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MS5: DESIGN OF HRF SOLUTION FOR PILOT TESTING IN LABORATORY

Internal project memo with description of the design and plan for laboratory testing

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MS5: DESCRIPTION OF HRF DEMO PLANT DESIGN AND PLAN FOR LABORATORY TESTING

TREATMENT UNITS AND INSTRUMENTATION FOR CSO TREATMENT SOLUTIONS THAT WILL BE DEMONSTRATED AT EMSCHER AND HOFFSELVA

SUMMARY

Inrigo Water is responsible for development and demonstration of a High Rate Filtration (HRF) system for Combined Sewer Overflow (CSO) control at the Hoffselva demo site.

This memo describes the design basis for the HRF demo plant and a plan for laboratory testing of the HRF demo version.

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List of Acronyms and Abbreviations

HRF:	High Rate Filtration
CSO:	Combined Sewer Overflow
SS:	Suspended Solids
COD:	Chemical Oxygen Demand
BOD ₅ :	Biological Oxygen Demand
N/TN:	Nitrogen/Total Nitrogen
P/TP:	Phosphorus/Total Phosphorus
PLC:	Programmable Logic Controller

1. About the HRF technology

HRF is an innovative CSO treatment system by using specific floating filter media with many benefits:

- Easy operation
- Less motorized equipment
- Quick start-up possible
- No chemical preparation
- No screenings handling
- No filter media replacement

The basic solution and principles for the HRF system are shown in the figure 1 below.

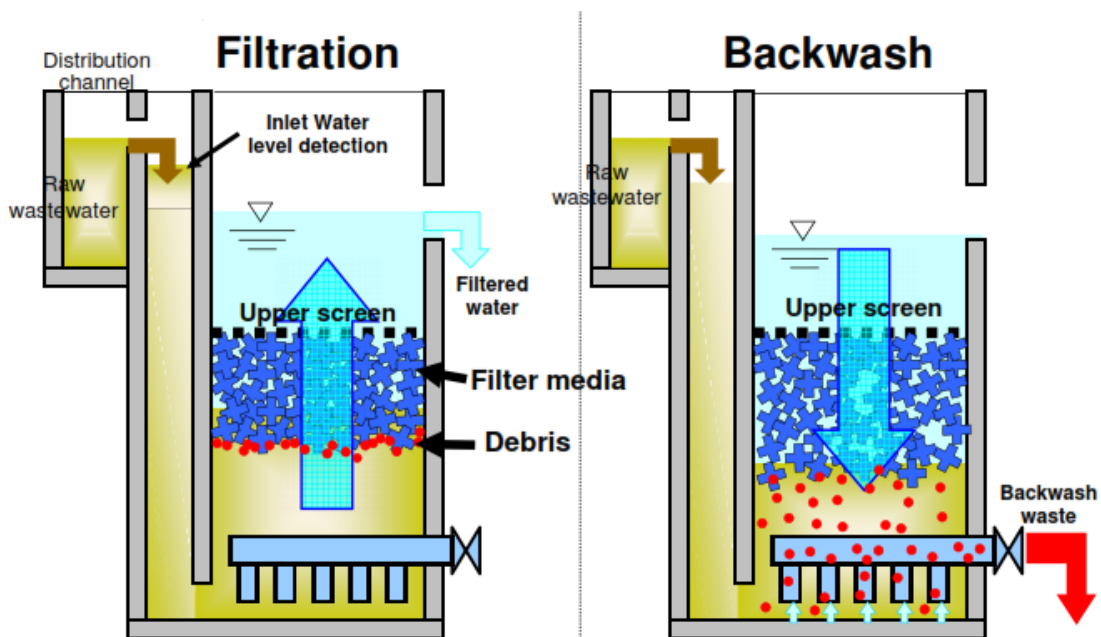


Figure 1: HRF principles

2. Input information as basis for the HRF demo plant design

- Oslo VAV to provide information (as much as possible) about:
 - Water quality information
 - Which water quality parameters can be analysed by Oslo VAV?
 - Effluent water quality requirements
 - Water flow rate information (CSO flow variations on site)

- Online monitoring requirements to be provided by LKI:
 - Online flow meter
 - Online suspended solid or turbidity
 - Online pH
 - Which type of signals will be transferred from the instruments? (To be integrated in HRF PLC).

- Water quality analysis:
 - COD/BOD₅, manual sampling
 - Total N, manual sampling
 - Total P, manual sampling
 - Automatic sampling equipment available?
 - For manual sampling, who will do it? How to do it?

3. HRF demo plant design basis and parameters

- Installation requirements for the HRF:
 - Raw water inlet pipe size: DN 80
 - Waste water outlet pipe size: DN 200 (filtrate pipe to be integrated in waste water pipe)
 - Tap water inlet pipe size: DN 25
 - Tap water consumption: 2,0 m³ for 2 hours a day
 - Feed pump capacity specifications:
 - located in manhole, controlled from pilot
 - Non-Blocking type submerge pump
 - $\phi 80 \times 0,4 \text{ m}^3/\text{min} \times 15 \text{ mH}$
 - 5 kW
 - Power connection:
 - 400 V, 3 phase
 - 15 kW including feed pump
 - Capacity for the HRF demo plant: 20 m³/hour
 - Space for installation of HRF pilot plant:
 - Footprint: 15 m² (W 2,450 mm x L 6,100 mm)
 - Height: 5,200 mm (2 times 20 ft. containers vertically)
- Remote control information:
 - The HRF will be operated by a PLC.
 - Any requirements for this PLC?
 - What kind of data collection (water quality and flow data) system and how can this be accessed by Inrigo Water?
 - On site camera/remote monitoring?
 - Who will provide this?
 - Remote control, for pumps, valves, sampling

The parameters and specifications listed above will be the input for construction of the HRF rig. The input will be subjected to a laboratory test to verify the design basis for the demo plant.

Lab scale testing will be carried out to verify the design parameters and the operational performance of full scale demo plant:

Design parameters

- Filtration rate
- Backwash frequency
- Media filling factor
- Media specification, i.e. density, shape, material, surface modification
- Air bubble cleaning strength

Treatment efficiency

- SS/turbidity removal
- COD removal
- BOD₅ removal
- TN/TP removal
- Micro-pollutants removal

The lab testing will be performed by using synthetic CSO wastewater, which can simulate different pollution load, hydraulic load, and shock load of the full scale/demo plant.

Time schedule for design, construction and laboratory testing of the HRF demo plant:

Collection of input information as basis for the HRF demo plant design	March – April 2014
Calculation of HRF demo plant design parameters	April 2014
Lab verification test of design parameters	May – June 2014
Construction of HRF demo plant	May – July 2014



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