SCIC
SINGAPORE CHEMICAL INDUSTRY COUNCIL

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Pre-Digest

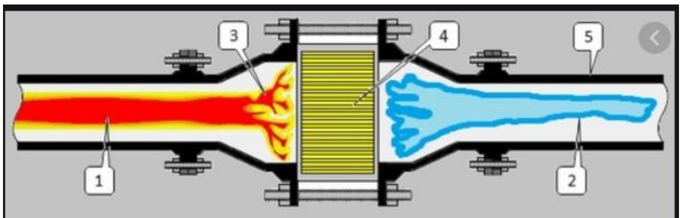
Importance Of a Flame Arrestor

What Is a Flame Arrestor?

A device that prevents transmission of an accidentally ignited **flame** by **interrupting** its progression through it. It is typically installed at the flange of an equipment or to the connecting pipe work in a system of equipment to allow gases, liquids, etc., to flow through but preventing the transmission of a flame. It prevents larger fire or explosion in the protected equipment.

Typically flame arrestors are used on tank vents and process piping which may have potential of flammable gases with oxygen (mainly from air) being present. When designed, installed and maintained properly, flame arrestors can prevent catastrophic damage to equipment and loss of lives.

How does a Flame Arrestor work?



1. Exposed Side 2. Protected Side 3. Flame stabilized on arrester element 4. Flame arrester element absorbs and quenches flame front 5. Piping

Whenever a flammable gas or vapour is mixed with air/oxygen, there is the potential for a fire in the presence of an ignition source. Ignition of the flammable mixture will result in a flame that may travel through the unburnt mixture until the fuel is consumed. In an enclosed space, such as an equipment or a pipe, the significant temperature increase of the mixture caused by the combustion process will lead to a rapid increase in the volume of the gas mixture. The resulting increase in pressure will induce turbulent effects which will further accelerate the flame front.

Flashback occurs when the flame propagation speed in the mixture is higher than the gas flow velocity. A flame arrestor works by removing the heat from the flame front sufficiently fast to extinguish the flame and cooling down the flowing gases sufficiently to prevent re-ignition at flame arrestor outlet. Typical construction of a flame arrestor consists of permeable metallic element which allows the gas to flow through but cools down the flame front as it passes through it due to the expanded path provided by the element. Other flame arrestor designs include metal packing, tube bundles, parallel plates, or liquid seals.

Flame arrestors may be installed in different configuration in field and appropriate selection of type is necessary for their effectiveness. Selection is usually from either “End of Line Deflagration Flame Arrestor” or “Inline Detonation Flame Arrestor”.

Flame arrestors are considered as passive barriers. However as flame arrestors internal element is continuously exposed to process gas, they may get clogged due to deposition (depending upon gas service) or damaged due to corrosion. Regular inspection and proper maintenance of flame arrestor are necessary to ensure its integrity is not impacted and will work as intended on demand. The cleaning of internal element of a flame arrestor should be done carefully to prevent its damage due to fragile nature of construction. Few chemical industry accident investigations have indicated the following contributing factors relating to Flame Arrestors:

- Inadequately maintained flame arrestors
- Missing or damaged elements of flame arrestor
- Installation of wrong type of flame arrestor made it ineffective

Reference:

- *Guidelines for Engineering Design For Process Safety, Center for Chemical Process Safety*
- *API RP 2028 - Flame Arresters in Piping Systems; Third Edition*
- *API RP 2210 - Flame Arresters for Vents of Tanks Storing Petroleum Products*

Process Safety is Everybody’s Responsibility!

An initiative of the Process & Engineering Committee

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