

## Tower Technical Bulletin

### Column Design for Extreme Fouling Services

#### Background

In the wide range of process operations, there is a tremendous variation in the fouling tendencies of the process fluids and associated equipment metallurgy. Historically, applications are considered as either “clean” or “dirty”. The dirty services are often prone to fouling levels which interfere with column operations.

A wide variety of column internal designs have successfully been used to better handle fouling conditions that could not be mitigated effectively with only process changes. Depending upon the fouling mechanism, some types of internals can handle fouling better than others. Fouling due to chemical reactions (e.g. polymerization, coke formation) is often minimized by using packed beds due to their inherently low residence time. Packing can be used in low to even moderate fouling applications by using larger crimp packing along with fouling resistant distributor designs. However, moderate to severely fouling applications, especially those with solid deposition (e.g. corrosion products, catalyst particles) or solid precipitation (e.g. carbonates, chloride salts), as shown in the photo below, typically employ trays.

#### Fouling Tray Design Features

Generally, moderate fouling applications have used trays with large, raised orifices along with perhaps pushing valves and/or mechanical modifications to reduce the tendency for scale material to accumulate on the tray decks. With severely fouling services, large orifice, dual-flow trays were often selected. For extreme conditions, baffle trays or shed decks have been used. However, these more fouling resistant designs come with a penalty of lower efficiency. Dual-flow trays only achieve a point efficiency which can be 15% less than a conventional cross-flow tray while baffle tray efficiency may have as much as a 70% loss in efficiency. From a process standpoint, there is a clear need for an extremely fouling resistant device that performs without a substantial loss in efficiency.



SVG™ Trays in Heavy Precipitate Fouling Application

As for the tray deck design, Sulzer has over 40 years of experience using fixed valves in fouling applications. Specifically, high lift SVG™ raised orifice valves have proven to have excellent fouling resistance in most applications. Building on that expertise, the new XVG™ valve, with a 50% larger opening, has been developed and successfully applied in several severe fouling applications (valve shown below).

#### Case Study

A North American refiner approached Sulzer with an extreme fouling application. Their existing trays had been fouling within a period of one month forcing a unit shutdown. Based on Sulzer's recommendation, the refiner replaced the existing trays with ultra-fouling resistant XVG valve trays for this service. These trays have been operating successfully for over one year with no measured degradation in column performance.



Sulzer XVG™ Valve for Extreme Fouling

#### Conclusions

Extreme fouling systems often lead to costly losses in column performance and unit down time; proper design is critical. Properly designed fouling resistant features can provide substantial increases in unit reliability even in the most difficult applications.

#### The Sulzer Applications Group

Sulzer has over 150 years of in-house operating and design experience in process applications. We understand your process and your economic drivers. Sulzer has the know-how and the technology to design internals with reliable, high performance.

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