CASE STUDY: WELL INTERFERENCE AND SPACING

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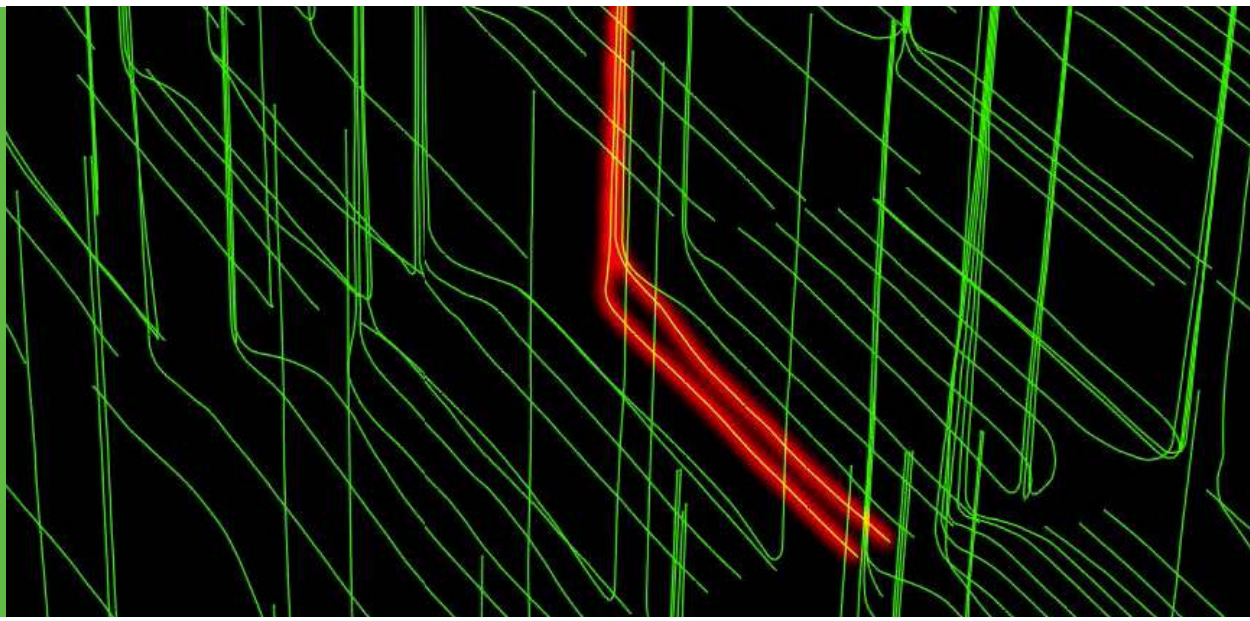
Optimize Well Interference and Spacing for Maximum Production

Learn How a Top Operator in the Eagle Ford Predicted the Effects of Nearby Wells



OVERVIEW

Drilling additional wells in productive acreage is a no-brainer, but determining where to put them is a challenge–and anticipating their impact on existing wells is even more difficult. A cautious approach that leaves ample room between wells could translate to missed opportunities, while excessively tight spacing could decrease productivity.

The VP of engineering for a successful midsize independent oil company confronted this dilemma when overseeing tight drilling operations in the Eagle Ford. Most of the company's new wells were being drilled in proximity to existing wellbores, and the production team noted significant impact on current production when each new well came online.

The proprietary Well Interference workflow in DI Transform accounts for the change in production that an existing well might experience when a new, nearby well is completed. The workflow analyzes time-series production data in an existing well before and after a nearby completion to determine the magnitude of communication between wellbores. As a result of using this workflow, the production team in the Eagle Ford was able to quantify the impact of new wells on existing production, predict future production, and determine optimal well placement to maximize productivity in both new and existing wells.

CHALLENGE

How do I calculate my well interference? How do I optimize my well spacing or plan my field? How can I maximize my production and ROI?

SOLUTION

Using the Well Interference workflow within DI Transform, the production team is able to quantify and calculate the impact of new wells on existing production.

PRODUCTS USED

DI Transform

STEP 1: ANALYZE WELL SPACING TO ACCURATELY PREDICT PRODUCTION FOR NEW INFILL WELLS

In order to predict the impact of future drilling activity in crowded acreage, the team first needed a detailed understanding of how recent infill wells had affected overall productivity.

Products Used:

- **DI Transform:** Time Display Field Development, Well Interference Tool, and MV Stats features

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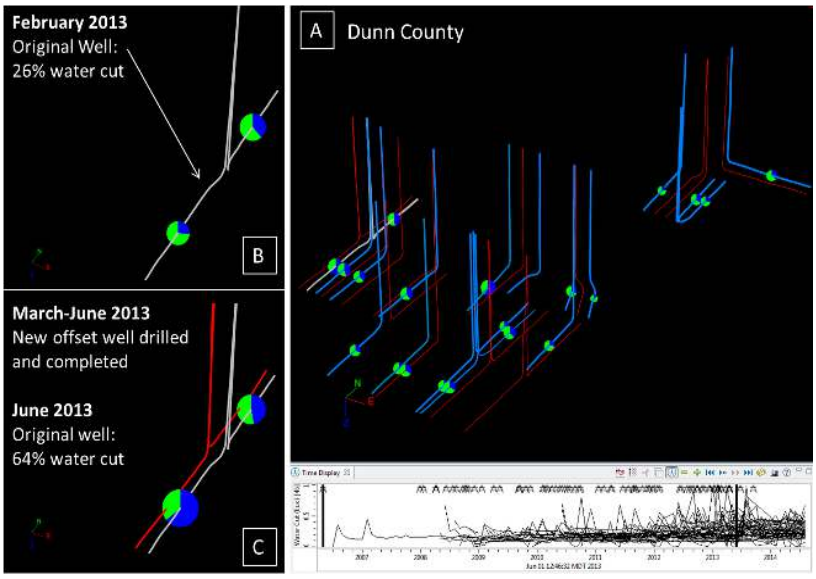
Using DI Transform, the team could quickly calculate lateral distances to nearby wells at the time they were drilled. They used this information as part of a sophisticated multivariate model incorporating relevant production, engineering, geoscience, and seismic data. Building and refining the model was simple using powerful data analytics tools in DI Transform, and within minutes, the team generated variable plots that made it easy to identify important trends and gauge the impact of variables like:

- Wellbore separation distance
- Well age and production history
- Engineering details such as proppant per foot and the extent of subsurface fracturing
- Geological characteristics such as rock properties and fault location



Snapshot of field development over time using the Time Display. Blue wellbore are older active wells, red wellbores are newer interference wells. Pie bubbles show oil and water time series data. A spike in the water cut of an existing well is used to quantify interference from the completion of a new well nearby.

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At best, companies that attempt to study the impact of newer wells on existing production tend to be limited to review of basic factors such as production data and location. Building more sophisticated multivariate models could take weeks or months, and the models would still exclude crucial elements such as reservoir quality.

STEP 2: CREATE A PRODUCTION PREDICTION (SWEET-SPOT) MAP THAT TAKES WELL SPACING INTO ACCOUNT

Next, the team needed to apply their model to the company's open acreage to identify promising new well sites and assess their potential productivity.

Products Used:

- **DI Transform**: Mapping Tools and New Well Production Prediction Map Builder features

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Using the multivariate model within DI Transform, the team created a series of graphs to enable

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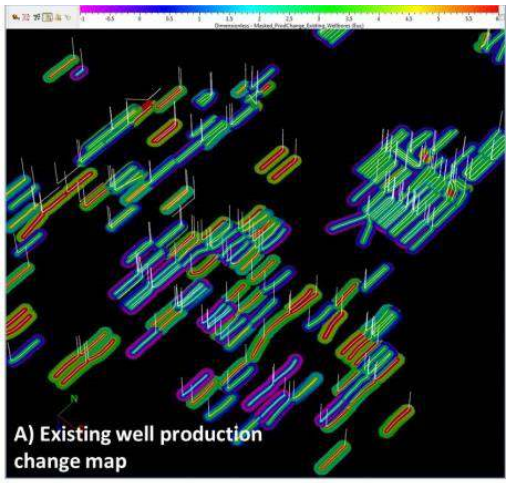
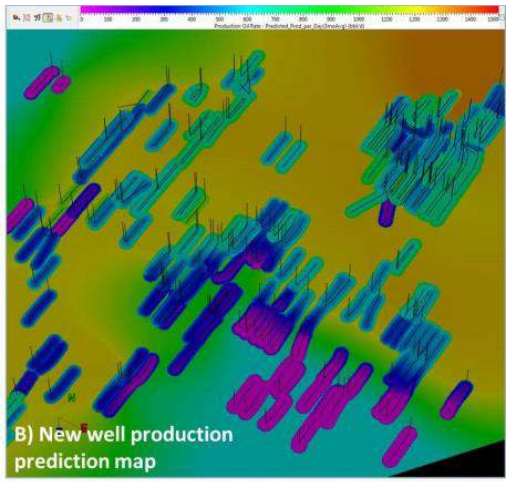
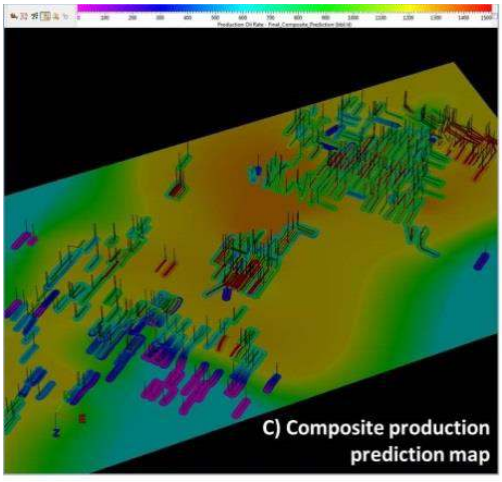
rapid visual analysis of key factors such as production, water cut change, well separation, reservoir depletion, and reservoir quality. The resulting composite production prediction map accounted for both new well production and the change in production expected in nearby wells. Their analysis indicated that new infill wells maximized production when they were drilled at least 2,250 feet from existing wells that were both high-producing and relatively young (producing less than 200 days). The team also pinpointed an optimal value of 400 pounds of proppant per foot.


A) Existing well production change map


B) New well production prediction map


C) Composite production prediction map

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Without intuitive heat maps based on robust multivariate analytical models, narrowing the options for new infill well sites is hit-or-miss at best. Comparing potential sites is an even less precise process, and the cumbersome analysis involved (using manual calculations or limited tools) create a high likelihood of inaccurate results or a woefully incomplete basis for decision-making.

STEP 3: CALCULATE IMPACT ON EXISTING WELLS

To make sure that new infill wells would not drain production from current wells (and reduce the company's overall production and ROI), the team needed to assess the new wells' impact on existing production.

Products Used:

- **DI Transform:** Well Interference Tool feature

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To calculate an interference analysis examining the impact on existing wells, the team took advantage of the Well Interference Tool. The tool enables bulk calculations and captures well associations for pre-interference and interference wells. A scan process identifies interference pairs and time series. Similarly, the team analyzed changes in water cut for existing wells, providing another valuable indicator of well communication relevant to productivity.

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STEP 4: OPTIMIZE PRODUCTION

The final, crucial step was to compare predicted production of new wells to the impact on existing production, so the VP of engineering could recommend the optimal placement for maximum overall ROI.

Products Used:

- **DI Transform**

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With DI Transform, one of the most crucial, challenging steps actually becomes the easiest. Because both potential new well sites and existing wells are represented visually in acreage maps, the team was able to review them side-by-side and identify the most promising places to drill to either maximize new production or boost existing production.

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Without the advanced functionality and intuitive tools in DI Transform, companies would struggle to conduct this kind of analysis at all, let alone with any degree of precision or confidence. In most cases, recommendations would have to be based on predicted productivity of new wells alone, resulting in millions of dollars of unrealized profit.

Even more powerfully, both models can be easily integrated to generate a combined map layer with “heat mapping” to show, in vivid color, where new wells could be placed to achieve maximum new output without affecting (or potentially boosting) existing production.

CONCLUSION

Equipped with the team's multivariate analysis, the VP of engineering selected two sites for new infill wells. Once the new wells came online, both began producing at or above the volumes expected, and the existing well saw an immediate increase as well. Within the first three months, production aligned with the volumes predicted by the DI Transform model with exceptional accuracy, validating the team's analysis and resulting in a major boost to revenue.

Based on this success, company leadership decided to increase investment in infill drilling, confident that the VP and his team would be able to pinpoint additional well sites to maximize productivity across their portfolio and drive ROI through the roof.

Learn how our solutions can help you optimize well placement for maximum production and ROI from new and existing wells. Speak with one of our dedicated DI Transform specialists today.

Learn more at www.drillinginfo.com