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پارس تکنیک

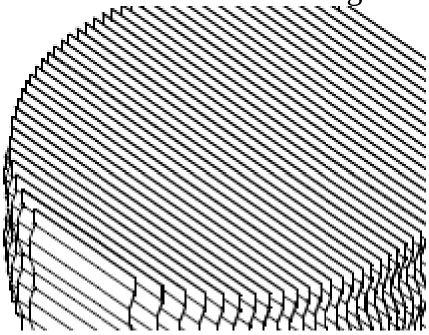
طراحی ، ساخت و نصب تجهیزات
پالایشگاهی و نیروگاهی

Vane Mist Eliminators

Vane mist eliminators consist of a series of plates or vanes spaced to provide passage for vapor flow and profiled with angles to provide sufficient change of direction for liquid droplets to impact, coalesce and drain from the surfaces of the plates. PTC design and manufacture a range of vane styles which provide the following benefits:

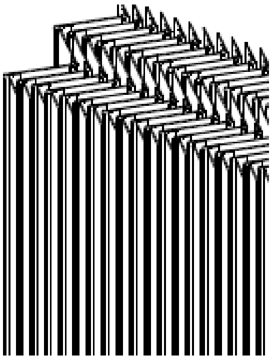
- High vapor capacity
- Resistance to fouling
- Low pressure loss
- Effective removal of high liquid loads

The "VV" Range is a plain, no pocketed style designed for larger droplet removal from vapor in normal light fouling applications with either vertical or horizontal gas flow.



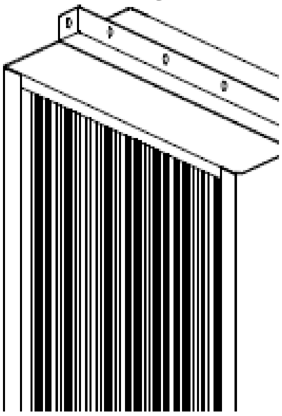
"V-V" Droplet Separator

The "VH" Range is designed for droplet removal from vapor flowing horizontally. In this configuration, the vanes are fitted with hooks (VH11) or pockets (VH-2) to trap and drain the collected liquid. They are generally effective at higher vapor velocities at which smaller droplet size removal can be achieved.



"VH-1" Droplet Separator

Both of the above styles can be supplied in sections for installation through vessel manways to be supported on full annular support rings welded to the vessel wall.
Alternatively, they can also be supplied as complete "**Vane Packs**" where the vanes are enclosed in a **Frame** which is flanged for direct attachment to a "gas box".



"VH-1-F" Droplet Separator

The "VV" Range

The VV is an efficient style of vane mist eliminator commonly used for removing entrained liquid from vapor flowing vertically upwards, and for fouling services. In this configuration, liquid droplets impinge and coalesce on the vanes as the vapor flow is elected around the vane profile. The liquid collected on the vanes drains downwards under gravity so long as the vapor velocity is not high enough to cause re-entrainment.
The graph overleaf shows the relationship between vapor rate and the droplet size range which is effectively removed (typically 99% removal).
Vane assemblies are fabricated in sections sized to fit through vessel manways. Generally, they are supported on an annular ring welded to the vessel wall with additional mid-span supports being required where the vessel diameter exceeds approx 1000mm. Hold down bars should be fitted to cleats welded to the vessel wall to secure the pack.

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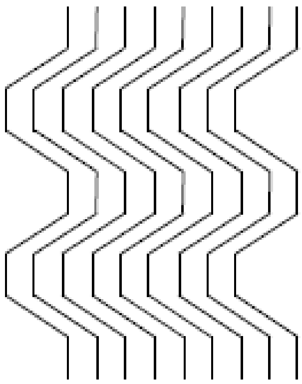
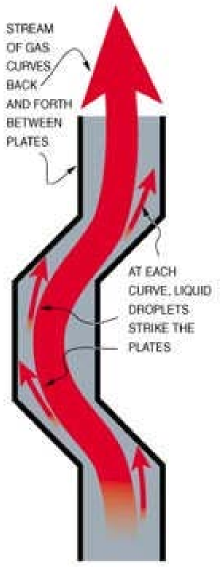
Vane Mist Eliminators

The principal applications for this style of droplet separator are the removal of coarse entrainment with high liquid load and also services of a fouling nature. For severe fouling duty e.g. containing dust, the unit could be installed together with a spray system designed to wash out collected solids.



Gas & Mist Flow

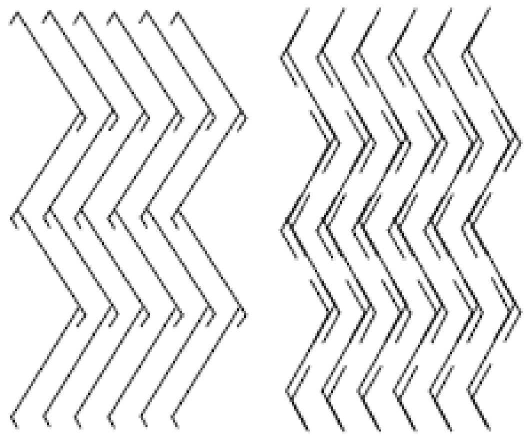


The "VH" Range

The AlphaMIST VH is a vane pack for efficient droplet removal and resistance to fouling suitable for high rate horizontal vapour flow. Entrained liquid droplets impinge on the vanes and collect in pockets that trap the coalesced liquid which then drains from the unit rather than being blown through by the vapour. Collection efficiency is a function of both vapour velocity and the difference in density between the vapour and liquid. The graph below shows the relationship between vapour rate and the droplet size range which is effectively removed (typically 99% removal).

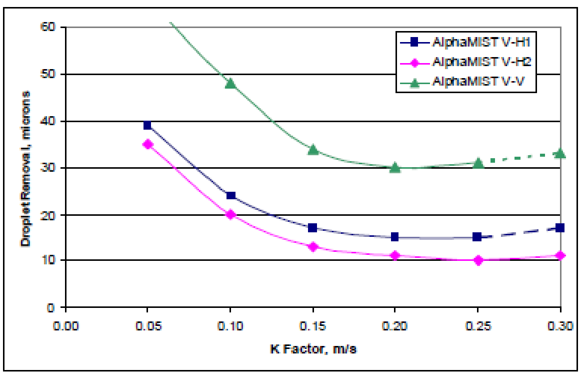
PTC offers a hooked (VH-1) design as standard and a pocketed (VH-2) design for more arduous applications in clean service.

VH vane packs are fabricated in sections sized to fit through vessel manways.



“VH-1” “VH-2”

The installation arrangement should ensure that the vane pack is clamped to a ledge and effectively prevents vapor from bypassing the vanes. To achieve this, the VH is normally supplied mounted inside a suitable frame as a VH-F unit with a drainage channel and flanged for mounting to a suitable plate or gas box inside the process vessel.



Vane Mist Eliminators

Mist Eliminator Design

The design of vane mist eliminators depends on many factors, but a preliminary sizing can be undertaken relatively easily using proprietary K factors in the same way as for wire mesh demisters.

Face Area

Although it should be treated with caution and confirmed with PTC before actual use, the following procedure may be used:

$V_{vme} = K . \{ (\rho L - \rho V) / \rho V \} 0.5$

where:

V_{vme} = Max velocity in vanes, m/s
K = K-Factor, see below, m/s

ρL = Density of liquid, kg/m³

ρV = Density of vapour, kg/m³
and:

A_{vme} (m²) = Q (m³/s) / V_{vme} (m/s)

Vane Style	K-Factor
V-V (vertical gas flow)	0.175
V-V (horizontal gas flow)	0.200
VH-1 (horizontal gas flow)	0.225
VH-2 (horizontal gas flow)	0.250

Pressure Drop

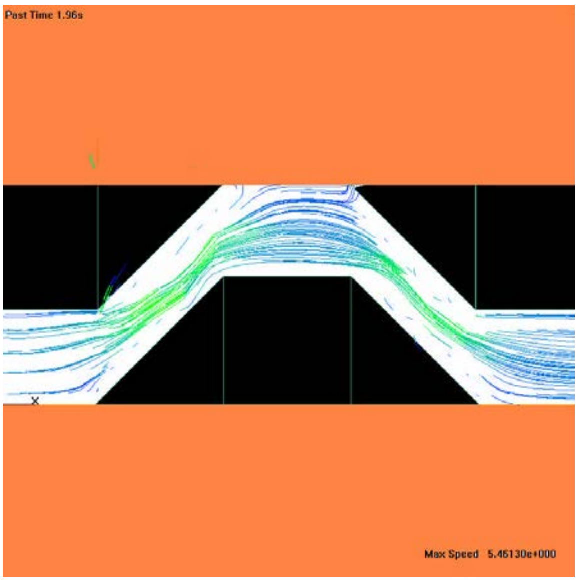
The disadvantage of using the more expensive, pocketed designs is that the pressure drop is higher. To estimate the pressure drop, the following method can be used:

$\Delta P = C . (\rho L - \rho V) . K2$

where:
ΔP = Pressure drop, Pa
C = Vane design factor

V-V style,	C = 10
VH-1 style,	C = 15
VH-2 style,	C = 20

Typically, the pressure drop will be in the range of 0.2 – 0.8 kPa (approx 20 to 80 mm water gauge).



CFD study of V-V vane design

Fine Mist Removal

Removal of very small droplets can be achieved using a two stage mist eliminator by fitting a mesh pad to the upstream face of the unit to coalesce droplets as small as 4 to 5 microns into droplets in the size range which are easily removed by the vane separator?

Add the prefix M to the relevant vane style for a two stage mesh / vane mist eliminator.

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