HydroGuard®

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CLEARLY WASTEWATER

Automatic Flushing Shield

Key Features & Benefits:

- Automatic sewer flushing
- Used within both foul and Surface Water systems
- For pipelines of greater than 500 mm diameter
- Can be fitted into Manhole chambers or pre-formed chambers
- Utilises existing foul flow to provide flush water
- Independent of rainfall events

How We Create Value:

- Ideal for maintaining shallow gradient pipelines, where sediments and grit can reduce pipe capacity
- Reduces the dependence upon expensive manual jetting / flushing provision
- Prevents organic overload at treatment works by preventing build up of solids in the trunk sewer
- Reduces impact of inorganic mater (e.g. Grit) arriving at the treatment works after dry periods
- Stainless steel fabrication of the flusher
- Pre-fabricated chambers can be utilised to speed construction

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The deposition of sediments in sewer networks, irrespective of the drainage system used, is a common problem. The reasons for this problem are mainly obvious: large sewer diameters with small dry weather flows (aggravated by economies in water usage), flat sewer gradients, and subsidence caused by geological factors, not achieving self-cleansing velocities, etc.

The possible consequences of sewer sediments are, for example, increased polluting load discharges at Combined Sewer Overflows (CSOs), intermittent biological overloading of wastewater treatment plants due to sudden liberation of solids during storm conditions, odour pollution, reduction in the hydraulic capacity of the sewers or damage to the sewers from sulphurous corrosion.

In addition, the potential sewer retention volume in most combined sewer networks is not fully utilised during rainfall events. This can lead to discharges into receiving waters, which could have been avoided. The protection of receiving waters from pollution by combined wastewater is effected by the volume of silts and sediments that are allowed to build up within the sewerage system. Heavy silts that have built up and become septic through times of low flow can become re-suspended during storm conditions, and thus pass over to the watercourse via CSO.

High-pressure cleaning of sewers with vactor tankers is labour and cost-intensive. In addition, the structural stability of the sewers can be adversely affected, which can result in a decrease in the expected service life of the sewer. The time intervals between tanker flushing operations are often too long due to economic considerations. Continual high-pressure jetting is not financially feasible.

The ***HydroGuard® Micro*** is an appliance for the continuous, automatic and preventive cleaning of Medium sized sewers (DN 500 – 800).

The ***HydroGuard® Mini*** is an appliance for the continuous, automatic and preventive cleaning of large sized sewers (DN 800 – 2000).

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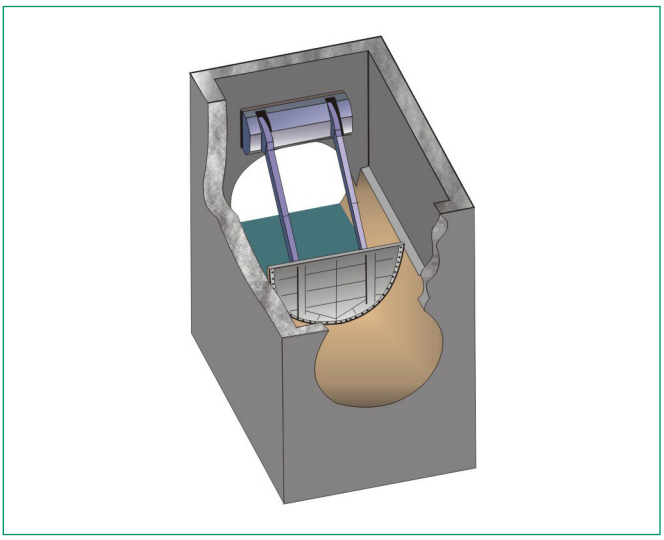
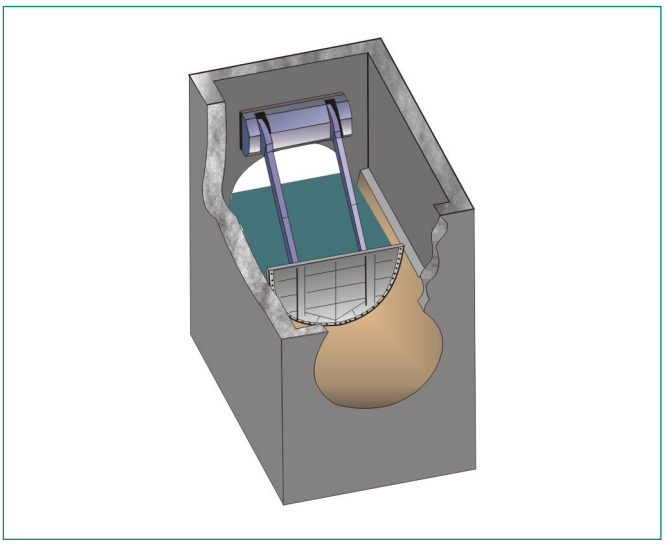
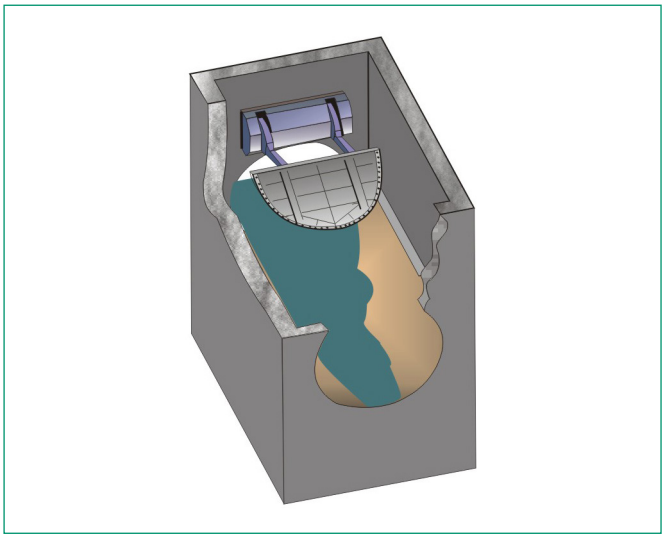
Flushing Sequence:



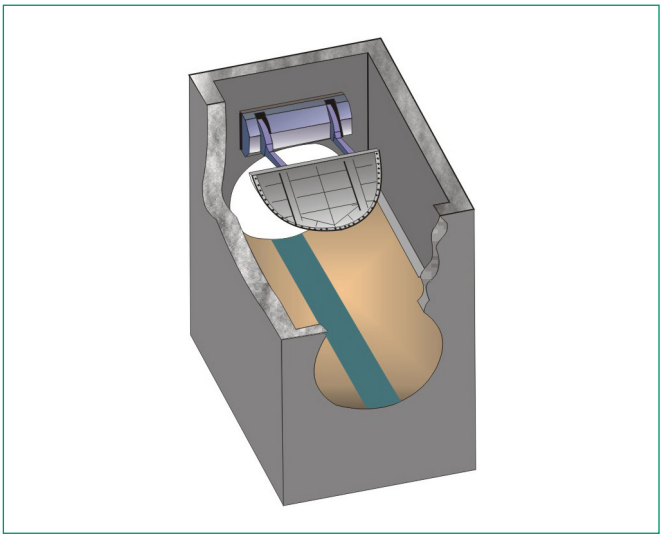
1. The shield is lowered into the channel. This can be controlled by timer to occur at specific times of the day / night when flows are low and storm flows are not present.



2. Flows are allowed to surcharge behind the shield to a pre-determined level. Providing a suitable volume of water to flush the required section of downstream sewer.



3. Once the pre-determined level is reached, the shield is raised permitting the flushing water to surge downstream. This flushing wave re-suspends any settled debris and carries it forward.



Idle Position: When not in use the shield is raised well above the sewer aperture so that is does not interfere with the normal operation of the sewer system. In storm conditions, the shield will remain in this position as the flushing sequence would be inhibited by the control system.

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The construction design and planning of the HydroGuard® Mini Flushing and Impound Shield is project-oriented. The measuring of the amount of flushing water required and positioning of the equipment is dependent on, among other things:

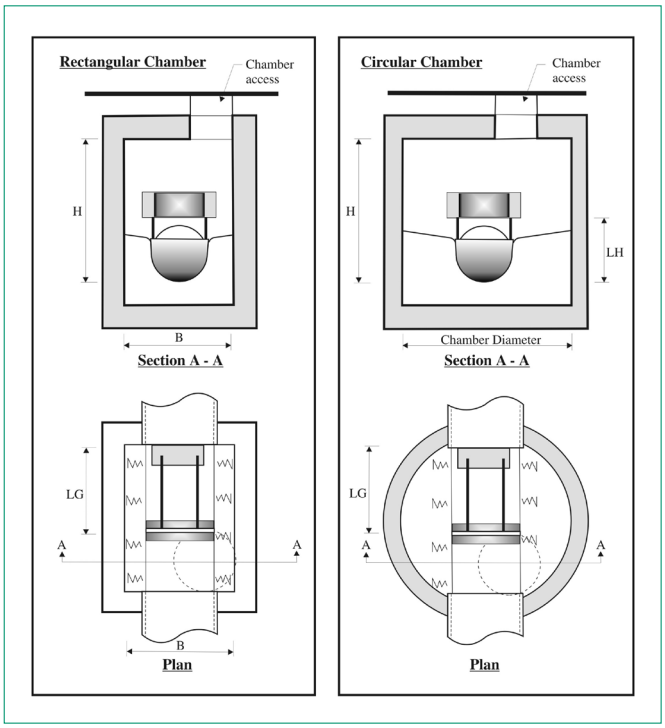
- Length of the flushing reach
- Hydraulic conditions of the impound reach
- State of the sewer (gradient of the sewer section, sudden widening or narrowing, etc)
- Depth of expected Sediments
- Dry weather flow
- Sewer diameter – Partial filling depth
- Inflows in the flushing reach
- Special structures e.g. culverts

When designing for the HydroGuard® Mini installation, attention must be paid to existing sewer and any downstream throttling due to CSO chambers must be allowed for to prevent backwater of the flushing wave causing an unwanted discharge.

The HydroGuard® Sewer Flush uses two kinds of flushing: the upsurge flush and the wave flush. When the flushing shield closes, the outlet sewer runs empty so that when the shield is raised the resulting wave remobilises any settled debris in the downstream sewer. The sudden opening of the flushing shield creates an upsurge effect, that is, a sudden drop in the upstream water level, in the where the flushing water is stored. Higher flow velocities are created which remobilise sediments in the impound area, which are then carried away by the flushing water.

In the event of heavy storm flows in the sewer, the flushing programme is interrupted and the shield remains in its upper position outside the flow section to prevent any obstruction to the flow.

The flushing frequency can be selected at the control. Because of local differences in sediment heights and density the flushing programme should be checked during operation and optimised together with Jacopa Ltd.



Sewer Diameter (mm)	Height of Weir (mm)	Impound Head (mm)	Min Chamber Dims Rectangular L (mm)	Min Chamber Dims Rectangular B (mm)	Min Chamber Dims Rectangular H (mm)	Min Chamber Dims Circular Dia (mm)	Min Access Dia (mm)	Drawing Dimensions LG (mm)	Drawing Dimensions LH (mm)
500	500	400 - 500	2000	1500	1500	1500	800	571	562
800	600	500 - 600	2000	1500	1500	1500	800	1200	850
900	600	600 - 700	2000	1500	1700	1500	800	1200	850
1000	800	700 - 800	2200	1500	1800	2500	1000	1300	1050
1100	800	700 - 800	2500	1700	2000	2800	1000	1400	1150
1200	800	800	2700	1800	2200	3000	1000	1600	1250
1400	1100	900 - 1000	3600	2400	2900	4000	1200	2300	1450
1600	1100	1000 - 1100	3600	2400	2900	4000	1200	2300	1650
1800	1350	1100 - 1200	4400	3000	3500	5000	1500	2750	1850
2000	1350	to 1350	4400	3000	3500	5000	1500	2750	2050

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HydroGuard® – Inverted Siphon Flush:

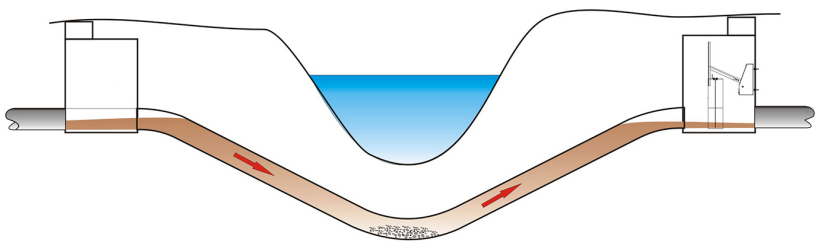
Sewer networks have been historically designed to overcome local topographical conditions.

Construction of deep sewers are expensive and sometimes cannot be achieved due to close buildings or ground conditions.

Inverted siphons have been used to pass under watercourse, buildings and roads and railways. These siphon sections have a propensity to encourage sediment settlement at the lowest point due to lack of self-cleansing velocity, and as such require regular maintenance to maintain capacity and function.

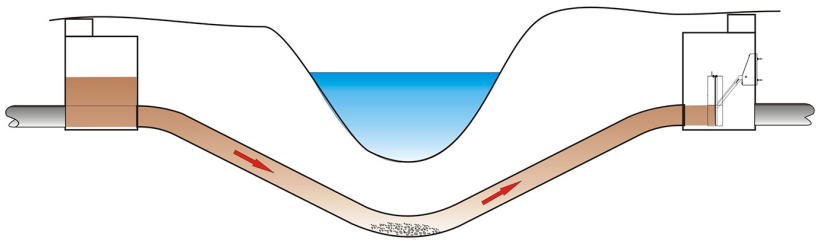
The usual method of cleaning siphons is to open the drain valve at the low point and flush the pipe with tankers until all silts have been removed. The discharge from the siphon has to be captured by tanker and transported to a suitable discharge point. Where siphons are located near watercourses this operation can be risky.

The velocity of flow through a siphon is dependent upon the head difference between the inlet and outlet positions. To increase the velocity, the upstream head needs to be increased and one way of doing this is with the HydroGuard® – Inverted Siphon Flush unit.



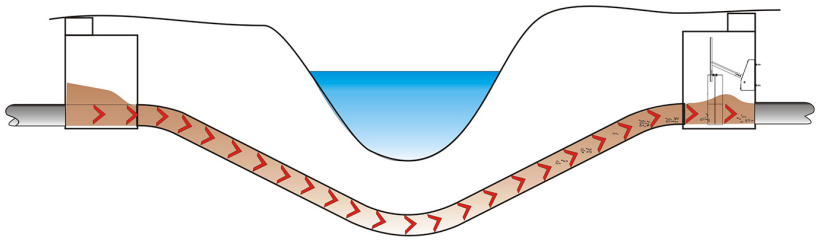
Siphon in normal operation

During normal dry weather conditions, the siphon may suffer from low velocity, this causes sediments to settle



Siphon in Flush Fill Mode

At predetermined times, the shield will be lowered allowing the upstream pipe to surcharge to a specified level.



Siphon Flush Release

Once this level is reached, the shield is raised allowing the siphon to run. The stored water together with the increased head drives the water through the siphon at a higher velocity re- suspending the settled debris and cleaning the pipe.

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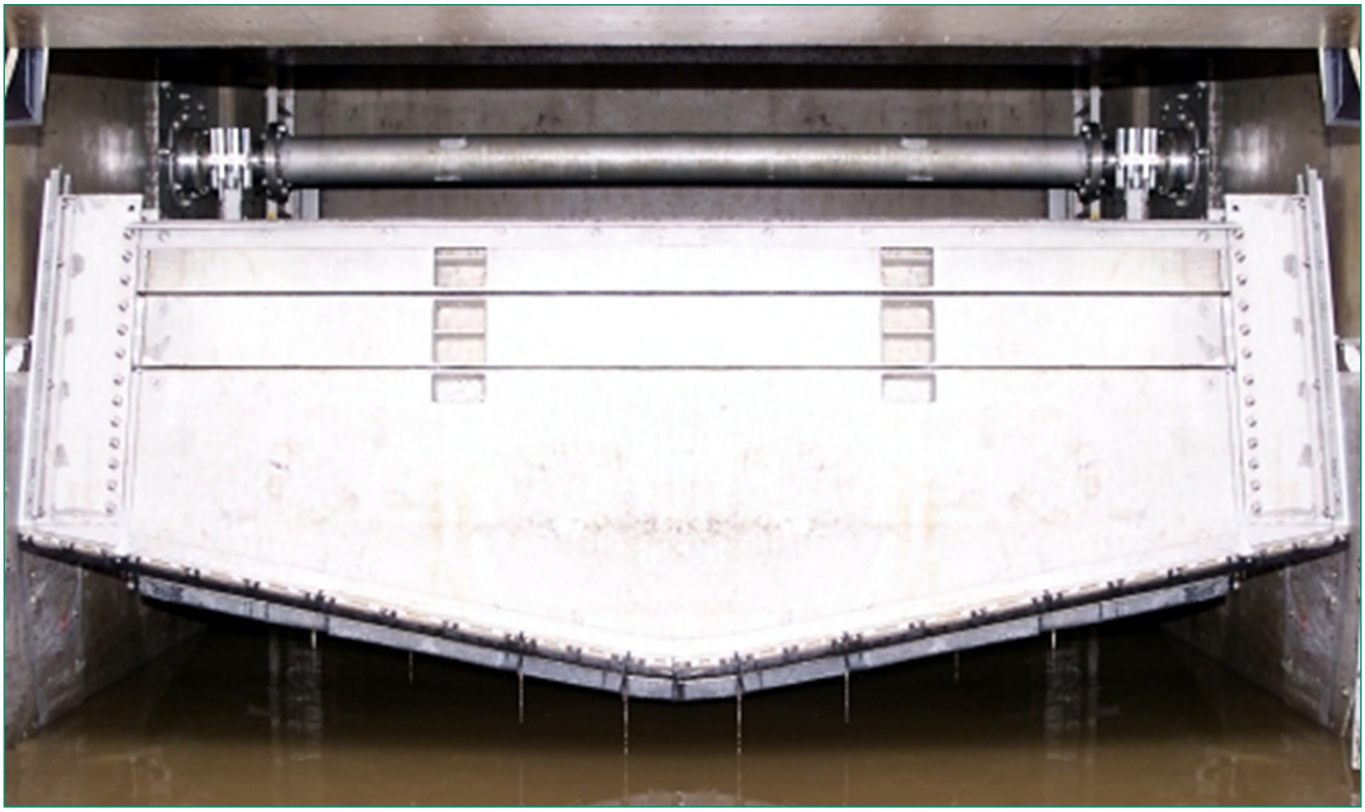
HydroGuard® for Culverts and channels:

The HydroGuard® system can be designed for large culvert or channel sections. This would involve the manufacture of the sealing frame, gate and support structure. The gate would be controlled via a control panel and hydraulic power-pack mounted above ground.



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