



### Introduction

Construction works were basically completed in Odense and in Aarhus in the beginning of this year. The winter brought extraordinary amounts of precipitation which caused problems with the earth work finish, especially in Aarhus. The finish works were completed in the mid spring. In the meantime the monitoring equipment was fully tested and the facilities ready to the monitoring actions.

The construction of the facility in Silkeborg was of various reasons delayed. Unexpected mollic soil conditions (organic silt / peat) and extraordinary amounts of precipitation caused severe problems with construction of the clay membrane during the winter season. The problems were solved and the construction works were completed in the beginning of May. The facility was fully equipped and tested in the middle of May and put on line to receive storm water. Unfortunately this was the at the beginning of a 6-8 weeks period with no precipitation in the region. The draught resulted in an arid and cracked clay membrane in the mid section of the pond. More clay has been added but the mid section is not yet tested impermeable. The demonstration facility is now expected to be ready for performance verification at the end of October 2008.

### The pond in Odense



Photos from the end of June 2008.  
Photo above shows the pond viewed from the inlet structure.

To the right the view is from the outlet end. The black cylinders in the pond are the vertical sand filters.

The structure in the front is the flow meter unit. Flows through the various filters are measured separately.





## Newsletter no. 3

### The pond in Aarhus



Photo above from September 2008 shows the pond from the outlet structure.

Photo at the right is from June 2008. The vertical sand filters are dimly seen in the reed vegetation and in the background Lake Brabrand.



### The pond in Silkeborg



Photo above shows the problem in Silkeborg, the mid section without water. Additional clay is expected to reestablish impermeability.





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#### Monitoring status

Monitoring at the facilities in Odense and Aarhus has advanced sufficiently to allow a preliminary assessment of the sedimentation performance. One important result at this stage is that the ponds behave as completely mixed reactors as opposed to plug flow reactors. This has been concluded from analyzing the response of pond turbidity to stormwater inflow (Figure 1). This understanding has significant impact on understanding sedimentation physics in stormwater ponds and consequently on design procedures for sedimentation ponds.

With respect to pollutant removal, the data so far confirm existing knowledge on the treatment efficiency of sedimentation facilities. However, the length of the measurement series does not yet allow a finite answer to this question.

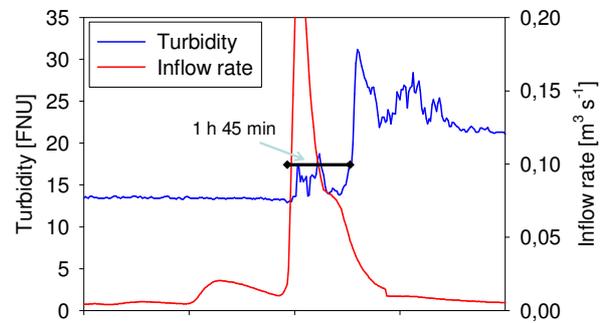


Figure 1 Time delay from start of inflow event to response in pond turbidity.

With respect to the sorption technologies, only the facility in Odense allows for a preliminary assessment of the filter performance. The reason here for is that the facility in Aarhus is still operated without iron enrichment of the bottom sediments in order to achieve a stable baseline of pollutant removal measurements, and because full monitoring of the facility in Silkeborg has not yet commenced due to technical problems mentioned previously in this report. However the efficiency of the filters in Odense has proven to be excellent. See for example the removal of zinc, Figure 2, or copper, Figure 3, where the filters reduce residual concentrations by a factor 5-10.

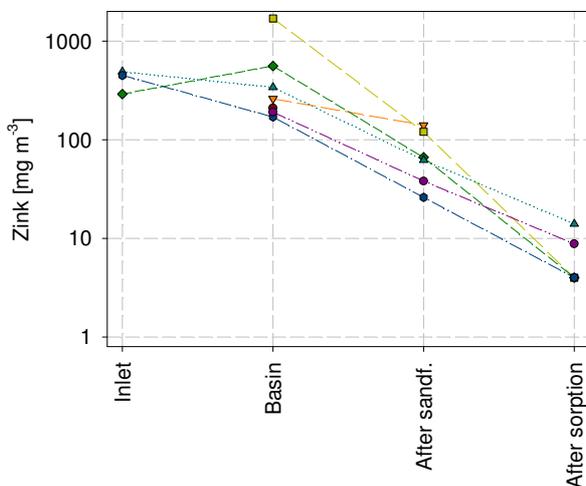


Figure 2. Removal of zinc at the facility in Odense

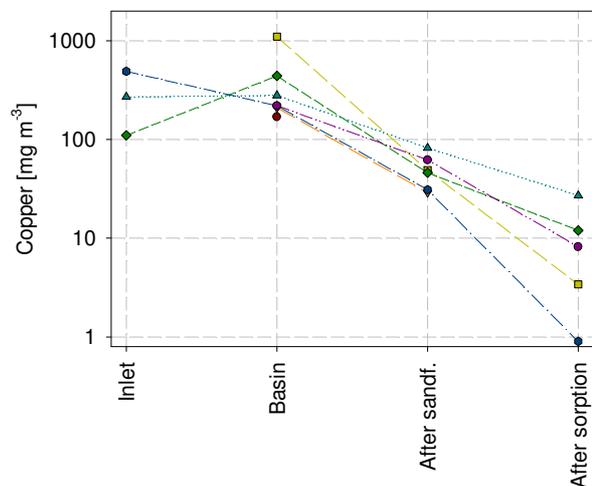


Figure 3. Removal of copper at the facility in Odense

The sand filters seem to have less capacity than originally envisioned, the likely cause being re-suspension of the clay membrane during the first couple of months of operation. This re-suspended clay has partly clogged the sand filters. On the other hand, the data do allow comparison between the three technologies applied for sand filtration. To assess the true capacity of the sand filters, the capacity of each filter must be investigated independently. This will be done within the next 6 months by closing off two of three filters and measuring the flow rate independently.

#### Next newsletter

Newsletter no. 4 will be issued January 2009. Monitoring results will be the main topic.