

TotalTreat[®] Continuous Precipitation System (CPS)

Water Technologies

SIEMENS

TotalTreat® Continuous Precipitation System (CPS)

Introduction

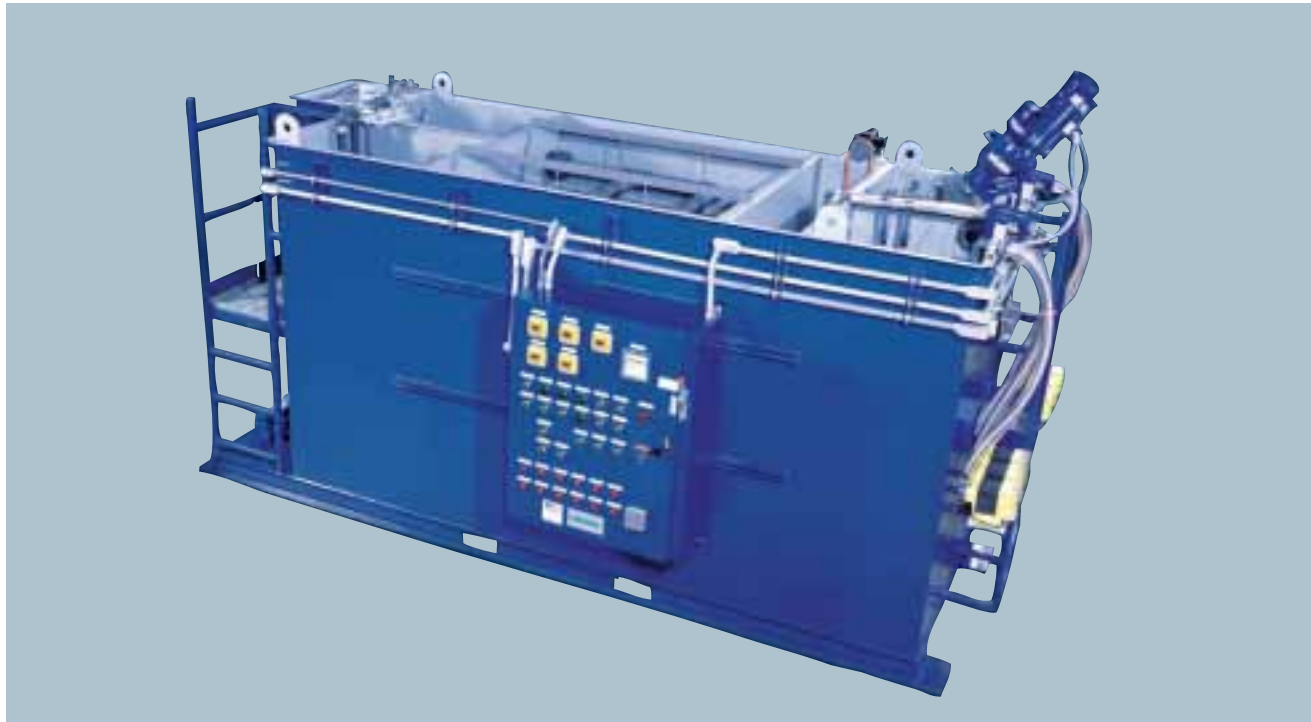
The TotalTreat® Continuous Precipitation System (CPS) has a compact, skid-mounted design that performs a continuous flow chemical precipitation process. The CPS incorporates two chemical process reaction chambers, a flocculation chamber, an inclined tube separator for solids separation, two sludge thickening chambers, and an effluent sampling/pumping chamber, all on one skid. The CPS has been used in a wide range of applications for wastewater treatment. Some markets/industries where the CPS is commonly used are: microelectronics, petrochemical, printed circuit board manufacturing, metal finishing/plating, industrial laundries, and landfill leachate/ground water remediation.

Features/Benefits

- Process guarantee ensures specified effluent pH/contaminant levels
- Compact design for small footprint requirement
- Skid-mounted, factory assembled and tested to ensure trouble-free installation
- PLC controls for low operating costs and safety interlocks
- Dual sludge thickening chambers for improved filter press operation
- 60° inclined tube settling modules for clarification
- Integral platforms for operator access
- Epoxy coated carbon steel materials of construction for superior corrosion resistance

Typical CPS Applications

- Hydrofluoric (HF) Acid Wastewater Treatment
- Grinding Slurry
- Chemical Mechanical Polishing (CMP) Slurry
- Arsenic Wastewater
- Heavy Metals (Cu, Ni, Pb, etc.)
- Hexavalent Chrome Wastewater
- Suspended Solids



Process Description

Waste flow from the facility is captured in an influent collection tank (separate equipment). During times of high flow or equipment maintenance, this tank provides flow equalization and normalization. The collected waste is transferred to the first reaction chamber of the CPS via a transfer pump.

The first stage reaction chamber is designed as a stirred tank reactor utilized for the neutralization and precipitation of the influent waste. Reagents, based on the specific waste water being treated, are added to the reaction chamber via metering pumps. The reagent addition is proportionally controlled by the system controller. The effluent flows by gravity from the first stage reaction chamber into the second stage reaction chamber of the CPS.

The second stage reaction chamber is also designed as a stirred tank reactor and is utilized for pre-clarification pH adjustment using chemical reagents. Reagents are added to the reaction chamber, via metering pumps, to complete the required process chemistry. The contents of chamber two gravity overflow into the flocculation chamber.

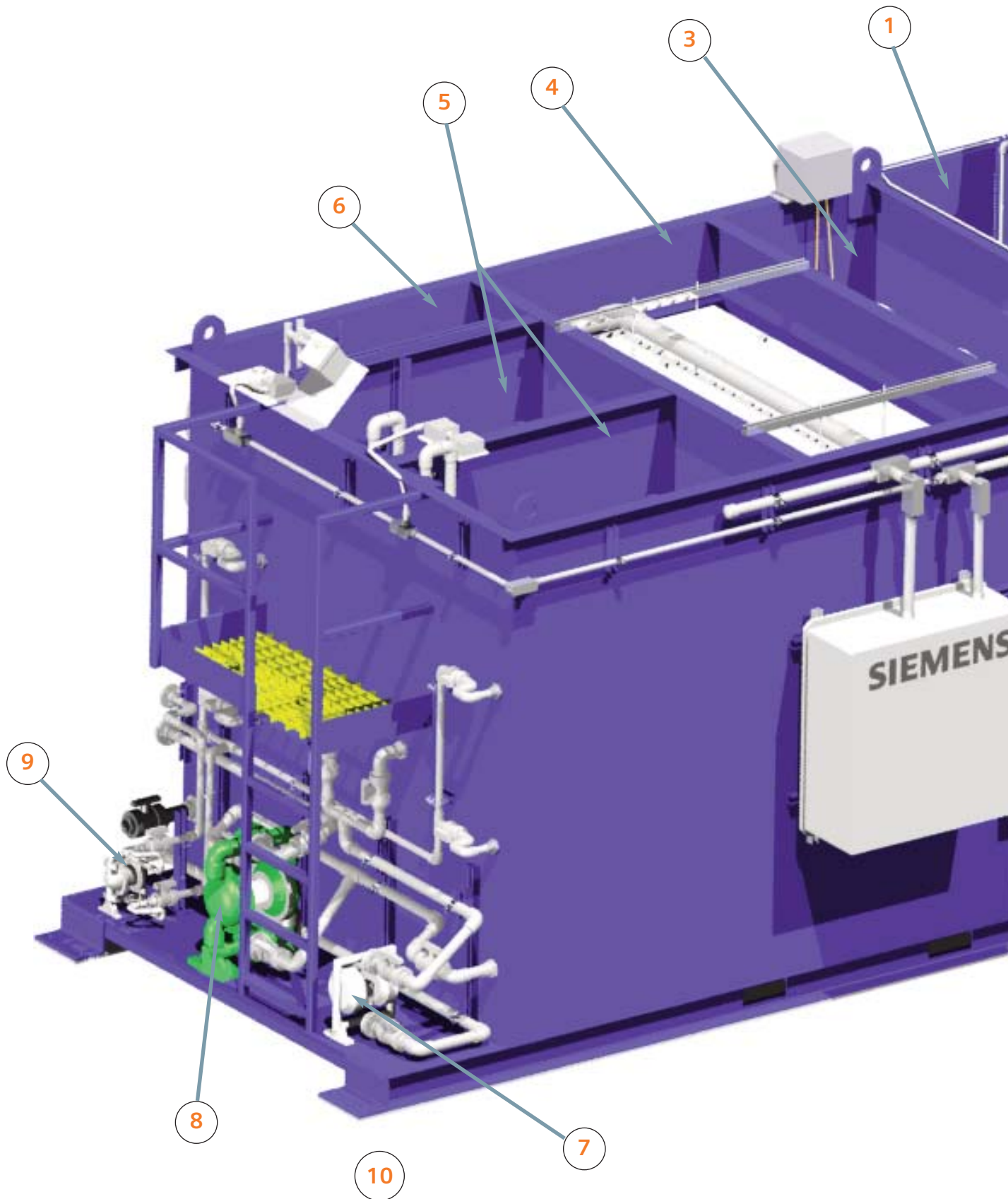
The flocculation chamber, also designed as a stirred tank reactor, is utilized for flocculation of the solid precipitates, using a low-shear paddle wheel mixer. To encourage the coagulation of the particles formed in chambers one and two into larger and faster settling particles, anionic polymer is added via a metering pump. The precipitate from the flocculation chamber flows by gravity into the clarification chamber.

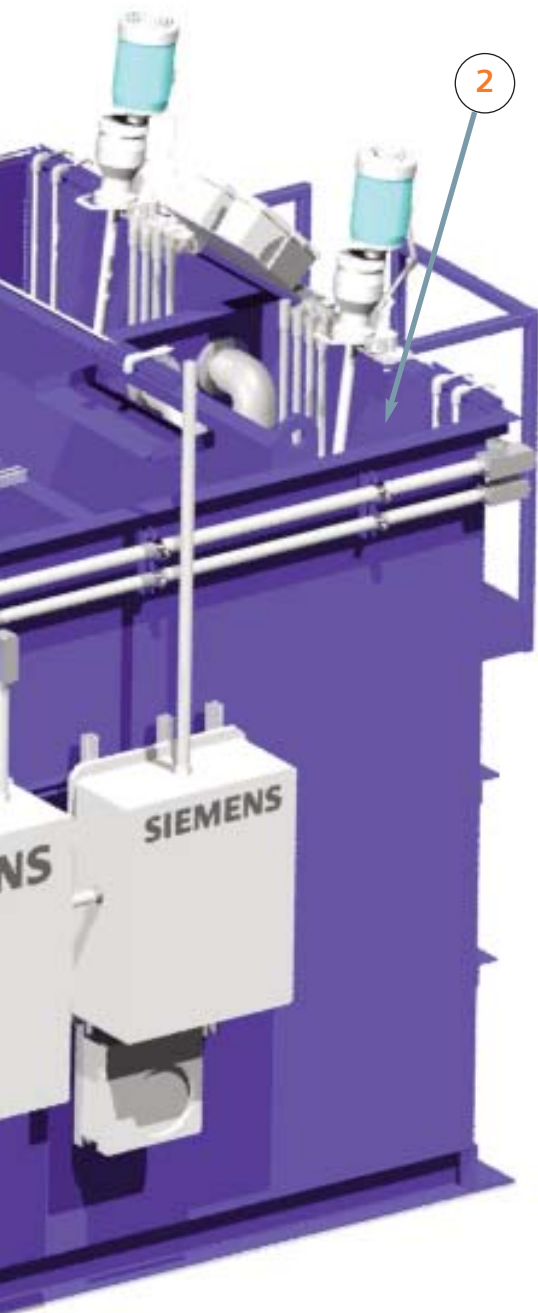
The clarification chamber is designed as an up-flow, inclined tube type clarifier, which allows gravity settling of the precipitate. This chamber is fitted with chevron style, inclined tube modules that provide the settling surface area required and create the laminar flow environment necessary for effective clarification. The precipitate enters the clarifier and settles to the chamber bottom where it is automatically pumped to the sludge thickening chambers. The precipitate-free effluent emerges from the top of the clarifier through a set of weirs and flows by gravity to the effluent clearwell chamber.

Two internal sludge thickening chambers are supplied with the CPS. These chambers are used to thicken the sludge to one to three percent solids prior to filter press dewatering. This thickening time improves the performance and reduces cycle time of the filter press. Two sludge thickening chambers are utilized to allow one to be filled while the other is thickening. Influent sludge valves direct the sludge from the clarifier to the desired thickening chamber. Clear decant from the sludge thickening chambers is transferred back to the influent collection tank via a decant valving manifold for reprocessing.

Prior to being sent to drain, the clarified water gravity flows to the effluent clearwell. An optional final pH transmitter and recorder is used to measure and record the effluent water quality. Effluent from the clearwell is either pumped, via an optional centrifugal transfer pump, or gravity overflows to the drain connection point.

TotalTreat® CPS Equipment Description





1. First Stage Reaction Chamber

Equipped with a mixer, two chemical metering pumps and a pH (optional ORP) probe, this chamber is used to pre-treat incoming wastewaters. Typically, lowering the pH and adding a coagulant in this step, helps treat metals that are tied up with chelating (complexing) agents.

2. Second Stage Reaction Chamber

As in the previous chamber, this chamber is equipped with a mixer, pH probe and two chemical metering pumps. The pH is evaluated in this chamber to induce the precipitation of insoluble metal hydroxides.

3. Flocculation Chamber

Once the metal hydroxides are precipitated, a polymer is added in this chamber, which allows the small precipitated hydroxides to slowly mix with the polymer. The small particles grow into larger solids which can be easily removed in the clarifier.

4. Clarifier Chamber

Solids that are formed in the flocculation chamber are removed in the clarifier chamber. Inclined tube modules are placed in the clarifier to provide the necessary surface area and laminar flow for effective solids removal.

5. Sludge Thickening Chambers

The underflow or dilute sludge from the clarifier is pumped to one of the two sludge thickening chambers. The sludge is allowed to gravity settle which increases the solids concentration to 1 to 3% prior to being dewatered. High level alarms and manual decant valves are provided.

6. Effluent Clearwell Chamber

The clarified effluent is collected in the effluent clearwell chamber. With optional equipment, the pH can be monitored and the waste can be pumped to its final destination. Gravity flow is the standard means of effluent discharge from this chamber.

7. Sludge Transfer Pump

This pump is used to transfer the dilute sludge from the bottom of the clarifier chamber to one of the two sludge thickening chambers.

8. Optional Filter Press Feed Pump

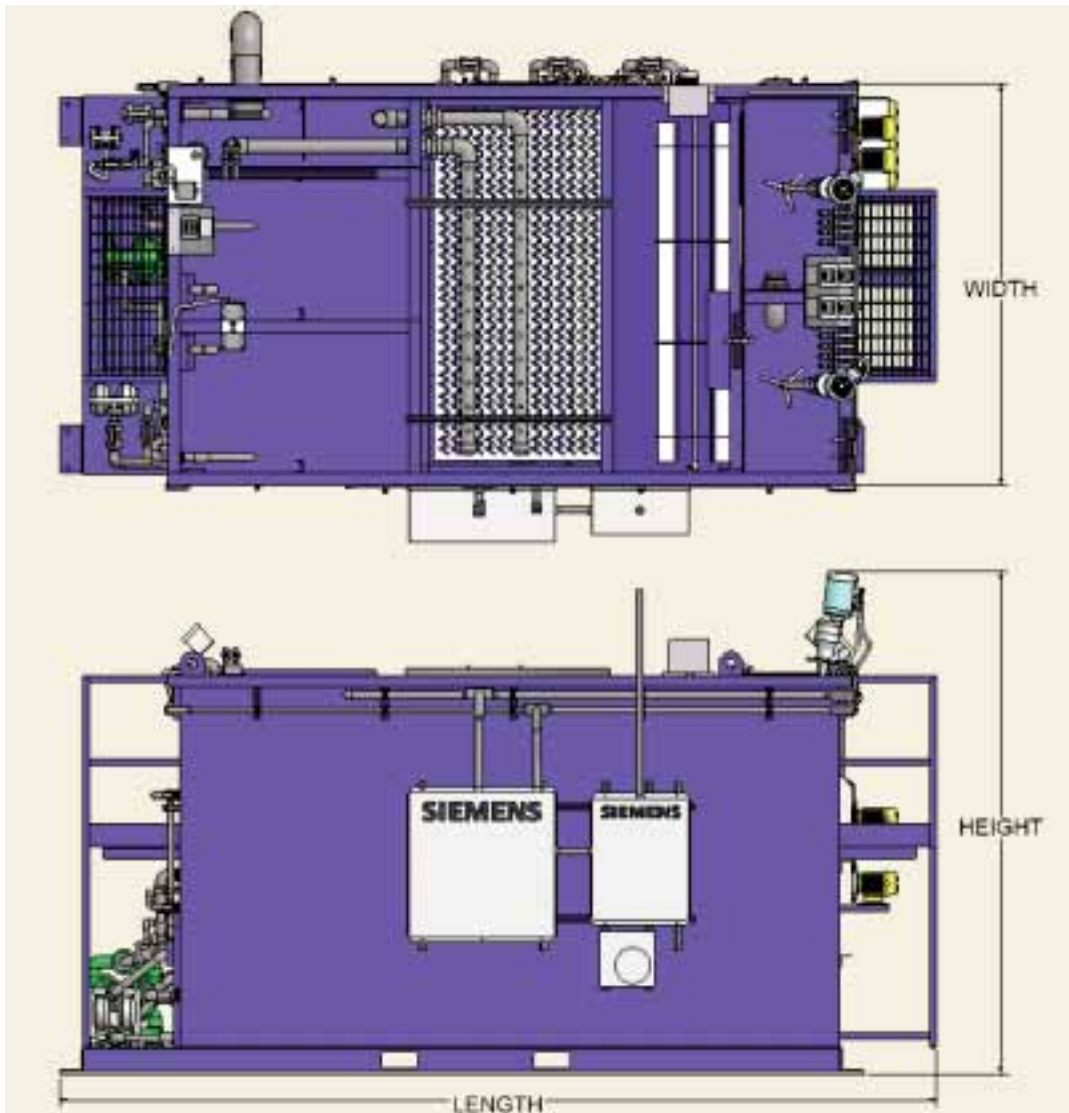
Thickened sludge from the sludge thickening chambers is transferred via this pump to an optional dewatering device, such as a filter press.

9. Optional Decant Pump

An optional small air-operated diaphragm pump can be provided to transfer the decant from the sludge thickening chambers back to the influent collection tank.

10. Modular Design

The system is fully skid-mounted and includes mixers, pH probes, polymer mixing paddlewheel, inclined tube modules, sludge transfer pumps, instrumentation and PLC controller. The system is fully piped, wired and equipped for operation.



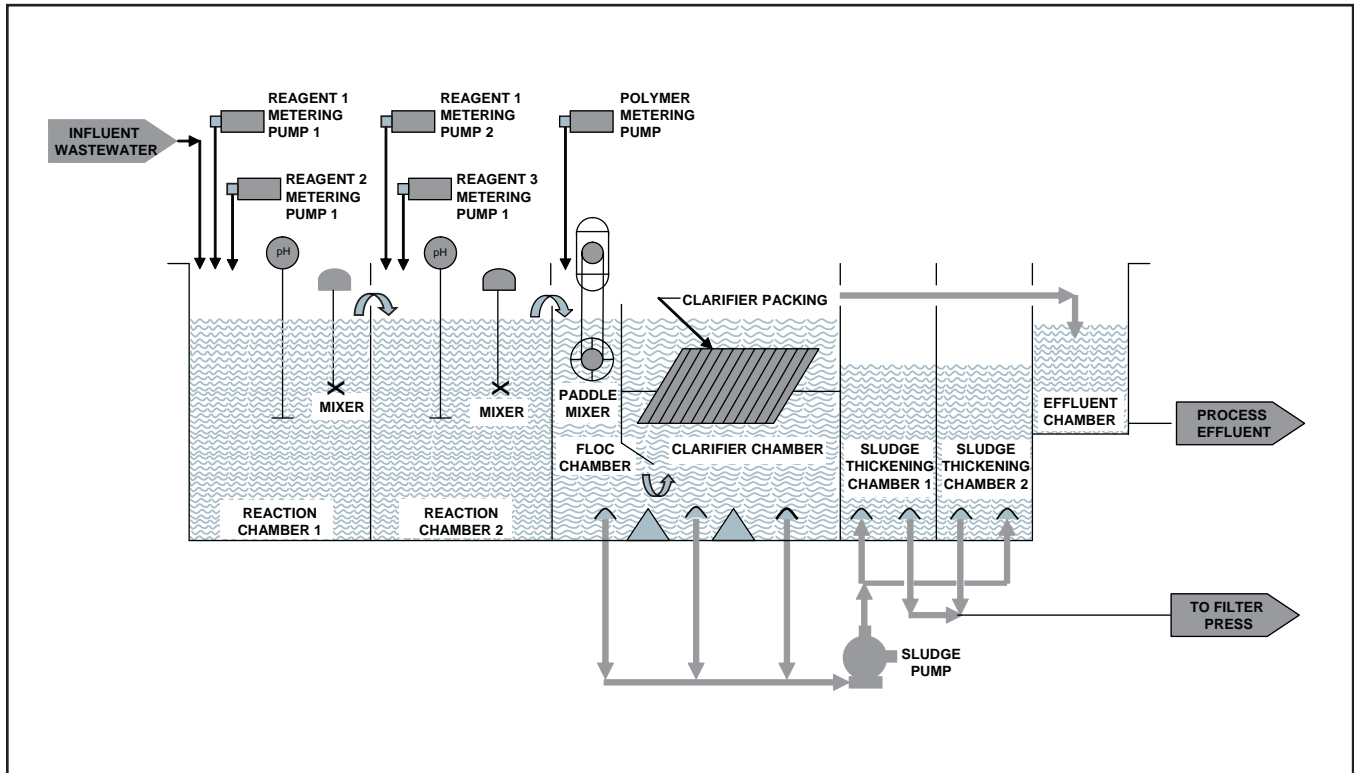
Technical Information

CONTINUOUS PRECIPITATION SYSTEMS		
MODEL*	FLOW RATE**	OVERALL DIMENSIONS (L x W x H)
CPS-10-2-SA	10 gpm (2.3 m ³ /h)	11'-6" x 7'-2" x 8'-5" (3.5 m x 2.2 m x 2.0 m)
CPS-30-2-SA	30 gpm (6.8 m ³ /h)	16'-1" x 7'-2" x 9'-0" (5.0 m x 2.2 m x 2.7 m)
CPS-50-2-SA	50 gpm (11.4 m ³ /h)	18'-5" x 11'-1" x 10'-7" (5.6 m x 3.3 m x 3.2 m)
CPS-100-2-SA	100 gpm (22.7 m ³ /h)	25'-10" x 10'-10" x 11'-7" (7.9 m x 3.3 m x 3.5 m)

* Epoxy Coated Carbon Steel is the standard material of construction.

** Assumes <500 ppm influent suspended solids and temperature of 40°F<T<120°F (4°C<T<50°C).

Process Flow Diagram



OPTIONAL EQUIPMENT	
Item	Description
Influent Flow Equalization Tank & Transfer Pump	Tank sized for 60 minutes retention at the rated flow
Solids Dewatering Filter Press	Recessed chamber filter press used to dewater the process sludge generated by the CPS unit
Reagent Mix Tanks	Used for preparation and storage of the chemical reagents
Effluent Flow Meter and Recorder	Paddle wheel type flow meter used to measure and record the treated wastewater flow to the drain connection
Instruments	Reaction chamber ORP transmitters/probes, effluent pH transmitter/probe with recorder, and dual pH/ORP transmitters/probes
Inclined Plate Separator	Packing of FRP construction
Effluent Media Filter	Sand or multi-media filter used to ensure effluent suspended solids limits (<20 ppm) are met
Influent Collection Liftstations	Used to collect individual waste streams that are not able to gravity flow, and transfer the wastewater to the influent collection tank

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