ALBERTA INNOVATES

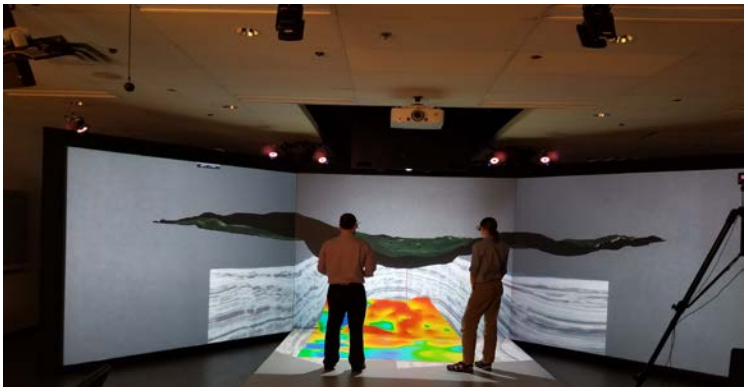
CLEAN ENERGY

ADVANCED HYDROCARBONS

CLEANER HYDROCARBON PRODUCTION – RECOVERY TECHNOLOGIES

NSERC / Energi Simulation Industrial Research Chair in Reservoir Simulation

A powerful thermal reservoir simulator PARSIM has been developed during the first two terms of the Chair Program from 2008-2018. It handles all thermal processes such as steam flooding, cyclic steam stimulation (CSS), steam assisted gravity drainage (SAGD), and in situ combustion (ISC). It is the first fully parallel thermal simulator worldwide and can be run on thousands of CPUs simultaneously. In the next five years, the simulator PARSIM will be strengthened and commercialized with the industrial partners in this project.



FUNDING DETAILS

RECIPIENT:

University of Calgary – Dr. Zhangxing John Chen

PARTNERS:

NSERC, Energi Simulation, Devon/CNRL, CNOOC, PetroChina Canada, Suncor, CMG Ltd. and IBM CAS

TOTAL BUDGET:

$4,180,000

AI FUNDING:

$200,000

PROJECT DATES:

July 1, 2019 – June 30, 2023

PROJECT TRL:

Start: July 1, 2018
End: June 30, 2023

APPLICATION

Reservoir simulations have widely been used to predict, understand, and optimize complex recovery processes of hydrocarbon resources. They are important for understanding the fate and transport of hydrocarbons and heat in the subsurface. With this understanding simulations are then applied to design new economic and environmentally friendly recovery processes of hydrocarbon resources. Reservoir simulations will continue to play an important role in the economic and environmental recovery of Alberta's vast energy reserves.

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PROJECT GOALS

- Simulators will link seamlessly and directly to geological models and will be fully coupled with chemical kinetics and geomechanics modules
- Development of reservoir models governing the physics and chemistry of fluid flow, heat transfer and additive transport, capable of predicting performance of steam co-injection recovery processes under different geological and reservoir properties and operating conditions
- Development of a reliable, accurate, intelligent heavy oil and oil sands reservoir simulator for steam co-injection recovery processes, coupled with geomechanics modules and parallel solvers and preconditioners
- Incorporation of artificial intelligence into this sophisticated reservoir simulator coupled with 3D visual technology
- analytics technologies.

BENEFITS TO ALBERTA

- Each innovation and scientific advance will be available to industry as the outcomes of the research unfold
- The implementation of the outcomes will impact the Alberta economy within the first 1-2 years of their use by directly impacting the decisions industry makes related to reservoir production processes and costs
- The reservoir models and simulators to be developed will significantly support the development of cleaner and more efficient fuels
- Albertans will benefit from increased economic activities associated with oil recovery
- The Chair Program will support the goal of environmentally friendly recovery of energy resources.
- It will contribute to the diversification and growth of Alberta's economy and quality of life through the technologies and jobs created

100 Publications

36 Students Trained

3 New Products

32 Project Jobs

CURRENT STATUS

August 2020

Mathematical evaluation models of relevant processes that incorporate the necessary physics and chemistry to describe the essential features of hybrid steam co-injection processes for heavy oil and oil sands recovery have been developed. A reliable, robust, intelligent heavy oil and oil sands reservoir simulator with flexible, unstructured grids, accurate, efficient numerical methods and fast, parallel solvers has been designed.