



A rapid and cost effective method of determining gas, water, and oil flow rates

A Tracerco Diagnostics™ Flow study. What information does it provide?

A Tracerco Diagnostics™ Flow study measures flow rates through flare lines or piping systems. Our flow study technology offers a rapid, accurate, and cost effective method of determining gas, water, and oil flow rates.

What type of tracer materials are used to perform the testing?

The Tracerco team of experts will work with the customer to select a suitable tracer material for the equipment based on a series of process questions to determine the appropriate radioisotope and its chemical form. An example of a few of the questions asked include:

- What are the phases and compositions of the streams?
- What are the temperatures, pressures and flow rates of the streams?
- What is the size of the pipe?
- How accessible is the pipe?
- Is there an injection point?

Radioisotope tracers can be in the form of liquids or gases and can be detected using radiation detectors mounted externally to the piping.

What preparation is needed to perform a Tracerco Diagnostics™ Flow study and how is the tracer injected into the flowline?

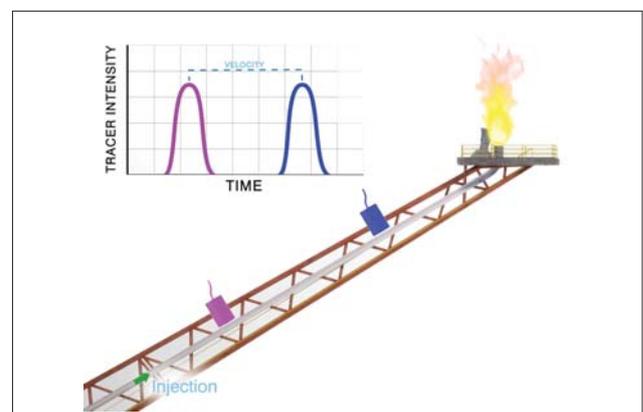
Studies can be performed on any pipe diameter and there is no need to remove any insulation to perform the flow study. The site requirements include a suitable injection point upstream of the detector placement into which the pulse of appropriate tracer can be injected. The injection point can

often be a drain point near a control valve, a pressure gauge tap or some other suitable nozzle.

A good set of Process and Instrumentation Diagrams (P&ID) is needed prior to performing the flow study so appropriate injection points can be determined.

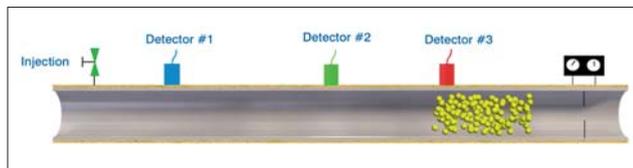
How is a Tracerco Diagnostics™ Flow study performed?

The most standard technique (Pulse Velocity) uses two or more radiation detectors on the outside of the pipe at a known distance apart. A sharp pulse of tracer that is compatible with the gas or liquid in the pipe is injected into the process stream. The tracer mixes radially in the pipe and flows at the same velocity as the gas or fluid. As the pulse of tracer passes each detector, the response is recorded. The time between the centroids of the response curves is the mean transit time of the tracer between the detectors and from this and detector separation, the flow velocity is calculated. Multiplying by cross sectional area and pressure within the line (for gases) allows flow rate to be measured.



Tracerco Diagnostics™ Flow study technology is used to measure flow in flare systems to locate sources of fugitive flow or calibrate flow meters. In the case of fugitive flow, once its' location is determined, each Pressure Safety Valve (PSV), block or relief valve can also be individually tested to determine which is leaking.

Tracerco has developed a meter proving technology based on the pulse velocity method that can accurately determine instantaneous flow velocities to prove the accuracy of flow meters in various applications such as critical process flow meters and custody transfer meters.



How safe is this procedure?

We offer the safest, highest quality and most accurate Process Diagnostics™ service available. Our procedures 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. Our crew members are always very 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.

What about radiation protection?

Tracerco employs fulltime Radiation Professionals to ensure regulatory and license compliance. Tracerco is licensed by appropriate agencies worldwide. Most staff are trained to act as Radiation Protection Supervisor (RPS) level during project execution.

In all cases radioisotopes will arrive at the work site inside transport containers suitable for the shipment of radioactive material. Tracerco has an excellent safety record and working relationship with shipping agents to ensure that movement between and within countries complies with all international and local legislation.

What logistics are necessary to deliver the equipment to our platform or FPSO?

The most common mode of transportation for the equipment to be deployed is by boat. In some cases the transportation of the isotope source can be by helicopter. In a preliminary job discussion with the customer, Tracerco will need to identify the mode of transportation for the equipment to be deployed.

On the boat or platform, provisions must be made for a location to store the radioactive source whilst not in use. Tracerco offshore personnel have completed offshore survival and helicopter flight training.

What are your limitations for flare flow rate testing?

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 imitations 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™ Flow study results provide?

After a Tracerco Diagnostics™ Flow study has been completed the lead crew member will leave a preliminary report with their customer before leaving the platform or FPSO. A formal report will be provided soon afterwards.

A Tracerco Diagnostics™ Flow study is used to help our customers determine flow, establish and allow the isolation of fugitive flare flow from within a flare line system, verify and calibrate meters and provide an independent verification that data reported for environmental compliance purposes is correct.

A few of the benefits a Tracerco Diagnostics™ Flow study provides include:

- Information on where excess gas is entering a flare system
- Determine the volume and thus the value of the material being lost to the flare
- Monitor process changes over start-up/shutdown cycle
- Determine leakage past relief valves or block valves
- Perform mass/flow relationships through flare lines or piping systems
- Verify and calibrate meters
- Determine efficiency of heat exchangers where flow meters may not be present

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

