Well Completions – Optimize your well design for return on investment and well performance

6X: Modeling optimal stage design through multi-well DSU's for value

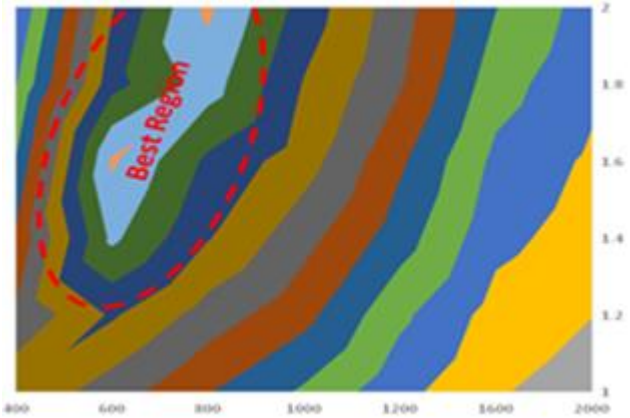
With a highly reduced rig count, operators are completing previously drilled and uncompleted (DUC) wellbores with the goal of optimizing productivity and profitability by maximizing rate and minimizing cost. Stimulation designs remain focused on propping the fracture to maximize the conductivity and improve the well's economic life by slowing the decline. The hydraulic fracturing of horizontal wellbores depends on both the rock properties and the completion treatment design and intensity. 6X is designed to model these for completions at any scale: from a cluster to a stage; from a well to a multi-well drill spacing unit (DSU).

Calibrate your model by history matching the parent well, then optimize the design of the child wells for performance and return on investment

In 6X the fluid injection effects the net pressure in the rock, causing fractures to propagate and grow, defining the fracture height, width, length and hence the stimulated reservoir volume (SRV). Tracer modeling is used to capture the proppant transport, slickwater movement and leak-off. The unique Implicit Stress Solution models the dynamic change in mean stress and, once pumping is completed and the pressure distribution stabilizes, the compressibility controls the closure of the fractures and trapping of the proppant.

The decline in flow from the matrix to the fracture, and the decline in fracture conductivity with depletion, depend on the fracture closure parameters. Their impact on the parent well's production and pressure may be used to tune the history match.

On completion of the history match, and having ascertained the reservoir character, multiple realization sensitivities of child infill well completion designs can be used to build a matrix of results. Return on investment (ROI) or net present value (NPV) can be correlated against effective fracture length and the number of stages, to determine the optimal value and performance scenario for wells in a particular DSU. This workflow should be used across multiple DSUs to reduce uncertainty and build the value.



Cross plotting well spacing vs. treatment size to identify NPV sweet spot

6X Well Completion Functionality:

- Optimize parent to child well spacing
- Design selection: cluster spacing, clusters per stage and treatment volumes
- Limited entry perforation erosion
- Dynamic stress change through SRV stimulation and depletion
- Proppant and fluid pump schedule
- Proppant transport model and proppant trapping
- Fracture conductivity change as fractures open and close

Assess and optimize your well completion from stage treatment design to multi-well drill spacing unit optimization.

Optimize your well completion design for both return on investment and well performance; minimize parent child interference and maximize the value of drill spacing units.

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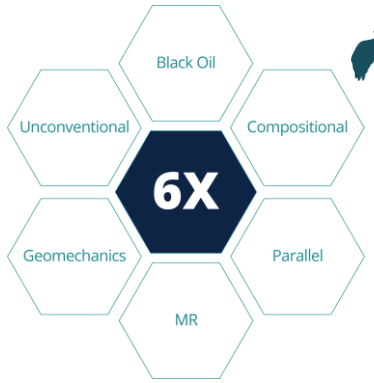
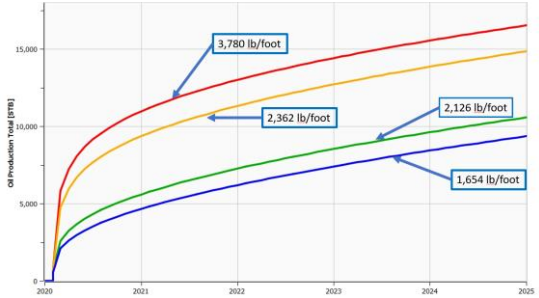
6X: Multiple Realizations – integral to every decision



All functionality available in ***one*** license

Conventional and Unconventional Simulator with Fully Integrated Multiple Realizations (MR) capability

Quantification of uncertainty can be difficult and time consuming. Subsurface uncertainty exists from intrinsic geological complexity. A desire to quantify development options drives the successful application of Multiple Realizations; a pragmatic approach to optimize performance and maximize recovery from oil and gas reservoirs. It has successfully been applied from development appraisal stage projects to mature field projects and has increased project net present value.

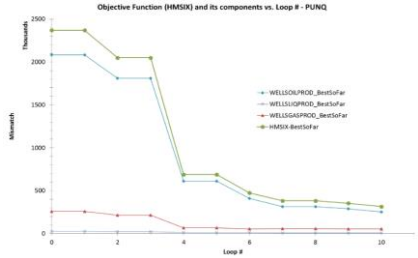


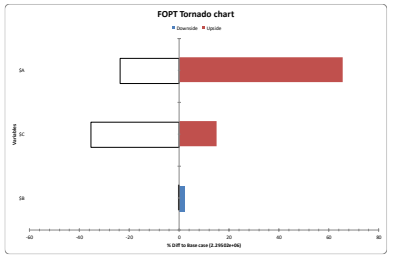
Different proppant concentration injection sensitivities – run simultaneously on multiple cores from one dataset.

6X Multiple Realization workflows

6X provides integrated functionality to create automated workflows performing hundreds of runs to quantify uncertainty in the following:

- Geological and fluid parameter sensitivities
- Experimental Design uncertainty quantification
- Assisted History Matching (AHM)
- Well and completion development selection
- Well and reservoir depletion forecasting





Unconventional reservoirs: well design to optimizing recovery

Many decisions are required to optimize recovery and economics from an unconventional well program. How may stages, how many clusters per stage, how much fluid and proppant to pump; how to determine the optimal well spacing and how many wells are required to develop a multi-bench drill spacing unit (DSU). A 6X Multiple Realization modeling workflow generates a range of outcomes to understand the hydraulic fracture growth and depletion to optimize EUR against net present value for a DSU.

No hidden extras – a 6X license includes the MR module

The MR functionality exploits modern massively parallel architecture of 6X and runs on multi-CPU and multi-GPU systems. With the breakthrough and general availability of Cloud systems, clients can access 6X on Amazon AWS, Microsoft Azure and Google GCP.

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