The Athabasca Tar Sands
Fort McMurray, Alberta, Canada

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The Athabasca Tar Sands (also known as Oil Sands) are a very large source of heavy, viscous oil, known as bitumen, located in Alberta, Canada.

The bitumen is mixed in sand or clay.

Bitumen is chemically similar to asphalt.

The oil extracted from the bitumen-sand mixture is known as synthetic oil which distinguishes it from the freer-flowing crude oil produced from oil wells.

Oil sands account for approximately 2/3 of the world’s total petroleum resource with 88% in Canada and 12% in Venezuela.

The sand is mined, not pumped as conventional petroleum.
Some views of the Athabasca oil sands
Syncrude operates the mine in the Athabasca Tar Sands
Originally bucket-wheel drag lines and conveyor systems were used to mine the sands in an open pit.
The bucket-wheels are being replaced by shovel and truck mining which is more cost effective.
The trucks operate 24-7
The trucks are three stories tall and can carry 400 tons of tar sand.

A truck costs $5 million.
The tar sands are composed of:

- 83% silica sand
- 10% crude bitumen
- 4% water
- 3% clay
Processing the Tar Sands

• The mined ore is crushed.
• Hot water at 50° - 80 °C is added to the ore to form a slurry.
• The slurry is transported to a primary separation vessel where bitumen is recovered by flotation as bitumen froth.
Processing the Tar Sands

- The recovered bitumen froth is cleaned to reject the contained solids and water to meet the requirement of downstream upgrading processes.
- Depending on the bitumen content in the ore, between 90 and 100% of the bitumen can be recovered using modern hot water extraction techniques.
- The bitumen is then transported and eventually upgraded into synthetic crude oil.
- About two tons of tar sands are required to produce one barrel of oil.
Processing the Tar Sands

- After oil extraction, the spent sand and other materials are eventually reclaimed.
- Alternative in-situ methods like steam assisted gravity drainage (SAGD) and cyclic steam stimulation (CSS) have been developed to extract bitumen from deep deposits by injecting steam to heat the sands and reduce the bitumen viscosity so that it can be pumped out like conventional crude oil.
- The standard extraction process requires huge amounts of natural gas. The oil sands industry uses about 4% of the Western Canada Sedimentary Basin natural gas production. This is expected to increase 2.5 fold by 2015.
Processing the Tar Sands

- The Alberta government requires companies to restore the land to "equivalent land capability". This means that the ability of the land to support various land uses after reclamation is similar to what existed, but that the individual land uses may not necessarily be identical.
The Syncrude refinery