

Refrac Analysis Workflow

March Update

11 March 2024

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Refracs

A 'refrac' or refracturing treatment refers to the process of performing another hydraulic fracturing operation on a well that has already undergone the process in the past.

This restimulation of a well by pumping high pressure fluid into the well to create new fractures or to restimulate existing ones that have become less productive over time after an initial period of production.

Refracs can tap into unstimulated parts of the reservoir with higher pore pressure and is seen as an effective way to increase production and may be a cost-effective alternative to drilling new wells.

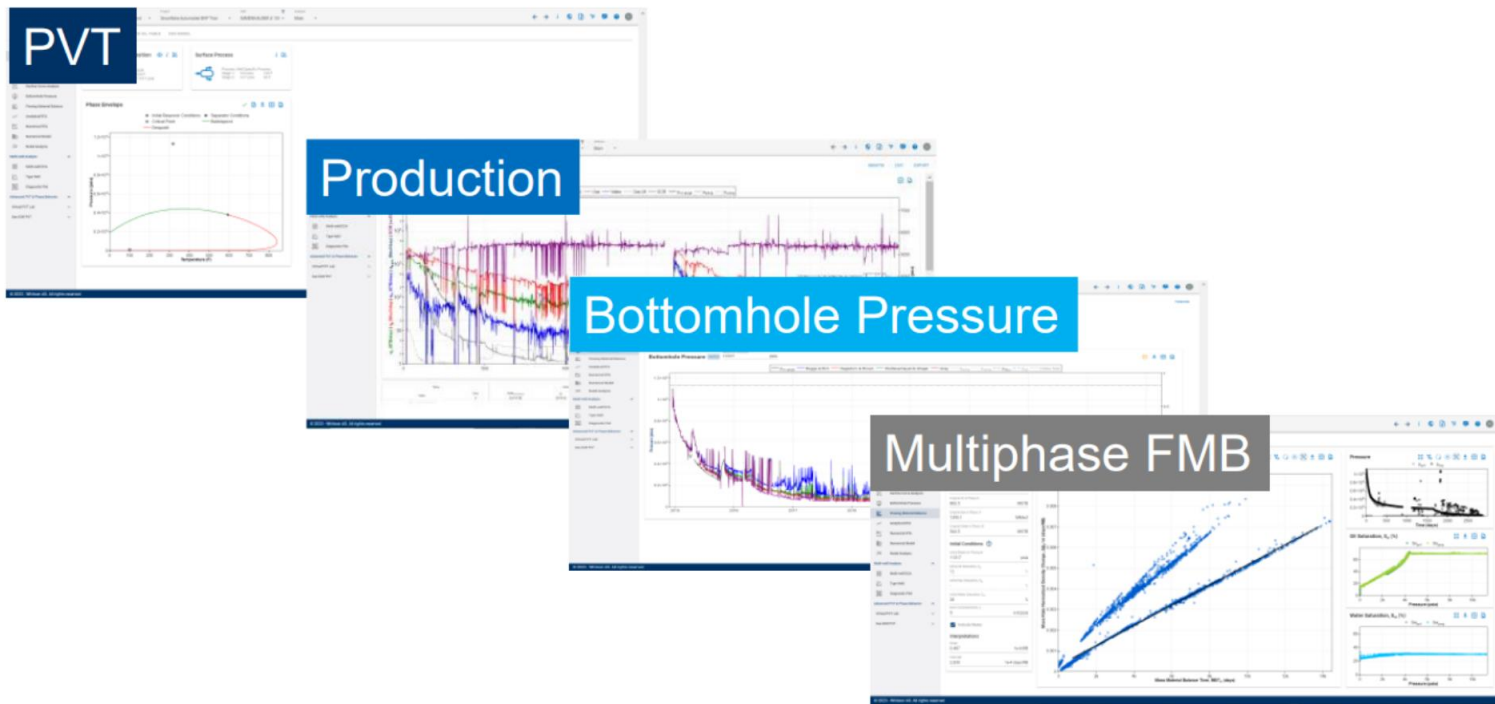
Refrac Analysis Workflow

There are two main reasons to do a Refrac Analysis –

1. To evaluate an already **existing refrac**, we recommend the paper Young et. al., 2023, where 46 refracs were analyzed in Eagle Ford using whitson+. The workflow recommends the use of MFMB for this purpose.
2. To predict the uplift on a **new refrac** (that hasn't been done yet), it is recommended to use Numerical Modeling.

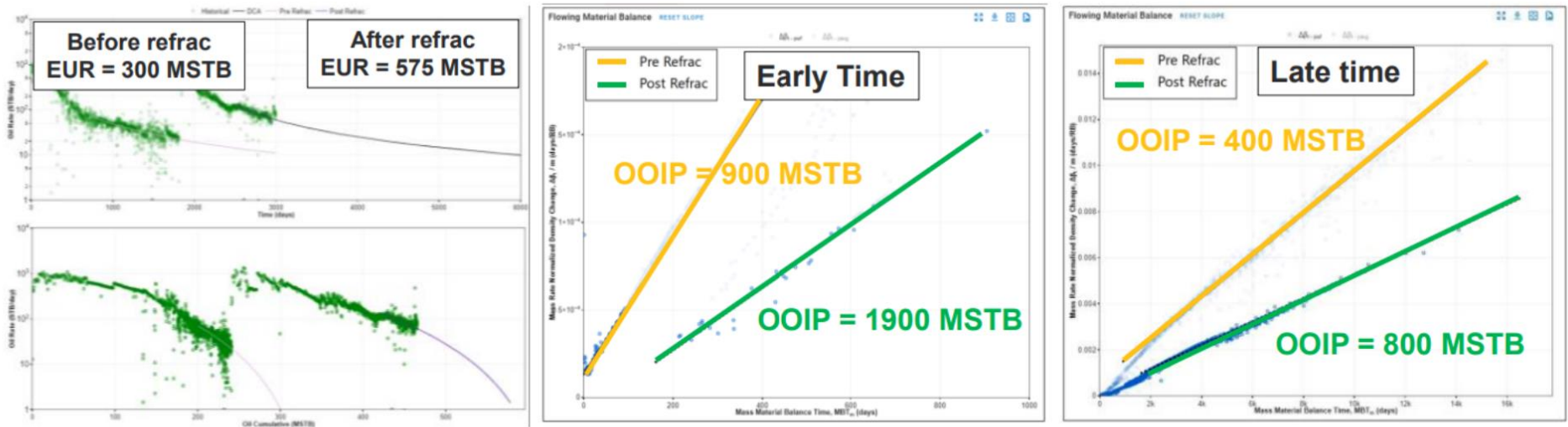
Existing Refrac Analysis Workflow

1. Set initial reservoir conditions and initialize PVT and calculate BHP.
2. Use the MFMB plot to capture the late time and early time slope before and after the refrac.
3. Compare the OOIP generated by the slope picks before and after the refrac at early time and late time separately and estimate the average increase in OOIP.



Existing Refrac Analysis Results

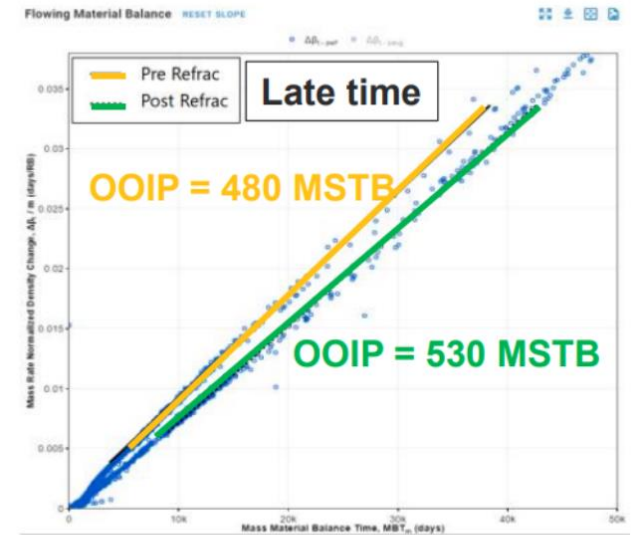
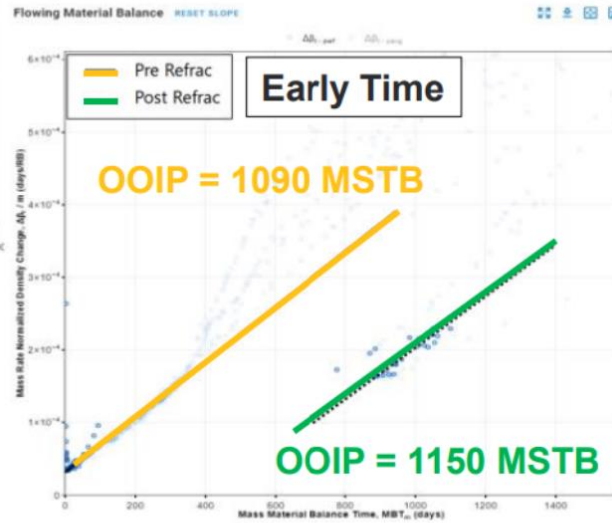
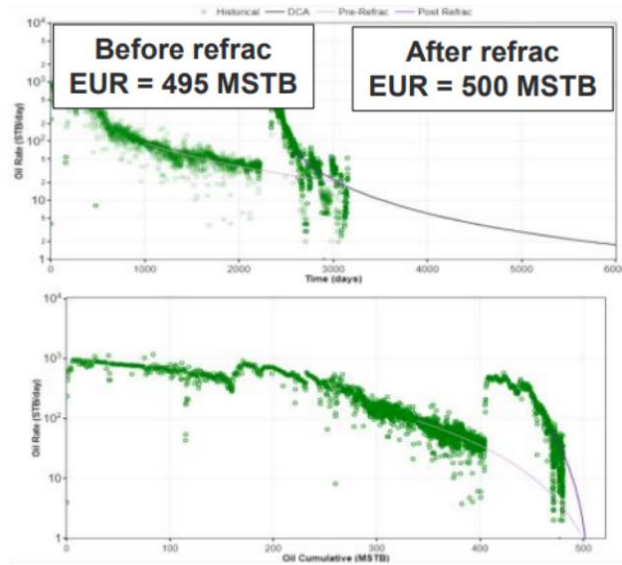
If the refrac was ***successful***, the MFMB method should resolve a higher contacted OOIP after the refrac compared to before in both early and late time slope picks.



Key plots related to a successful refrac in the Eagle Ford.

Existing Refrac Analysis Results

If the refrac was unsuccessful, you will see the same or smaller volume in both pre and post refrac slope picks.

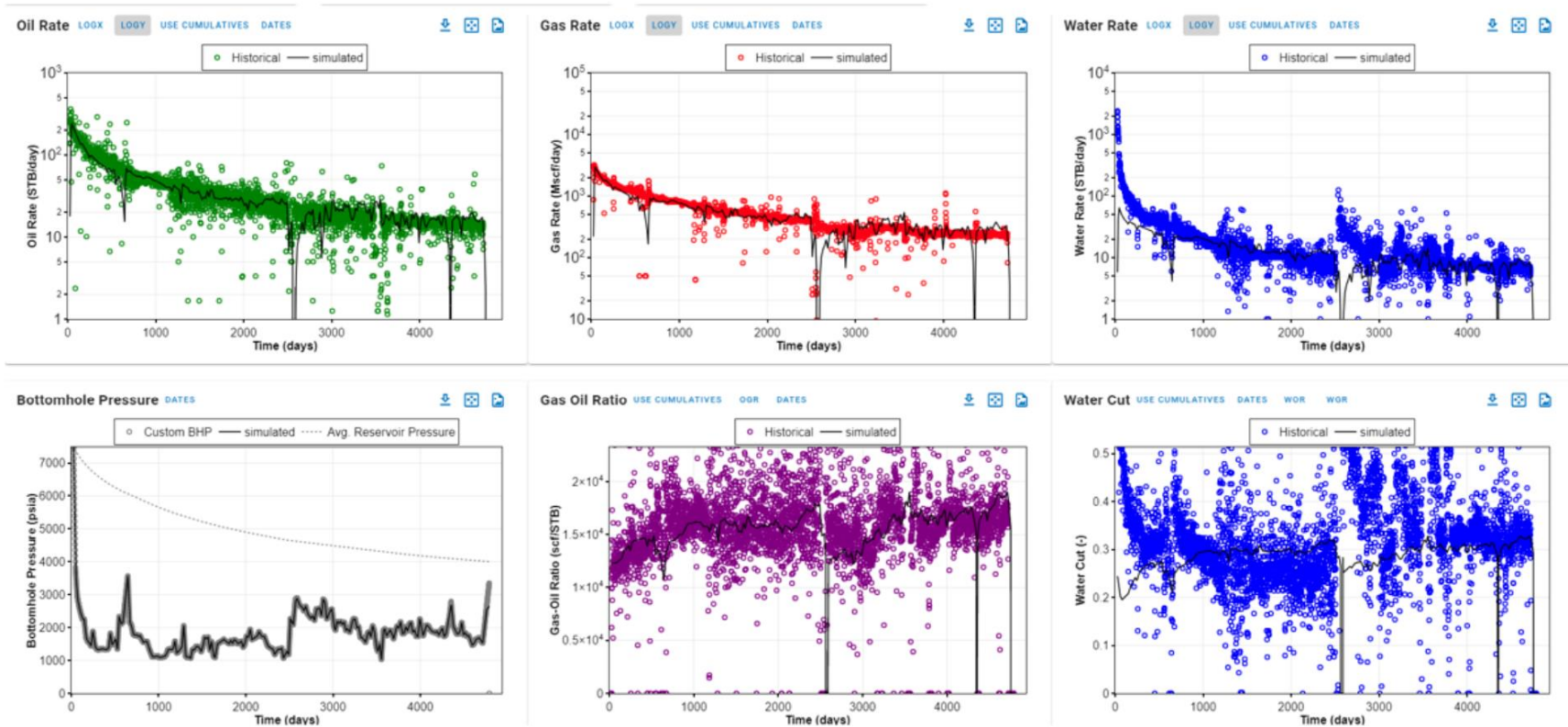


Key plots related to an unsuccessful refrac in the Eagle Ford.

New Refrac Analysis Workflow

Workflow for estimating uplift on planned refracs

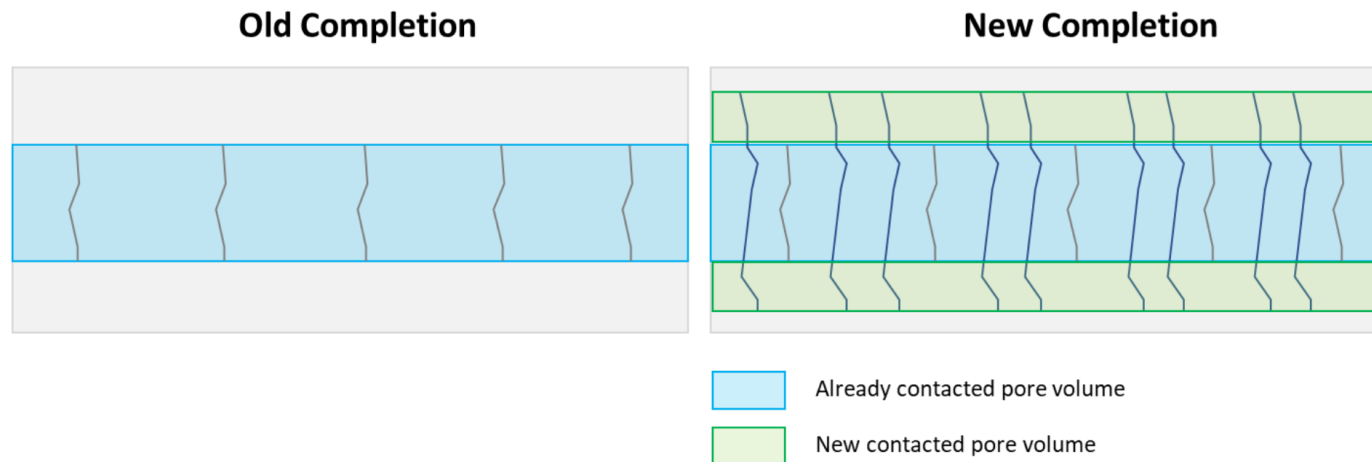
1. History match the target well and resolve a numerical model with high confidence. Then forecast this model to generate a baseline future expectation from the well, under current conditions.



High confidence history matched numerical model

New Refrac Analysis Workflow

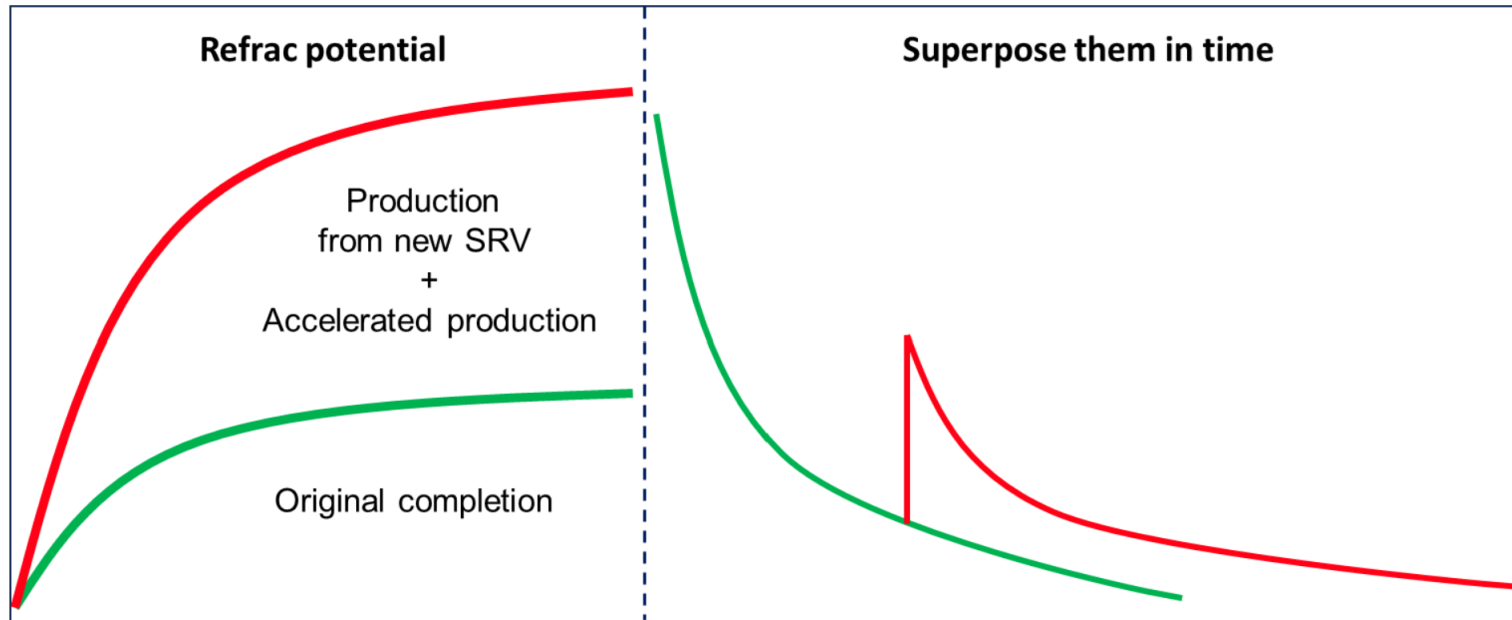
2. Copy the well (Wells page --> Click the three dots to the right of the well name --> Copy well)
3. On the copy of the well, modify the numerical model to reflect the expectation from the refrac, i.e. -
 - a. Change the completion - increase the number of fractures (N_f), fracture Height (h_f) and/or fracture half-length (x_f).
 - b. Increasing N_f will primarily accelerate depletion but yeild a higher intial rate.
 - c. Increasing h_f , x_f (if we expect a bigger refrac completion) will add additional pore volume.
 - d. Forecast this updated model.



Updating the baseline numerical model

New Refrac Analysis Results

- Delta between outcomes of steps 1 and 3 is the refrac potential of this well.
- Superpose these resulting rates at the time of refrac to get the uplift expected after refrac



Forecasting the updated model and evaluating uplift

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Appendix