Tracerco

Providing Insight Onsite

# Packed Column - Damaged Packing

**Tru-Grid™ Scans of packed beds are often used as part of a programme to periodically monitor fouling, evaluate the quality of liquid phase distribution, detect fouled or damaged packing, and to identify any other hydraulic problems before entering the tower.**

A Tru-Grid™ Scan consists of four column scans consisting of pairs of parallel scanlines ninety degrees to each other. The objective of a Tru-Grid™ Scan is to measure the degree of bias or coincidence among the scanlines overlaying one another. If non-uniformity is detected between the scanlines this confirms bulk density differences that is usually attributed to an imbalance in liquid traffic.

## Project Field Test

One of the more unfortunate events that process plant operators and support staff face is an unexpected pressure surge. Whether the surge affects an entire plant, a unit or a single piece of equipment, assessing the physical condition afterwards can be a challenge.

Recently a customer contacted Tracerco regarding an acid solvent recovery column. Since a pressure surge the column had been experiencing poor recovery efficiency. Plant personnel suspected damage caused from the pressure surge and they needed to confirm it's extent or find what other problems may exist. This particular column was packed with two beds of random ceramic saddles. During upsets or pressure swings this type of ceramic can dislocate, compressing and crushing some of the packing. Alternatively liquid distributors, bed supports, and other internals can be dislocated or damaged preventing them from performing as they should.

A Tru-Grid™ Scan is a series of four conventional column scans performed using a grid consisting of pairs of parallel scanlines ninety degrees to each other. A Tru-Grid™ Scan can detect evidence of fouling and crushed or corroded packing which often results in flow distribution problems.

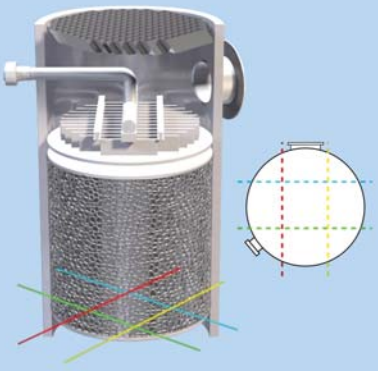
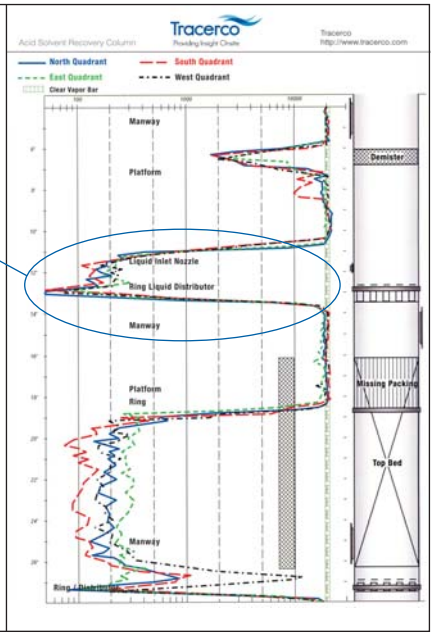


**Figure 1** - Scan results indicated the top liquid distributor was holding approximately 24 inches of dense material and operating in a flooding condition and/or had packing resting on the distributor tray.




A Tracerco Tru-Grid™ Scan was performed to verify that the beds and distributors were in place and to identify any problem before entering the column.

## Project Analysis

Based on the scan results (Figure 1) the top liquid distributor was shown to be holding approximately 60cm of dense material and was operating in a flooded condition and/or had packing resting on the distributor tray.

The top portion of the upper bed appeared to be missing 30" of packing which could be due to lack of packing elements installed or displaced packing that was blown up onto the top liquid distributor. This bed was also operating with poor liquid distribution with liquid channeling through the south quadrant and liquid deficiency through the east quadrant.

The space between the bottom of the top bed and the liquid distributor above the lower bed should have shown a clear vapour space if all was well with the column. Instead this space was very dense with either liquid and/or packing material, especially in the eastern quadrant of the column. This could indicate a breach in the eastern portion of the top bed support that would have caused packing to collapse onto the distributor.

Process Diagnostics

The top portion of the bottom bed appeared to have 25-46cm of packing missing and the top of the packing was uneven with 25-30cm missing in the south and west quadrants and 41-46cm missing in the north and east quadrants (Figure 2). This missing material could indicate displaced packing that could have been blown up onto the bottom liquid distributor. The bed was also operating with a slight density gradient with denser material in the lower portion compared to the top indicating crushed or settled packing or fouling in the lower portion of the bed. The liquid distribution through this bed was fair-to-good in the top half but was worse in the bottom half of the bed.

After reviewing the scan results the customer entered the column a few weeks after the scan to make repairs. They found that the top bed hold down plate was missing so packing from the top bed had been carried up onto the top liquid distributor. This caused the top distributor to appear flooded. The top hold down grid for the top bed was found buried in the lower portion of the packing. The bottom support grid for the top bed was still in place so no packing from the top bed had collapsed onto the bottom liquid distributor.

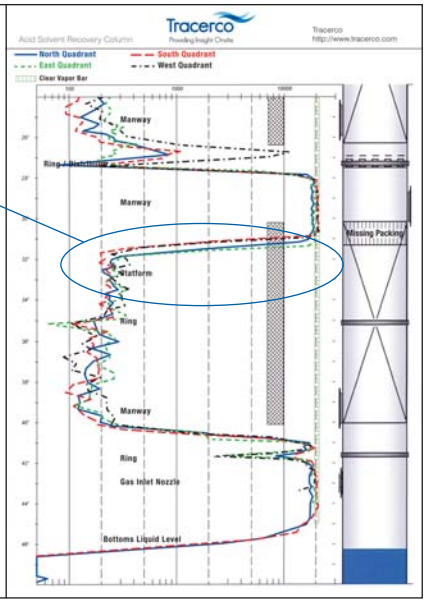



**Figure 2** - The bottom bed was missing 10- 18" of packing and the top of the packing was not level with 10-12" missing in the south and west quadrants and 16-18" missing in the north and east quadrants.

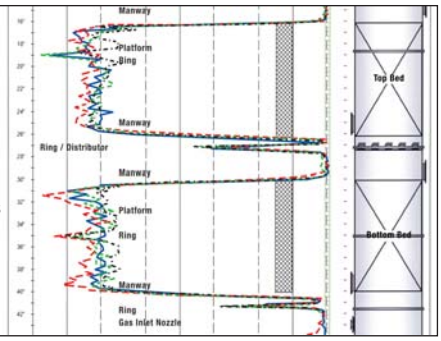



**Figure 3** - A baseline scan was performed following repairs to the column which indicated that all the internals remained in their proper places during startup.

Like the top bed, the hold down plate for the bottom bed was not in place so packing had carried up from the bottom bed onto the bottom liquid distributor. This accounted for the high density in the vapour space between the top bed and the bottom liquid distributor instead of a top bed collapse. The hold down grid for the bottom bed was buried in an almost vertical position in the lower portion of the packing.

After all repairs were complete and the column restarted, the customer requested a baseline scan. The baseline scan results can be viewed in Figure 3. The baseline scan indicated that all internals remained in their proper places during startup and both beds were operating with fairly good liquid distribution. The baseline information will provide invaluable reference data for future troubleshooting scans.

## Customer Conclusion

The application of a Tracerco Tru-Grid™ Scan allowed confirmation to the customer that significant packed bed displacement had occurred and pinpointed those areas of most concern. This allowed the customer to verify that a shutdown was necessary, understand the areas within the column of most concern and prepare equipment and field services for the necessary repairs in advance minimising downtime at the site.

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