



UOP Distillation Trays

Petrochemicals

Introduction

For more than 25 years, UOP has been a leader in the supply of high performance trays for distillation, absorption, stripping, and extraction. UOP trays not only have outstanding performances but are backed by broad and documented field experience. UOP distillation trays provide:

- Reduced column diameter in grassroots applications.
- Increased capacity from existing columns.
- Maximum number of theoretical trays in a given column height.
- Easy scale-up to any diameters.
- Fast, simple installation giving short turnaround times.
- Low sensitivity to out-of-levelness.
- Minimization or elimination of foaming/fouling.

Applications

MD™ trays are used for large liquid loads, particularly when the volumetric ratio between vapor and liquid rates is low. These situations occur in medium to high pressure distillation, in absorption and stripping, and in direct contact heat transfer applications.

MD trays can be used at close tray spacings. They allow a reduction in both height and diameter of a new column compared to a column fitted with conventional multipass trays. Vessel shell costs are significantly lowered by using MD trays. When retrofitting an existing column with MD trays, a significantly greater number can be installed, providing increased product purities and recoveries, as well as reduced reflux ratio for reduced energy consumption and/or increased column capacity.

The use of MD trays has often reduced the number of columns needed in difficult separations, such as superfractionation of propylene-propane or of xylene isomers.

UOP continues to improve the design of its proprietary trays to meet specific customer needs. In recent years, the EEMD™ and ECMD™ tray were developed and have been installed to achieve

specific distillation objectives. Both of these advanced trays are based on the same operating principles, design philosophies, and experience as the original MD tray.

UOP also provides other proprietary equipment, including the MU™ tray and Slotted Sieve™ tray, for various applications.

Functional features of MD trays

- Long total weir length and large downcomer area provide high liquid handling capability.
- No receiving pan area to detract from bubbling area.
- 90° rotation of downcomers on successive MD trays promotes lateral mixing and provides easy scale-up.
- Low crest heights over weirs permit close tray spacings.
- Typically, downcomers provide the necessary structural support up to 30 foot diameters, without center beams.
- Downcomers are supported on a 360° ring, no bolting bars are required.
- Unique downcomer lengths give fast, simple installation.
- Trays can be fabricated with an underflow weir and vapor seal downcomer options to achieve a large turndown ratio.
- Tray efficiencies range from 70-90% in distillation service.
- Low tray pressure drop of 0.06-0.09 psi.

Turndown

MD trays can generally turn down to 70% of their design flow rates, particularly when they are used at large tray spacings. The use of sieve decks helps keep the tray efficiency constant as rates are being turned down. In columns where a large number of trays are required, only MD trays can be used at the requisite close tray spacings. In cases where additional liquid turndown capability is required, special "vapor seal" downcomers can be employed.

General design considerations

The key to MD tray performance is the very large total weir length provided on each tray. This gives low liquid loads per unit weir length even at very

Because of the short flow path length, MD trays operate only slightly above point efficiency. However, experience has shown that because of the adverse effects found on conventional trays, the tray efficiencies of MD trays and conventional multipass trays are usually comparable.

MD Tray Applications

Acetic acid/ water separations	Cryogenic separations	Glycols dehydration heat transfer applications
Acetone/water separations	Debutanizers	Heavy water production
Acetylene absorbers	Deethanizers	Xylenes separation
Acid gas absorbers & strippers	Demethanizers	Phenol/cresol separation
Acrylonitrile absorbers & strippers	Dichlorobenzene purification	Propylene/propane splitters
Butadiene absorbers	Ethylbenzene-xylene splitters	Stabilizers
Butane splitters	Ethylene-ethane splitters	Tetraethylene glycol strippers
Cresol/xylenols purification	Ethylene oxide absorbers & strippers	Vinyl acetate purification

high total liquid flow rates. The weir load on MD trays is usually about 1/4 to 1/3 of the weir load on conventional two- or four-pass trays. The low weir loads on MD trays allow the use of lower tray spacings at the same capacity factor or allow a higher capacity factor to be used at the same tray spacing compared to conventional trays. The result is a larger number of trays in a given column height and reduced column diameters. An additional advantage of MD trays is the absence of receiving pans, because downcomers terminate above the froth of the tray below. This provides extra bubbling area, reducing the column diameter required.

The tray spacing used for MD trays is sometimes determined by the backup of froth in the downcomer. The low weir loads on MD trays allow close control over the froth height on the tray, which is set by the weir height. As a result, weeping can be prevented with a lower dry tray pressure drop, further reducing the tray spacing required.

High liquid loads on conventional trays often result in foaming and a reduction of efficiency from vapor entrainment through the downcomers. MD trays largely avoid these problems by the use of low liquid velocities across the tray, without costly and cumbersome antifoam additions.

Commercial experience

UOP trays have been proven to increase separation performance, reduce capital and operating costs, and/or increase column capacity in a wide range of applications. They are particularly effective for:

- Medium to high pressure distillation (MD tray, ECMD tray, EEMD tray)
- Medium to large diameter columns (Slotted Sieve tray, MD tray, ECMD tray, EEMD tray)
- Difficult, low relative volatility separations (Slotted Sieve tray, MD tray, ECMD tray, EEMD tray)
- Heat pumping applications (Slotted Sieve tray, MD tray, ECMD tray, EEMD tray)
- Low pressure and vacuum distillation (Slotted Sieve tray)
- Heavily liquid loaded absorbers and strippers (MD tray, ECMD tray)
- Low interfacial tension extraction systems (MU tray)

For more information

For more information, contact your local UOP representative or our Des Plaines sales office:

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