**INTRODUCING**

**MATHEMATICA In The Petroleum Industry**

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**WHY MATHEMATICA?**

For over 12 years Mathematica has proven itself to be a leader in technical computing software. Now, an increasing number of companies consider it an indispensable tool for decreasing development time and speeding up communications. Mathematica allows consolidation of all calculations, graphics, code, and notes into one notebook that can be shared with other departments and partners, even if they do not have Mathematica. Additionally, Mathematica expressions can now be evaluated in real-time over the internet using webMathematica. This will give you the ability to build custom web sites that provide specialized calculations to employees and premium customers.

**CONNECT MATHEMATICA TO DATA ACQUISITION SYSTEMS AND CORPORATE DATABASES**

Getting your data into and out of Mathematica is easy. Database Access Kit and Link for LabView are just two examples of application packages that transparently connect Mathematica to your corporate databases and acquisition systems. This means you can send data directly from the field to a database or model for immediate computation, allowing you to analyze LWD, seismic or other data in real-time. You can also connect Mathematica to your own custom data acquisition routines using MathLink, a general and flexible interface for communication between external programs and Mathematica. New Wolfram Research products like webMathematica also give engineers and geoscientists immediate access to data and analysis routines over the web or your corporate intranet.

**LINK MATHEMATICA to EXCEL SPREADSHEETS**

Mathematica Link for Excel works with Mathematica to give you all its computational power, accuracy, and graphics capabilities within your Excel spreadsheet. By adding Mathematica to your Excel platform, you can manipulate and visualize data and equations with over a thousand more functions and options. Instead of relying solely on linear regression for your production forecasts, take advantage of the nonlinear and polynomial curve fitting routines available in Mathematica. This link product offers proven accuracy and computational power for all your Monte Carlo simulations, giving you a new level of confidence in your models for field performance optimization, reservoir management, risk analysis, and more.

**USE MATHEMATICA AS A PROTOTYPING TOOL**

Mathematica’s high-level programming language lets you build sophisticated programs more quickly and with less code than most other programming languages. Before wasting valuable time and computer resources on an intense computation, write a short application that lets you optimize the parameters. You can also link your C, C++, Java, Fortran, and other code to Mathematica. Dr. Kurt Thearling of Pilot Software states, “Mathematica is interactive and comprehensive. I can type something in and see the effects immediately. If I had to code it in C, it could take days to implement the algorithm and add the proper visualization routines to display the results. Prototyping in Mathematica saves me a lot of time.”

**KEY FEATURES OF MATHEMATICA**

- **ACCURACY**—unmatched by other commercial software
- **SPEED**—extensive improvement in speed and memory efficiency for numerical calculations
- **CONVENIENCE**—store all your code, calculations, graphics and notes in one notebook
- **FAST PROTOTYPING**—use fewer lines of code for your applications
- **VISUALIZATION**—quickly rendered, mathematically correct, and completely customizable graphics
- **SCALABILITY**—use Parallel Computing Toolkit to create a virtual supercomputer
- **RELIABILITY**—twelve years serving the world’s most technologically sophisticated institutions

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**ABOUT MATHEMATICA**

Mathematica is the world’s only fully integrated technical computing system, combining unrivaled computational power with unprecedented ease of use. Used by over a million scientists, engineers, programmers, and students worldwide, Mathematica provides unmatched ease of computation (both symbolically or with unlimited numeric precision), two- and three-dimensional visualization, and programming. Mathematica creates fully customizable, publication-quality, cross-platform electronic and printed documents with professional mathematical typesetting quality, and it generates web-ready documents. Now it can also be used to create interactive web applications.

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**USER QUOTES**

“The pattern-matching capabilities of Mathematica are great. There is no other language or package that allows me to look for certain kinds of patterns, find them, and then rewrite them in another way.”

Bob Gore

Lockheed Martin Corporation

“Mathematica achieves unparalleled accuracy and reliability on the NIST SIRD and on the ELV benchmark... By virtue of its variable precision arithmetic and symbolic power, Mathematica’s performance on these reliability tests far exceeds any finite-precision statistical package.”


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**MATHEMATICA USERS IN THE PETROLEUM INDUSTRY**

- Schlumberger
- Enron
- Halliburton
- Conoco
- BP Amoco
- Texaco
- ExxonMobil
- Chevron

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**Mathematica Link for Excel connects the power of Mathematica to your worksheets.**
WAYNE J. BEECROFT
BP Amoco Corporation

At BP Amoco, Wayne Beecroft uses Mathematica to develop software that predicts, optimizes and monitors oil production in irregularly shaped reservoirs. Typically, prediction of three-dimensional velocity fields must be done using sophisticated and time-consuming finite element software that is subject to numerical dispersion. The new Mathematica-based program models fluid flow by exploiting a powerful technique that separates the problem in two autonomous parts: (i) transformation of an odd-shaped reservoir into a simple domain and (ii) prediction of a velocity field with the help of analytical functions. The separation drastically decreases computation time and thus allows optimization of well positions in a few minutes using a laptop computer. The software currently addresses two-dimensional (2D) domains and in the future will be generalized for three-dimensional (3D) domains.

BILL HANEWEBG
Haneberg Geoscience

Bill Haneberg has relied on Mathematica to solve quantitative geologic problems for more than a decade, first as a New Mexico Tech research scientist and now as the owner of Haneberg Geoscience, a geological consulting business. One project used depth-porosity data to estimate the compressibility of an important aquifer in the central Albuquerque Basin, New Mexico. This involved fitting both logarithmic and exponential type curves to density-porosity well data that were read in directly from standard ASCII files. Another aspect of that project required the development of elastic continuum solutions to analyze the perturbing influence of large-scale topography and regional stress regimes on the subsurface state of stress. In another study, he solved an entire system of differential equations and boundary conditions to calculate the influence of an idealized vertical fault on steady-state horizontal groundwater flow. He routinely uses Mathematica’s built-in graphics primitives to quickly create publication-quality images and visualize the results of his models. Haneberg also uses Mathematica for projects in landslide, rockfall and debris flow investigations; land subsidence, fissure, and sinkhole analysis; erosion and sedimentation problems; geologic hazard assessment and GIS applications; mathematical modeling of geologic processes; and geologic data analysis and statistical characterization.