CMG COMPUTER MODELLING GROUP LTD.

GEM

Compositional & Unconventional Simulator

Benefits

- Understand fluid property composition and behaviour
- Accurately model naturally and hydraulically fractured reservoirs
- Full physics capability for modelling foam and other cEOR processes
- Troubleshoot bottlenecks with coupled surface network modelling in CoFlow-X
- Capture effects of geochemistry and clay distribution when modelling LSW
- Model geomechanical effect of stress and strain to understand effects on production

New Features

- Fully customize natural fracture orientation for more accurate and flexible geomodelling using discrete fracture networks
- Utilize new features for more flexible hydraulic fracture modelling including overlapping fractures, height specification, and selective history matching of fractured wells
- Track a fluid's movement without the need of a separate component using the new Passive Tracer Module

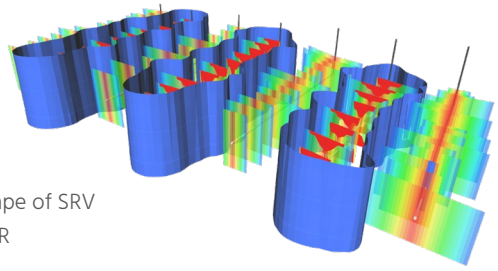
GEM is the world's leading reservoir simulation software for compositional, chemical and unconventional reservoir modelling.

- **Unconventional Oil, Gas and Liquids Rich Reservoirs** (Shale Gas/Liquids, Tight Oil/Gas, and CBM)
- **Naturally or Hydraulically Fractured Reservoirs**
- **Foam and Geochemical EOR**
- **Enhanced Oil Recovery** (Hydrocarbon and Acid Gas Injection)
- **Gas, Gas Condensate and Volatile Oil**
- **Carbon Capture and Storage (CSS)**

Unconventional Oil & Gas

The industry-leading unconventional reservoir modelling workflow robustly simulates natural and hydraulic fractures, multi-component adsorption, geomechanical effects, inter-phase mass transfer, multi-phase diffusion and non-Darcy flow.

- Explicit representation of fracture dimensions in grid design, non-Darcy flow and velocity-dependent relative permeability effects
- Import third-party fracture simulation data to generate better fracture characterizations, history matches and forecasts
- Achieve better accuracy around hydraulic fractures with logarithmically spaced gridding
- Parameterize microseismic data to automatically adjust the size and shape of SRV
- Feature-rich reservoir simulator for modelling primary and advanced EOR processes, in all types of unconventional reservoirs
- Integrate the geomechanical fracture model to design and optimize well completions



Model geochemical processes and reactions in GEM

Enhanced Oil Recovery (EOR)

GEM™ provides accurate simulation of miscible/immiscible displacement, chemical EOR and non-steam based thermal recovery processes to improve and optimize the recovery factor from oil and gas reservoirs.

- Use hysteresis, interfacial tension and velocity dependent effects on relative permeability in miscible floods and WAG processes
- Capture the effects of pore blockage and its impact by modelling adsorption of aqueous phase components on a rock surface
- Model the physics of asphaltene-related effects when gas/solvent is injected in the reservoir
- Estimate molecular diffusion coefficients, via correlation, in the aqueous phase

Chemical EOR (cEOR)

Design and evaluate the effectiveness of chemical additives with GEM's advanced cEOR features.

- Model mobility control by adding polymers, and interfacial tension reduction using surfactants and/or alkalis
- Study complex effects of foam in the reservoir with the empirical foam model
- Capture the interactions between foams and reservoir fluids with more accuracy and versatility
- Model polymer and surfactant flood recovery mechanisms and the effects associated with geochemical interactions between the chemicals and reservoir rock
- Obtain stoichiometry of chemical equilibrium, dissolution and precipitation ion reactions directly from the reactions

Low Salinity Waterflood

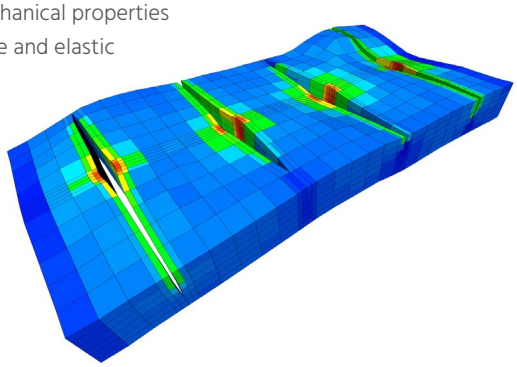
Maximize oil recovery and reduce environmental impact with GEM's accurate simulation of fundamental Low Salinity Waterflood (LSW) mechanisms, including ion exchange reactions, geochemistry and wettability alterations.

- Confidently forecast production and recovery factor by configuring full-field or hybrid LSW models
- Model salinity effects for multiple salt components to capture their impact on the overall reservoir performance
- Use CMOST AI to optimize oil recovery by identifying wells for optimal wettability alteration and sweep efficiency

Geomechanics

The rigorous and iteratively-coupled 3D geomechanics module accurately models subsidence, compaction and dilation behaviour that occurs during advanced recovery methods.

- Model porosity-dependent and solid-component-dependent geomechanical properties
- Simulate stress-induced phenomena, near wellbore formation collapse and elastic or plastic deformation
- Accurately perform mechanistic 3D compaction and dilation modelling to study effect of stress on porosity
- Properly model fracture initiation and growth to understand fracturing mechanisms and impact of stress or strain dynamics
- Specify a direct relationship between stress and fracture/matrix permeability



Design and optimize well completions by visualizing hydraulic fracture initiation and propagation using discrete finite elements.

Coupled Surface Network Modelling

CoFlow-X bridges the gap between reservoir simulation models and the surface network. By explicitly coupling GEM reservoir models to the surface facility model in CoFlow, companies will achieve faster and more efficient network optimization.

- Couple any number of GEM reservoir models to the surface network, without any model conversion
- Troubleshoot bottlenecks in the entire reservoir and surface network system with coupled system modelling
- Leverage CMOST AI to apply iterative decision-based workflows to the integrated modelling workflow

Carbon Capture & Storage (CCS)

Simulate the long-term effects of carbon dioxide (CO_2) injections into a geological formation or a saline aquifer thereby helping determine the viability of the CCS project.

- Increase accuracy by including gas trapping effects due to hysteresis, water phase density and viscosity alteration due to solubility and salinity change, mineral precipitation and dissolution mechanisms
- Water vaporization model reformulated for two-phase hydrocarbon systems to allow for increased accuracy
- Improve CCS model reliability by including complete aqueous phase chemical equilibrium calculations

Performance Enhancement Technologies (PET)

CMG's focus on all aspects of simulator performance maximizes hardware potential and provides software that runs large, complex simulation jobs in the shortest amount of time.

- CMG Cloud (Public & Private) meets on-demand needs, improves project delivery, improves hardware efficiency and uses the latest CMG software releases
- Parallelization of the relative permeability calculations improves large model run time
- Maximize productivity by quickly loading results of large models using the standardized and compressed SR3 files
- Achieve reduced run-time and solver iterations with CMG's combinative solver
- Apply Dynamic Grid (DynaGrid) amalgamation to significantly speed up simulation models, while maintaining accuracy in important regions of the reservoir

Contact

For more information please contact **cmgl@cmgl.ca**

R&D Investment

CMG reinvests 20% annual revenue back into R&D, to further innovation and drive technology forward

Superior Software

CMG delivers easy to use software that provides the most accurate results

Dedicated Support

Experienced technical sales & support personnel, deliver high-quality, timely and personalized customer support

Relevant Training

CMG's industry renowned reservoir software training provides the skills to improve productivity and efficiency