CASE STUDY

maillance®

oilfield.ai® Water Flooding Optimization Software unlocks Fast, Valuable Insights on Drainage Strategy

Evergreen model provides operator with continuous understanding of producer-injector interaction, production back allocation, and by-passed areas, all at layer level.

CHALLENGES

- Identify well interaction at layer level
- Back allocate production at layer level
- Optimize allocation of injected water
- Identify bypassed areas
- Identify workover opportunities: isolation or stimulation
- Identify possible sweet spots for infill
- Probabilistic forecasts.

SOLUTION SUMMARY

Leveraging clean, contextualized data from automated curation, oilfield.ai was used to build predictive models that matched historical data within minutes and inferred future scenarios in seconds to provide the reservoir engineers with fast, valuable insights on layer-level drainage strategy and guidance on how to optimize the water flooding operations.

RESULTS

- High-fidelity, self-updating predictive models
- Optimal sweep efficiency
- Optimal injection volumes
- Optimal number of wells.

DATA REQUIRED

- Well positions and trajectories
- Well tops and completion data
- Well production data
- Fault networks
- Fluids originally in place.

DELIVERY TIME

- 2-8 weeks.

Lack of visibility in injection-production outcomes

An operator with two oilfields under waterflooding, both producing from the same two geological formations, was experiencing variability in injection-production results. This is typical when the geological formations are made of several layers with each well, producer or injector, completed in a subset of the layers, without the availability of regular production or injection PLTs.

To improve productivity and optimize injection costs, the operator sought to fully grasp the producer-injector interaction and production back-allocation at layer level.

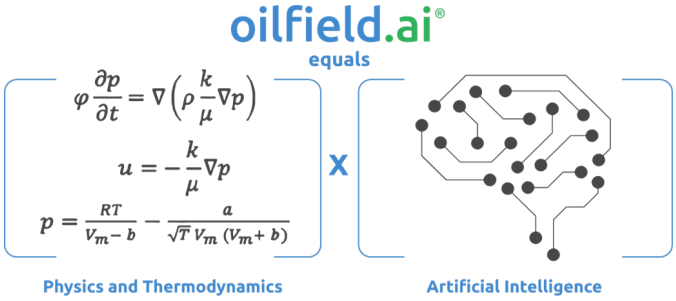

Figure 1 - The oilfield.ai approach.

Holistic reservoir management and production optimization in near real time

Leveraging mostly production data, the oilfield.ai suite of applications uses a unique blend of physics and artificial intelligence (AI) modeling to create bespoke predictive models for each oil or gas asset.

Models are trained in minutes, predictions are achieved in seconds, thousands of scenarios are run in hours, turning curated data into decisions that can be executed in day-to-day operations.

Models continuously update, learning from integrated old and new (CICD) geological, completions and reservoir data, ensuring a powerful reconciliation of the subsurface world and the production engineering and operations worlds, to break down the existing silos and retire suboptimal and protracted decisions cycles.

Insights from oilfield.ai well placement workflow provide the subsurface teams with reservoir targets for further use for well planning and delivery solutions, keeping full data lineage and versioning. Associated "what-if" forecasts can be used by financial teams for full economical evaluation.

With nearly 200 wells between the two fields producing from up to 7 geological sublayers, the 16 years of historical production were matched after deconstructing the dimensionality of the problem by using well clustering.

Robust modeling of the waterflooding (at the level of each layer) yielded models that fit the data on average within 5% to 10% at well level, with R2 values in excess of 0.85 at field level.

These models provide

- Time-lapse pictures of connectivity between injector-producer pairs and sweep visualization, providing information for infill and conversion opportunities;
- Time-lapse of the orientation density and magnitude of the connectivity field;
- Decomposition of each profile into it constituents (reservoir response, BHP changes, effect of ach injector, etc.);
- The opportunity for multiobjective optimization of the waterflood with thousands of scenarios assessed.

Optimized drainage strategy

The insights continuously unlocked by the models as they evolve through time will help the operator continuously adjust the drainage strategy to aim to prioritize injection (selective injection) and production (targeted workovers, injection/production swaps, infill wells) to recover more oil with the same or a lesser water injection capacity.

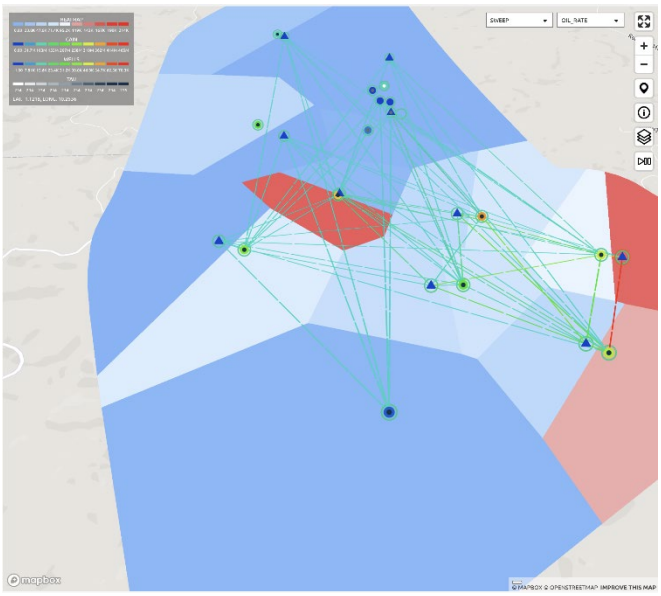

Figure 2 - At each timestamp, each model provides the cumulative sweep and quantitative details on all well interactions at layer level.

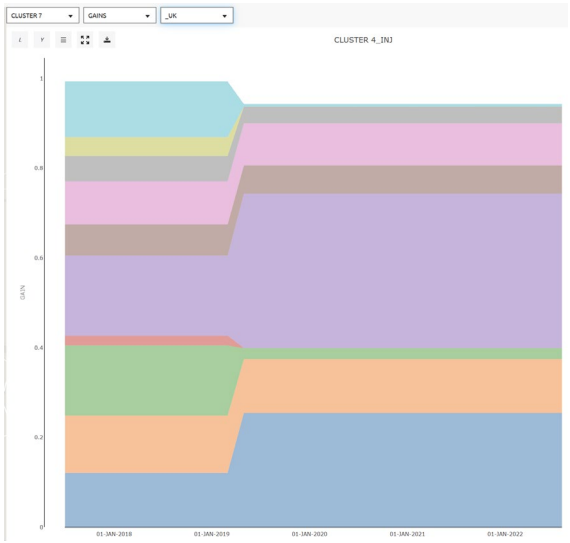

Figure 3 - The dynamic view of connectivities at layer level, together with the back allocation of production and injection at layer level clearly pinpoints producers which completions should be nurtured and which completions should be ignored.

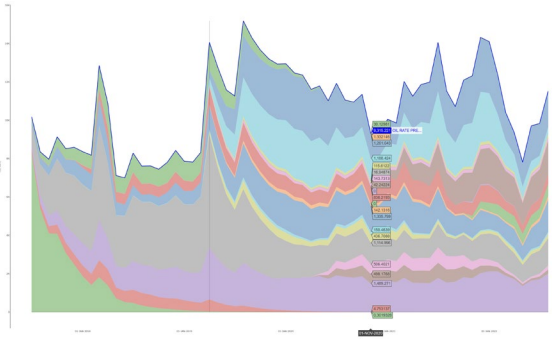

Figure 4 - The models deconstruct each well's production into the contribution from each injector at layer level.

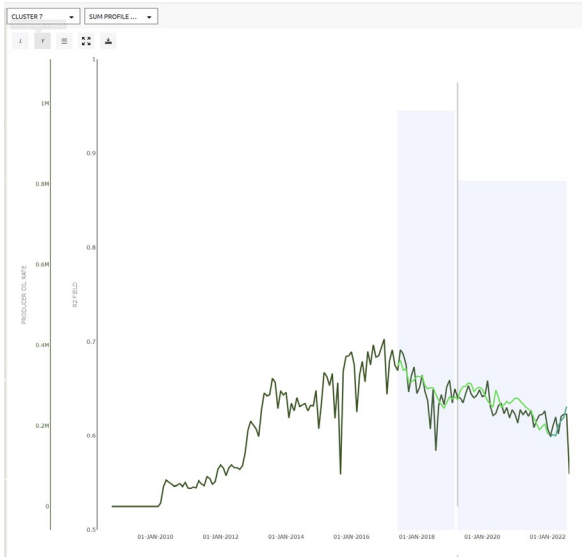

Figure 5 - Models fit historical data within 5% to 10% tolerance at well level.