PALL

Food and Beverage

ENABLING A GREENER FUTURE

Application Bulletin

Save 98 % Water from Filter Backwash Recovery

Overview

Today, the demand for water is fast outstripping supply. This water scarcity underscores the need for better water management. The Food and Beverage industry started measuring its water footprint – water volume used in the process to produce 1 L or 1 kg of finished product - as part of its sustainable strategy.

Water management programs are in place in main Food and Beverage manufacturers in order to optimize water usage, reduce the water footprint and achieve overall cost improvements.

Traditional water treatment in place in most food and beverage industries uses sand and carbon filters. Typically in a water treatment plant 2 to 5 % of the total water production is used for backwashing those filters [1]. This filter backwash water contains a high amount of solids and the general practice of disposal is to use sedimentation storage tanks where the sludge is settled with the optional help of chemical treatment. The clarified water is then recycled back to the water treatment plant (Figure 1).

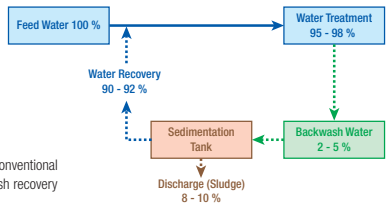

Figure 1 - Conventional filter backwash recovery

The Challenge

Without adequate control, there is a risk of re-introducing increased concentrations of pathogenic contaminants such as *Cryptosporidium* and *Giardia* to the filters and recovery water.

By treating the recovered backwash water before re-introducing it to the filter, this risk can be controlled.

Furthermore, depending on the level of water flow per day, more than a hundred of cubic meters of backwash water per day may require treatment. Recovery of water is key to reduction of water fees within the plant and the reduction of water footprint. Chemical treatment can improve sedimentation time of waste water streams but they increase the cost of the recovery treatment.

Finally, the waste streams coming from the water treatment plant may contain different type of contaminants such as clarifier sludge with high levels of colloids that may be difficult for some installations to treat.

Ultimately, each water treatment plant manager wants :

- to reduce the waste streams and conserve as much as water as possible
- to produce clean water of consistent and safe quality
- a robust installation that can withstand feed variability
- to improve the operating costs of the water treatment plant

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Pall Aria FB4 system for 20m³/h water treatment

The Solution

Beside the conventional water treatment using clarification and sand filtration, single step membrane microfiltration has proven to be an efficient and cost effective way to obtain consistent water quality from backwash waste [2].

The Pall Aria™ FB membrane system (Figure 2) has been specifically developed to satisfy the water treatment plant manager requirements in a single step.

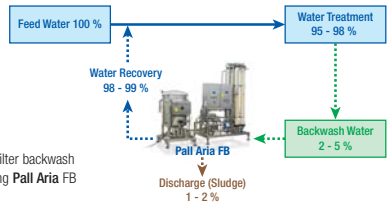


Figure 2 - Filter backwash recovery using **Pall Aria** FB

The system utilizes a robust PVDF hollow fiber microfiltration membranes to retain suspended solids and pathogenic microbes, thus reducing the risk of recontamination of the water treatment plant. The hygienic stainless steel design combined with an automated disinfection cycle when the system is not in operation for more than 24 hours ensures a high microbiological safety level to the water recovery process.

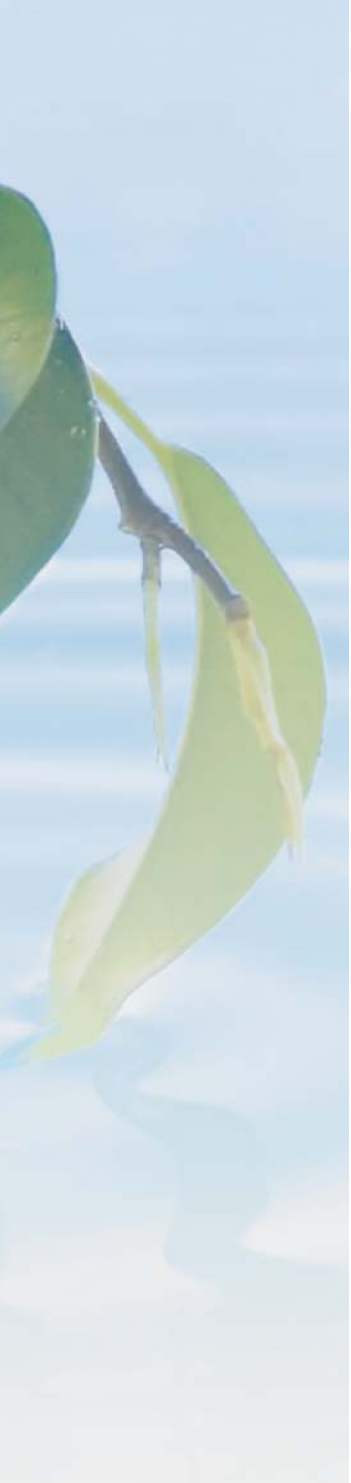
The retained solids are concentrated in a low volume waste stream that is discharged from the system.

A proprietary mechanical backwash with air scrubbing allows uninterrupted performance and high yield, achieving over 98 % backwash water recovery.

Downstream, the water quality is maintained to the required standards regardless of the variability of the feed water stream. The system provides water quality far superior to conventional treatment with typical water turbidity lower than 0.1 NTU.

Thanks to its compact footprint, the system is easy to integrate into existing water treatment plants.

The fully automated system is simple and easy to operate. Mechanical backwash and low energy consumption (typically 0.09 kWh per m³ filtered water) allows operating costs improvement by over 50 % compared to conventional treatment (Table 1).



	Conventional treatment	Pall Aria FB
Water Turbidity	> 1 NTU Variable	< 0.1 NTU Consistent
Pore Size Stability	Variable	Stable
Operating Flexibility	**No** dependent from feed water loading variations	**Yes** Independent from feed water loading variations
Chemical Consumption	High (coagulants)	Low (chlorine for disinfection)
Water Recovery	90 – 92 %	98 %
Energy Consumption	High	0.09 kWh/m^3
Footprint (e.g. for 1 m^2 building)	Large (15 m^3/h system)	Small (50 m^3/h system)
Microbial Contamination	Can occur	High retention of *Cryptosporidium* and *Giardia*
Typical Operating Costs	> 0.25 $/m^3	< 0.12 $/m^3

Table 1 - Filter backwash recovery treatment comparison

Per year	No recovery treatment	Pall Aria FB
Water reclaim	0	98%
Water savings (m^3)	0	4018
Water costs ($)	4100	82
Operating costs ($)	-	287 – 574
Water costs improvement (%)	-	84 - 91

Table 2 - Case study

Benefits

Table 2 shows an economical approach using data from a published case study [3].

Parameters :

Sand filter backwash per week : 44 m^3

Carbon filter backwash per week : 38 m^3

Filter backwash per year (50 weeks per year) : 4100 m^3

Incoming water fees : 0.6 $/m^3

Wastewater fees : 0.4 $/m^3

The **Pall Aria** FB membrane filtration system provides :

- Up to 98 % water recovery
- Consistent water quality production regardless to raw water quality within specified limits covering the most typical water treatment applications
- High microbiological removal
  - Stainless steel hygienic design and automatic disinfection when the system stays out of operation for more than 24 hours.
  - Typically 6 log removal for *Cryptosporidium* oocysts and *Giardia* cysts
- Overall costs improvement
  - Low chemical consumption, low energy consumption (typically 0.09 kWh per m^3 filtered water) and minimal water losses (up to 98 % water recovery).
- Simple single step filter backwash water recovery
- Long production cycles

There are no globally harmonized water or food regulations. Please contact Pall to verify that the product conforms to your national and/or regional regulatory requirement.

References :

[1] S. Vigneswaran, S. Boonthanon, H. Prasanthi, Filter backwash water recycling using crossflow microfiltration, Desalination 106 (1996) 31-38.

[2] CBC Raj, T E Kwong, W W Cheng, L M Fong, S H Tiong, P S Klose, Wash water in waterworks : contaminants and process options for reclamation, Journal of Environmental Sciences 20(2008) 1300-1305.

[3] P Padhiar, P Anderson, Industry taking action – Case study of a water use efficiency program in Coca-Cola plants, Proceedings of the 2005 Georgia Water Resources Conference held in April 25 – 27, 2005, at the University of Georgia. Kathryn J. Hatcher, editor, Institute Ecology, The University of Georgia, Athens, Georgia.

About Pall Corporation

Pall Corporation is the largest and most diverse filtration, separation, and purification company in the world. Pall serves the food and beverage industries with advanced membrane filtration technology and systems engineered for reliability and cost-effectiveness. Easy to install and simple to use, our systems satisfy a wide range of filtration requirements. Our Total Fluid Management approach offers customers solutions to address the needs of an entire process, encompassing filtration products, services, systems and training.

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