



## General Inclined Plate Clarifier Overview

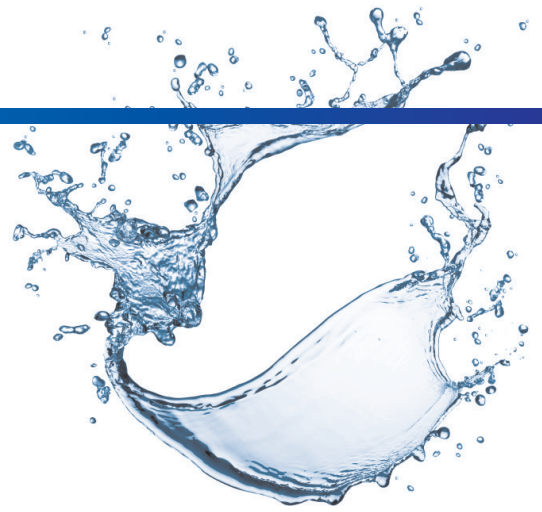
The Water & Wastewater Equipment Company Inclined Plate Clarifier is designed to remove and thicken suspended and flocculated solids from industrial waters and wastewaters in one step. The basic inclined plate clarifier consists of a separator with a sludge collection cone underneath. A flash mix/flocculation tank usually precedes the inclined plate clarifier. The primary use of the inclined plate clarifier is to increase a highly dense underflow of high concentration, which leads to an appreciable reduction in dewatering costs.

Before we go into a discussion of the unit, it would be beneficial to cover the principle of the inclined plate clarifier plate separator. This device is designed to increase the settling capability of a basin. The design principle utilizes the fact that the depth of a gravity settler has very little bearing on its' settling capacity. Of much more importance are the available settling areas of 140 square feet in each inclined plate clarifier plate pack.

In a conventional clarifier or sedimentation basin, the available settling area is limited to the area of the bottom. The inclined plate clarifier principle utilizes a series of inclined plates mounted together in a pack. There is only a short distance in the plate openings of 1 ¼" in the inclined plate clarifier design. With this principle, the available settling area becomes the total area of the plates projected on a horizontal surface.

It should be remembered that in a conventional settling basin, the sludge particle often has a considerable distance to traverse before reaching the bottom. In an inclined plate clarifier this settling distance is something less than 1 ¼".

Since the inclined plate clarifier plates are mounted at a 60-degree angle to the horizontal, the settling sludge can easily slide down the plates for collection.



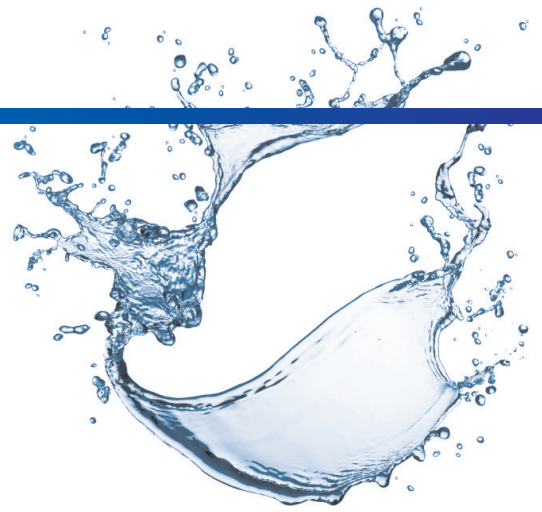
With the inclined plate clarifier the wastewater entering the unit is introduced slightly below the clarifier separator, allowing the majority of the solids to be discharged over, and settle out over essentially the entire surface of the sludge collection basin, the lower part of which is designed as a hydraulically static thickener. This design allows for 100% use of the 140 square feet of the settling area in the pack to be utilized for separation of a reduced solids concentration up-flow. With the efficiency of horizontal plate separators being fixed for each type of wastewaters and solids particles, the net effect of the design is lower supernatant suspended solids concentrations.

Contrary to conventional inclined plate clarifiers, where a continuous flow of sludge of up to 10% of rated capacity of the unit is rejected from the cones; the Water and Wastewater Equipment Company inclined plate clarifier produces an underflow 4 to 6 times denser in most applications.

This is due to the conservative cone volume designed into the inclined plate clarifier and the timed rejection of sludges. In standard applications, dense sludge is hydrostatically pumped during an 8 to 12 second period every 30 to 60 minutes. This allows for removal of only the highly dense sludge at the cone's bottom.

During the timer's off period, the solids collecting in the cone are subjected to the extended period of static thickening.

The inclined plate clarifier method of removing only the densest sludge through the full three-inch pipe eliminates the requirement for supplemental expensive thickening equipment, and prevents "rat-holing" in the sludge bed.



For each application, the timed sludge withdrawal is field set. Sampling ports provided on the inclined plate clarifier's cones allows for a convenient method for determining proper settling.

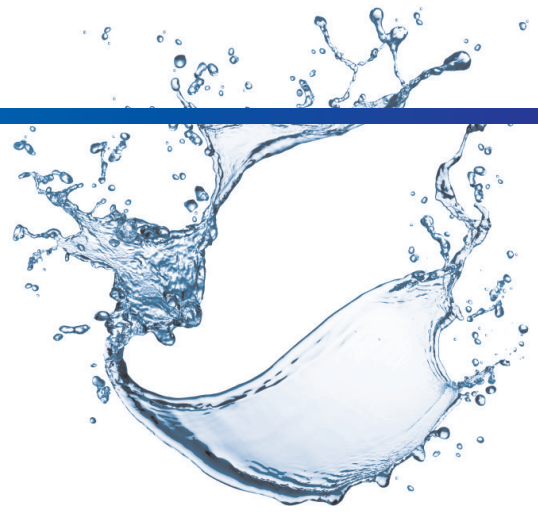
The standard inclined plate clarifier consists of a flash mix/flocculation chamber, the specially designed plate pack and the coned thickener underneath. For many applications, polymer addition is necessary to increase particle size. Where required, polymer is applied into the first chamber. An air mixer provides the rapid mixing necessary for uniform application and dispersion. The waters then are transferred through a series of overflow/underflow baffles, where a gentle mixing accomplishes floc growth. Retention time required with this inclined plate clarifier design is 1 to 2 minutes. In contrast, competitive units require 10 to 20 minutes of flocculation time in significantly larger and more costly tanks.

The flocculated wastes enter the inclined plate clarifier in an influent launderer and flow distributor. Uniform distribution of flow accomplished by the launderers allows for even distribution of solids onto the sludge bed and hydraulic loadings upward through the plate pack.

The inclined plate clarifier water rises up the plates and is discharged near the top over weirs into effluent troughs mounted above the plate packs.

The settling sludge slides down the plate into the thickening compartment below the plate pack and is applied to the surface of the sludge bed.

The dense sludge collected in the cones is removed on a timed basis for additional dewatering. Sludge removal is made by a timer actuated solenoid valve controlling an automated butterfly valve on the cone. As air pressure is applied to the valve, the valve opens allowing the dense sludge to be driven by the hydrostatic head pressure of the unit, through a three-inch sludge-piping network into a storage tank. A two-foot differential head pressure between the incline plate clarifier surface and the sludge storage tank is recommended.



Applications requiring a taller sludge storage tank in excess of the two-foot differential will require a lift station and a suitable diaphragm pump. Pumping of sludge directly from the inclined plate clarifier cone is not recommended as “rat-holing” can occur.

The main advantages of the Water and Wastewater Equipment Company inclined plate clarifier over competitive inclined plate clarifier's are:

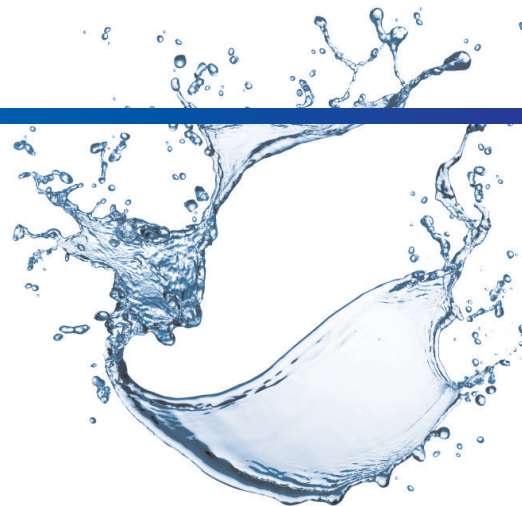
1. Conservative sizing provides for plate pack hydraulic loading rates of 0.2 GPM per square foot.
2. Standard equipment includes flash mix/flocculation, flash mixer, coal tar epoxy lining.
3. Cone volume and static thickening, coupled with timed sludge blow down, eliminates the need for further thickening.
4. Maximum unit height of 12 feet allows for installation in most any plant without building modifications.
5. Use of a launderer system for flow distribution rather than submerged orifices insures uniform flow because of possible plugging of orifices.
6. Our design allows for cleaning of plates without removing effluent troughs by use of the pack-cleaning valve.
7. The Water and Wastewater Equipment Company inclined plate clarifier design allows for visual assurance of uniform flow at the effluent launderer and adjustable troughs.
8. Optional sludge blow down package (frequency/duration timer, air actuated valve, air solenoid, pilot valve, and butterfly valve).

Other features of the Water and Wastewater Equipment Company inclined plate clarifier over conventional clarifier systems are:

1. Surface area of sedimentation basis reduced up to 80% against conventional and up to 50% versus tube settler systems.
2. Ability to produce easily dewatered sludge underflows, typically four to six times conventional sedimentation or tube settle systems.
3. Elimination of need for second stage thickening.
4. Up to 50% reduction in cost of sedimentation basins.
5. Performance relatively unaffected by changes in the solids loading.
6. Immediate start-up of system under full load.
7. Effluent quality unaffected by hydraulic shock loads.

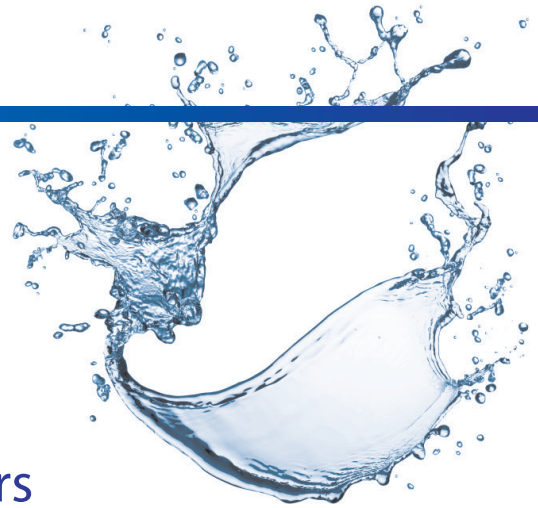
Avoid costly repairs, decrease your power usage and meet environmental compliance requirements more easily. Call us to learn more about replacing your aging conventional clarifier with one of our carbon or stainless steel inclined plate clarifiers. Click here to see our selection of inclined plate clarifiers in six standard sizes with flow rates from 30 to 360 gpm.





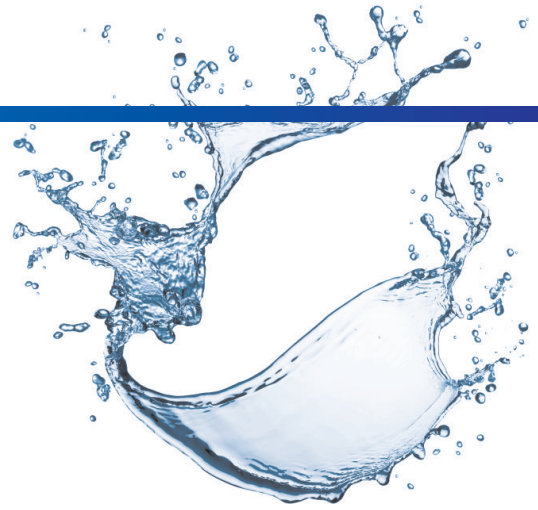
## Compare Conventional and Inclined Plate Clarifiers

Inclined Plate Clarifier	Conventional Clarifier
Installs easier and faster – up to 50% in cost savings	Requires system reconfiguration for installation
Up to 90% less floor space	Large footprint
Increased settling capacity	Limited settling capacity
Completely automatic operation	Less efficient manual operation, uses more electricity
No moving parts	Requires downtime for repair
Pack-cleaning valve for easier cleaning	Requires downtime for maintenance
Built-in sludge thickening	Less efficient design
Reduced dewatering	Longer processing time



## What makes our inclined plate clarifiers stand out over the competition!

Ours	Theirs
Conservative sizing – plate pack hydraulic loading rates of 0.2 gpm per square foot	?
Standard equipment includes flash mix/flocculation, flash mixer, coal tar epoxy lining	Upgrades mean added expense
Cone volume and static thickening, coupled with timed sludge blow down means shorter treatment cycles	Need for further thickening means longer treatment cycles
Maximum unit height of 12 feet allows for installation in most any plant	Larger footprints and unit heights require building modifications
Use of a launderer system for flow distribution rather than submerged orifices insures uniform flow	Submerged orifices become plugged, requiring maintenance downtime
Pack-cleaning valve makes plate cleaning faster and easier than conventional designs	Plate cleaning process requires removal of effluent troughs
Flow at the effluent launderer and adjustable troughs can be checked visually	No way to visually inspect flow uniformity
Optional sludge blow down package (frequency/duration timer, air actuated valve, air solenoid, pilot valve, and butterfly valve)	Not available or more expensive

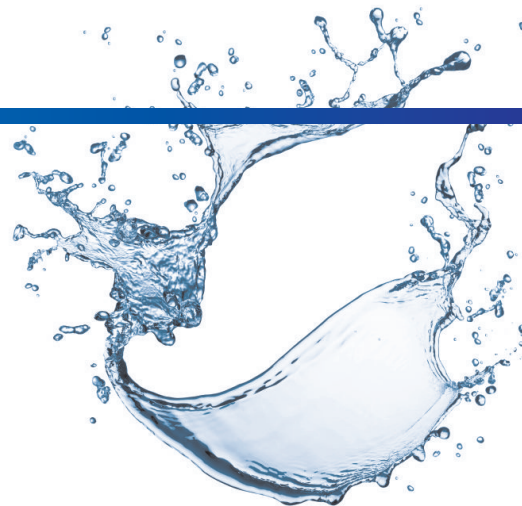


## Why consider an inclined plate clarifier instead of a conventional clarifier?

Avoid costly repairs, decrease your power usage and meet environmental compliance requirements more easily. Call us to learn more about replacing your aging conventional clarifier with one of our carbon or stainless steel inclined plate clarifiers. [Click here](#) to see our selection of inclined plate clarifiers in six standard sizes with flow rates from 30 to 360 gpm.

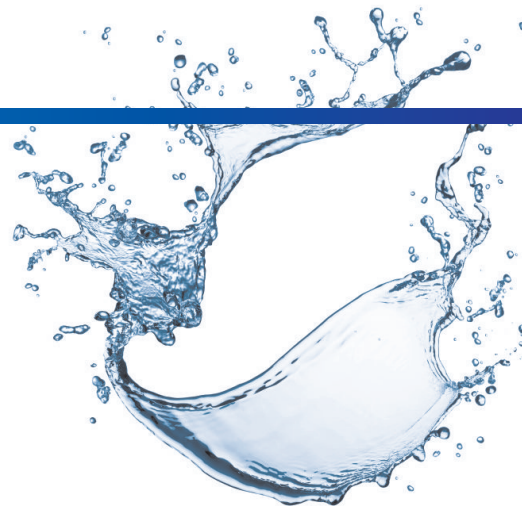
### Compare Inclined Plate and Conventional Clarifiers

Inclined Plate Clarifier	Conventional and Tube Settle Clarifiers
Surface area of sedimentation basis is significantly reduced compared to conventional and tube settler systems	50% to 80% more surface area of sedimentation basis
Ability to produce easily dewatered sludge underflows, typically four to six times conventional sedimentation or tube settle systems	Dewatered sludge underflow rates mean slower treatment cycles
Elimination of need for second stage thickening	Additional treatment is required
Up to 50% reduction in cost of sedimentation basins	Higher sedimentation basin costs



Up to 90% less floor space	Large footprint
Increased settling capacity	Limited settling capacity
Completely automatic operation	Less efficient manual operation, uses more electricity
No moving parts	Requires downtime for repair
Pack-cleaning valve for easier cleaning	Requires downtime for maintenance
Built-in sludge thickening	Less efficient design
Reduced dewatering	Longer processing time





Performance relatively unaffected by changes in the solids loading	Performance may be inconsistent when increases or decreases in operations change solids loading
Immediate start-up of system under full load	Usually require time-consuming warm ups
Effluent quality unaffected by hydraulic shock loads	
Installs easier and faster – up to 50% in cost savings	Requires system reconfiguration for installation