MORPHEUS
Model Areas for Removal of Pharmaceutical Substances in the South Baltic

EU STRATEGY FOR THE BALTIC SEA REGION FLAGSHIP

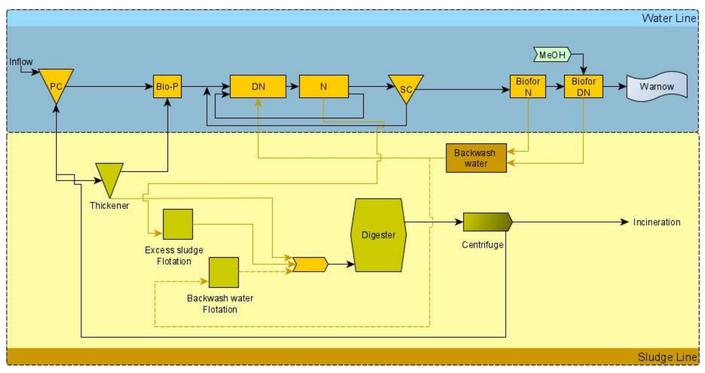
Interreg South Baltic

EUROPEAN UNION
European Regional Development Fund

Integration of Advanced Treatment Technologies in the South Baltic Catchment – Model-site WWTP Rostock (Germany)

Background – Relevance of WWTP

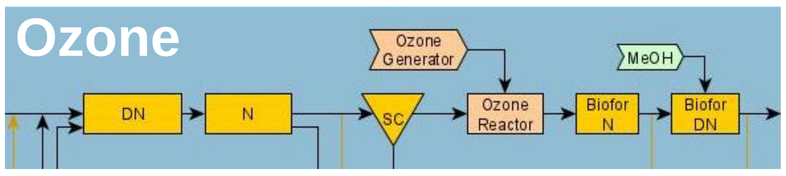
Within the German model area, WWTP Rostock is the largest plant and treats a yearly average wastewater load about 335.000 PE. Besides industrial effluents, domestic wastewater of 235,645 inhabitants (data 2015) is treated here. Based on the mass-flow analysis for a selection of four pharmaceuticals (see Del. 4.2), both measured and predicted loads in the influent (MEC/PEC) confirmed that according to discharged loads into the South Baltic Sea WWTP Rostock represents the highest priority for introducing an advanced treatment technology for removal of micropollutants including pharmaceuticals.

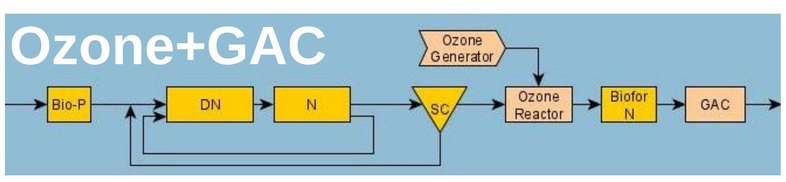


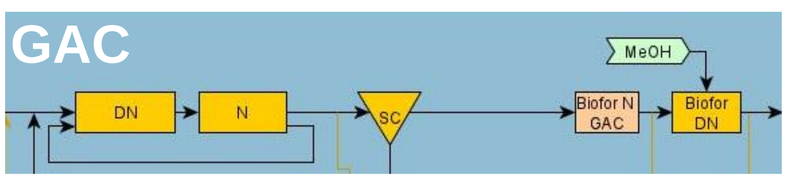
Technological Status of WWTP

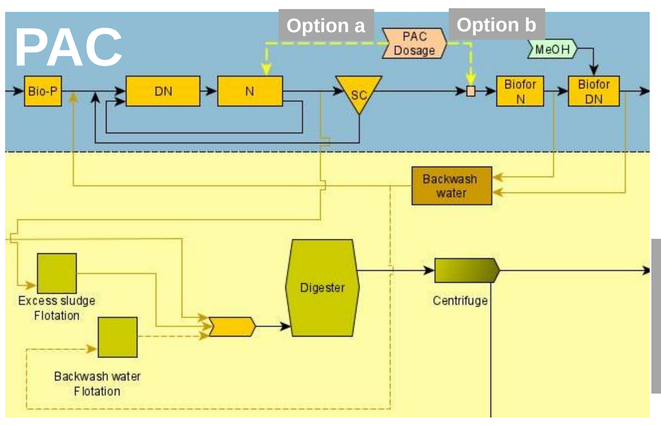
Following a conventional mechanical treatment (rake, aerated sand trap and primary clarifier), the biological treatment is performed in two technological units in series. The main treatment is performed in an activated sludge unit with pre-denitrification and enhanced biological P-removal (Johannesburg). In the so-called BIOFOR® reactor basins, the effluent of the secondary clarifiers is post-treated in two biological filter units: (1) nitrification and (2) denitrification with Methanol dosage. With the current operation conditions the filters rather provide a polishing function (N, P and VSS) than an intense biological treatment. The primary and excess sludge are thickened separately and anaerobically digested. The digested sludge is dewatered with centrifuges and incinerated in external incineration plants.

Assessment of Options to Integrate Advanced Treatment









Option a
Dosage in AST

Option b
Dosage in front of BIOFOR-N

Efficient use of existing infrastructure for integration	Possible conflicts with existing processes	Expenses *S: Staff* *C: Consumables* *E: Energy*	Expected elimination efficiency	Summarized assessment
Good BIOFOR-N for post treatment	Nitrogen removal at BIOFOR-DN	S: low C: high- O_2 E: high	Good	**Promising** Nutrient removal needs be resolved, BIOFOR-DN cannot be used efficiently
Very good BIOFOR-N for post treatment and SM reduction, BIOFOR-DN as GAC	Nitrogen removal at BIOFOR-DN	S: low C: high- O_2 E: high	Very good	**Very Promising** Nutrient removal needs be resolved, best elimination potential
Very good Multipurpose use for adsorption and polishing filter (SM ammonia)	Existing raw water bypass would impair GAC	S: low C: high- GAC E: low	Good	**Very promising** Lowest additional investments
Moderate BIOFOR-N for rest removal of PAC	Reduction of SRT	S: high C: very high E: low	Medium	**Not efficient**
Good BIOFOR-N for PAC removal and a contact volume	Increasing backwash intervals (SRT reduction)	S: medium C: high E: high- backwash	Good	**Requires further assessment** Mainly regarding PAC separation

National Boundary Conditions for Integration of Advanced Treatment

There exist no emission standards for PIE. Also the ordinance for surface water quality (OGewV, 2016) does not define environmental effluent standards, yet. Recently the so-called Federal Stakeholder Dialogue on trace substances is developing a mutually strategy to reduce micropollutants in the water system in a joint approach. Herein, a prioritization process description for advanced treatments is suggested. However, the expected actual integration remains difficult, not least to the fact that financing of additional capital and operational costs cannot be generalized or depicted in detail. As a result, this roadmap was designed preliminary according to given boundary conditions.

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