HydroM.E.S.I.®

CLEARLY WASTEWATER

Particle Separation

Key Features & Benefits:

- Capturing more than 95% of solid pollutants as a Gross Pollutant Trap (GPT)
- High performance due to swivel lamella structure
- Enhances the performance of conventional settlement tanks
- Robust construction made of high-quality materials
- Capacities of 20 to 2000 l/s are possible in a single lamella lane

How We Create Value:

- No moving parts and requires no mechanical devices to support the solid separation function
- Modular structure allows for retrofit modifications
- Easy maintenance
- Environmentally friendly with no noise or external power

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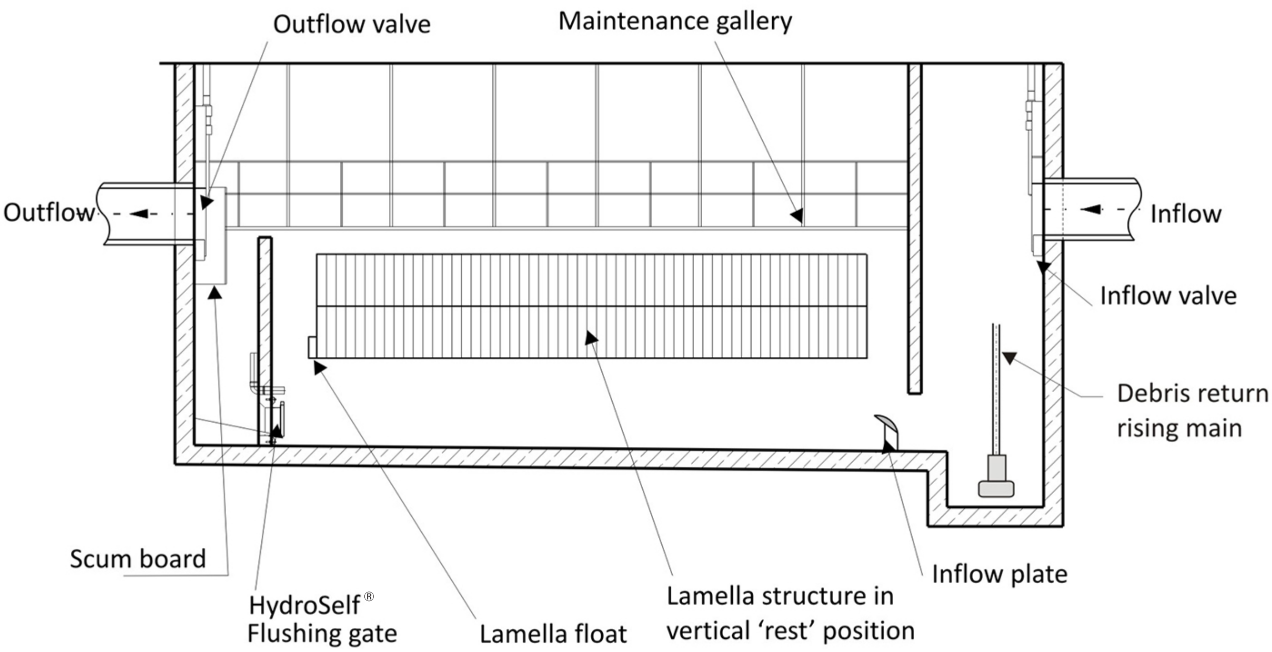
Rainwater flowing into stormwater sewers also contain run-off from other impermeable areas such as roofs, building walls, roads, parking lots, etc. The content of these surface water discharges have been analysed and it is generally accepted that they are heavily polluted and require treatment before being discharged into the watercourse. The potential degree of environmental damage caused by the discharge depends on the combined effects of pollution concentration, hydraulic conditions, duration of discharge, as well as the frequency and intensity of annual precipitation.

Composition of surface water pollutants:

Pollution carried by urban storm-water is considered a significant contributor to the degradation of receiving waters and is perceived by the Environment Agency and the public as requiring remedial action. Urban storm-water pollutants include gross pollutants, trace metals and nutrients that are associated with sediments, and dissolved pollutants.

Gross pollutants are often the first type of storm-water pollutants targeted in urban catchment management for water quality improvement. Many structural measures for the removal of gross pollutants have been developed to improve the quality of urban receiving waters. The costs and 'land take' associated with these measures vary across a wide range, both in design and construction, and in ongoing maintenance requirements. Trapping efficiencies also vary widely and are an important consideration when selecting Gross Pollutant Traps (GPT).



M.E.S.I. Cross section

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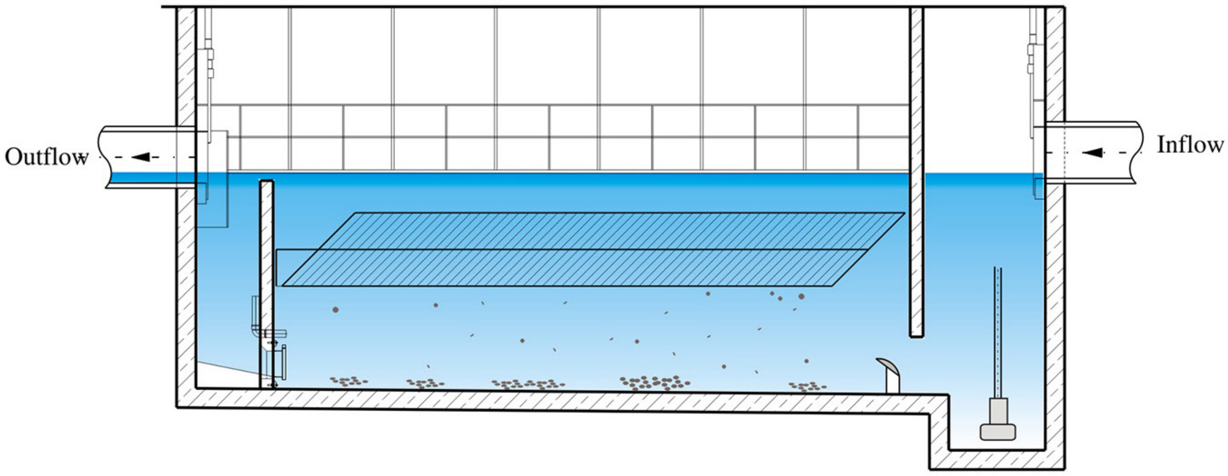

M.E.S.I. In Operation

It is well recognised that a significant amount of pollutants are transported by storm-water as sediment-bound contaminants. Results from an investigation by Mann and Hammerschmid (1989) on urban runoff from two Australian catchments in the Hawkesbury/Nepean basin showed high correlations between total suspended solids (TSS) and total phosphorus (TP), total Nitrogen (TN) and Chemical Oxygen Demand (COD). Ball et al. (1995) similarly demonstrated a high correlation between TSS and TP.

The HydroM.E.S.I.® particle separator is a special treatment installation designed to separate solid particles that are transported within storm flows and are generally discharged into watercourse systems. The HydroM.E.S.I.® particle separator is fitted with swivel mounted lamella settlement panels to aid quicker settlement of fine particulates. This increases the performance and quality of the treated flow in a very economic manner.

Because of its modular structure, the HydroM.E.S.I.® particle separator can be tailored to suit the needs of each individual catchment, and can be fitted with additional features to simplify maintenance operations if desired. The additional features can include trash screens, flow regulators, tank flushing, sludge removal to create a complete treatment facility.

The main area of application for the HydroM.E.S.I.® particle separator is to increase the performance of conventional storm-water settlement tanks.

Existing storm-water settlement tanks can be retro-fitted with the lamella units to either increase the discharge quality, or to maintain the existing quality performance within a smaller area. The settlement of existing tanks is increased by the addition of the lamella plate system.

Screen and Flow regulator:

A static bar screen can be fitted upstream of the HydroM.E.S.I.® particle separator to retain gross debris, such as plastic bottles, wood, etc from entering the separator structure. A flow regulator can be utilised to regulate the flow rate into the HydroM.E.S.I.® particle separator in line with the hydraulic design capacity.

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Inlet Shaft collecting sump and pump sump:

The regulated inflow is transported through an inlet shaft (collecting sump), where sand and coarse solids are settled and retained prior to the separating chamber.

This inlet shaft serves both as flushing sump and return pump sump. When the separator chamber is flushed clean after the storm event, the flush-water and settled debris is washed into the flushing sump, where the return pump transports this mixture to a disposal point.

Guide Plate:

A hydraulic guide plate is attached to the edge of the collecting sump and separating chamber floor. This plate is designed to create laminar flow conditions between the settlement plates. The 'Guide Plate' also prevents sediment from being stirred up from the bottom floor. The width of flow corresponds to the full width of the settlement structure. The 'Guide Plate' is height adjustable and allows the current under the lamella plates to be regulated.

Separation / Lamella Chamber:

The main innovation of the HydroM.E.S.I.® particle separator lies with the moveable lamella plates. The plates are coupled together and set at a pre-designed distance. A control float is located at the outlet end of the plates. When the water level rises within the chamber, the control float becomes buoyant tilting the lamella plates to an angle of between 45 and 55o. The angle of tilt is adjustable, and can be altered to suit site conditions as appropriate. The separation of particles occurs between the lamella plates where the velocity of water flow is low, and the particles are able to settle on the plate, then dropping to the sump of the chamber.

Flushing Chamber:

The flushing chamber is situated at the rear wall of the separating chamber. The flushing water required for the automatic cleaning of the floor of the separating chamber is retained in the flushing chamber.

Scum-board / Run-off:

The treated water is discharged from an outlet at the rear wall. A scum-board is installed to prevent floating debris and free hydrocarbons from being discharged in to the receiving watercourse.

Inlet / Outlet Isolation:

Both the inlet and outlet can be fitted with an isolation penstock, which allows the HydroM.E.S.I.® particle separator to be isolated for maintenance operations.

Lateral Drainage Channels:

Instead of having a single outlet point at the end of the settlement chamber, an option to provide lateral channels extending the length of the chamber can be offered. These channels incorporate a castellated weir enabling a more even flow over the whole length of lamellas, providing an improved discharge quality.

Maintenance Platform:

In order to maintain the lamellas free from the build up of debris and growth, it is necessary to clean the lamellas with pressure washing at regular intervals (min annually). This cleaning can be carried out from a maintenance basket, or a permanent platform can be provided above the structure.

Filling:

During a storm event, the flow enters the system through the bar screen. This traps large debris such as bottles and timber. The inflow passes to the inlet, controlled by a HydroSlide® flow regulator. Coarse solids (sand, gravel etc) are retained at this position. The flow is then directed by a guide plate into the separating chamber. The inflow is distributed evenly over the width of the lamella structure. The guide plate also prevents settled debris for being re-suspended by the flow velocity entering the chamber.

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Separating Process:

As the water level rises in the separating chamber, the control float tilts the lamella plates from their swivel point along the horizontal axis, to their pre-determined angle of inclination. The water rises up through the lamellas, where the separation process of the lighter particles takes place.

Particles are trapped between the lamella plates when the settling rate is greater than the upward flow rate. The particles then settle on the plates and slide to the tank floor. The hydraulic guide plate prevents the settled sediments from rising again. Floating pollutants that are lighter than water, such as free hydrocarbons, are retained within the chamber by the scum-board.

Emptying:

When the storm event is completed, the flow of cleaned water to the watercourse ceases and the HydroM.E.S.I.® particle separator is full of water and captured pollutants. The structure now empties to the desired disposal point. The disposal point could be the foul sewer network, allowing the pollutants to be transported to a treatment facility. The chamber is emptied either by pump or by the HydroSurf® Surface Draw-Off.

Cleaning and Sludge Removal:

During the draining process, the water level within the HydroM.E.S.I.® particle separator drops. As the level drops, the control float allows the lamella plates to move back to the vertical position. This permits any solids retained on the plates to slide off and drop to the chamber floor.

Once the draining of the chamber has been completed, any silt and debris can be washed from the settlement chamber into the pump sump area with the HydroSelf® flushing gate unit. This can be carried out automatically or by operator intervention. The sediments that are flushed into the sump can either be pumped to the sewer network or tankered to a suitable disposal point.

An alternative operating method is to remove the deposited silt at regular intervals. This can be beneficial if the treatment facility can only deal with small amounts of pollutant at a time. Sludge can be removed automatically at certain times of the day or night when the sewage load is less if required.

If there is no wastewater facilities available near the HydroM.E.S.I.® particle separator, the polluted water can be transported to a specific treatment facility such as an infiltration lagoon or sludge drying facility.

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Cross Flow:

The use of the cross flow design may be necessary when installing the unit into an existing tank structure. The inflow on the lamellas occurs laterally. The settlement process is identical to the counter flow method; however, the treated water exits the structure on the side, opposite the inflow.

Planning the Lamella Chamber:

The planning and design of the lamellas is always based upon the inflow rate Q (l/s), to be treated. The next design parameter s are the diameter d (μm) and the density r (Kg/m3) of the target pollutants that the HydroM.E.S.I.® is to be designed to settle. This establishes the settling rate and required upward flow rate.

The selection of the lamella width and height in existing structures is dependent upon the space available, however, in new designs the dimensions can be selected with no such limitations. The width and height of the lamella sheets should not exceed 3 m for reasons of stability and weight.

The spacing of the lamella sheets is dependent upon the quality of required discharge and the settlement area required for the inflow rate. The spacing is also affected by the type of water to be treated. The lamellas can be closer together for highway surface water, but wider for highly contaminated CSO discharges.

In principle, there is no upper limit to the quantity of the inflow rate to be treated. The length to width ratio of the lamella field should not exceed the value of 5. In practice, it is shown that long lamella lanes are not as effective in their settling characteristics, and because of this, where large inflows are expected, it is recommended that several lamella lanes are positioned parallel to each other.

Maintenance – Cleaning of Lamellas:

The cleaning of the lamella plates can be carried out using high pressure water jetting , from the access platform above the plates. The frequency of cleaning is usually determined in the course of its operation, as this is determined by storm frequency and pollutant type / loading, which is site specific.

Differentiating Counter flow – Cross Flow:

Depending on local conditions, the HydroM.E.S.I.® can be operated in counter flow or cross flow mode.

Counter Flow:

The inflow to the HydroM.E.S.I.® particle separator is longitudinal. The current flows upwards through the lamellas, and when the settling rate of the particles is greater than the upward flow rate, they fall on to the lamella plates. The particles then slide downwards to the floor of the separator. The clean water flows above the lamella plates and passes out to the watercourse via the outlet pipe.