

Tracing report Höganäs

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TRACING OF HEAVY METALS IN THE COLLECTION SYSTEM AT HÖGANÄS WWTP

Background

The three municipalities Höganäs, Hörby and Östra Göinge are all participating in the South Baltic Project Euroslam. One purpose of this project is to promote a better use of sewage sludge from waste water treatment. If a beneficial use of sludge in agriculture should be possible it is imperative that the content of heavy metals in the sludge is low. Höganäs have a Revaq certification and to be able to maintain that, the content of cadmium must decrease in the sludge.

One indicator for sludge quality is the ratio between cadmium and phosphorus measure as mg Cadmium per kg of phosphorus, Cd/P-ratio. This figure should be as low as possible since one kg of phosphorus should contain as little cadmium as possible. The three municipalities have different readings of this figure with low numbers in Östra Göinge, medium numbers in Höganäs and higher numbers in Hörby.

This makes the set up ideal for research. Why are the numbers low in Ostra Göinge and what circumstances provide the contribution of extra heavy metals in Hörby? The Swedish National certification system, Revaq, which have about 30 WWTP in their list, is also a base for comparison. Höganäs is one of these treatment plants which serves as a base for broader characterization of environmental effects.

Höganäs WWTP are audited through the certification system yearly. This gives access to broader information that can be used within the Euroslam project.

Goal

The purpose of these investigations are to find sources of heavy metals in the collection system. By eliminating these sources, the content of heavy metals in the sludge should be lower. The Cd/P-ratio should decrease which is an improvement.

Another purpose of this work is to establish a working method for finding heavy metals sources in the collection system. This method, the Euroslam-method, could thereafter be used by other small and medium sized municipalities that wnts to improve their environmental control of the sewage sludge. Especially interesting could this be for small and medium sized municipalities in Lithuania and Poland, where a clear cross border effect of the findings from the three municipalities in Sweden may contribute with.

Höganäs WWTP should reduce their Cd/P ration in the sludge to 23 mg Cd/k P to year 2015.

Method

The method used was first presented at the Euroslam meeting in Poland, in Kurzercyna in Maj 2012. The Power Point presentation used at this meeting is enclosed in this report. The method is used a five step procedure to produce a better sewage sludge. The five steps are.

1. Balance of phosphorus over the treatment plant.
2. Check the flows in the collection system
3. Identify what paramethers that needs to be improved
4. Start sampling and analyse in the collection system



5. Start a dialogue to remove unwanted sources of pollutants to the treatment plant

This tracing program started in October 2012 by collecting existing data from the following treatment plants.

- Höganäs WWTP
- Lyby WWTP in Hörby
- Broby WWTP in Östra Göinge
- Knislinge WWTP in Östra Göinge

This means that two smaller treatment plants are representing Östra Göinge making the possibility for cross border effects even greater. Höganäs are the largest treatment plant with many corresponding plants in Lithuania of the same size.

Base data for Höganäs

This is the basic information for Höganäs Waste Water Treatment Plants.

The figures below is an example of a daily composite sample of influent water taken May 20, 2013.

		Höganäs WWTP, Höganäs
Daily flow	M3/day	7200
Connected persons	No of people	22658
Alkalinity	Mg hco3/l	310
Alkalinity	Mg HCO3/l filt	310
BOD	BOD 7 (ATU)	250
BOD dissolved	Filtered sample	41
COD	Cr MG/L	590
COD dissolved	Filtered sample	110

The values above will be used to compare influent characteristics and to calculate the portion of organics that are easily dissolved and dissolved.

Datum		2013-05-20		Höganäs Kommun		Flöde m3/dygn		l/p,d		318
Ämne	Mängd/liter	Höganäs ink	Höganäs utg	gram/dygn ink	gram/d utg	Avskilt till slam g/d	Avskilt till slam g/år	Inkommande g/p	Inkommande mg metall/kg P	
Ag	µg/l	< 0,5	< 0,5	3,60	3,60	0,00	0,00	0,0002	72	
As	µg/l	1,23	0,671	8,86	4,83	4,02	1469	0,0004	177	
Cd	µg/l	0,18	< 0,05	1,30	0,36	0,94	342	5,72E-05	26	
Co	µg/l	1,24	0,654	8,93	4,71	4,22	1540	0,0004	178	
Cr	µg/l	3,42	< 0,9	25	6,48	18,14	6623	0,0011	492	
Cu	µg/l	67,3	7,76	485	56	429	156471	0,0214	9683	
Hg	µg/l	< 0,0408	< 0,02	0,29	0,14	0,15	54,66	1,3E-05	6	
Mo	µg/l	1,58	< 0,5	11,38	3,60	7,78	2838	0,0005	227	
Ni	µg/l	5,45	7,85	39	57	-17	-6307	0,0017	784	
P	µg/l	6950	117	50040	842	49198	17957124	2,2085	1000000	



Pb	µg/l	2,97	<	0,5	21	3,60	18	6491	0,0009	427
Sn	µg/l	2,37	<	0,5	17	3,60	13,46	4914	0,0008	341
V	µg/l	1,58		0,322	11,38	2,32	9,06	3306	0,0005	227
Zn	µg/l	143		31,7	1030	228	801	292496	0,0454	20576
Cd "Low"	µg/l	0,18	<	0,0315	1,30	0,23	1,07	390	5,72E-05	26
W	µg/l	2,77	<	11,8	20	85	-65,02	23730,84	0,0009	399

The influent heavy metal analyses are done together with a special cadmium analyses called "Cd Low". The analytical package was specially designed for this Euroslam investigation. A typical analyses of the influent sample is shown in the table above.

It is interesting that Höganäs get the same value for Cd/P both with the Cd analyses as well as the Cd Low analyses. Cd Low is appropriate to use.

The following calculations can be made to estimate these quality figure.

- Influent phosphorus content according to flow and people connected
- Phosphorus balance over the treatment plant
- Removal efficiency of a number of parameters
- Difference between normal Cd and "Cd Low"
- Samples of influent and effluent values can be compared.

These parameters will indicate the efficiency and sampling procedures at the treatment plants.

The daily composites samples will now be used to create a table showing a weekly figure. The sampling procedures were done during the same period at all treatment plants. This means that high flows due to rainy weather should occur at the same time for all plants.

The weekly table for Höganäs, including the above sampling date is the following.

		Höganäs		Flöde m ³ /dygn				l/p, d	
				6961				307	
Ämne	Mängd/liter	Halt Inkommande	Halt Utgående	gram/dygn in	gram/d utg	Avskilt till slam g/d	Avskilt till slam g/år	Inkommande g/p	Inkommande mg metall/kg P
Ag	µg/l	0,52	0,51	3,60	3,52	0,09	31,20	0,0002	79
As	µg/l	1,22	0,58	8,47	4,03	4,44	1622	0,0004	186
Cd	µg/l	0,17	0,05	1,20	0,36	0,84	306	5,312E-05	26
Co	µg/l	1,25	0,60	8,68	4,17	4,51	1646	0,0004	190
Cr	µg/l	3,40	0,94	24	6,56	17,12	6249	0,0010	513
Cu	µg/l	68	6,96	470	48	422	154014	0,0208	10296
Hg	µg/l	0,04	0,02	0,29	0,14	0,15	55	1,284E-05	6
Mo	µg/l	1,66	0,50	12	3,50	8,06	2941	0,0005	253



Ni	µg/l	6,66	8,29	46	58	-11	-4151	0,0020	1010
							1632274		
P	µg/l	6559	134	45657	937	44720	3	2,02	1000000
Pb	µg/l	2,74	11,03	19	76,74	-58	-21035	0,0008	416
Sn	µg/l	1,96	0,50	14	3,48	10,13	3696	0,0006	297
V	µg/l	1,72	0,31	12	2,19	9,74	3557	0,0005	260
Zn	µg/l	125	34	872	237	635	231874	0,04	19059
Cd									
"Low"	µg/l	0,17	0,03	1,20	0,21	0,99	361	0,0001	26
W	µg/l	4,64	4,02	32	28	3,89	1419,43	0,0014	703

g ämne år/p

735

The average load of phosphorus to a treatment plant within Revaq is 700 g per person and year. The number above, 735 g of phosphorus per person and year, indicates a very accurate sampling and sample handling at Höganäs.

This means that the figure Cd/P of 26 must be reduced according to the plan. The accuracy in sampling and handling will be very useful.

The average level of cadmium in influent water is 0,17 µg/l both with Cd and Cd low. This value, together with the Cd/P ratio, will make it possible to track stream of water in the collection system with additional loads of cadmium.

Conclusions

The sampling methods indicate the basic knowledge about influent water characteristics. This can be used to determine different aspects in how the metals will be removed from the water and either leave the plant with effluent water or be added to the sludge.

By comparing sludge data there now exist an information what the influent water will look like creating a typical sludge analyses.

This information may now be used to further develop sampling procedure in the collection system.

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