



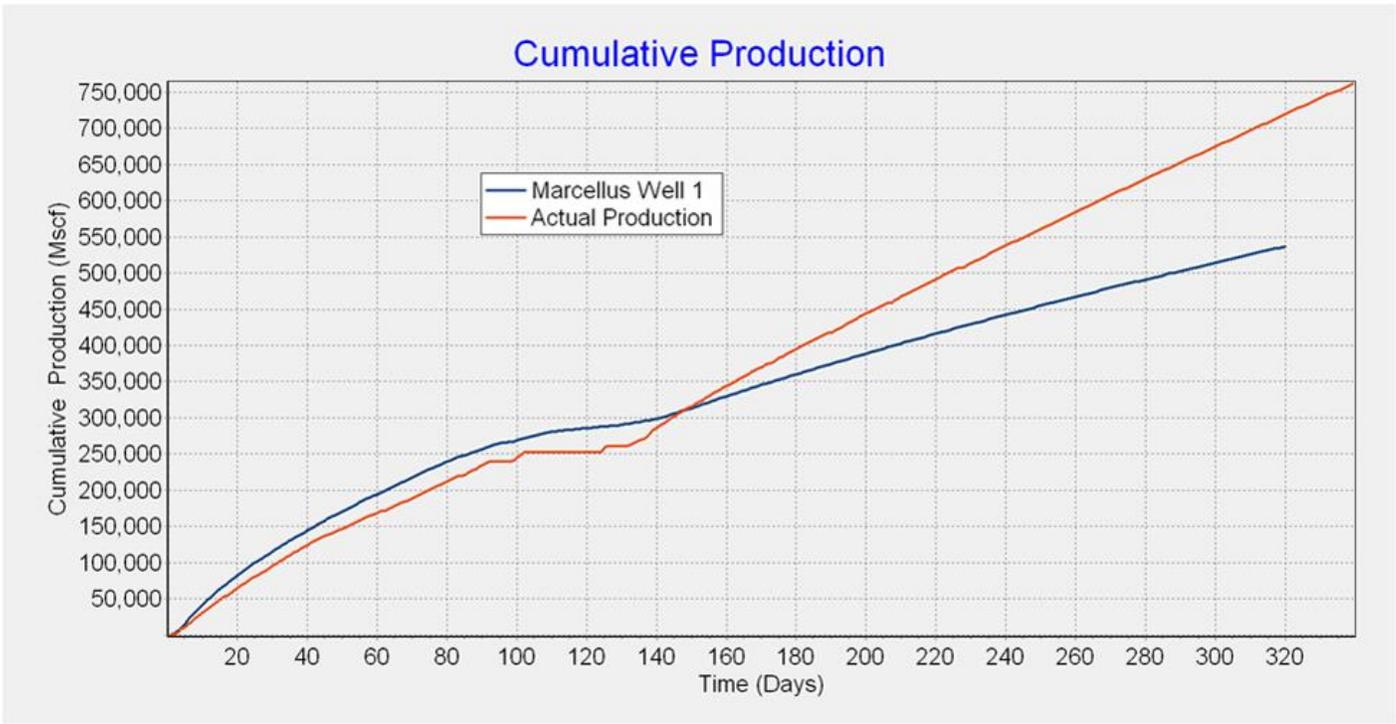
PREDICT-K “TIP OF THE MONTH”

Identifying Changes in Production Potential

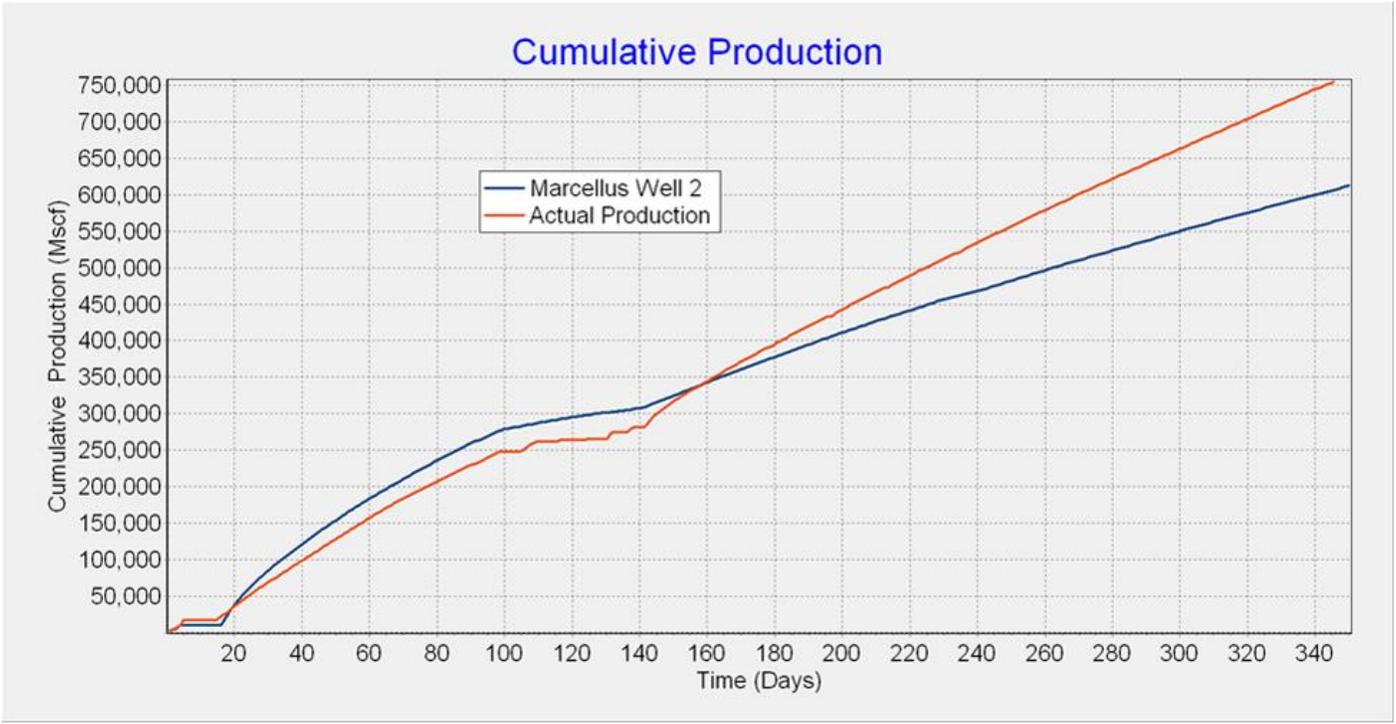
The Predict-K Production Analysis mode is a powerful and efficient analytical production simulator. In most cases, this allows completions and production engineers to quickly develop a reservoir description that will mirror actual well production. Once this reservoir description is in place, completion design can be optimized, or sensitivity analysis can be performed to determine the variables that are most critical for controlling production results. With this knowledge, better properties and assumptions can be fed to the reservoir simulation team so that these time-consuming simulations can be targeted towards the critical reservoir variables. This process will be discussed in a future tip.

While Predict-K can be used to match most production cases, it is not built to account for changes in the well’s productive capacity. These changes could include frac hits, well interventions, shut-in effects, production interference from offset wells, well damage, or anything else that changes permeability and reservoir contact. With an understanding of this limitation and confidence in the Predict-K simulation results, you can find possible causes of the change in production potential and quantify the impacts in terms of hydrocarbon recovery and net present value.

As an example of this capability, the examples shown are from SPE 173620 “Determining the Number of Contributing Fractures in Shale Wells with Production Analysis and Proppant Tracer Diagnostics.” Two of the wells from the Marcellus were shut in with a significant change in the production character as a result of the shut in.



Marcellus Well 1 Cumulative Production Results



Marcellus Well 2 Cumulative Production Results

In both wells, an acceptable match was achieved before the shut in, but the data after the shut in could not be matched at the same time with reasonable well properties. The early time data was matched using known reservoir and wellhead pressure data and the results from rate transient analysis on the available production and flowback data. These datasets clearly show that the shut in resulted in a large production improvement. Based on the Predict-K results, each well produced an additional 0.15 to 0.2 Bcf of gas in the 180 days after the shut in compared to what would have been

expected without a shut in. These two wells are prime examples of the benefit of the soaking phenomenon seen in the Marcellus and other shale gas reservoirs. In these reservoirs, the formation and water interact during the shut in resulting in an improvement in apparent reservoir and fracture properties. With more well and cost data, the economic benefit could be determined accurately, but the production increase is substantial enough to demonstrate that some economic benefit was present. In other reservoirs, we have seen both damage and production benefit that can be easily and quickly quantified using Predict-K.

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