

Types of Wells

- Vertical, horizontal, or deviated wells
- Offshore or onshore wells
- Single or multiple zone analyses
- Multi-branching wells

Drilling Instability

- Evaluate instability risks as function of ECD, EMW, BHP, SG, mud density, over- or underbalance pressures
- 3D linear elastic models
- 2D elastoplastic models
- 3D passive shear failure initiation (borehole ballooning)
- Swab and surge pressure effects
- Underbalanced drilling features
- Calculate a mud density, EMW, ECD or bottomhole pressure required to achieve a tolerable instability risk, e.g., hole enlargement
- Calculate wellbore instability risks for a specified mud density, ECD, EMW or bottomhole pressure
- Calculate and display the drilling "mud weight window"
- Thermo-elastic effects due to steady-state conductive heat transfer
- Predict a profile of enlarged hole sizes for hydraulics optimization

Lost Circulation and Fracturing

- 3D elastic tensile fracture criterion
- Penetrating fluids (water, selected drilling and completion fluids)
- Non-penetrating fluids (cement, some muds)
- Thermo-elastic effects on fracture breakdown due to steady-state conductive or convective heat transfer
- Analyze packer and sleeve induced fractures
- Fracture toughness-based breakdown criterion (after Morita)
- Specify a critical fracture plugging aperture
- Calculate points of hydraulic fracture initiation and display on borehole cross-sections and polar plots

Sand Production and Control

- 2D elastoplastic models
- 3D linear elastic models
- Extent of horizontal well collapse (rubble fill percentage)
- Near-wellbore skin can be used as an input parameter
- Perforated, openhole, slotted liner, screen and expandable completions can be analyzed
- Cylindrical or hemi-spherical perforation cavities
- Input pressure drop across liners, screens and expandables
- First-order estimate of isotropic loading on liners, screens or expandables
- First-order estimate of borehole wall deformations

In-situ Stresses

- Biaxial stress state (2D models)
- Triaxial stress state (3D models)
- Correct stresses for reservoir pressure depletion or injection effects
- New poroelastic stress models for different reservoir shapes
- * Rotated principal stresses, e.g., salt intrusion, thrust fault stress regimes

Planes of Weakness, Faults and Natural Fractures

- Account for the effects of ubiquitous, weak discontinuities on the risk of borehole collapse
- Mohr-Coulomb failure criterion
- Shear failure and slip tendency analysis for weak bedding planes, faults, natural fractures, cleats
- Re-opening pressure analysis for weak bedding planes, faults, natural fractures, cleats
- * Display log-derived bedding planes, faults, natural fractures and cleats on polar plots

Pore Pressure and Capillarity

- Steady-state flow with pore pressure gradients into or out of the wellbore
- Capillary threshold pressure for OBMs and pseudo-OBMs
- Apparent capillary strength for weak, partially saturated sands
- Filter cake efficiency model for permeable sandstones
- Wall coating efficiency model for shales
- Effect of an instantaneous BHP change
- Fluid viscosity and permeability effects
- Formation damage and skin effects
- Steady-state non-Darcy flow effects for high rate gas wells and perforations
- Compressible fluid effects in the near-wellbore area
- Skin damage option for underbalanced drilling
- Biot or Terzaghi effective stress

Rock Failure Models

2D Elastoplastic strain-weakening

- Mohr-Coulomb Model

3D Linear Elastic Models

- Mohr-Coulomb
- Modified Lade
- * Mogi-Coulomb
- Non-linear Hoek-Brown
- Tensile fracture criteria
- Passive shear failure initiation

Other Options

- * Time-dependent loss or gain of rock strength and elastic properties

Borehole Stresses and Pressures

(As a function of radial distance)

3D Linear Elastic Models

- Principal stresses ($\sigma_1, \sigma_2, \sigma_3$)
- Normal stresses ($\sigma_\theta, \sigma_r, \sigma_z$)
- Shear stresses ($\tau_{r\theta}, \tau_{rz}, \tau_{\theta z}$)
- Pore pressure

2D Elastoplastic Models

- Pore pressure
- Normal and shear stresses

Borehole Deformations and Strains

2D Elastoplastic Model for Isotropic Stresses

- Total strains
- Plastic strains
- Total radial displacements

* New feature in development

STABView™ Technical Features (Version 3.8)

Physico-chemical Effects

- Osmotic pressure model for reactive clay inhibition effects based on shale and mud activities (API RP13B specification)
- Handles many common oil-based and water-based drilling fluids
- Database of published shale water activities and membrane efficiencies for a variety of shales and fluids
- Drilling fluid activity calculator

Thermal Effects

- Steady-state conductive or convective heat transfer effects on fracture breakdown pressure
- Steady-state conductive heat transfer effects on 3D elastic borehole collapse risk
- Time-dependent thawing and hydraulics model for permafrost

Calibration & Validation Options

- Fix an acceptable BHP, drawdown pressure or mud density based on the performance of an offset well
- User-defined borehole breakout angle criterion
- Calibration options for borehole collapse and fracture breakdown

Quantitative Risk Analysis* (for 2009 release)

- Define input uncertainty with a variety of statistical distributions
- Include parameter correlations
- Minimize simulation runs with optimized Monte Carlo methods
- Cumulative probability mud weight window display
- Cumulative probability of yielding displayed on a borehole cross-section
- Statistical input and output in convenient data analysis reports

Back Analysis Assistant *(for 2009 release)

- Automatically back analyze and update a geomechanical model from observed hole enlargement on offset well caliper logs

Database Links

- Link to ROCKSBank™, AG's worldwide rock mechanical and petrophysical properties database
- Link to the World Stress Map (Karlsruhe University)

Reports and Graphics

- Parameter sensitivity plots available for most stability models
- Tornado and spider plots for multiple input parameter sensitivities
- Scrollable "mud weight window" with re-scaling and zoom
- Color contoured polar plots for all 3D collapse and fracture models
- Export graphics to BMP and EMF file formats
- Clipboard support for copying and pasting output graphics and text
- Print to any Windows-supported device
- Single or multi-zone input and output reports
- Print preview capability
- Well plan and profile plots with color-contoured BHP, EMW, ECD, mud density, drawdown pressure, or other parameters
- Customizable color selection and pattern for lithologies
- Compare yielding size for different rock failure criteria
- * New export file formats: JPG, GIF, RTF, XLS

3D Wellbore Visualization

- Import well surveys and display in plan, profile and 3D views
- Visualize well trajectories in a rotatable 3D display with zoom and pan capabilities
- Display color-coded stratigraphic tops
- Display casing and/or liner profiles
- Color shaded wellbore for collapse or breakdown pressures
- View principal stresses as a function of radial distance
- Ability to move and position the view window as required
- Set the scale of the displayed wellbore radius
- No special 3D hardware required

Integration with Other Software

- Export text or graphics files
- Import well survey data
- Cut and paste annular pressure data from actual wells or wellbore hydraulics and multiphase flow modeling software
- Run in parallel with casing design, pore pressure prediction, hydraulics and other wellbore design software

Units

- US oilfield and SI units
- High precision units for shallow wells and pipeline horizontal directional drilling (HDD)
- Customizable mixed units

Functionality

- Right-click drop-down menus on most screen output
- Solution algorithms optimized for rapid performance (most calculations in seconds)
- Designed to perform graphical sensitivity analyses
- Preferred user settings saved on exit
- Ability to cancel calculations in progress
- Run button to compute results only when required
- Toolbar buttons for most common tasks

Operating Systems

- Windows 2000/XP/Server 2003/Vista

Network/Deployment Options

- Can license for up to 3 PCs for a single USB security key
- Network version available with one or more concurrent seats
- Customized network configurations

Help & Documentation

- Real-time input data validation
- Comprehensive online Adobe Acrobat and hard copy user manuals
- Example files for all problem types (17)
- Comprehensive list of related technical publications and references
- Website and email support
- Advanced Geotechnology newsletter "Geotechnology Views"

* New feature in development