

This jointly developed technology between Honeywell FM&T and Millennium Technologies Inc. identifies a process to recover heavy oil from oil sands.

## Background

Much of the world's oil reserves are in the form of oil sands. In the US, western states primarily Colorado, Wyoming and Utah have estimated heavy oil reserves near 100 billion barrels. The significance of this patent is two-fold. It can help eliminate U.S. dependence on foreign oil and uses an environmentally friendly, non-aqueous process well suited for water scarce western regions.

## Description

This process yields heavy oil and clean dry sand. The heavy oil is extracted from the oil sands using a renewable, generally recognized as safe (GRAS) solvent followed by a liquid or supercritical carbon dioxide rinse to remove the extraction solvent from the sand. Both the extraction and rinse phases are recovered using closed-loop processing to eliminate losses. A process schematic and images of oil sand from Asphalt Ridge, Utah before and after processing are shown below.

## Advantages

The primary advantage of this technology is the use of a non-aqueous process for heavy oil removal. This has special significance in arid regions of the west where water is scarce and where the bulk of the U.S. oil sand reserves are located. It also eliminates the need for large settling ponds which have environmental liability to wildlife and groundwater.



Oil Sand from Uinta Basin, Utah



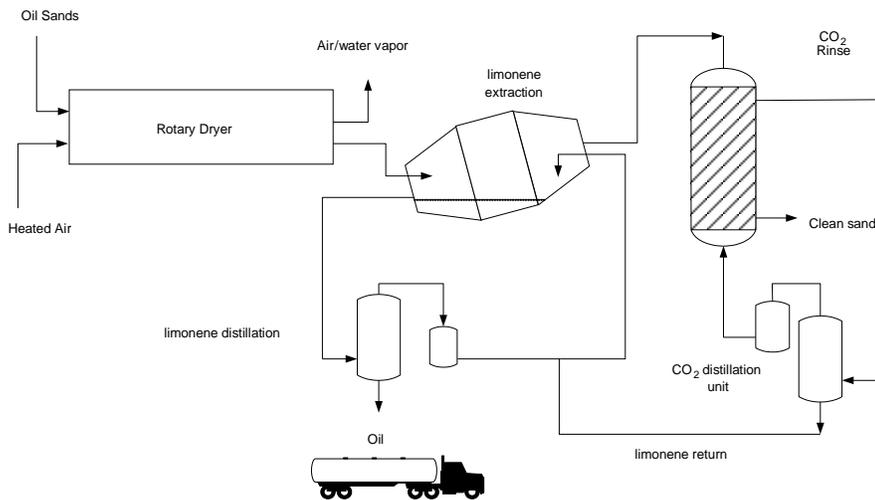
Sand and oil after processing

In addition, this process uses solvents generally recognized as safe, limonene and liquid carbon, which are recovered in closed loop processing. Furthermore, the sand recovered from the process is clean and dry ready for use.

## Applications

This technology is targeted for heavy oil recovery from oil sands. It would also have application were oil is spilled onto the soil and clean-up of the contaminated soil is desired. Existing and potential markets include:

- Heavy oil recovery from oil sand
- Production of clean dry sand
- Oil contaminated soil remediation



Heavy Oil Extraction Schematic

## Intellectual Property Status

This technology is patented under US Patent # 8,398,824 issued March 19, 2013.

## Keyword List

Oil sands, non- aqueous heavy oil extraction, closed loop environmentally responsible, process, generally recognized as safe (GRAS) solvent

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