

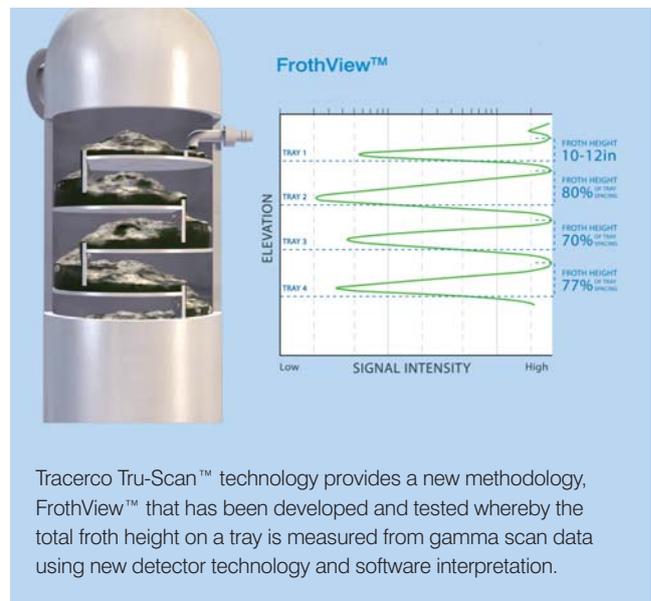
Distillation Column - Flooding

Tracerco's Tru-Scan™ service provides reliable information on distillation column performance while the column is online and operating at normal, test, or upset conditions.

The scan provides an "inside look" at the column's process from the top tangent down to the base liquid level. The interpretation of a Tru-Scan™ can be used to diagnose virtually any operating malfunction that can be identified by an observable density difference. This includes most mechanical, process, or rate related problems - such as tray damage, foaming, weeping, and entrainment - to name a few.

FrothView™ Technology for Trayed Towers

Plant engineers have been asking the question "How much more useful capacity do I have with the trays in a tower"? This is where FrothView™ technology offers quantifiable and less subjective information using Tru-Scan™ data. FrothView™, has been developed and tested, where the total froth height on a tray is measured using new detector technology and software interpretation. Dividing the total froth height by the tray space provides the percentage of tray space occupied by tray froth. The "% tray space" has been shown to correlate very well with % flood, allowing field measurements to be directly related to specific tray design criteria to determine the useful capacity of operating trays.



Project Field Test

A column had been experiencing poor separation, higher-than-normal pressure drop, and unacceptable carryover. Because the column had recently undergone a major retrofit, the customer was convinced that the column had either sustained damage during re-commissioning or was experiencing problems relating to poor column design.

Tru-Scan™ services were performed two times on the column under different operating conditions. (Figure 1) The first shown in Figure 1 (green-dashed line) was at design conditions. At design rates the column was delivering off-spec performance. After reviewing initial scan results onsite, it was agreed to scan the column a second time at reduced reflux rates. The second scan is depicted by the blue (solid) line. The scan plot results focus on the top seven trays of the column.

Project Analysis

Summary of results and the first scan at design rates (green-dashed line):

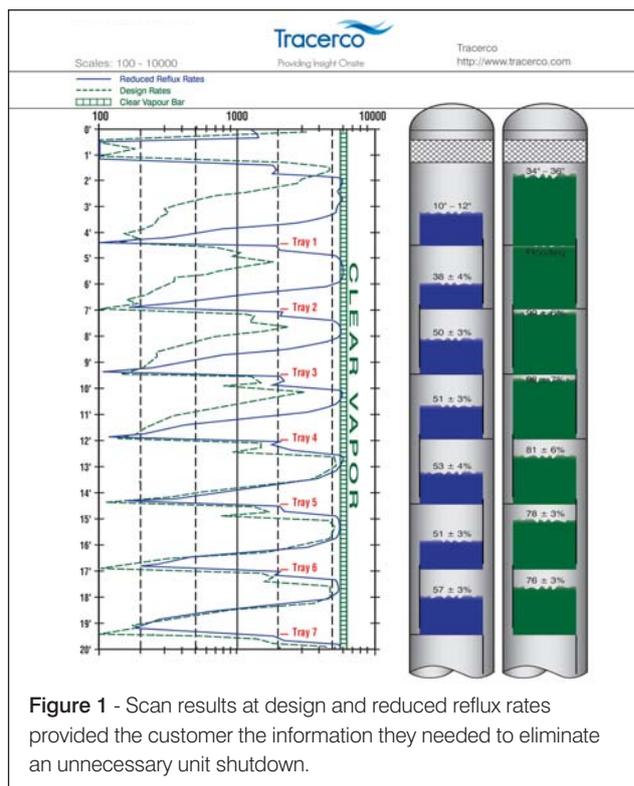
Results of the scan at design conditions found that the mist eliminator above Tray 1 was in place with liquid from Tray 1 being entrained upwards, saturating it. The allowable liquid/vapour disengagement space between the froth height and the tray above was greatly reduced on Trays 2 - 4. In general, a single-point, reduced vapour space is a telltale sign symptomatic of moderate-to-severe entrainment. The total froth height on Tray 1 was 86-91cm, nearly reaching the elevation of the mist eliminator. Trays 2, 3 and 4 had total froth heights of essentially 100% or the total tray space was filled with froth - the classic definition of flooding. The trays below Tray 4 appeared to be operating normally with good vapour/liquid disengagement.

Summary of results and the second scan at reduced reflux rates (blue solid line):

Results from the second scan at reduced reflux rates showed all trays were found to be in place with no evidence of damage. Tray 1 held 25-30cm of total froth which is much more typical. Tray 2 held a total froth height of 97cm \pm 3% of tray spacing and the trays below Tray 4 had similar froth levels. These trays now had clear vapour spaces between the trays rather than the flooding seen earlier. At the reduced reflux rates the column appeared to be operating normally.

Customer Conclusion

Based upon the Tru-Scan™ information, the customer conducted a thorough investigation that focused on the reflux rate entering the column. The reflux rate set point should not have caused the trays to flood. Confident that the tray design was correct and that the trays had been installed correctly, the only other explanation was a reflux rate greater than what the flow instruments indicated. The investigation found that an orifice plate in the reflux measuring system had not been installed properly, therefore the measured reflux rates had been greatly understated. The poor column performance had been a direct result of too much reflux flow, and not tray damage or improper design.



This study not only eliminated an unnecessary unit shutdown and column inspection, but enabled the customer to achieve on-spec production at higher unit feed rates. Tracerco has used this same approach countless times with other customers to identify the root cause of an operating problem. This is especially true with entrainment concerns, or to give the customers additional insight as to what is physically taking place inside their columns at adjusted conditions.

Tru-Scan™ services have proven to be cost effective by reducing off-spec production and equipment downtime. In today's highly competitive refining, petrochemical, and chemical processing markets, more customers are using TRU-SCAN™ information to stop plant bottlenecks and to optimise performance.

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For our worldwide offices: www.tracerco.com/processdiagnostics/our-people