- Aerospace
- Engineered Materials
- Filtration
- Fluid Connections
- Hydraulics
- Instrumentation

Acid Gas Recovery

Refinery - Amine Unit
Filtration Solutions with PECO Products

Oil & Gas
(Downstream)

Parker

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 A REFINERY AMINE UNIT

Parker Industrial Process Filtration provides optimized engineered solutions to:

- Minimize foaming
- Decrease chemical usage
- Protect carbon beds
- Eliminate carbon carryover
- Protect processing equipment
- Improve production and operation efficiency
- Reduce process upsets and downtime
- Lower maintenance costs

AMINE PROCESS

The objective of the Amine Treating Unit is to remove H_2S, CO_2 and mercaptan compounds from various gas streams, such as recycled gas in hydrotreating and hydrocracking processes, hydrogen plant feed, and fuel gas systems. The H_2S recovered is used as feed for the Sulfur Recovery Unit (SRU).

Gas containing hydrogen sulfide (H_2S) is generated as a result of the hydrotreating process. Amine is used for selective removal of H_2S often referred to as "Acid Gas". Acid gas is introduced to the bottom of the absorber (contact tower) while an amine/water combination is introduced at the upper section of the contactor. As the streams circulate and come into contact with one another, the amine removes the acid gas by absorption. The rich amine is then fractionated to separate and remove the hydrogen sulfide. The lean amine, which is stripped of the hydrogen sulfide, is recycled back to the contact tower.

AMINE CONTAMINANTS

Amine contaminants can be grouped into five distinct categories:

1. Heat Stable Salts
2. Degradation Products
3. Injection Chemicals
4. Hydrocarbons
5. Particulates

COLOR OF AMINE – KEY INDICATORS

Bright and clear: Amine is in excellent shape. A yellow tinge indicates the presence of iron, but this is of no great consequence.

Grayish cast: Solution is a pale, dull gray. Objects can be seen through the bottle without difficulty. This is okay; however, do not let the amine solution get dirtier.

Translucent black: Objects can barely be seen through the bottle. Upon standing 10 minutes, a small amount of sediment is visible. You are now in trouble. Erosion-corrosion is generating particulates faster than they can be removed.

Opaque black: Give the bottle a good shake. If you notice a lot of particulates settling in the bottle then this could cause fouling in critical equipment such as the absorber, stripper, heat exchanger and reboiler.

Brownish: Air is getting into the system. Oxidized amine is corrosive.

AMINE UNIT - KEY ISSUES

Running a sulfur recovery operation with dirty amine is analogous to deficit spending. The insidious aspect of circulating dirty amine is its erosive nature. Carbon steel is corroded by clean amine. However, the sulfide products of corrosion stick to the metal surfaces and inhibit further attack. Particulates in the circulating amine erode this protective layer. New metal is exposed to corrosion and then more particulates are generated as the corrosion-erosion cycle perpetuates itself. This environment is manifested by several signs:

Foaming

Dirt reduces the surface tension of liquids. Particulates will cause amine to foam. Foaming in the regeneration system stripper results in high amine concentrations in the regenerator reflux water. Foaming in the absorber causes amine to be carried overhead with the inlet sour gas being scrubbed.

Plugged Instrument Taps

Flow rates in dirty amine systems tend to be erratic. Orifice taps on flow meters and level taps on float chambers often plug. Level control in the bottom of the absorber and stripper becomes unreliable and massive carryover of amine is frequent.

Condenser Fouling

Rich amine regenerator feed splashes overhead. Particulates accumulate in the regenerator condensers, heat transfer is impaired to a certain extent, and the reflux temperature rises. This results in amine carryover.

Reboiler Tube Failures

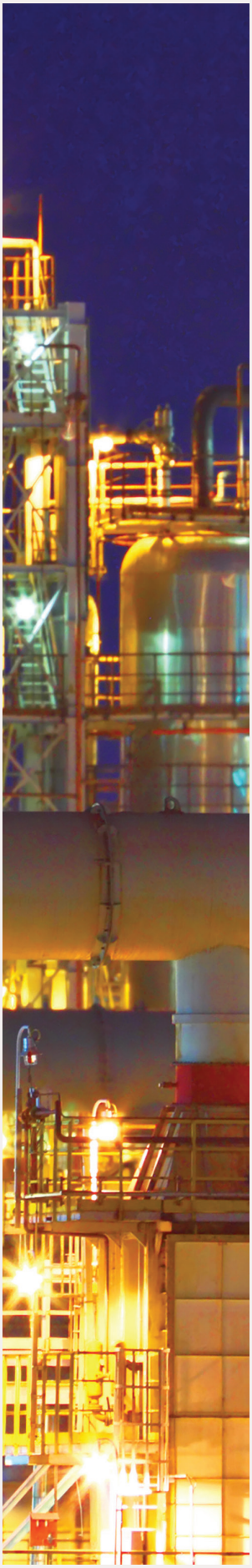
Enhanced corrosion rates are most evident in the regenerator reboilers. Dirty amine has caused tube failures after six months of service.

Filter Plugging

The dirtier the amine, the shorter the filter life. The shorter the filter life, the dirtier the amine. For really bad amine, filter pressure drop can increase by 1 psi per hour.

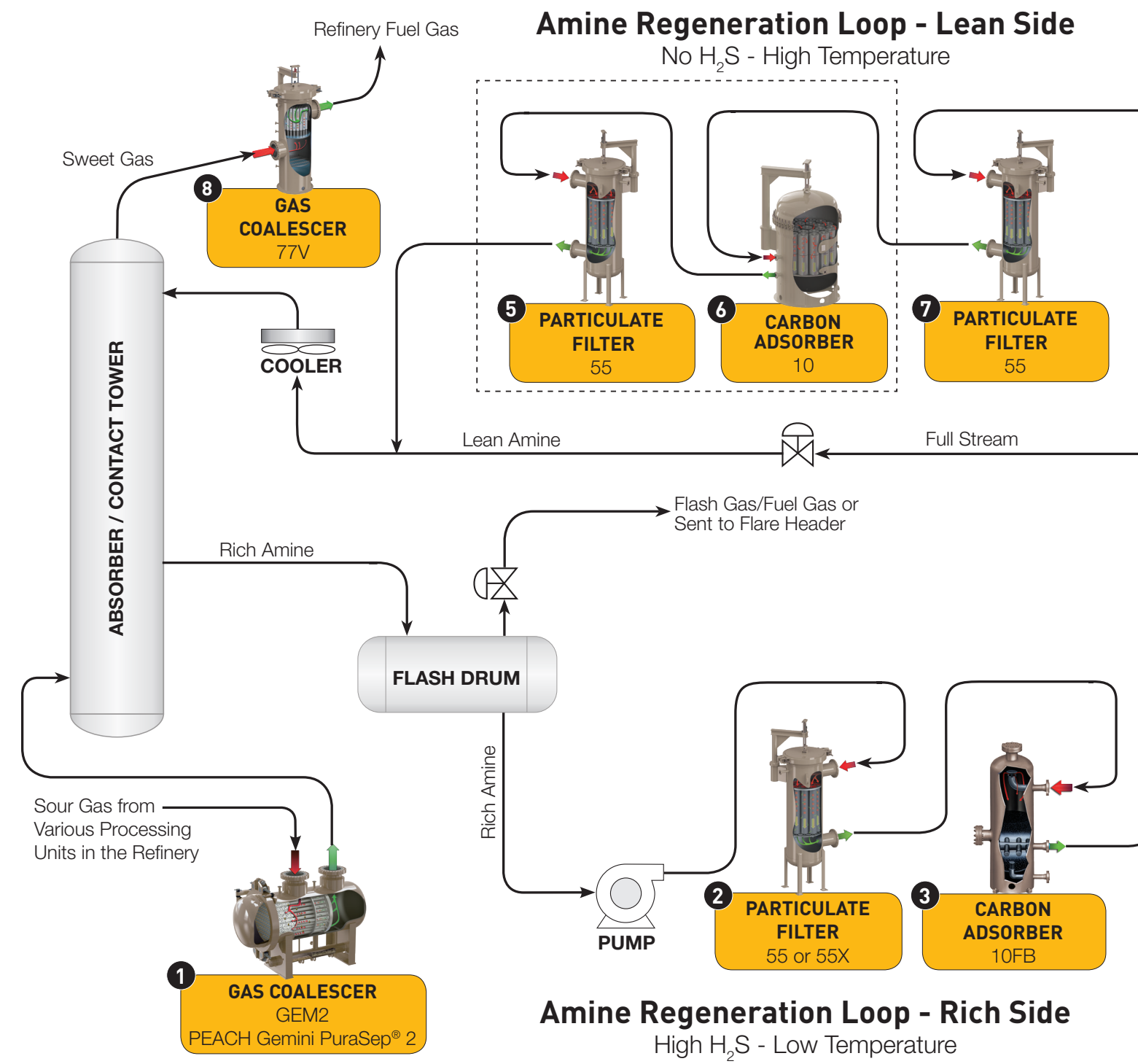
Regenerator Flooding

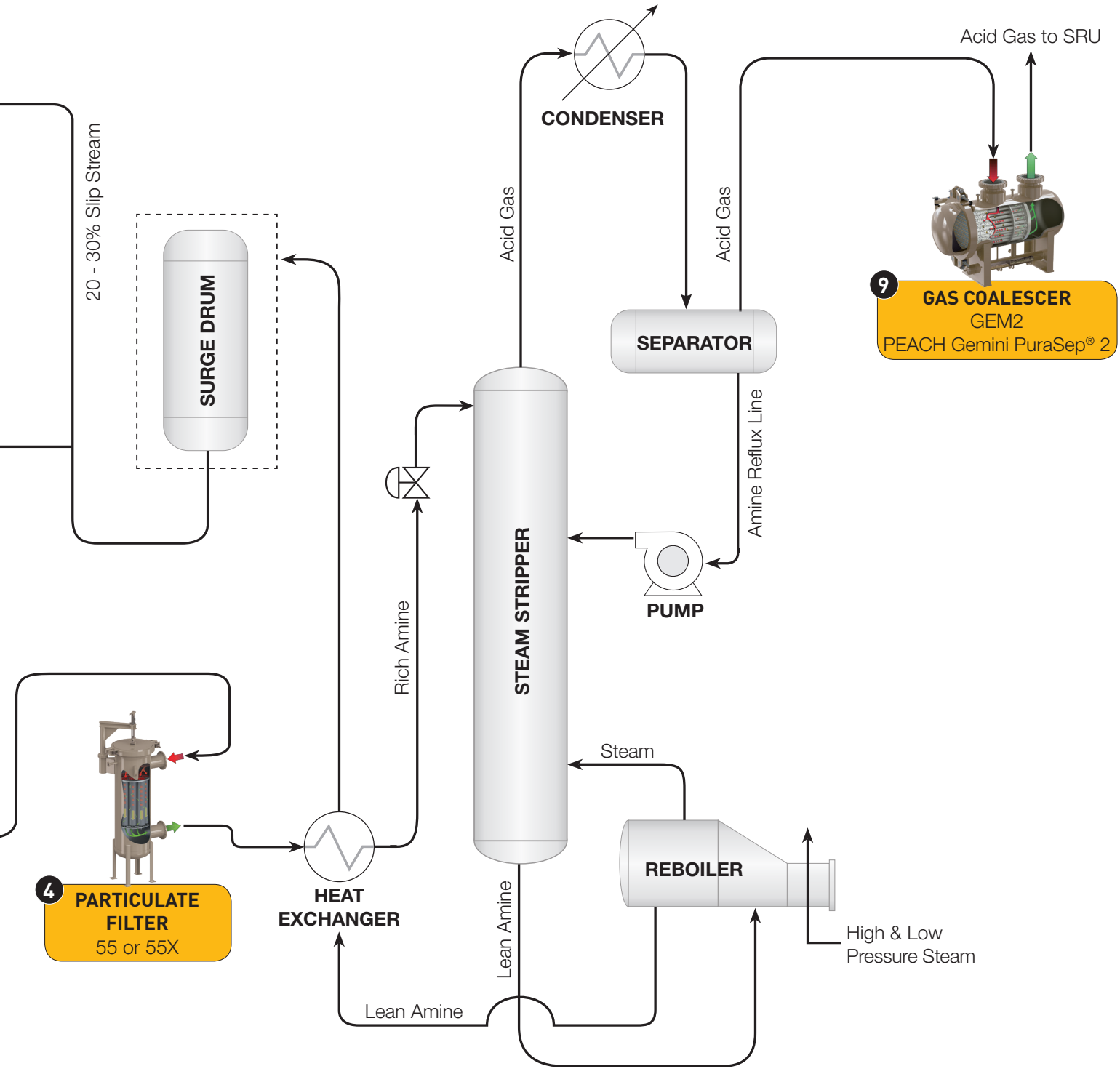
Eventually, dirty amine plugs the regenerator trays in the stripper and the massive carryover of liquid which follows shuts down the SRU.



REFINERY - AMINE UNIT

FILTRATION & SEPARATION EQUIPMENT




Acid Gas to SRU
CONDENSER
20 - 30% Slip Stream
SURGE DRUM
Acid Gas
Acid Gas
9
GAS COALESCER
GEM2
PEACH Gemini PuraSep® 2
SEPARATOR
Amine Reflux Line
STEAM STRIPPER
PUMP
Rich Amine
Steam
REBOILER
4
PARTICULATE FILTER
55 or 55X
HEAT EXCHANGER
Lean Amine
Lean Amine
High & Low Pressure Steam

FILTRATION SOLUTIONS

FEED, SOUR GAS FILTRATION

❶ Gas Filter-Coalescer

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

- High efficiency 0.3 micron coalescer
- Prevents hydrocarbon liquid & solids from entering the amine loop
- Reduces amine foaming
- Improves acid gas throughput
- Lowers antifoam consumption
- Reduces amine makeup
- Provides higher acid gas removal efficiency
- Lowers energy consumption in Reboiler
- Protects Absorber Contact Tower
- Lowers amine unit operational costs

RICH AMINE FILTRATION (usually full flow)

❷ Liquid Filter

PECO, XtreamPure®, Series 55X filter with 6" diameter XP cartridges or PECO, Series 55 filter with 2.5"/3" diameter PEACH® P90/PPL cartridges

- Minimizes solid contaminants in amine
- 20 micron filtration or smaller recommended
- Reduces fouling in Heat Exchanger, Reboiler, Stripper

❸ Carbon Adsorber

PECO, Series 10 carbon adsorber with bulk activated carbon or PECO, Series 10FB carbon adsorber with activated carbon canisters

- Carbon prevents degradation products & liquid hydrocarbons in amine
- Carbon needs to be changed on a regular basis

❹ Liquid Filter

PECO, XtreamPure®, Series 55X filter with 6" diameter XP cartridges or PECO, Series 55 filter with 2.5"/3" diameter PEACH® PPL/P90 cartridges

- High efficiency filter that minimizes solids in amine
- 20 micron filtration or smaller recommended
- Post carbon filter that removes carbon fines from amine

LEAN AMINE FILTRATION (20-30% slip stream)

❺ Liquid Filter

PECO, Series 55 filter with 2.5"/3" diameter Hot/Chem PEACH® HCP cartridges

- Minimizes solid contaminants in amine
- Handles high temperature amine
- 20 micron filtration or smaller recommended

❻ Adsorber Filter

PECO, Series 10 carbon adsorber with activated carbon canisters

- Carbon prevents degradation products & liquid hydrocarbons in amine
- Carbon needs to be changed on a regular basis

❼ Liquid Filter

PECO, Series 55 filter with 2.5"/3" diameter Hot/Chem PEACH® HCP cartridges

- Minimizes solid contaminants in amine
- Handles high temperature amine
- 20 micron filtration or smaller recommended
- Post carbon filter that removes carbon fines from amine

REFINERY FUEL GAS (Sweet Gas)

❽ Gas Coalescer

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

- High efficiency 0.3 micron coalescer
- Removes liquid carryover from the sweet gas
- Liquid carryover can cause issues with the downstream Refinery Fuel Gas system

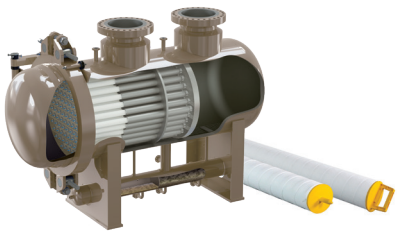
ACID GAS TO SULFUR RECOVERY UNIT

❾ Gas Filter-Coalescer

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

- High efficiency 0.3 micron coalescing & solids removal
- Removes particulate and liquid carryover from the acid gas
- Acid gas after the Steam Stripper goes to the Sulfur Recovery Unit (SRU) to be processed
- Contaminated acid gas affects the yield of sulfur in the SRU as these contaminants impact the functionality of the Claus catalyst

PECO Filtration Products

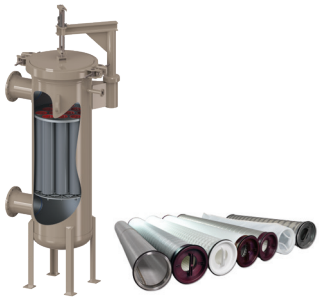


SERIES GEM2, PEACH GEMINI PURASEP 2
HORIZONTAL GAS FILTER-COALESCER

The PEACH Gemini PuraSep 2 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 solid 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 55 WITH HOT/CHEM PEACH
TRADITIONAL LIQUID FILTER

The Series 55 liquid vessels fit a variety of different styles of 2.5” and 3” diameter cartridges depending on the application needs. The vessel can be coupled with Hot/Chem PEACH, Series HCP cartridges for use in high temperature, sensitive compatibility fluids such as lean amine.

SERIES 10 & 10FB
CARBON ADSORBER

The Series 10 & 10FB carbon vessels utilize high quality activated carbon to adsorb dissolved liquid impurities from process streams such as air, gas, water, amine and glycol. Removal of these impurities is critical to prevent problems such as foaming, odor and contaminant buildup. The Series 10 holds carbon canisters and the Series 10FB holds loose, bulk carbon.

GLOBAL OIL & GAS FILTRATION OFFICES

North America

USA Oil & Gas Filtration
Mineral Wells, TX
940-325-2575
industrialprocess.na@parker.com

Canada Oil & Gas Filtration
Calgary, Canada
403-717-2891
industrialprocess.na@parker.com

Asia Pacific

Malaysia Oil & Gas Filtration
Kuala Lumpur, Malaysia
+603-8941-2366
IPF_Malaysia@parker.com

Korea Oil & Gas Filtration
Gyeonggi-do, Korea
+82-31-359-0782
KFDsales@parker.com

Europe & Middle East

Europe Oil & Gas Filtration
United Kingdom
+44 (0)191-402-9200
peco.emea@parker.com

Middle East Oil & Gas Filtration
Dubai, UAE
+971-4-812-7100
peco.emea@parker.com

Latin America

Latin America Oil & Gas Filtration
São José dos Campos, Brazil
+55-12-4009-3500
falecom@parker.com

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Parker Hannifin Corporation
Industrial Process Filtration Division
www.parker.com/ipf