ADVANCED PROCESSES & THERMAL RESERVOIR SIMULATOR

STARS™ is the undisputed industry standard in thermal and advanced processes reservoir simulation. STARS is a thermal, k-value (KV) compositional, chemical reaction and geomechanics reservoir simulator ideally suited for advanced modelling of recovery processes involving the injection of steam, solvents, air and chemicals. The robust reaction kinetics and geomechanics capabilities make it the most complete and flexible reservoir simulator available.

STARS is used extensively for modelling:

- **Thermal Processes** Steam Assisted Gravity Drainage, Expanding-Solvent SAGD, Steam Flooding, Cyclic Steam Stimulation, Thermal VAPEX, Air injection, Electrical and Radio Frequency Heating
- **Chemical EOR Processes** Emulsions, Gels, Foams, ASP, Microbial EOR, VAPEX, Low Salinity Waterflooding
- **Complex Wellbore Modelling** Flow Control Devices, Transient Flow

Reservoir engineers use STARS to simulate changes to the reservoir based upon fluid behaviour, steam or air injection, electrical heating or chemical flooding. Use STARS to optimize and forecast production while incorporating the advanced processes and unique challenges encountered in today’s reservoirs.

**THERMAL RECOVERY**

STARS enables the simulation of complex processes, such as in-situ combustion, by representing the physical processes as a series of reactions between the various fluid and solid components in the reservoir – those reactions can be tuned by the reservoir engineer to match the laboratory experiments and field results. Accurate steam distribution simulation provides increased knowledge of wellbore integrity, thereby allowing operators to mitigate the environmental impact of their heavy oil reservoirs.

In 2014, several new thermal recovery features have been added to STARS, including:

- **Shale breakage:** users are now able to simulate the breakage of the shale rock after it is heated and breaks allowing fluid to flow. This feature is applicable to SAGD operations and other reservoirs using thermal recovery techniques.
- **Steam trap:** the new steam trap location options prevent steam breakthrough along the entire wellbore by dynamically monitoring wellbore temperature. An additional option has been added to this feature to prevent breakthrough of other components such as injected solvents.

As industry implements more complex thermal projects, STARS remains the choice for advanced and experimental recovery processes, including conductive and radio-frequency (RF) heating. With STARS, engineers are able to characterize well stimulation, reservoir mobility control, and effectively manage production profiles and net present value (NPV).
**CHEMICAL ENHANCED OIL RECOVERY (EOR)**

Chemical EOR involves adding sufficient chemicals (Alkaline, Surfactants, Polymer) to a reservoir to increase fluid or oil flow. STARS simulates the wellbore treatment procedures required to evaluate the effectiveness of chemical additives used in chemical EOR processes. Globally, STARS is also the most widely used foam simulator as it is the only commercial simulator to mechanistically model the complex physical processes involved in foam flooding. STARS has full gel modelling capabilities using a general reaction kinetics model to handle multi-stage, multi-component gelation and syneresis. Use STARS to mechanistically model full-field or enhanced low salinity waterfloods, as it can model the fundamental processes – ion exchange, geochemistry, wettability – essential for low salinity processes.

**COMPLEX WELLBORE MODELLING**

FlexWell, a complex flexible wellbore modelling tool, simulates well geometry or steam configuration more accurately than a standard source-sink well and more robustly than a discretized wellbore. FlexWell models all industry Flow Control Devices (FCD) using the flexible and powerful FCD input table. Engineers are able to calculate wellbore pressure gradients to determine its impact on reservoir simulation inflow and outflow. FlexWell models a variety of wellbore completion configurations, including concentric wellbores and flow-control devices, while properly accounting for well trajectories. Model multiple heater cables within the wellbore to visualize increase fluid mobility from the heated wellbore.

**GEOMECHANICS**

STARS includes a rigorous, iteratively-coupled 3D geomechanics module, as well as, integration with third party packages for modelling subsidence, compaction and dilation behaviour that occurs when applying thermal or advanced processes recovery methods. The STARS geomechanical model simulates stress-induced phenomena, such as: plastic deformation and fracturing of reservoir rock, shear dilatancy of produced and injected fluids, near wellbore formation collapse and sand production.

**COUPLED SURFACE NETWORK MODELLING**

STARS is now coupled to surface network modelling software (Petroleum Experts GAP® and Invensys PIPEPHASE®) to allow simultaneous modelling of the reservoir and the surface. Coupling surface network modelling with reservoir simulation provides insight into the complexities of the subsurface while the network simulator accounts for changing network conditions. In addition, the new outboard updates enable further modelling of electrical magnetic heating.

**WHY CMG?**

Computer Modelling Group Ltd (CMG) is the leading supplier of advanced oil and gas recovery process simulation software. CMG offers products for Black Oil, Compositional and Thermal/Chemical reservoir simulation, Assisted History Matching and Optimization, and visualization software to best understand simulation results. Experienced support teams are stationed in offices around the world to provide the best software, training and client support for advanced recovery process simulation.

CMG is devoted to providing the ultimate customer experience through its commitment to R&D investment, superior technology, and support network.

1. **R&D Investment:** With more than half our employees devoted to R&D, CMG exceeds its customer needs. CMG reinvests approximately 20% of its annual revenue back into R&D which results in significant expansion of the R&D team to further innovation and drive technology forward.

2. **Superior Software Technology:** CMG, the leader in enhanced oil recovery, delivers software that is easier to use and provides the most accurate results for unconventional, compositional, advanced IOR/EOR and conventional processes.

3. **Customer Experience:** CMG provides experienced technical sales and support personnel, located around the world. CMG engineers deliver same-day turnaround for support calls, small industry relevant training and a personalized customer experience.