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About Tar Sands

Basic information on tar sands, tar sands resources, and recovery of oil from tar sands.

What Are Tar Sands?

Tar sands (also referred to as oil sands) are a combination of clay, sand, water, and **bitumen**, a heavy black viscous oil. Tar sands can be mined and processed to extract the oil-rich bitumen, which is then refined into oil. The bitumen in tar sands cannot be pumped from the ground in its natural state; instead tar sand deposits are mined, usually using strip mining or open pit techniques, or the oil is extracted by underground heating with additional upgrading.

See the [Photos page](#) for additional photos of tar sand and tar sand mining.



Tar Sands



Tar Sands Open Pit Mining, Alberta, Canada

Tar sands are mined and processed to generate oil similar to oil pumped from conventional oil wells, but extracting oil from tar sands is more complex than conventional oil recovery. Oil sands recovery processes include **extraction** and **separation** systems to separate the bitumen from the clay, sand, and water that make up the tar sands. Bitumen also requires additional **upgrading** before it can be refined. Because it is so viscous (thick), it also requires dilution with lighter hydrocarbons to make it transportable by pipelines.

Tar Sands Resources

Much of the world's oil (more than **2 trillion barrels**) is in the form of tar sands, although it is not all recoverable. While tar sands are found in many places worldwide, the largest deposits in the world are found in Canada (Alberta) and Venezuela, and much of the rest is found in various countries in the Middle East. In the United States, tar sands resources are primarily concentrated in **Eastern Utah**, mostly on public lands. The in-place tar sands oil resources in Utah are estimated at **12 to 19 billion barrels**.

See the [Maps page](#) for additional maps of tar sands resources in Utah.



Primary Tar Sands Resources in Utah

Utah Tar Sands Estimated In-Place Resources

Deposit	Known (MMB)	Additional Projected (MMB)
Sunnyside	4,400	1,700
Tar Sand Triangle	2,500	420
PR Spring	2,140	2,230
Asphalt Ridge	830	310
Circle Cliffs	590	1,140
Other	1,410	1,530
Total:	11,870	7,330

The Tar Sands Industry

Currently, oil is not produced from tar sands on a significant commercial level in the United States; in fact, only Canada has a large-scale commercial tar sands industry, though a small amount of oil from tar sands is produced commercially in Venezuela. The Canadian tar sands industry is centered in Alberta, and more than one million barrels of synthetic oil are produced from these resources per day. Currently, tar sands represent about 40% of Canada's oil production, and output is expanding rapidly. Approximately 20% of U.S. crude oil and products come from Canada, and a substantial portion of this amount comes from tar sands. The tar sands are extracted both by **mining** and ***in situ*** recovery methods (see below). Canadian tar sands are different than U.S. tar sands in that Canadian tar sands are water wetted, while U.S. tar sands are hydrocarbon wetted. As a result of this difference, extraction techniques for the tar sands in Utah will be different than for those in Alberta.

Recently, prices for crude oil have again risen to levels that may make tar-sands-based oil production in the United States commercially attractive, and both government and industry are interested in pursuing the development of tar sands oil resources as an **alternative to conventional oil**.

Tar Sands Extraction and Processing

Tar sands deposits near the surface can be recovered by **open pit mining** techniques. New methods introduced in the 1990s considerably improved the efficiency of tar sands mining, thus reducing the cost. These systems use large hydraulic and electrically powered shovels to dig up tar sands and load them into enormous trucks

that can carry up to 320 tons of tar sands per load.



Tar Sands Extraction Separation Cell, Alberta, Canada

After mining, the tar sands are transported to an **extraction plant**, where a hot water process separates the bitumen from sand, water, and minerals. The separation takes place in **separation cells**. Hot water is added to the sand, and the resulting slurry is piped to the extraction plant where it is agitated. The combination of hot water and agitation releases bitumen from the oil sand, and causes

tiny air bubbles to attach to the bitumen droplets, that float to the top of the separation vessel, where the bitumen can be skimmed off. Further processing removes residual water and solids. The bitumen is then transported and eventually upgraded into synthetic crude oil.

See the [Photos page](#) for additional photos of tar sand processing facilities.

About **two tons** of tar sands are required to produce **one barrel** of oil. Roughly 75% of the bitumen can be recovered from sand. After oil extraction, the spent sand and other materials are then returned to the mine, which is eventually reclaimed.

In-situ production methods are used on bitumen deposits buried too deep for mining to be economically recovered. These techniques include **steam injection**, solvent injection, and firefloods, in which oxygen is injected and part of the resource burned to provide heat. So far steam injection has been the favoured method. Some of these extraction methods require large amounts of both **water** and **energy** (for heating and pumping).

Both mining and processing of tar sands involve a variety of **environmental impacts**, such as global warming and greenhouse gas emissions, disturbance of mined land; impacts on wildlife and air and water quality. The development of a commercial tar sands industry in the U.S. would also have significant **social and economic impacts** on local communities. Of special concern in the relatively arid western United States is the large amount of water required for tar sands processing; currently, tar sands extraction and processing require **several barrels of water** for each barrel of oil produced, though some of the water can be recycled.

For More Information

Additional information on tar sands is available through the Web. Visit the [Links](#) page to access sites with more information.



Tar Sands Open Pit Mining, Alberta, Canada