

Identifying FCCU operational and mechanical issues at an early stage leads to greater efficiency and higher profitability.

What information will a Tracerco Diagnostics™ FCCU study provide me?

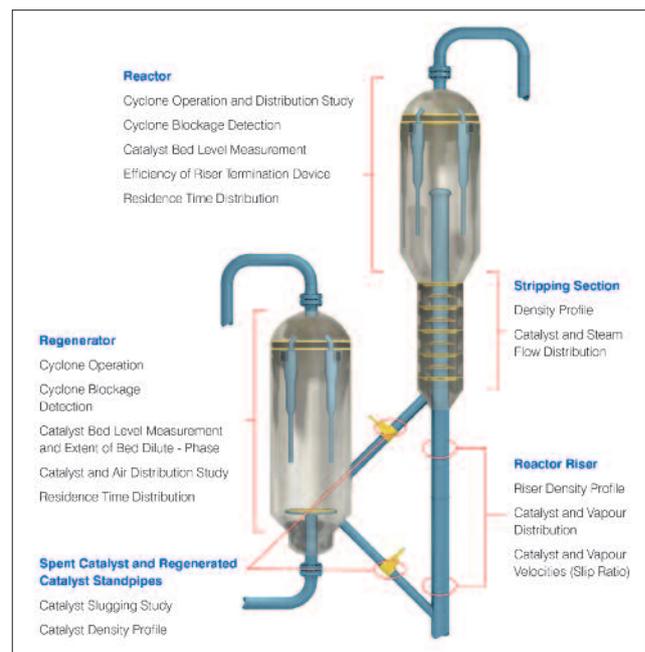
Tracerco has performed hundreds of FCCU studies worldwide to help diagnose operating problems and improve the performance of all major components of FCC units. These technologies are used to measure the velocity, distribution and residence time of the catalyst or vapour phase through any part of the system as well as density profiles within vessels. This includes testing to determine the efficiency of riser termination devices, cyclones or distribution devices. Each project is performed online and customised to provide the information needed to optimise or troubleshoot your specific process.

Which pieces of equipment in an FCC unit can Tracerco conduct studies on?

A typical Tracerco Diagnostics™ FCCU study can be conducted on any or all parts of the FCC including:

- Reactor Riser
- Reactor
- Reactor Stripping Section
- Regenerator
- Spent Catalyst & Regenerated Catalyst Standpipes

The illustration shown on this page will provide an overview of the type of studies that can be conducted on each piece of the FCC equipment.

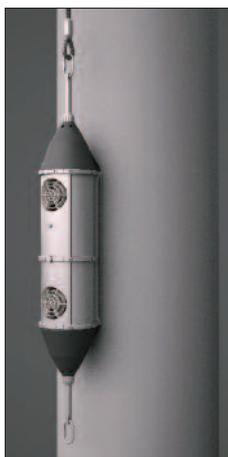


What preparation is needed before a study can be performed?

In general, most work is performed without any preparation to the vessels. 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. The detection systems are portable but may require additional support such as scaffold if the work scope is large enough and platforms are not readily available. Current drawings, showing the orientation of internals, is needed prior to ensure the appropriate detector or scanline locations are selected to get the best possible evaluation of the process conditions

What if I would like to measure refractory wall thickness?

InDepth™, the latest product from Tracerco, is the only tool that measures refractory wall thickness online and in real time. InDepth™ provides operators with an effective solution to determining refractory wall thickness inside process vessels or piping prior to a shutdown or turnaround, saving time and money on shutdown planning and execution. InDepth™ can also be used to accurately define the size of a known area of thin refractory, identifying the difference between localised damage from spalling and more general failure over a wide area with only a small hot spot.



How safe is this procedure?

We offer the safest, highest quality and most accurate Process Diagnostics™ service available. Safety features of our tracer, Tru-Scan™ and ThruVision™ detection systems include:

- Tracerco's in-house multi-channel detector system provides a more focused diagnosis, detecting subtle but important problems that might be missed using other detector technology.
- Low-voltage scanning detectors and electronics to minimize risk,
- Wireless detector system means no danger from co-axial cables getting burned or stuck on structures,

Our procedures for tracer studies ensure we comply with regulatory requirements to protect all plant personnel. We segregate a small area around the injection point, but do not need to restrict access to the equipment being tested.

Tracerco 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 about radiation protection?

Compared to industrial radiography (X-rays of welds and piping) our scanning applications use much weaker radiation sources - 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 currently being tested. Our crew members are always very willing to explain these procedures with everyone potentially affected and to make sure we do not block access to critical areas.

Tracerco is licensed by multiple regulatory agencies to be able to provide products and services to our customers worldwide. Where we are not currently licensed, we will work with local authorities to acquire temporary permissions. Based on regulatory and license conditions within each country there will be limitations on what isotopes and maximum source sizes can be used to perform flow projects. A Tracerco representative can discuss any restrictions or limitations that may impact the feasibility of projects within different countries.

What information will the Tracerco Diagnostics™ FCCU study results provide?

After a Tracerco Diagnostics™ FCCU study has been completed the lead crew member will leave a preliminary report with the customer before the project completion. A formal report will be provided soon afterwards.

A few of the results the study provides on FCC equipment include:

- **Reactor** - Tracer distribution studies of the reactor cyclones are used to determine vapour residence time, relative amounts of vapour or catalyst traffic entering the primary reactor cyclone, and detection of vapour carry under to the diplegs as well as catalyst carry over through the cyclones. A Tru-Scan™ provides a density profile of bed level and effectiveness of catalyst disengagement.
- **Reactor Riser** - Tracer flow studies provides information on the velocities and distribution of the lift steam, feed, and catalyst allowing for flow adjustments to increase efficiency to get the best conversion rate possible. A Tru-Scan™ can identify the size of the expansion zone providing details on unit efficiency. ThruVision™ generates a cross-sectional density profile that can determine the flow distribution of the catalyst, identify flow inefficiencies such as catalyst maldistribution, and determine if a nozzle is plugged or fouled.
- **Stripping Section** - Tracer techniques yield information about steam/catalyst distribution, mean residence times, and damage or plugging in steam rings. A Tru-Scan™ of the spent catalyst stripper will identify blockages and damage to internals.
- **Regenerator** - A detailed analysis of maldistribution from the air grid to the primary cyclone inlets is achieved by using vapour or catalyst tracer injections to track the flow distribution, superficial velocities, and mean residence times. A Tru-Scan™ identifies problem cyclones, the evenness of the dilute phase catalyst levels (which can indicate air maldistribution), and high catalyst levels in diplegs.
- **Spent & Regenerated Catalyst Standpipe** - Tru-Scan™ results characterise catalyst flow, identify blockages, bubble formation, and study the effects of fluffing steam that might influence the catalyst flow regime. Tracer studies will also identify areas of de-fluidization and backward vapour flow.

For further details email: process.diagnostics@tracerco.com or visit: www.tracerco.com/processdiagnostics

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

Enabling you to make the right decision

