Case History

Waste Water Ultra-Filtration Re-use

Drives Water Savings for Next Generation

- Reduction of space occupancy
- Continuous production warranty
- Warranty of discharge compliance
- Return on investment less than 1 year

Challenge

We intend to obtain potable water quality by tertiary treatment of wastewater from the WWTP, for use in non-noble purposes.

Conventional tertiary treatments does not assure a constant, high quality of water.

The effluent to be treated comes from a slaughterhouse, with processes of cutting and packaging of meats and derivatives.

The final objective is to reduce water consumption in the network, looking for solutions where to use this treated water, according to the quality that we will be obtain.

Parameter	Units	Value
QOD	mg/l	1 500
BOD_5	mg/l	550
TSS	mg/l	900
Total Nitrogen	mg/l	187
pH	Sorenson	7.1

Adopted Solution

GreatWater E & S performed a pilot test with PVDF capillary type ultrafiltration membranes, building a pilot unit available for customer testing.

We Build a pilot using HydraCap 40Max UF membrane, with a porosity of 0,08 µm a filtration area of 52 m^2.

The quality of the effluent was the exit of costumer WWTP, and is showed in the table above.

Due to the high content of suspended material it was consider to use a turbine filter before the pilot unit to avoid collapse the membrane in a short time.

Also we have used a bag 100 µm filter before the Ultra-filtration unit to clarify the effluent and increase the performance of the unit.

We use a pump for 1 000 lt/h at 2 bar pressure. We have also installed a compressor for cleaning for a working point of 15 Nm3/h at 0,5 bar.

We installed a CIP system, to perform a 3 times daily cleaning with chlorine and weekly with caustic soda and acid.

Test Results:

Parameter	Units	5 hours	30 hours	120 hours
QOD	mg/l	189	87	15
BOD_5	mg/l	33	5	2
TSS	mg/l	2	1	1
Total Nitrogen	mg/l	18	12	9
pH	Sorenson	7.1	7.0	7.0

The Ultra-filtration process allowed to prove that the parameters of an effluent can be practically reduced to zero, allowing to reuse this water in different industrial processes.

Note that Ultra-Filtration membranes remove 99% of viruses and bacteria present in water .

Additionally, in order to verify the installation's operating limit, an activated carbon filter was added.

Also the effluent before ultrafiltration was chlorinated with 10 mg / l of sodium hypochlorite, just as the treated final effluent was chlorinated to obtain a stock of 0.2 to 0.6 ppm as free chlorine .

Final Results:

Parâmetro	Un.	Valor
COD	mg/l	5
BOD_5	mg/l	< 1
Micro-organisms at 22º C	Ufc/ml	0
Micro-organisms at 37º C	Ufc/ml	0
Total Coliforms	Ufc/100 ml	0
E. coli	Ufc/100 ml	0
Enterococcus	Ufc/100 ml	0
Free Chlorine	mg/l Cl_2	0,35

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Comments

The water resulting from the tertiary effluent treatment process demonstrates that it is possible to reach a state that complies with the legal requirements for drinking water.

This assumption is important as it shows what we could achieve in terms of quality of the resulting waste water by a biological treatment process, thus allowing to determine the use of such water in various industrial processes.

We monitored and tested for 6 months the production of this type of reused water, which was used for the following purposes, as a feasibility test and with the objective of determining its impact .

Thus, this water was used in the following processes:

1. Compensation of open cooling systems
2. Outdoor floor washings
3. Necessary washes at the WWTP
4. Use for watering green spaces
5. As feed to a reverse osmosis process for the production of steam

In all these points, the water quality that was being used in terms of evaluating changes in its drinking characteristic, was monitored for 6 months.

Knowing also that ultrafiltration membranes already have a greater than 4-log reduction in bacteria and viruses, their subsequent passage in a reverse osmosis unit allows the reduction of microbiological contamination to zero, turning safe for the production of steam.

A monitoring of the quality of the condensates generated by the production and use of steam was carried out, in order to determine the existence of any type of microbiological contamination, which was not verified.

Likewise, the normal monitoring of the treatment program of an open cooling system allowed the determination of the non-abnormal increase of the microbiological contamination that this type of equipment usually has, and the research analyzes of Legionella Pneumophila were also null.

In this way, the ability of these systems to perform the tertiary treatment efficiently, consistently and with a performance superior to the initial base calculations of this project is well known.

As a result, the implementation of a tertiary treatment system in an industrial wastewater treatment plant will, on average, allow a reduction of 50% of its discharge flow, as well as the reduction of the water consumption of the network or of holes, making the environment and water resources more sustainable.