



# Understanding Toe-To-Heel Air Injection Process, Clues for Future In-Situ Combustion Technologies for Heavy Oil Recovery

## One-Day Course

- 1. Essential information on current ISC commercial projects** Challenges in Application of Conventional ISC process, SDOD processes, and New ISC processes
  - Current conventional ISC commercial operations: Bellevue (USA), Suplacu de Barcau (Romania), Balol and Shantal (India)
  - Challenges in application of conventional ISC process
  - **Short-distance oil displacement (SDOD)** concept
  - SDOD thermal processes; COSH, Top-down ISC and THAI/CAPRI processes
- 2. History of development of THAI and CAPRI processes**
  - 3-D lab work of U of B investigating ISC in different configurations, including horizontal wells
  - Patenting of THAI
  - Systematic investigation of THAI; significant lab tests
  - Development of CAPRI
  - Systematic investigation of CAPRI
- 3. Basic mechanisms of THAI/CAPRI; general and combustion reaction mechanisms**
  - Description of THAI; the three phases; communication, start up (ignition) and propagation of ISC front
  - The three main crucial mechanisms of THAI (SDOD, gravity stable and self-healing feature preventing air/O<sub>2</sub> short circuit)
  - Differentiation of THAI chemistry from that of conventional ISC
  - Upgrading potential of THAI/unintentional in-situ upgrading in some field ISC projects
  - Description of CAPRI and its upgrading potential
- 4. Status of technology; some essential laboratory 3-D cell test results**
  - Systematic investigation of THAI and CAPRI
  - Main conclusions from the systematic investigation of THAI and CAPRI

## **5. Status of technology; field testing results**

- Description of the Athabasca WhiteSands THAI pilot and of the conventional Heavy Oil Kerrobert (Saskatchewan Province, Canada) THAI Project (in the presence of bottom water)
  - Communication and ignition phases
  - Main phase (TTH propagation)
  - Performance of the pilot/project; control of the process, peak temperature, burning characteristics, oil rate, upgrading and hydrogen production, etc.
  - Operational issues
  - Lessons learned
- Discussion on possible applications of THAI process in other fields in Canada ; May River Project and Dawson Creek Project
- Four THAI pilots outside Canada with emphasis on Fengcheng Pilot in Xingjiang Province, China

## **6. Pros and Cons of THAI application; screening criteria**

- Maturity of the THAI process; challenges/limitations
- Pros & Cons
- Screening criteria
- Sweet spots for applications

## **7. Towards commercialization of THAI; possible improvements of the THAI process**

- Staggered line drive application
- THAI grafted on a suspended or active ISC operation
- THAI as a follow up process after SAGD and THAI conducted as a stand-alone process in a SAGD well configuration
- Propagation of the ISC front on the last portion of the horizontal section (heel section)
- Reduction of the gas injection rate, controlling wells just for gas production (partial) to some extent as in COSH, other possible solutions
- Safety of operation; oxygen ingress in the horizontal producer
- Excessive catalyst loading in CAPRI process

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