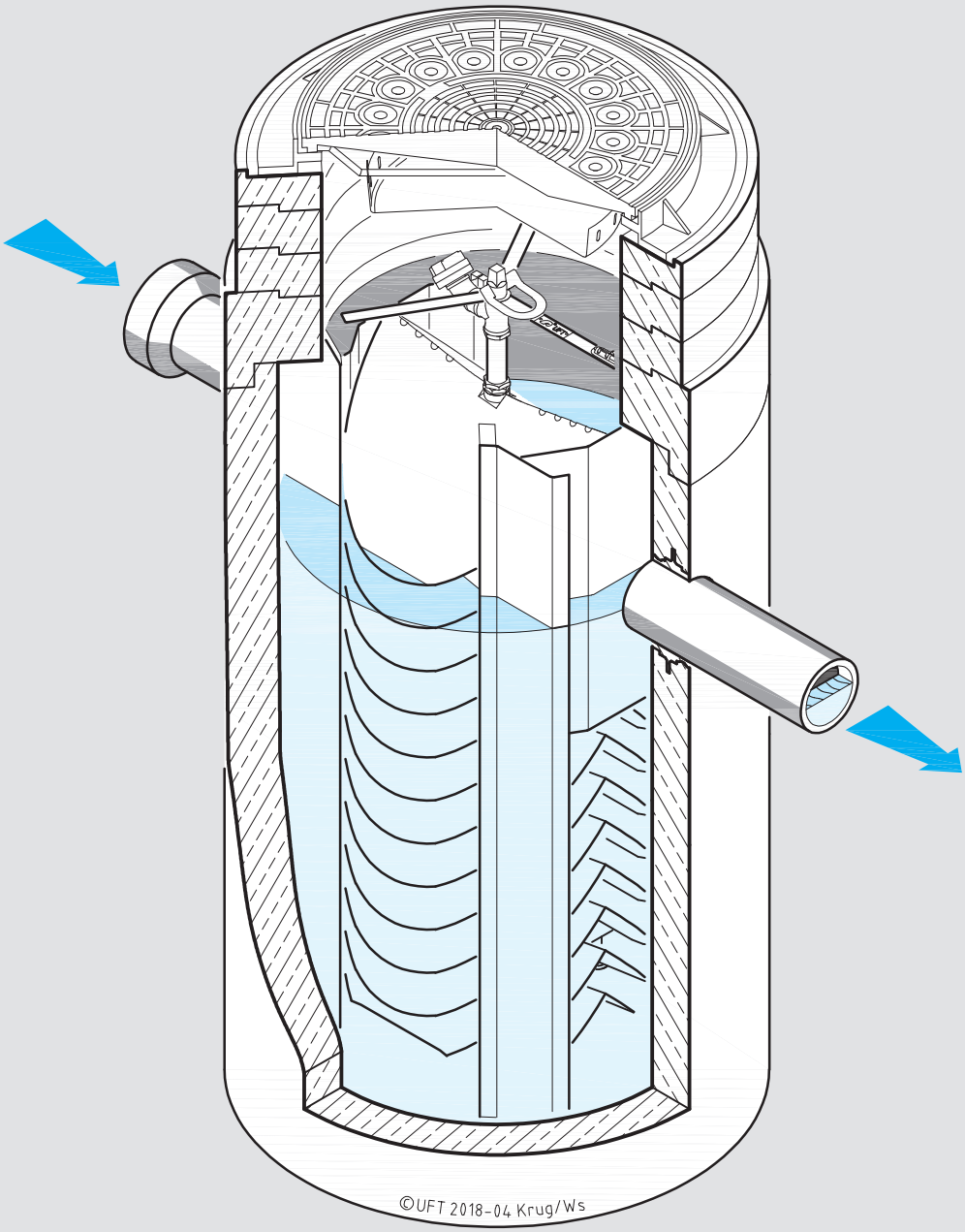
UFT
Pioneers in Stormwater Management

PRODUCT INFORMATION

Sedimentation Shaft
UFT-*FluidSettle*

SED 0239

HYDRO-MECHANICS | ELECTRICAL ENGINEERING | PROCESS CONTROL TECHN. | SERVICE AND MAINTENANCE | SCIENTIFIC SERVICES



1 Intended use

The sedimentation shaft UFT-*FluidSettle* is a decentralised treatment structure for rainwater runoff in the separate drainage system, especially from small catchment areas with moderate contamination. The device uses cross-flow lamella separator technology to achieve good separation efficiency for total suspended solids (TSS), especially for the fine fraction TSS63 with particle sizes smaller than 63 µm. According to the new German DWA guideline A 102 (2016), this fine material will be the future target fraction for rainwater treatment.

The core of the sedimentation shaft UFT-*FluidSettle* is a cross-flow lamella separator module with horizontal throughflow. Due to the large total lamella surface area, a very good separation efficiency is achieved even with strong rain inflows.

2 Mode of operation

The sedimentation shaft UFT-*FluidSettle* is based on a monolithic prefabricated concrete manhole DN 1000 having a cover with a diameter of 800 mm. Inlet and outlet (in standard version DN 150) are at the same level. At the beginning of a rainfall, an increasing discharge flows through the shaft. The water is distributed over the shaft depth through openings in a baffle plate. It then flows horizontally through the 'lamella tree' where the cross-flow clarifier lamellae are arranged as a stack. Due to the small distance between the plastic lamellae, settleable substances suspended in the incoming rainwater have to pass a very small sinking pathlength only until they will settle on a lamella. This results in a very high separation efficiency compared to conventional settling tanks or basins. The baffle plate ensures an even distribution of the inflow, so that each lamella gap contributes to sedimentation performance (**Fig. 4**).

The sediment deposited on the lamellae can slide off to both sides following gravity (**Fig. 2**). Between the outer lamella edges and the shaft wall there is on both sides a calm area shielded from the flow by vertical deflectors. In this area, slipping sediment is not mixed up even during rain.

The 'lamella tree' can be manually swivelled back and forth about its vertical axis with the aid of a key that can be inserted from above through the opened shaft opening (**Fig. 3**). The sediment is loosened by the sloshing movement and can slip off more easily. This process can be carried out regularly, but in any case prior to emptying of the shaft. The clean water then flows under a baffle before it enters the offgoing drain channel.

Light liquids such as oil and other floating substances are trapped by rising up and collecting under the 'roof ridges'. There, a series of holes allows the oil to rise to the permanent water surface. Even if the UFT-*FluidSettle* sedimentation shaft is not primarily designed as an oil separator, it thus also retains smaller quantities of oil efficiently. Inlet and outlet channels are level, so the sedimentation shaft can also be retrofitted in existing rainwater pipes. A bottom drop is not required, and the shaft only produces very little additional headloss.

3 Area of application

The sedimentation shaft is designed for connection of an impervious catchment area of up to approximately A = 2 000 m² = 0.2 ha. From there, depending on rain intensity, approx. 20-30 l/s are discharged during heavy rainfall, which can be directed entirely through the sedimentation shaft (full-flow treatment). An upstream overflow is not required.

During most rain events, however, the inflow is much less. Since these events yield the majority of the annual

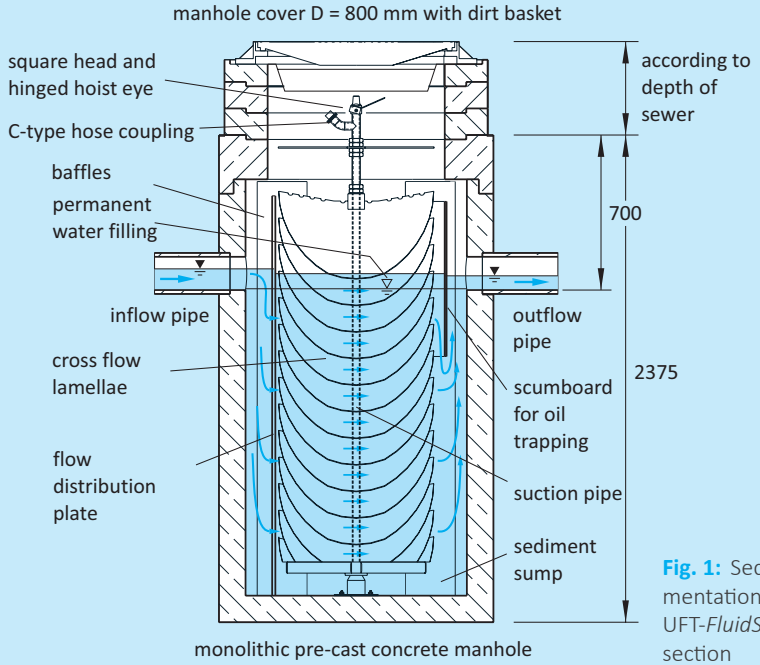


Fig. 1: Sedimentation shaft UFT-*FluidSettle*, section

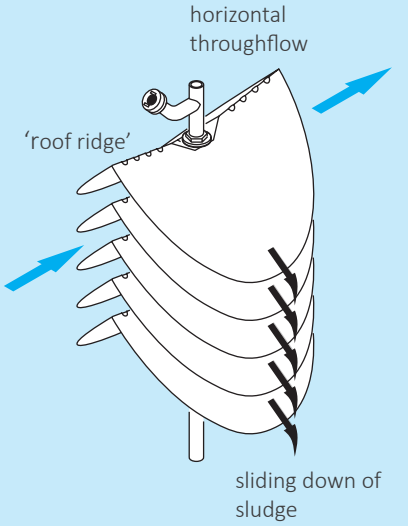


Fig. 2: Horizontal flow through the cross-flow lamellae

PROPERTIES OF THE SEDIMENTATION SHAFT UFT-*FluidSettle*

The sedimentation shaft is a device for decentralised treatment for storm runoff from small surfaces. It meets modern requirements for sustainable treatment by sedimentation prior to discharge into a sensitive river. The advantages are:

- low surface loading, thus very high sedimentation efficiency
- during operation no mechanically moved parts
- no wear
- no auxiliary energy required
- high operational reliability
- full flow treatment, no separate overflow shaft required
- can be combined with a downstream filter shaft for further cleaning (e.g. prior to infiltration)
- corrosion-resistant construction made of waste water resistant PE-HD and stainless steel in commercially available prefabricated concrete shaft
- minimal upstream backup even at large inflows
- no pipe invert drop required, thus the shaft may be inserted in most existing rainwater sewers
- simple maintenance

precipitation runoff, the sedimentation shaft has a very high annual pollutant removal efficiency.

The sedimentation area of the lamellae in the UFT-*FluidSettle* sedimentation shaft is very large and amounts to 5.75 m². With a critical rainfall intensity of 15 l/(s·ha) and a connected impervious surface area of A_U = 1 000 m², the system has a surficial loading of only q_A = 0.94 m/h.

The degree of rainwater treatment which is necessary to comply with the valid technical standards can be determined e.g. according to the German DWA guideline M 153 (2012). In this guideline, the pollution potential of the surfaces in the catchment area as well as the sensitivity of the water body are both accounted for with a score sys-

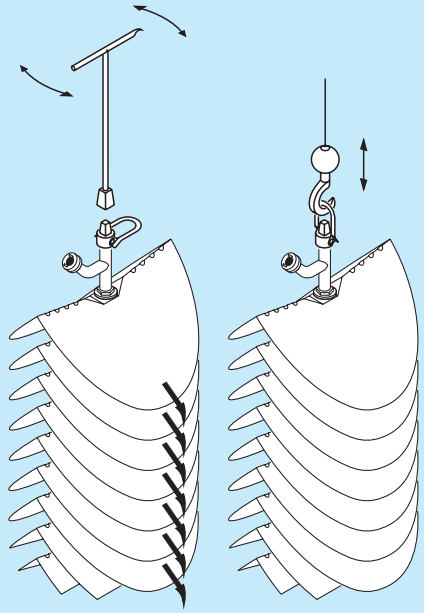


Fig. 3:
Lamella tree

Left:
Manual swivelling of the lamella tree back and forth about the vertical axis loosens sticking sludge.

Right:
The lamella tree is pulled out.

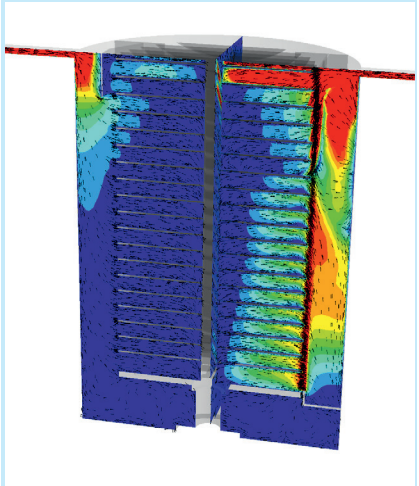


Fig. 4: CFD visualisation of flow velocity in the sedimentation shaft

MAINTENANCE OF THE SEDIMENTATION SHAFT UFT-*FluidSettle*

Sludge accumulates in the UFT-*FluidSettle* sedimentation shaft after a few rain events – this is a sign of the efficiency of the device. However, this sludge must be removed regularly. We recommend the following procedure:

- open the manhole cover, remove and empty the dirt traps
- if oil has accumulated in the shaft, it must be sucked out and properly get discarded first
- pivot the lamella tree quickly back and forth several times with a key inserted onto the square head to loosen stuck sludge
- connect the suction hose of the suction truck to the hose coupling
- remove the top 20 cm of the permanent water filling (in order to prevent contaminated shaft water from draining into the receiving waters)
- empty the entire shaft content including any sludge, if necessary spray with a water hose
- if necessary, lift out the lamella tree with the crane used also for emptying the dirt basket, place it next to the shaft.
- if necessary, clean the lamella tree and also the retractable distribution plate
- re-insert all parts, close the cover

tem. A typical application would be the cleaning of rainwater from an industrial or commercial backyard area before the flow is discharged into a small watercourse. We recommend equipping the shafts and inlets with dirt baskets to keep coarse materials and litter off from the sewer.

4 Maintenance

After a few rain events, muddy sediment collects on the lamellae and also in the lower part of the shaft. This sludge must be removed regularly. We recommend the procedure described in the box on the previous page. For emptying by a suction truck, the lamella beam is designed as a suction pipe and carries a fireman's C-coupling at the upper end to connect a suction hose.

The water in the shaft which has been pumped out will fill up again automatically with the next rain. The maintenance period depends on the amount of sludge coming from the catchment area. Initially, we recommend a check after any heavy rain event. Later, six-monthly inspections and sludge emptying are usually sufficient.

The cast-iron manhole cover with an internal diameter of 800 mm has heavy load class D 400 according to the European standard EN 124, making it suitable for installation in road surfaces that can be driven on by all types of road vehicles.

When the lamella tree is removed, the shaft can be accessed using a ladder. The sludge can be pumped out through the suction pipe without removing the lamella tree.

SAMPLE TENDER TEXT

Pos.	Qty.	Description
1	x	Sedimentation shaft UFT-*FluidSettle* Sedimentation shaft, permanently filled with water, for decentralised treatment of rainwater runoff by sedimentation. Connectable surface area according to hydraulic design. Prepared for regular disposal of sediment by suction truck. Round monolithical prefabricated concrete shaft, inlet and outlet pipes in the same level, shaft connection sleeves suitable for PVC or stoneware pipes. Concrete cover plate with central access and concrete rings to compensate for the depth of the rainwater sewer. Shaft cover made of grey cast iron class D 400 with dirt trap made of galvanised steel sheet. Baffle plates and removable flow distribution plate made of stainless steel AISI 401. Rotatable, removable lamella tree with cross-flow lamellae made of PE-HD and suction tube made of stainless steel AISI 401 with C-type firehose coupling for suction vehicles. Square head for rotating the lamella tree with a slide key, hinged eye for lifting out the lamella tree.

Model UFT-*FluidSettle*	**Model SED**
Connectable catchment surface area A_U:	… m²
Interior shaft diameter D:	1 000 mm
Shaft volume V:	1.2 m³
Depth of shaft T below sewer invert:	1.,675 m
Depth t of sewer invert below terrain surface:	… m
Weight of shaft G:	ca. 4 000 kg incl. appurtenances
Diameter of access hatch d:	800 mm
Nominal diameter of oncoming and offgoing pipes:	DN 150 or DN 200
Vertical gap width between lamellae h_L:	60 mm
Projected sedimentation surface of lamellae A_{proj}:	5.75 m²

Delivery of the ready-to-install unit ex works, including hydraulic dimensioning, data sheet and installation, operating and maintenance instructions.

5 Materials

The sedimentation shaft UFT-***FluidSettle*** is based on a standard reinforced concrete shaft system according to the European standard DIN EN 1917 for waste water. It uses elastomer ring seals and pipe connections. All internal components are made of corrosion-proof stainless steel AISI 304. The lamellae themselves are vacuum-formed PE-HD (polyethylene) parts. This material is well suited for wastewater applications. The manhole cover with ventilation holes is made of grey cast iron. The removable grit basket underneath is made from galvanised steel.

6 Assembly

The manhole parts are produced by a renowned manufacturer of prefabricated concrete manholes and comply with the standards customary in road construction, i.e. they are installed on site like normal sewer manholes. The UFT-*FluidSettle* sedimentation shaft is supplied in individual parts. The shaft parts are installed on site as usual (hoist required). This is done by the contractor who will also connect the pipes and add the shaft neck and cover. Backfilling and road construction will complete the installation. Water may also flow through the shaft without any installations. As a last step (if necessary after emptying the shaft), the baffles are installed and the lamella tree is inserted. The sedimentation shaft is then ready for operation.

LITERATURE

DWA-A 102 (2016): Grundsätze zur Bewirtschaftung und Behandlung von Regenwetterabflüssen zur Einleitung in Oberflächengewässer (Draft, October 2016).

DWA M 153E (2007): Recommended Actions for Dealing with Stormwater. DWA-Merkblatt, English translation

LfUBW (2005): Arbeitshilfen für den Umgang mit Regenwasser in Siedlungsgebieten. Landesanstalt für Umweltschutz Baden-Württemberg.

Standard CSN EN 124-1 (2015): Gully tops and manhole tops for vehicular and pedestrian areas - Part 1: Definitions, classification, general principles of design, performance requirements and test methods

Standard DIN 1917 (2004): Einsteig- und Kontrollschächte aus Beton, Stahlfaserbeton und Stahlbeton.