November 2020 – CSUR Technical Webinar #2

Well Performance in Transient Flow - RTA & Monte Carlo Risk Analysis

TECHNICAL
WEBINAR
SERIES

"WELL PERFORMANCE IN TRANSIENT FLOW - RTA & MONTE CARLO RISK ANALYSIS"

By Yohana Vivas, Technical Advisor - IHS Markit.

To continue the focus on unconventional reservoir evaluations and well performance analytics, CSUR was pleased to have on hand Yohana Vivas, Senior Technical Advisor at IHS Markit (Houston), to provide additional context in assessing a well's performance during its transient flow period. Horizontal multi-fractured (HMF) wells from unconventional reservoirs present a unique challenge in that they have long transient linear flow periods prior to achieving boundary dominated flow. This results in a multitude of possible answers that provide acceptable history matches of the data. The objective of the session was for the speaker to provide a workflow and potential approach to minimize the uncertainties.

Elaborating and expanding on the workflow suggested by her colleague, James Ewert, at a CSUR webinar in early November 2020, the speaker reiterated on the specific applications and the limitations of the proposed methodology. Traditional methods using a deterministic technique were sufficient to arrive at a unique answer for conventional reservoirs. However, with exploration into low and ultra-low permeability (unconventional) reservoirs using HMF wells, earlier methods fell short on providing definitive results. As such and to consider inherent uncertainties with unconventional reservoirs, a probabilistic determination is necessary to bracket the range for all the completion and reservoir flow parameters.

The technique proposed by the speaker utilizes the general production data analysis tool within the Harmony platform (RTA) to arrive at estimates for completion & reservoir parameters and to perform modeling to validate the interpretation of the data. Typically, the goal of the analysis is to obtain a unique set of results to represent the well-reservoir system. However, not knowing the size or the extent of the reservoir constrains the analysis, especially in unconventional systems. Therefore probabilistic analysis is required to account for uncertainties in model input parameters, provide a range of acceptable results, and generate an array of Expected Ultimate Recovery (EUR) values to define the P90/P50/P10 scenarios while still honoring the historical well performance all within the Harmony platform.

As indicated by the speaker, this type of a probabilistic analytical approach or Monte Carlo Risk analysis allows for the investigation of many possible solutions. In addition, complex systems such as HMF wells, which are essential to maximize recoveries from unconventional reservoirs, involve the investigation of many additional parameters to properly establish reliable solutions and acceptable reserves estimates.

Summary

With transient reservoir flow comes uncertainty. Anyone who's attempted to history match their well history with a reservoir model knows there are many possible reservoir descriptions and combinations of permeability, fracture size, etc that can produce beautiful history matches, but provide very different forecasts. How to we bracket this range of uncertainty, while honoring the historical well performance? RTA & Monte Carlo Risk Analysis. Join us to see one solution to tackle this challenge of wells in transient flow.
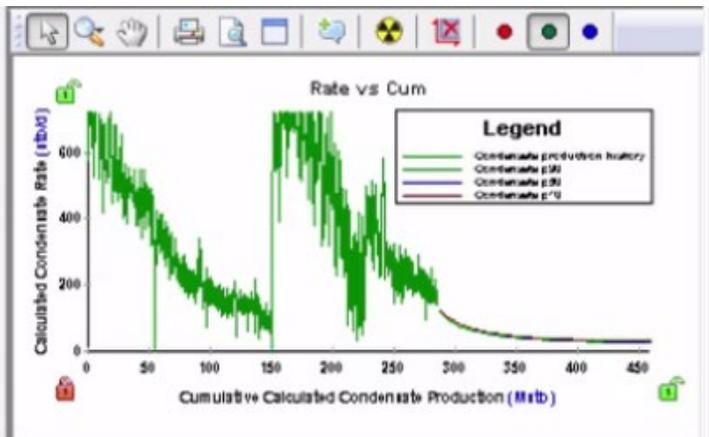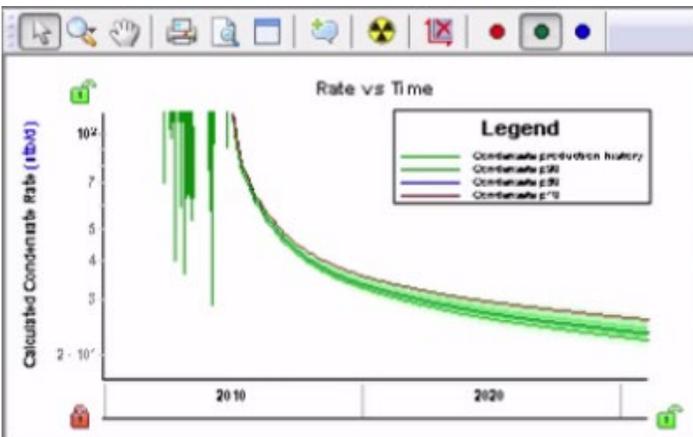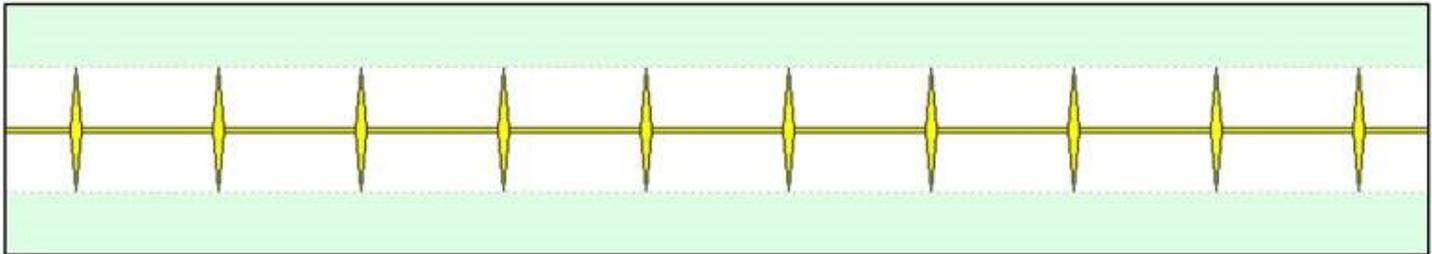
Parameter	Unit	p90	p50	p10
x_f	ft	162	175	188
k_{SRV}	md	3.5003e-03	3.5006e-03	5.9992e-03
OGIP	MMscf	9385	9385	9385
OWIP	Mstb	1937.3	1937.3	1937.3
OCIP	Mstb	1407.8	1407.8	1407.8
$OGIP_{SRV}$	MMscf	1885	2034	2182
$OWIP_{SRV}$	Mstb	389.1	419.8	450.4
$OCIP_{SRV}$	Mstb	282.7	305.0	327.3
EUR_g	MMscf	5598	5698	5898
EUR_o	Mstb	44.550	44.792	45.279
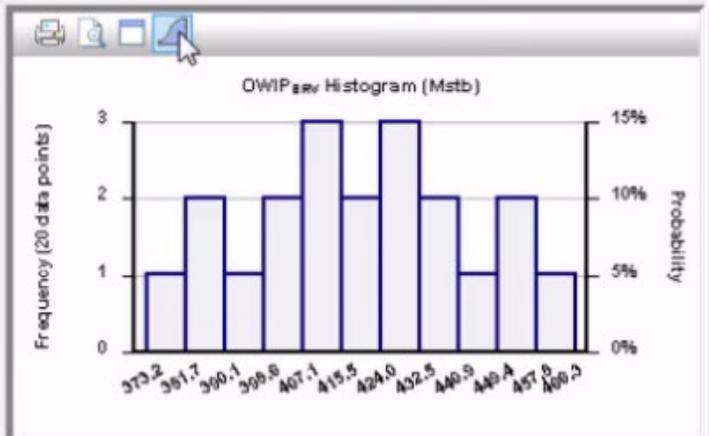
PRESENTER: Yohana Vivas, Technical Advisor - IHS Markit. (Yohana.Vivas@ihsmarkit.com)

Yohana Vivas is a Senior Technical Advisor for the IHS Markit Engineering Software. She graduated with a B.Sc. in Petroleum Engineering from the Universidad del Zulia, Venezuela. Her industry experience has been focused in reservoir management and production optimization. She has brought practical experience for service companies and E&P operations in the US and Latin America. Yohana has worked on conventional and unconventional, onshore and offshore gas and oil assets on both Reservoir Engineering and Production Optimization teams. She has over 10 years' experience in the O&G Industry and around 7 years supporting technical applications within IHS Markit.