

# Failed Oilsands Tech Idea Finds Growing Commercial Success With Chinese Refiners

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100,000 tonne-per-year Ionikylation unit, 2013, photo by Deyang Chemical Co. Ltd. (previously published in Hydrocarbon Processing).

A technology that was developed by accident while researchers looked for ways to add value to bitumen is gaining momentum as a refinery process that reduces reliance on toxic and hazardous chemicals.

The commercialization began in China, where refiners can now face jail time for implementing inherently unsafe technologies that lead to workplace accidents or environmental damage, but **Well Resources Inc.** president **Warren Chung** says now that it is proven, the technology is on its way to North America.

It's called Ionikylation, a new take on the alkylation process that has been incorporated into refineries around the world for decades. Alkylation creates a blending stock that allows refiners to increase the octane rating of gasoline.

For the last 50 years, hydrofluoric and sulfuric acids have been the gold standard catalysts for the alkylation process, although they are dangerous chemicals to use, Chung explained. That's changing at a number of refineries in China. The Ionikylation catalyst is both non-hazardous and safe to handle.



*Above: 150,000 tonne-per-year Ionikylation unit, 2018, photo by PetroChina.*

In January 2019 Well announced the commissioning of a second brownfield Ionikylation unit at **PetroChina**'s Golmud, Qinghai refinery. Commissioning of the Golmud unit came just two months after PetroChina announced the successful start-up of a 150,000 tonne-per-year Ionikylation unit at its Harbin, Heilongjiang refinery.

In October 2018, **Sinopec** confirmed it is proceeding with the implementation of three 300,000 tonne-per-year Ionikylation units at its Jiujiang, Anqing, and Wuhan refineries. In all, Chinese refiners are planning on building and commissioning upwards of 10 Ionikylation units during the next two years, according to Well.

The technology was developed alongside the **China University of Petroleum**, where Well founder **Keng Chung** — Warren's father — is currently a distinguished professor of chemical engineering. The elder Chung, who was the first doctoral student of SAGD inventor Roger Butler, has worked for more than 30 years in heavy oil and bitumen R&D. Among his numerous accolades is an ASTech leadership award for his contributions to the industry.

He founded Well in 2006 in order to commercialize some of the technologies he had been working on. He's currently the company's vice-president.



*Above: 50,000 tonne-per-year Ionikylation unit, 2019, photo by PetroChina.*

“Originally we were looking at different ways that we could optimize the bitumen value chain, and one of the attractive options was this use of ionic liquids. The attraction was that you synthesize this catalyst that exhibits ‘super acid’ characteristics towards hydrocarbons and hopefully you can crack bitumen at low temperatures. We embarked on that journey for about a year and ultimately were unsuccessful,” Warren Chung told the *DOB*.

“We took the catalyst we developed and we found that you can not only produce a high yield of alkylate, but with a very high selectivity as well. That was the breakthrough moment for us. We essentially discovered this catalyst by accident, and we proceeded with commercializing it. Luckily, we had some good backers in the Chinese realm who were willing to take the step and implement it, and now we’re commercial,” he said.

“It’s very interesting because sometimes you just have to step back and see where the data takes you. Where we found failure in the bitumen processing side, we were quite happy with what we found on the alkylate production side.”

Ionikylation was first demonstrated in 2005 when PetroChina retrofitted an existing 65,000 tonne-per-year sulfuric acid catalyzed alkylation unit at its Lanzhou refinery, Well says. In 2013, Chinese independent refiner **Deyang Chemical Co. Ltd.** constructed the first greenfield 100,000 tonne-per-year Ionikylation unit.

The technology has yet to be implemented in North America. However, Chung sees opportunity for Ionikylation because refiners are increasingly prioritizing safety and maintenance.

“Many of traditional hydrofluoric and sulfuric acid catalyzed alkylation units are anywhere from 40 to 60 years old, and require very expensive and exotic metallurgies because the acids are highly corrosive. The

refiner's concern is (1) it's costing more and more to maintain these units in pristine operating condition and (2) if something goes wrong, how would that impact their operations and how would leakage of hazardous chemicals affect surrounding communities?"

Chung said there are a number of companies in North America currently in the initial feasibility stages of incorporating the new technology – a process he expects to benefit from the deployments in China.

"Oftentimes when it comes to adopting any of these new refining technologies, people in North America like to see it proven somewhere else first, so it is very comforting to see that all these Chinese refiners are going ahead with such quantities. That tells a good story for us to our prospective clients that are thinking about alternatives to existing operations."

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