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# Case Study - Malatech Bioaugmentation

# 1 300 m3/d Municipal Wastewater Treatment Plant of a city

## Goals of bioaugmentation:

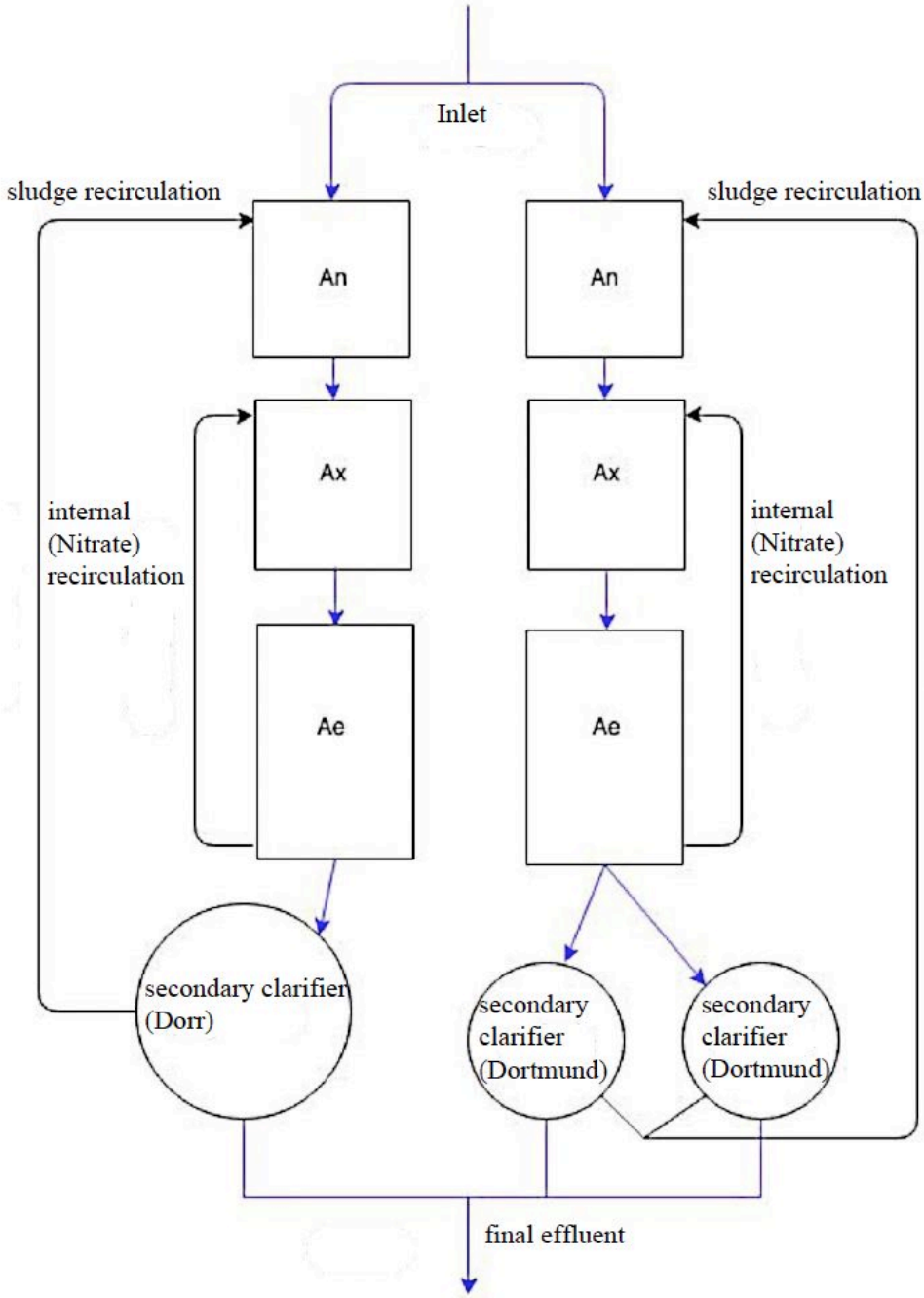
**Increasing the treatment capacity of the overloaded activated sludge biology, eliminating fines, and effluent limit violations. Operator wanted to postpone capital investment for several years, while handling the 20-30% increase in cumulative load with the current system**

**Author:** Malatech Water Ltd.

**Title:** Municipal wastewater treatment plant optimization

Our municipal WWTP operator client operates this plant which has a decent technology for purification, as well as mechanical, and electrical hardware, just the population of the city has grown big time, and the upgrade of the plant has not been executed yet. As a result, the overloaded biology failed to meet with effluent requirements in terms of COD, BOD, TSS, NH4-N, TN, TP. Operator wanted to reduce or eliminate the growing fines by bioaugmentation instead of investing into a new installation.

The plant received constantly 20-30% higher cumulative C,N load, and hydraulic load than it has been designed for. The process technology looked good apart from that: the plant is equipped with full biological nutrient removal units, precise DO control in aeration basins, frequency-controlled recirculation pumps, quality SCADA. The secondary clarifiers struggled with hydraulic overload, which means the activated sludge was washed out partially from the plant, especially at peak hours, or in case of rainy weather.




**Schematic view**

**Our focus was on increasing the treatment capacity of the biology, we needed to demonstrate that with Malatech bioaugmentation a 20-30% cumulative overload does not require immediate capital investment, new reactors, new plant, or expansion.**

Bioclean TM as our core technology has been applied, with BioGuarde I for the first 4 weeks.

The shock dosage of Bioclean TM was 7 kg/d on week 1, followed by 6 kg/d on week 2, then 5 kg/d on week 3, and 2 kg/d on week 4. The maintenance dosage was 0.5 kg/d, dosed into the raw influent after pretreatment.

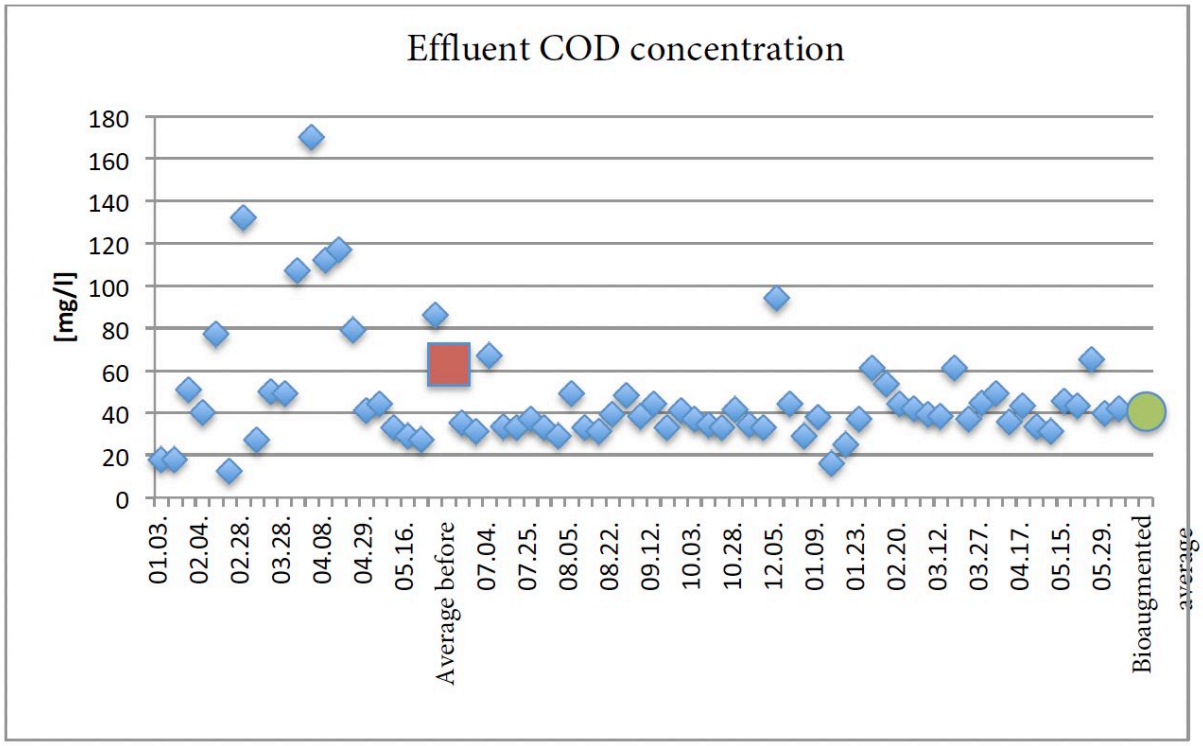
BioGuarde I was used at 2 l/d dosage for the first 2 weeks, which has been lowered to 1 l/d for week 3, and 4.

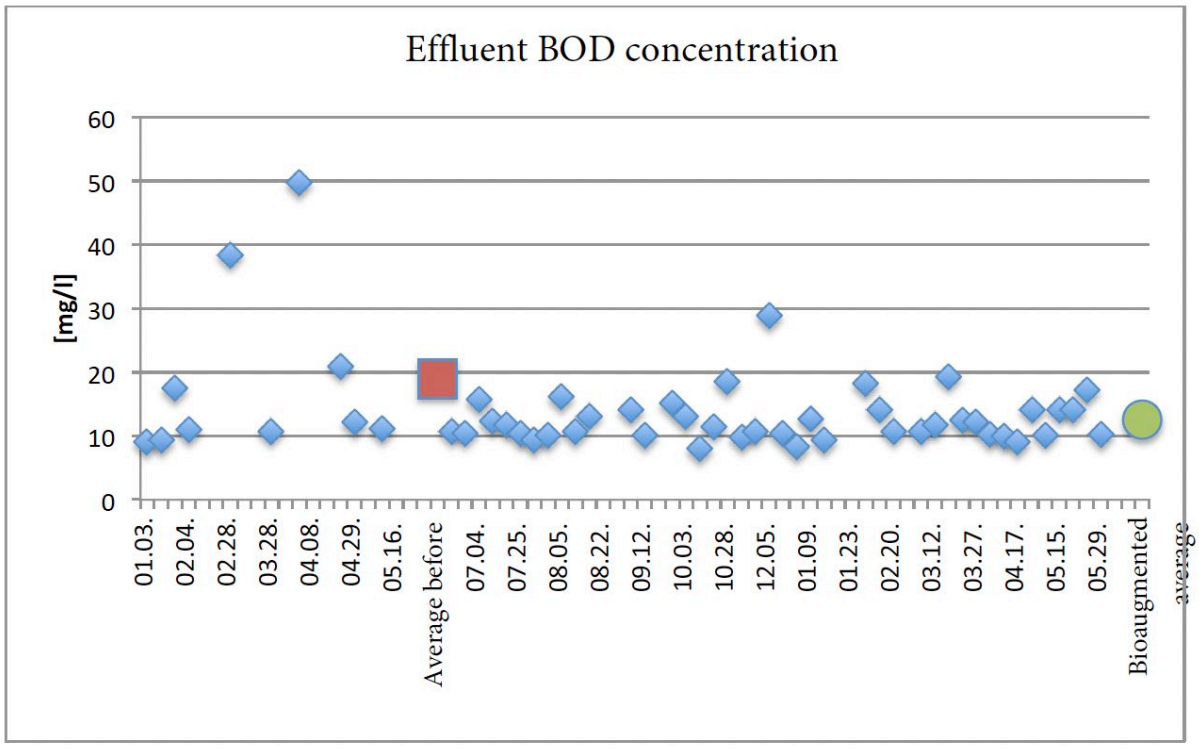
**Results:**

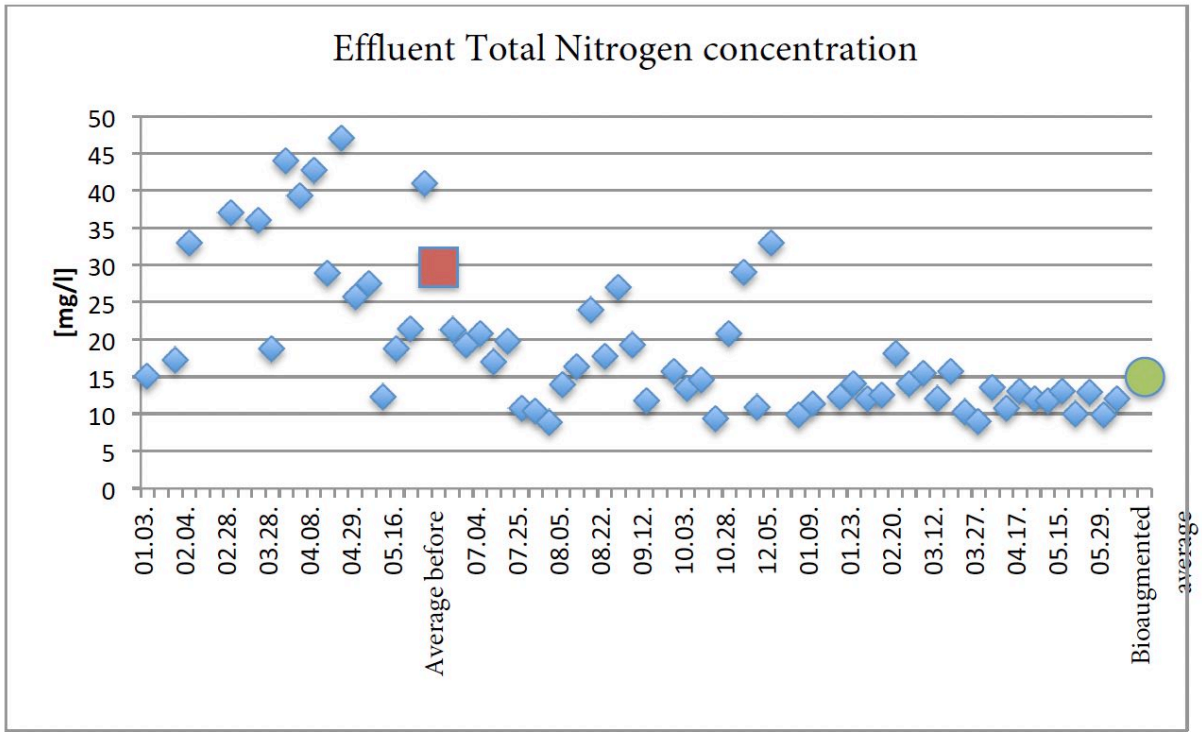
As it shown on the diagrams, effluent quality fluctuations greatly diminished, and the plant can handle the increased load. **COD, and BOD removal became stable, as well as nitrification. The improved sludge structure and settleability eliminated sludge washouts from the secondary clarifiers which was caused by increased hydraulic load, and loose flocs before our treatment.**

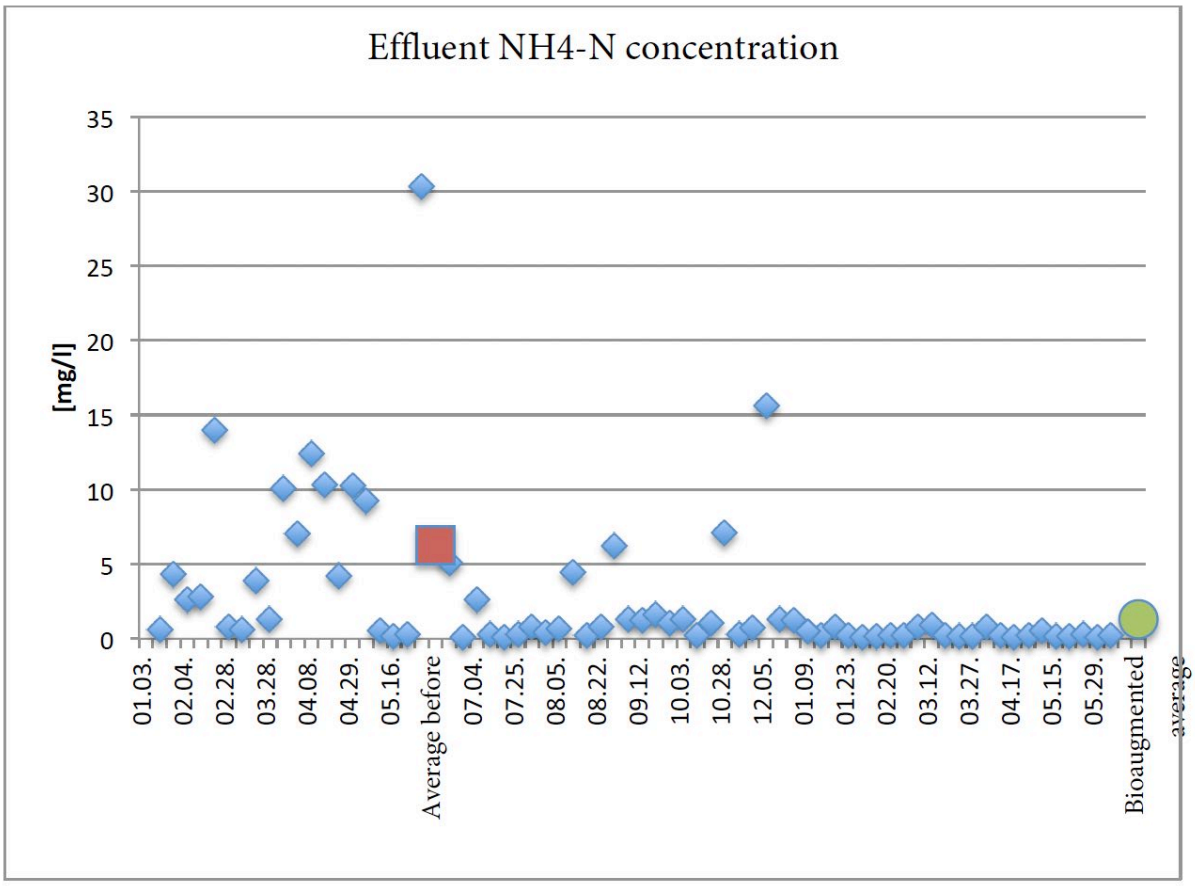
**Total Nitrogen removal**: Bioclean TM has a massive impact on denitrification, it boosts Nitrogen removal both in anoxic, as well as in the aerobic reactors by its unique microbes with high **simultaneous nitrification-denitrification (SND) capabilities**. By enhancing the floc structure, the more compact, better settling, dense flocs are able to carry out intrafloc denitrification more efficiently in the aerobic reactors. The combination of the 2 processes results a significant drop in effluent Total Nitrogen concentration at every Bioclean TM bioaugmented plants.

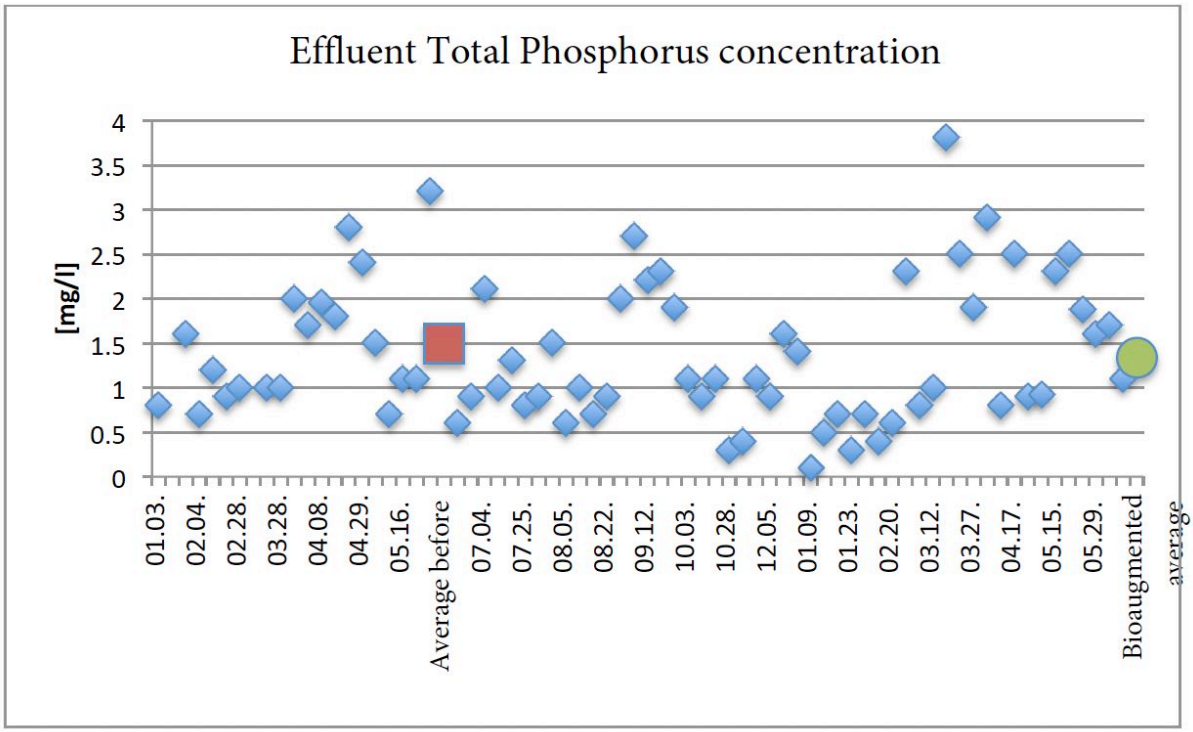
**Total Phosphorus removal**: The complex Bioclean TM solution's other key strength also has been demonstrated here: massive enhancement of Biological Phosphorus removal. Bioclean TM has a decent positive impact on **both poly-Phosphate formation, and excess Phosphate uptake**.

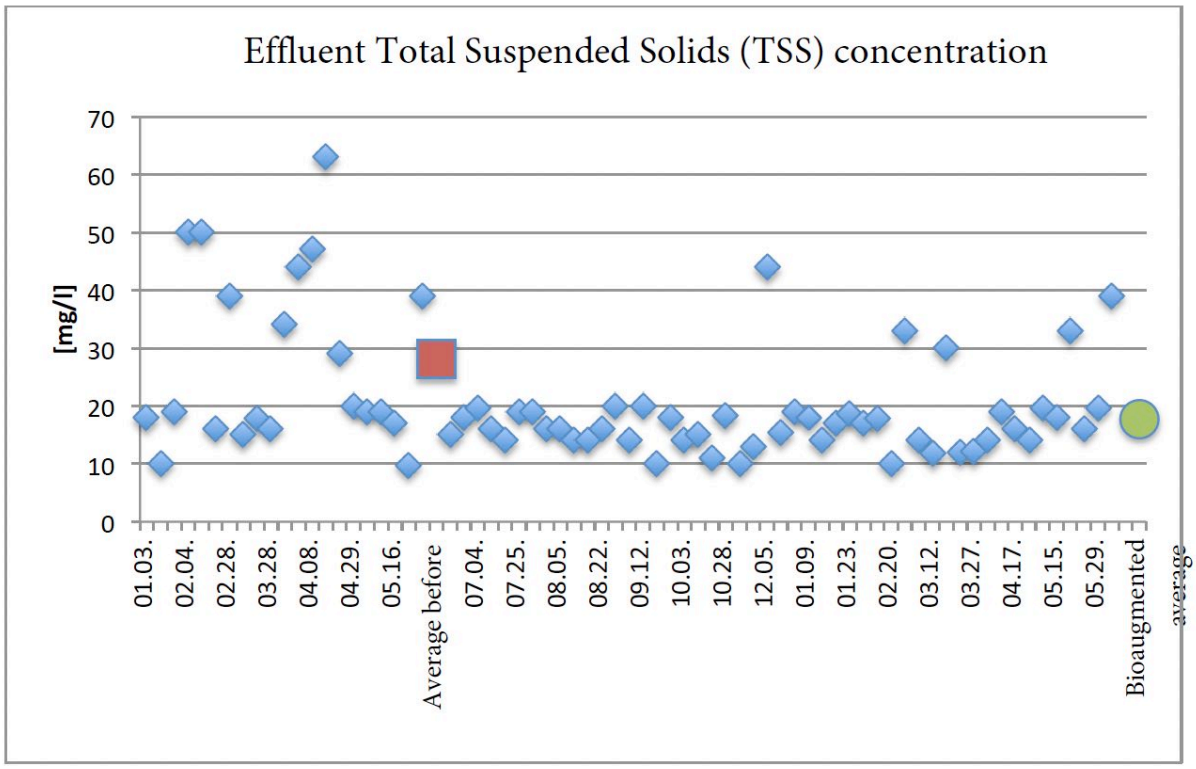



Effluent BOD concentration
[mg/l]
60
50
40
30
20
10
0
01.03.
02.04.
02.28.
03.28.
04.08.
04.29.
05.16.
Average before
07.04.
07.25.
08.05.
08.22.
09.12.
10.03.
10.28.
12.05.
01.09.
01.23.
02.20.
03.12.
03.27.
04.17.
05.15.
05.29.
Bioaugmented average


Effluent Total Nitrogen concentration
[mg/l]
50
45
40
35
30
25
20
15
10
5
0
01.03.
02.04.
02.28.
03.28.
04.08.
04.29.
05.16.
Average before
07.04.
07.25.
08.05.
08.22.
09.12.
10.03.
10.28.
12.05.
01.09.
01.23.
02.20.
03.12.
03.27.
04.17.
05.15.
05.29.
Bioaugmented average


Effluent NH4-N concentration
[mg/l]
35
30
25
20
15
10
5
0
01.03.
02.04.
02.28.
03.28.
04.08.
04.29.
05.16.
Average before
07.04.
07.25.
08.05.
08.22.
09.12.
10.03.
10.28.
12.05.
01.09.
01.23.
02.20.
03.12.
03.27.
04.17.
05.15.
05.29.
Bioaugmented average


Effluent Total Phosphorus concentration
[mg/l]
4
3.5
3
2.5
2
1.5
1
0.5
0
01.03.
02.04.
02.28.
03.28.
04.08.
04.29.
05.16.
Average before
07.04.
07.25.
08.05.
08.22.
09.12.
10.03.
10.28.
12.05.
01.09.
01.23.
02.20.
03.12.
03.27.
04.17.
05.15.
05.29.
Bioaugmented average


Effluent Total Suspended Solids (TSS) concentration
[mg/l]
70
60
50
40
30
20
10
0
01.03.
02.04.
02.28.
03.28.
04.08.
04.29.
05.16.
Average before
07.04.
07.25.
08.05.
08.22.
09.12.
10.03.
10.28.
12.05.
01.09.
01.23.
02.20.
03.12.
03.27.
04.17.
05.15.
05.29.
Bioaugmented average