



Scientific Article

Ideal treatment of laundry wastewater with ultrafiltration installations

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Treatment of very dirty work clothing also produces heavily polluted, oily/greasy wastewater. It is the aim of laundry wastewater treatment to reduce fresh water consumption and to minimise the volume of residuals. At the same time, adherence to the limit values according to appendix 55 of the General provisions on hydrocarbon, heavy metal and AOX contamination in wastewater must be guaranteed.

For the treatment of laundry wastewater with a high percentage of blue cloth and footmats, EnviroChemie has developed a low-cost, easy-to-operate and robust technology, used in the standardised, modular Envopur UFI NA ultrafiltration installations. An advantage of these ultrafiltration installations is their small footprint and low operating costs.

The filtrate produced by the ultrafiltration installation can be directly used for prewash programmes or for mat wash, thus decreasing the specific fresh water consumption. The ultrafiltration installation is the first stage of a wastewater recycling plant within a recycling concept. Through expansion by a second membrane stage, an Envopur NFI NA nanofiltration stage, the wastewater can be recycled in a way that makes it suitable for use in the entire washing

process. The modular addition of a nanofiltration installation is possible any time. As an option, a wastewater disinfection stage with ozone, UV, hydrogen peroxide or combinations thereof can be installed. An optional concentrate treatment stage from the Envopur product family facilitates an additional reduction of the volume of residuals by 50%. An advantage of the system solution presented is its modular construction, allowing any combination of the components according to the requirements.

Wastewater treatment in laundries for working clothes

The laundry wastewater load can vary considerably depending on the percentage of blue or white laundry and of mats. Below you can see the typical composition of wastewater coming from a laundry with high percentage of blue clothing and mats. Further you can see the accessible wastewater concentration values in the filtrate of the ultrafiltration installation and in the filtrate of a downstream nanofiltration installation.

Laundry wastewater load

Parameter	Unit	Raw water	Filtrate from ultrafiltration	Filtrate from nanofiltration
Temp.	°C	45–60	< 35*	< 35*
pH	-	9–12	9.0	9.0
Conduct.	µS/cm	approx. 3,000	approx. 3,500	500–1,000
KW (H18)	mg/l	150–500	< 2.0	< 0.1
COD	mg/l	2,000–4,500	500–1,000	approx. 50–100
Cu	mg/l	< 6.0	< 0.1	< 0.01
Total Cr	Mg/l	< 1.0	< 0.1	< 0.01
Pb	mg/l	< 6.5	< 0.1	< 0.01
Zn	mg/l	< 10	< 0.5	< 0.01

Envopur wastewater treatment plant

The wastewater from the washing process in the working clothes laundry is carried from the washing machines to a pump sump. There, special wastewater feed pumps are mounted, that use level control to carry the water to the wastewater stacking tanks via a sieving machine for lint removal.



Fig-1: Example of a typical wastewater pretreatment stage (vibration screens, sand trap, etc.) of an Envopur UFI NA 2.000 ultrafiltration plant



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Fig-2: Example of an Envopur ultrafiltration installation's standardised module rack

As an option, an additional sand trap or disc filter can be installed for further lint and sand separation. The wastewater stacking tank is permanently stirred for homogenous wastewater and is equipped with a pH control system. For heavy metal precipitation, an additional organosulfide dosing station can be installed. The wastewater is pumped using level control to the actual water treatment installation. The ultrafiltration installation removes macromolecules and undissolved substances up to the average membrane pore size (e.g. oils, greases, lipophilic substances). The low molecular substances (e.g. tensides, water) penetrate the membrane body. The wastewater is pumped from the working tank into the module circuit by a booster pump. In order to obtain high overflow rates and thus high filtrate flow rates, a high volume is pumped through the membrane modules by a feed pump (max. 2 modules in a row). Part of the concentrate is recirculated into the working tank in order to avoid larger concentrations in the module circuit. Inside the ceramic membrane tube modules that are especially adapted to the medium to be filtered a separation into a clear filtrate stream and a concentrate stream takes place. The raw water flows through the inside of the tube membranes while the filtrate is carried away orthogonally.

The filtrate capacity of each module can be determined with a flow meter. The filtrate still contains large amounts of the tenside components that have not been consumed during the washing process and is carried into the recycling water storage tank or into the interim storage tank. Part of the filtrate can be reused for prewash or mat wash programmes. The other part undergoes a final control and is carried via a heat exchanger to the drain. If reuse of the wastewater as main washing water is desired, the wastewater must be further treated with a nanofiltration installation.

All process stages such as filtration, concentration, concentrate elimination and membrane cleaning are automated using a PLC. The PLC is controlled via touchscreen with process visualisation.

Residual amount of the ultrafiltration installation

The residual amount (concentrate) to be disposed of is approximately 1% for the load values stated above. This corresponds to a concentration of 1:100. If an additional concentrate treatment stage is installed, the residual amount to be disposed of is approximately 0.5%. This corresponds to a concentration of 1:200. If the wastewater load is below the values stated above, lower residual volumes (or higher concentrations) are possible. The values to be obtained are then up to 0.3% (i.e. 1:300).

Water recycling rate with downstream nanofiltration installation

If a nanofiltration installation is installed downstream, the water recycling rate is approx. 70–80%, depending on the wastewater load. Generally, the recycling water must additionally be disinfected. As water disinfection processes, ozonation, UV radiation and hydrogen peroxide dosing or a combination thereof have been proven in practice.

EnviroChemie has already implemented 15 treatment plants for laundry wastewater. The modular design of the laundry system solutions is perfect for the customer, since for any requirement an appropriate solution can be custom-tailored.

In addition to the safe adherence to the required wastewater limits, the fresh water costs are reduced and the volume of residual is minimised.