Reliable leak detection technology for challenging heat exchanger process conditions

Tracerco's technology helps ensure a swift resolution, saving valuable time and resources while protecting product quality and operational efficiency.

The Approach

Tracerco's chemical leak test tracers offer precise, reliable leak detection specifically engineered for challenging process conditions. Our tracers meet all relevant criteria, selected for their solubility, chemical inertness, thermal stability, and faithful flow with the process medium, ensuring they remain stable and do not precipitate, minimising contamination risks or interference with the process.

With the capability to detect leaks as small as 0.5%, Tracerco's solutions have already proven, effective globally and exceeding industrial standards. However, in response to increasing demands for detecting even smaller leaks that can affect product quality, Tracerco has developed specialist chemical tracers that are detectable in samples at concentrations as low as 1 ppb, meaning that extremely small leaks can be detected. This allows manufacturers to monitor for leaks that might otherwise compromise quality or impact regulatory standards.

The techniques used to complete an injection program with tracers entail the introduction of the system-compatible tracer into the process medium that is unique to the system and sample for its presence downstream of the potential leak sources.

The Field Test

This investigation was initiated to determine the cause of off-specification product with high sulfur content, with two main potential causes identified: a leak from the naphtha hydrotreater feed effluent heat exchangers contaminating the product, or poor reactor performance.

After a careful assessment of in-situ conditions, Tracerco's subject matter experts (SMEs) selected specific, unique chemical tracers for targeted leak testing.

Using a targeted approach, Tracerco's team injected unique tracers into each high-pressure (HP) inlet over an 11-minute period and monitored the LP outlets for any signs of leakage. This method allowed for clear differentiation between potential sources.
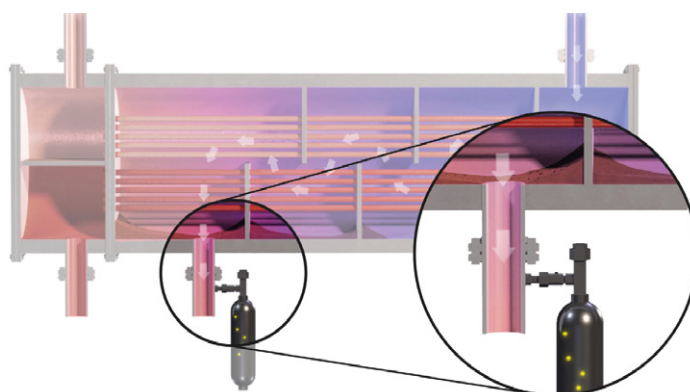
The Analysis

Figure 1 - Sample analysis results from heat exchanger E-002 A/B - Delayed positive response due to recycle from E0003 - No leak.

| Cylinder no.	Sample number	T-624 PPB	Remark
581	0	NA	Baseline
593	1	0.00	0-45 Sec
594	2	0.00	46-90 Sec
584	3	0.00	91-135 Sec
585	4	0.00	136-180 Sec
195	5	0.00	181 - 225 Sec
194	6	0.00	Plus 45 Sec
193	7	0.00	Plus 45 Sec
192	8	0.00	Plus 45 Sec
191	9	2.39	Plus 45 Sec
580	10	13.44	Plus 45 Sec
579	11	20.79	Plus 45 Sec
577	13	15.98	Plus 45 Sec
576	14	9.85	Plus 45 Sec
ND	Background	0	0

Figure 2 - Sample analysis results from heat exchanger E-0001 A/B/C - No leak.

Cylinder no.	Sample number	T-624 PPB	Remark
575	0	NA	Baseline
574	1	0.00	0-45 Sec
573	2	0.00	46-90 Sec
572	3	0.00	91-135 Sec
571	4	0.00	136-180 Sec
590	5	0.00	181 - 225 Sec
589	6	0.00	Plus 45 Sec
588	7	8.22	Plus 45 Sec
587	8	45.72	Plus 45 Sec
586	9	43.30	Plus 45 Sec
570	10	28.32	Plus 45 Sec
569	11	18.21	Plus 45 Sec
568	12	13.26	Plus 45 Sec
567	13	8.12	Plus 45 Sec
566	14	4.00	Plus 45 Sec
ND	Background	0	0

Figure 3 - Sample analysis results from heat exchanger E-0001 A/B/C - No leak.

Cylinder no.	Sample number	T-624 PPB	Remark
590	1	0	Baseline
589	2	0	0-45 Sec
588	3	0	46-90 Sec
587	4	0	91-135 Sec
586	5	0	136-180 Sec
575	6	0	181 - 225 Sec
574	7	0	Plus 45 Sec
573	8	0	Plus 45 Sec
572	9	0	Plus 45 Sec
571	10	0	Plus 45 Sec
566	11	0	Plus 45 Sec
567	12	0	Plus 45 Sec
568	13	0	Plus 45 Sec
569	14	0	Plus 45 Sec
570	15	0	Plus 45 Sec
ND	Background	0	0

Figure 4 - E-0002A/B and E-0003 dilution curves.

Tracer concentration vs time

E0003 T-450

E0002A.B T-412
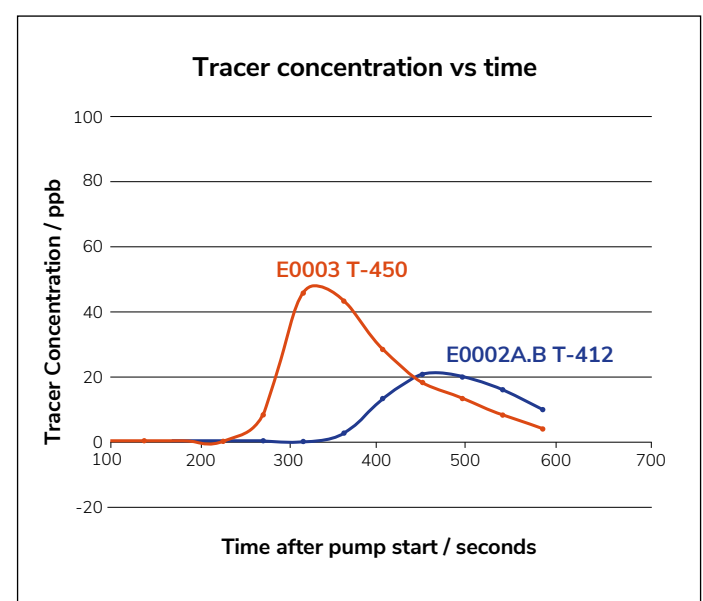
The Conclusion

The results of the test indicate one of the six exchangers tested was leaking, as summarised in the table below.

E-0001 A/B/C units showed no signs of leakage, ruling them out as contamination sources. E-0002A/B displayed a delayed, minor tracer response, ultimately identified as a false positive due to recycling effects from another source. The E0003 heat exchanger was confirmed as the leaking unit, providing the client with clear direction to address the sulfur contamination issue at its source.

By isolating the exact source of the leak, Tracerco's technology helped ensure a swift resolution, saving valuable time and resources while protecting product quality and operational efficiency.

Exchanger	Leak %	Result confidence level
E-0001A	0	High
E-0001B	0	High
E-0001C	2	0.00
C	0	High
E0002A/B	0.043*	Low
E0003	0.089	High

* Positive leak response probably from E0003 leak given the long-time frame before detection

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**

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