

# What you need to know about Tracerco Diagnostics™ Distribution and Residence Time studies

Tracerco online technologies that will provide answers why your reactor is not operating at optimal performance.

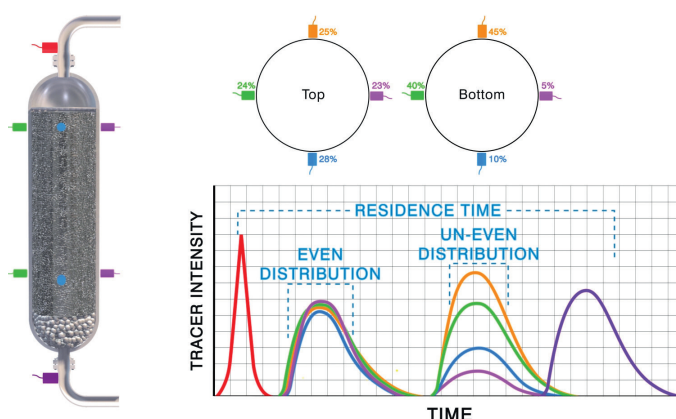
## What type of studies does Tracerco provide for reactors and what do they reveal?

A Tracerco Diagnostics™ Distribution or Residence Time study provides crucial information to measure reactor performance. They provide valuable information about the residence time and distribution of solids, vapour or liquid at specific operational conditions. Results from the study can assist plant personnel to accurately diagnose integrity problems with internals and determine uniformity of distribution aiding site personnel with modifications to increase efficiency. A Tru-Scan™ of a reactor provides a density profile of the reactor's internals, including distributors, beds and collectors. The power of the technology is its ability to offer real-time information about vessel internals and performance. The scan 'sees through' the vessel wall, allowing a determination of what is happening inside and if sufficient signal transmission through the catalyst bed is possible, interpretation of fouling and crushed catalyst can be made.

## What preparation is needed to the reactor before Tracerco services are performed?

In general, most work is performed without any preparation. For example, no insulation needs to be removed. A Tracerco crew will need access to the top of the vessel, or above the section to be studied, but that is usually available by existing platforms. Our scan equipment is very portable and we are able to carry it in backpacks. The tracer study detection systems are also portable, but may require additional support such as scaffolding, if the work scope is large enough and platforms are not readily available. Good drawings,

showing the orientation of internals, are needed prior to ensure detector or scanline locations are selected properly to get the best possible evaluation.

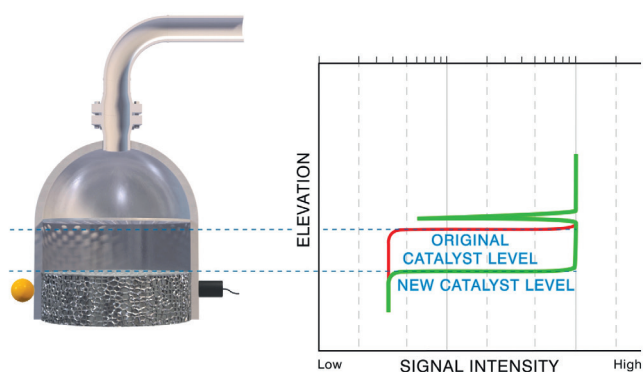


## How is a reactor distribution or residence time study performed?

A liquid or vapour distribution study using a radiotracer is performed by positioning a number of detectors around the reactor at key locations. A small amount of a suitable tracer material is injected into the vessel that will follow the phase under investigation, and the response of each detector is measured. Analysis of each detector response allows flow dynamics to be determined, including cross-sectional distribution, velocity, and residence time. A residence time study is performed when a tracer is injected upstream of the reactor and its inlets. The exit times are measured using sensitive detectors or a sampling method. This information is used to determine the mean residence time through the vessel, and the degree of mixing in the vessel.

## How is a Tru-Scan™ of a reactor performed and what information will it provide?

A Tru-Scan™ measurement is typically performed using a very low-activity, sealed radiation source, and a sensitive radiation detector aligned on opposite sides of the vessel. The scan is performed whilst the vessel is online and operating at normal, test, or upset conditions. Any external obstructions are noted to make sure they do not affect the scan interpretation.



## How safe are these procedures, and what about radiation protection?

We offer the safest, highest quality, and most accurate Process Diagnostics™ service available. The features of our systems include:

- Low-voltage scanning detectors and electronics that minimise risk.
- Wireless detector system, so there is no danger from co-axial cables getting burned or stuck on vessel structures.
- Our in-house multi-channel detector system provides a more focused diagnosis, detecting subtle but important problems that might be missed using other detector technology.

Compared to industrial radiography (X-rays of welds and piping), we use much weaker radiation sources for scanning – typically a thousand times smaller in terms of source activity. We strictly abide by our radiation license requirements to segregate an area around the equipment we are working on, to provide a safe boundary for all the personnel in your plant. Practically speaking, this usually means restricting access onto the equipment

being scanned. When conducting tracer studies, we segregate a small area around the injection point, but do not need to restrict access to the equipment being tested. Our procedures ensure we comply with regulatory requirements to protect all plant personnel. Our crew members are always willing to explain these procedures with everyone potentially affected, and to be sure we do not block access to critical areas. There is no danger to plant personnel working around process equipment, as long as they stay out of the work area.

## What information will a reactor study provide?

After a reactor study has been completed, the lead crew member will leave a preliminary report with the customer before leaving the plant site. A formal report will be provided soon afterwards. Whenever the productivity of a reactor system diminishes, the integrity of internals or the quality of catalyst in the reactor is often questioned. Maintenance costs and lost productivity strongly affect unit profitability, so advanced knowledge about needed repairs to a reactor is vital. Benefits of the study:

- Measures liquid, vapour or solid distribution characteristics to help identify operational problems.
- Generates a density profile of the reactor's internals.
- Locates the top of the catalyst bed.
- Identifies crushed catalyst.

Our innovative work gives customers the insights they need to help solve their problems. To learn more, read our case studies at [tracerco.com/downloads/case-studies](https://www.tracerco.com/downloads/case-studies)