Sludge water treatment using membrane technology

In general, treated drinking water is used for the backwashing of filters in water plants and subsequently, this contaminated water has to be disposed of.

However, in line with the concept of water reuse and for energy saving reasons, the further treatment of this backwash water is often desirable and should be an integral part of the process sequence.

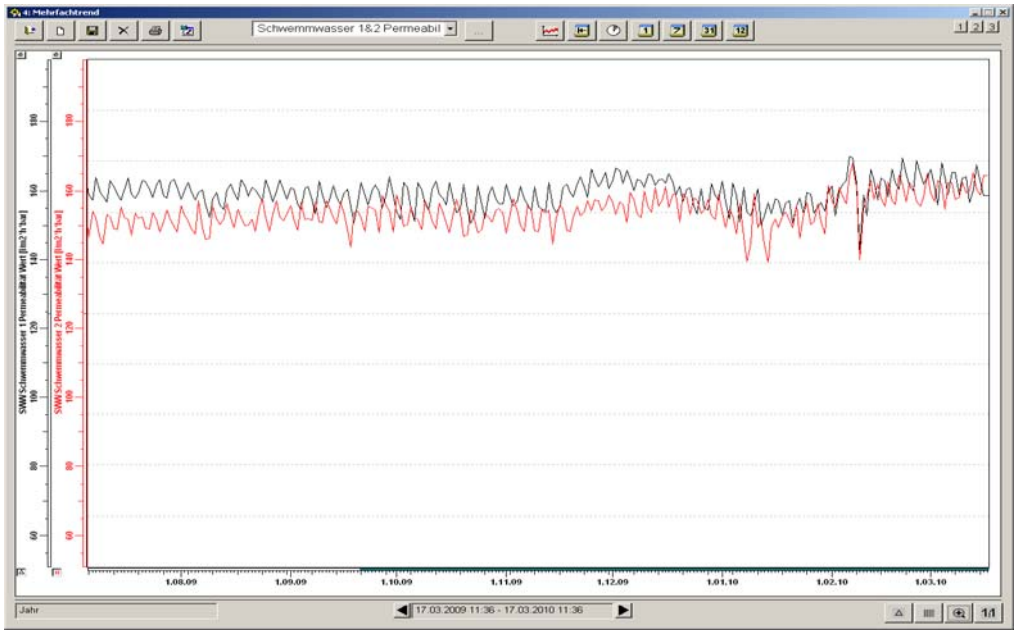
Many modern water treatment plants have an ultra filtration stage in their treatment chain and this requires backwashing at frequent intervals and thus more water than conventional treatment processes. However, although membrane technology raises the levels of wastewater in the main process, as a result of its permeate, which is harmless from a bacteriological standpoint, it can provide a product for raw water supplementation.

This makes the separate treatment of backwash water even more economical and due to today's membrane technology, which offers highly efficient processing, recycling is no longer a cause for concern.

Even if the treated backwash water is not recycled, treatment substantially reduces the amount of used water going to wastewater plants and thus cuts discharge rates. This is because only the concentrated sludge water derived from the emptying of the filtration basins is disposed of.

In view of the fact that backwash waters are usually highly charged with solids, WABAG favours ultra filtration with submerged membranes. However, as the membranes have to deal with a far higher level of water contamination, in order to maintain stable operating conditions the various cleaning processes have to be adapted to the characteristics of the backwash water, e.g.

- 45-second permeate washing every 15 minutes
- Tank drainage after every 12-18 hours of continuous operation
- Maintenance cleaning with NaOCl after every second tank drain
- Yearly recovery cleaning (oxidizing/acid)



As shown by the curves above, this backwash pattern maintains favourable operational values and stable permeability. The permeability trend of both lines over a 8-month period demonstrates constantly high level values of between 140 and 170 l/m^{2}hbar. The plant has been in operation since January 2006.

Under optimum conditions, a multi-barrier system for drinking water production with integrated backwash water treatment can produce a yield of over 99.5% and hence less than 0.5% sludge water.

Depending on the use of capacity of a WTP, sludge water quantities as low as < 0.2% of the drinking water volume produced can be attained, although in many cases production is well below full plant capacity and therefore in ratio to the produced drinking water, the sludge water percentage is higher. This is clearly demonstrated by the table below, which shows figures from treatment on Lake Zurich (WTW Männedorf, Switzerland).

Operational year: 2009	Raw water drawn from lake	Drinking water production Total	Backwash water consumption	Backwash water – share of production	Used back-wash water discharge into lake	Sludge water discharge to canalisation	Sludge water – share of production
	Vol. in m^3	Vol. in m^3	Vol. in m^3	in %	Vol. in m^3	Vol. in m^3	in %
Jan. – Dec.	1,670,917	1,409,046	223,766	15.9	228,684	32,001	2.3

The production of a bacteria-free permeate during backwash water treatment allows unrestricted recycling into the main treatment process. Particularly in WTPs where the raw water requires expensive pumping, the target must be the highest possible recycling level and membranes are capable of making this goal achievable.

The small footprint required by ultrafiltration as compared to conventional treatment processes such as sedimentation filtration, allows the upgrade of almost any existing treatment plant with backwash water treatment using membrane modules.

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