

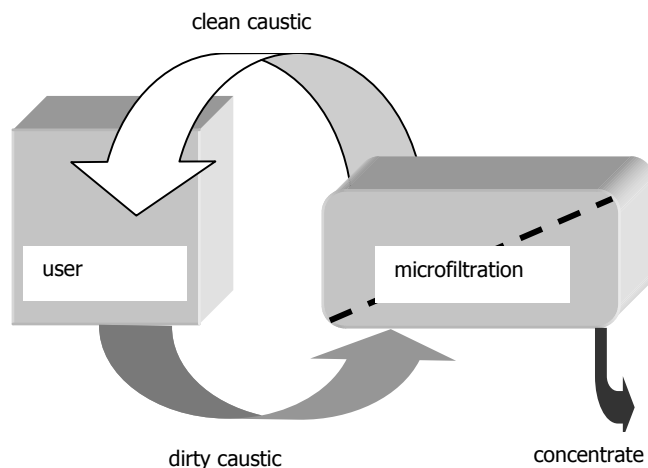
MF-LK – Microfiltration for the treatment of CIP - solutions

A constant high quality and permanent cost cutting projects – the typical challenge for almost all production sites in the food and beverage industry. The treatment of cleaning media from CIP-stations and bottle washing machines contributes both to cost reduction and quality improvement – by reducing the consumption of cleaning agents, less waste water, a low dirt concentration of the cleaning solutions. Thus, applications of this type of filtration are the main caustic of bottle washing machines, the caustic and / or acid of CIP-stations in different steps in the beverage production.

The dirtiness of the main caustic of a bottle washer is a factor influencing the consumption of water and detergents. It is the objective of the filtration to avoid the carrying of undissolved, haze forming particles into the rinsing zones, because all particles give shelter for microorganisms. Thus, suspended solids in the main caustic have to be reduced as far as possible. The only possibility for a permanent treatment of hot caustic with 82 – 85 °C without additional chemicals is membrane filtration.

In general, various technologies with different cut-off rates can be applied. For several reasons, IMECON is using microfiltration for this type of clarification:

- ✓ The cut-off is sufficient to eliminate suspended solids
- ✓ a high specific flux rate is achieved
- ✓ efficient backflushing
- ✓ long filtration cycles between cleaning



The bottle washing machine as example

Results

The filtrate of the microfiltration plant is free of suspended solids and will be transferred directly back to the main caustic, resulting in a closed loop between the dirt source (bottle washer or CIP-plant) and the membrane filtration. Buffer tanks, sedimentation tanks and other peripherals become unnecessary. The small concentrate volume is discharged directly to the neutralisation or to a waste water treatment plant. If the factory has a surplus of acid waste water, a direct use of the concentrate for the neutralisation is a possibility too.

Basic concept

The filtration of hot caustic is a critical application for the chemical and physical stability of membranes used. Several parameters have to be taken into account:

- ✓ the temperature can be up to 85 °C
- ✓ abrasive solids, glass fragment or similar may be found in the caustic
- ✓ the operation pressure at the membrane surface is several bar
- ✓ the pH is around 13 – 14

Due to these operation conditions. Membranes from polymer materials would have a short lifetime. IMECON uses microfiltration membranes from a ceramic material and an appropriate pore size. The membranes are put together in stainless steel housings. A the unfiltrate entry to the recirculation tank, a filtration against coarse particles above 500 µm is installed.

Process concept

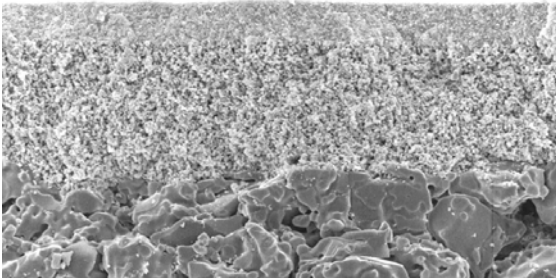
The plant is designed as a semi-continuous recirculation type: the cleaning solution is permanently circulated in a bypass of the bottle washer or the CIP-plant. Thus, these main units are completely independent from the operation of the caustic filtration. The caustic to be filtered is continuously taken out of the CIP-tank or the bottle washer in a part stream. The solution is filtered and brought back as a completely clear liquid. The concentrate, with the suspended solids filtered out, is collected in the batch tank and automatically discharged if necessary.

Automation concept

Different concepts are available for the automation: a standard module including PLC control and a touch panel as operator interface. Master control units of the factory can be coupled

right: Execution of a microfiltration plant for a filtrate volume of 6'000 l/h, application at a bottle washer (type MF-LK6000)

bottom: structure of a ceramic membrane



via bus systems, operation and control is then available on several levels.

The plant operation itself is fully automated, after the plant start, all steps are self-controlled. Filtration, refill and concentrate discharge will be repeated until the operators stop the plant or start a cleaning cycle.



Some reasons for the recycling of cleaning agents

Apart from the cost reduction for detergents and additives, the quality improve by a constant low dirt load of the cleaning solutions is a major topic for the filtration of caustic and acid from CIP plants and bottle washers. Constant product quality requires constant production parameters – we contribute to this target with our process know-how.

As a first step on the decision path to an investment in this field, a simulation model should be used to forecast possible results. IMECON offers up-to-date tools with the dynamic simulation of single machines up to complete process steps or production units.

Simulation models – a possible start for the optimisation

With the elements of system dynamics, the behaviour of complicated systems with feedback loops can be simulated. The variations of different process parameters are calculated as time series and visualised within a very short time. Interferences like stop and go operation, changes in the throughput or external factors can be quantified fast.

Examples are changes in the temperature if the throughput is reduced or increased and the fresh water rinsing is kept unchanged or the behaviour of the dirt load and the dirt transfer depending on a treatment of the caustic.

In a similar way, the most parameters of a bottle washing machine can be simulated. Based on the simulation results, an optimisation can take place. The results can include topics like the potential savings in fresh water consumption, the changes of the bottle temperature at the machine outlet (important for beverages with CO₂) and other informations.

In the simulation, different items are considered and visualised, like feedback loops and links between different water flows, bottle flows, dirt levels or other influences. Due to the layout of the model, one can run a lot of scenarios within a short time. Chances and risks of a possible optimisation become visible, without making investments in complex units with an uncertain result. With the results of a simulation, investments can be precisely targeted.

**IMECON supports you in your efficiency programs,
contact us for further informations !**