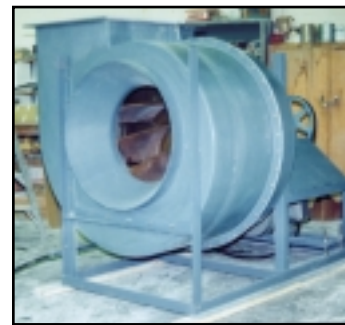


Plasticair Inc., Servicing Industry



Polycube™



FRP Fans



Scrubbing Equipment



Laboratory Fumehoods

Patent
Pending

Bulletin #090
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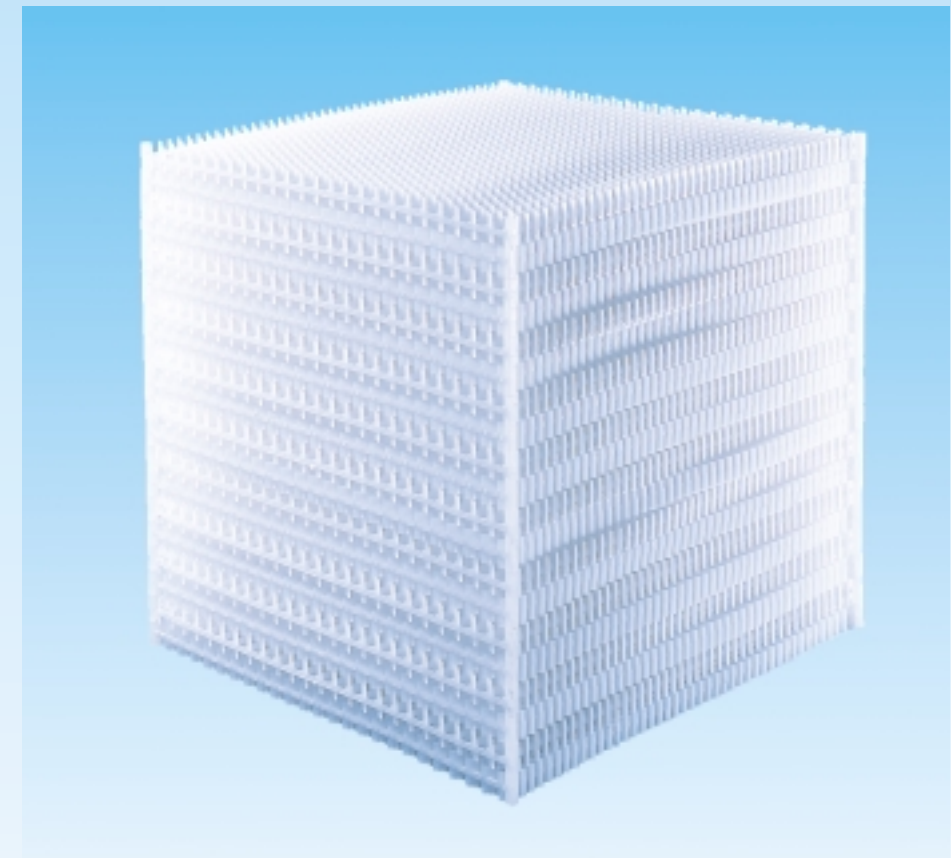
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Polycube™

Mass Transfer Packing Technology Breakthrough



50% Reduction In Energy Consumption



Plasticair

PLASTICAIR POLYCUBE™ PACKING

Plasticair's **Polycube™** Packing is a revolution in Crossflow mass transfer technology. The innovative high density design has taken the best qualities from random packing and the best qualities from structured packing. The sum of these combined assets results in a packing efficiency never before achieved.

Why was Polycube™ Developed? Conventional random packing comes in a variety of shapes and sizes. Typically the larger sizes are used to minimise the airside pressure drop. Doing this however requires using large amounts of liquid to achieve an acceptable contaminant removal efficiency due to the low available wetted surface area. *(Reducing the size of random packing lowers liquid requirements and increases mass transfer due to more surface area. However, these positive features are countered with a very high airside pressure drop leaving this option unfavourable, and in most cases, impractical).* The various types of random packing, mentioned above, all have one common characteristic, vertically flowing liquid and horizontally flowing gas are forced through identical turbulent pathways, which results in wasted energy. Conventional structured packing reduces liquid requirements and airside pressure drops. However, high removal efficiencies combined with affordable designs are unachievable. Plasticair has developed a far more effective approach.

Why is Polycube™ So Efficient? One of the main design features of the **Polycube™** incorporates high resistance for vertically flowing liquid, therefore causing tremendous liquid turbulence and an abundance of liquid retention within the packing. The payoff is utilizing gravitational energy which accomplishes the majority of work required for mixing and ultimately achieving mass transfer. As liquid is continuously flowing downward, horizontally flowing gas encounters far less resistance. Although the gas is not exposed to a high rate of turbulence, it is exposed to a high rate of liquid contact.

Why is Polycube™ So Economical? The spin-offs of the new **Polycube™** design directly affect the economics of mass transfer. The high rate of gas to liquid contact directly results in shorter bed lengths. This not only saves money on plant room space requirements, but also results in lower system pressures which in turn lower the exhaust fan energy requirements. The high liquid turbulence and retention feature shows a 66% reduction in the required recirculation flow rate. Combining all of these factors has a tremendously positive effect on the initial acquisition cost of mass transfer equipment, but more importantly, the end user will benefit for years to come as the total electrical energy cost will be reduced by close to 50%.

Comparison of Plasticair Polycube™ with conventional random packing at 99% H₂S removal:

	Plasticair Polycube™	Best Other Packing
Nominal size	305x305x305 mm (12"x12"x12")	51 mm (2")
Material	Polypropylene	Polypropylene
Structure type	Structured	Random
Surface area	338 m ² /m ³ (103 ft ² /ft ³)	164 m ² /m ³ (50 ft ² /ft ³)
Dry density	176 kg/m ³ (11 lbs./ft ³)	70 kg/m ³ (4.4 lbs./ft ³)
Pressure drop	179 Pa/m (0.22" W.G./ft)	163 Pa/m (0.20" W.G./ft)
Void space	81 %	92 %
Liquid rate	81.5 Lpm/m ² (2 gpm/ft ²)	244.4 Lpm/m ² (6 gpm/ft ²)
Superficial air velocity	2.03 m/s (400 ft./min.)	2.03 m/s (400 ft./min.)
Bed length at 99 % H ₂ S	1.13 m (3.7 ft.)	1.52 m (5 ft.)
Scrubbing solution	Sodium Hypochlorite & Sodium Hydroxide	Sodium Hypochlorite & Sodium Hydroxide
Energy per 1000 cfm	0.45 kW (0.6 hp)	0.86 kW (1.15 hp)

Performance data for Polycube™ installed in a pilot scale cross flow scrubber:

Packing Dimensions	1220x305x610 mm (48"L x 12"W x 24"H)	Scrubbing solution	Sodium Hydroxide & Sodium Hypochlorite
Liquid loading	81.9 Lpm/m ² (2.0 gpm/ft ²)	pH and ORP	10.8 & 350 mV
Volume	0.39 m ³ /s (818 cfm)	Inlet, H ₂ S	54.2 ppm avg.
Velocity	2.12 m/s (418 fpm)	Outlet, H ₂ S	0.39 ppm avg.
Total pressure drop	273 Pa (1.1" W.G.)	Removal efficiency	99.3 % avg.
Temperature	13.3 degree C (56 degree F)		

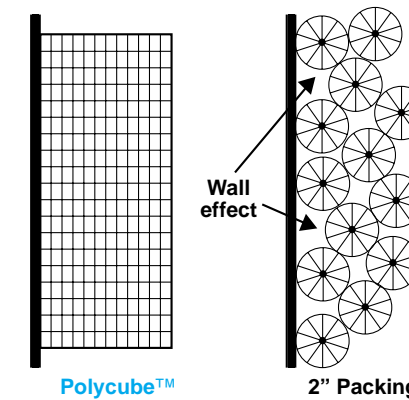
PLASTICAIR POLYCUBE™ PACKING

Features of Plasticair Polycube™:

- High mass transfer efficiency
- Even water distribution due to the structured geometry
- Eliminates wall effect found with random packing
- Lowest liquid loading of any packing available
- Highly packed fins maximizes wetted surface area while minimizing pressure drop
- Lower pressure drop as compared to similar performance scrubbers using other packing
- Standard sheet size of 12"x12" that can be stacked to any length required (standard size 12"x12"x12" cube)

Advantages of Plasticair Polycube™:

- **Low liquid rate** - High surface area per cubic foot allows the packing to utilize the scrubbing liquid more effectively. The result is a liquid rate that is 1/3 the liquid rate of conventional random packing.
- **Low energy consumption** - With lower liquid rates, scrubbers using **Polycube™** require smaller pump(s) that consume less energy. Lower total pressure drop also reduces fan energy requirements. The result is a significant reduction in operating costs.
- **Smaller scrubber** - With high efficiency, scrubbers using **Polycube™** require shorter bed lengths to perform identical tasks as compared with conventional random packing. This is a distinct advantage when plant space is at a premium.
- **Lower cost** - Scrubbers using **Polycube™** will reduce acquisition and operating costs.



Eliminating wall effects with Polycube™: Wall effect occurs at the interface of the packing and a flat surface. As illustrated in the adjacent diagram, voids with no packing are formed. These voids provide an easy passage for untreated gases to bypass, therefore reducing mass transfer performance. In packed bed mass transfer operations, wall effect also causes channeling of the liquid down the walls. To remedy this usually requires liquid redistribution. **Polycube™** eliminates wall effect and ensures mass transfer performance without the need for liquid redistribution. Its flat surface actually touches the scrubber walls thereby eliminating voids between the walls and packing. This ensures uniform packing densities throughout the scrubber including the area adjacent to the wall.

Plasticair Polycube™ Packing - Pressure Drop Vs. Superficial Velocity Liquid loading = 2.0 gpm/sq.ft., Horizontal Cross Flow Scrubber

