HFC 1001/1003/1005/1009/1020

HIGH FLOW LIQUID/GAS COALESCER

Technical Specification

Product Description

The John Crane HFC High Flow Liquid/Gas Coalescer is specially designed to remove aerosol liquids and solids from process and fuel gas to undetectable levels. Improved separation efficiency and longer operation lifetimes are assured by specially formulated oleophobic and hydrophobic coalescer elements housed in a forged/welded pressure vessel, complying to international standards.

In addition to complying to filtration requirements for contaminants of 0.3 micron at particulate efficiencies of 99.9%, the coalescing performance will remove 99.9% of the aerosol droplets, all within a small footprint with a high dirt-holding capacity. For highly contaminated gases with aerosol concentrations of 500 ppm and above, a combination of conventional technologies such as mesh pads or cyclone separator is recommended for use with the HFC.

Applications

Treatment of fuel and process gases in refinery, petrochemical and chemical plants including:

- Protection of burner tips in furnaces from fouling created by fuel gas contaminants
- Protection of molecular sieve dryer beds (dehydrators) from process gas impurities
- Protection of amine units in refineries from process sour gas contaminants

In addition, the coalescer can be considered for treating fuel gases to medium size gas turbines and compressors. Future applications will include green hydrogen.

Qualification Standards

Standard compliance ASME VIII Div 1/U Stamp/PED/ATEX
Optional compliance: CRN, TR-CU, DOSH, NR13, AS1210, UKCA

Operating Parameters/Design Conditions

Pressure vessels (housings) are available in stainless steel 304 and in carbon steel

- Filtering of process and fuel gases with cleanliness requirements down to 0.3 micron and removal of 99.9% of solids
- Removal of aerosol liquids down to 99.9% efficiency
- High dirt-holding capacity

Temperature:	-29° to 175°C/-20° to 347°F (fuel gases) -29° to 100°C/-20° to 212°F (process gases)
Pressure:	Up to 30 barg/441 psig (fuel gases) 3 to 10 barg/44 to 147 psig (process gases)
Flow rate:	450 actual m3/hr (265 actual CFM) per element (Handling capacity varies depending on number of elements in the pressure vessel)
Initial DP	0.1 barg/1.5 psig (recommended)
Change-out DP	1 barg/14.7 psig (recommended)

Design Features

- Particle filtration coupled with coalescence to remove solids and aerosols
- Optimization of element length/diameter ratio, inlet/outlet location and flow control to enable the lowest pressure drop across elements
- Special coating to impart oleophobicity to elements for improved drainage and reduced pressure drop
- Simplified forged/welded vessel construction to handle a wide range of gas flow rates

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Characteristics of Pressure Vessels (Housings)			
Actual Gas Flow Rate Range	**# Elements**	**Vessel Type/Material**	**Name**
0 to 450 am^3/hr (0 to 265 ACFM)	1	Forged, SS 304 or CS	HFC 1001
450 to 1350 am^3/hr (265 to 800 ACFM)	3	Forged, SS 304 or CS	HFC 1003
1,350 to 2,250 am^3/hr (800 to 1325 ACFM)	5	Welded, SS 304 or CS	HFC 1005
2,250 to 40,50 am^3/hr (1325 to 2380 ACFM)	9	Welded, SS 304 or CS	HFC 1009
4,050 to 9,000 am^3/hr (2380 to 5300 ACFM)	20	Welded, SS 304 or CS	HFC 1020
9,000+ am^3/hr (> 5300 ACFM)	20+ (TBD)	Welded, SS 304 or CS	Custom

Dimensions of Pressure Vessels*		
HFC 1005 (5 elements)	**HFC 1009** (9 elements)	**HFC 1020** (20 elements)
Outer Diameter: 655 mm/2.1 ft	Outer Diameter: 915 mm/3 ft	Outer Diameter: 1,150 mm/3.8 ft
Total Height: 3,170 mm/10.4 ft	Total height: 3,350 mm/11 ft	Total Height: 3,700 mm/12.1 ft
Weight of Housing: 1,620 kg/3,500 lbs	Weight of Housing: 2,900 kg/6,400 lbs	Weight of Housing: 7,500 kg/16,500 lbs

*HFC 1001 and HFC 1003 – available upon request.

Characteristics of Element

- Length: 775 mm/30 inches
- Dimensions: 162 mm/6.4 inches (outer diameter)
  (One element size is designed to cover the entire product range)
- Weight of element: 16.5 kg (36.2 lb)

Pressure Drop

The pressure drop in a filter system is the pressure difference before and after the filter system. Pressure drop occurs due to transfer valves, pipe bends, filter media selection and the loading of the filter element. Pressure drop curves in gas coalescing application show three stages:

Start-up (clean) pressure drop

When a new filter element is installed, the element is clean and dry, the filter media pores are not blocked with particles or liquid droplets, and gas flows freely; most of the pressure drop is caused by the filter system.

Operational (saturated) pressure drop

The filter element is capturing/coalescing and draining liquids from the gas flow. The filter element pores are partially blocked with captured droplets (saturated) and the gas has more restrictions when passing through. The operational pressure drop when fully saturated can be 4 times higher than start-up. Depending on the liquid concentrations in the gas, the filter element becomes saturated in a time ranging from several hours to several days.

Replacement stage

Over time, the element also traps more and more particle contamination from the gas flow. Increased particle loading blocks more of the filter media leading to a further increase in pressure drop, up to the alarm point where the filter element requires to be replaced.

Why is pressure drop important?

- Operational/saturated pressure drop has direct impact on the performance, lifetime, and energy consumption of the filter element.
- The HFC liquid/gas coalescer has a combination of solutions to keep both clean and saturated pressure drop as low as possible:
  - Flow optimized system design
  - Oleophobic filter media
  - Optimal filter element size

Using advanced prediction software based on actual CFD tests, clean and saturated pressure drop is predicted for every filter to optimize filter size for process conditions.

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