NAU case study:
Removing micropollutants from wastewater at Aalborg University Hospital

Micropollutants found in wastewater are partly residuals of drugs and medicine

Domestic households and hospitals are mainly the micropollutant sources in wastewater. Increased legislative focus to remove those harmful substances from water encourages treatment solutions to be implemented in municipal and hospital wastewater treatment plants.

Client issue

Growing population increases medicines intake resulting in more micro medicinal residues ending in wastewater. Research of water ecosystems points out increasing negative impact on living organisms due to a presence of micropollutants. It leads to conclusion that wastewater is not efficiently treated to remove harmful residues.

Danish Environmental Protection Agency (EPA) has advised to focus on removing micropollutants from hospital wastewater.

NAU, known as New Aalborg University hospital, has implemented a treatment solution to target and remove unwanted micropollutants from its wastewater system. Therefore, NAU takes more precautions of the discharge water quality returning back to nature. In this particular case, SUEZ is responsible for designing and building a dedicated wastewater plant at the hospital site in Aalborg.

Solution implemented

Based on NAU's specification and needs, a combination of SUEZ solutions has been implemented at hospital's wastewater plant.

This multibarrier solution is specifically adapted to remove micropollutants from hospital wastewater using Powder Activated Carbon addition in ultrafiltration membranes reactor known as Ultrafor™BioPAC and combined with tertiary ozonation known as Oxyblue™ solution.

Ultrafor™BioPAC coupled with Oxyblue™ is an extremely effective solution with relatively low investment and operational costs, thus it has a fantastic value for money.

Benefits and value

Combination of ozone and powder activated carbon provides extreme efficiency in removing micropollutants from wastewater.

Removal of odors, colors are also highly efficient. It also reduces antibiotic resistant bacteria and genes, and decreases the number of E.Coli bacteria.

All aspects combined have a positive impact on the aquatic environment and improve protection of the most important resource - our water.

suez

Removing micropollutants from hospital wastewater

NAU case

How it works

NAU hospital wastewater treatment plant is designed for the maximum daily flowrate of 400 m^3 foreseen in 2030 (approx. 4000 PE). The plant is designed for fluctuating and increasing flowrate over time.

The plant is built on 40m x 40m site with easy access for personnel. Easy truck maneuverability is also considered. Separate rooms are designed for particular units i.e. blowers, sludge unit and PAC room.

Tanks are covered and all potentially bad smelling units are connected to deodorization unit.

Shredding pumps
Hospital wastewater washes away coarse material (textile, diapers etc.) which may clog pipes and equipment however prefab unit equipped with shredding pumps is installed to chop coarse material and reduce load to fine screen downstream.

PAC dosing
Powder activated carbon is mixed with water which is then pumped directly into the biological tanks. Within the biological reactor the retention time is sufficiently high to assure micropollutants removal by adsorption.

The carbon is attached to the biological sludge and is then separated together with excess sludge by ultra filtration membranes, and later treated and disposed off as sludge.

The dosage of PAC is so little that the increase of sludge volume to be disposed is not significant.

PAC preparation units for small plant have very simple configurations, small footprint and are service friendly.

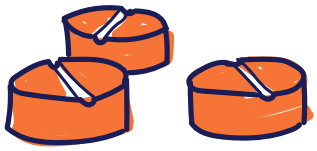
Discharge limits at NAU

	Unit	Limit
pH	—	6-9
COD	mg/l	75
BOD5	mg/l	15
Total N	mg/l	8
Total P	mg/l	1
Azithromycin	ng/l	90
Ciprofloxacin	ng/l	89
Clarithromycin	ng/l	60
Diclofenac	ng/l	100
Erythromycin	ng/l	200
Sulfamethoxazol	ng/l	120
Sum of ICMs	ng/l	1.000.000
E.Coli	MPN/100ml	<1

Ultra filtration membranes
Liquid-solid separation after biological treatment is performed by ultrafiltration. Ultrafiltration membranes can achieve low solids concentration in the effluent, partial disinfection, and allow the biological unit to work at higher MLSS concentration.

Ultrafor™ process
The Ultrafor™ is a wastewater treatment process which combines biological purification by activated sludge and clarification by ultrafiltration membrane.

Benefits of Ultrafor™
- it reduces environmental footprint thanks to its compactness,
- protects nature and biodiversity thanks to an effluent quality that meets discharge standards in protected areas,
- protects resources by reusing the effluent for specfic needs,
- optimizes energy consumption thanks to the leap system,
- allows to obtain class A water.



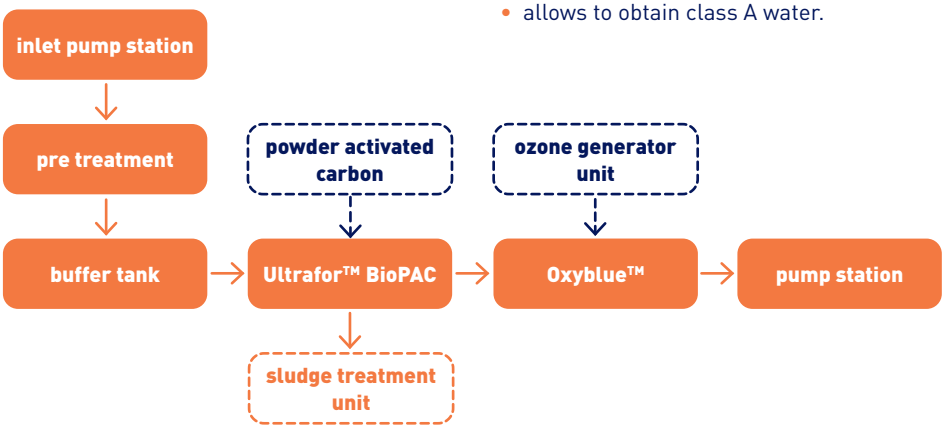
Oxyblue™ solution
Tertiary ozonation is a polishing treatment aimed at improving the quality of wastewater treated by its action on organic micropollutants. Oxyblue™ uses the high oxidation power of ozone to initiate and boost the residual organic matter degradation process.

Waste sludge treatment unit
Considering given requirement, the excess sludge is treated by dewatering (up to 20-25% DS) and drying (up to approx. 90% DS).

PNEC values
Predicted No Effects Concentrations values may change over time.

Solution implemented at NAU is flexible and it can deal with more restrictive discharge limits, for example: increase in PAC and/or ozone dosage without further issues.

Process flow diagram



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