

Combustion Characteristic and Thermal Efficiency

(Comparison of Porous Media for Atmospheric Premixed Burners)



Ceramic Plaque (CP)



Stainless Steel Fin (SF)



Metal Fiber (MF)

| | | | |
|------------------------------------|--|---|--|
| Media description | Cordierite and ceramic fiber are square or circle plate designed suit for less power input as infrared heating due to limited by pore size | Stainless steel fin or metal perforate plate produces by customizing various flame hole along the burner head | MF can produce even sintered and kitted media. The latter can manufacture any shapes suit for customized process heating |
| Pressure drop | MF < SF < CP, MF perforated media offers the lowest pressure drop range between 1-40mm WC (80% < SF) * Less media ΔP allows gas travel through burner head without blocking cause of flashback circumstance | | |
| Combustion character | Surface radiation | Partial heating / Hot spot | Homogenous combustion even radiation and blue-flame mode which hole surface being heat |
| Turndown ratio | 3:1 | < 10:1 | up to 20:1 |
| Thermal efficiency | Moderate | Lowest | Highest |
| Emission | Moderate emission level CO : MF << CP < SF NOx : SF < CP < MF | Lowest NOx emission CO : MF << CP < SF NOx : SF < CP < MF | Lowest CO emission but highest NOx emission than others except during radiation mode which intimate contact between gases and fibres leading <u>lower NOx</u> than other burners |
| Operation | Recommend to operate on/off due to low gas pressure is regularly use. | Instant high/low operation but need special designed e.g. slow-open gas train prevention burner flame-off | Silence and smooth high/low operation without any special components |
| Strength / Weakness | Inexpensive / A lot of maintenance work | Easy to make / Hole is easy to deform when burner operate exceed gas *red | Material is extremely resistance to oxidation / Not resistance with base-acid corrosion or operate over limit temperature 1,100 deg.C |
| Thermal shock resistance | Flame surfaces are vulnerable to water | Yes | 100% resistance thus water splashed on surface without leaving any damages |
| Mechanical shock resistance | Easy to breakage due to the brittleness of material | Yes | Yes |



Left : Normal operation surface 850 deg.C
* Infrared mode offer radiation heating

Right : Exceed gas surface 1,000 deg.C
* flame lift on surface present, near to flashback circumstance



Left : Low fire operation

Right : High fire operation
* Incomplete combustion due to limited by drilled hole as long orange flame occurred



Left : Low fire operation

* Infrared mode offer radiation and less NOx

Right : High fire operation

* Blue-flame mode offer complete combustion with large amount of hot air