

Filter Technology

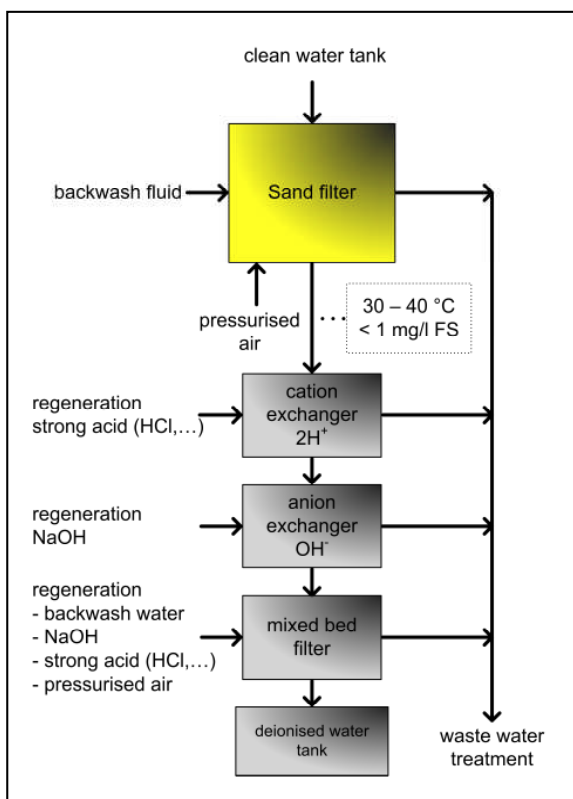
Flyweight replaces sandcastle

Automatic backwash filter for use in deionised water treatment

Josef Baumgartinger, Stefan Strasser

Due to its special design, the automatic backwash filter RWF, from Lenzing Technik, has the ability for filter-caking. This technology makes it possible to filter very finely – to 1 µm – and with a large amount of solid content and high throughput. For these reasons the RWF is also suitable to replace sand-filters in deionised water treatment.

Over three years ago Lenzing Technik developed the backwash filter RWF with the distinguishing feature that it could filter not only to a very fine level but also concurrently throughput a large amount of solid content at high rates. Since its introduction to the market, the filter has opened up new possibilities for use and delivered good results in various applications. For example, since December last year, the filter has been in use for the filtration of deionised water.



Deionised water is extracted from river water in a multiple step process. Previously, the corresponding technology used for the filter step between the decarbonisation through limewater precipitation and the following ion-exchange was a sand-filter.

For a throughput of 108 m³/h, one requires a sand-filter that can be as big as 3m wide and over 5m high. The sand-filter needs to operate with a very low filtration speed so that one can be sure that there is not more than 1 ppm (1 mg/l) of solids present in the filtered output and also to ensure that no build up of exchanged-ion resin occurs. The sand-filter must stop operation during the backwashing. Therefore, in single machine installations, there must be at least one spare sand-filter for the continual operation of the filtration unit. Additionally, an allowance must be made for a volume of at least 160 m³ backwash liquid. Finally, the backwashing of a filter requires a period of 20 minutes. The backwash liquid of the sand-filters is then channelled into the waste water cleaning equipment.

The treatment from clean water to deionised water. Until now, sand-filters have been used between the decarbonisation and the ION exchange.

Without Interruption

The RWF-filter has a partial backwash. With this, a backwash only needs to use approximately 20 to 30 litres water. However, this process must happen often. During the backwashing, the filtration of 95% of the filter surface is retained.

Thanks to the special filter geometry, a very fine filtering level can be achieved and, at the same time, a high degree of impurity separation.

The particle elimination curve shows that already at 5 to 6 µm there are absolute deposition rates. Even at 1 µm, as much as 35% of the particles have been eliminated – and this at filter throughput rates of 120 m³/h. The

Filter Technology

impurity concentration in the filtrate of the RWF filter permanently accounts for less than 0.5 mg/l at an inflow concentration of between 35 and 150 mg/l.

The filters are, depending on their application, operated with a very fine filter-media or even with a metal fibre fleece, here absolute deposition rates of up to 3 µm are achievable.



The deposition mechanisms of the sand-filter system and the RWF automatic backwash filter have significant differences. In the sand-filter, the particles sit on the surface area of the sand grains. The dirt particles that are to be separated must have specific electrochemical properties as they are often caught through chemical dosing. The separation succeeds only to a certain extent through a sieving effect of the pores between the sand grains, as they are by definition too big to pass through.

For the treatment of deionised water a 10-µm-filter-media is used with the RWF. A surface area filtration of the sieve comes at the beginning of the filtration cycle. After only a few seconds, a filter layer has already started to build up – an effect made possible by the patented design of the RWF. Filtering is then performed via a thin filter-cake. It is through this cake-filtration that the especially high particle deposition is made possible.

The automatic backwash filters RWF leads, through its special design, to filter-caking. This technology makes very fine filtering – to 1 µm – a possibility.

Significantly Lower Costs

Users of deionised water applications can experience up to 50% lower investment costs as a result of the use of an RWF filter. In addition to this, the RWF filter is significantly simpler compared to the complexity of a sand-filter. This results in lower equipment acquisition costs for filters, and marginal expenses for piping, fittings, controls and above all buildings. The surface area requirement for a single sand-filter with approx. 110 m³/h throughput rate is approximately 7 m². In contrast, the surface area requirement of an RWF with a throughput of approximately 130 m³/h is only about 1.3 m².

More impressive is the difference in the weight of each system. The sand-filter described above weighs about 47t. In comparison, the automatic RWF filter proves to be a pure flyweight weighing only 350 kg. In total space requirements – converted space and weight – about 95% can be saved.

The more than 30% lower usage costs come about through the significantly reduced use of backwash water. RWF uses approximately 1% in comparison with about 8% used by the sand-filter. The disadvantages of the sand-filter are the consumption of air and the very manpower-intensive and time-intensive maintenance (change of sand) in connection with the longer standstill of the filter. In comparison, the once or twice yearly filter-material change required in the RWF is accomplished within one to two hours.

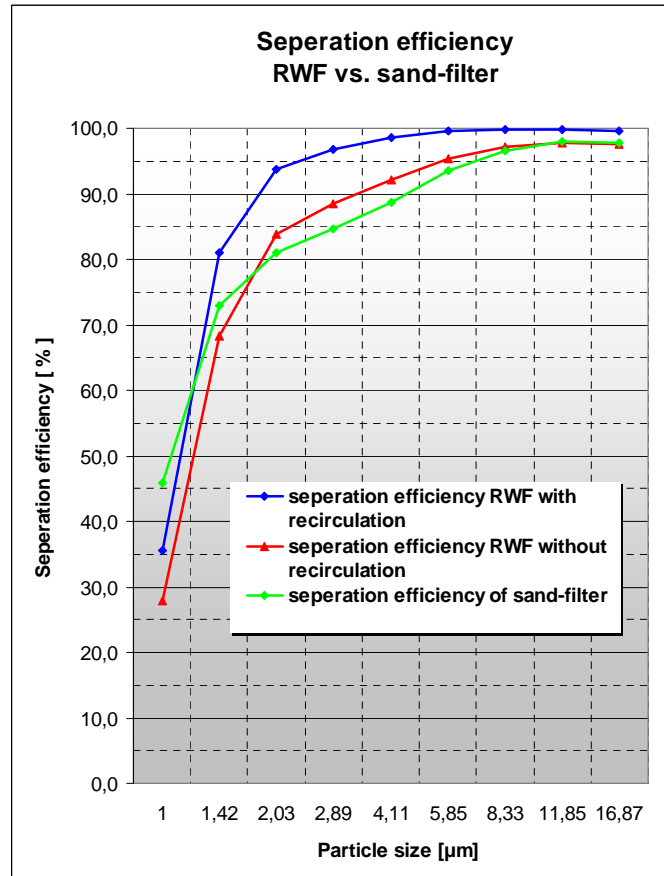
Crucial for the implementation of the automatic backwash filter was the achievement of the required quality parameters, such as a level of undissolved solids of < 1 mg/l. From the analysis data it is obvious that the filter quality of the water from each of the filter types is about the same. It would be possible, through reprocessing the first filtrate output immediately after the backwash, to achieve a significant improvement in the filtrate quality. This is, however, not necessary with the previously described deionised water treatment.

Filter Technology

Summary

The application of the automatic backwash filter RWF is a commercially attractive solution for investment in new installations, investment in expansion or for the replacement of a sand-filter. The simplicity of the RWF filter equipment and the greatly reduced space and building requirements are convincing reasons to purchase the equipment. The function of the filtration before the ion exchange is that the equipment is protected from getting dirty, i.e. the accumulation of impurities. For this reason, a very effective particle deposition is required. As can be seen in the overview table and is also easy to see in the particle deposition diagram, RWF meets this requirement. Even further optimization is possible – if necessary – through the reprocessing of the first filtrate.

Through the reprocessing of the first filtrate it is possible to raise the deposit degree even higher.



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