration and gases for various purposes throughout the entire plant.

The line of filter technology includes also the FST stabilizing filter, which provides colloidal stability of beer and storage life. Our production assortment includes the CIP sanitary units, which are essential to ensure flawless results of filtering and a complete technological purity of operation without any contamination.

All products are undergoing a constant technological development, which is closely linked with the analysis of the results from the top brewing plants and research facilities.

Excellence in beer making is necessarily associated with controlling the filtering quality. Therefore, we offer variety of the control and analytical instruments. These include for instance turbidity meters, integrity testers for microfiltration cartridges.

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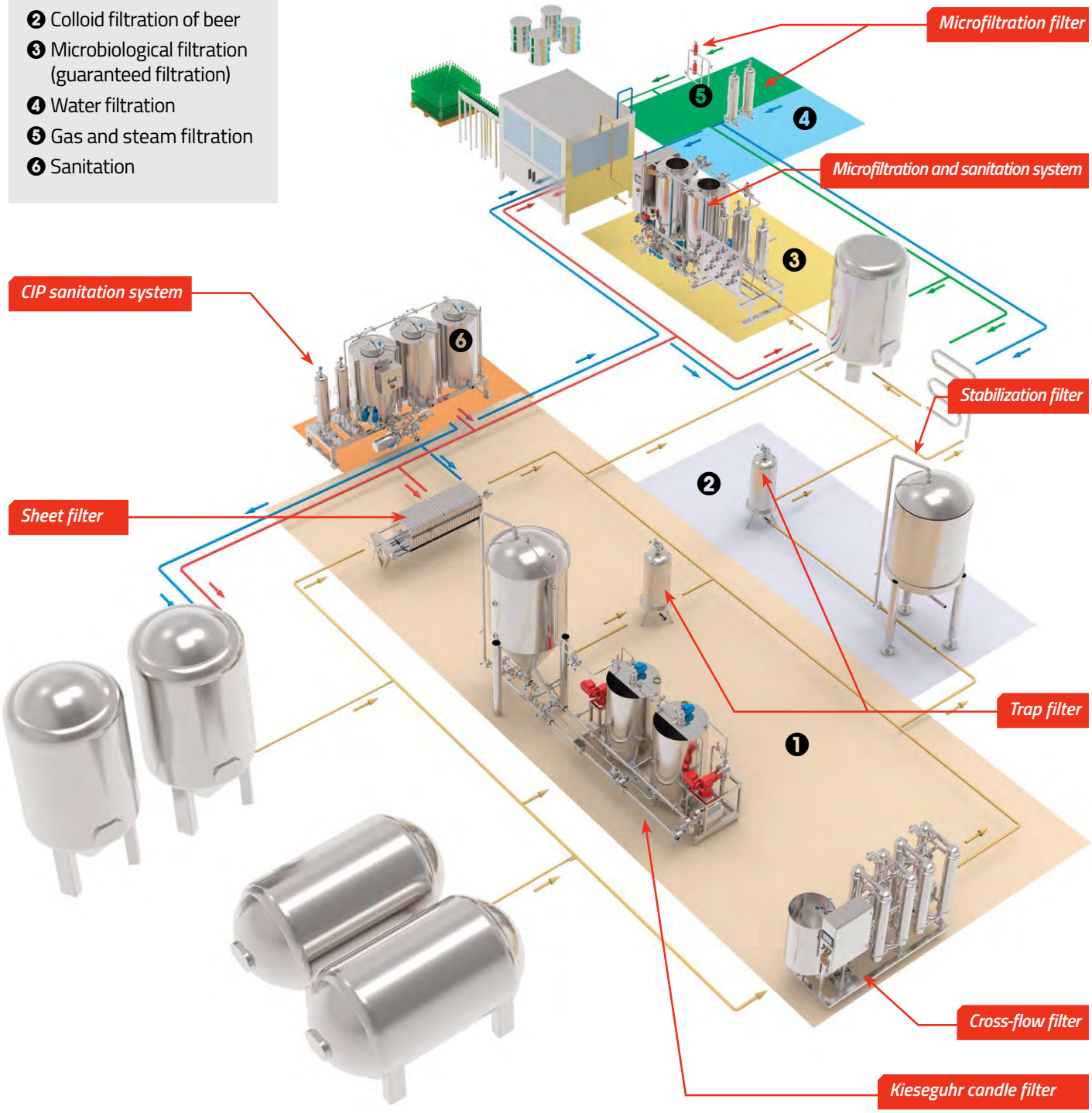
Scheme of filtration and sanitation in breweries

❶ Primary filtration of beer
❷ Colloid filtration of beer
❸ Microbiological filtration (guaranteed filtration)
❹ Water filtration
❺ Gas and steam filtration
❻ Sanitation



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Beer filtration

FKS - Kieselguhr filter of candle type

- Established technology
- Good capacity performance
- Good sensorial capabilities
- Very low consumption of sanitation aids
- Long filtration cycles

FCB – Crossflow for beer

- Polymer and ceramic capillary membranes
- Allows absolute detection of microbiology
- Excellent sensorial characteristics of beer
- Minimum exposure to oxygen and no exposure to minerals
- Without the burden of environmental waste

FMS – Depth and membrane filtration

- Cold beer stabilization without pasteurization
- Absolute guarantee of microbiology
- Very low cost of filtration
- Without pasteurization aftertaste
- Significantly extended shelf life of beer
- Zero oxygen content

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FKS beer filtration

A time-proven technology

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FKS filtration principles

The filtering layer consists of a filter material (mostly of kieselguhr, pearlite, etc.) floated onto the filtering carriers - filtration candles from steel of a special spiral structure for high deformation resistance and long life of these carriers, resulting in high efficiency of filtration.

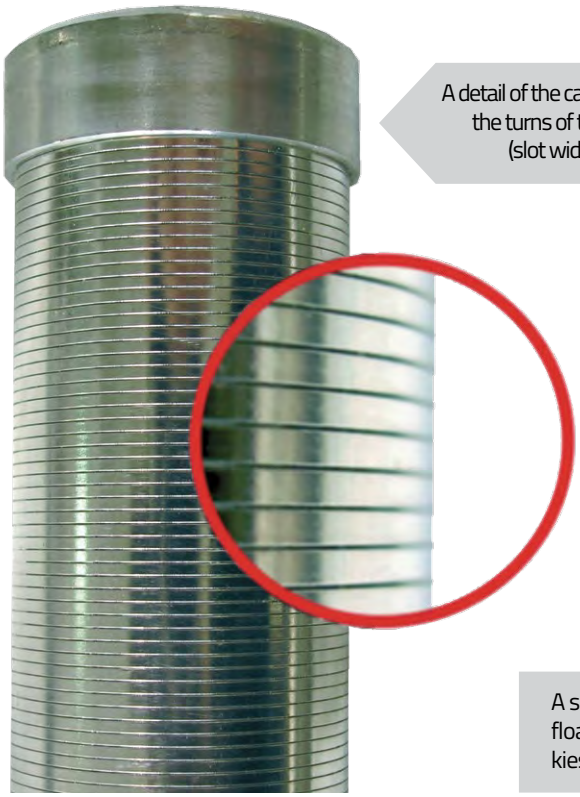
The filtering agent – suspension – (mostly kieselguhr) is prepared in a mixer vessel. The basic filtering layer is floated onto the candles by means of a so-called "quick floating", or a circulation with a circulation pump. A liquid fluid is flown across the candles and the kieselguhr therein will cling to the candle surfaces, making a filtering layer there.

The liquid to be filtered is forced through this filtering layer by action of the circulation pump. The turbid-making particles will remain caught up there.

To make the filtration cycle sufficiently powerful in the capacity and cost-saving, additional kieselguhr is continuously supplied onto the candles in controllable amounts during the filtration, driven by a dosing pump. Hereby, the filtration cake is maintained in a permeable condition with a relatively constant flow rate and filtration effect for a predefined period of time.

The filtration cake is removed from the candles manually, by means of a semi-automatic or automatic rinsing(blast) once the filtration ends up.

Very low operating costs per unit of volume and high productivity and efficiency are typical for this kieselguhr filtration.



A detail of the candle slots between the turns of the trapezoidal wire (slot width 50 micrometres)

A sample of the uniformly floated individual layers of kieselguhr on the candle.

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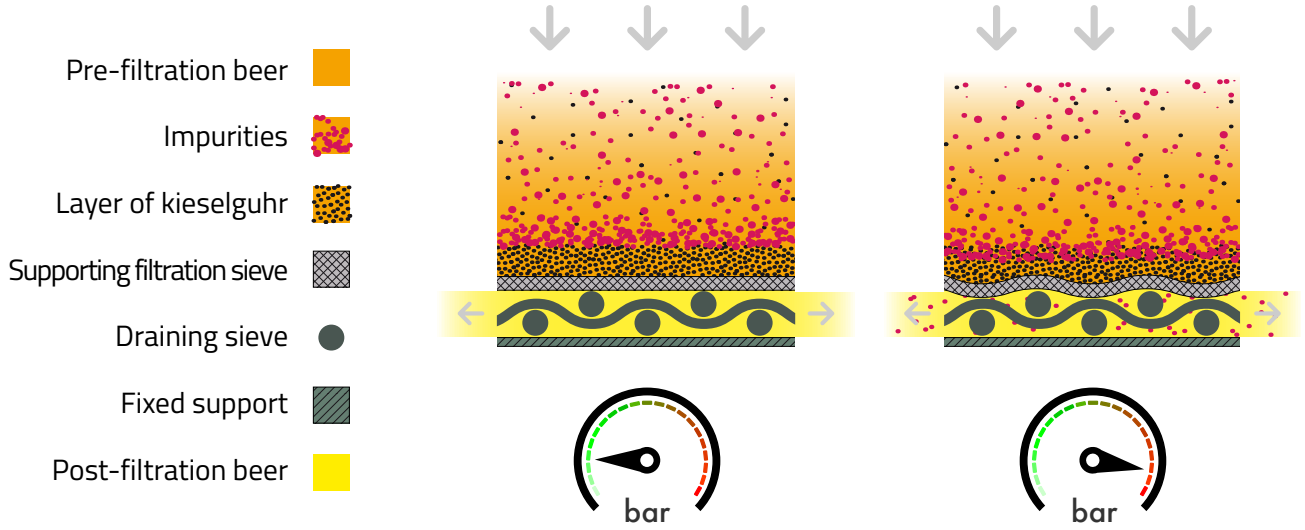
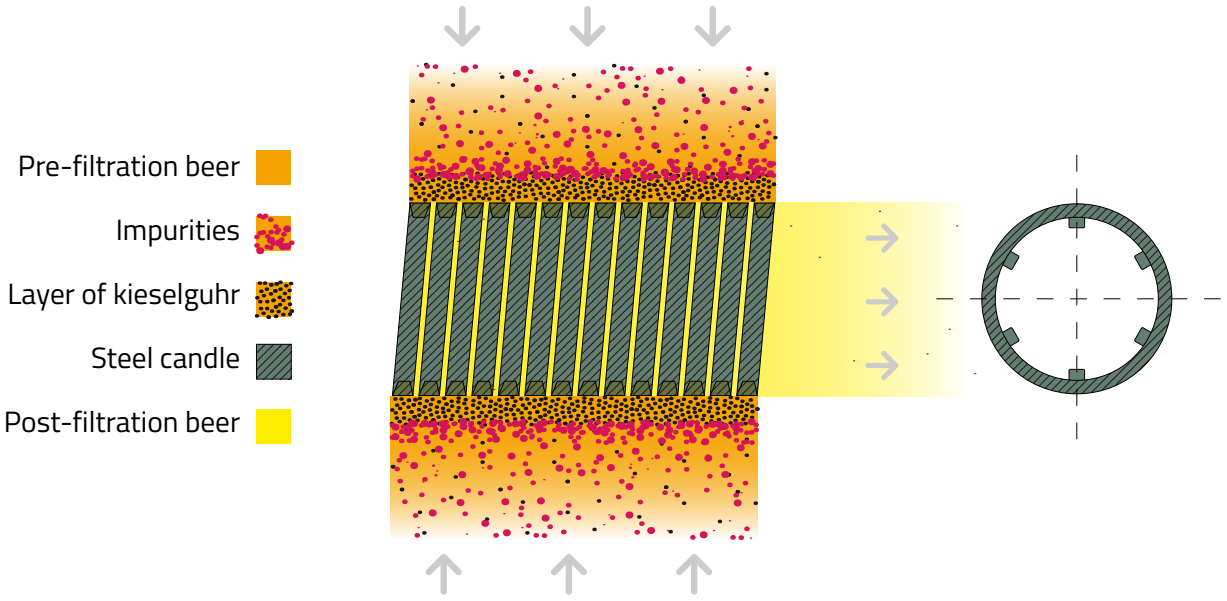
Efficiency comparison: FKS filter versus sieve filter



In the event of the sieve filters, the growths or changes in the filtration flow rate or pressure will cause deformation of the bearing sieve (fabric from fine wires), and thus also of the kieselguhr filtration layer. Imperfect compactness of the layer will then cause a leakage of kieselguhr and caught up impurities into the filtrate. The filtration efficiency is dependent on the rate and amount of pressure changes.



Being strong, the cylindrical filtration candle of steel will prevent the filtration layer deformations, given normal pressure conditions during the filtration. The stable filtration layer shows a high efficiency in capturing the impurities. As such, the candles from trapezoidal wires will allow even the fine filtration of beer with microbiological impacts.

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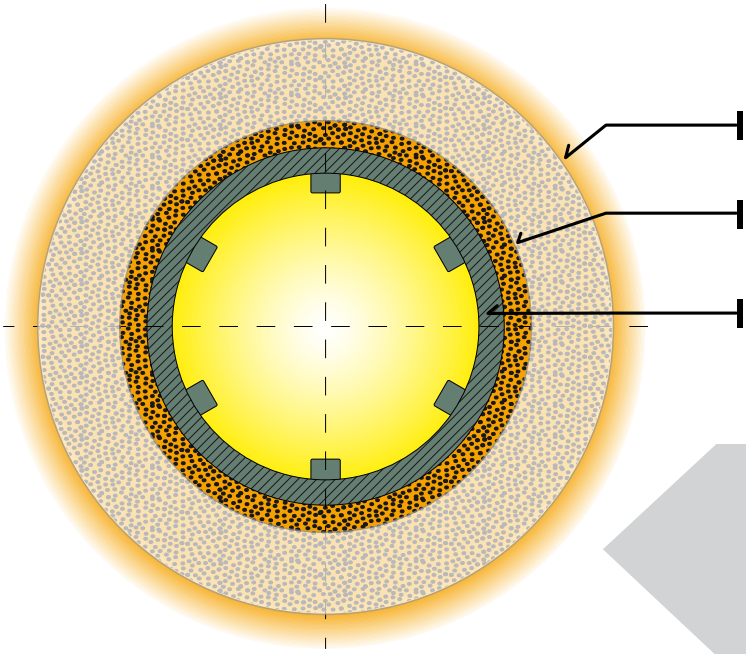
Greater filtering capacity



The candle filtration surface grows with growing amounts of the floated kieselguhr and captured impurities, resulted in a prolonged filtration cycle and increased volumes of filtered beer.

Kieselguhr filter construction and efficiency: Comparison

PLATE FILTER OF SIEVE TYPE

- *low purity of filtered beer*
- *for coarse/primary filtering only*
- *mechanical rinsing of plates – slower cleaning method*
- *low sanitizing ability of sieve plates*
- *lower filtering capacity – filtration surface of a sieve plate is constant during filtration*
- *low life of the filtration sieve*

FKS FILTER

- *high purity of filtered beer*
- *all the filtration levels are mastered*
- *quick cleansing by a reverse pressure surge (firing) – shorter pre-filtration phases*
- *excellent sanitization of the filtration candles*
- *higher filtration capacity due to growing active surface during the filtration process*
- *long life of the filtration candle*

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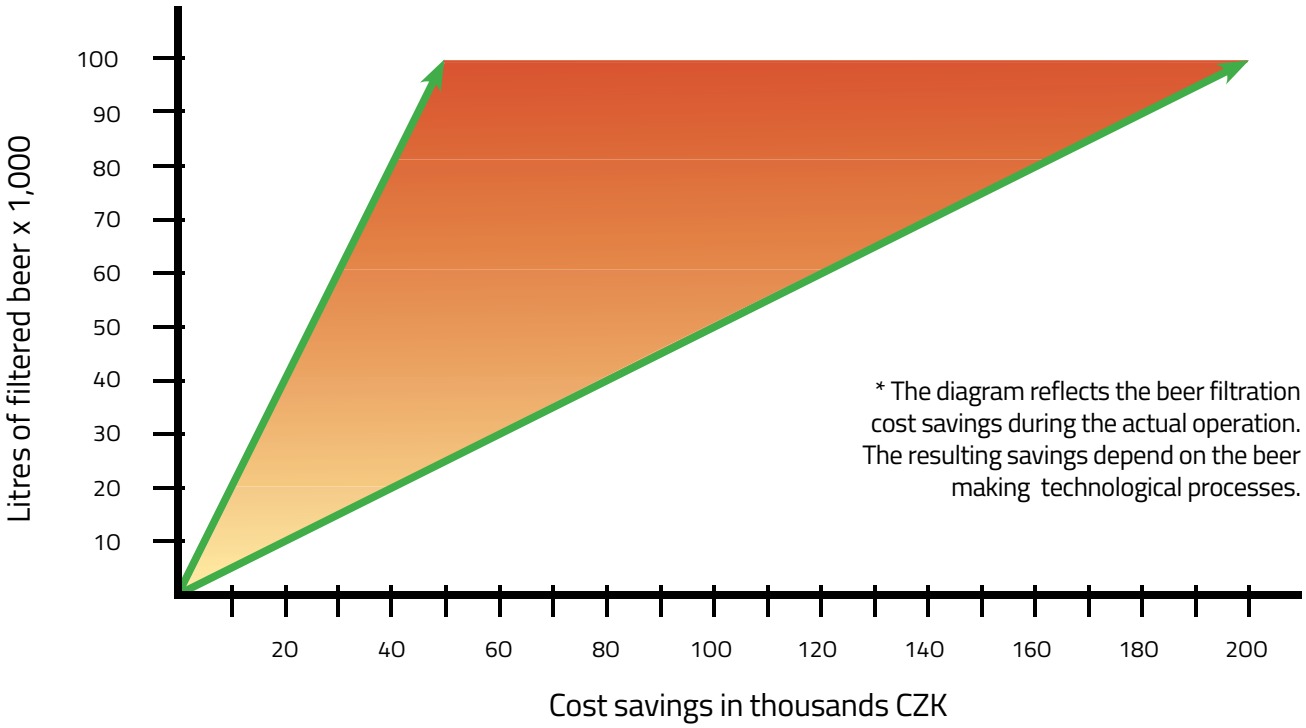
Cost savings when matched against the sheet filtration



Overall comparison of filtration efficiency

SHEET FILTRATION

- *reduced body, aroma, taste, and colour*
- *high expenses for sheet filters*
- *open hydraulic system – risk of external infections and dripping losses*
- *Impurities may infiltrate into beer should the recommended pressure level be exceeded*

FKS FILTRATION

- *will preserve body and enhance aroma, taste and colour*
- *filtration with kieselguhr is 10-times to 50-times cheaper*
- *closed hydraulic system = sanitizable system*
- *A fixed steel candle will guarantee the same filtration efficiency at any pressure*

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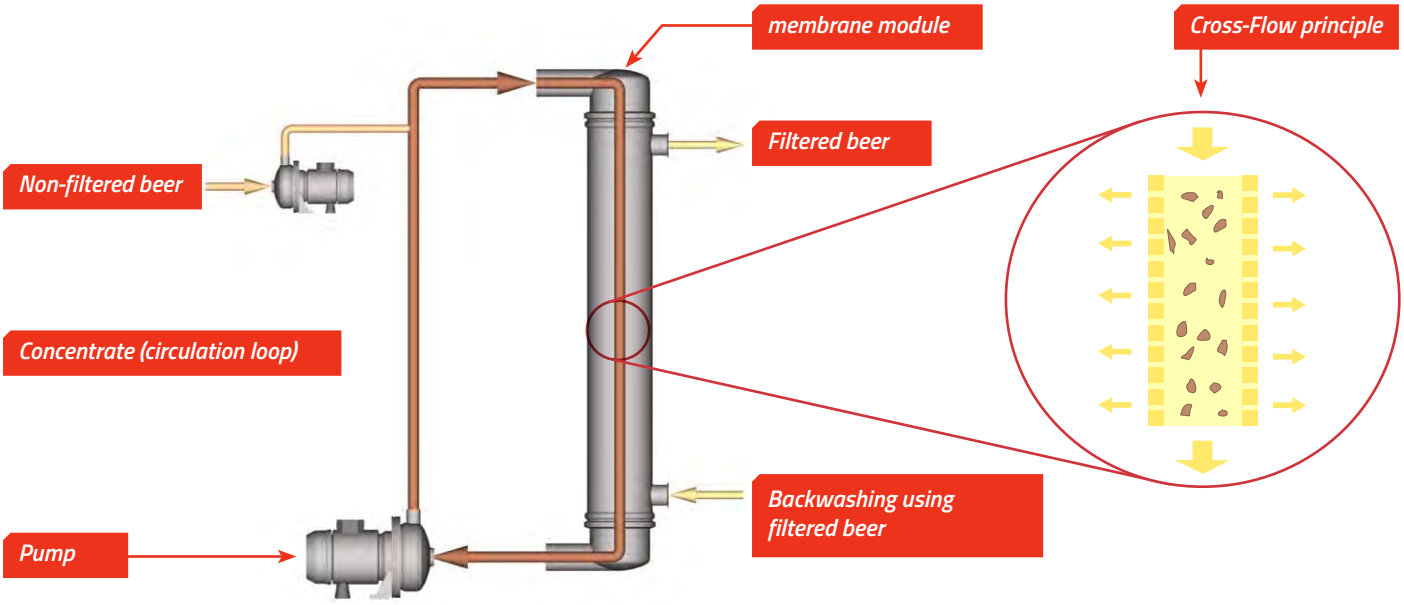
FCB Crossflow

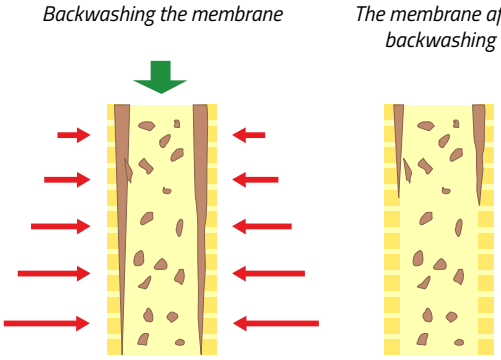
Future technology for beer

Filter functions diagram



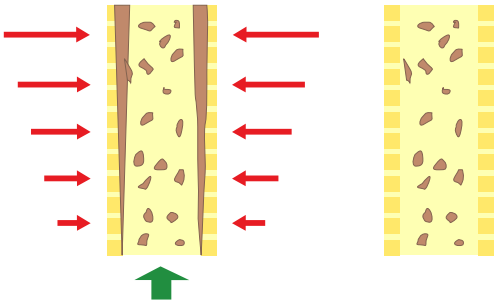
Conventional system – one-way flow

In the tangential flow circulation in one direction only, there is uneven fouling of the membrane filter surface, lower efficiency of backwashing and hence a reduced filtering performance.



A system with reverse flow

With automatic changing of direction of the tangential flow, the entire filter surface is utilized more evenly. Backwashing is therefore more efficient and the membrane is cleaned better.



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Cold microbiological stabilisation of beer

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FMS Cold Microbiological Stabilization = alternative to pasteurisation

Advantages of cold stabilization

- Lower acquisition costs
- Lower operational costs
- Without taste of pasteurisation
- Significantly longer shelf-life of stabilized beer
- Integrity test of the filter prior to each filtration

Bílek Filters have been using world-class **Parker DH** filtration membranes in their technological equipment for more than 20 years.

FMS offers optional filtrate quality guarantee

- Absolute retention of yeasts and reduction of bacteria
- Absolute retention of yeasts and of unwanted bacteria

Better sensual properties of beer compared to pasteurisation

- Cold stabilization = FMS microfiltration preserves the unique original properties of beer and, compared to pasteurisation, allows the achievement of a fresh and natural taste unaffected by pasteurisation.
- The material properties of the filtration membrane are characterised by low adsorption, which minimises the loss of beer components that add character to the beer and maintain the beer head.

Significantly longer shelf-life of stabilized beer

- Cold stabilisation ensures the preservation of the unique properties ofbeer throughout its shelf life.
- Guaranteed „zero" amount of yeasts in the beer at the filter outlet-in this case, however, the duration of the microbiological stability of the beer is shorter.

Adjustable FMS filtration interception performance

- FMS microfiltration can remove all the microorganisms from the beer; it can also effectively remove microorganisms in developmental stages, such as spores and cysts, which are resistant to heat during pasteurisation.
- If a brewery requires merely the removal of yeasts (not bacteria) from beer, FMS allows the application of adequate (less acute) filtration elements, which however remove yeasts absolutely (at lower economic cost).

Optional level of automation

- Manual execution without any automation for less demanding customers.
- Various levels of automation - from semi-automatic control to fully automatic with a connection to the technological environment.

Guaranteed FMS results even under higher than standard microbiological load on the beer input

- Highest effectiveness of yeast interception compared to other established filtration methods (up to 10^7) irrespective of the initial mibiload.
- Filtration performance higher by order of magnitude compared to MMS filter - practically 100% retention ability.
- The integrity (intactness) - i.e. the maximal effectiveness -of the filtration cartridges can be easily tested prior to each filtration.

Note

Secondary filtration (microfiltration) **comesimmediately** before filling (the beer is filtered from the pressure tanks to FMS microfiltration and from there it goes into the filler). Microfiltration output thus depends on the performance of the fillers, not of the primary filters. In a brewery, usually more than one filler is in operation (kegs, bottles…) and the requirement is for each filling machine to fill independently a different type of beer -that is why fillers are fitted withseparate microfiltration systems.

Variants of FMS systems depending on size and need

Standalone microfiltration housing

Filtration housing in almost any size with optional fittings and connections.

Microfiltration station including integrated CIP station - basic design

Performance design 1 ÷ 30 hl/h - has its own integrated manually controlled CIP station and is equipped to optimise the process during filling.

Microfiltration station including integrated manually controlled CIP station

Performance design 10 ÷ 140 hl/h - has its own integrated manually controlled CIP station and is equipped to optimise the process during filling.

Microfiltration station including integrated automatically controlled CIP station

This variant is supplied with a performance of 10 ÷ 140 hl/hour - it has its own automatically controlledCIP station including dosage of sanitation products and accessories for the optimisation of the process during filling.

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Microfiltration provides cold microbiological stabilization of beer

Introduction

Microbiological stabilization is crucial for the shelf life of botled beers. Along with this, as the producers are currently focusing on the new and faraway emerging markets, there is a critical question about how to ensure that the end users receive beer with desirable characteristics.

It has been proven that beer which has undergone a filtration under the cold stabilization, retains its unique and desirable characteristics better and longer than beer stabilized by a flash pasteurization. For a cold stabilization, beneficial effects on taste characteristics throughout the life of beer have been proven as well.

The line of BEVPOR microfiltration products from the Parker domnick hunter company not only performs the microbial stabilization of beer, but also retains its unique sensory characteristics.

The line of membrane filtration BEVPOR products, i.e. filtering, which employs the PES membrane, minimizes adsorption of beer components compared with polyamide membranes.

Main benefits of microbiological filtration

- Cold stabilization preserves the unique original characteristics of beer by preventing major changes in taste.
- The line of Parker domnick hunter membrane filters allows achieving a fresh and natural taste compared to the flash pasteurization.
- Cold stabilization ensures unique characteristics of beer throughout its shelf life.
- For BEVPOR filters, it is possible to easily test their integrity before each filtering and thus verify their effectiveness.
- The material properties of the PES membrane are characterized by low adsorption and thus minimize the loss of desirable beer components and preserve foaming.
- Microfiltration removes all microorganisms; Microfiltration is also effective against microorganisms stages that are heat-resistant during pasteurization, such as spores and cysts.
- The filters with the BEVPOR membrane can be repeatedly regenerated effectively to achieve its longer life.

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Introduction

When deciding on the method of filling beer into bottles and kegs it is necessary to ensure the microbiological stability of the finished product that leaves the brewery gates, and thus guarantee its adequate shelf life. When shipping beer, the increasing distance from the brewery, there is an increased emphasis on the shelf life of beer.

Brewers carefully select and tune the character components of beer so that their brand had unique and distinctive characteristics. These unique characteristics, which include colour, brightness and taste, as well as bitterness and sweetness, should remain unchanged after treatment by the microbiological filtration and stabilization.

Cold stabilization is a method of final microbial beer filtration using a microporous membrane, in which the yeasts and typical organisms causing spoilage are removed from beer, thereby achieving a longer shelf life. In the case of conventional methods of beer stabilization, i.e. the flash pasteurization, there is no removal of yeast and microorganisms by separation unlike in the microfiltration; instead, they are deactivated by the action of heat.

Flash pasteurization also requires a higher relative consumption of water and energy, which makes the method of cold stabilization more attractive to micro-breweries, as well as large manufacturers.

In the past, the flash pasteurization was the primary method of beer stabilization. When using this method, however, due to heating, cooling and use of chemical additives, there might be changes in taste (the so-called pasteurization flavour) and thus changes in the unique characteristics of beer, which have been previously selected with such care.

The line of microfiltration filters from the Parker domnick hunter company warrants the microbiological stabilization of beer while preserving its unique characteristics.

Comparison of cold stabilization vs. flash pasteurization

The final stabilization of beer using microfiltration is a generally accepted method of a more gentle stabilization and getting „a cleaner, fresher, more natural flavour in comparison with the flash pasteurization.

The effect of flash pasteurization and cold stabilization using the BEVPOR microfiltration line from the Parker domnick hunter company has been studied through a series of independent tests.

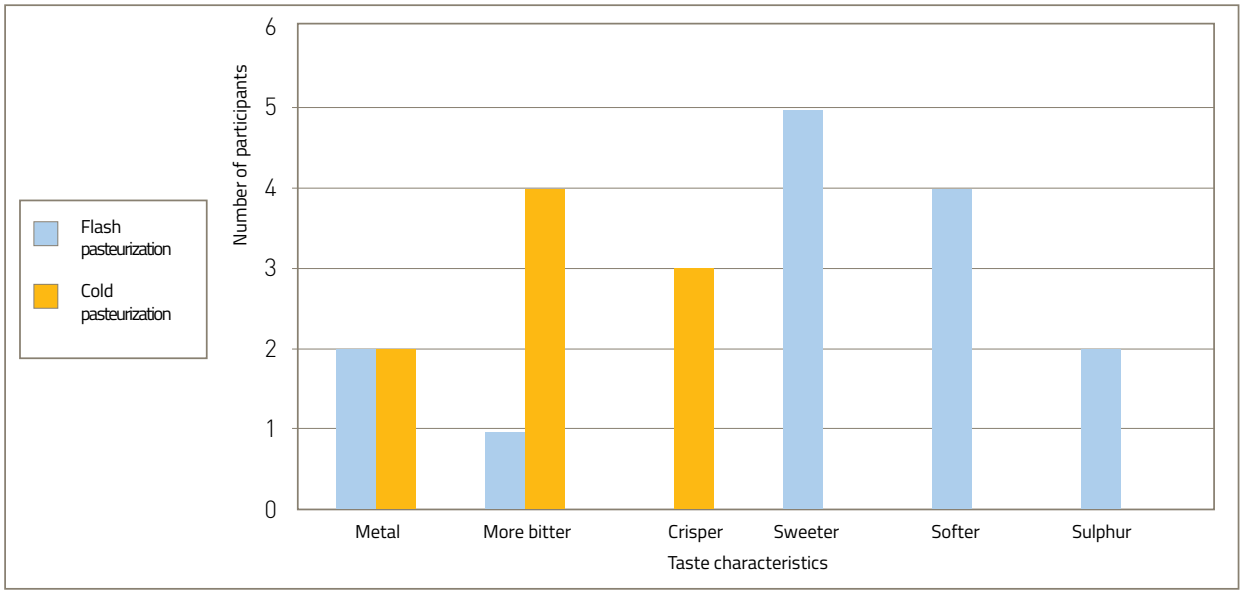

Figure 1 - Triangular taste test using three glasses, which was conducted by one of the leading brewers in the UK

The above study conducted by a UK's leading brewery shows that on the basis of the triangular taste test, beer packed after the cold stabilization becomes a product that protects the profiles of a desirable, crisp and bitter taste, compared to the pasteurization (Figure 1).

In this test, carried out by a panel of experienced taste panel, the same batch of beer was tested after the cold stabilization and the flash pasteurization.

The objective was to determine whether a method of stabilization influences the beer characteristics of the finished product. In this case, the obtained data of the brewery helped choosing cold stabilization as a preferred method of microbial stabilization.

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Does the stabilization method affect the shelf life of beer?

The conducted studies found not only the instantaneous changes in the characteristics of beer after pasteurization, but also helped determining that the method of stabilization affects the characteristics of beer throughout its shelf life (Figures 2 and 3).

In this work it was found that the cold stabilization through BEVPOR filtration prolongs the period during which the beer shows the characteristic signs of staleness / oxidation. Microfiltrated beer showed the signs of oxidation not only after a longer period; they were also much less pronounced in that 12-month test.

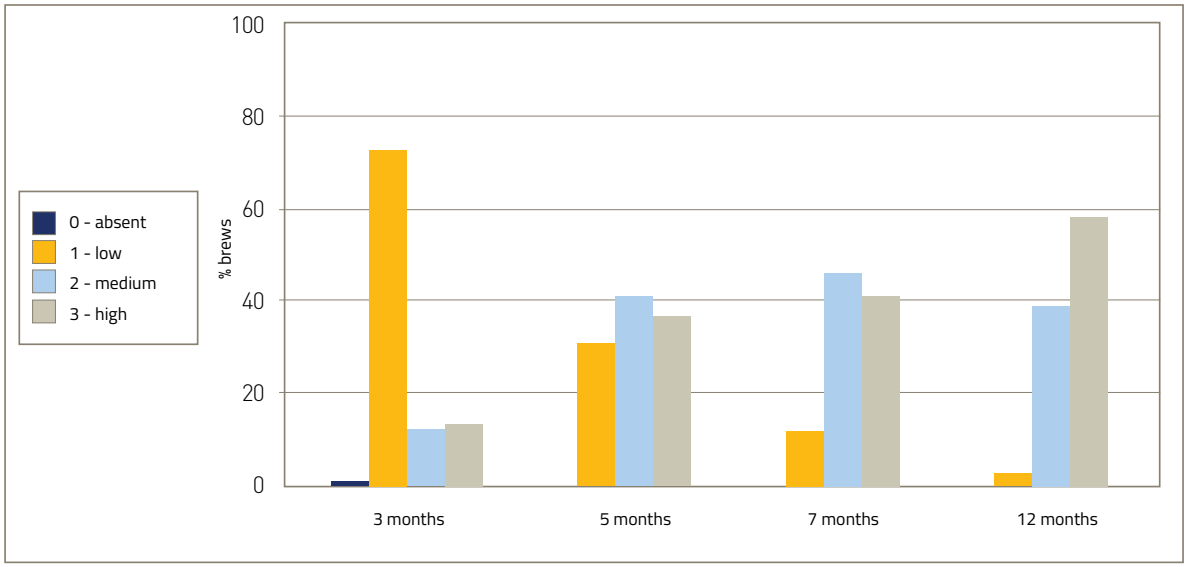

Figure 2 - The taste during the shelf time after pasteurization with signs of staleness / oxidation

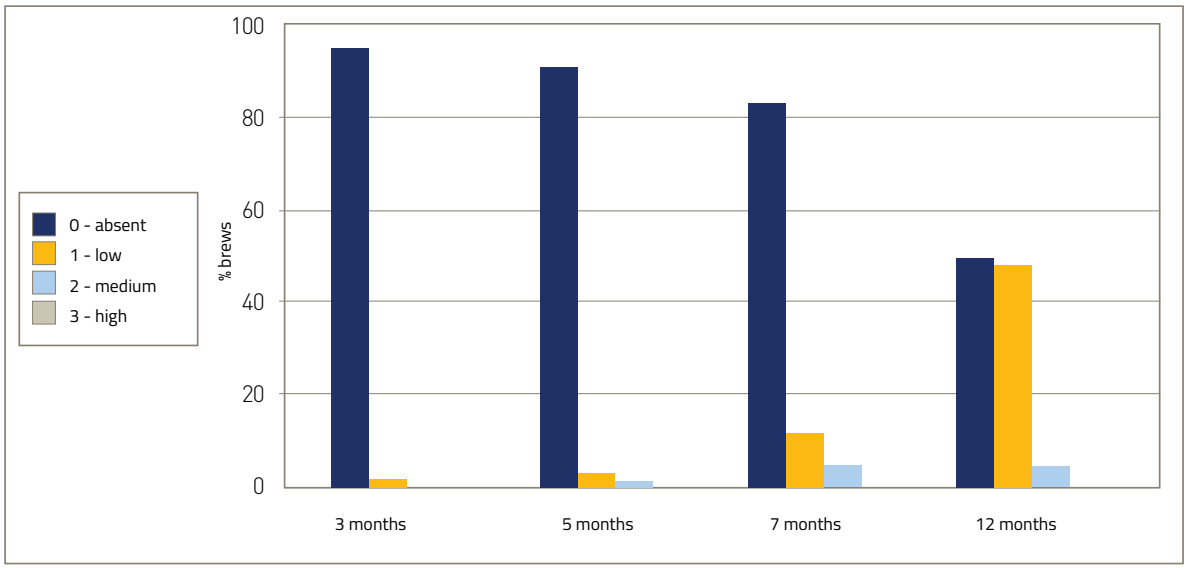

Figure 3 - The taste during the shelf time after microfiltration with signs of staleness / oxidation

Another brewery in the south of England performed another test, which studied both the flash pasteurization and the cold stabilization, in order to determine which of these methods will be used for bottling premium, high quality beer. The same brew of beer was sent to two different contractors for packaging, where one of them bottled beer after the flash pasteurization and the second one after the cold stabilization.

According to the brewing team, microfiltration proved as a gentler process that preserves the late hoppy properties of beer.

Microfiltration membrane system with CIP

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Does cold stabilization change the characteristics of beer?

The cold stabilization has an effect on beer properties of the finished product, however, upon the correct choice of the filter materials this impact can be minimized, thus preserving the unique characteristics of beer.

The line of BEVPOR microfiltration products utilises a polyether sulfone (PES) membrane, which has been carefully selected because of its excellent performance characteristics in the applications of beer stabilization. One of the major job requirements laid on the PES membrane was to ensure that the unique characteristics of beer are preserved, while guaranteeing the elimination of yeasts and typical spoilage organisms.

The microfiltration elements are designed to eliminate spoilage organisms according to their size, but also remove the other substances, such as suspended solids, proteins, polysaccharides and colour through adsorption. Depending on the extent of adsorption, the final characteristics of beer may change.

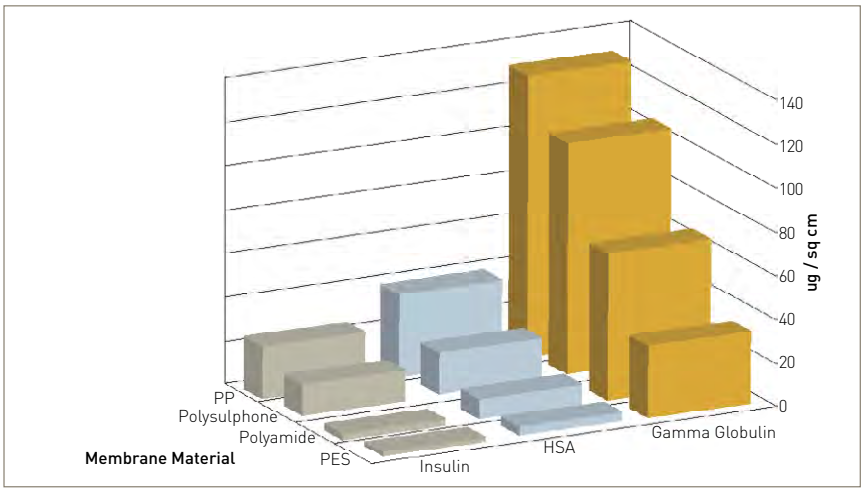

Figure 5 - Adsorption of proteins on microporous membranes (Source: Akzo Nobel)

Studies were conducted on the adsorption of protein components of foam during the membrane microfiltration using two commonly used membrane materials, polyethersulfone (PES) and polyamide (PA), in both cases of 0.45 and 0.65 micron ratings. (1) (2) The results showed that the membrane material had an impact on the protein content in the filtrate. PES decreased the protein content less than the PA membrane. It has also been found that the micron rating has influence on the adsorption of proteins, wherein the effect of 0.65 micron filters is lower than 0.45 micron filters.

One more study was conducted to demonstrate the low degree of protein adsorption expected with PES membrane in comparison with the other materials that are used for filtration of beer, and demonstrates functional advantages of PES in terms of multiple aspects (Figure 5). Primarily due to its lower adsorption of proteins in the case of PES, the filtration has a negligible effect on the physical and sensory properties of the first run brew, which means that the quality, such as the foaming capacity, colour and flavour remain unchanged.

Secondly, due to the low adsorption affinity the PES membrane does not get clogged as easily as the PA, and can be easily cleaned using the CIP processes, so that the system can be regenerated and reused. Both of these qualities were observed by different brewers who reported the related functional benefits of using the BEVPOR filters.

We offer a team of specialists from the Parker domnick hunter company, which can help determine the correct filtration system based on a series of tests and investigations.

Based on understanding the application and the critical issues for the business, Parker domnick hunter can help arrange such a filtering solution that will increase the value of your business.

Literature:

(1) Adsorption of Beer Components During Membrane Microfiltration of Beer - MBAA TQ Vol.44, No. 3. 2004.

(2) The Effect of Microporous Membrane Filtration on Beer Foam Stability - MBAA TQ Vol.41, No. 4. 2004.

Conclusion

- It was demonstrated that the final stabilization of beer preserves the unique properties of beer over the lifetime of the product in comparison with the flash pasteurisation.
- Gentle effects of the microfiltration cold stabilization and the low adsorption properties of the PES membrane prevent significant changes in taste.
- BEVPOR filters can be routinely and reliably tested in terms of integrity to guarantee the microbial stabilization of beer filled into bottles or kegs.

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Referential customers

„Gentle and efficient filtration“

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Some of our customers abroad

Application	Equipment	Customer
Primary beer filtration*	Filter FKS 2	**Werdumer Hof, Germany**
Primary beer filtration*	Filter FKS 2	**Admiral Kolchak, Russia**
Primary beer filtration*	Filter FKS 1	**Bruggsmidjan, Iceland**
Primary beer filtration*	Filter FKS 5	**Cogalinic, Moldova**
Secondary beer filtration***	Micro-filtration and sanitation system FMS 40x30“	**ARASAN, Kazakhstan**
Primary beer filtration*	Filter FKS 10	**Ak Arlan, Kazakhstan**
Primary beer filtration*	Filter FKS 10	**Pivnaya Compania, Russia**
Primary beer filtration*	Filtration line FKS 14 with buffer tanks	**Birra Korca, Albania**
Primary beer filtration*	Filter FKS 14 with buffer tanks	**ZAO LISPI, Ukraine**
Primary beer filtration*	Filter FKS 14 with buffer tanks	**Pinta, Ukraine**
Primary beer filtration*	Filter FKSV 20	**Afamia, Syria**
Primary beer filtration*	Filter FKS 1	**Bozen, Slovakia**
Primary beer filtration*	Filter FKSV 3	**Valar, Russia**
Primary and secondary beer filtration***	Filter FKS15 and fully automated microfiltration system with CIP	**Sheriff, Moldova**
Primary beer filtration*	Filter FKSV 3	**Štamgast-SK, Slovakia**
Primary beer filtration*	Filter FKS 2	**Sessler, Slovakia**
Primary beer filtration*	Filter FKS 2	**Brewery Apeni, Georgia**
Beer filtration	Filter FKS 1	**Taddington Brewery Ltd., UK**
Primary beer filtration*	Filter FKSV 15	**Bajrancham, Turkmenistán**
Primary beer filtration*	Filter FKS 3	**Browar Miejski Gloger, Poland**
Primary and secondary beer filtration***	FKS2, 2xFMS 5x30 + CIP	**Skinner‘s brewery, UK**
Primary beer filtration*	Filter FKS 2	**Waxholms Bryggeri, Sweden**
Primary beer filtration*	Filter FKSV 3 with automation	**OOO Benc, Russia**

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Some of our customers in the Czech Republic

Application	Equipment	Customer
Waste kieselguhr treatment	Special filter press HOL 20	**Prazdroj a.s.(Pilsner Urquell), Plzeň**
Drink water filtration	Filter FMS 6x30“	
Water filtration	Filter FS 22x40“	
Trap-filtration**	Filtration system FR	
Pressured air filtration	Air filtration system	
Beer filtration (mini batches)	Sheet filter	
Yeasts treatment	Special filter press HOL 20, Tanks	**Starobrno a.s., Brno**
Primary beer filtration*	Filtr FKS 40	**Regent, Třeboň**
Primary beer filtration*	Filter FKSV 3 with automation	**Tambor, Dvůr Králové**
Primary beer filtration*	Filtr FKS 2	**Kout na Šumavě**
Primary beer filtration*	Filtr FKS 2	**Hrádek, Slavičín**
Primary beer filtration*	FKSV 3 with automation	**Radas, Frýdek-Místek**
Primary beer filtration*	Filtr FKS 3	**Bonver CZ, Praha**
Secondary beer filtration***	FMS 8x30 + 12x30 + CIP	
Primary beer filtration*	Filter FKS 14 with buffer tank and automation	**Polička a.s., Polička**
Waste kieselguhr treatment	Special filter press HOL 10	
Water filtration	Filter FMS 3x30“	
Waste kieselguhr treatment	Special filter press HOL 10	**Bernard s.r.o., Humpolec**
Primary beer fitlration*	Kieselguhr filter refurbishment	
Primary beer fitlration*	Filtr FKS 3	
Trap-filtration**	Filtr FS 3x30“	
Secondary beer filtration***	FMS system 2x18x30“	
Primary beer filtration*	Filtr FKSV 5	**Janáček a.s., Uherský Brod**
Primary beer filtration*	Fltr FKS 3	**Pivovar Uherský Brod, Uherský Brod**
Primary beer filtration*	FKSV 15	**Pivovar Chotěboř, s.r.o., Chotěboř**
Secondary beer filtration***	FMS system 2xFMS 3x30 + CIP	**Pivovar Svijany, a.s., Svijany**
Primary beer filtration*	FKS 15 with full automation	**Chodovar spol, s.r.o., Chodová Planá**

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Application	Equipment	Customer
Primary beer filtration*	Filter FKS 1	**Pivovar Národní Třída, s.r.o., Prague**
Primary beer filtration*	Filter FKS 2	**Pivovar Koníček, s.r.o., Frýdek-Místek**
Primary beer filtration*	Filter FKS 1	**PM Company, s.r.o., Havířov**
Secondary beer filtration***	2xFMS 1x30 + CIP	
Secondary beer filtration***	FMS 8x30 + 12x30 + CIP	**Maxdrinks, s.r.o., Kralupy nad Vltavou**
Primary beer filtration*	Filter FKSV 2	**Olivův Pivovar, s.r.o., Dolní Březany**
Primary beer filtration*	Filter FKS 2	**Zámecký pivovar Frýdlant, Frýdlant**
Secondary beer filtration***	2xFMS 1x30 + CIP	
Primary beer filtration*	Filter FKS 2	**Pivovar Hladov, Stonařov**

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Glossary

Primary beer filtration *

Primary beer filtration is a process during which bulk yeast is removed from the fermented beer. On entry, the typical turbidity of such beer is 60-120 EBC and the number of yeast cells some 10 mil/ml. Sedimentation on its own cannot produce the clarity of the beer required for the subsequent production stages. Primary filtration also helps remove components contributing to the formation of a veil or turbidity in the form of a cluster of proteins and polyphenols and hop resin. The most commonly used filter in primary filtration is the diatomite filter, which has a nominal selectivity of 0.5 - 30 micrometres. Cross flow filters (selectivity up to 0.65 micrometres) have been gaining more ground recently, but they are usually combined with centrifugal separation which eliminates a large amount of the yeasts in beer.

Trap beer filtration **

Trap particle filtration removes residual filtration material from the filtrate. In most cases this applies to diatomite and cellulose. All types of diatomite filters have a certain amount of diatomite escaping into the filtrate and this must be removed prior to expedition of the beer, otherwise fine filtration must follow. There is a number of trap filtration materials. The most commonly used are filtration cartridges made of materials such as glass and polymers, filtration plates made of cellulose, and also special cartridges made of steel and other inorganic materials. The typically applied selectivity of trap filters is 5 - 10 micrometres (>ß 1000).

Secondary filtration – final microfiltration of beer ***

End microfiltration is the last filtration step before bottling. In breweries employing a three stage filtration system (trap, fine and final filtration), fine filtration filters also serve as prefilters protecting the final membranes. The purpose of final filtration – also referred to as cold microbiological stabilisation – is to remove all the yeasts and common beer-spoiling bacteria from the beer. That is why filtration membranes with selectivity from 0.45 do 0.65 micrometres are used for beer, ensuring a reduction of microorganisms, but not sterility of the product.

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