BEST
Better Efficiency for Industrial Sewage Treatment

Piloting in Tartu, Kohtla-Järve, Ādaži and Viimsi

Event / Date
17.09.2020

Organisation
Contact

Tallinn University of Technology

EUROPEAN REGIONAL DEVELOPMENT FUND
EUROPEAN UNION

Interreg
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Objectieves of the piloting

The piloting has the following main objectives:

- to compare different tertiary treatment technologies for suspended solids removal, phosphorous removal, heavy metals removal, COD removal;
- to analyze the effect of tertiary treatment on municipal WWTP, when it consists industrial effluents (like hard degradable COD, heavy metals);

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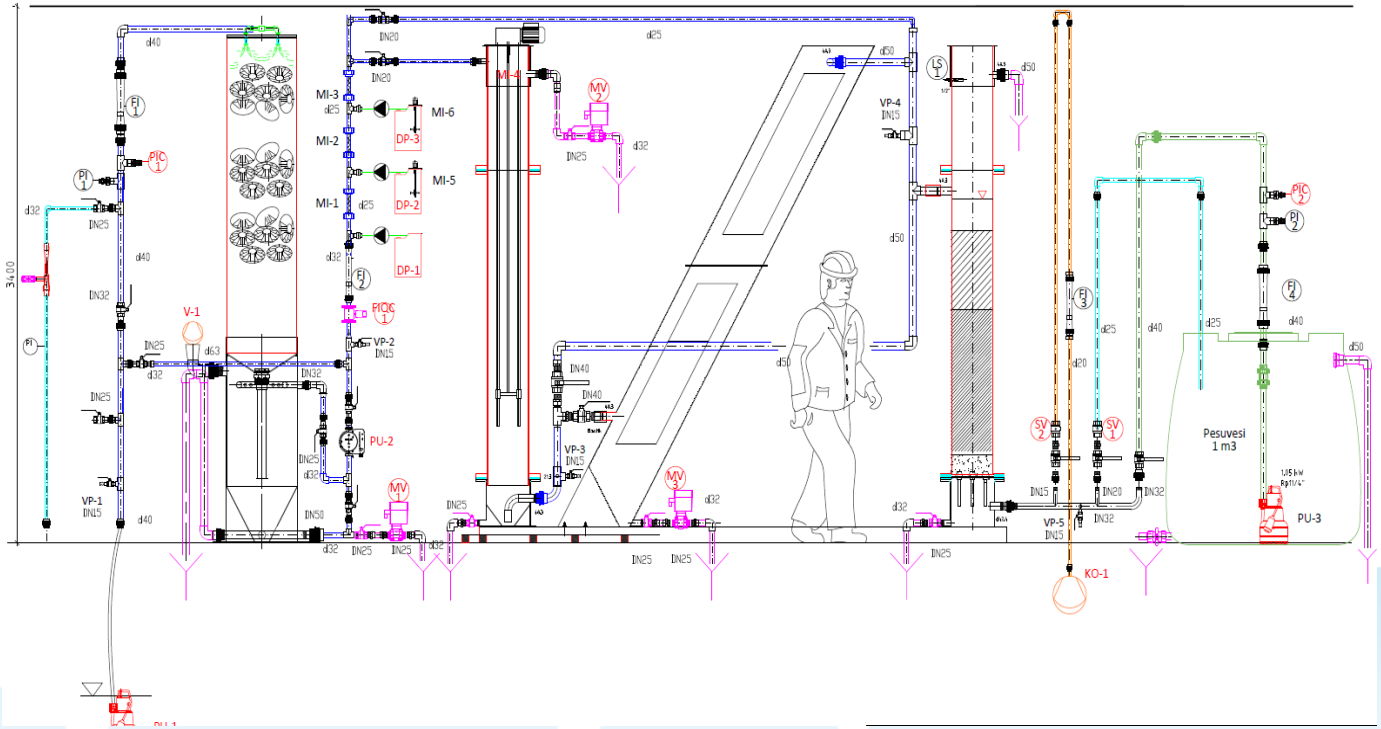
Pilot device project



The model consists of four main elements:
- the aeration system
- coagulation flocculation system
- sedimentation system
- filtration system.

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Pilot device

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Pilot device

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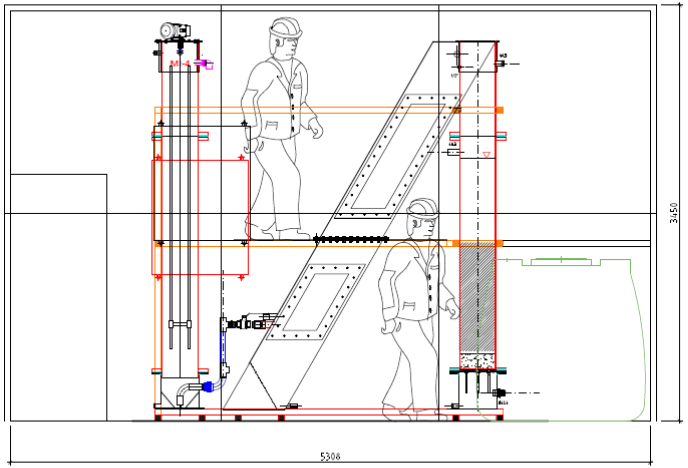
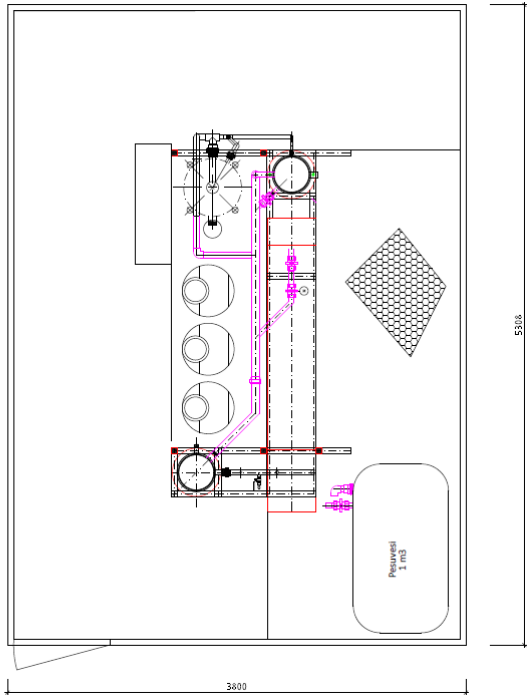
Pilot casing





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Piloting in Tartu

Tartu is located in southern Estonia, with a population about 93 865. The local wastewater treatment plant is a conventional activated sludge system. The influent comes mostly from the households, but the city has different industries.

- Sand filter without chemicals;
- Coagulation;
- Manipulating the pH to 8.0;
- Manipulating the pH to 10.0;
- Flocculation;
- GAC (granular activated carbon);

Piloting in Kohtla-Järve

Kohtla-Järve is a small city in Estonia, with a population about 33 743. The local wastewater treatment plant is a conventional activated sludge system. The influent comes from the households and different industries.

- Sand filter without chemicals;
- Coagulation;
- Manipulating the pH to 8.0;
- Manipulating the pH to 10.0;
- Flocculation;
- GAC (granular activated carbon);

Piloting in Ādaži

Ādaži is a small city in Latvia, with a population about 11 400. The local wastewater treatment plant is a conventional activated sludge system. The influent comes mostly from the households, but the city has different industries too, like potato processing factory. In Ādaži the same regimes in the piloting were conducted, like in Tartu and Kohtla-Järve.

- Sand filter without chemicals;
- Coagulation;
- Manipulating the pH to 8.0;
- Manipulating the pH to 10.0;
- Flocculation;
- GAC (granular activated carbon);

Piloting in Viimsi

In Viimsi piloting where carried out at the local wastewater treatment plant, where we have a loading of 18 500 p.e. Viimsi WWTP receives industrial wastewater from Muuga harbor. What is forming ca 6% of total flowrate. In Viimsi some different regimes where conducted, than in other 3 WWTP.

- Taking samples from existing disc-filter;
- Flocculation;
- Zeolite adsorption;
- $MnSO_4$+$KMnO_4$ (in some other studies >90% Cr removal was achieved);
- Green sand filtration.

Table 5. The removal of pollutants with various technological solutions.

Technology / Problem	A	B	C	D	E	F	G	H	I	K	K	L	M	N
As	-	-	-	-	-	-	-	-	-	-	-	-	+	+
Ba	-	+	-	+	-	+	-	+	+	+	+	-	-	-
Cr	+	-	+	-	+	+	-	-	-	-	-	-	-	-
Ni	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pb	-	-	-	+	-	-	-	-	-	-	-	-	-	+
Zn	-	-	-	+	-	-	+	-	-	-	-	-	-	-
Cu	-	-	-	-	-	-	+	-	-	+	-	-	-	+
BOD_7	+	+	-	+	-	-	+	+	+	+	-	-	-	+
COD	+	+	-	-	-	-	+	+	-	+	-	+	-	-
PO_4-P	-	+	+	+	-	+	-	-	-	-	+	+	+	-
P_{tot}	+	+	+	+	-	+	-	+	-	-	+	+	+	-
SS	+	+	-	+	+	+	+	+	+	+	+	+	+	+
N_{tot}	-	-	-	-	-	-	-	-	-	-	-	-	-	-

A – sand filter and anthracite,
B – coagulation using ferric,
C – manipulating pH to 8.5,
D – manipulating pH to 10,
E – adsorption with GAC,
F – coagulation and flocculation,
G – green sand AFM,
H – green sand AFM with potassium permanganate dosing,
I – green sand AFM with reduced potassium permanganate dose,
J – green sand AFM with coagulation and flocculation,
K – green sand AFM and aluminium coagulant and flocculation,
L – green sand and pH manipulation to 11,
M – zeolite ion exchange,
N – disc filtration.

Failures - blockages

Failures

Main outcomes (1)

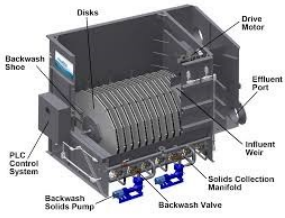
•There is no universal treatment technology that would remove all phosphorus and the heavy metals relevant to us. Therefore, laboratory tests should be carried out prior to planning of each new equipment to assess the efficiency of the proposed equipment in removing the pollutant of concern.

•The pH manipulation, which reduces solubility of heavy metals and allows them to be filtered out, proved to be the most efficient of the solutions studied. However, it should be borne in mind that, with the backwash of filters, much of the pollutant loading is returned to the treatment process, thus increasing the concentration of heavy metals e.g. in waste activated sludge. Therefore, post-treatment filters always require a solution to problems related to backwash water.

Main outcomes (2)

- In case only phosphorus removal is required, the tests showed that phosphorus was most efficiently removed when coagulation and flotation processes were applied prior to filtration.

- In comparison of the granular filter and the disc filter, the filter filled with medium is certainly more flexible because we can use different filter media like sand, activated carbon, etc., whereas the disc filter is easier to operate. However, in terms of the size of investment, it should be borne in mind that the granular filter needs more space and the equipment is also more expensive overall.



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Thank you for the cooperation!

- Tartu Veevärk AS
- Järve Biopuhastus OÜ
- Ādažu Ūdens
- Riga Technical University
- Viimsi Vesi AS

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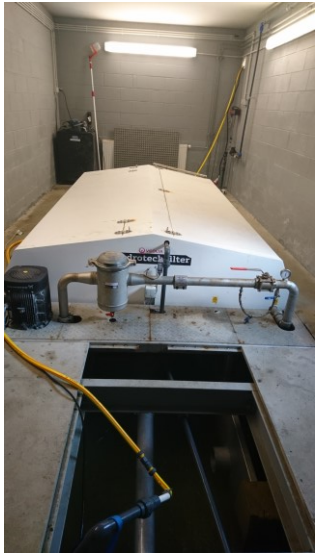

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