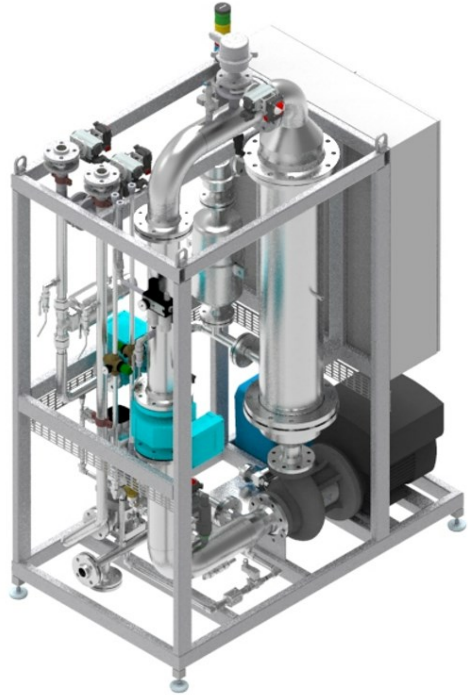




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Protection Systems



## Microfiltration for Bottle Washing Machines





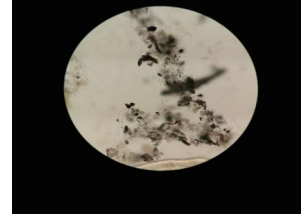
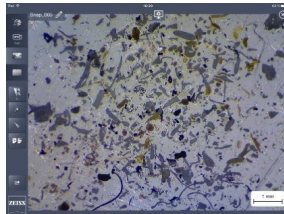


## Microparticles:

Microparticles have been detected worldwide in filled beverages and food products. Smallest particle that has been analyzed according to research studies had a particle size of 5  $\mu\text{m}$  (Schymanski et al., 2018) or 1,5  $\mu\text{m}$  (Oßmann et al., 2018).

### Types of contamination:

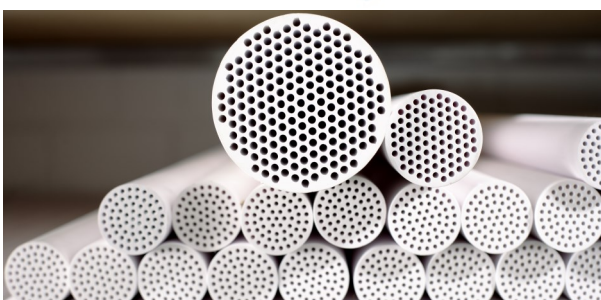
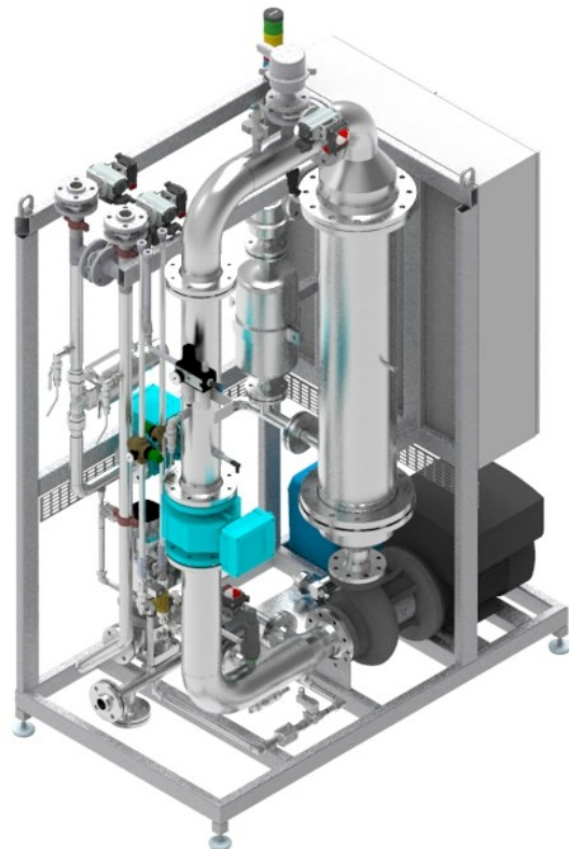
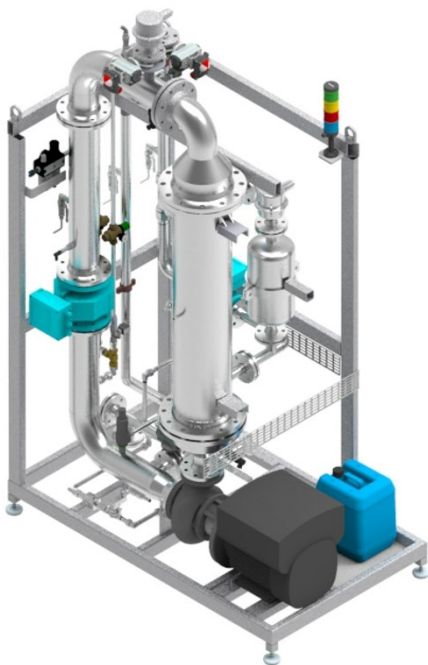
- label fibres
- color pigments
- glass / PET / metal abrasion
- dust
- organic contamination



## Solution:

Membrane filtration of the main caustic in order to reduce the contamination by microparticles in the entire bottle washing machine down to the final water bath and to assure the quality of the filled product.

**The BOLL & KIRCH Fine Filtration Unit (FFU BWM) is exactly designed for the efficient filtration of microparticles.**



Fine pored ceramic membrane for microfiltration



## Filtration results:

- turbidity of permeate app. 0 NTU
- reduction of COD up to more than 50%
- reduction of turbidity in main caustic bath up to more than 90 %
- reduction of settleable particles up to more than 98 %
- reduction of filterable particles up to more than 90 %

	Cut-offs of different liquid filtration techniques										
Micrometer logarithmic scaled	0,001	0,01	0,1	1	10	100	1000				
Angstroms logarithmic scaled	1	10	100	1000	10 <sup>4</sup>	10 <sup>5</sup>	10 <sup>6</sup>	10 <sup>7</sup>			
Molecular weight (Dextran in kD)	0,5	50	1.000								
Size ratio of substances to be separated	Solved salts	Sugar	Pyrogens	Viruses	Albumin (66 kD)	Red blood cells	Bacteria	Yeast	Pollen	Human hair	Sand
Separating process	Reverse osmosis	Nano filtration	Ultra filtration	FFU BWM	Micro filtration			Particle filtration			

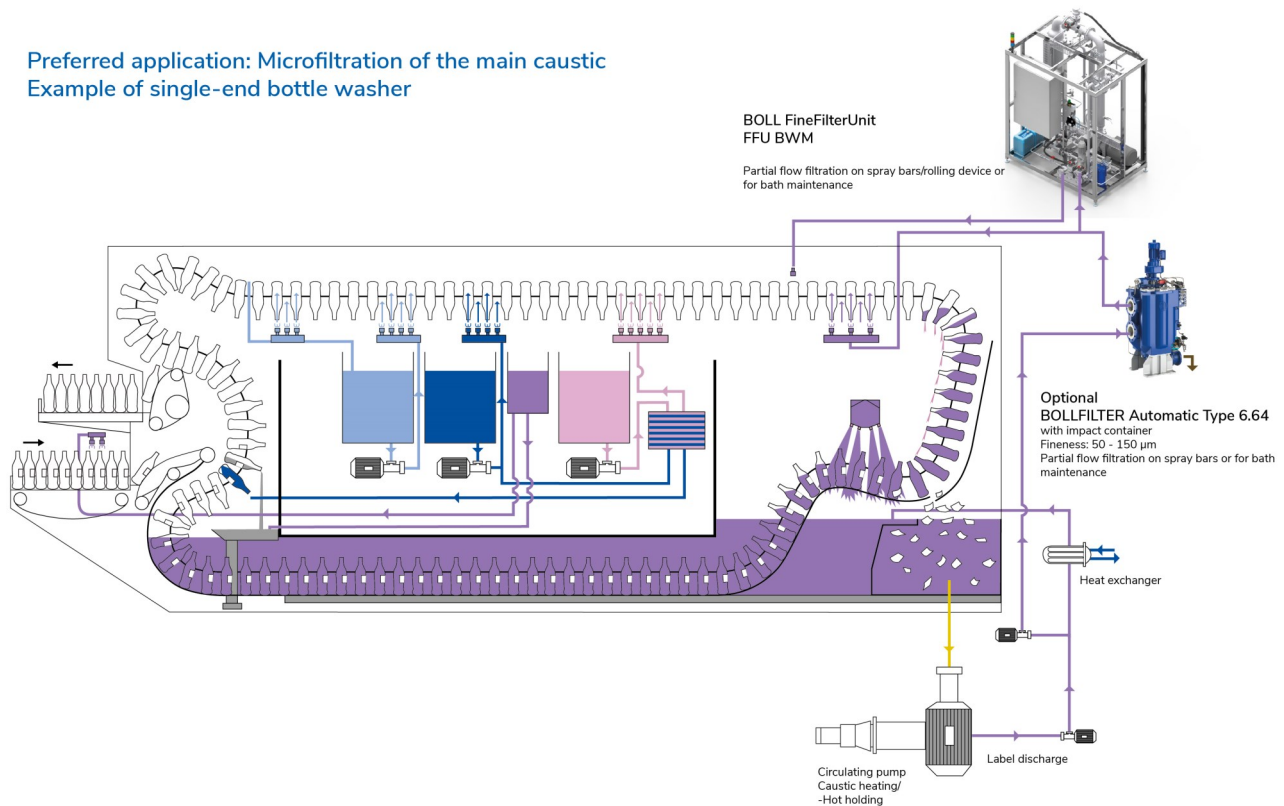


## Advantages:

- Increase of caustic lifetime due to continuous removal of contamination
- Carry over of particles into post-treatment baths is reduced
- Increase of line productivity due to reduced machine stops or unforeseen failures
- Non-sedimenting contaminants are removed efficiently
- Flexibility in production - no caustic sedimentation required
- Improved cleaning results of the cleaned bottles
- Tremendously improved machine condition regarding all components
- No fouling in machine areas with lower flow velocities
- Reduced maintenance effort for the bottle washing machine
- In total no increased concentrate or additive consumption realistic

As an example the integration of the membrane unit can be realized in the bypass of an Automatic Filter which has the function of a prefiltration for the membrane

Preferred application: Microfiltration of the main caustic  
Example of single-end bottle washer

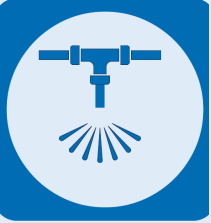


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### Advantages of system integration:

- hydraulic integration in every type of bottle washing machine possible, new or as a retrofit
- complete system integration by BOLL & KIRCH - from one source
- very low installation effort
  - short installation and commissioning period within two days
  - small foot print
  - no impact on production in case of failure or maintenance
- very low power consumption
- no additional operational effort due to fully automatic filtration unit
- Automatic maintenance & service by BOLL & KIRCH - highest operational availability



### **Protection of spray nozzles:**

- Spray nozzles stay effective throughout the entire operation time
- Tremendously reduced wearing of spray nozzles
- unnecessary pressure losses avoided
- homogenous cleaning result throughout entire production
- Effective component protection and bath conditioning



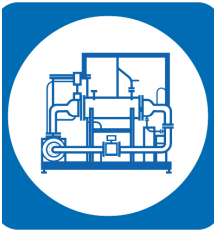
### **Protection of heat exchanger:**

- Homogenous heat transfer in recuperative area
- Extensive maintenance and cleaning of heat exchanger avoided
- Reduced fouling in tubular heat exchangers
- Clear caustic -> no residues -> optimized heat transfer
- Maintenance intervals reduced to a minimum
- No additional energy consumption



Mineral water producer:

- Mineral water, shandys and CSD
- mainly usage of 0,75 and 1,0 l company owned re-turnable glass bottles with paper labels



Membrane filtration unit:

- Upconcentration in loop
- 4 – 6 m<sup>3</sup>/h
- 1 membrane module
- 12 kW
- Fully automatic regulation
- Fully automatic cleaning
- Foot print (mm):2000 x 1350 x 2965



The BOLL FFU BWM microfiltration is installed behind a BOLLFILTER Automatic Type 6.64 filtering the caustic out of the main caustic bath and supplies spray nozzles cleaning the outer surface of the bottles with clean filtered main caustic.



Target:

Continuous reduction of contaminants for a homogenous cleaning efficiency of the main caustic.



Result:

Process security due to higher caustic quality and cleaning efficiency of the main caustic.

**Turbidity reduction from more than 800 NTU down to app. 160 NTU within only 72 hours.**



	Main Caustic	Water Baths
Before commissioning	900 NTU	6 NTU
Two months later	app. 100 NTU	app. 1 NTU

**Reduction in main caustic app. 89%**

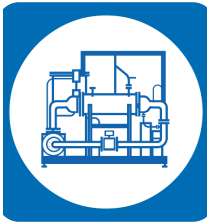
**Reduction in water baths app. 83%**





### Brewery in Bavaria:

- usage of 0,5 l returnable pool glass bottles with paper labels
- High fluctuation of caustic quality due to high proportion pool glass bottles with various label types



### Membrane filtration unit:

- app. 4 m<sup>3</sup>/h
- 1 membran module
- 10 kW
- Foot print (mm):2000 x 1350 x 2965
- Integrated behind Automatic Filter Type 6.64 connected to main caustic as well as post caustic



### Result:

Best results were achieved with the filtration of main caustic.

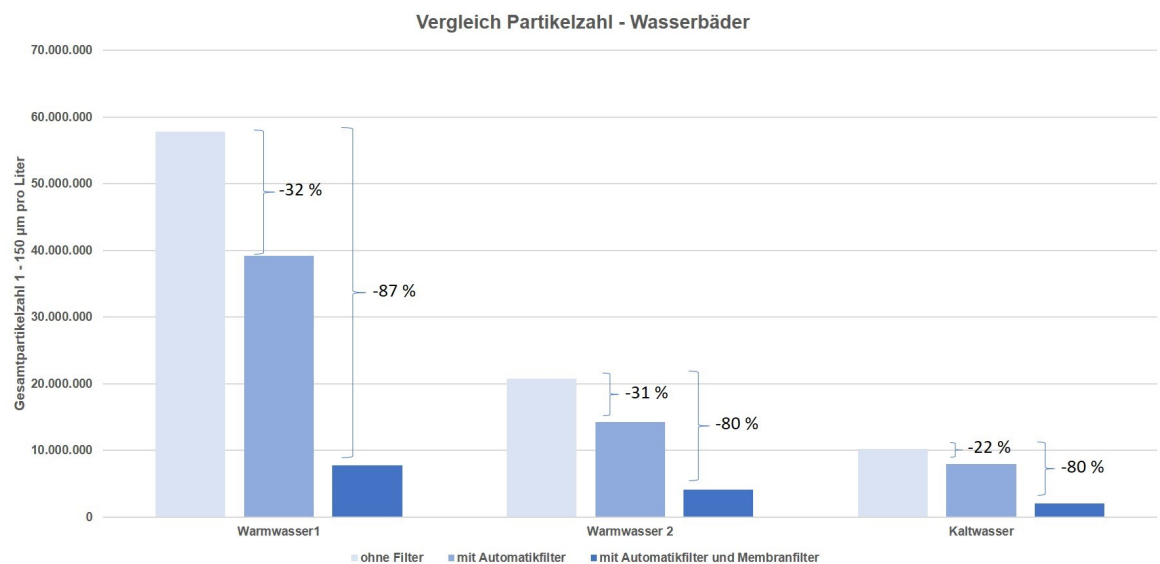
**Turbidity reduction from more than 600 NTU down to app. 120 NTU within only 48 hours.**

In the same time the settleable particles were reduced from app. 120 ml/l down to 2 ml/l.

Caustic quality has been improved effectively.



### Reduction of particle contamination of about 80 % down to the cold water zone:





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