

Sheet Filtration of Beer

Backwashing of BECO Depth Filter Sheets for Beer

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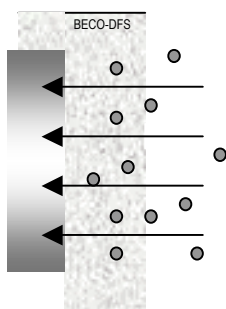
High efficiency through long filter serviceability, per charge, is a decisive factor in the sheet filtration compared with competitive filtration systems. Here, not only the flow rate per square meter and hour is important, but rather the total service life of the filter until the filter sheets are completely exhausted. Consideration of how capacity reserves of the filter sheets can make the filtration process more economic is thus a prime aspect.

Backwashing - a Benefit for Users

One possibility for obtaining a more favourable cost result is by regenerating the depth filter sheets by means of backwashing after a filtration cycle.

The purpose of backwashing is to re-open the pores and channels within the depth filter sheets that have become clogged with turbid matter, i.e. to regenerate them for further use. Due to the construction of BECO depth filters (the maximum pore sizes are near to the surface of the filter sheet inlet side and narrow down in tunnel form) it is important to backwash depth filters in the reverse direction to the normal direction of filtration.

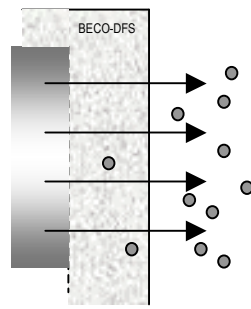
Filtration



Filter outlet side Filter inlet side

Depth filtration in flow direction with the retention of colloids and particles (small and very fine pores are found towards the outlet side)

Backwashing



Filter outlet side Filter inlet side

Backwashing of filter sheets is realized against the flow direction for washing out of the sheet pores all turbidity and particles.

Realization

All backwashing operations should be carried out with a slightly loosened filter package, a counterpressure of at least 0.5 bar and at 1 to 1.5 times the filtration rate, means about 1.5 – 2.3 hl/m²h.

- a) Direction and Temperature:
 1. reverse direction cold,
 2. reverse direction warm, between at least 50 up to max. 80 °C
- b) Time of backwashing:
 1. Until no trace of foam at least 5 minutes cold.
 2. Until no trace of froth and clear of flow at the outflow lanterns, approx. 15 to 20 minutes hot.

Flow Rate and Counterpressure

Backwashing should be done at 1 to 1.5 times the filtration rate, which means 1.5 to 2.3 hL/m²h at a counterpressure of at least 0.5 bar. A sufficient backwashing effect will only be obtained if the counterpressure is high enough. Simply allowing water to flow back through the sheet without pressure is less effective. To improve the counterpressure which is necessary for an optimal backwashing effect, the drain and vent valves at the filter side where the backwashing water comes out should be throttled, the drain and vent valves at the filter side where the water is fed into the filter should be closed shortly after starting the backwashing procedure.

The water used shall be biologically safe (drinking water quality) and free from mechanical impurities.

Backwashing Times

Long backwashing times will not always produce the best regeneration effect. Analyses have shown that backwashing with cold water involves the use of large quantities of water that are in no way in relation to the achieved washing results.

However, if the flow rate and necessary counterpressure are chosen with care, good regeneration results will often be achieved after only 5 minutes washing with cold water.

A final warm washing is always required. In this case a backwashing time of between 15 and 20 minutes has proven sufficient. Flow rate, counterpressure and temperature must be optimised again.

Backwashing Temperature

In order to wash out turbid matter such as beta-glucane, albumen and colloids out of the depth filters, a temperature of between 40 °C and max. 55 °C was previously considered to be ideal. New findings show, however, that a temperature of up to 80 °C produce a better washing effect. The procedure is to fill the filter with cold water and to heat it up with warm water to 80 °C, the turbidities and colloids are washed out at the respective optimum dissolving temperature. It was observed especially that by a hot water temperature of 70 – 80 °C more turbid matter is released and the service life of the depth filters in general is substantially prolonged.

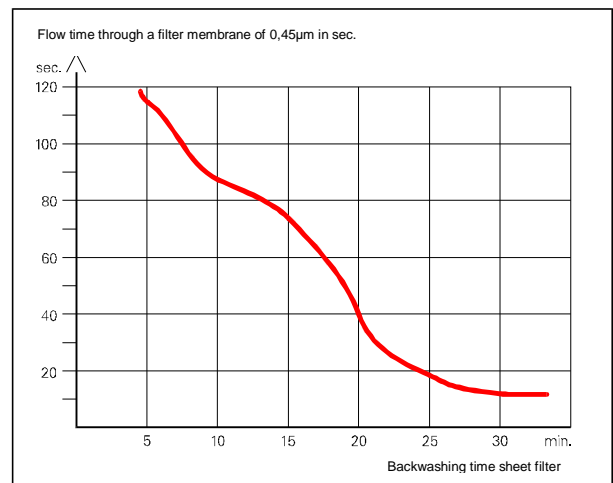
The backwashing operation is finished when the water running from all taps and valves after passing through the depth filters is clear and not frothy.

At the end of the backwashing operation the filter has a temperature of about 80 °C and can then be sterilised in the direction of flow without energy loss.

Checking the Backwashing Effect

At regular intervals 100 ml of the backwashing water should be taken from the filtration in the same spot, cooled to a temperature of about 6 to 8 °C in a refrigerator and then drawn through a filter membrane (vacuum produced via water jet or vacuum pump).

The flow time of the single specimens are related to the initial fresh water sample (clear water quality at the wash water inlet). In order to ensure the reproducibility of the measured data, this operation must always be carried out under the same conditions. The smaller difference in time to the initial fresh water sample the better the backwashing effect achieved. To help decide when to finish backwashing, a diagram is provided in which the rate of flow through the membrane is shown against the washing time.



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