

Tower Technical Bulletin

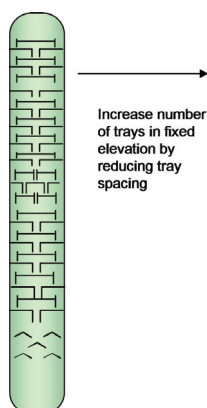
Improve Separation in your Column by Increasing the Number of Trays

Background

Refiners often face revamp challenges when trying to improve separation within an existing column. Improving diesel recovery from gas oil, splitting benzene precursors from naphtha re-former charge, or simply minimizing product overlaps after capacity creep can all be difficult when limited by a fixed existing tower height. For these cases, revamp solutions that increase the number of theoretical stages by adding trays to an existing column or a section of a column pay large dividends.

Improving Separation by Increasing Tray Count

One direct way to increase efficiency within a column section is to simply increase the number of trays. In a revamp with a fixed section height and column diameter, stage count can be increased by reducing tray spacing and installing a larger number of high capacity trays.



The number of stages in the section will increase with additional trays, dependent on the function of the column or section. For example, stripping trays may have only 30-40% efficiency, so one additional tray only results in a partial theoretical stage. Since tray capacity is directly a function of tray spacing, column capacity will be reduced unless a higher capacity device is used. Therefore, a decrease in tray spacing to a highly loaded column is only possible when high performance trays are used for the replacement.

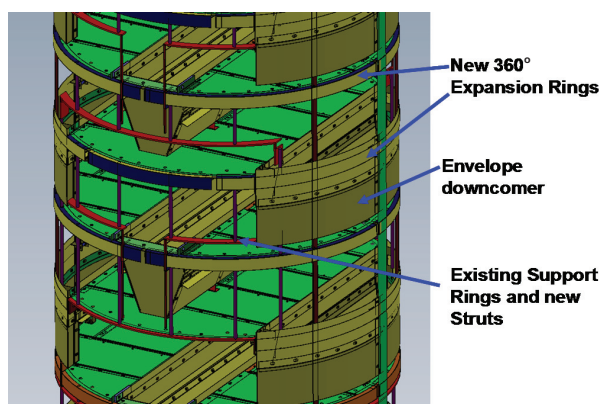
High capacity trays address both liquid and vapor tray capacity requirements within the column's physical limits. Sulzer VGPlus™ trays incorporate the use of high capacity valves with an optimized layout, high performance downcomer technology, and additional features like froth promoters that improve distribution across the tray. With conventional trays, the froth height and jet flood constraints may require additional spacing. VGPlus trays have larger capacity than conventional trays and can be installed at tray spacings as low as 14".

Mechanical Aspects to the Re-Tray Design

Shutdown time constraints often prohibit revamp modifications such as welding to the column shell. Commonly, existing column support rings and downcomer bolting bar configurations do not match with the geometries required for the new trays. Additionally, the new, smaller tray spacings require new tray rings at elevations where no rings currently exist. In these cases, new ring segments or full 360° expansion rings are used to provide support for new trays. New ring segments can be sup-

ported off existing rings. Expansion support rings are expanded out to press tightly against the column wall and supported from below or above with support rods welded to existing attachments. Sulzer also uses envelope downcomers to allow the installation of trays on expansion rings or in positions where no downcomer was previously located.

The column cutaway figure illustrates a revamp where additional trays are added. Envelope downcomers, new support ring segments, and support struts are utilized to avoid welding to the column shell. Existing supports are shown in red – these previously welded attachments are utilized as the base for the new supports.



Other High Capacity Technology

Many conventional tray designs can be upgraded by replacing trays with structured packing or installing high capacity trays like Sulzer VGPlus on smaller tray spacings. Sulzer can also provide specialized trays that can be installed at tray spacing as low as 12", like Shell HiFi™ multiple downcomer trays. These can also be excellent potential solutions to increasing stages in a fixed column elevation.

The Sulzer Process Applications Group

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