ECHELON

CASE STUDY // Evaluating the productivity enhancements of Fishbones in fractured carbonate reservoirs using high-performance cloud-based reservoir simulation

STONE RIDGE TECHNOLOGY | Fenix Consulting Delft

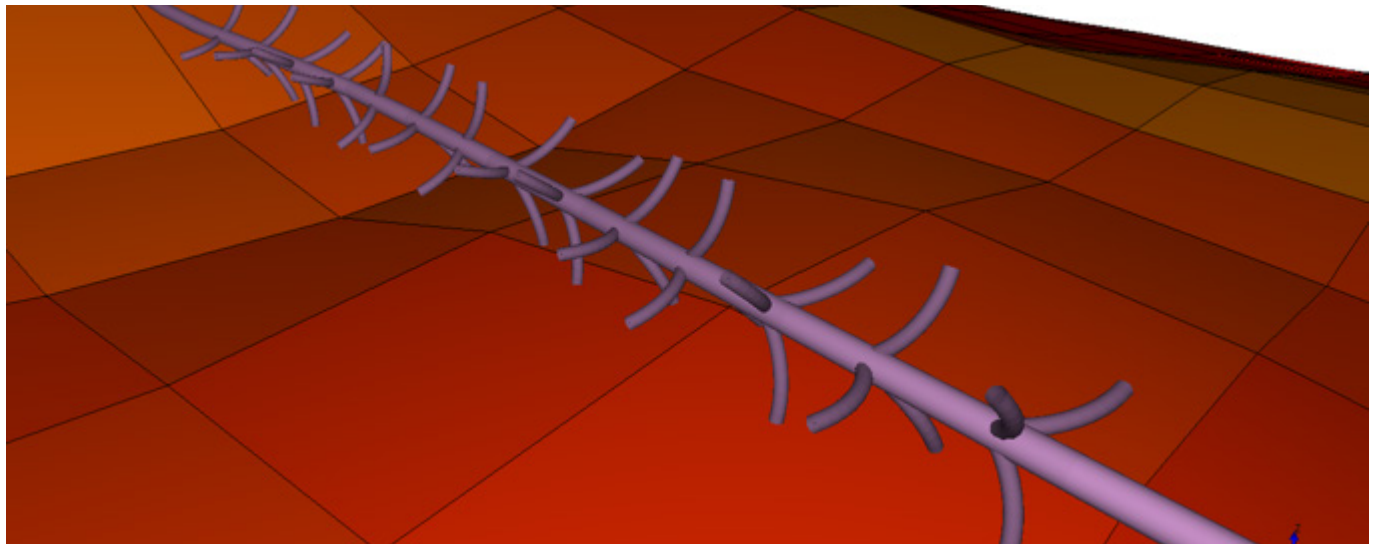
1.5 MIN
SIMULATION TIME

0.5%
EFFECTIVE POROSITY OF FRACTURE CELLS

1
AWS CLOUD INSTANCE WITH A V100 GPU

ECHELON CASE STUDY:

Evaluating the productivity enhancements of Fishbones in fractured carbonate reservoirs using high-performance cloud-based reservoir simulation

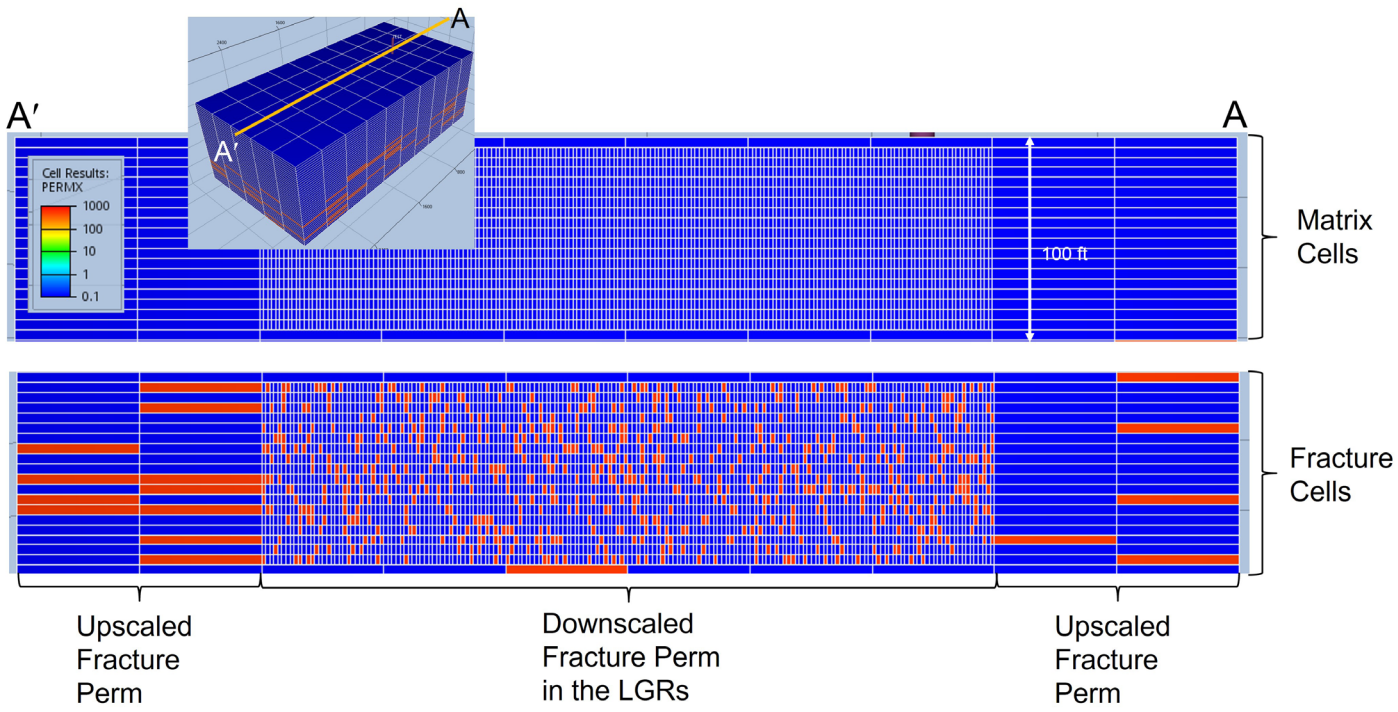


Horizontal well with lateral Fishbones

CHALLENGE

Simulating well productivity improvement from a Fishbones completion in a dual porosity/dual permeability reservoir model requires a very fine grid in order to capture the flow physics around the Fishbones laterals (obtained by local grid refinement, or LGR) and consequently a large number of completion connections.

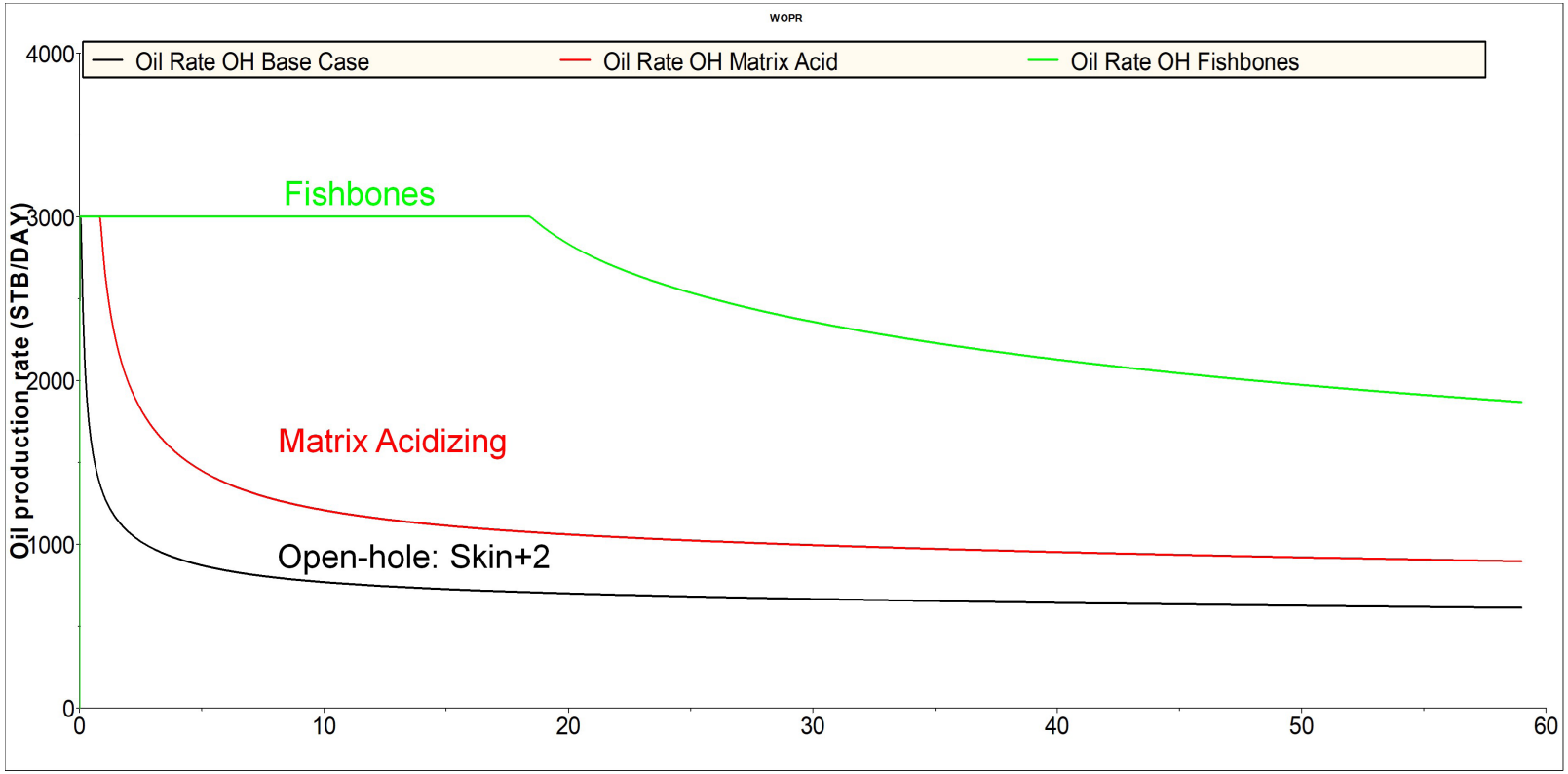
This, coupled to the small effective porosity of fracture cells, causes simulators to take small timesteps; from 5 minutes at startup, to a maximum of 2 hours.



Simulation model with local grid refinement for both matrix and fracture

SOLUTION

Multiple completion optimization strategies were simulated using ECHELON Cloud. The model at hand has 100,000 cells in the LGRs. To model the Fishbone laterals, 1500 well connections are needed in six different LGRs.

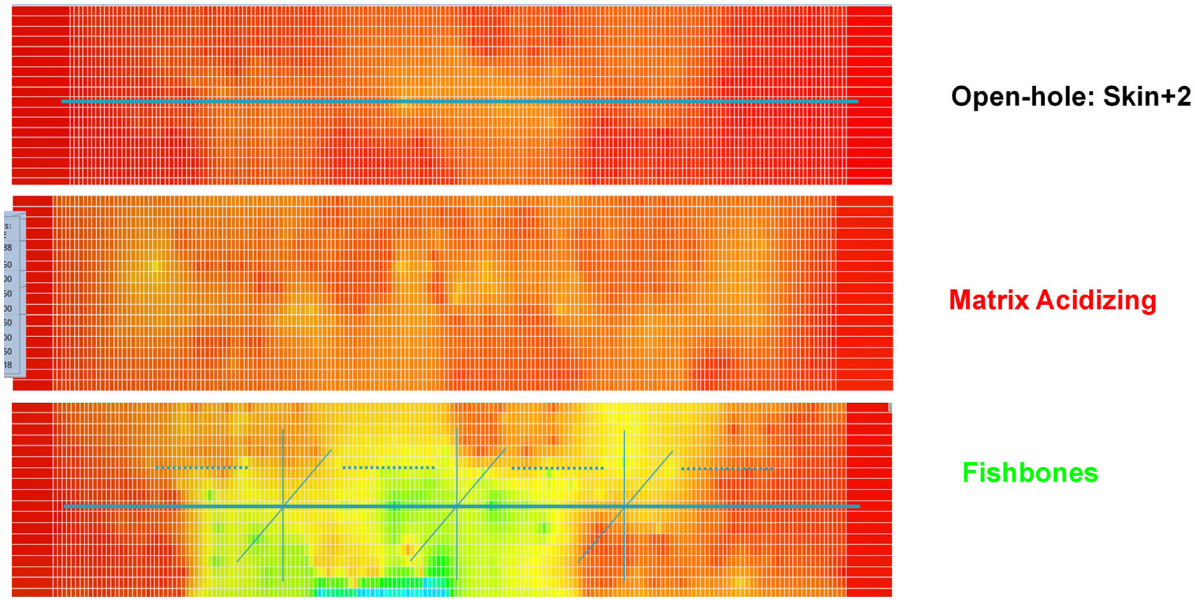


Simulation results for oil production for 3 different completion scenarios

RESULTS

It became practical to use a dual porosity/dual permeability model with very finely gridded LGRs to perform long-term forecasts for this type of reservoir and completion, or to perform history matching of initial production (3-6 months), to understand and optimize the completion performance.

In the figure below, we can see the simulation results for pressure in the model; these show how the different stimulation methods increase the connectivity of the well to the existing natural fracture network. Thus producing more oil and resulting in more pressure depletion across the entire reservoir height.



Pressure depletion in the model for 3 different completion scenarios after 60 days

“THANKS TO ECHELON IN THE CLOUD, WE ARE FINALLY ABLE TO SIMULATE REALISTIC SITUATIONS IN A DUAL POROSITY/DUAL PERMEABILITY RESERVOIR CAPTURING THE EFFECT OF A FISHBONE MULTI-LATERAL COMPLETION.”

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