Interreg
Baltic Sea Region

EUROPEAN UNION

EUROPEAN REGIONAL DEVELOPMENT FUND

VillageWaters

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Wastewater treatment in sparsely populated areas

Jari Heiskanen, MSc, Project Manager
SYKLI, Envirnomental School of Finland

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Introduction

VillageWaters = Water emissions and their reduction in village communities – villages in Baltic Sea Region as pilots

Aim: is to find out the most sustainable **technological wastewater treatment solutions** to decrease wastewater emissions of **sparsely populated areas** of the Baltic Sea

Schedule: 1.3.2016-28.2.2019 (6 periods)
Budget: about 3 milj. e
Funding body: Interreg Baltic Sea Reagion (BSR)

Partners

13 partners from 5 different countries of Baltic Sea:

Estonia (ES), Finland (FI), Latvia (LA), Lithuania (LT), Poland (PO)

Lead partner: Luke (FI)

Outputs

Pilots

- 1-2 small-scale WWTPs in each partner country
- Old WWTPs renovated or replaced by new ones
- Water analyses

The Information Tool

- Web based tool in seven languages
- Helps to find the most effective, practical, cost-effective and environmentally friendly wastewater treatment solutions
- More than 500 small scale WWT systems

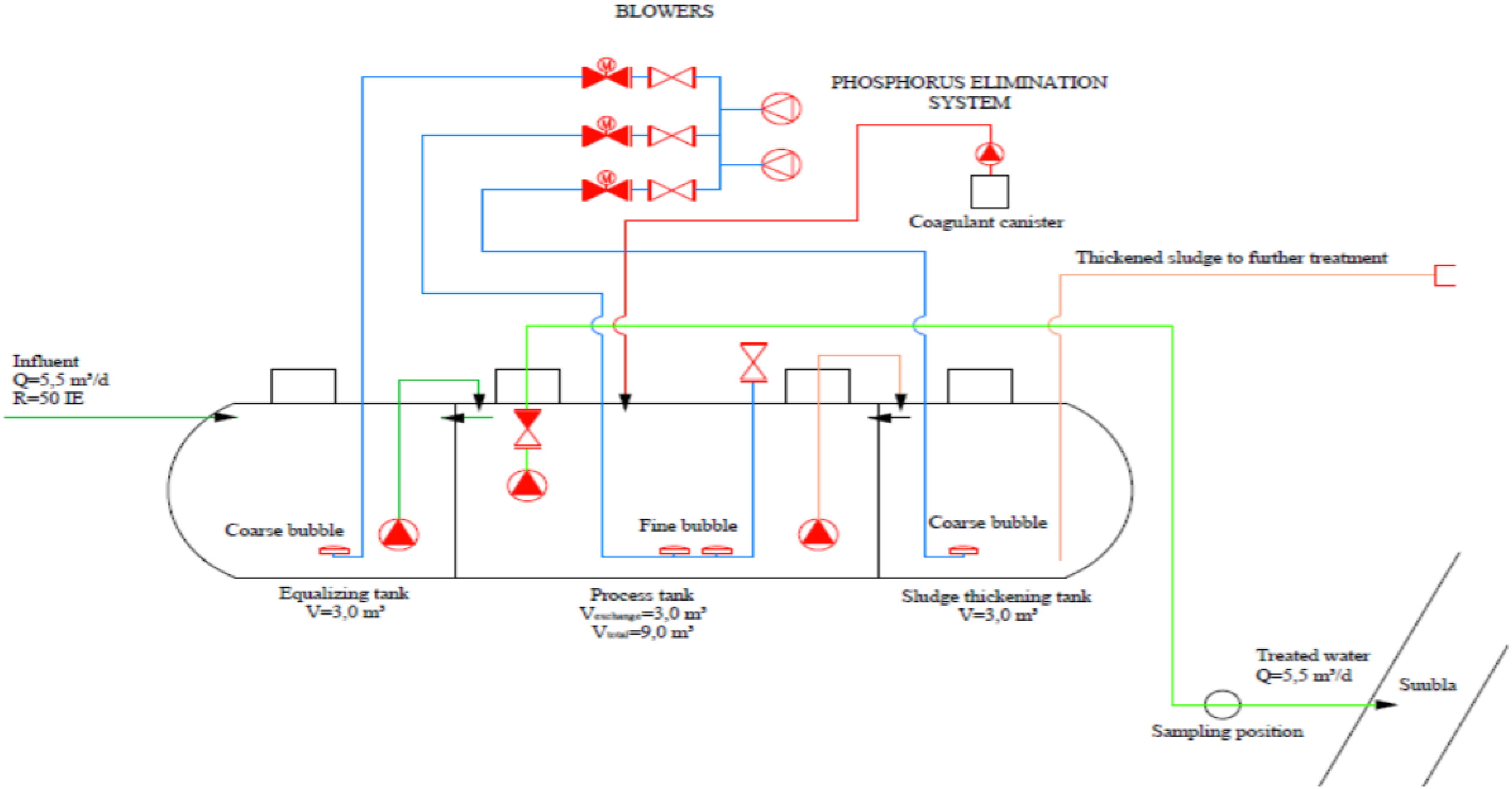
Articles, guidelines, instructions

Estonian pilots

Compact SBR system for a small WWTP in Kolgaküla and Valkla

- Biological wastewater treatment with activated sludge process
- Separate sewage treatment systems for apartment houses (Kolgaküla 33 inhabitants, Valkla:49 inhabitants)
- Targets
  - efficiently remove the organic load
  - decrease the load of nutrients into the environment
  - bring the general quality of the effluent into compliance with the national regulations.
- Renovation of pipelines system and the construction/installation of the new WWTP

TECHNOLOGICAL SCHEME



Design and construction

Kolgaküla village pilot:

- Amount (l/m^3) of wastewater inflow: 3…9 m^3/day
- Inflow and outflow of BOD, N, P:

2. Capacity	Waste water m3/day	BOD g/day	N g/day	P g/day	Acceptable duration days
Design inflow	6.6	3600	660	110	
Maximum inflow	9	4200	770	130	
Minimum inflow	3	1800	330	50	
Peak inflow	12	3600	660	110	1
Low occupation inflow	2	1200	220	40	7

- Use of chemicals and electricity: around 20 litres of ferrous sulfate

Valkla village pilot:

- Amount (l/m^3) of wastewater inflow: 100..150 m^3 /month
- Inflow and outflow of BOD, N, P

2. Capacity	Waste water m3/day	BOD g/day	N g/day	P g/day	Acceptable duration days
Design inflow	5.5	3000	550	90	
Maximum inflow	9	3600	660	110	
Minimum inflow	3	1800	330	50	
Peak inflow	12	3600	660	110	1
Low occupation inflow	2	1200	220	40	7

- Use of chemicals and electricity: around 20 litres of ferrous sulfate

Costs	Valkla	Kolgaküla
SBA Reactor, €	9 200	9 200
Installation, €	8 000	8 000
Pipeline, m	190	290
Pipeline, €	18 000	26 000
Installed reactor, €	17 200	17 200
Totally, €	35 200	43 200

Valkla and Kolgaküla village pilots efficiency

	In	Out	Requirements
BOD, mgO_2/l	248 -930	28 - 117	40
Suspended Solids; mg/l	92 - 1000	25 - 200	35
pH	7,7 - 8,9	7,05 - 8,4	6 - 9
$P_{total,}$ mg/l	22 - 39	1,3 - 11	-
$N_{total,}$ mg/l	150 - 412	24 - 121	-

Helcom recommendation:

Avl	300 - 2 000		2 000 - 10 000		10 000 - 100 000		> 100 000	
	%	mg/l	%	mg/l	%	mg/l	%	mg/l
BHK_5	80	25	80	15	80	15	80	15
P_{kok}	70	2 *	80	1 *	90	0,5 *	90	0,5 *
N_{kok}	30	35 **	30	---	70-80	15 **	70-80	10 **

Lithuanian pilot: Leitgiriai WWTP

Bioreactor with air blowers and an excess sludge tank

1. Mechanical pre-treatment:
- Hand skimmed screen;
- Sand/grit separator, sand box for gravitational dewatering.

2. Wastewater distribution
- Local pumping station;
- Equalisation tank;

3. Biological treatment step:
- Biological reactor with anaerobic, anoxic, aeration, clarification chambers in one compact tank;
- Airblowers (1 operational + 1 on standby);
- Excess sludge tank.

Design and installation costs

2. Design parameters

	163	PE
Average daily in inflow	26,08	m^3/d
Maximal daily in inflow	37,0	m^3/d
Maximal hourly inflow (dry)	4,67	m^3/h
Maximal hourly inflow (wet)	6,63	m^3/h
Concentrations/contamination loads:		
BOD_7	437,5	mgO_2/l
N_{tot}	76,7	mg/l
P_{tot}	16,9	mg/l
BOD_7	11,41	mgO_2/l
N_{tot}	2,0	kg/d
P_{tot}	0,44	kg/d

3. Design treatment efficiency

BOD_7	23	mgO_2/l
N_{tot}	30	mg/l
P_{tot}	4	mg/l

Cost: 92 700 EUR

Finnish pilots

Renewal of a private household soil filtration system in Nurmijärvi

- Four septic tanks
- The principal of the system is to lift the wastewater from the septic tanks through a pump higher to the filtering field
- Discharged to the nearby ditch.
- The new sand filtration layer removes phosphorus more efficiently than the old one.
- As another pump was added to the system, the total energy consumption of the system rose from 18.6 kWh per year to 37 kWh per year.

Efficency

- One household, consisting of four inhabitants.
- The total amount of inflow was assumed as 575 L per day
- Cost: 8 431 EUR

	Inflow	Reduction
BOD	200 g/d	38 %
Phosphorus	8,8 g/d	97,5 %
Nitrogen	56 g/d	78%

Other pilots

Finland, Gennarby
- New pumping station
- Connected to municipial WWT network
- Built by water cooperative

Poland, Tylicz
- Soil filter & denitirification ditch

Poland, Sokoly
- Soil filter & nitirification pond

Latvia, Ainaži - SBR
Latvia, Svētciems -SBR

Wastewater Solutions Information Tool

Let us help you select best wastewater treatment solution for your needs

Country	Capacity	Technology	Dimensions	Costs
Estonia	30 persons	3 selected	9 x 6.6 m	61 - 1547 €

By current criterias, there are 25 results

ATO-30 CE
AugustEstFin OÜ (Estonia)
Biological plant
97% BOD removal efficiency
Dimensions 6.42 x 5.26 x 2.5 m
30 years. Investments 10140 €
Sludge removal times 0.9 / year
Cost-Efficiency 1.07 € / kg BOD

ATO-40 CE
AugustEstFin OÜ (Estonia)
Biological plant
97% BOD removal efficiency
Dimensions 7.282 x 5.26 x 2.5 m
30 years. Investments 13000 €
Sludge removal times 0.6 / year
Cost-Efficiency 1.34 € / kg BOD

Conclusions

- All life cycle effects should be taken into account when choosing a device, not only a price of system
- Different countries have different practices and circumstances. Each case is a case by case study.
- Without legal requirements, wastewater issues would not be a top priority but perceived as an additional cost.
- The equipment itself should be simple, requiring as little maintenance as possible.
- Renovation of WWTP had positive impact into surrounding water status
- Inhabitants interviewed in the pilots were satisfied with their new wastewater systems
- Reduced costs, lower maintenance, elimination of odor nuisance

Links

- The information tool
- A survey of available wastewater treatment technologies for sparsely populated areas - User's manual
- Guidelines for the best technical solutions and practices for the wastewater treatment in scattered dwelling areas
- Learning materials
- Baltic Smart Water Hub

Thank you!

Jari Heiskanen
Project Manager / Trainer
SYKLI Environmental School of Finland
Jari.Heiskanen@sykli.fi

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