NORIT BMF-100/120
Brewery Membrane Filtration






NORIT
PROCESS TECHNOLOGY

Beer Filtration

The recently developed BMF-120, a new cross-flow technology, overcomes all earlier barriers to successful commercial implementation of membrane filtration as an alternative to Kieselguhr filtration in breweries. The key to the feasibility of this new technology is a newly developed cleaning strategy and the excellent properties of the employed NORIT membranes. The advance of production technology of NORIT permits membranes to be tailored to desired filtration caracteristics and the results necessary to develop a reliable filter and filtration process for any type of beer. As the Beer Membrane Filtration system is fully automated, a continuous and consistent process is guaranteed. Filter aids, like diatomaceous earth, are no longer required. NORIT's Membrane filtration is a very attractive solution from an economical and technological point of view. No filter aid is required and waste disposal is not an issue anymore. As Kieselguhr is not longer required, no health risk is involved. The facility is modularly built and therefore easy to up-scale, and adapt to a lower capacity for special beers, and low season production.

Filtration principles

The principle of Membrane Filtration is very straightforward. The filter is fed by the feed pump, which provides the pressure necessary for the process. The filter itself is contained in a recirculation loop, with a second pump, providing the necessary cross flow velocity through the membrane fibres, in order to keep deposition of solids on to the surface as low as possible. The recirculation loop has a bleed valve fitted, in order to control the concentration of solids in the recirculation loop. The filter itself is formed by porous fibers, with a very well defined pore size. The mature beer is pumped through the fibres, whilst part of the beer permeates through the wall, driven by the pressure difference between the inside and outside of the fibres, separating the beer from all haze causing constituents.

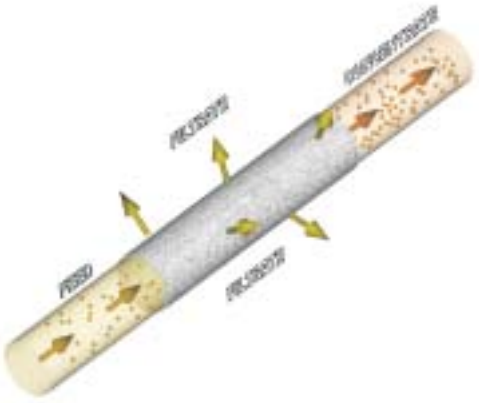
Membranes

The characteristics of the membranes are crucial for the success of beer filtration.

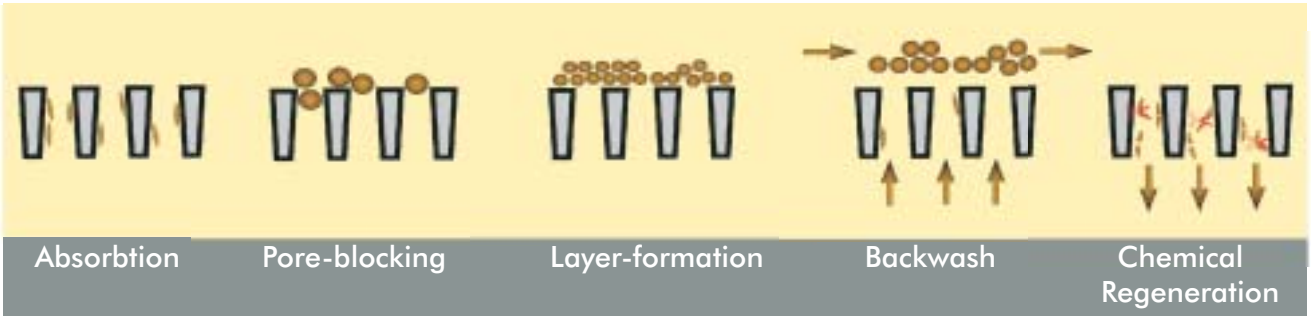
The most important characteristics are the pore size and the membrane material. A large pore size would not perform to well accepted haze standards, whereas a small pore size would result in retention of beer components, e.g. high molecular weight proteins and polysaccharides. Based on extensive trials, a pore size of max. 0,5 m was chosen. Given this pore size, the process is usually referred to as microfiltration. The membrane modules used are based on a pore size of max. 0,5 m with an inner fiber diameter of 1,5 mm and a total membrane area of 9,3 m^2 per module.

NORIT BMF-100 skid for 100 hl/h filtration capacity

Fouling and fouling control strategy



The key factor to control Membrane Filtration is fouling. Fouling of the membrane can occur by accumulation of rejected yeast cells and flocculated protein on the membrane surface. The yeast and/or protein can form an additional layer on top of the membrane. This layer will form an additional barrier to filtrate the flow and, at constant applied Trans Membrane Pressure (TMP) drop, the filtrate flow will decrease in time. Yeast cells and protein particles can also block the pores of the membrane, which reduces the capacity of the membrane. Finally several solutes, suck as carbohydrates, can be absorbed within the inner surface of the membrane, increasing the hydraulic resistance of the membrane.

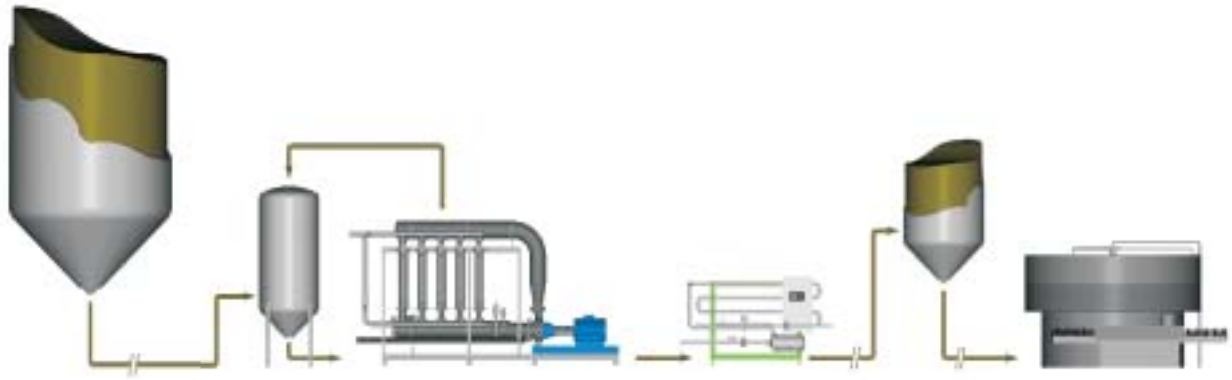


Fouling may either be reversible or irreversible in character. By increasing the recirculation velocity, by rinsing with water or by back flushing (i.e. temporary reversal of filtrate flow direction) this fouling can be removed. However simply rinsing or back flushing is not enough, a chemical regeneration is required to remove all foulants. Pore blocking is partly reversible and easy to remove with back flushing; however, certain particles may be stuck in the pore and be difficult to remove. The only solution will be to break down these particles by cleaning agents. An optimal cleaning procedure is the key factor in the success of processing beer by Membrane Filtration. For this purpose a innovative and patented cleaning procedure has been developed.

Integration concepts

The optimal integration configuration of the filter in the process line is determined by the design of the brewing process. Particularly the following aspects have to be considered:

- Existing equipment
- Continuous or semicontinuous production process
- Required method of stabilisation
- Requirement of beer recovery from surplus yeast
- Specific technological requirements (i.e. non pasteurized concept)
- Number and type of beer varieties



- BMF-100

Benefits of NORIT BMF-120

Quality
Physical / chemical analytical data comparable or better
Equal sensoric quality
Predictable and reliable because of constant and
Unaffected barrier
No Fe- leaching

Environment
No waste Kieselguhr / sludge diposal

Health and safety
No Kieselguhr dust
No health risks
Meeting strickter regulation in future

Process flexibility
Modular design (small-step function)
Variable in flow: 0-120Hl/h
Continious process
Short swith-over time
More beer types at the same time

Process simplicity
No separator
No Kieselguhr handling equipment
No waste Kieselguhr handling
No pre-adter run systen required
No "bright beer tank" cellar
Simple downstream operation

Brand image
Clean and green

Costs
Competitive pricing

A NORIT beer filtration membrane module

Basic skid BMF-120
Filtration capacity: 120 hl/h
Number of modules: 12
Total filtration surface: 111,6 m^2
Circulation pump: 336 m^3/h; 30 kW
Nett weight kg.: approx. 1000 kg
Dimensions(WxHxD): 4385 x 3230 x 1350
Integrated cooling unit: 20 kW

Properties of the membrane modules
Pore Size: max. 0.5 m
Membrane material: Polyethersulfon (PES)
Permanently Hydrophilic
Length: 1 m
Inner diameter fibers:1.5 mm
Filter area: 9.3 m

Process parameters
Cross flow velocity: 2 m/s
System pressure: 3 bar
Trans Membrane Pressure: ≤1,5 bar
Pressure drop circulation: 1-1,5 bar
Flux: 107 l/ m^2/h
Beer temperature: 0°C

A NORIT BMF-100 skid for 100 hl/h filtration capacity

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