



The Beginners Guide to Canadian Oil Sands Mining

Nobody denies, not even the most rabid environmentalist, that there will be an extended transition period as the U.S. economy shifts in any significant way from hydrocarbon based energy to alternative energy sources. In the meantime, we could start shutting down the high CO2 producing Canadian oil sands and oil production in general and import the growing difference from the Middle East and other countries that have lower environmental standards; OR we can rely on increased production and transport to the U.S. oil from refined Canadian oil sands, increasing national security by reducing supply from less reliable countries with longer, more exposed supply lines.

Oil Sands Players

Both Suncor (NYSE:SU) and Encana (NYSE:ECA) are major operators in the oil sands. They're both excellent energy companies for the long haul and they've both appreciated quite nicely over time. Encana's dividend yield is currently over 3% as well.

Also, Halliburton (NYSE:HAL) and Baker Hughes (NYSE:BHI) are important companies in the oil sands business. Not so much in surface mining, but Halliburton and Baker Hughes are definitely players in the in situ extraction process, which involves complex drilling and underground heating systems to mobilize the deep, thick bitumen. That is, Halliburton is a specialist in the high-tolerance directional drilling that goes into the in situ process, and Baker Hughes is an important supplier for the complex down-hole tools and equipment. Nevertheless, HAL and BHI seem to always underperform with periodically less than stellar management.

The Past and Future of Oil and Oil Sands

There is a large geological and social similarity between the oil sands of Alberta and the oil patch of Pennsylvania.

Geologic similarity? Yes, because the reason that the hydrocarbons are so near the surface in both areas -- Pennsylvania and Alberta -- is that the Pleistocene glaciers

scraped off much of the overlying rock. When the glaciers retreated about 10,000 years ago, they left hydrocarbon-bearing rock formations exposed near the surface, or buried not too deep. This led to oil seeps, which led to people being curious about the black, gooey stuff.

To be sure, the hydrocarbon resource is quite different between the two places. That is, in Pennsylvania, you have light, sweet crude oil that flows easily and is soft and smooth to the touch. Indeed, Pennsylvania crude feels like hand lotion. (It's the origin of Vaseline, for example. And some people use it as the basis for a shampoo.)

In Alberta, the "bitumen" from the oil sands is as thick as cold molasses, and very sticky. It's got some sulfur in it as well.

On a warm day in August, oil sands have the consistency of really stiff, dry oatmeal. Bitumen is a far cry from hand lotion.

And as for social similarities? Well, the Indians of old used to skim the oil from streams near Titusville, Pa. So did people of the "First Nations" of Alberta, who used to recover the tarry bitumen from the rocks along the Athabaska River of northern Alberta. Thus both oil and oil sands have been around for a long, long time.

Early white explorers in both Pennsylvania and Alberta noted the oil seeps. They wrote in journals and logs that eventually somebody could do something with the substance.

Eventually, both Pennsylvania and Alberta had their oil booms. In fact, the 150th anniversary of Col. Drake's oil discovery at Titusville, Pa, on Aug. 27, 1859 just passed last week. Pennsylvania's oil boom is colorful history at this point (although Marcellus Shale development will soon change that).

Whereas Alberta is still in the midst of its oil sands boom, the SterlingAccount believes it's a boom that's going to last for quite some time.

"Easy" Oil Versus Heavy Oil and Bitumen

There's a reason Col. Drake started an oil boom in Pennsylvania more than a century before Alberta enjoyed the same thing. Col. Drake found some of that so-called "easy" oil. No, it's not easy to find. It's that Col. Drake's oil flows easily from a well.

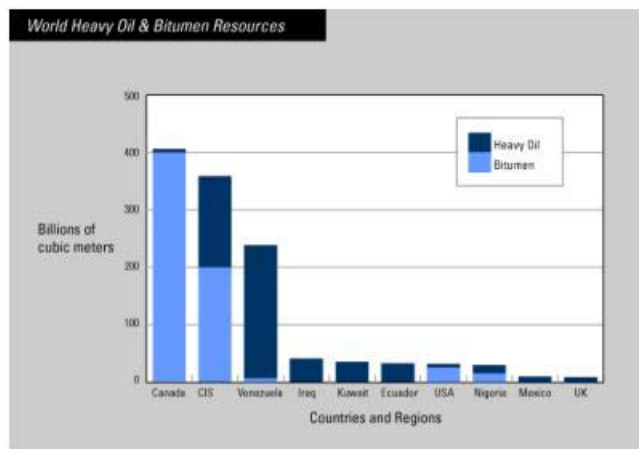
That is, for all the oil that mankind has pumped out of the ground in the past 15 decades, almost all of it has been the light, sweet stuff that flows easily. Generally, when people looked for oil they bypassed the heavy oil and bitumen. Until lately, of course.

When we think about the concept of "Peak Oil" today, we need to keep in mind what we're talking about. The curves show oil output peaking in so many parts of the world. This phenomenon is quite real, as long as you understand that it's the "old fashioned"

kind of oil deposit that Col. Drake was drilling. The light, sweet, easy-flowing oil is getting harder and harder to find, certainly in significant quantity.

But there are a lot of other hydrocarbon molecules out there. Most of those molecules are not light, sweet crude oil. Indeed, most of the hydrocarbon molecules that the world will use in the future will be “heavy,” with lots of carbon atoms and not so many hydrogen atoms.

Here’s a graph from oil services giant Schlumberger that estimates the world’s heavy oil and bitumen resources. Canada’s 400 billion cubic meters of bitumen translates into something like 1.4 trillion barrels of oil equivalent. How much is that? Well, it’s about seven times the total oil reserves of Saudi Arabia.



It just so happens that most of that Canadian bitumen is located in Alberta (with some in Saskatchewan). And Fort McMurray, about 250 miles north of Edmonton, is the heart of the development process.

Surface Mining

Large-scale oil sands development began in the 1970s. It took gigantic levels of capital investment, around tens of billions of dollars. That's not pocket change. So a group of lease-owners got together and pooled their capital to form privately held Syncrude Canada, a joint venture. First mining started in 1978.

The way Syncrude operates, it's not really “mining.” It's landscape architecture. Under Alberta law, Syncrude could not turn over its first shovel of rock without a master plan for remediation and restoration at the end of the cycle. It's quite a farsighted model for long-range resource development.

Thus for much of the 1970s, Syncrude performed baseline environmental studies and data gathering. It started digging in 1978. At first, the pit looked like a moonscape of open-pit mining. See the photo below. It looks like a mess, right? Well, there's more to the story.



The mining process is fairly straightforward. Big shovels scoop large volumes of oil-laden sand (API number 8, the "bitumen") into gigantic loaders.



The loaders haul the rock to a crusher. The crushed rock goes to a washing bin, kind of like your washing machine at home except it's the size of a high-rise office building. The Syncrude operation washes the bitumen off the sand using naphtha. Then it separates the bitumen, recovers the naphtha for reuse and takes the clean sand (and it's clean) and replaces it in a previously mined pit.

The process uses a lot of water, but not as much as the horror stories you might hear about "draining the rivers" of northern Canada. Each barrel of water is recycled about 18 times.

The process uses a large amount of natural gas, but not as much as you may have heard (like "all the natural gas of northern Canada"). Pretty much everything about the operation is built with cogeneration in mind, so the company continuously recovers the heat at each stage. That natural gas goes a long way.

If it takes, say, five years to dig a pit, and then it may take five or more years to fill it back up with sand during the restoration process. Syncrude's goal is to handle the rock as little as possible.

Eventually, Syncrude returns the land to original grade, although the company has some artistic license with the contours. It covers the land with the original topsoil, which has been in cold storage (northern Alberta; it's cold up there for 10 months of the year). Then it replants trees, and that's saying something, because the growing season is less than two months. It takes 80 years for your basic spruce tree to reach maturity.



There's even a new water table, despite the disturbance of the land.

Where Things Now Stand

So at this stage, after 30 years or so of mining (with about 80 years to go, at current rates of extraction), Syncrude has come to a point of delivering 350,000 barrels of synthetic crude oil per day. It takes the 8-API bitumen and upgrades it to oil that's competitive with West Texas Light. Then it delivers it to the JV members, for whatever use the owners want to make of it.

Along the way, the Syncrude process removes the sulfur, so it's sulfur free (refiners like that). In fact, there's a mass of sulfur up at Syncrude that's about the size of the step pyramid at Saqqara, Egypt. And along the way, Syncrude sells the sulfur to the chemical industry.

The former Syncrude mine is about 3.5 miles square, and formerly about 200 feet deep. Now it's restored to grade, with trees growing and a herd of 300 wood bison grazing.



For the cynics out there, the SterlingAccount would say that it's not some environmental Potemkin village, because you can't fake a replanted forest of 25-year-old trees. You can't fake a 300-bison herd. Not on a former mine site 3.5 miles square.

Sure, there are still issues about land disturbance, settling ponds, water usage, gas usage and myriad of other things that come up when you're spending billions of dollars on a major mining effort. But Syncrude has built its business model around dealing with the "other" issues, and not just moving oil sands and recovering oil products. Don't underestimate the ability of the Alberta government to regulate its energy producers. This is a long way from Appalachia.

Meanwhile, we're talking about literally billions of barrels of bitumen (or oil equivalent) that the process makes available to the North American marketplace. And if the U.S. wants to get onto its environmental high horse about the source of the hydrocarbons from the oil sands -- and tax or ban their importation -- there are other buyers in the world. Like the Chinese, who have racked up many frequent flyer miles on their treks to Fort McMurray.

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