Canadian plans to transport oil as solid briquettes move forward

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Enlarge / A Canada National Railway Co. train in Alberta.
The Canada National Railway Company (CN) has spent years developing a product called CanaPux, in which thick bitumen crude oil from Canada’s oil sands is mixed with a polymer to become a solid puck that can be transported with little fear of spills or fires. When the pucks reach their destination, the polymer is separated from the oil and can be sent back to the processing plant for reuse.

Now, CN Innovations, the branch of CN that developed CanaPux, has found two partnering groups that are interested in building production plants to develop the pucks. One is a Chinese group seeking to export bitumen (the name for the low-grade heavy oil found in Canadian oil sands) to China, the other is a Canadian group wanting to export the stuff to South Korea and India, among other countries. The Canadian group in particular has been focusing on exporting bitumen for non-combustion purposes: heavy oil like bitumen is often used to pave and waterproof roofs, according to James Auld, the project lead for CanaPux at CN.

Auld told Ars on Monday that a 10,000 barrel-a-day CanaPux production plant would cost about CAN$50 million (US$37.6 million) to build, not including a facility at the other end of the transportation chain that would de-polymerize the briquettes of oil. The two groups looking to build CanaPux plants are eyeing plants that could process between 10,000 and 50,000 barrels per day.

Why would a company spend money to make a puck?

The economic case for CanaPux isn’t obvious. But Auld said that bitumen’s unique properties make the case more compelling. First, to send bitumen through a pipeline, a diluent to make the bitumen flow more easily must be added, and that diluent is often 30 percent or more of the volume traveling through the pipeline. That means less volume for transporting the oil producer’s product. Instead, Auld says that CanaPux can be manufactured with only 10 percent of each puck being polymer additive.

However, Auld stressed that CanaPux aren’t seeking to complete with oil moving through pipelines. After all, CN is a railway company, and moving bitumen by train often allows producers to load their bitumen into special cars that require no diluent.

But if producers want to later export that oil overseas, they do have to add a diluent at that point to get the bitumen onto ships. On trains, “we have no flammability issues and we’re moving closer to 100 percent product, but the problem for us isn’t really getting to the US Gulf Coast,” Auld said. “If you want to export west or east of Canada you can’t do that.” According to Auld, there are no terminals on either Canadian coast that allow diluent-filled bitumen to be loaded onto oil tankers.

In addition, heating elements are often needed on rail cars that transport bitumen in Canada.

But if the bitumen is in puck form, things are a bit easier. Auld said CN can transport pucks in a light aluminum gondola car, usually reserved for coal transportation (which is likely to fizzle out as Canada phases out coal-fired electricity plants by 2030 and potential export partners follow suit). Gondola cars hold more product, don’t have heating elements, and solid oil can be offloaded at existing Canadian ports. Then, all that’s left is reconstituting the oil on the other side.

That said, Auld was explicit that a solution like CanaPux probably wouldn’t work for anything but the heaviest of crudes. “The heavier your crude oil is, the less polymer you need [to make CanaPux] and the more diluent you need” to send that oil through a pipeline, Auld said. In those specific cases, the economics favor CanaPux. Lighter crudes, on the other hand, flow through pipelines much easier and would need a lot more polymer additive to be made into solid form.

An environmental case

A prototype version of CanaPux. It looks like a chocolate pudding cup. Put them in your kids' lunches!
CN Innovations

Of course, oil is a fossil fuel, and burning it will continue to contribute to carbon emissions that are already threatening our world. But Auld said that, although demand for coal and oil for combustion is likely to drop, "we're going to require heavy, heavy bitumen, especially for non-combustion purposes. We're always going to pave roads, etc."

In addition, as long as oil transportation isn't made obsolete, the environment along those routes will be at risk. One promise of CanaPux is that it could reduce environmental problems, especially at export terminals.

In pipelines and at export terminals, the diluent used to move bitumen is often extremely flammable, and because it's meant to move oil, if there's a leak or an accident, the diluent ends up moving over a wider area in the environment than the oil itself would.

A 2012 *New York Times* article describes a pipeline failure over the Kalamazoo River in Michigan in 2010. As the diluent-filled bitumen leaked into the river, "it began separating into its constituent parts. The heavy bitumen sank to the river bottom, leaving a mess that is still being cleaned up. Meanwhile, the chemical additives evaporated, creating a foul smell that lingered for days. People reported headaches, dizziness and nausea."

CanaPux, by contrast, floats on water and can be picked up by

hand (or shovel) if a gondola car gets derailed. Sensitive ocean ecosystems are also at less risk of spillage and fire if a tanker carrying the product fails.

The polymer that solidifies the bitumen can also be reused, which reduces waste. The pucks don’t dissolve in water and don’t release any dust as they are transported (something that thermal coal often does, despite railway attempts to minimize coal dust by loading it a specific way and spraying “glue-like polymer” on the coal).

All these things bode well for the future of CanaPux, despite the long lead time the project has had at CN Innovations. Part of that is because the use-case is so narrow. “This is a much more niche type of thing,” Auld told Ars. It applies only to heavy crude that needs to be exported from Canada. But for that case, CN thinks it can reduce spill disasters in an economically compelling way.

Listing image by CN

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