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# Tower Technical Bulletin

## Improve Fouling Resistance in Your Wastewater Benzene Stripper

### Background

Benzene stripper columns, built so that refineries can meet the National Emissions Standards for Hazardous Air Pollutants (NESHAP), operate with several unique conditions – low vapor rates, high liquid loads, and a high tendency toward fouling make designing well-balanced, effective internals difficult.

### The Problem: Two Refinery Case Studies

Sulzer was contacted by two separate refiners who noted a continued fouling problem and short run lengths on their wastewater strippers. The configuration of the units was very similar, with both strippers processing wastewater from the desalters, coker blowdown, and various waste sumps from around the refinery.

Refiner “A” was operating a retrofitted column, formerly utilized as a Coker Main Fractionator. They wanted to install new internals to fit within the existing tray support rings to avoid welding on a stress-relieved vessel. They targeted an increase in run-length from 8 weeks to 6 months.

Refiner “B” had noted their fouling problem becoming worse with opportunity crudes being processed. They were batching flow to the Stripper, with a surge tank upstream. Refiner “B” was controlling stripping steam injection to maintain a middle tray temperature target. They had planned to replace the trays in kind, but wanted to investigate other options before the next outage for cleaning.

### The Strategy

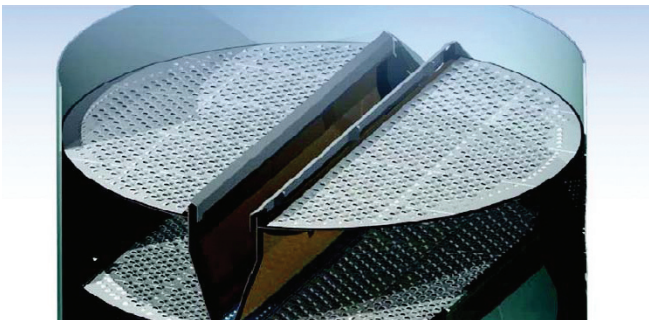
Benzene steam stripper columns tend to have very low vapor rates as the refiner seeks to minimize energy consumption and steam usage. The vapor load on the top trays is primarily stripped hydrocarbon, with much of the steam having condensed on the lower trays. The low vapor rates are coupled with high liquid rates, which can make a good, balanced tray design tricky.

Without the appropriate stripping steam, the top vapor loads can be non-existent. Sulzer starts with a simple heat balance in the column. A significant amount of latent heat from the steam is transferred to sensible heat in the water and unable to be used to strip the benzene. Steam injection must be sufficient to where enough steam remains in the vapor phase or no tray design will be successful in this application.

An anti-fouling tray design should be considered. There are several features that Sulzer implements in many services to reduce fouling accumulation like a deck design to reduce stagnation zones, high performance downcomers to enhance liquid disengagement, and large fixed valves like the Sulzer V-Grid™ LVG trays.

### The Solutions

Presented with an anti-fouling tray option or a less efficient shed deck option, Refiner A chose to equip their column with V-Grid LVG trays and channel baffles in order to create an active area with adequate sweep of liquid and adequate valve density to maintain efficiency.



For Refiner B, Sulzer recommended an alternate control scheme to maintain a stripping steam to feed rate ratio, ensuring that the system had adequate duty to strip out benzene. The Refiner B Stripper was equipped with antifouling trays, featuring sloped downcomers to keep a higher velocity in order to sweep solids from the exit.

### The Payout

Refiner B was able to increase run length on their tower by contacting the Sulzer Refinery Applications Team prior to replacing their internals in kind. Check with your Sulzer representative to see if you have upgrade potential with your in-kind replacements. At very little cost difference, you’ll realize substantial improvements in the profitability of your process unit.

**The Sulzer Refinery Applications Group**

Sulzer Chemtech has over 50 years of operating and design experience in refinery applications. We understand your process and your economic drivers. Sulzer has the know-how and the technology to provide a scrubber internals design with reliable, high performance.

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