

Chemical Tracers for Empirically-based Resources Assessment and Data Driven Valuations throughout an Asset's Life

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Abstract

Direct measurements of zonal production whether in multi-stage unconventional horizontal wells or multi-zone conventional vertical and directional wells are essential to a true understanding of an asset's value. Over the past 15 years chemical tracer innovations have advanced for measuring targeted producing formations and horizontal well zone contributions for reservoir characterization and asset assessments. Mid-life asset management and infield development can be further characterized for enhancing production while minimizing capital investment in depleted acreage and focusing on best ROI. And for later life asset development, chemical tracers are critical for EOR project management by understanding injector-producer relationships to understand enhanced recovery performance and further maximizing capital returns.

There are many reasons for surface recovery of "in-situ" measurements of production data using chemical tracer technology providing a wide-variety of production assessments throughout the life-cycle of an asset.

In unconventional wells that are hydraulically stimulated in multiple staged intervals across a long reach horizontal wellbore, geologic and other reservoir characteristics will have a direct impact on a well's overall production. Using chemical tracers, a resource's staged productivity can be monitored for a correlated understanding of drilling parameters, stratigraphy and geologic composition, and completion techniques over time. Tracers provide a better understanding of the resource and changes in different completions technologies that are used to liberate hydrocarbons can be directly measured and understood towards making improvements in D&C best practices while enhancing a resource's ultimate valuation.

Likewise, in conventional wells with multiple producing zones through vertical penetrations of comingled interval hydrocarbon production, tracers can be used to provide details of formation zone productivity to understand individual zone contributions of oil, gas and water. Again, chemical tracer measurements are valuable in managing the targeted resource stacked pay for optimizing production and a truer asset valuation over time.

As a resource development evolves, chemical tracers can be applied for continuing in-fill development assessments and understanding depletion, interwell-communications and, ultimately, identifying the best well candidates for late life asset development and field recovery enhancement investments using secondary- and tertiary-recovery techniques.

This paper will focus on how tracer technologies are used over the life-cycle of full-field development of hydrocarbon assets, both oil and gas

reservoirs, including different EOR techniques in conventional and unconventional petroleum assets. Case studies in different US basins are included to illustrate the application of tracer technology available today.

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