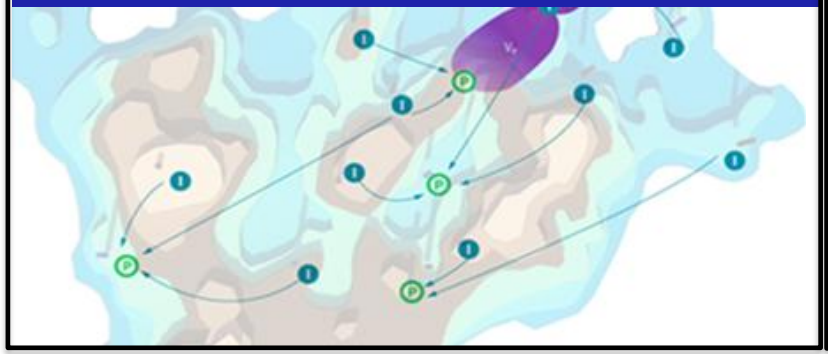
We Are Your Partner for Global Reservoir Flow Insight.

Tracers are used for reservoir characterization as well as production and field development optimization

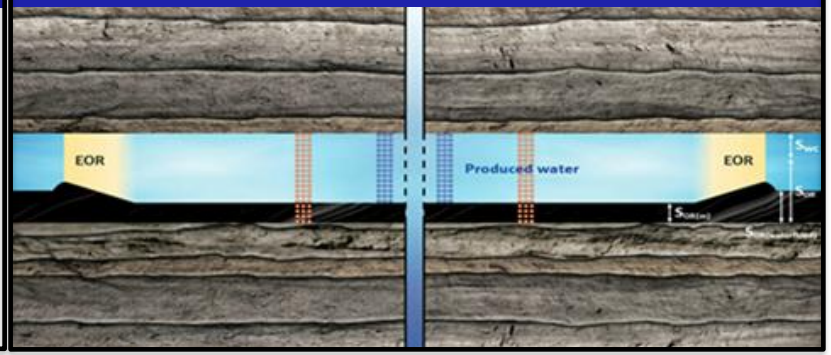
Inter-well Test

Inter-well Connectivity, Heterogeneity Sweep Volume, Remaining Oil Saturation



Single Well Tracer Technology

Remaining/Residual Oil Saturation Measurement

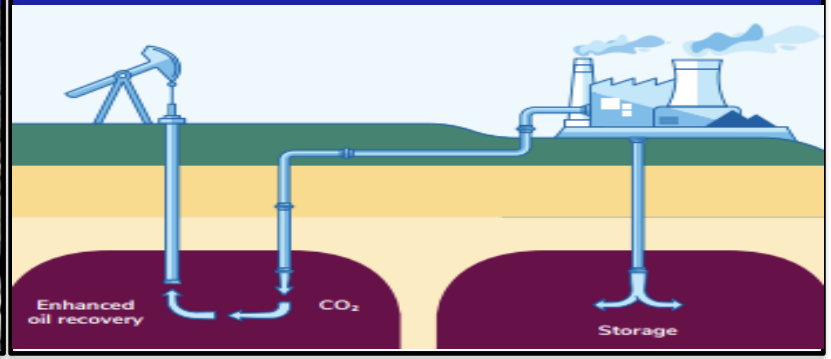


Inflow Study

Wellbore Fluid Inflow Profiling

CCUS

Confirm storage seal, Identify leak source



With 40 years of experience, Tracerco's chemical tracer technology delivers actionable flow intelligence across onshore and offshore reservoirs, enabling accurate tracking of oil, gas, and water from reservoir to wellbore.

Chemical Frac Tracers Are Used to Study Drilling and Well Performance

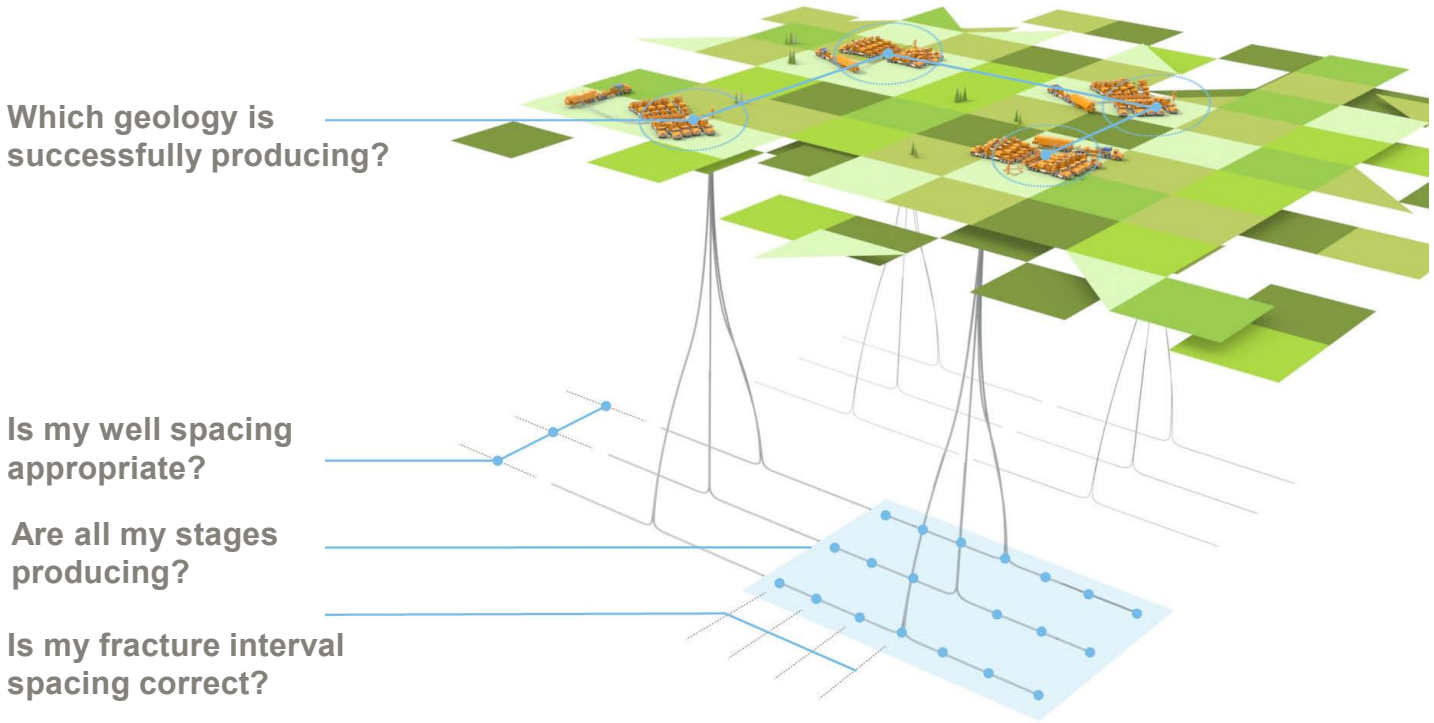
Available as gas, oil and water specific variants, in liquid and proppant form, and are mixed on the fly with typical fracture fluids.

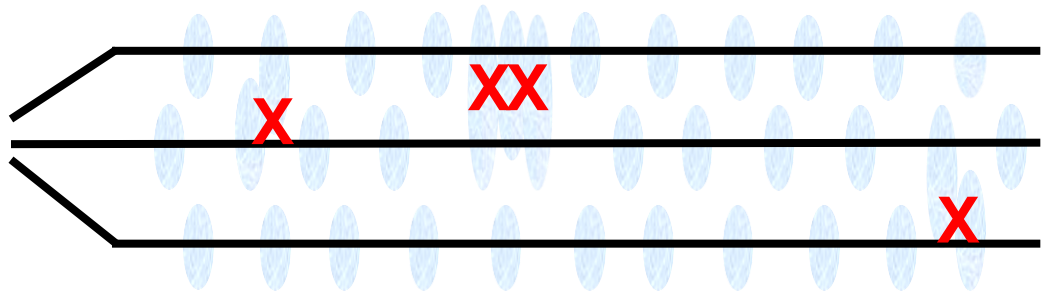
The fracture fluids transport the tracers deep into the fracture matrix, tagging any in-situ oil, gas or water phases they contact along the way.

On production, the tracers then flow back with the oil, gas or water phase they have affinity with and are collected in surface samples.

Collected samples are then analysed in our laboratories around the globe.

The relative amounts of each tracer measured in samples are used to estimate individual stage production contributions.





Case Study:

Four vertical wells were drilled intersecting five target zones within a stacked play.

Each well was fractured with multiple stages in each zone.

Chemical tracers were used to estimate individual oil production of each zone from each well (zonal contribution) alongside conventional production logging tools (PLTs) to confirm the accuracy of their use.

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Zonal Contribution Profile

Comparison of the amounts of each tracer in samples serves as a proxy of stage production contribution, with sequential samples providing a Tracer Production Log™ (TPL) that captures production variations in each stage over time.

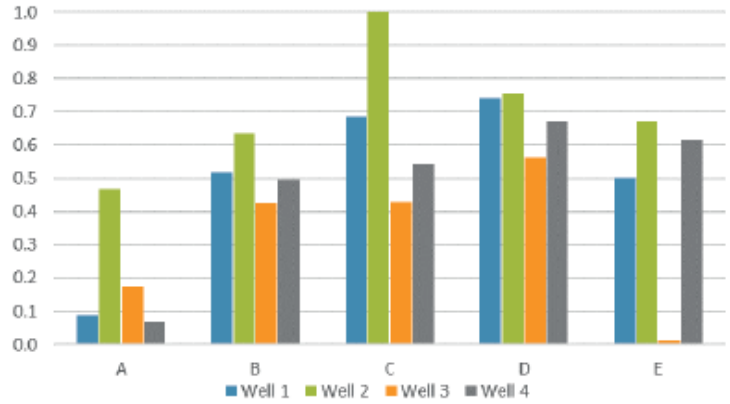

Figure 1a - Zonal Contribution Ratio (Oil) by Wellbore.

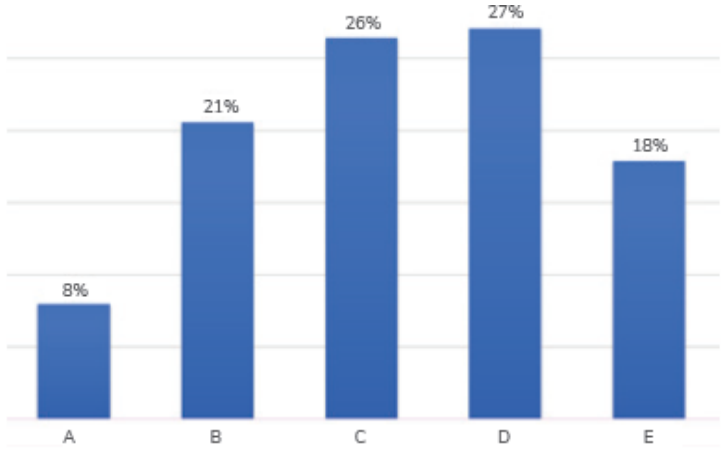

Figure 1b - Overall Zonal Contribution Ratio (Oil).

- Zonal contributions indicated that zone A was the least productive and zones C and D were the most productive.
- A review of individual variation between wells showed that zone C had greater production variability across the field as compared to zone D. This was attributed to variations in rock properties in zone C.
- Zone D had more consistent rock properties across the field, giving higher confidence to landing horizontal wells in this zone.

Tracer Observation Confirmation via Sliding Sleeve and PLT Testing

A test of zonal contribution in a well installed with sliding sleeves was carried out with data shown in Figure 2. Production was isolated to each zone by mechanically closing all but one sleeve for a two week period. Flow from zone A was blocked by a bridge plug during this testing. Flow rates were then compared.

A PLT in well 1 was also run with data shown in Figure 3.

- The comparison of oil production measured with open sleeves and tracer technology is shown in Figure 2. Agreement between the methods was confirmed and was consistent with zonal production measurement in Figure 1a.
- The PLT and tracer results were in good agreement for zones C, D, and E. It was not possible for the PLT to distinguish the individual contributions of zone A and zone B due to obstructions to tool movement.
- Overall, both technologies yielded similar zonal contributions based upon a combined flow from zones A and B and individual flows from zones C, D, and E.

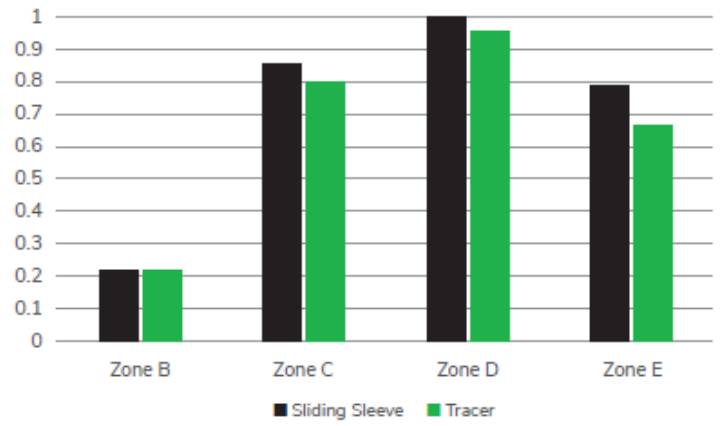

Figure 2 - Sliding Sleeve vs Tracer

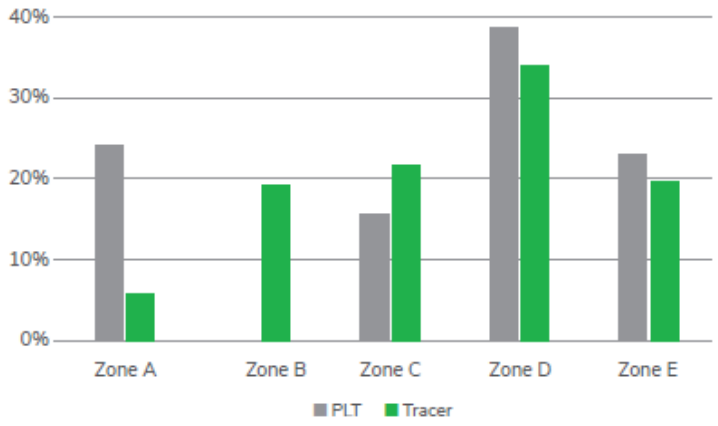

Figure 3 - PLT vs Tracer

Flow Contribution Over Time Using Tracer Data

One of the main advantages of tracer technology is the ability to capture continuous data without shutting in the well through sampling and analysis.

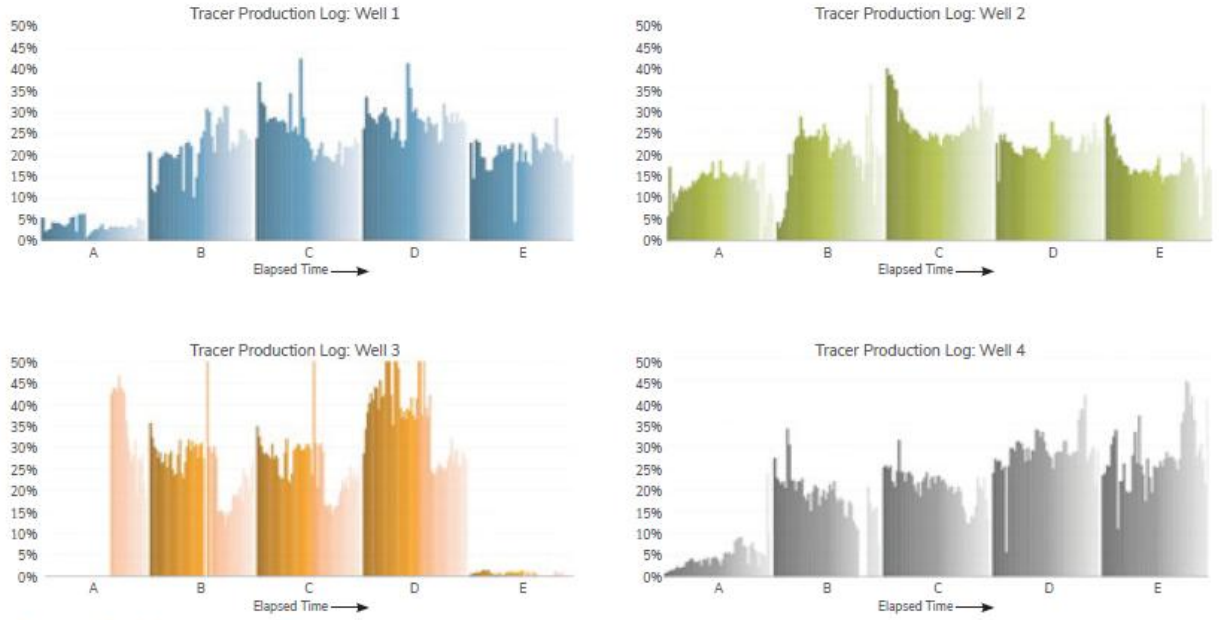

Figure 4 - Flow Contribution over Time

- Figure 4 shows the zonal contribution variation of each zone over 150 equivalent days. This type of knowledge helped in understanding the effectiveness of the well stimulation program and characterising the true potential of the reservoir. A single snapshot in time will not capture the true potential of a zone if it is changing with time.

- As an example, zone C generally showed a declining production trend with time during the test whilst zone D showed the most stable production during the time period, suggesting it is the best target for further development.

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Conclusion

Chemical tracer technology gave insight into the zonal production contribution and helped identify the most productive zones for future horizontal well development in a stacked reservoir.

The tracer results of zonal contribution were in agreement with zonal contribution results from a PLT and sliding sleeve testing.

Tracer results clearly indicated that production contribution from individual stage and zones varied over time.

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Questions

If you have any questions, you can reach me at:
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