



FRACMAN[®]
TECHNOLOGY GROUP

RESERVOIR EDITION SOFTWARE



ARE YOUR FRACTURES GIVING YOU PROBLEMS?

Variable production? Early water breakthrough? Rapid production decline? Uncertain reserves? Meet the challenges of your fractured reservoirs with FracMan, the world's leading fractured reservoir modeling software from Golder Associates.

"When clients asks me for options for a fractured reservoir modeling workflow, I give them one word: FracMan!"

**Kevin Isaac, Petros
Geoscience**

FracMan Reservoir Edition gives you the benefit of the insights that Golder's geologists, geophysicists, and engineers have gained in more than three decades of world-wide experience with fractured reservoirs.

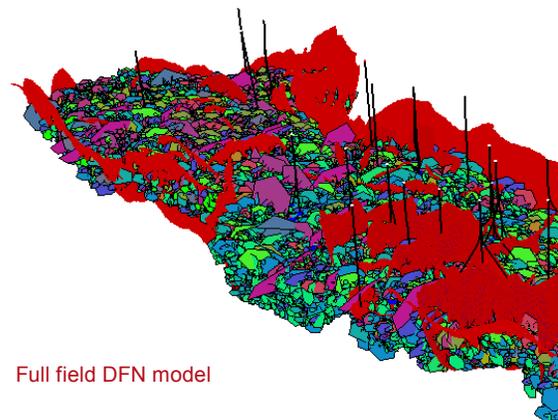
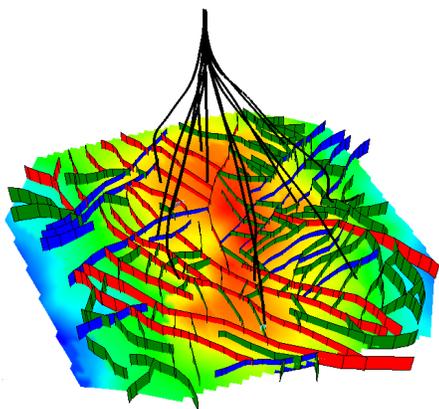
FracMan is the tool you need to understand the porosity, permeability, and connectivity of your fractured reservoir. FracMan success stories include fractured clastics and carbonates, basement and volcanic reservoirs, as well as tight gas, oil shales, and other unconventional reservoirs.

FracMan enables you to develop a traceable route between your reservoir data and its use in reservoir modeling. The software helps geologists and reservoir engineers work more closely together, providing a common platform and a common language. Complex geologic concepts are transformed easily to reservoir model parameters, in a clear and consistent manner.

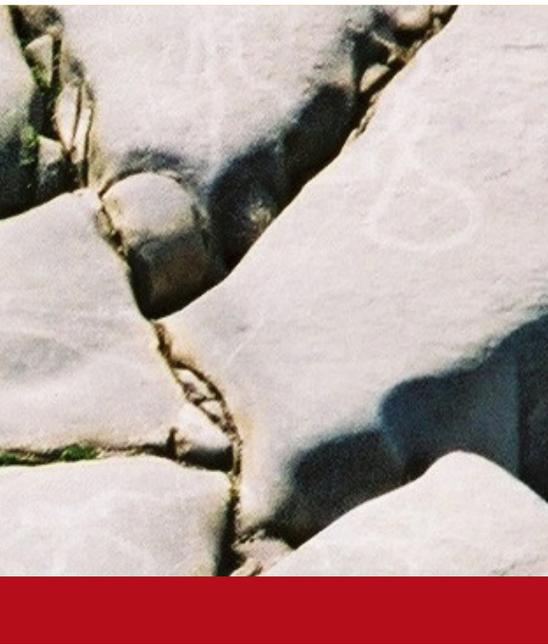
HOW CAN FRACMAN HELP YOU?

Whether you are involved in exploration, prospect appraisal, full field model development, or addressing specific local issues, FracMan has the tools for developing understanding and insights that will help you make the best development decisions.

Visualize your fracture system, test your conceptual understanding, determine the best strategies, and quantify risks and uncertainties. Let FracMan help you close the gap between geology and production behavior.



Full field DFN model



EXPERIENCE FRACMAN WORKFLOWS

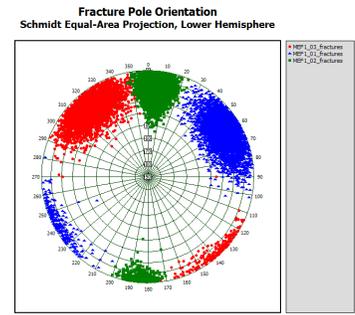
Your reservoir's fracture network makes a significant impact upon performance and success. Discrete Fracture Network (DFN) based work flows available in FracMan offer the only way to capture the anisotropy and connectivity of the fracture system and have a clear advantage over conventional modeling approaches.

FracMan helps you integrate all of your geological, geophysical, petrophysical, geomechanical, well test, and production data to accomplish the following:

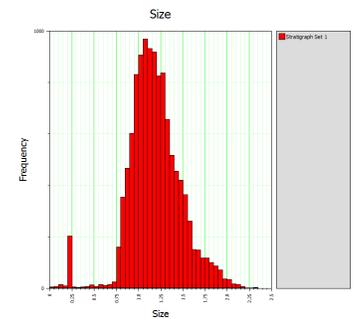
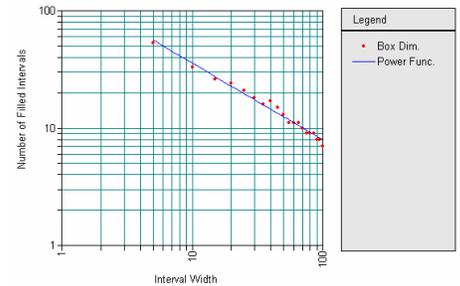
- Quantify the properties of your reservoir's fracture network through a suite of advanced analysis tools
- Generate geologically realistic DFN models based upon a range of properties including seismic attributes, structural modeling, curvature analysis, or outcrop data
- Validate your models by simulating pressure transient and well interference tests within the DFN model

With a calibrated DFN model you can:

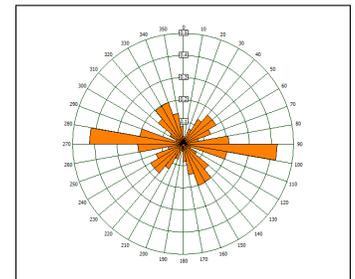
- Calculate fracture pore volume, STOIP, and probable recovery
- Plan well paths to optimize production
- Upscale your DFN model to full field dual porosity reservoir model properties including directional permeability and Sigma factor
- Plan EOR or water mitigation strategies



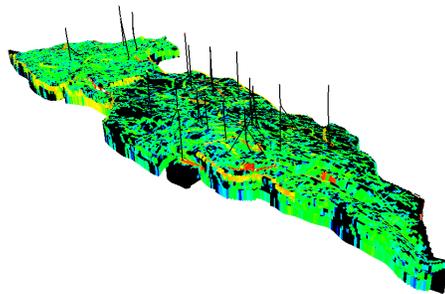
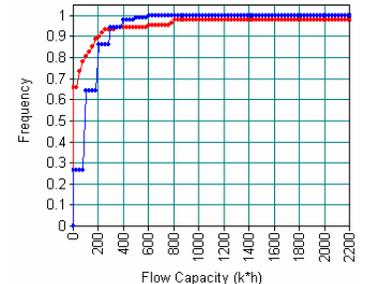
Box Dimension Analysis - B19



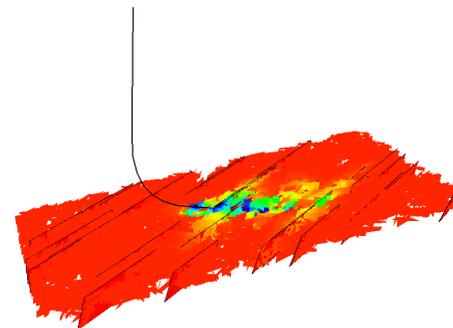
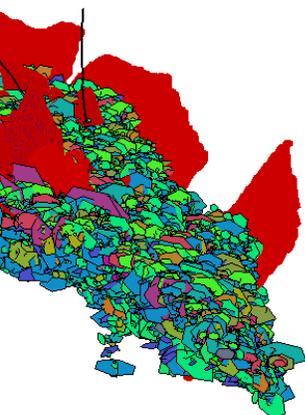
Fracture Orientation plot showing Wulff Equal-Angle Projection, Lower Hemisphere, Strike.



EB/EC - Flow Capacity plot showing Frequency vs Flow Capacity (k*th).

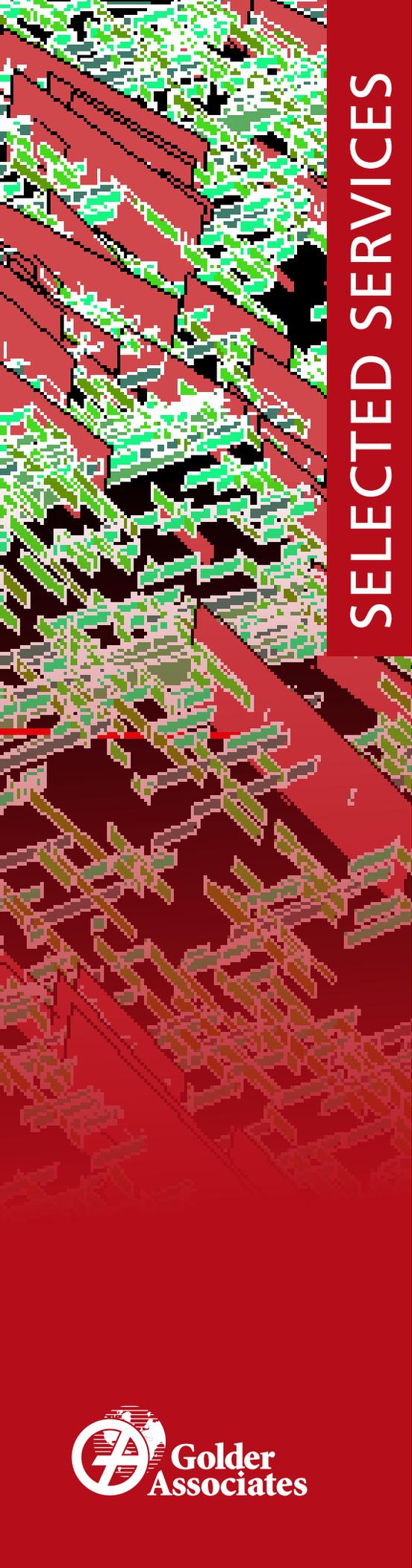


Upscaling of DFN model to simulation-ready properties



Well test simulation through DFN model

FracMan offers a rich array of fracture analysis tools



SELECTED SERVICES

THE LEADING FRACTURE MODELING SOFTWARE FOR: FRACTURED RESERVOIR GEOLOGY

- Analysis of Faults and Fractures
- Fracture Analysis from Geophysics
- Discrete Fracture Reservoir Modeling
- Field Scale Fracture Extrapolation
- Fracture Data Analysis
- Reservoir Architecture Assessment

FRACTURED RESERVOIR ENGINEERING

- Development Strategies
- Well Trajectory Optimization
- Upscaling of Fracture Permeability
- Fracture Porosity Analysis
- Stress/Permeability Coupling
- Anisotropy and Heterogeneity
- Uncertainty Analysis
- Risk Assessment
- IOR Strategy Development
- Critical Stress Analysis

FRACTURE RESERVOIR STATIC MODELING

- Reservoir Volumetrics
- Tributary Drainage Volumes
- Compartmentalization Analysis
- Matrix-Fracture Interaction

FRACTURED RESERVOIR DYNAMIC MODELING

- True Multiple Porosity/Multiple Permeability Dynamic Simulation
- Production Test, PLT, and DST Analysis and Interpretation
- Multiphase Discrete Fracture Network Flow Modeling
- Calibration and Conditioning to Dynamic Data
- Dynamic Upscaling

HYDRAULIC FRACTURE MODELLING

- Full 3D analysis
- Multistage hydraulic fracture stimulation
- Microseismic data matching
- Infill strategies
- Optimize completion and hydraulic fracturing strategies
- Simulated post-frac production
- Evaluation of exploration prospects



ENGINEERING EARTH'S DEVELOPMENT, PRESERVING EARTH'S INTEGRITY.

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