

COMPLETE UPSTREAM PRODUCED WATER TREATMENT SYSTEMS



CETCO MONARCH™
Produced Water Treatment Systems



CETCO
OILFIELD
SERVICES





CETCO[®] MONARCH[™]

Produced Water Treatment Systems

Integrated design engineered and manufactured exclusively by CETCO MONARCH for both oilfield and industrial oil & water separation and deoiling applications.

CETCO MONARCH's Produced Water Treatment Systems epitomize performance, value, and quality. Our systems rid our customers of the frustrations associated with non-performance, size, and costs that come with most equipment. They are capable of handling everything necessary for separating/treating gas/oil/water from a production stream.

With more than forty years cumulative experience, CETCO Oilfield Services Company and Monarch Separators Inc. have been able to focus on the design, technology, engineering, and manufacturing to provide their customers treatment systems with unparalleled removal efficiency, maintenance-free design, reliability, and durability.

The results speak for themselves—with installations around the world and proven results, CETCO MONARCH Systems are the technology of choice for produced water treatment.

The difference is clear.

Upstream Produced Water Treatment

Free Oil Content
>1,000 ppm Inlet @ >150 Microns >Oil Droplet

<15 ppm Outlet @ > 10 Microns

Primary Treatment

Reduces oil in water levels
from 20,000 ppm
to 200-300 ppm

Secondary Treatment

Reduces oil in water levels
from 200-300 ppm
to 25-30 ppm

Tertiary Treatment

Reduces oil in water levels
from 50-75 ppm
to <10 ppm

Primary Treatment:

Corrugated Plate Separators, Liquid/Liquid Hydrocyclones

Secondary Treatment:

Horizontal Induced Gas Flotation/Dissolved Gas Flotation Vessels,
Vertical Induced Gas Flotation/Dissolved Gas Flotation Vessels,
Compact Flotation Vessels

Tertiary Treatment:

Walnut Shell Filters, Hi-Flow® Filters, CrudeSorb® Filters



Primary Treatment

CETCO MONARCH CPI & SCPI Oil Water Separators

Performance, Value, and Quality

For various oilfield and industrial separation applications, the CETCO MONARCH Corrugated Plate Interceptor (CPI) fulfills all of the prerequisites necessary for separation of oil, water, and solids from a wastewater or produced water stream. Released from frustrations associated with nonperformance, size and costs of most separation equipment, buyers and end-users alike enjoy a technology epitomizing performance, value, and quality.

A Leading Standard in Oil/Water Separation

For more than three decades, CETCO MONARCH has engineered and manufactured CPI's that emphasize complete customer satisfaction. With their combination of removal efficiency, maintainability, and durability, the CETCO MONARCH CPI Separator remains a paragon of oil, water, and solids separation technology. The results speak for themselves. With well over two thousand worldwide installations, CETCO MONARCH's CPI Separator is the preferred technology for oil, water, solids separation.

Benefits

- Standard Models to 150,000BWP/4500gpm
- High Performance and Reliability
- No Moving Parts and Fully Customizable Design
- API 421 Design & ASME Code Vessels Available
- Complete Skid Mounted Packages Available

Applications

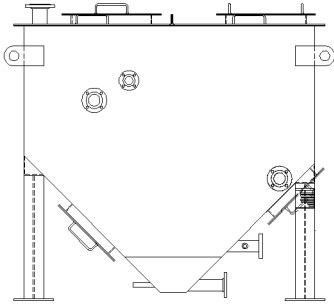
- Oil/Water Separation in Petroleum Refineries
- Oil/Produced Water Separation on Platforms
- Treating Ship/Terminal Bilge & Ballast Water
- Oil Separation from Industrial Wastewaters
- Oil/Water Separation in Chemical Plants
- Oil Removal from Environmental Remediation



CETCO MONARCH™ Atmospheric CPI Oil Water Separator

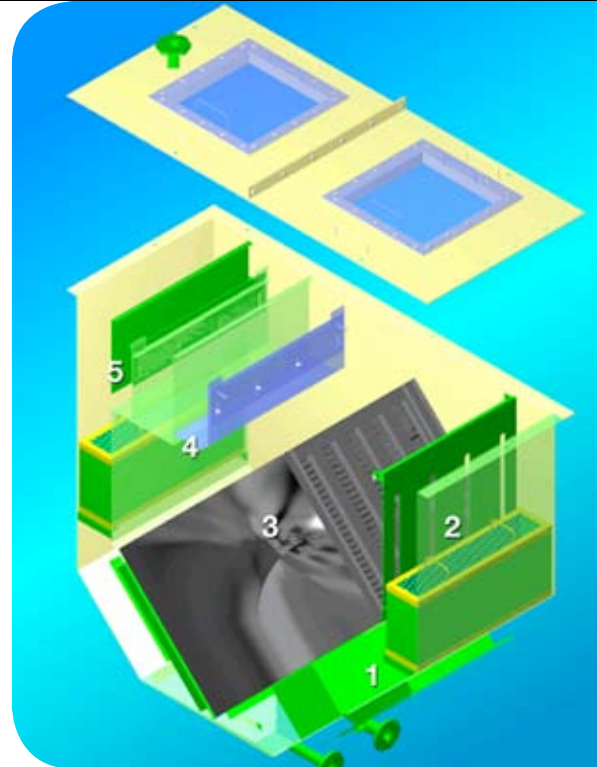


CETCO MONARCH™ ASME Coded CPI Oil Water Separator



Operation of the CETCO MONARCH CPI Separator : Simple & Efficient

- (1) Liquid flow is introduced into the CETCO MONARCH CPI separator via gravity or at a specific pressure.
- (2) The CETCO MONARCH CPI Separator distributes flow and creates the necessary laminar flow for proper oil & water separation.
- (3) The CETCO MONARCH CPI Separator and its internal CETCO MONARCH CPI Pack provides the necessary surface area to successfully separate oil from water and solids into their various distinct phases.
- (4) The lighter liquid or oil flows upwards and discharges via the CETCO MONARCH CPI Separator oil discharge sump.
- (5) The heavier liquid or water and flows downward and discharges via the CETCO MONARCH CPI Separator water discharge sump.



CETCO MONARCH's CPI Separator is designed to many U.S. industrial codes and incorporates advanced features such as a unique packaging design to enhance space and maintainability, long lasting materials of construction to extend the life of the system, and a flexible design providing an array of sizes, connections, and ancillary choices to meet individual client needs and requirements.

General Specifications

Functional

Service

- Oil Production
- Refining
- Chemical Processing
- Wastewater Treatment
- Hazardous Waste Remediation

Design Temperatures

Standard

- Up to 200F (93C)
- Custom Available

Design Flow Rates

Standard

- 150,000BWP/4,500 GPM
- Larger Flow Rates Available

Physical

Material of Construction

Tank or Vessel

- A-36 or 516 Gr. 70
- 304 or 316 SS
- Custom Available

Packs

- 304 or 316 SS
- Galvanized
- Custom Available

Gasket

- Neoprene
- Viton
- Custom Available

Hardware

- 304 or 316 SS
- Teflon Coated Available

Options

Packaged Systems

ASME Section VIII, Div. I Vessel

- Piping per Code
- Fully Tested
- Customization Available
- Various Materials of Construction

PLC Based Control System

- Complete System Functionality
- Remote DCS or Local Control

Complete Instrumentation Package

- Process Control, Indication
- Integral Design

Pumping System

- Various Designs and Capabilities
- Automated Process

CETCO MONARCH Deoiling Hydrocyclone Separators

Simplicity & Value

Great technological advancements share two common traits: simplicity and value. CETCO MONARCH's Deoiling Hydrocyclone series uses centrifugal motion to cause two liquids having different specific gravities, such as oil and water, to separate in an efficient process. The advanced CETCO MONARCH Deoiler Hydrocyclone separates significantly more oil from water than conventional oil and water separation equipment, allowing our customers to operate under more stringent environmental standards and regulations.

The New Standard in Oil/Water Separation

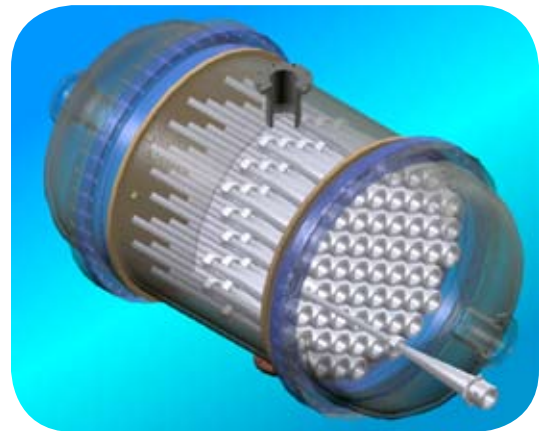
CETCO MONARCH's Deoiler Hydrocyclones are engineered and sized to cover a wide range of capacities and applications using standard designs to provide reliability, cost-effectiveness, service accessibility, and shortened delivery time. Designed to be highly efficient, compact, and durable oil water separators, CETCO MONARCH's Deoilers exceed the various demands of oilfield and industrial applications throughout the world. CETCO MONARCH packages its hydrocyclones in vessels or manifolds to specific engineering and manufacturing specifications.

Benefits

- High Performance and Reliability
- No Moving Parts and Modular Construction
- Lightweight and Small Footprint
- Not Affected by Fluctuations in Motion
- Complete Skid Mounted Packages Available

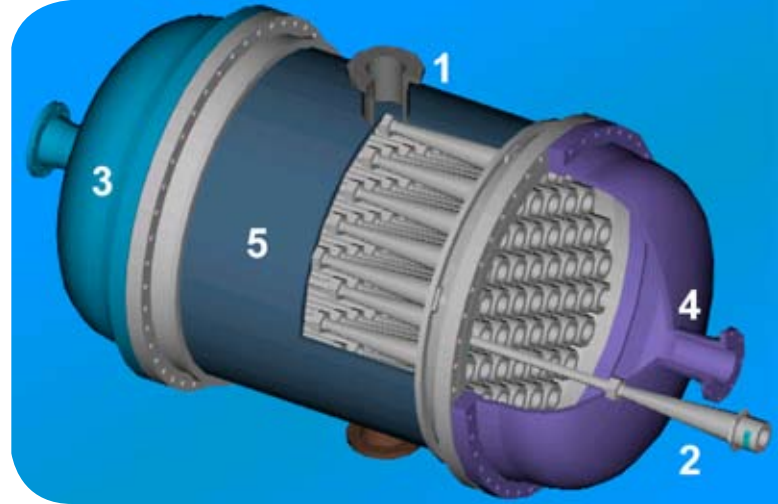
Advantages

- Oil/Water Separation in Petroleum Refineries
- Oil/Produced Water Separation on Platforms
- Treating Ship/Terminal Bilge & Ballast Water
- Oil Separation from Industrial Wastewaters
- Oil/Water Separation in Chemical Plants
- Oil Removal from Environmental Remediation



Operation of the CETCO MONARCH Hydrocyclone: Simple & Efficient

- (1) Liquid flow is introduced tangentially into the CETCO MONARCH hydrocyclone at a specific pressure, creating a centrifugal motion within the hydrocyclone liners).
- (2) The centrifugal motion causes the lighter liquid or oil to separate to the center of the hydrocyclone liner's separation chamber where it tends to coalesce and form a small oil core.
- (3) The denser liquid or water migrates toward the hydrocyclone liner's outer edges and travels in the opposite direction of the oil toward the hydrocyclone's underflow section.
- (4) The lighter liquid or oil flows in reverse flow in relation to the denser liquid or water and discharges via the hydrocyclone's overflow.
- (5) Individual liners are housed in a pressure vessel, which is designed to all industrial codes and incorporates advanced features such as a unique packaging design to enhance space and maintainability, long lasting materials of construction to extend the life of the system, and a flexible design providing an array of sizes, connections, and ancillary choices to meet individual client needs and requirements.



General Specifications

Function

Service

- Oil Production
- Refining
- Chemical Processing
- Wastewater Treatment
- Hazardous Waste Remediation

Design Temperatures

Standard

- Up to 200°F (93°C)
- Custom Available

Design Flow Rates

Standard

- Call CETCO Monarch for Details

Physical

Construction Material

Vessel

- SA 106 Gr.B or 516 Gr. 70
- 304 or 316 SS
- Custom Available

Liners

- 304 or 316 SS
- Duplex Stainless
- Custom Available

Gasket

- Neoprene
- Viton
- Custom Available

Hardware

- 304 or 316 SS
- Teflon Coated

Options

Packaged Systems

CETCO MONARCH HydroSep Vessel

- Designed to Enhance Hydrocyclone Performance & Operation

- Various Materials of Construction

PLC Based Control System

- Complete System Functionality
- Remote DCS or Local Control

Turndown System

- Turndown Capabilities
- Integral Design

Pumping System

- Various Designs and Capabilities
- Automated Process



Secondary Treatment

Induced Gas Flotation (IGF) and Dissolved Gas Flotation (DGF)

A Leading Separation Technology

Take advantage of top-notch technology and experience solutions to your water problems with the performance-packed Induced Gas Flotation Systems (IGF) engineered and manufactured by CETCO MONARCH. Accomplish water discharge or re-use goals, customize your CETCO MONARCH IGF to improve facility or field integration, and optimize your CETCO MONARCH IGF with performance options and tightly integrated auxiliary equipment. One of the most effective and efficient technologies available for removing oil and suspended solids from large volumes of produced water or wastewater streams is CETCO MONARCH Induced Gas Flotation (IGF) Systems.

CETCO MONARCH offers an advanced Dissolved Gas Flotation system which utilizes a unique recirculating pump and improved technology to inject a myriad of micro-bubbles into a process stream. CETCO MONARCH system's micro-bubbles massive surface area creates exponential contacting potential, producing superior separation performance of oil and suspended solids from the process water. Available on skid packages or standalone configurations, CETCO MONARCH routinely builds to our US industrial standards or customer specifications.

Benefits

- Standard Models to 170,000BPWD/5000gpm
- Fully Customizable Design
- High Performance and Reliability
- ASME Code & None Code Vessels Available
- Complete Skid Mounted Packages Available

Applications

- Oil/Water Separation in Petroleum Refineries
- Oil/Produced Water Separation on Platforms
- Treating Ship/Terminal Bilge & Ballast Water
- Oil Separation from Industrial Wastewaters
- Oil/Water Separation in Chemical Plants
- Oil Removal from Environmental Remediation



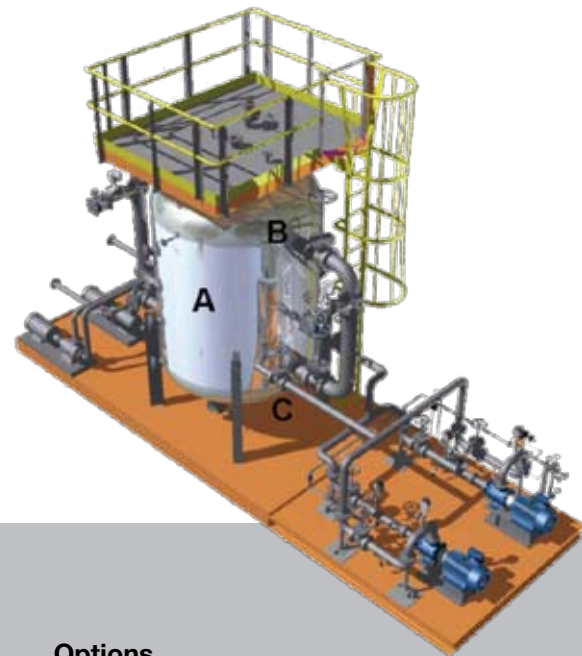
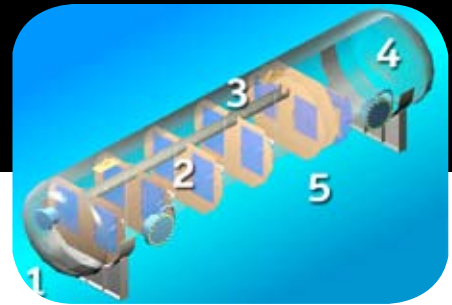
CETCO MONARCH™ ASME Section VIII, Div. 1 IGF Separator



CETCO MONARCH™ Non-Coded IGF Separator

Operation of the CETCO MONARCH IGF Separator

- Operation of the CETCO MONARCH IGF Separator is simple and efficient.
- (1) Liquid flow is introduced into the CETCO MONARCH IGF Separator via gravity or at a specific process pressure.
 - (2) The CETCO MONARCH IGF Separator distributes flow and creates “plug flow” via four (4) separate and distinct flotation zones. These four (4) flotation zones provide the necessary area for micobubbles, created from CETCO MONARCH’s Eductor Technology, to contact oil and/ or suspended solids, making them buoyant, and rising them to the surface for skimming.
 - (3) The CETCO MONARCH IGF Separator has a unique oil skimming trough and skimming system which is automatically set and adjustable external from the unit.
 - (4) Clean water is maintained via level transmitters and discharged for disposal or additional treatment.
 - (5) A percentage of the collected clean water is recycled and used by CETCO MONARCH’s unique eductor manifold (not depicted to maintain picture clarity) to mix with the IGF’s blanket gas to form a myriad of micro-bubbles. As with all CETCO MONARCH products, CETCO MONARCH’s IGF Separator is designed to many U.S. industrial codes and incorporates advanced features such as a unique packaging design to enhance space and maintainability, long lasting materials of construction to extend the life of the system, and a flexible design providing an array of sizes, connections, and ancillary choices to meet individual client needs and requirements.



General Specifications

Functional

Service

- Oil Production
- Refining
- Chemical Processing
- Wastewater Treatment
- Hazardous Waste Remediation

Design Temperatures

Standard

- Up to 200F (93C)
- Custom Available

Design Flow Rates

Standard

- 170,000BWP/5000gpm
- Larger Flow Rates Available

Design Pressures

Standard

- Atmospheric or Per Code
- Custom Available

Physical

Material of Construction

Vessel

- A-36 or 516 Gr. 70
- 304 or 316 SS
- Custom Available

Eductors

- 304 or 316 SS
- Custom Available

Gasket

- Neoprene
- Viton
- Custom Available

Hardware

- 304 or 316 SS
- Teflon Coated Available
- Custom Available

Blasting & Coating Standard

- SSPC-SP-10
- In/Out 6-8 Mils C.T.E.
- Custom Available

Options

Packaged Systems

ASME Section VIII, Div. I Vessel

- Piping per Code
- Fully Tested
- Customization Available
- Various Materials of Construction

PLC Based Control System

- Complete System Functionality
- Remote DCS or Local Control

Complete Instrumentation Package

- Process Control, Indication
- Integral Design

Pumping System

- Various Designs and Capabilities
- Automated Process

Safety Shutdown System

- Various Designs and Capabilities
- Automated Process

Upstream Primary Oil Separator

- Add a CETCO MONARCH Skimmer
- Add CETCO MONARCH Hydrocyclones
- Add a CETCO MONARCH CPI

CrudeSep® Produced Water Treatment System for high-efficiency removal of oil, gas, and solids

CrudeSep® Produced Water Treatment

CrudeSep is an unparalleled technology which separates oil, water, gas, and solids at variable flow ranges. Based on application of fluid dynamics, the CrudeSep is a novel technology which eliminates the dependency on gravitational separation prolific in traditional methods.

The inlet and outlet are located at the bottom of the vessel. The whole body of water is directed in a controlled vertical flow pattern towards a primary interface where droplets break out and accumulate. The return flow interacts with a series of specially engineered interfaces which encourage swirling eddies to form. These forced eddy currents propel the oil droplets towards additional gas interface surfaces for breakout and collection. Accumulated oil on these surfaces combines to form much larger oil droplets which join the main body of flow. These are now of a significantly larger size and interact with the initial interface at the top of the fluid column.

The vessel also works as a degassing unit as entrained gas will break out and be released with the separated oil particles. Solids and heavier particles will accumulate at the bottom of the vessel to be flushed out on an intermittent basis.





Tertiary Treatment

Applications

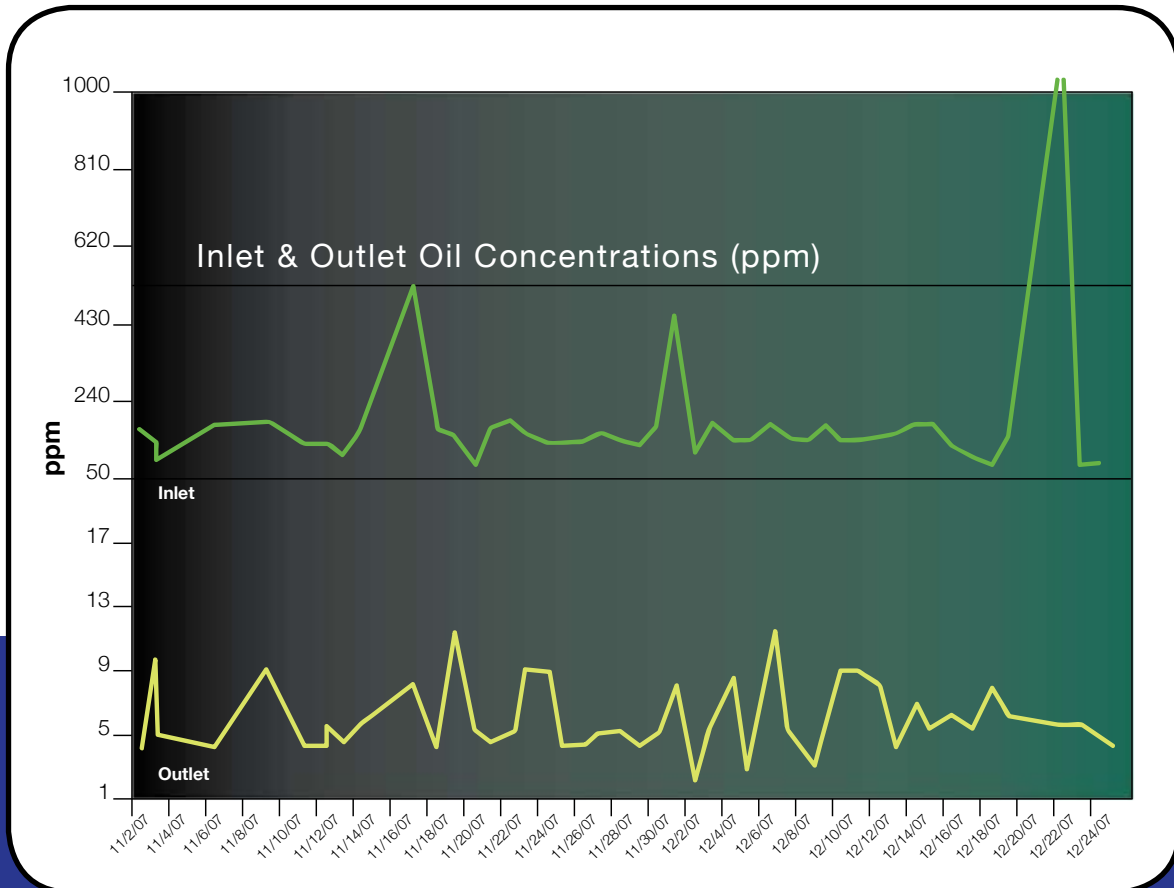
- Permanent Produced Water Treatment and Polishing
- Diversion Skid
- System Upsets
- Increase Produced Water Handling Capacity



Hi-Flow® Process

CETCO Oilfield Services Hi-Flow Process can treat high rates of produced water, allowing the operator to return the produced water back into the environment in compliance with governmental regulations. Our Hi-Flow Process gives you the flexibility you need in having one solution for many applications—the Hi-Flow process can handle small to large volumes of liquid, from 1,000 BWPD to more than 40,000 BWPD; it is not hindered by large fluctuations in oil and grease inlets; and it can be used on projects with short or long durations.

Results from CETCO MONARCH Tertiary Filtration Equipment



Nutshell Filter

Nutshell media is a resilient media utilizing a high flux rate to remove both oil and oil-wet solids. With a deep media bed channeling is eliminated. Backwashing the media easily removes oil and solids from the vessel. Pneumatic or electrically actuated valves control the vessel functions automatically via skid PLC or facility DCS. Flow rates of up to 50,000BWPD per vessel are easily handled.



Benefits

- Handles Small to Large Volumes of Liquid, from 1,000 BWPD to More Than 40,000 BWPD
- Features a Small Footprint
- Performs Well with Large Fluctuations in Oil and Grease Inlets
- Ensures Discharge Compliance
- Allows Flexibility – Can be Used on Projects with Short or Long Durations
- Media that Regenerates In-situ
- Handles Variations in Flow Rate and Level of Contaminants
- PLC Controlled and Self-cleaning Actuated by Differential Pressure or Time

Pleated Filter Unit

CETCO's Pleated Filter Unit is used in applications where solids filtration and hydrocarbon removal is a challenge. Delivering solids removal to 1 micron and hydrocarbon removal up to 98% efficiency, the Pleated Filter Unit can meet even the most stringent requirements, being both highly effective and reliable.

A variety of media types are available to suit most applications including MEG, condensate, brines, and many other oilfield fluid streams.

The unit is housed in a DNV2.7.1 skid protection frame and has a flow rate capacity up to 167m³/hr (17.5 BPM) and is capable of handling pressures up to 254 psig and temperatures from -20°C to 100°C.



In addition to providing produced water treatment systems, CETCO is also capable of handling all your waste management needs, including solid filtering/solidification technologies, waste storage containment, cleanup solutions for heating/cooling systems & gas scrubbing systems, and site remediation.

CETCO is also a world leader in remediation technologies for Brownfields redevelopment. CETCO's products have been used to solve challenging environmental remediation projects worldwide, providing a combination of expertise in physiochemical contaminant reactions, civil engineering products and application knowledge.

One of our premier products is our Geosynthetic Clay Liners (GCLs). CETCO GCLs provide superior hydraulic performance and greater installation efficiencies making them more cost-effective than traditional compacted clay liners. Additional benefits of CETCO GCLs are lower permeability of 5x10⁻⁹ cm/s, better composite liner leakage protection, resistance to the effects of freeze-thaw cycles, resistance to differential subsidence, and the ease and speed of installation. Examples of applications where GCLs have been successfully used are: tank containment facilities, runoff or storm water protection, wastewater impoundments, engineered wetlands, landfill liners, remediation or landfill caps, drilling wastes storage, contaminated cuttings pits, and biotreatment pad liners.



WATER TREATMENT | PIPELINE | WELL TESTING | WASTEWATER | RENTALS | NITROGEN | COILED TUBING



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