Newsletter no. 5

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Introduction

The project is now nearing its final stage. The project period ends October 1st, 2009, leaving 3 months to complete the monitoring of the processes, collect and analyze water samples, process the remaining data and reach the final conclusions.

Recent photographs of wet ponds

Odense, early spring 2009

Århus, April 2009

Spring 2009 in Silkeborg

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Monitoring

The monitoring of all 3 facilities is approaching its last phase and the first conclusive results are beginning to show. Each facility makes use of a different innovative technology to treat the runoff water. The objective of the project is, amongst other, to test these technologies and compare their effectiveness. The effectiveness is then compared with practical and financial issues related to construction and operation of the facilities.

Odense

Fixed media filters are tested at the facility in Odense. The facility consists of a wet detention pond that is designed to retain the major part of the particulates conveyed by the stormwater. After passing the pond, the water is lead through a sand filter designed to retain finer participles and hereby protect the last treatment step, the sorption filter, against clogging. The sorption filter consists of a large filter filled with 40 m^3 of crushed shells (Skellsand) and of 3 smaller test filters. The filters are filled with Skellsand, Olivin and a sandwich construction of Skellsand and iron oxide coated Oliving, respectively.

The results so far indicate that the treatment unit train tested in Odense is very effective towards the targeted pollutants. An example of such pollutant removal is shown in Figure 1. In the inlet to the wet pond the median concentration of total phosphorous is 0.29 g m^{-3}, while the outlet concentration is 0.018 g m^{-3}. The treatment train is furthermore capable of reducing heavy metal concentrations down to a rather constant and very low concentration, even though the inlet concentrations vary significantly. Figure 1 shows how copper is removed down to low outlet concentrations even though the inlet concentrations at times are extremely high.

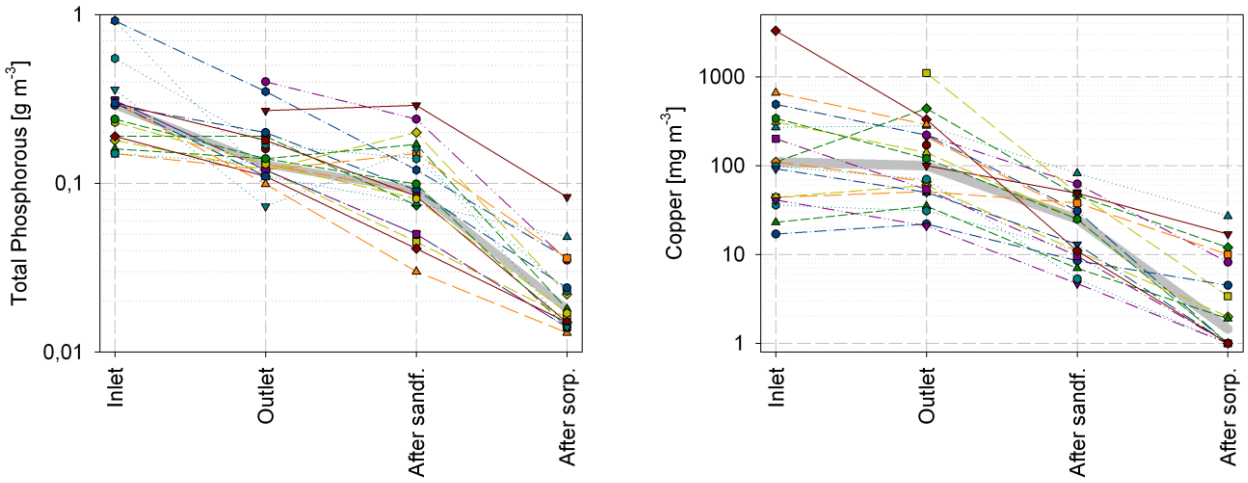

Figure 1 Removal of total phosphorous and copper through the facility in Odense. The strong gray line indicates the median concentrations while the dashed lines indicate values from the same sampling period.

Århus

At the facility in Århus, iron addition to the bottom sediments has been tested. The intention is that the increases iron concentration will increase the sorption capacity of the pond bottom. This technology is well-known from lake restoration but has hitherto not been tested on wet detention ponds. Iron was dosed to the basin in the beginning of April (Figure 2).

Figure 2. Addition of iron salts to the pond in Århus. A total of 3 tons of solution was added to the pond.

It is still too early to say how effective the technology is as such analysis demands a large number of water quality samples. It is, however, clear that the algae growth – and thereby the biological availability of phosphorous – has been significantly reduced compared to a pond without iron addition.

The treatment for other compounds is good and a significant fraction of the time, a number of heavy metals and PAH'es are removed to below the detection limits by the treatment train consisting of wet detention pond and sand filter.

Silkeborg

The technology which is tested in Silkeborg is also inspired by lake restoration technologies. At this facility, aluminum salts are added to improve the treatment efficiency of the wet detention pond (Figure 3). Opposed to Århus, the aluminum is added flow proportionally to the inlet during rain. The addition was started up in the middle of April and there are still insufficient data to tell how effective the technology is. However, and similar to the first results from Århus, the algae growth has been strongly limited by the addition, indicating that the technology is effective – at least towards phosphorous. At the same time there are no indications to increased aluminum concentrations in the outlet.

Figure 3. The facility in Silkeborg. On the left hand picture the lid of the container for aluminum dosing is seen. On the right hand picture, the dosing pump and space for a pallet containing the aluminum is shown.

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Plants

Research activities in the three ponds have continued as planned and during the spring and the summer samples are and will be taken to evaluate the accretion of pollutants in the sediments, as well as in the plants. The laboratory worked has continued with the samples taken from previous sampling campaigns and are currently being analyzed.

The sampling campaigns included the gathering of sediment and plant material for the evaluation of heavy metals and selected organic micro-contaminants in sediment and plants. Visits to the sites have been done to assess plant health, and system performance.

Figure 4. The photographs show sampling during a visit. The first row shows the system at Århus. The second row shows a sediment core and accreted sediment selected for analysis.

The systems are still being used for university educational purposes, and have been included in some of the technical visits and field trips required in different water, ecology and aquatic plant related courses.

Next newsletter

Newsletter no. 6 will be issued October 2009.