

CRUDE OIL FROM OIL SANDS

IN SITU PROCESS: ENHANCING OIL RECOVERY

The In Situ Combustion Research Team led by Dr. Gordon Moore and Dr. Raj Mehta, has been conducting research on in situ combustion (ISC) method for more than 30 years. Their goal is: "to leave the dirty stuff in the ground and produce higher quality oil on the surface with significantly reduced environmental impacts and pollutants".

Their research team has tested the process more than 320 times in over 80 reservoirs in 10 countries. In the laboratory, they have developed models for all types of reservoirs, including for recovering Athabasca oilsands bitumen.

Moore and Mehta are currently partnering with 22 companies on the project, in Calgary's oil patch. Their work has drawn attention because in situ combustion typically burns up only 10% of the targeted oil, an amount that would be unrecoverable anyway. Besides, there are no other processes yet, that can enhance the recovery under environmental or technological considerations, including on-shore and offshore locations.

How does the ISC process work?

The ISC process uses a wall of fire driven by the injection of air or oxygen to force oil through the reservoir toward production wells, where the oil can be recovered.

The underground process doesn't have as many of the pollutants associated with surface combustion, and it does not require transportation of steam where energy losses occur.

The anticipated financial impact?

Just a one percent change in oil recovery will have a huge impact on energy reserves. This could mean trillions if not billions of dollars – if they can open up these reservoirs.

Advantages of the in situ process:

- It is "cleaner, more efficient and sustainable with less oil wasted in the extraction process".
- Conservation of fresh and ground water supplies - as the process, for water or steam injection, does not need to be fed with large quantities of water
- Results in fewer carbon dioxide emissions per barrel of oil produced than steam injection – reducing its emissions into the atmosphere

Peculiarities and Processes:

- In situ combustion is not a thermal recovery process - rather displacement process reactions occur at both low and high temperatures- operating outside these ranges will consume oxygen, but displace very little oil
- The process parameters for light oil are very different to those for a heavy oil
- High thermal efficiency, universal availability of air, low water and natural gas fuel requirement specifications must be met to generate reaction conditions within the bitumen reservoir, which is favourable for in situ upgrading of the produced oil.
 - Such in situ upgrading would eliminate the need to burn huge amounts of increasingly expensive natural gas to generate steam, for steam-assisted gravity drainage recovery and for upgrading the heavy crude in surface facilities.
 - Another advantage is that if pure oxygen is mixed with recycled produced gas and injected for in situ upgrading, the produced gas is relatively pure carbon dioxide that can be transported and used in conventional reservoirs for enhanced oil recovery.
 - Hybrid processes are attractive because of constraints on natural gas, water availability and the increasing cost of natural gas and solvent.



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