



# API

API Design  
Oil Water Separators

**The API Series oil water separators are designed per the American Petroleum Institute (API) separator design guidelines.**

Pan America Environmental API Series, steel oil/water separators are gravity differential separation devices for removal of free and dispersed oil droplets from oily wastestreams. The design follows the American Petroleum Institute's (API) #421 Design & Operation of Oil/Water Separators Manual, February 1990.

API performance: 100mg/L, 150-micron free, dispersed and non-emulsified oil droplets.

The typical use of the API separator is to reduce inlet loads of oil and suspended solids in refinery wastewater. Following the API further treatment may be required, i.e. coalescing oil water separator as a polishing step and treatment of dissolved organic materials with biological treatment, and/or other treatment technologies (DAF, chemical treatment etc.).

The API steel design is just one of 8 different oil/water separator designs from Pan America Environmental that can be used singularly or in combination with other treatment processes such as emulsion cracking, DAF & clarifier pretreatment.

The API can be installed above, flush with or below grade. Conversion to a DAF can also be accomplished for flotation where needed. The API can also be provided in a concrete construction design.

### **Features:**

- ◆ A-36 carbon steel
- ◆ Adjustable water weir
- ◆ Integral oil reservoir
- ◆ Influent diffuser
- ◆ Expandable effluent chamber
- ◆ Sealed/gasketed covers
- ◆ Internal/external epoxy coatings
- ◆ Lifting lugs
- ◆ Flat Bottom
- ◆ Skid mounted
- ◆ Multi-section cover

### **Typical applications:**

- ◆ Refinery process water treatment
- ◆ Produced/frac water treatment
- ◆ DAF/Clarifier pretreatment
- ◆ Power plant water treatment
- ◆ Petrochemical plant water
- ◆ Aircraft wash racks
- ◆ Machining coolant oil removal
- ◆ Tank farm tank bottoms
- ◆ Vehicle washwater treatment
- ◆ R.O. Filter pre-treatment
- ◆ Oil spill recovery
- ◆ Trench water treatment
- ◆ Bilge water treatment
- ◆ Hydraulic fluid tank de-watering





## Gravity Separation

The API separator separates via gravity and the density differential of liquids per Stokes Law, which defines the rise rate of an oil droplet based on its density and size. Typically, the difference between the specific gravity of the oil and water is much closer than the specific gravity of the suspended solids and water. Therefore the design of the API separator is based on the difference in the specific gravity of the oil to be separated and the wastewater. Using this criteria results in most readily settleable solids settling in the API. API effluent is then treated further in most refinery wastewater treatment plants to increase contaminant removal.

### Per API guidelines design criteria are:

**Oil droplet size:** Oil droplets in refinery wastewaters are about 150 micron and larger. The API design standards are based on this droplet. Droplets smaller than 150-micron may pass through the separator.

**Depth to width ratio:** A minimum depth to width ratio of 0.3 to 0.5 is specified so that separator does not increase droplet rise time to reach the water surface.

**Length to width ratio:** A minimum length to width ratio of 5:1 is specified for API separators to keep flow characteristics homogeneous, reducing short circuiting effects.

**Maximum channel width and depth:** The maximum API separator channel width is 20 ft; maximum depth is 8 ft.

**Influent distributor:** Minimization of high influent velocity into the API separator, and possible short circuiting associated with these high velocities, a diffuser directs flow across the width and depth of the inlet chamber.

**Horizontal velocity:** Maintaining a horizontal velocity of no more than 3.0 ft/min to minimize turbulence and its interference with the separation process. The cross sectional velocity is calculated and imposed on the design to assure this velocity or less.

## Solids Removal

Solids are typically present in most applications and exist in a variety of types, characteristics and concentration. The API design is ideal for settling these solids and can be provided with sludge handling features to simplify removal of large sludge volumes.

## Designs

API tank design is highly configurable around your application needs. The standard design is a flat bottom with fixed oil skimmer and integral reservoir.

From this basic design we add other features to offer many configurations to custom tailor the tank to the application.

### Available Optional Features

- Oil removal:**
- Adjustable, rotary pipe skimmer
  - Motorized drum skimmer
  - Surface drag skimmer
  - Adjustable weir skimmer

### Sludge collection/removal:

- V-hopper
- Sludge auger
- Inverted pyramid hoppers
- End hoppers
- Sludge scraper

## Elevation

The API design can be elevated to match facility requirements. Pan America can customize the legs or elevation structure to fit the installation needs for gravity flow.

## Options

Pan America offers a wide variety of options to allow you to tailor the API system to fit your needs. See page 6 of this brochure for an options list.

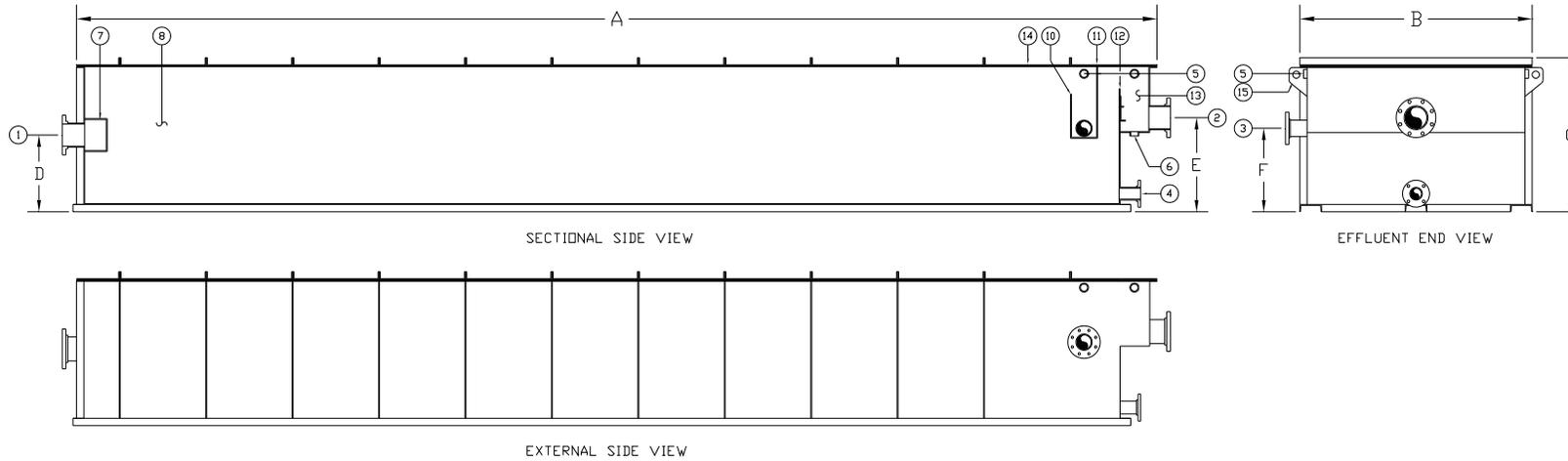


# Model API

## API Design Oil Water Separators



# API Reference Drawing & Tables



Model	Length A	Width B	Height C	Influent D	Effluent E	Oil Outlet F	Oil Chamber	Influent Size	Effluent Size	Drain Size	Oil Outlet Size	Empty Weight	Operating Weight	GPM		
							Gals.					LBS	LBS	.85 SG	.90 SG	.95 SG
API-15	13'-8"	3'-4"	2'-7"	1'-2"	1'-1"	1'-0"	15	3"	3"	2"	2"	2417	5912	50	25	15
API-25	17'-2"	3'-10"	2'-9"	1'-2"	1'-1"	1'-0"	15	4"	4"	2"	3"	3375	9423	75	50	25
API-50	26'-6"	4'-8"	3'	1'-2"	1'-3"	1'-7"	17	6"	6"	3"	3"	5775	18544	150	100	50
API-75	22'-9"	5'-8"	3'-7"	1'-5"	1'-8"	2'-1"	22	6"	6"	3"	3"	8400	32605	225	150	75
API-100	33'-6"	6'-8"	4'-1"	1'-10"	2'-2"	2'-7"	26	6"	6"	3"	3"	10,182	46,526	300	200	100
API-150	37'-1"	8'-9"	4'-3"	2'	2'-4"	2'-9"	25	6"	6"	4"	4"	14,615	68,200	450	300	150
API-200	47'-6"	8'-8"	4'-9"	2'-1"	2'-11"	3'-1"	35	8"	8"	4"	4"	18,913	100,663	600	400	200
API-250	55'-6"	9'-3"	5'-3"	2'-4"	2'-11"	3'-3"	40	8"	8"	4"	4"	24,000	145,000	750	500	250
API-300	56'	10'-8"	5'-3"	2'-4"	2'-11"	3'-1"	45	8"	8"	4"	4"	26,424	163,524	850	600	300
API-400	66'-9"	11'-8"	6'-3"	3'-4"	3'-11"	4'-1"	50	12"	12"	4"	4"	30,900	253,440	1100	800	400
API-500	70'-3"	12'-8"	6'-9"	3'-4"	3'-11"	4'-1"	65	12"	12"	4"	6"	35,000	342,000	1400	1000	500
API-600	77'-8"	14'-8"	7'-9"	4'-4"	4'-11"	5'-1"	75	12"	12"	4"	6"	41,000	476,861	1800	1100	600

SG = Oil Specific Gravity

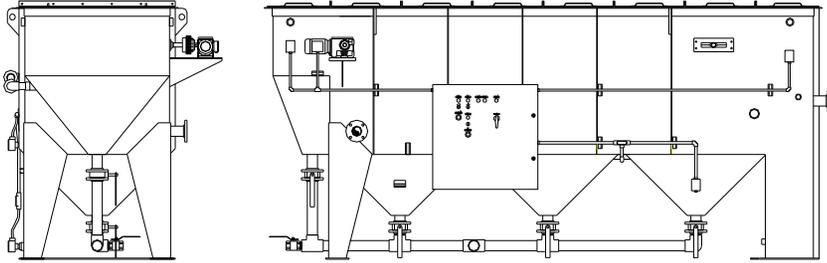
Flow rates are nominal and subject to change upon project review. Design subject to change without notice, drawing & dimensions not for construction

Item	Qty	Description	Item	Qty	Description	Item	Qty	Description	Item	Qty	Description	Item	Qty	Description
1	1	Inlet	4	1	Drain	7	1	Inlet Diffuser	10	1	Oil Skimmer/Reserv	13	1	Effluent Chamber
2	1	Outlet	5	4	Vent 1" NPT	8	1	Influent Chamber	11	1	Oil Baffle	14	1	Cover
3	1	Oil Outlet	6	1	Drain 2" NPT	9	-	Flopak Media (option)	12	1	Water Weir	15		Lift Lug

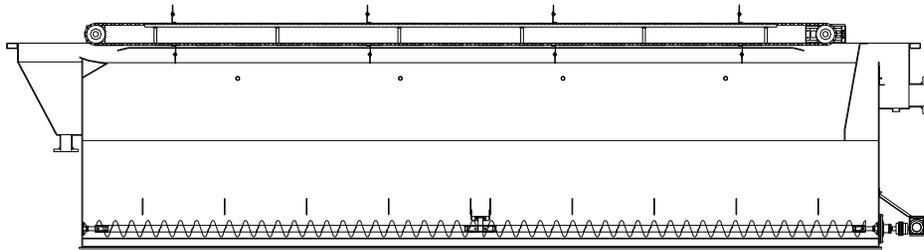


The API design can be custom configured in many ways to provide the features you want based on your project and budget needs. The basic API is the flat bottom design from there we add features to create the final configuration to fit your project.

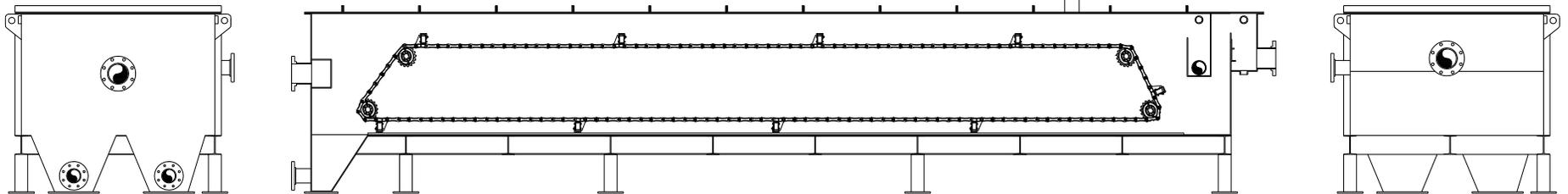
*Optional design features include:* surface drag skimmer, sludge scraper, sludge auger, sludge V-hopper (perpendicular), full length V-hopper, pyramid sludge hopper.



**Inverted pyramid hoppers**, surface drag skimmer, expanded effluent chamber, cover



**V-hopper**, sludge auger, drag skimmer, open or closed top



**Flat bottom with sludge hopper(s)** and sludge/oil scraper system, adjustable slotted pipe oil skimmer, drum skimmer, fixed or adjustable oil skimmer weir



# API Steel Oil Water Separators Engineering Specification

## Performance

The Pan America Environmental API Series Oil/Water Separators are designed to produce an effluent concentration of 100 mg/l or less of oil droplets 150 micron and larger of non-emulsified, free and dispersed oils. Readily settleable solids are also removed.

## Section 1.0 Separator Design

### 1.01 Design

The oil/water separator will be designed and fabricated per the following specifications. Rectangular tank with features as described designed per API #421 Design & Operation of Oil/Water Separators Manual and Stokes law. The design will incorporate flexible flow rating capability based on application parameters.

### 1.02 Influent Chamber

Influent flow enters the clog proof influent diffuser and is immediately spread out across the depth and width of the chamber. Any readily settleable solids drop to the bottom of the flat bottom or V-shaped solids accumulation chamber located directly under the separation chamber.

### 1.03 Oil/Water Separation Chamber

The separation chamber width, depth and length is to be sized per API 421 calculations.

### 1.04 Solids Accumulation Chamber (optional)

The separator shall have a V-shaped solids accumulation chamber located under the separation chamber. This chamber will provide temporary solids storage. The chamber walls are to be pitched at 45 degrees to assure simple and thorough solids removal. Outlet ports will be provided for sludge removal. Hopper design shall allow an optional sludge auger system to be accommodated at the factory.

### 1.05 Clean Water Effluent Chamber

The cleansed water will flow under the oil retention baffle, over the water weir and into the effluent chamber. This chamber is to have the capability to be expanded at the factory by modifying the standard integral chamber so a

greater volume of water is available for pump suction directly from the tank.

### 1.06 Oil Reservoir

A fixed weir oil skimmer with an integral oil reservoir is to be provided for the temporary storage of separated oils. This chamber is located at the effluent end of the separator. The reservoir will have fittings for pump suction, high/low level switch accommodation and vent. This chamber is to have the capability to be expanded at the factory by modifying the standard integral chamber so a greater volume of oil can be stored and pumped directly from the tank.

### 1.07 Separator Cover & Vents

The separator is to have a multi-section cover that provides complete closure of the tank. The separator cover will be mounted to the tank via zinc plate hardware and vapor sealed with an industrial grade closed cell, compressible polyethylene gasket. Multiple vent fittings are provided on tank walls.

### 1.08 Skid & Lifting Lugs

The tank shall be provided with an integral, skid base with anchor bolt holes (hardware by others). Lifting lugs shall be provided.

### 1.09 Fittings

All fittings are to be FNPT coupling up to 3". Fittings larger to be 150# FF ANSI B16.5 flange.

### 1.10 Sludge Auger System (optional)

The solids hopper is provided with a rotating, screw type sludge auger system. The auger consists of stainless steel shafts with coated steel screw auger driven by a slow speed gear motor drive assembly. The auger extends the full length of the solids hoppers and conveys solids to the sludge outlet. A NEMA 4 on/off control panel is provided, power required: 230 or 460V/3ph/60Hz.

## Section 2.0 Materials of Construction

### 2.01 Steel Construction

Tank shell, baffles, cover and external structural members shall be constructed of ASTM A-36 carbon steel. Welded joints are continuous double welded and dye penetrant tested.

### 2.02 Surface Preparation

Interior surfaces shall be prepared to an SSPC-SP10 near white metal blast. Exterior surfaces shall be prepared to an SSPC-SP6 commercial blast.

### 2.03 Coatings

Interior coating shall be coated with Ameron High Build Coal Tar Epoxy Amercoat 78HB (16-20 mils DFT). Exterior coating shall be coated with Ameron epoxy primer, Amerlock 2, (5-8 mils DFT). Final coat to be Ameron Amersfield Aliphatic Polyurethane Enamel coat (5 mils DFT). Surface color to be Green RT-2203.

### 2.04 Piping

Internal piping shall be ASTM, A-53 black steel.

### 2.05 Coalescing Media (optional)

Flopak, cross-fluted, oleophilic, PVC coalescing media shall be provided as manufactured by Pan America Environmental. The media shall be packed in 304 stainless steel frame(s) with lifting lugs and removable cover.

### 2.06 Cover Gasketing

Closed cell, industrial grade polyethylene constructed vapor sealed cover gasketing shall be provided. No neoprene shall be permitted.

### 2.07 Manufacturer

The manufacturer of preference shall be: Pan America Environmental, Inc.

### 2.08 Warranty

Pan America Environmental warrants its products to be free of defect in materials and workmanship for a period of one year from the date of shipment.

## Section 3.0 Standards of Construction

### 3.01 Standards of Construction

Pan America utilizes the following standards and others in design and construction:

- ANSI
- AWS D1.1/1.1M
- AWS D1.6
- ASTM
- API-421
- ASME
- SSPC
- NEMA
- NEC
- NFPA79
- UL-508
- UL-845



## Oil Water Separator Options Descriptions

**Influent Feed System** Air operated, diaphragm pump with air controls or progressive cavity pump, sump level switches & Nema 4 control panel, base mounted, 115/230/460V power offered. Electric diaphragm pumps available.

**Effluent Pumpout** Centrifugal pump with level switches & Nema 4 control panel, base mounted, 115/230/460V power offered. OS Effluent chamber must be expanded to accommodate pumpout or provision of an external pumpout tank.

**Sludge Pumpout System** Air operated, diaphragm pump with air controls & Nema 4 control panel, auto on/off timer, base mounted, 115V/1ph/60Hz power required. Progressive cavity pump system also available. 1 - 100 GPM.

**Oil Pumpout System** Air operated, diaphragm pump with air controls, level switches & Nema 4 control panel, base mounted, 115V/1ph/60Hz power required. Electric gear or progressive pump systems available. 1 - 100 GPM (larger if required)

**Sludge Auger** Separator V-hopper(s) can be provided with a sludge auger. System consists of stainless steel shafts with coated steel screw auger driven by a slow speed gear motor drive assembly. The auger extends the full length of the solids hopper(s) and conveys solids to the sludge outlet. A Nema 4 on/off control box is provided, power required: 230 or 460V/3ph/60Hz.

**Freeze Protection** Immersion heaters mounted through tank wall. Each heater has an independent thermocouple well, 0-60° F thermostat and Nema 4 housing. 230/460V/3ph/60Hz power required.

**Retpak Secondary Coalescer** High surface area, reticulated, secondary coalescing media for polishing flow after standard Flopak media.

**Oil Sight Glass** Two automatic, brass valves with tempered sight glass and protection rods mounted in oil reservoir. If glass is broken check ball stops outflow from reservoir.

**External Sight / Level Glass** An externally mounted clear PVC sight tube is provided with multi-point level switch for indication or pump control of oil or water. Switch is removable for cleaning and inspection.

**Oil Skimmers** The following oil skimmer types are offered:

- Adjustable rotary slotted pipe skimmer
- Adjustable weir standard skimmer
- Motorized drum skimmer
- Surface drag skimmer

**Elevation Legs** Epoxy coated steel legs to elevate tank to desired level. Full platforms & walkways with ladders or stairways can be designed where required or desired.

**High Temperature Design** Flopak coalescing media and any piping is constructed of a combination of CPVC &/or polypropylene (or other materials) for temperature resistance up to 200° F.

**Alternate Media Construction** Standard Flopak media is PVC. HPVC, polypropylene, glass-coupled polypropylene and 304/316 stainless media is available. Media plate spacing is available in 1/2", 3/4" & 1.2".

**External Storage/Feed Tanks** A wide variety of tank volumes can be supplied for your water, product and sludge holding needs. Flat bottom and cone bottom designs constructed in polyethylene, fiberglass, steel & stainless steel can be provided.

**Effluent Filter Systems** Solids filter systems can be provided to remove filterable solids from the separator effluent.

**AQAM Filter Systems** AQAM (Alkyl Quaternary Ammonium Montmorillonite) filter systems can be provided to remove trace hydrocarbons, sheens, DNAPLs, slightly soluble chlorinated hydrocarbons and high molecular weight organics from the separator effluent. Can be used to protect and increase GAC lifespan.

**Carbon Filtration Systems (GAC)** GAC carbon filters can be provided to remove contaminants after the separator.

**Cover Hatch** Hinged/latched hatches can be provided.

**Emulsion Cracking Systems** Emulsion cracking systems can be provided to remove oil-in-water emulsions prior to the separator.

**pH Adjustment Systems** pH adjustment systems can be provided to maintain pH levels prior to or after the separator.

**Walkway** Separator can be provided with a walkway(s) on any/all sides including kick plates, handrails, ladders/stairs and safety gates per OSHA standards. Design is cantilevered from tank and is detachable.

**Field Skid Mounting** Separator system can be mounted to a mobile skid with leveling for quick field mobilization.

**Skid Mounted System** Separator can be combined with our other treatment equipment and options into a fully integrated, custom designed system completely mounted, plumbed and wired to a system skid. To simplify your need to do the wiring and plumbing on site, reducing your time frames and on site costs, we design around your requirements.

**Vent Scrubber** Separator vapors can be extracted and scrubbed prior to discharge to atmosphere to remove VOC content.

**Level Sensors** Level sensors can be provided to detect water, sludge and oil/fuels. One or more sensor points can be provided to perform various functions such as high level, low level, pump on/off based on liquid levels and level detection for DCS controls or other functions based on your needs.

**Class 1 Div 1 & 2** Systems can be designed for use in a class 1 div 1 or 2 environment. Controls, components and wiring are changed to meet the needs of these environments. Intrinsically safe relays are also used for level sensors.

**Oil Monitor** An oil detection system can be provided to monitor effluent oil content and provide various actions based on the oil alarm set-point. Actions might include: audible/visual alarm, redirection of influent or effluent via actuated valve, shutdown of influent pump or your custom action.

