Filtration Requirements for Downstream Oil and Gas Processes

Monday, April 9, 2018 by Filtration Team

Downstream oil and gas operations include refineries and petrochemical plants where crude oil is processed into finished products such as jet fuel, diesel, lubricants, and gasoline. Refineries operate around the clock, processing several hundred thousand barrels of crude oil a day. Reliable filtration is necessary to protect equipment, ensure production efficiency, minimize process upsets and downtime, and reduce maintenance costs.

Downstream processes that require filtration include:

- Amine sweeting and glycol dehydration
- Hydrocracking
- Hydrotreating
- Final product filtration

This blog will examine the role of filtration in each process and application.

Amine sweetening/glycol dehydration

Amine sweeteningremoves toxic and corrosive components, such as hydrogen sulfide (H2S) and carbon dioxide (CO2), from a hydrocarbon gas stream. Glycol dehydration removes water from the gas stream to prevent corrosion and freezing of processing equipment.

Filtering the amine or glycol liquid is necessary to remove particulate contaminants that reduce the operational efficiency of the processes. Full flow filtration is the best method for optimum efficiency of the sweetening and dehydration processes. Filtration products suitable for amine sweeting/glycol dehydration: Pleated media and depth media.

Amine sweeting and glycol dehydration filtration applications:

Sour water

Filtration on the sour water stream removes particulates caused by corrosion from hydrogen sulfide (H2S) and ammonia (NH3) to prevent fouling of the downstream piping and wastewater treatment equipment.

Make-up amine/make-up glycol

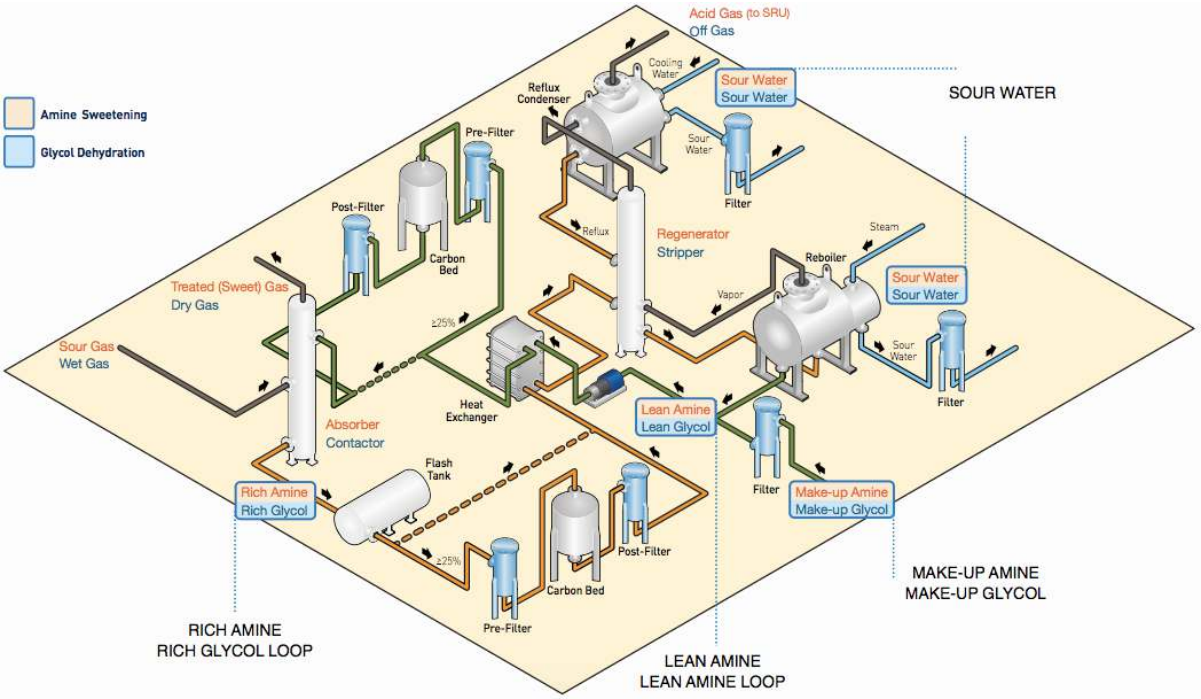
Make-up amine and glycol filtration protect the process loop from particulate contaminants that are carried over from the liquids' holding tank.

Lean amine / lean glycol loop

Lean amine filtration located upstream of the carbon bed extends the life and efficiency of the adsorbent resin. Located downstream of the carbon bed, post-filtration captures carbon dust and particles that plug process piping, valves, and the absorber/contactor. Protecting the absorber/contactor also reduces anti-foaming agent consumption.

Rich amine / rich glycol loop

Addressing the corrosive nature of hydrogen sulfide (H2S), carbon dioxide (CO2), and water with filtration on the rich process stream, closest to the source of contamination, is most effective at reducing system upsets and downtime.



Hydrocracking

Hydrocrackingis a process that breaks down heavy hydrocarbon molecules into a light, shorter chain hydrocarbons to produce valuable fuel products. Hydrocracking is done with heat, catalyst, and hydrogen. Hydrogen is used to purify the hydrocarbon stream from sulfur and nitrogen.

Solid and liquid filtration at this stage improves hydrocracking process fluid quality by removing contaminants from sour water, reactor feeds, and hydrocracker feeds. Filtration products suitable for hydrocracking applications: Pleated media, depth media, absorption cartridges, and liquid/liquid coalescers.

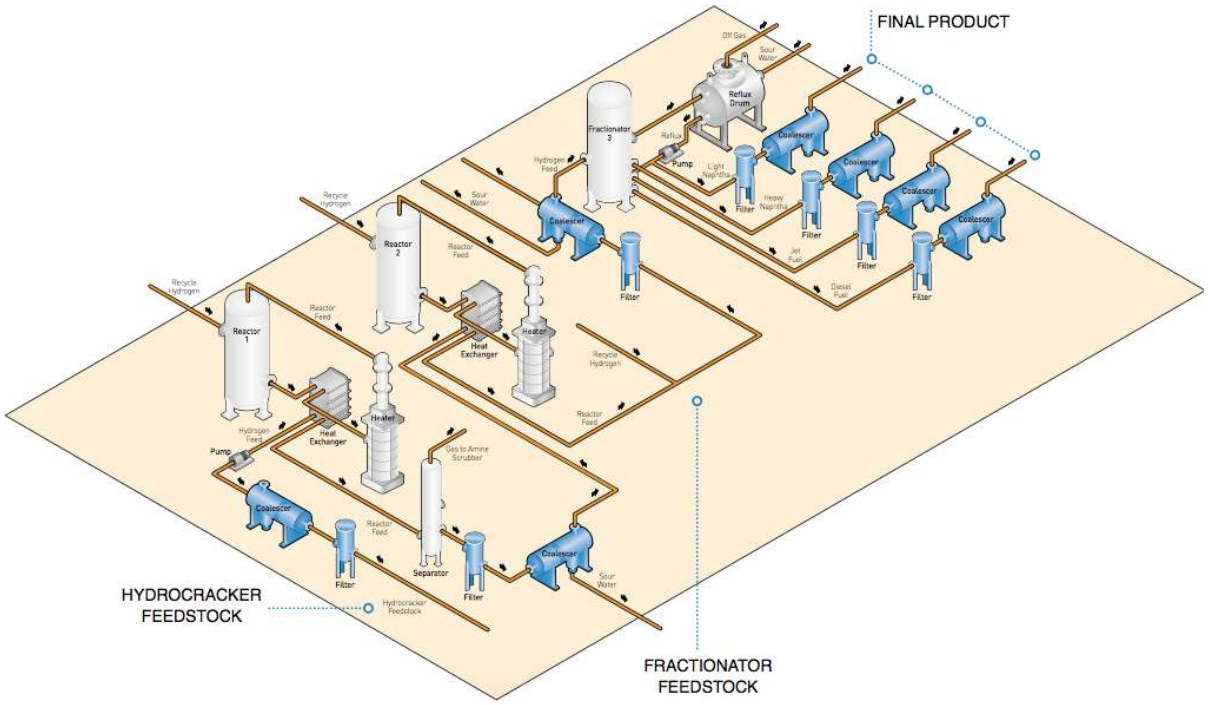
Hydrocracking filtration applications:

Hydrocracker feedstock

Filtration of the hydrocracker feedstock minimizes buildup of scale in the heat exchanger and heater and protects the reactor catalyst to ensure optimal heat transfer of fluids and reduce energy and maintenance costs.

Fractionator feedstock

Fractionator feedstock filtration prevents contamination on separator plates within the fractionator ensuring accurate and efficient separation within the column.



Hydrotreating

Hydrotreatingis used to desulfurize petrochemical feedstock through a catalytic conversion.

Petrochemical feedstocks and hydrogen are combined downstream of the refinery distillation process and fed to the fixed-bed catalyst hydrotreater at high temperatures and pressures. Filtration is essential during this process to remove contaminants from catalytic reactions and feedstock and protect the downstream pump, heat exchanger, heater, compressors, and fixed bed catalyst reactor. Filtration products suitable for hydrotreating applications: Pleated media and depth media.

Hydrotreating filtration applications:

Lube oil

Filtration of lube oil removes damaging particulates, extending the life of the compressor and other critical equipment.

Make-up hydrogen

Filtration of the hydrogen stream removes particulates prior to entering the petrochemical feedstock and protects system performance.

Hydrotreater feedstock

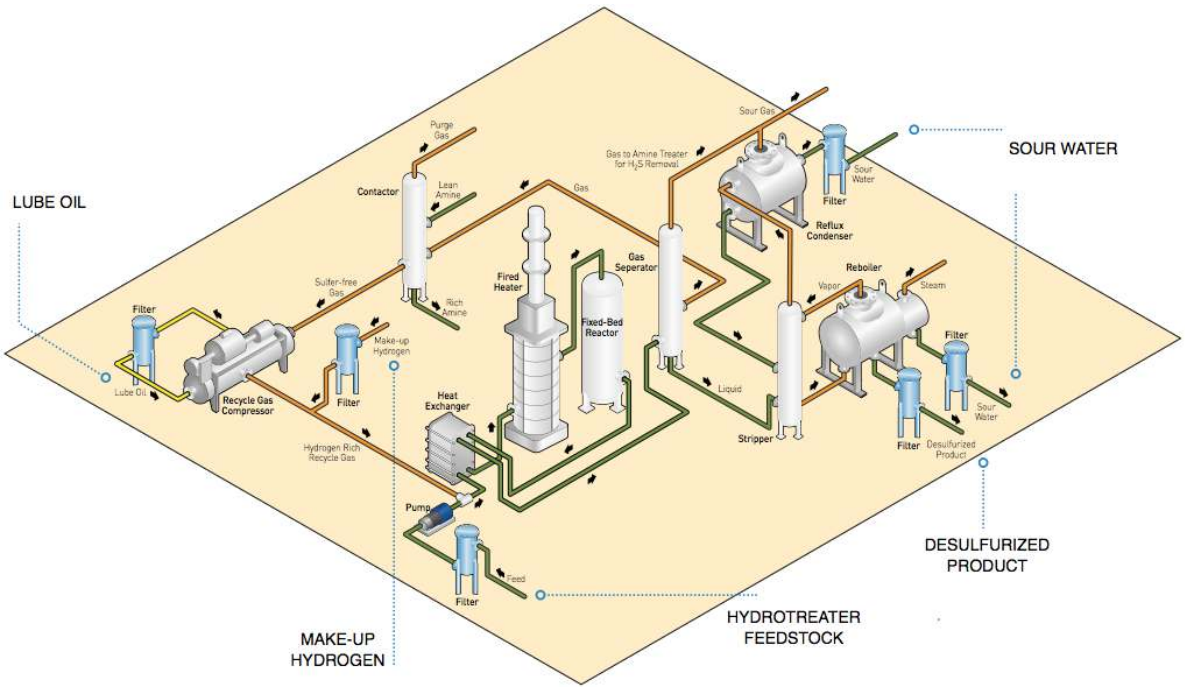
Hydrotreater feedstock filtration prevents scale buildup in the heat exchanger and heater and protects the reactor catalyst to ensure optimal heat transfer of fluids and reduce energy and maintenance costs.

Desulfurized product

Filtration systems safeguard downstream equipment, such as distillation columns, reactors, heat exchangers, and pumps, to maximize refinery efficiency and limit process downtime.

Sour water

Filtration is necessary to remove particulates in sour water caused by corrosive hydrogen sulfide (H2S) and ammonia (NH3) that can foul downstream piping and wastewater treatment equipment.



Final product filtration

Final product filtrationoccurs after processing and refining when fluids and fuels are transferred through pipelines and storage systems for delivery. At this stage, water, dirt and other contaminants can enter the system and must be removed by high-quality micro-filtration and water separation systems. Final product filtration extends catalyst life and protects processing equipment. Filtration products suitable for final product filtration: Pleated media, depth media, absorption cartridges, and liquid/liquid coalescers.

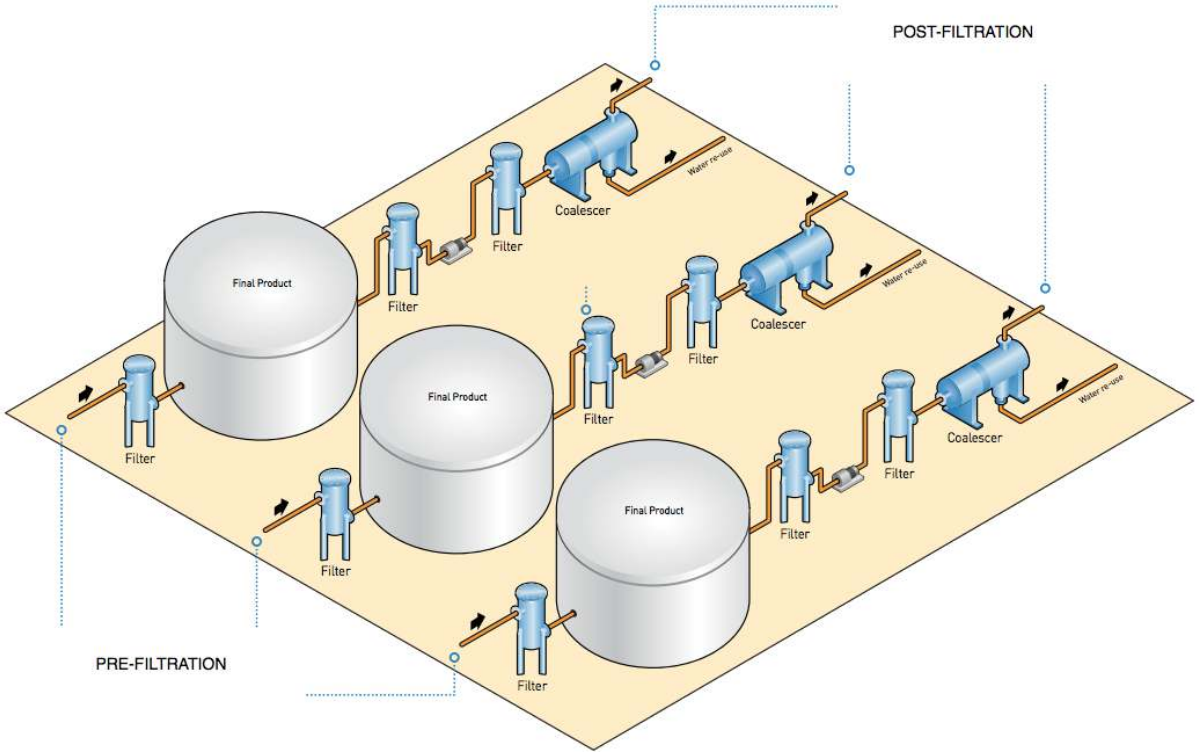
Types of final filtration:

Pre-filtration

Contaminants are generated when the final product is transferred from the refining processes to the storage tanks. Pre-filtration located upstream of the storage tanks prevents solid contaminants from entering the tank farm, which improves the overall quality of the finished product and reduces maintenance associated with tank cleaning.

Post-filtration

Coalescing filtration located downstream of the storage tanks protects critical equipment from solid impurities caused by pipe scale and corrosion during storage and removes entrained water from the final product.



Conclusion

The proper design and optimization of filtration systems will directly impact the efficient and reliable function and operational costs of downstream oil and gas processes. Parker domnick hunter offers a broad range of filtration media technologies — pleated, depth media, absorption, and coalescing — to meet the most demanding compatibility issues as well as efficiency, temperature, and flow requirements. Parker also offers standard and custom designed stainless steel vessels that adhere to GMP Industrial design with coded options (ASME, CRN, PED-CE).