



EVERPACK

COLUMN PACKING

&

EVERSEP

INTERNALS

EVERPACK WM COLUMN PACKING

WIRE MESH STRUCTURED PACKING

INTRODUCTION

EVERPACK WM COLUMN PACKING was developed by EVERGREEN as part of a comprehensive development program to improve column packing performance.

The EVERPACK COLUMN PACKING is constructed with innovative textured wire gauze layers. This special gauze (which is normally made of stainless steel) provides a high degree of wicking action, drawing the liquid in all directions into a thin film and thus providing a marked improvement in uniform wetting of the packing bed.

The wire gauze layers are corrugated in a novel contoured pattern and arranged vertically in close contact, to form modules. These modules are then stacked with an alternating 90 degrees orientation of every other layer which gives a good lateral distribution of liquid and gas.

PERFORMANCE

The capillary action and high surface area provide maximum exposure between the liquid and vapour phases, thus providing a very high mass transfer efficiency.

We design and manufacture various internals to help maximize tower performance. Good initial distribution, together with systematic redistribution, is critical to tower performance. EVERPACK WM packing are available in the EVERPACK WMX 500 & WMY 750 high efficiency version

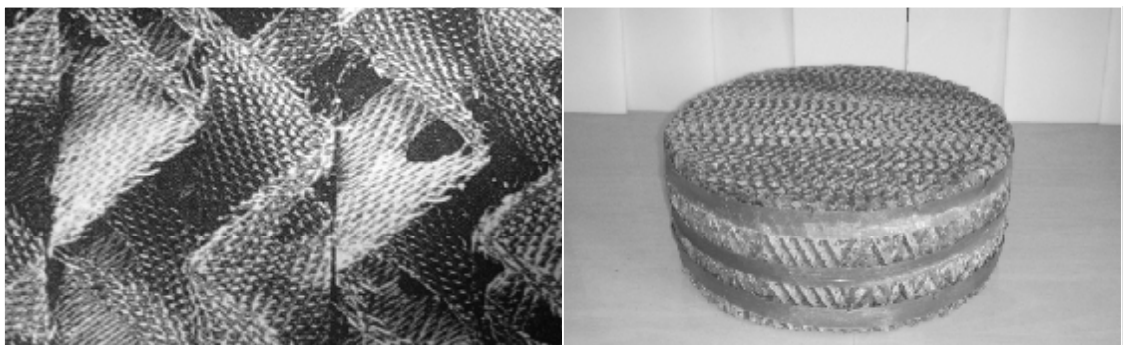
Special features of these packing include:

- High number of theoretical stages per unit height. (Between 3-8 theoretical stages per meter of packed height)
- Pressure drop per theoretical stage 0.1-1.0 mbar.
- Can operate at minimum liquid load of 0.05m³/m²h (approx).

A high performance version EVERPACK WMX 255 is also available now with a 20% lower pressure drop and the same efficiency of WMX 250.

APPLICATIONS

Because of their low pressure drop and minimum hold-up characteristics, EVERPACK is an ideal mass transfer media for temperature-sensitive systems. These include:- Vacuum distillation, temperature sensitive compounds, low-liquid loading systems, speciality chemicals, isomer separation, essential oils and fragrances, organic intermediates, amines, glycols, fatty acids, fatty alcohols, plastic monomers, vitamins and pharmaceuticals. Wire gauze packing has a limited suitability for fouling services and applications involving non-wetting liquids. Contact us for performance graphs and characteristics of EVERPACK WM column packing.



EVERPACK SM COLUMN PACKING

SHEET METAL STRUCTURED PACKING

INTRODUCTION

EVERPACK SM COLUMN PACKING is the sheet metal version of the popular EVERPACK WM (wire mesh) PACKING. EVERPACK SM is supplied in modules which consist of parallel layers of uniquely designed embossed sheet metal strips which are corrugated and arranged vertically. These modules are then stacked at an alternating 90 degree orientation with respect to every other layer which results in good lateral distribution of liquids and gases. The embossed metal strips help to draw the liquid in all directions into a thin film and provides a marked improvement in uniform wetting of the packing bed. With the improved internal liquid distribution, a high volumetric mass transfer efficiency is achieved and low pressure drop is maintained. Also because the liquid is evenly distributed through the packing as a thin film, the total liquid hold-up in the packing is substantially reduced. The standard packing version has specific surface area of 250 m²/m³ (EVERPACK SMY 250). However, other variants with specific surface areas of 125 m²/m³ (SMY 125), 175 m²/m³ (SMY 175), 350m²/m³ (SMY 350), 500m²/m³ (SMY 500), 750 m²/m³ (SMY 750) and X crimp (60 degree crimp alignment) are also available.

PERFORMANCE

EVERPACK SM series of packings display excellent performance characteristics. For example, EVERPACK SMY 250 provides:-

- Upto 3 theoretical stages per meter of packed heights in the normal operating range and up to 4 stages at low gas loads.
- Large operating range with a high separation efficiency up to high F factors.
- Low specific pressure drop (below 1 mbar per theoretical image).

Performance curves for EVERPACK SMY 250 as well as the other packing versions are available upon request. Special features of these packing include

- Can be used for increasing capacity of existing tray or packed columns.
- Pressure drop per theoretical stage 0.3-0.1 mbar.
- Can operate at minimum liquid load of 0.2 m³/m²h (approx).

High performance versions EVERPACK SMY 25S/45S/75S are also available now with a 20% lower pressure drop and the same efficiency as their generic versions.

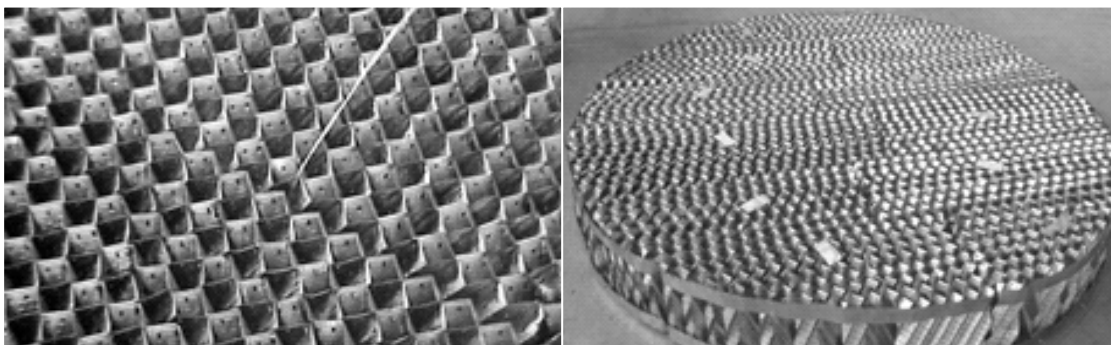
APPLICATIONS

Vacuum Distillation: Where a relatively low pressure drop is critical to maintaining low bottom temperatures so as to reduce product degradation.

Atmospheric Distillation: Where a large number of theoretical stages are required and/or where there are restrictions to overall column height.

Debottlenecking/energy reduction programs: With the advantage of a high efficiency packing used to reduce reflux requirements and increase throughputs.

Increase product purity: This is possible due to the availability of more equilibrium stages when compared to a similarly sized column.



EVERPACK LABORATORY PACKING

For laboratory and pilot plant/small capacity applications, high efficiency distillation packings are offered by EVERGREEN.

These include:

A. HYFLUX

High efficiency knitted wiremesh packings belong to the family of Goodloe/Hyperfil/Knitmesh type. When a moderate to large number of theoretical stages have to be accommodated within limited tower height, HYFLUX provides a high mass transfer rate (and hence maximum separation efficiency) because the fine wire or filament from which it is made provides a contact surface area in the range of 1200-2000 m²/m³ with a free volume between 94%-97%.

TECHNICAL DATA SPECIFICATIONS

HETP \geq 100 to 200mm in production columns.
 \geq 75mm in pilot/laboratory stills

NTU/metre \leq 10 in production columns
 \leq 13 in pilot/laboratory stills

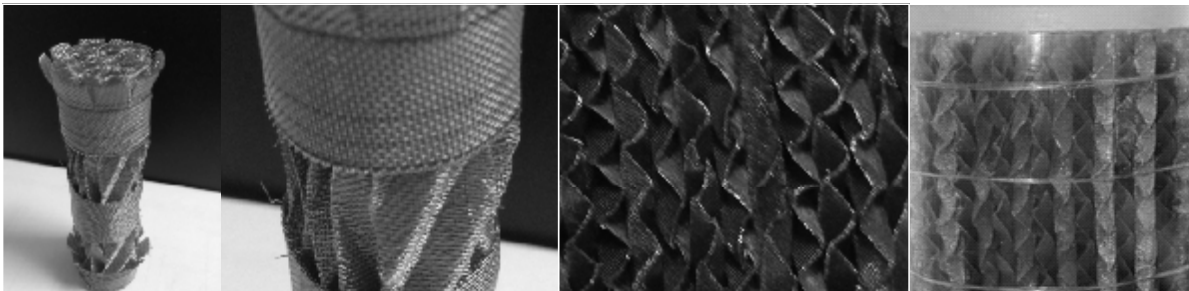
ΔP /theoretical : 0.05-0.75 mm Hg. Plate.
Vapour load : 0.2-2.75 F factor m/s.
Liquid load : < 0.7 m³/m²h



B. EVERPACK WMXD & WMXE

High efficiency wire gauze packings module find special applications for services where a large number of theoretical stages are required in a limited headroom such as in a laboratory or pilot facility. These can be used to provide a preliminary assessment of a separation task and also to derive reliable scale-up data.

EVERPACK WMXE is a more efficient version than the WMXD but with a lower capacity factor.



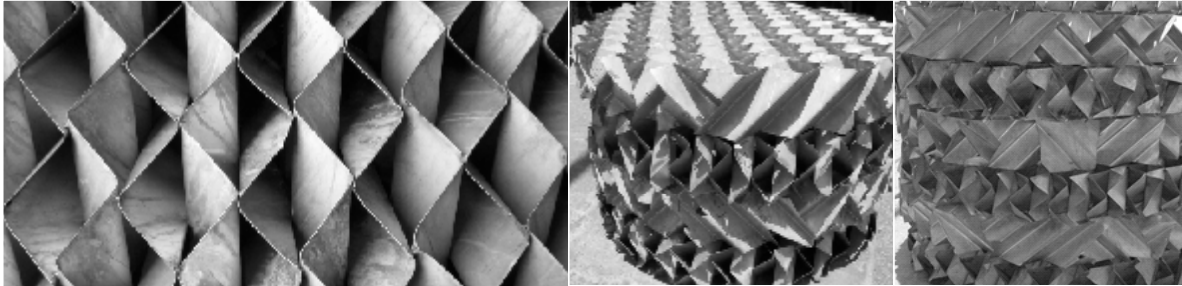
EVERKAT REACTIVE DISTILLATION PACKING

Evergreen offers its structured packings [EVERKAT] for reactive distillation packings incorporating catalyst media within the structured packing modules. Evergreen is actively involved with universities and progressive companies to develop special material to meet their unique requirements.



EVERGRID PACKING

EVERGRID PACKINGS combine the fouling resistance and mechanical strength of a grid with the efficiency of structural packing. The grid packing can be removed and disassembled for cleaning with a water jet and are extensively used for wash zones, pump around sections or when choking is a concern. A larger sheet thickness (0.5mm-2mm thick) and open structure (50m²/m³, 64 m²/m³ area) give the modules a mechanically robust structure.



EVER-RINGS RANDOM PACKINGS

EVERGREEN offers a family of metal and plastic RANDOM COLUMN PACKINGS in various sizes and materials of construction (plastic and metallic). The standard range of EVER-RING packing include:

1. EVERPALL ring equivalents and other variants equivalents to HYPAK type, cascade mini ring type, Hiflow type, etc.

2. EVERLOX Saddle type packing equivalent to Intalox type (including IMTP packings).

All the above random packings are available in metallic (Stainless steel as standard) and plastic materials (Polypropylene as standards) of construction.

3. In addition special configurations such as snow flake type, tellerette type and specific spheroidal shape high performance packings are also available primarily in plastic (Polypropylene as standard) material of construction. Special polymer material and grades such as LTHA Polypropylene, Talc and glass filled Polypropylene, PVDF, ECTFE, FEP and PFA are also available on special order.



EVERSEP COLUMN INTERNALS

INTRODUCTION

As the oil & gas and chemical processing industry matures, a new class of high efficiency tower internals are required. As a result of its in house design and engineering capabilities, as well as its working relationship with various end users, Evergreen has developed a comprehensive range of high efficiency tower internals.

We recognise that not all packed towers require state-of-the-art performance from the packings. For these towers (such as those containing generic random packings), we offer our traditional tower internals. However, for high efficiency column packings (such as sheet metal and wire gauze structured packings and new generation random packings) we offer a range of compatible high performance column internals. An optimum combination of tower internals and column packings can be offered to meet the requirements of our customers.

With our well honed experience in design and execution, we can provide close to perfect initial liquid distribution along with matching liquid collectors/redistributors and other associated column internals.

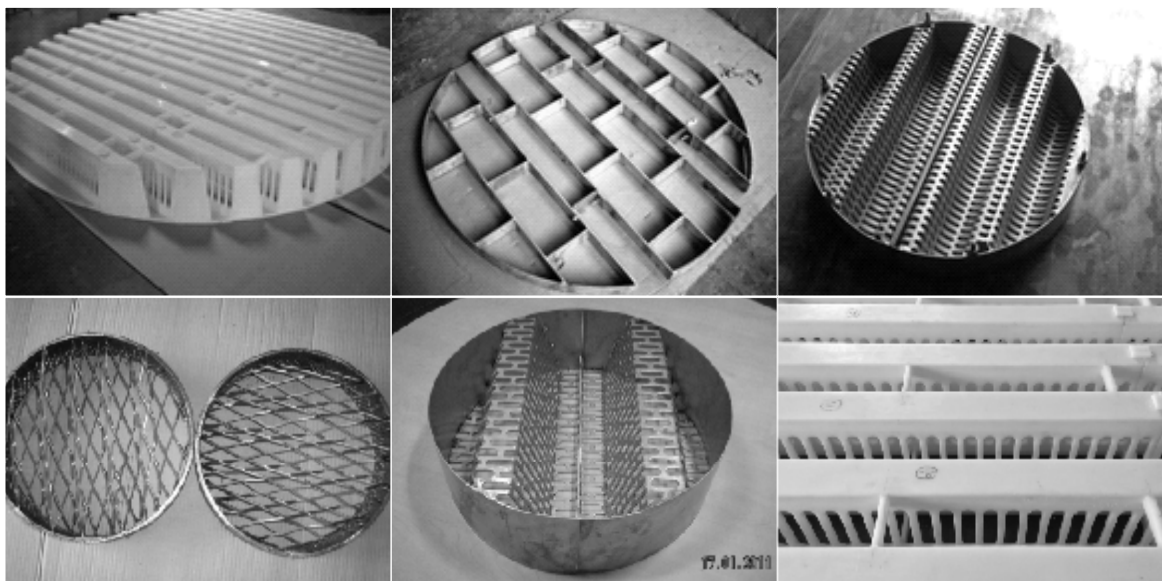
The following column internals are widely used to obtain optimum performance of well designed system:

- Packing support and retainer grid
- Liquid distributor
- Liquid collector / Re-distributor
- Chimney trays

PACKING SUPPORT & RETAINER GRID

Packed beds must be supported within the column with a compatible support grid. These should be mechanically strong enough to support the dead weight of the packed bed along with the liquid hold up in the column. Packing support grids should also be sufficiently open so as to not restrict the flow of vapour and liquid, but also close enough to hold the packings (especially for random packings).

A packing retainer grid is also recommended as a good engineering practise at the top of each packed bed to restrict movement of the bed. It will also ensure that the top of the packing remains level during service.



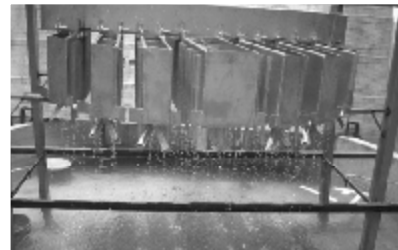
LIQUID DISTRIBUTOR

Liquid distribution is a critical factor in consistently maximizing mass transfer efficiency from a packed bed. One of the basic functions of a liquid distribution system is to reduce the horizontal inertia of the liquid at the inlet nozzle/orifice and redirect the flow downwards over the top of the packing such that the complete packing cross section receives the liquid at a uniform irrigation rate. The entire surface area of the packing must be irrigated to promote vapour / liquid contact.

Various distributor designs and configurations are available to cater to specific requirements of high numbers of drip point locations, wide turn down ranges, moderate fouling services, etc. High efficiency liquid distributors are equipped with level adjustment mechanisms so that levelness tolerances necessary to ensure design performance can be achieved on site.

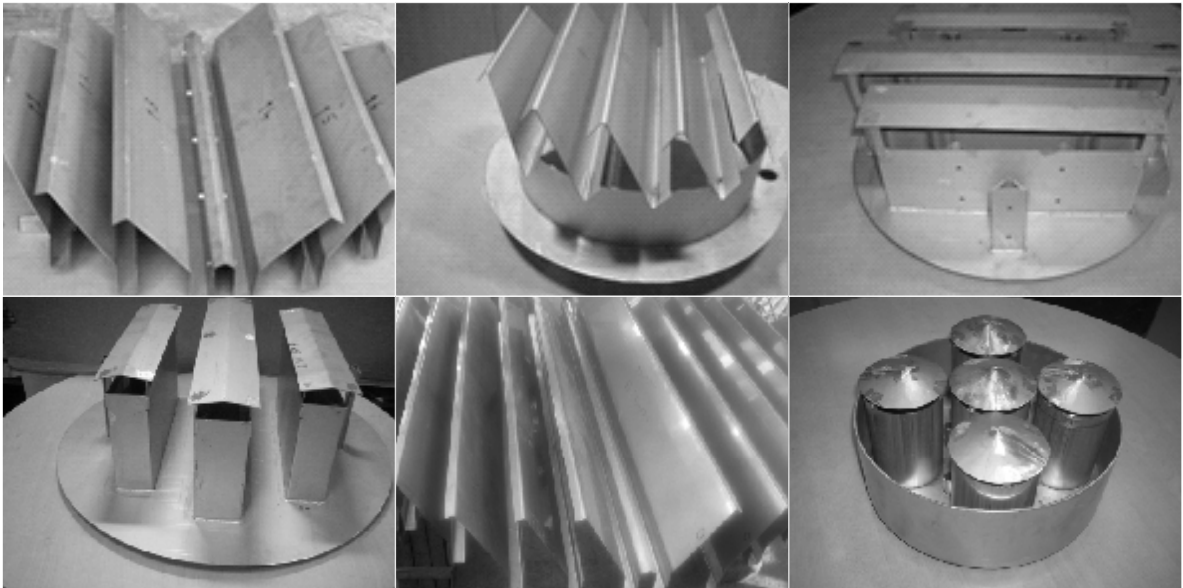


In addition EVERGREEN can hydraulically test certain design and liquid flow ranges at their test facility. Distributor flow tests on a test rig are simulations of expected distributor performance. The distributor irrigation performance can be quantitatively measured and a standard coefficient of variation (CV) can be computed and compared with an allowable value.



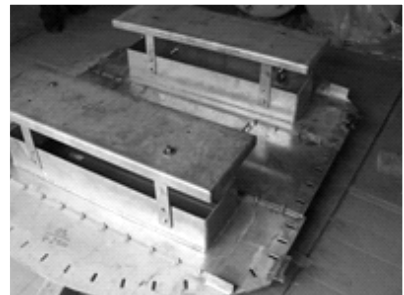
LIQUID COLLECTORS / RE-DISTRIBUTOR

Where the mass transfer duty requires a total packed height that exceeds the efficient design of a single bed, two or more separate beds should be installed. The function of the liquid collector /re-distributor is to collect all the liquid draining from the bottom of one bed, mix the collected liquid to blend out composition variations and to redistribute the liquid over the second bed so that the complete packing cross section receives a uniform irrigation rate. The complete distribution system must be sufficiently open so as to avoid excessive restriction of the gas flow leaving the packed bed, which may in turn lead to gas maldistribution or high velocities resulting in re-entrainment of the feed liquid. These devices can be of a collector cum distributor design (with a chimney tray) and these are used for high liquid load application. Alternatively, one can use a vane type design, especially for vacuum and low liquid load service.



CHIMNEY TRAYS.

Chimney trays consist of a liquid collection deck and gas risers or chimneys designed to allow gas flow to bypass the tray. The collected liquid can either be drawn from a side draw nozzle in the vessel or it can be channelled to a location below the tray (and in some cases both).



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