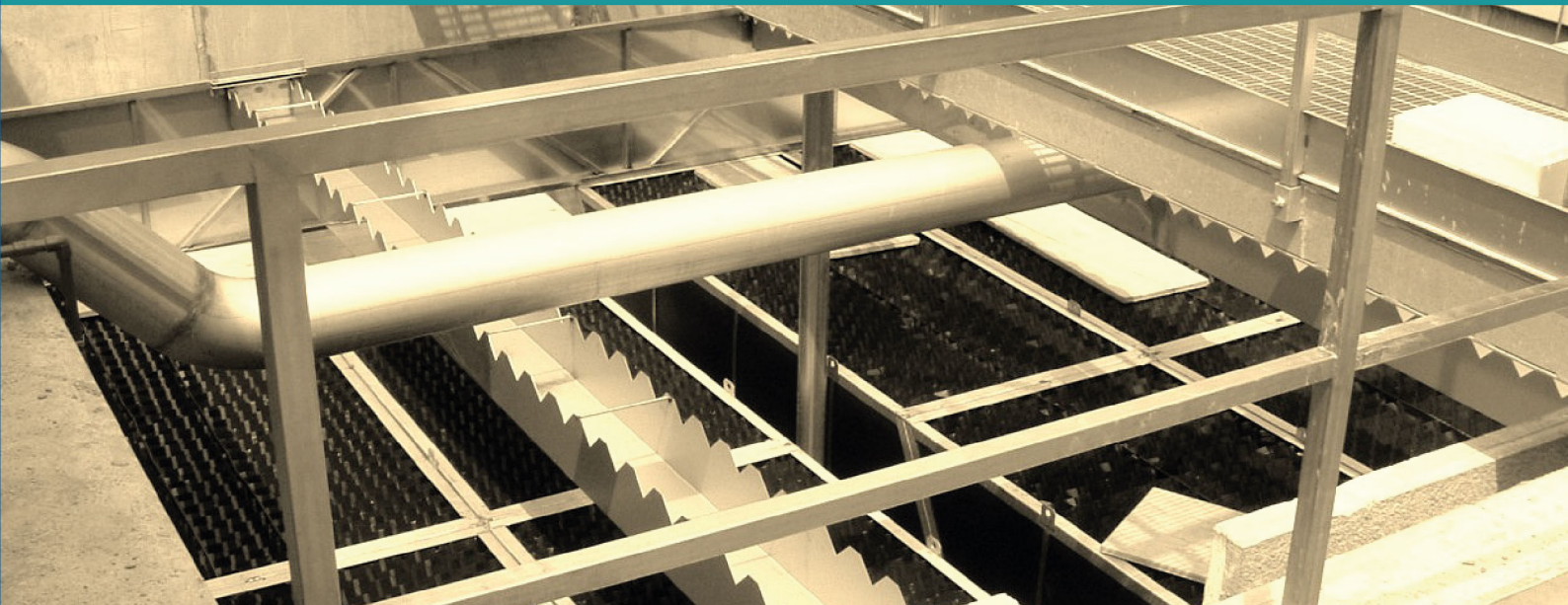
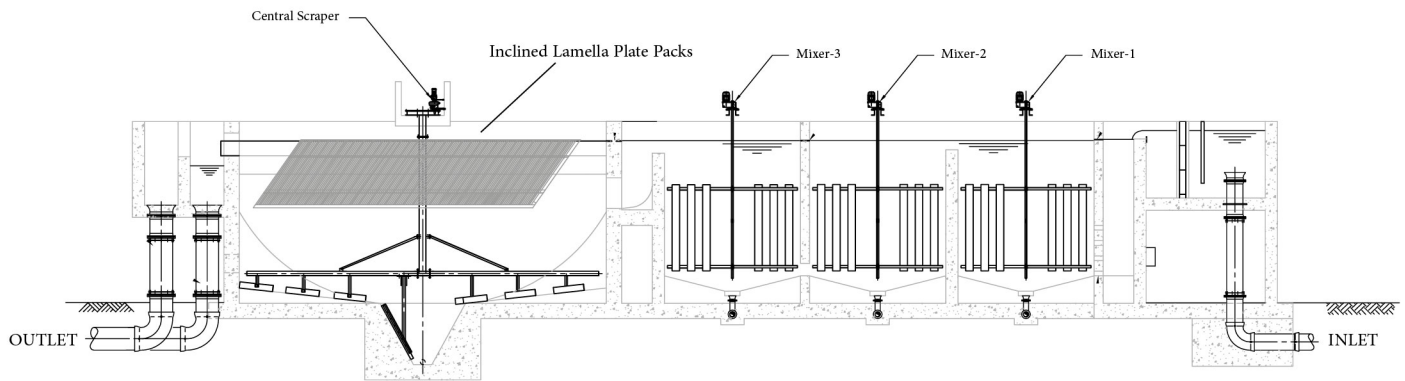


PurewaterGroup



L A M E L L A
CLARIFICATION SYSTEMS



Flow schematic of surface water treatment plant employing chemical flocculation and lamella sedimentation

INTRODUCTION

Sedimentation basins and clarifiers have traditionally been employed to separate solids suspended in water and wastewater, comprising of concrete or steel tanks where raw water or effluent containing suspended solids are retained within for a length of time, enabling gravity settlement under quiescent conditions, often with chemical coagulant aid, with the resultant liquid flowing out appreciably free of suspended solids.

Advancements were made to the basic rectangular, square or radial sedimentation basins over the years to enhance the efficiency of solids-liquid separation, including incorporation of sludge removal mechanisms, variable speed flocculators, and sludge recycle mechanisms. But the apparatus and basins are cumbersome and are disadvantaged by relatively large footprint and cost.

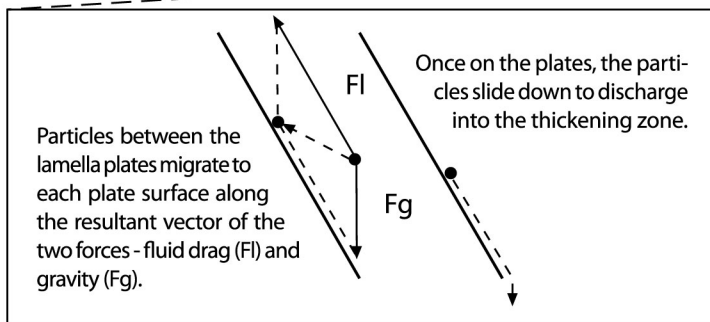
However, the most notable advancement in separation technology in more recent years has been the introduction of inclined plate and tube settlers of varying designs, configurations, and materials to effectively increase the surface settlement rate many fold and, thus, create conditions for faster and more efficient settlement of suspended and flocculated solids, within a relatively decreased footprint – be it for surface water treatment, for sewage or industrial effluent treatment, or for the oil and mineral separation industry.

The Lamella Principle

The two basic criteria for gravity settling equipment are good clarity of the overflow liquid and maximum density of the underflow solids discharge.

The area required to clarify a suspension is often greater than that needed for thickening. This means that in a cylindrical thickening tank, the lower section with rakes and drive mechanism can be oversized.

The lamella principle uses several parallel inclined plates to maximise the available settling area for any available floor area. In this way, the size and cost of the gravity settler can be minimised by matching the clarifying and thickening requirements more closely.



[courtesy METSO Minerals]

The principle of Lamella separation is based on suspended solids in the carrier liquid settling out by directing the liquid between series of inclined plates (lamellae) or tubes, that provide multiplicity of settling surface areas, totalling some ten-fold and above, within a very small enclosure or basin.

For instance, the effective settling area of each lamella plate is equivalent to the horizontal projection of that lamella plate, the latter being typically spaced a few inches apart, with the result that large settling surfaces are concentrated within a relatively small area. The separated particles settling on the inclined lamella plate slide down into a sludge hopper area below the lamella plates. The same is applicable to inclined tube packs placed within various configuration tanks.

Thus the lamella separation promotes laminar and stable flow conditions throughout the clarification processes, leading to a very high degree of separation.

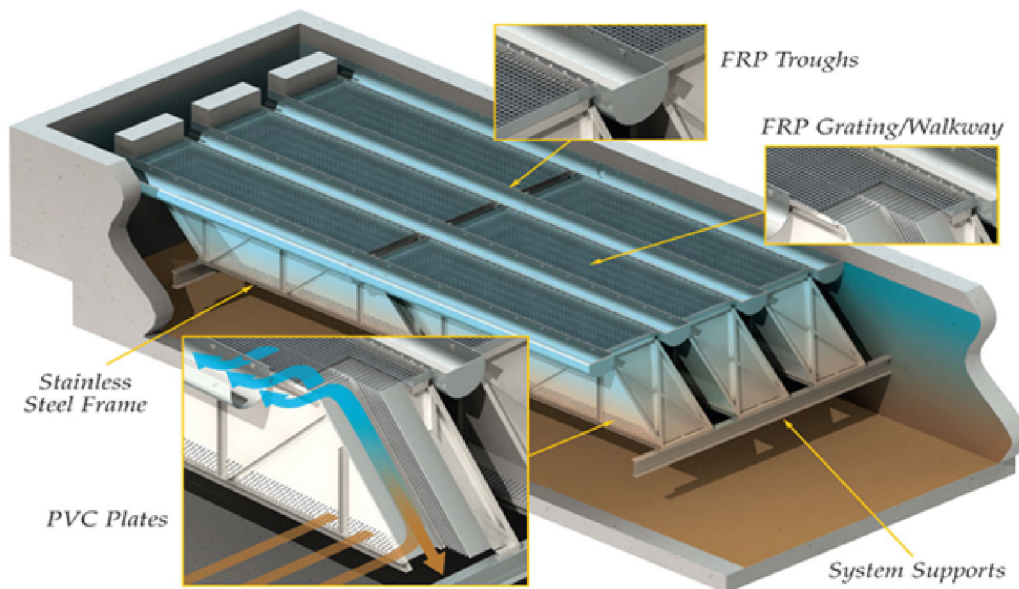
Lamella separators can be classified into three main categories based on the flow regime, namely (1) counter-current, wherein the suspension and the liquid flows are counter-current to the sludge flow; (2) concurrent, wherein the suspension and the liquid flow are concurrent to the sludge flow; and (3) cross-current, wherein the suspension and the liquid flow are at right angles to the sludge flow.

However, the counter-current flow regime provides the best option when taking into account installation and operational costs.

INCLINED LAMELLA PLATE SETTLER (IPS)

The Inclined Plate Settler comprises of 2 main components: the upper basin containing the suspended lamella plates inclined at an average 55° and the lower conical / cylindrical /or square hopper bottom sludge tank. The feed for the IPS enters through vertical chambers on either side of the lamella packs and passes into each plate gap through slotted feed ports. Clarification takes place above the suspension inlet so there is no mixing of the clarified or supernatant liquid with the incoming feed waters.

Above each pack is a full-length overflow launder fitted with throttling holes to create a slight hydraulic back pressure on the incoming feed stream. This method of feed control guarantees equal distribution to all lamella chambers with minimum turbulence at the entry points. The solids settle onto and slide down each lamella plate to the sludge tank where the solids are further thickened and compressed with the assistance of the bottom mechanical scraper / raking system and subsequently evacuated as disposed sludge.



[Courtesy Brentwood AccuPac®]

Inclined Lamella Plate Settler System

LAMELLA SETTLER ADVANTAGES

- Heavy duty construction of tank, sludge hopper and lamella plate packs, as well as the rake system. Rake lifting mechanism as option;
- Positioning of specifically designed feed ports for optimum ratio between clarification and thickening area;
- Wide spacing of lamella plates to handle high density feed pulps and coarse solid particles;
- No short circuiting or surface turbulence;
- Integrated flocculator with variable speed stirrer.

LOWER INSTALLATION COSTS

- Delivered as one-piece unit or in prefabricated sections;
- Smaller foot-prints and foundations;
- Square or near-radial outline for easier planning and construction.

FLEXIBILITY FOR PLANT CHANGES OR EXTENSIONS.

- Can be installed in any system
- Easy to relocate to adapt to process changes

SIMPLIFIED IN-PLANT INSTALLATION

- Shorter pipe work runs.
- High level installation for gravity feed to downstream processes
- Easier supervision.

SMALL INTERNAL VOLUME AND SURFACE AREA

- Easily insulated against heat loss or toxic fume emissions
- Evaporative losses are minimized.

SIMPLE CONSTRUCTION OF SHEET STEEL AND STANDARD PROFILES

- Special materials and coatings can easily be incorporated
- Easy to maintain

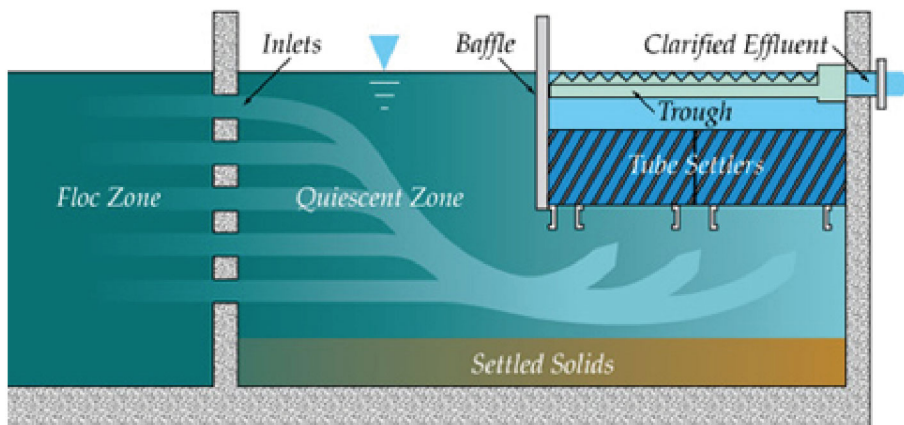


Lamella plate pack frame in AISI-316L during assembly outside clarifier tank



AISI-316L plate-type lamellae being assembled in module pack for placing in clarifier tank

INCLINED TUBE SEPARATOR- SETTLER



Tube settlers and parallel plates increase the settling capacity of circular clarifiers and/or rectangular sedimentation basins by reducing the vertical distance a floc particle must settle before agglomerating to form larger particles.

SETTLER PACK CHARACTERISTICS

- Inclined tube settlers offer an inexpensive method of upgrading existing water treatment plant clarifiers and sedimentation basins when compared with plate settlers and likewise improve performance and treatment efficiency of municipal / potable and industrial water treatment processes.
- Like the lamellar plate settler packs, tube settlers also reduce the tank foot-print required in new installations, and improve the performance of existing settling basins, by reducing the solids loading on downstream filters.
- Inclined settler packs in general (both plate and tube) will capture the suspended fine flocculated matter that escape the normal clarification zone and allow the larger flocculated solids formed to travel to the tank bottom in a more stable and efficient form.
- Settler packs are normally manufactured of lightweight, potable-grade PVC, PE, or in very thin stainless steel profiles, and thus can be easily located with minimal structural supports.
- The settlers are available in a variety of module sizes and tube lengths to fit any tank geometry, with custom design and engineering. But, generally, tube settlers have a shorter length than the plate packs and are ideal for shallower basins, or for existing clarifiers that are limited in depth.



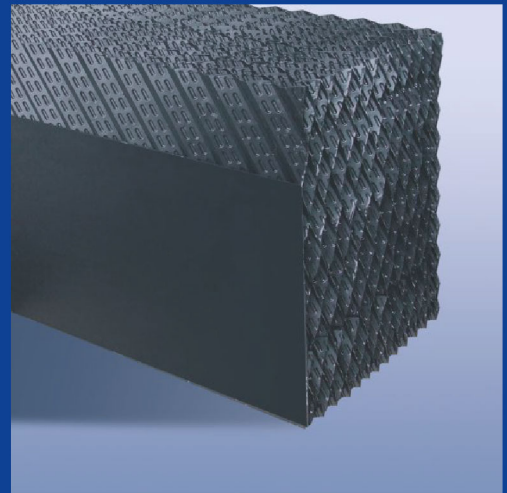
Purewater-EcoM compact Stainless-Steel Tube Settler Packs for industrial process application, such as API oil-water separator

WHY USE SETTLER PACKS ?

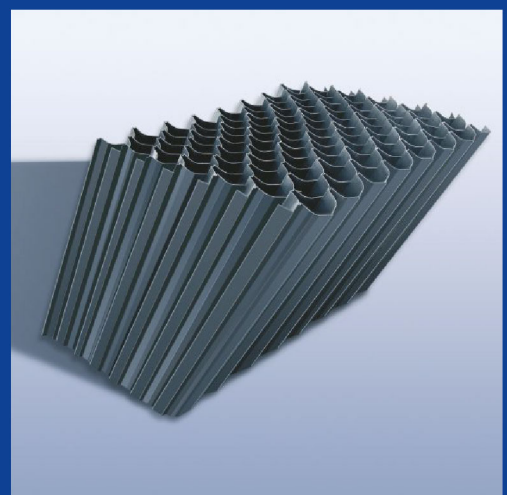
- The advantages of tube or plate settlers, or separators, can be applied to new or existing clarifiers/basins of any size, shape and configuration.
 - Clarifiers/basins equipped with tube /plate settlers can operate several times the normal rate of standard clarifiers/basins, with loading rates generally less than for inclined plates.
 - It is possible to cut coagulant dosage by as much as 50 % while maintaining a lower influent turbidity to treatment plant filters downstream.
 - New installations using tube or plate settlers can be designed with smaller footprint because of increased flow capability.
- Flow of existing water treatment plants can be increased through the addition of tube or plate separators pack, and increase allowable flow capacity by expanding settling capacity and increasing the solids removal rate in settling tanks.
-

The inclined MODULAR LAMELLA TUBE PACKS are designed to substantially increase the surface area of clarifier basins while decreasing their overall footprint.

The tube shape facilitates the flow of liquids and thus increases system performance, while the thermoplastic materials used prevent formation of sediments and clogging and are corrosion resistant at the same time for certain liquid applications. Process separation and sedimentation of suspended solid particles is accelerated by increase in the available area in comparison to non-lamellar clarifiers.

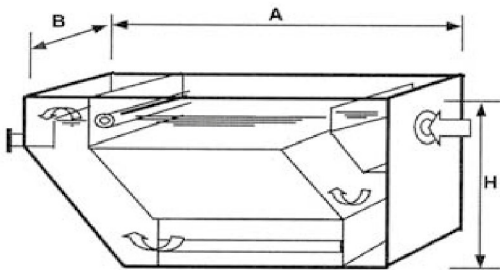
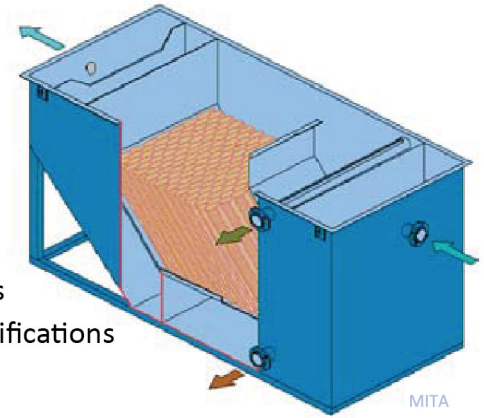


PVC or PE Tube Settler Packs



PACKAGED LAMELLA CLARIFIERS FOR OIL AND SLUDGE SEPARATION

Oil interceptors & separators employing tubular or plate lamella packs are extensively used in the petrochemical industries where large amounts of heavy and light oils have to be separated and extracted from raw or effluent streams, before finer downstream separation by DAF (dissolved air flotation) or similar processes. These compact packages within prefabricated steel tanks or purpose built basins are also known as API Separators which comply with the American Petroleum Industry specifications and codes.



Packaged OIL SEPARATOR [p-OSU]
employing Lamella Tube or Plate packs

Pre-Packaged OIL SEPARATOR Units [p-OSU]					
Model	Incline (°)	Flow rate (m ³ /h)	A	B	H
			(mm)	(mm)	(mm)
OM 85-2-60	45	5	2.500	1.350	2.000
OM 85-2-110	45	10	3.000	1.350	2.000
OM 85-3-140	45	20	3.300	2.000	2.000
OM 85-3-200	45	30	4.000	2.000	2.000
OM 85-3-260	45	40	4.600	2.000	2.000
OM 85-3-320	45	50	5.300	2.000	2.000

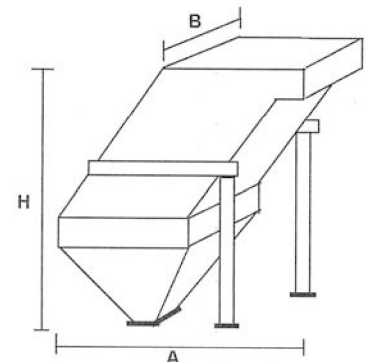
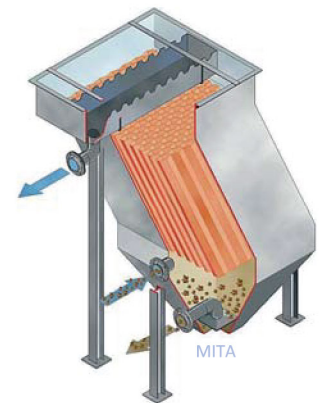
[courtesy MITA - Changes may be made without notice]

Oil interceptors are also employed in many other industries, such as food, where effluent contains natural or oil constituents, while wastewaters from numerous human industries require oil extraction from effluent streams prior to final disposal.

LAMELLA TUBE & PLATE PACKS FOR EFFLUENT SOLIDS SEDIMENTATION

Our prefabricated compact lamella packs of different dimensions and flow capacities are employed for sedimentation of solids in numerous industries, as well as in potable water and wastewater streams.

The advantage of such packs is its compactness and suitability for placement in differing basins or tanks with small footprint and greatly increased surface area for effective sedimentation and clarification of liquids.



Packaged LAMELLA SEDIMENTATION [p-LSU]
employing Tube or Plate packs

Pre-packaged Lamella Sedimentation Units [p-LSU]					
Model	Incline (°)	Flow rate (m ³ /h)	A	B	H
			(mm)	(mm)	(mm)
FM 100-2-100	60	5	2.000	1.500	2.800
FM 100-3-125	60	10	2.500	2.100	3.000
FM 100-3-240	60	20	3.400	2.100	3.200
FM 100-3-350	60	30	4.500	2.100	3.200
FM 100-3-470	60	40	5.700	2.100	3.200

[courtesy MITA - Changes may be made without notice]



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