

FACING PAGE: Zircon grains

PHOTO: Titanium Corporation

Tailings Twist

Oilsands waste could become a source of needed titanium and zircon

In August 1896, a small party of intrepid prospectors struck gold in Canada's Yukon Territory. The discovery sparked the Klondike Gold Rush and caused people to dash to Canada's northern wilderness in an attempt to make their fortunes from the precious metals to be found there.

Over a century later, a similar story could again be in the cards for Canada; however, the search is now taking place in Alberta's vast Athabasca oilsands deposit, and the prize being sought this time isn't gold, but titanium and zircon.

Alberta's oilsands represent a major potential source of these sought-after minerals, according to Titanium Corporation, a mining and exploration firm based in Toronto, Ontario. The company is seeking to extract commercial supplies of both titanium and zircon from the tailings left behind by companies mining crude from the region's oilsands. Worldwide demand for both of these products is growing, and oilsands tailings could be a viable new source.

"Our mission is to become the first titanium and zircon producer from Canada's oilsands. We're developing a new source of heavy minerals," says Scott Nelson, Titanium Corporation president and chief executive officer.

Titanium, being both light and strong, is probably best known as a product used to make airplanes or golf clubs. However, over 90 per cent of global supply is actually consumed in the pigment industry, where titanium dioxide is used to produce paints, plastics, and toothpaste.

Titanium Corporation is now building a \$3-million pilot zircon production facility at the Syncrude mine.

Anything that is bright and white likely contains titanium. Zircon is a valuable heavy mineral widely used in the ceramics industry and is often used to make tiles.

The heavy minerals are usually found together in sand deposits, where a titanium concentration of between four and six per cent is considered enough to make

production worthwhile. Mining sites in South Africa and Australia provide most of the world's supply; pigment plants in Asia and the southeastern United States are the major consumers of titanium, while zircon travels mainly to ceramics factories in Europe and China.

Alberta's mineable oilsands generally have a titanium concentration of around one per cent—not enough to justify commercial mining for the minerals. However, the extraction process carried out by oilsands mining companies produces a

“dry” mill uses magnetism and electricity to separate out the titanium and zircon. While Titanium Corporation will follow that method, getting its feedstocks to those stages is a little more complex than usual.

“Because our feedstock comes from the oilsands tailings, it contains bitumen, naphtha, and water, as well as the sand itself. We had to develop the technology to clean this material so it would process more conventionally,” Nelson says.



PHOTO: Titanium Corporation

Titanium Corporation's bulk sampling facility producing washed mineral sands at the oilsands tailing site in Fort McMurray.

waste product called tailings, comprised of leftover sand and currently unrecoverable bitumen and naphtha.

It's in these useless tailings that Titanium Corporation hopes to metaphorically strike gold. While the sand sticks to the last remnants of bitumen, so does valuable zircon and titanium, raising the concentration of the heavy minerals in the tailings to around 30 per cent—a source Titanium Corporation thinks it can exploit.

In conventional titanium and zircon mining, the sands go through a two-stage process. First, a “wet” plant uses gravity to separate the sands, concentrating the heavy minerals and rejecting unwanted material. Then, a

The company has signed an exclusive agreement with Syncrude—Canada's largest single source of crude oil, at about 35,000 barrels per day from the oilsands—that gives it access to the waste tailings produced there. Since 2004, Titanium Corporation has been carrying out core analysis of the samples from the Syncrude site to build up data and has developed ways of cleaning the oil from the sands.

While the company is keeping exactly how those methods work close to its chest, the process will result in some of the bitumen and naphtha being recovered from the tailings, Nelson says. The reclaimed crude, which had previously been discarded, could instead be sold to refiners.

Titanium Corporation is now building a \$3-million pilot zircon production facility, capable of producing 12 tonnes per hour, on site at the Syncrude mine. It is expected to start operations this fall. The company raised \$26 million in 2005 from financial markets to fund the development, which it hopes will demonstrate the oilsands' commercial potential for titanium and zircon production.

"We hope to produce thousands of tonnes of material. It can be used for final testing in the marketplace by large consumers in full-scale facilities, after which we can put long-term sales contracts in place," Nelson says. "Then, we'd move ahead with the final stage: building the full-sized facilities."

The company was originally planning to build a full-scale titanium and zircon plant, operating at the Syncrude mine in 2009–2010, at a cost of around US\$120 million. However, spiralling prices in the zircon industry mean the company is now looking to build the zircon plant first, with the titanium plant following later.

"There's a worldwide shortage in zircon, and it's gone up in price quite nicely. Logic

PHOTO: Titanium Corporation



says we should start with the most valuable product and move forward from there," Nelson says.

Titanium Corporation now hopes to have a zircon plant producing around 67,000 tonnes per year, in operation in late 2008 or early 2009, bringing materials to the market more

Mineral separation equipment in Titanium Corporation's Regina, Saskatchewan pilot facility.

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PHOTO: Titanium Corporation

Titanium Corporation connected a pilot processing facility to a fresh tailings pipe on-site to produce washed mineral sands from oil sands tailings for the first time in 2005.

quickly than previously expected. Leaving the titanium plant until later means the company doesn't yet have to build a dry mill to separate out the titanium, meaning the costs of the initial plant will be below prior estimates.

From there, Titanium Corporation eventually hopes to have a plant at every oil sands mining operation in Alberta. Although only 20 per cent of Alberta's oil sands can be exploited through surface mining, there is still a vast potential resource of titanium and zircon that is growing rapidly as companies bring new projects on stream.

"What they're doing is really something. In time, they could be the largest producer of titanium in the world," says Peter Duggan, a manager at Syncrude's Aurora mine.

While developments are still in the pilot stage, indications are that this could create an exciting new opportunity in the oil sands, says Ian Potter, director of sustainable energy futures with the Alberta Research Council.

"Assuming [titanium and zircon production] works at commercial scale, it will allow added value to be extracted from the oil sands in a form that people wouldn't normally consider. Also, the process is dealing with a waste material, so it makes sense not only from a business sense, but from an environmental and social sense as well. It's an exciting opportunity."

A new supply of zircon couldn't hit the market at a better time. Worldwide demand has grown from 900,000 tonnes per year in 2000 to 1.2 million tonnes in 2006, while prices have risen from \$400 per tonne in 2003 to over \$700 per tonne today. Increased Chinese consumption is partly responsible for the rise in demand, and it is feared that demand could soon outstrip supply.

Titanium Corporation is looking to fill that potential gap. Its full-sized plant at the Syncrude site could, when constructed, eventually supply around five per cent of the world's zircon and titanium needs. Despite the added complexity of using the oil sands tailings, Titanium Corporation also expects to be in the top quartile of low-cost producers worldwide.

"Our minerals don't have to be mined—that's already been done—and the disposal and reclamation [systems] are already in place. Therefore, producing our minerals consumes a substantially lower amount of energy than a conventional source. It's an environmentally friendly product," Nelson says.

However, Titanium Corporation still has to negotiate a few hurdles before it gets to that stage, not the least of which is convincing a skeptical business community—which is only just getting used to the idea of the oilsands themselves being a viable source of crude oil—that titanium and zircon can be produced there as well.

In addition, the company still has to negotiate a royalty agreement with the Alberta government. While Alberta has a standard royalty structure in place for companies extracting crude from the oilsands, it has no such plan in place for a titanium equivalent, especially one that is using other companies' waste as its supply source.

"We're working the fiscal arrangements through with the government and everyone's supportive and saying the right things, but we have to get that through to conclusion. I'm hopeful of an agreement by early 2007," Nelson says, adding that the company also hopes to obtain government funding to help the development process.

Ultimately, while Titanium Corporation expects to supply titanium markets in the

southeastern United States and Asia, the establishment of a new source could lead to the development of an entirely new industry in Alberta, Nelson adds.

"In time, [Titanium Corporation] could be the largest producer of titanium in the world."

~ Peter Duggan,
Syncrude Aurora mine

"There is the potential for the development of a pigment industry in Alberta. The key ingredients are a quality source of titanium feedstock, chlorine, coke, and deep well disposal. All those things are here in Alberta."

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