



Aerospace
Engineered Materials
Filtration
Fluid Connections
Hydraulics
Instrumentation



Hydrotreating

Refinery - Hydrotreating Unit

Filtration Solutions with PECO Products



Oil & Gas
(Downstream)



ENGINEERING YOUR SUCCESS.



When refining presents complex challenges, Parker, with its breadth of PECO Oil & Gas filtration products, presents solutions which respond to today's demanding worldwide market. We offer innovative and application-specific filtration to help ensure integrity and purity throughout the downstream process.

Filtration for process efficiency

From crude to final production

DOWNSTREAM DEMANDS

After upstream drilling and transport, crude oil must be processed in a refinery. Efficient processing of several hundred thousand barrels of crude oil a day – essentially a nonstop operation – demands filtration solutions that perform reliably, even under extreme conditions. Parker meets these needs with filtration that gets the job done with minimal maintenance and downtime.

COMMITTED TO PROCESS OPTIMIZATION

Parker recognizes that due to the hazards associated with maintenance in petroleum production facilities along with high disposal costs, minimizing both change-out frequency and process downtime are of utmost importance. That's why we optimize our filtration products to ensure that the total cost of ownership for contaminant control is balanced, without compromising process efficiency.



For over 80 years the PECO brand of products has led the way in oil & gas filtration solutions. Customers trust the PECO brand for quality and performance to handle complex contaminant management issues.

FILTRATION IN HYDROTREATING UNITS

Parker Industrial Process Filtration provides optimized engineered solutions to:

- Eliminate fouling of Catalyst and Reactor beds
- Improve plant capacity and availability
- Meet final product purity and end customer specification
- Eliminate low NOx burner tip plugging and flameouts
- Protect processing equipment
- Improve production and operation efficiency
- Reduce process upsets and downtime
- Lower maintenance costs

HYDROTREATING PROCESS

Commonly used as Feed Preparation Units for downstream Catalytic Processes. Hydrotreating Processes remove impurities such as Sulfur and Nitrogen from Distillate Fuels (Naphtha, Kerosene and Diesel) by treating the feed with Hydrogen at an elevated temperature and pressure in the presence of a catalyst. Hydrotreating has been extended in recent years to atmospheric residuals to reduce the sulfur and metal content of residuals for producing low sulfur fuel oils. The principal impurities removed by this unit are Sulfur, Nitrogen, Oxygen, Olefins, Aromatics, Halogens, and Metals.

All Catalytic Processes such as CCR (Catalytic Reforming), HCU (Hydrocracker Unit), FCC (Fluid Catalytic Cracking), ISOM (Isomerization), ALKY (Alkylation) need the feed to be treated in a Hydrotreater.

HYDROTREATER CONTAMINANTS

- Metals
- Sulfur Compounds
- Nitrogen Compounds
- Oxygen Compounds

HYDROTREATER - RELIABILITY ISSUES

- Furnace and Exchanger Fouling
- Feed Quality – high contamination
- Reactor Pressure Drop
- Catalyst Deactivation
- Effluent Exchanger Fouling and Corrosion (NH_4Cl , NH_4HS)
- Tower Stripper Operation – fouling and corrosion

HYDROTREATING - KEY ISSUES

Feed

Contaminated feed stocks foul heat exchangers, clog reactor nozzles, cause corrosion, reduce reactor efficiency and results in catalyst deactivation.

Feed such as VGO, HCGO, AGO, diesel, and middle heavy distillate need to be water washed to take out the salts. Otherwise nitrogen, which gets converted to NH_3 in the reactor, reacts with the salts to form NH_4Cl . This can cause downstream catalyst issues and exchanger fouling. The washed feed needs to be free of water as water fouls critical downstream equipment.

Hydrogen

The HDS reaction needs hydrogen. The hydrogen is either added as fresh make-up hydrogen or hydrogen produced as a byproduct in the CCR unit is used. The hydrogen, which is recycled, contains particulates, trace liquids and aerosols. If not treated, this creates issues with compressor performance and also causes reactor catalyst bed and tower fouling.

Acid Gas/Sour Gas

The acid gas, which is mainly sour gas, contains hydrocarbon liquid as carryover. This can create foaming issues in the downstream amine unit.

Reactor Fouling

Heavily contaminated feed stock contains scale, rust and corrosion products. It deposits these contaminants, mixed with hydrocarbon, on the reactor bottom. This is a major maintenance issue, and in some cases heavy scraping is required to clean the reactor.

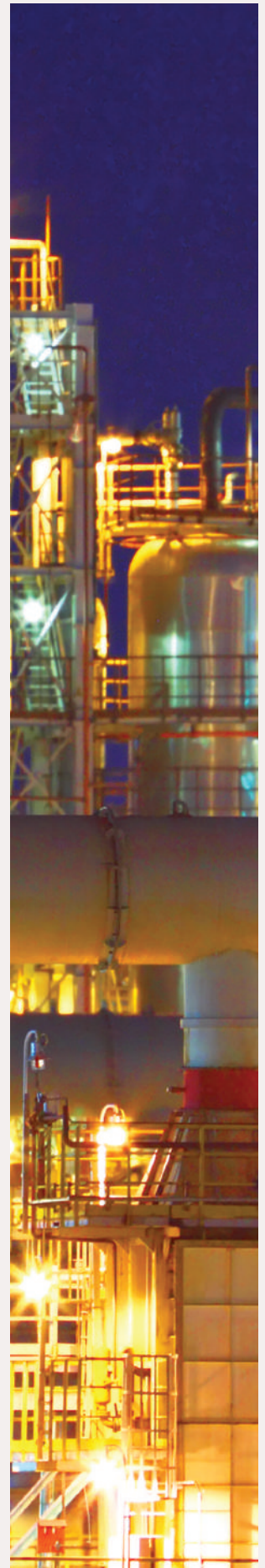
Tower Stripper Fouling

The stripping column separates the light gases from the hydrotreater products. Contaminated inlet feed to the stripping column impacts the separation and hence leads to poor quality of hydrotreated product. The effluent exchanger or reboiler fouling not only creates limited heat transfer but in order to maintain the same reboiler temperature, more energy is consumed. Fouling causes shutdowns and maintenance leading to production losses.

Water

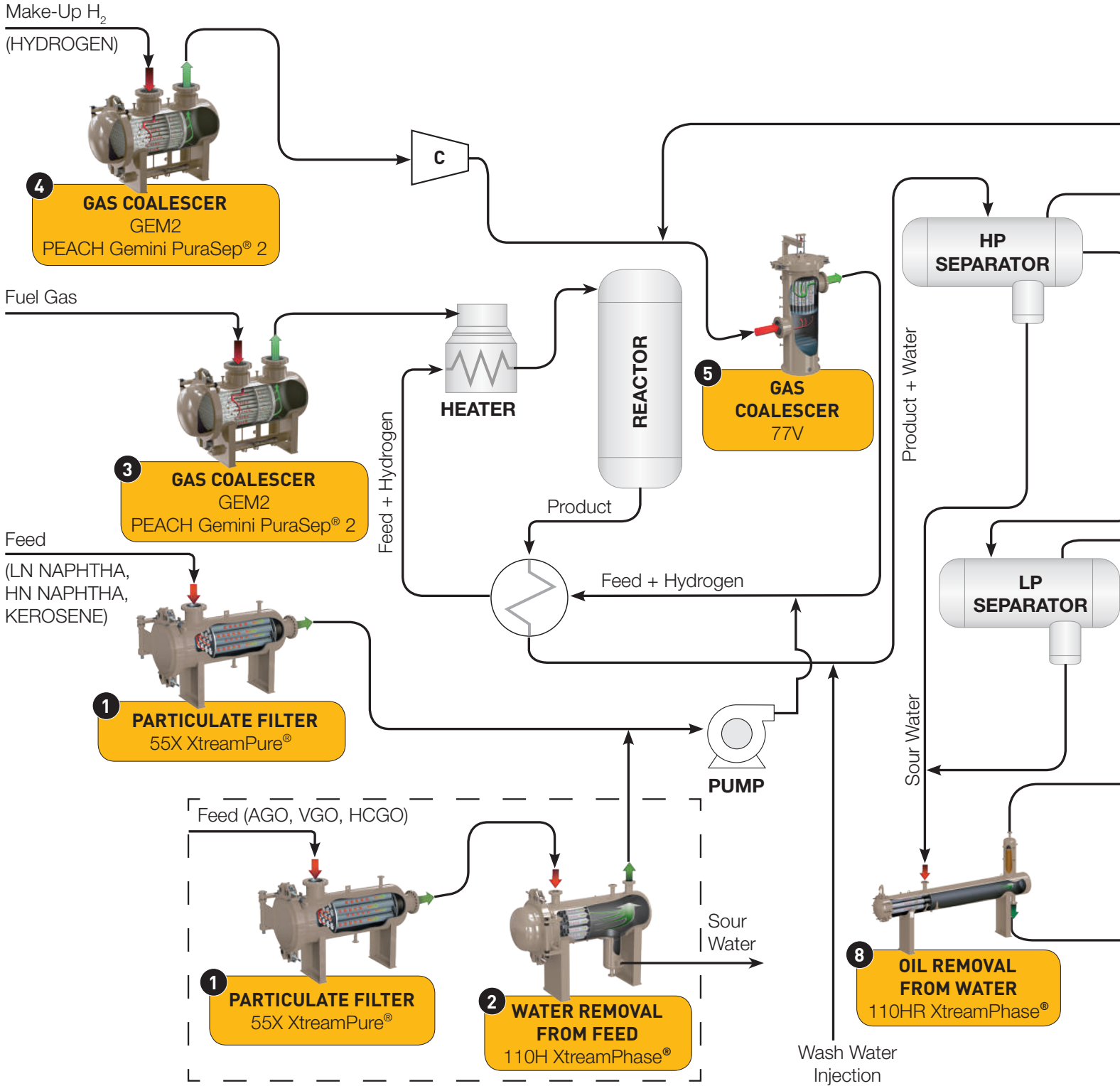
Wash water is used to take out salts so as to prevent the formation of NH_4Cl and NH_4HS . This wash water is then designated as sour water. Water is also produced in the reactor as a result of the conversion of organic oxygen compounds. The sour water is separated in a separator. If there is any hydrocarbon carryover along with the sour water it leads to fouling of the sour water stripper column.

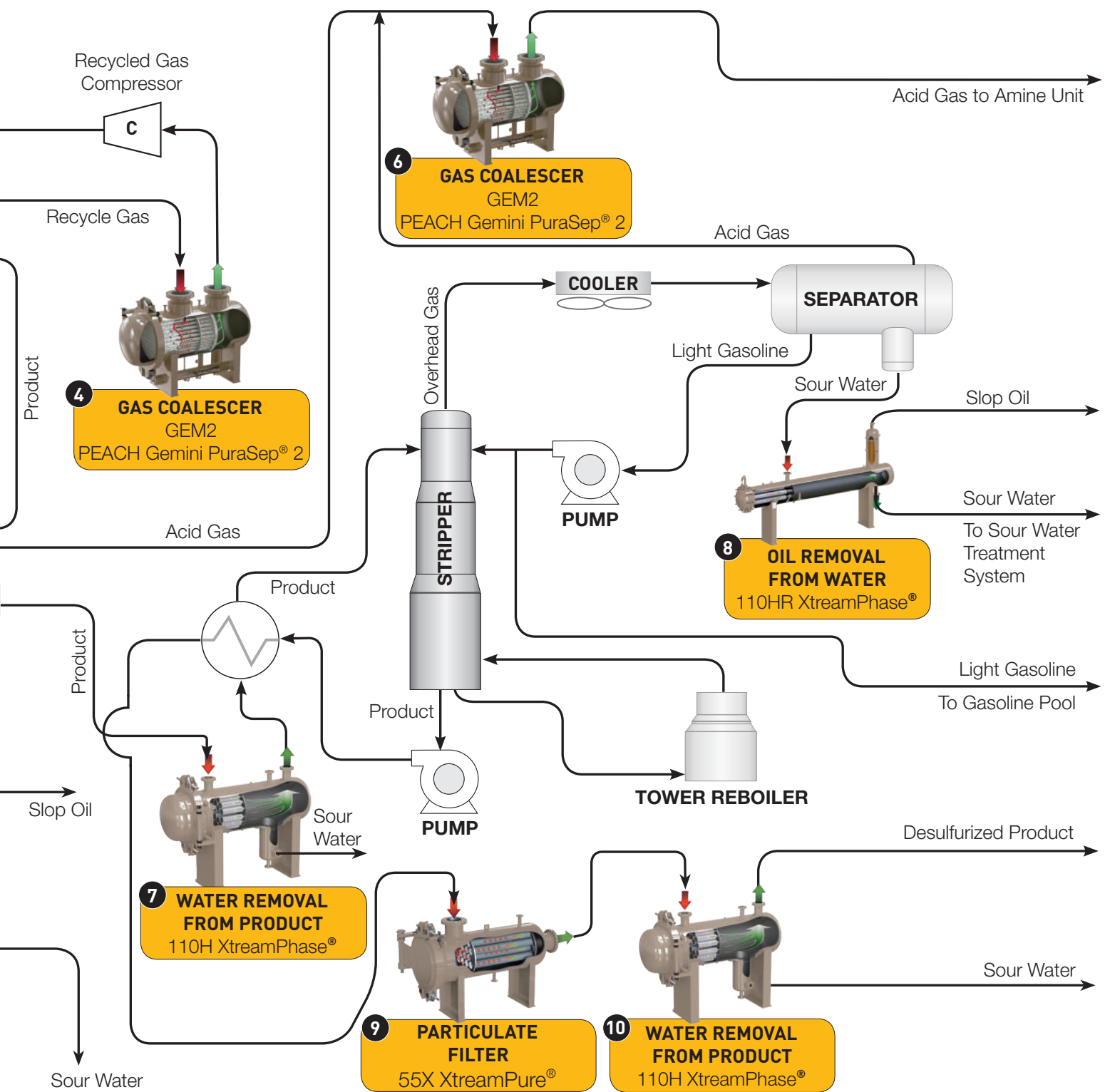
The hydrotreated product needs to be free of water before it is fed to downstream catalytic processes, like a reformer, because the presence of water acts as a catalyst poison.



REFINERY - HYDROTREATING UNIT

FILTRATION & SEPARATION EQUIPMENT





FEED FILTRATION

1 Liquid Filter

PECO, XstreamPure®, Series 55X filter with 6" diameter XP cartridges

- Removes corrosion products and particulates
- Assists in maintaining reactor pressure drop
- Prevents clogged reactor nozzles
- Prevents particulate deposits in reactor bed
- Prolongs catalyst life and yield

2 Liquid-Liquid Phase Coalescer

PECO, XstreamPhase®, Series 110H coalescer with TLPC or PLPC cartridges

- Protects reactor catalyst fouling by removing water down to 8-10 ppm in the feed stream

FUEL GAS FILTRATION

3 Gas Filter-Coalescer

PECO, PEACH Gemini PuraSep® 2, Series GEM2 horizontal coalescer with PGC cartridges

- High efficiency 0.3 micron coalescer
- Removes solid and liquid contaminants
- Protects burner tips

HYDROGEN FILTRATION

4 Gas Filter-Coalescer

PECO, PEACH Gemini PuraSep® 2, Series GEM2 horizontal coalescer with PGC cartridges

- High efficiency 0.3 micron coalescer
- Protects compressor to minimize downtime and maintenance costs
- Removes particulates, trace hydrocarbon liquids and aerosols

5 Gas Coalescer

PECO, Spartan PuraSep®, Series 77V vertical coalescer with NGGC cartridges

- High efficiency 0.3 micron liquid coalescing
- Prevents lube oil carryover in the compressed hydrogen to the reactor
- Prolongs catalyst life and yield

ACID GAS TO AMINE UNIT

6 Gas Filter-Coalescer

PECO, PEACH Gemini PuraSep® 2, Series GEM2 horizontal coalescer with PGC cartridges

- High efficiency 0.3 micron coalescer
- Removes particulate and liquid carryover from the acid gas
- Helps protect amine absorber/contacter
- Assists to reduce amine foaming and contamination

STRIPPER FEED FILTRATION

7 Liquid-Liquid Phase Coalescer

PECO, XstreamPhase®, Series 110H coalescer with TLPC or PLPC cartridges

- Protects stripper fouling by removing water carryover down to 8-10 ppm
- Helps to maintain stripper efficiency

SOUR WATER FILTRATION

8 Liquid-Liquid Phase Coalescer

PECO, XstreamPhase®, Series 110HR coalescer with TLPC or PLPC cartridges

- Removes particulates in the sour water stream
- Removes hydrocarbon (oil) carryover down to 8-10 ppm in the sour water stream
- Prevents fouling in downstream equipment such as Sour Water Stripper and Reboilers
- Helps maintain good water quality and steam balance
- Reduces loss of water or requirement of fresh water make-up

Typically all sour water is taken to a Sour Water Treatment System which includes a Liquid Filter and Liquid-Liquid Phase Coalescer. A Liquid-Liquid Phase Coalescer is shown in the diagram for reference. For particulate removal it is recommended to include a PECO, XstreamPure®, Series 55X filter with 6" diameter XP cartridges (not shown) before the Liquid-Liquid Phase Coalescer.

PRODUCT FILTRATION

9 Liquid Filter

PECO, XstreamPure®, Series 55X filter with 6" diameter XP cartridges

10 Liquid-Liquid Phase Coalescer

PECO, XstreamPhase®, Series 110H coalescer with TLPC or PLPC cartridges

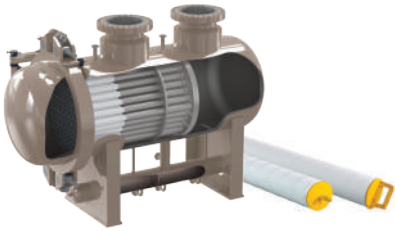
- Removes particulates in product stream
- Removes sour water carryover down to 8-10 ppm from the product stream

The product from the hydrotreater becomes a feed for various downstream processes which have catalyst that is highly sensitive to water. Removal of water helps in protecting the downstream catalyst from getting poisoned. For example, in an Isom unit, 1.6 lbs of water can kill 100 lbs of catalyst. Hydrotreater product such as diesel also needs removal of water, as water in diesel decreases the product quality (considered off-spec) and prevents the refinery from selling it.



SAFE • RELIABLE • EFFICIENT

PECO Filtration Products



SERIES GEM2, PEACH GEMINI PURASEP 2 HORIZONTAL GAS FILTER-COALESCER

The PEACH Gemini PuraSep is an innovative product in gas coalescing technology which provides the solids loading capabilities of a filter-separator with the liquid removal efficiency of a vertical coalescer. This patented design provides ultra-clean gas with high efficiency removal of solid and liquid contaminants down to 0.3 microns. It can effectively handle higher inlet solids and liquid loads versus conventional vertical coalescing equipment and is designed to remove a wide range of liquid contaminants such as lubricating oils, low surface tension liquids and aerosol mists.



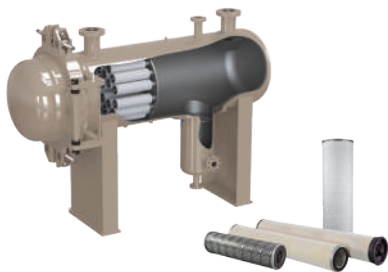
SERIES 77V, SPARTAN PURASEP VERTICAL GAS COALESCER

The Spartan PuraSep gas coalescer is a highly efficient mist and aerosol remover down to the 0.3 micron level. Series 77V coalescers work best with minimal solids and low surface tension liquids such as lube oil and NGL with minimal liquid loading.



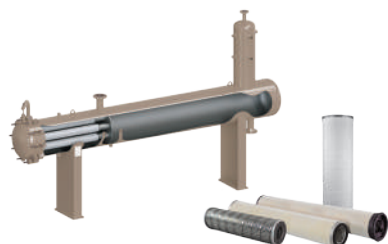
SERIES 55X, XTREAMPURE HIGH FLOW RATE, LIQUID FILTER

The XtreamPure vessel and cartridge line removes particulate in liquid applications with flow rates over 200 gpm. It provides high capacity filtration for virtually any liquid application by utilizing large 6" diameter cartridges in 40", 60" and 80" lengths with a variety of material choices for compatibility and performance needs. The inside-to-outside flow through the cartridge ensures contaminant is captured within the cartridge allowing a cleaner cartridge extraction during change-outs.



SERIES 110H, XTREAMPHASE HORIZONTAL LIQUID-LIQUID PHASE COALESCER

The Series 110H vessel is used to separate and remove a discontinuous phase fluid, such as water from a continuous phase fluid, such as a product stream. Removal of the discontinuous phase fluid down to 8-10 ppm can be achieved.



SERIES 110HR, XTREAMPHASE HORIZONTAL LIQUID-LIQUID PHASE COALESCER

The Series 110HR vessel is used to separate and remove a discontinuous phase fluid, such as a hydrocarbon from a continuous phase fluid, such as water. Removal of the discontinuous phase fluid down to 8-10 ppm can be achieved.

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