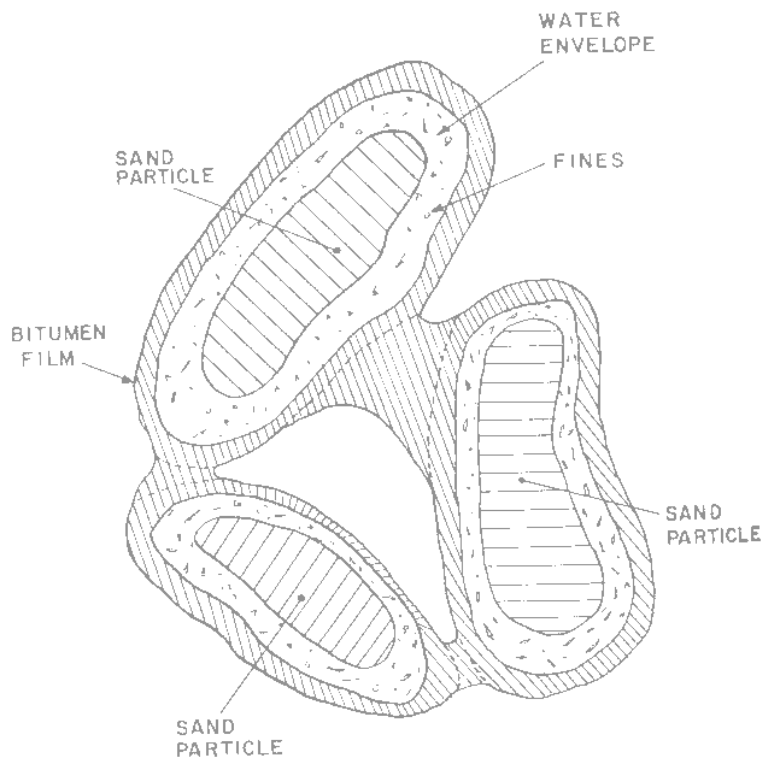


OIL SANDS

Oil sands are "hydrophilic" or "water wet." Each grain of sand is covered by a film of water, which is then surrounded by a slick of heavy oil (bitumen). The sands are bonded firmly together by grain-to-grain contact. The sand is composed of 92% quartz with traces of mica, rutile, zircon, tourmaline, and pyrite. The sand is triangular in shape, making it very abrasive. On the Moh's hardness scale, with diamond being 10, oil sand is 7.4.

COMPOSITION OF OIL SANDS



Graphic: pp. 194, Athabasca Oil Sands – The Karl A. Clark Volume

Oil sand is often referred to as "tar sand," because the bitumen (or oil) resembles black, sticky tar. However, the term "tar sand" is incorrect. Tar is a man-made substance formed through the distillation of organic material. It is BITUMEN (a heavy thick oil) not tar that is found in the oil sands. The bitumen content in deposits varies from 1% - 18%. More than 12% bitumen content is considered rich, and less than 6% is poor and not usually considered economically feasible to mine, although it may be mined with a blended stock of higher grade oil sand. On average, it takes 2 tonnes of mined oil sand to produce one barrel of synthetic crude oil (159 litres). In the winter the water layer in the oil sand will freeze making it as hard as cured concrete. In the summer, it's as soft as molasses and makes driving conditions treacherous.



Fact Sheet



OIL SANDS, Continued:

SURFACE MINING

The Athabasca deposit is the only oil sand deposit with reserves shallow enough to be surface mined. There are currently three oil sand plants mining in the Athabasca deposit, north of Fort McMurray: Suncor Energy Inc., Syncrude Canada Ltd. and Albian Sands Energy Inc. Many other companies have plans underway to construct oil sands plants. Capital spending in both In Situ areas and Mining projects in the oil sands totaled more than **\$28 billion U.S** from 1996-2004. It is estimated that Canadian companies will spend close to \$7.0 billion U.S on oil sands investments by the end of 2005. If all of those projects go through, by 2010 projected bitumen production should be 2 million barrels per day. The Alberta Energy and Utilities Board speculates that Alberta's oil sand reserves will be the primary source for Canada's crude oil within a decade, offsetting rapidly declining conventional crude oil stocks.

IN SITU – TAPPING INTO THE POTENTIAL

Approximately 80% of Canada's oil sands lie deep below the surface and cannot be recovered by open pit (surface) mining techniques, so *in situ* processes are used to get at some of the deposits. No single method of *in situ* recovery can be applied to all oil sand deposits, since the bitumen varies considerably from deposit to deposit as well as within each deposit. One of the most promising *in situ* methods is referred to as SAG-D (Steam Assisted Gravity Drainage). This involves injecting steam through a series of wells into the oil sand. The pressure and high temperature cause bitumen and water to separate from the sand particles. The hot bitumen migrates towards producing wells, bringing it to the surface, while the sand is left in place ("*in situ*" is Latin for "*in place*").

There are, however, a number of other techniques that are being used including THAI and VAPEX. THAI (Toe to Heal Air Injection) is a proposed revolutionary technology for the in-situ recovery of bitumen and heavy oil that combines a vertical air injection well with a horizontal production well. VAPEX (Vapor Extraction Process) is technically similar to SAGD but instead of steam, solvent is being injected into the oil sands resulting in significant viscosity reduction.

Source:

Carrigy, M.A., ed. Athabasca Oil Sands – The Karl A. Clark Volume. Edmonton, Alberta, Canada: Research Council of Alberta, 1963.

McRory, Robert E. Energy Heritage – Oil Sands and Heavy Oils of Alberta. Edmonton, Alberta, Canada: Alberta Energy and Natural Resources, 1982.

The Petrobank Energy and Resources LTD: www.petrobank.com/faqs

Canadian Association of Petroleum Producers. www.capp.ca