THREE-PHASE, BLACK-OIL RESERVOIR SIMULATOR

APPLICATIONS

CONVENTIONAL & NATURALLY FRACTURED RESERVOIRS
- Solution-gas drive
- Water drive
- Compaction drive
- Gravity drainage
- Gas-oil gravity drainage

UNCONVENTIONAL (SHALE/TIGHT GAS/LIQUIDS) RESERVOIRS
- Explicit modelling of hydraulically fractured wells
  - Non-Darcy flow
  - Pressure & time-dependent compaction

GAS STORAGE FIELDS COMPLETED IN
- Abandoned gas fields
- Aquifers

FEATURES

MULTIPLE PVT REGIONS
- PVT fluid models (seawater, polymer, pseudo miscible solvent, black or volatile oil, gas condensate, API tracking)
- Shear-rate dependent polymer viscosity
- Saturated & under-saturated oil & gas properties
- Variable bubble point & dew point pressure formulation
- Limit maximum rate of gas dissolution in oil phase and oil increase in gas phase
- Multiple solvent PVT tables
  - extended oil-solvent mixing parameter table (version 2014)
  - oil saturation threshold for solvent mixing (version 2014)
- Model gas adsorption effects in shale gas and CBM reservoirs
- Reservoir pressure vs. depth tables for initialization regions
- Initialization regions separate from PVT regions

CONVENTIONAL & NATURALLY FRACTURED RESERVOIRS
- Waterflooding
- Polymer flooding
- Dry gas injection
- Pseudo-Miscible Gas Injection

COUPLED (RESERVOIR + SURFACE NETWORK) MODELS
- Use hydraulics tables to model branched surface networks
- Use 3rd party surface network simulators to model looped surface networks
- Ability to link to:
  - GAP™, FORGAS™, Avocet IAM™, METTE™

NATURALLY OR HYDRAULICALLY FRACTURED RESERVOIRS
- Hydraulically fractured wells with non-Darcy flow
  - Single plane
  - Complex fractures
- Fracture clean-up model
- Seawater/scale build-up option
- Dual porosity (sub-domain and multiple interacting continua – MINC) and dual permeability
- Permeability vs. pressure
- Rock compaction table reassignment in recurrent data
- Hydraulic fracture keywords to improve the definition (version 2014)
- Hydraulic fracture properties written directly to dataset (version 2014)
- Phase segregation model modifier (version 2014)
### FEATURES (CONTINUED)

#### RELATIVE PERMEABILITY MODEL
- Relative permeability with hysteresis and ‘end-point scaling’
- 3-point end point scaling of rock-fluid data (version 2014)
- Capillary pressure with hysteresis
- Water-wet & oil-wet options
- Three-phase relative permeability formulations (Stone 1, Stone 2, Segregated, Linear-Isoperm)
- Non-Darcy flow
- Change minimum oil saturation with API-Tracking option

#### PSEUDO-MISCIBLE & POLYMER PROCESSES
- Pseudo-miscible fluid injection
  - Solvent solubility in water, chase gas injection
  - First contact miscible (Todd and Longstaff)
- Polymer injection
  - Aqueous phase viscosity increase
  - Polymer adsorption and dispersion
  - Absolute and relative permeability reductions
- Triggers for polymers and solvents (version 2014)

#### WELLS & RECURRENT DATA
- Accurate representation of well trajectories for deviated & horizontal wells
- Head & friction pressure loss in horizontal & multi-lateral wells
- Triggers – condition-dependent operation of wells
- Group cyclic controls
- Voidsage replacement by well-group
- Frac-Pac® well model
- Cumulative transmissibility multiplier
- Output of Well Productivity Index based on flexible estimates of drainage pressure
- Wellbore calculation option for injected gas composition (version 2014)
- Specify time step size after a well management change (version 2014)

#### SURFACE NETWORK MODELLING
- Seamless integration with surface network modelling software (FORGAS® and GAP®)
- Single or multiple reservoirs
- Time-step level coupling
- Field development scheduling controls and constraints
- Multi-phase flow in both the gathering system and wellbore
- Semi-implicit IPR calculation

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**2014 NEW FEATURES**

- Easily modify hydraulic fractures and matrix properties with Block Groups
- Edit fracture half length and height directly in dataset with new hydraulic fracture keywords
- Quickly define irregular aquifer boundaries on the reservoir boundary
- Model more complex oil-solvent mixing rules and residual oil saturations functions
- Scale relative permeability and capillary pressures with new 3-point, end-point scaling option
- Monitor injected or produced solvent and polymer with additional triggers

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### FOR MORE INFORMATION

**PLEASE CONTACT**

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**GRID PROCESSING**
- Local grid refinement (LGR)
- Cartesian
- Cylindrical
- Fully non-orthogonal corner point grids
- Transmissibility multipliers
- Corner-point to node-based grid conversion

**WELL MANAGEMENT**
- Control well production and injection at the field, group, platform, and well levels
- Voidsage replacement
- Gas lift optimization
- Gas recycling
- Calculation of well index for directional wells
- History-matching mode for treatment of observed surface phase rates

**ADAPTIVE IMPLICIT FORMULATION**
- Run-Time Dimensioning
- Comprehensive Rock-Fluid Interaction
- Relative permeability with hysteresis
- End-point scaling
- Capillary pressure with hysteresis

**PARALLEL PROCESSING**
- Automatic parallel partitioning in two-grid dimensions

**64-BIT WINDOWS AND LINUX**
- Operating environments and performance standardized for 64-bit compatibility for Windows, Linux, Intel and IBM

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**SEAMLESS INTEGRATION WITH CMOST**

All CMG simulators have a base set of common modules to ensure compatibility, speed and quality of output remains consistent.