Protecting Ultra Lo NOx Burners Cost Effectively

With increased demand on emissions control, United States refineries are required to find ways to further reduce NOx emissions. Although conventional Lo NOx burners are capable of reducing NOx emissions to the 25-50 ppm range, further reductions are necessary. In order to achieve these reductions, refineries are implementing Ultra Lo NOx burners. Ultra Lo NOx burners are capable of reducing NOx emissions to below 25 ppm. The smaller orifices required in these burners, however, make them susceptible to fouling from the liquids and solids present in refinery fuel gas systems. Liquids, such as light hydrocarbons and amines or solids, such as rust and scale, can coat or plug tips negatively impacting flame pattern and burner performance. This results in excessive costs from unscheduled maintenance & downtime and as a worst case scenario, the need to shut down an entire unit. One way to prevent these problems is by using high efficiency liquid/gas coalescers to treat the fuel gas before it reaches the tips.

LIQUID/GAS Coalescers

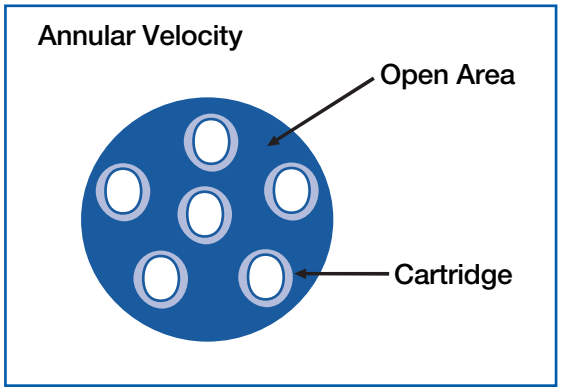
Liquid/gas coalescers are a common sight in todays refineries. These devices are used to coalesce fine aerosols from gas streams and protect various equipment such as contact towers, compressors and burners. Although liquid/gas coalescers are generally viewed as indistinguishable between manufacturers, there are substantial differences in performance and sizing characteristics.

Critical sizing parameters such as annular velocity, media velocity, clean differential pressure, saturated differential pressure and drainage capability need to be considered in order to properly size the coalescers to insure adequate downstream equipment protection. Although the lowest initial cost is usually the determining factor in choosing a liquid gas coalescer, the initial dollars saved may be minimal compared to the problems experienced once the unit goes on line.

Definitions

1. Annular Velocity:
   Velocity of the gas in the annulus of the filter housing. Maximum annular velocity is affected by such parameters as gas density, aerosol density, gas viscosity and interfacial tension of the liquid being coalesced.

Figure 1: Top View of a Pall Liquid/Gas Coalescer



2. Media Velocity:
   Velocity of the gas as it passes through the filter medium. Aerosol concentration and the wettability of the media contribute to the determination of the maximum media velocity.

3. Clean Differential Pressure Drop:
   Represents the pressure losses from inlet to outlet in a filter assembly. It includes nozzle, tubesheet and cartridge losses.

4. Saturated Differential Pressure:
   Represents the pressure losses experienced once the cartridge is exposed to liquids causing the cartridge to become saturated. This is some value higher than the clean differential pressure.

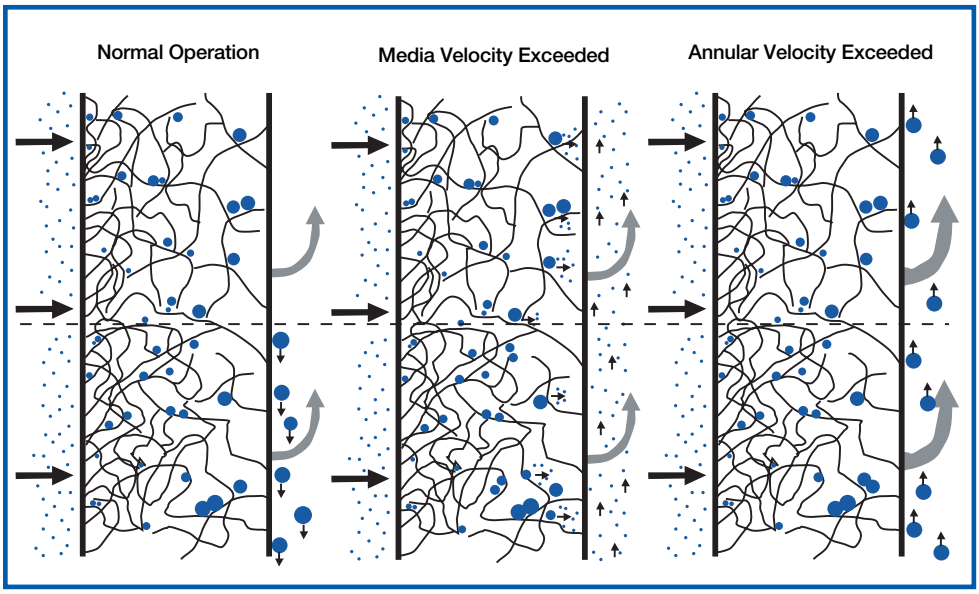
5. Drainage Capability:
   How effectively the cartridge sheds liquids.

LIQUID/GAS Coalescer Sizing

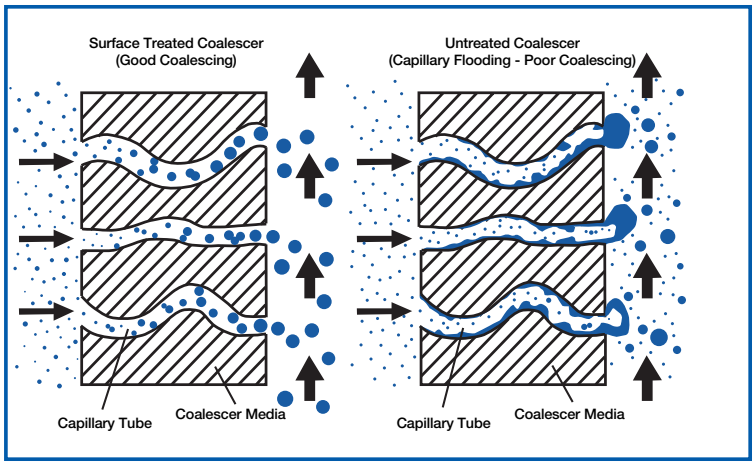
As stated earlier, a number of parameters need to be considered when sizing a liquid/gas coalescer. If any of these parameters are exceeded or ignored, the coalescer could be rendered ineffective. For example, if critical annular velocities are exceeded, liquids could easily be re-entrained in the gas stream and reach the burner tips or other critical downstream equipment. If media velocities are exceeded, a sparging effect could occur which would break larger droplets into smaller droplets which would easily be carried over (see Figure 2) Although a liquid/gas calescer may have an acceptable clean pressure drop, the question to ask is what happens once liquids contact the media? If the media doesn't effectively drain the liquids, the effect is of a sponge soaking up liquid. Initially, this may appear to be a acceptable, until the media becomes saturated and starts shedding liquids which carryover into the burner tips. Careful sizing steps need to be taken in order to avoid these issues.

Pall Corporation has been providing high efficiency liquid gas coalescers to the oil and gas industry for over 15 years. Pall's proprietary sizing program and patented media treatment technology provide the most economic and efficient sizing for each individual application. All critical parameters are taken into account and calculated based on the input values provided. Maximum annular velocity; maximum media velocity; clean and saturated differential pressure and droplet size are all calculated by the sizing program for each application.

Figure 2: Three Conditions of Operation



Plus, Pall's patented media treatment (illustrated in the diagram below) allows smaller overall systems to be used compared to other manufacturers because of the enhanced drainability provided. An untreated cartridge needs to be in a larger vessel because it can't handle the velocities and doesn't have the drainage properties of a treated element.



Not all manufacturers take these parameters into account and no other manufacturer (besides Pall Corporation) has an oleophobic/hydrophobic media for enhanced drainability.

If you are considering upgrading to ultra Lo NOx burners or are currently having contaminant related burner problems, please contact Pall Corporation or visit our website @ www.pall.com.

Case Study

A major producer in the mid-continent area operates a 400,000 bpd refinery. Fuel gas produced at this refinery is burned and used to heat the coker unit.

Problem Area

Liquids and solids in the fuel gas line would prematurely plug the burner tips. This resulted in unscheduled maintenance, downtime and lower heating values for the coker.

Solution

Refinery management installed a Pall Liquid/Gas Coalescer system on the main fuels gas header. Pall Corporation's SepraSol™ system successfully removed liquids and solids from the fuel gas stream providing protection to the burner tips.

Benefits

1. No unscheduled maintenance for the burner tips.
2. Maximum heating value is derived from the burned fuel gas.
3. A minimum of $25,000 in maintenance savings per year.
4. A potential savings of $2,000,000, if the coker was required to be shut down due to burner fouling.
5. Other lines not protected by the liquid/gas coalescers required five times the routine maintenance of the Pall protected lines.
6. Element change out frequency is every 8–12 months.

PALL Fuels and Chemicals

Pall Corporation

888.873.7255 toll free in the USA
+01.516.484.0364 fax
FuelsandChemicals@pall.com email

Pall Europe Limited

02392 303303 phone
02392 302509 fax
FuelsandChemicals@pall.com email

Filtration. Separation. Solution.SM

Visit us on the Web at www.pall.com

Pall Corporation has offices and plants throughout the world in locations including: Argentina, Australia, Austria, Belgium, Brazil, Canada, China, France, Germany, Hong Kong, India, Indonesia, Ireland, Italy, Japan, Korea, Malaysia, Mexico, the Netherlands, New Zealand, Norway, Poland, Puerto Rico, Russia, Singapore, South Africa, Spain, Sweden, Switzerland, Taiwan, Thailand, United Kingdom, United States, and Venezuela. Distributors are located in all major industrial areas of the world.