

## Revitalizing effluent of STP Soerendonk

### Client:

Waterschap De Dommel

### Services:

Preliminary & final designs, bidding documents, operation and maintenance instructions

### Cooperation with:

Paul van Dijk, flowform sculptor

### Location:

Soerendonk, Netherlands

### Period:

April 2008 – June 2009

### Realization:

2009-2011



Flowform harmonic flow

### Situation and ambition

For more than 40 year STP Soerendonk has treated domestic wastewater from nearby villages. It's hidden behind dense vegetation in a beautiful landscape with ecologically valuable water courses. Renovation now was necessary. The design brief reflected high ambitions.

The treated effluent complies with the new EU Water Framework Directive standards and with plans for revitalization of the nearby river valley. After renovation an op-to-date biological treatment plant with nitrogen and phosphorus removal and final sand filtration eliminates practically all pollutants from the wastewater. A tree-stage ecological filter – based on the *water harmonica* principle – removes the last remaining bacteria and pathogens and inoculates the treated effluent with appropriate surface water flora and fauna species. The overall treatment effort results in improvement of ecological water quality, retention of rain weather discharge, and strengthening of natural values. A long distance foot path and a bicycle route leads tourists across the marshes and ponds. DHV has prepared the preliminary and final designs and the tender documents for the renovation works according to these design specifications.

### Project

The design of the Soerendonk *water harmonica* includes Daphnia ponds, reed marsh canals and a final biotope pond, which mimics the morphological characteristics of the receiving water environment. The final section will be inundated several times a year when high river discharges occur. A fish ladder enables fish to enter this pond and use it as a spawning area. Recent experiences from different designs at other locations have been used to create a robust, compact set-up, with good access for maintenance equipment. The lay-out respects existing trees and vegetation, which have a protected status in the interregional ecological infrastructure. The full dry weather flow from 40.000 inhabitants (5000 m<sup>3</sup>/d) can be treated ecologically; the maximum hydraulic capacity being 1000 m<sup>3</sup>/h. The treatment site area amounts to 9 ha. The investment costs for the entire STP are € 25 million, of which € 1.2 million for the *water harmonica* section alone.

### Innovations

Site-specific requirements and characteristics urged to use the available space very efficiently. The reed meshes include a deeper subsection with submerged aquatic plants with a high filtering efficiency. The total residence time is 4 days. Maintenance is done with navigable equipment, which enables separation dikes to be narrow and non-stabilized.



For the retention of surface water, operational water levels in the marshes section and in the biotope pond are low enough to let river water penetrate into the system at high discharge. Under low flow conditions fish can move in and out via a fish ladder.

Public has free access to the ecological section. A bridge leads bicyclists over the Daphnia ponds and a foot path enables a view on the water dividing structure and the fish ladder.



### Full-scale flowform treatment

A flowform cascade is placed between the 'concrete' sand filters and the Daphnia ponds of the 'green' section. Flowforms, developed by John A. Wilkes ARCA in the 1970-ties, evoke a rhythmical flow, which mimics a meandering river. This is the first full scale flowform application for treatment of STP effluent. The cascade reoxygenates the effluent. Also a stimulating effect on the downstream ecosystems development is expected. The flowform element have been sculpted by Paul van Dijk, who has created a special design, which requires only a minimal slope and can deal with the large capacities to be treated here. The vivid water movement can be observed from the nearby bicycle bridge.



Above: 3 water harmonica Sections – 3 environments. From top 1 Daphnia ponds – 2 Reed marshes – 3 fish pond

Right: Design sketch. Numbers indicate the successive water harmonica sections.



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