

NUS researchers' startup aims to halve the price of sustainable marine fuel

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THROUGH their own startup, two scientists are tackling a major challenge in the maritime industry's green push: the high cost and low supply of sustainable methanol.

In 2022, Lim Kang Hui and Haw Kok Giap – both then researchers at the National University of Singapore (NUS) – founded CRecTech, short for “carbon recycle technologies”.

The core offering: a unique catalyst technology that reduces the costs and emissions involved in making certain chemicals. CRecTech is currently applying this to methanol production.

“The problem now is actually the limited supply of green methanol,” said Dr Lim, the startup's chief executive. “This is why we're trying to focus on that – providing that affordable green methanol solution.”

Added Dr Haw, who is chief operating officer (COO) and chief technology officer (CTO): “We expect that compared to conventional biomethanol production, we can achieve up to 50 per cent cost reduction in capital expenditure and operational expenditure.”

The pair received initial funding from the NUS Graduate Research Innovation Programme and Enterprise Singapore's Startup SG Founder Grant.

CRecTech has since grown to five people and is now in the pre-seed stage.

Last year, it received US\$500,000 in funding under the

Breakthrough Energy Fellows – Southeast Asia programme, backed by Temasek, Enterprise Singapore, and Bill Gates' climate organisation, Breakthrough Energy.

Charting a new course

The startup's catalyst technology was developed over the past decade by Dr Haw, who has a PhD in chemistry and left NUS to run the startup full time.

The technology is now patented. Said Dr Lim: “The process is known in the literature, but the specific details of our process is our trade secret.”

Initially, CRecTech wanted to use this catalyst to make hydrogen production greener, by reducing the energy and carbon footprint of “steam reforming” – the most common production method.

But this proved unpopular with venture capitalists, said Dr Lim. “Venture capitalists said they are looking to invest in new, emerging technologies – they are not looking for improvements in existing ones.”

The startup thus pivoted to sustainable maritime methanol, which is more novel.

In 2023, it pitched its catalyst technology for biomethanol production in the Port Innovation Ecosystem Reimagined at Block71's (Pier71) Smart Port Challenge – and won second place, cementing its shift towards the maritime sector.

Pier71 is a joint startup incubator and accelerator by NUS Enterprise and the Maritime and Port Authority of Singapore.

Green methanol is among the al-

ternative fuels expected to replace petroleum-based ship fuel.

Methanol made from fossil fuels is readily available, but not sustainable. Green methanol – made from non-fossil fuel sources – can cut emissions of carbon dioxide by up to 95 per cent and nitrogen oxide by 80 per cent, while eliminating sulphur oxide and particulate matter.

However, green methanol is two to five times more expensive than regular methanol. Research firm Bloomberg NEF has reported that low-carbon methanol made up under 1 per cent of global methanol production in 2024.

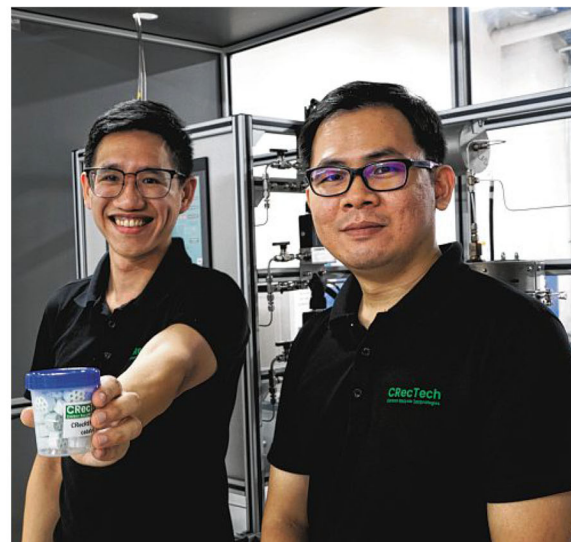
Furthermore, the maritime industry's demand for green methanol remains extremely low, as not many ships can use it.

But Dr Lim expects this demand to increase in the coming years, as regulations prompt shipping companies to cut emissions.

He noted that Europe now penalises shipping emissions through its Emissions Trading System scheme; the International Maritime Organization is also adopting stricter emissions targets.

The global green methanol market was worth around US\$2 billion in 2024 and is expected to increase to US\$37 billion by 2034 with a compound annual growth rate of 34 per cent, according to Precedence Research, even as a growing number of new ships being built can use alternative fuels, including methanol.

There are two forms of green methanol: biomethanol that is



Left: CRecTech's CEO Lim Kang Hui (far left) and CTO/COO Haw Kok Giap aim to bring the cost of renewable methanol closer to the price of conventional methanol from fossil fuels. Above: An example of CRecTech's proprietary catalyst technology.

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made from organic sources, and e-methanol that is synthesised from hydrogen and carbon dioxide, with electricity used to obtain the hydrogen.

E-methanol is more expensive to produce, costing around US\$800 a tonne, compared to around US\$400 for biomethanol, based on CRecTech estimates.

CRecTech's process slashes the production cost of biomethanol to US\$200 a tonne, bringing it closer to the US\$150-a-tonne cost of conventional methanol production.

This is achieved by making the process shorter and less energy-intensive.

In traditional biomethanol production, organic material ferments and produces biogas, a mixture of methane and carbon dioxide.

This biogas is “upgraded” to become synthesis gas – a mixture of hydrogen and carbon dioxide – and then “conditioned” to achieve the correct ratio of each gas, before being used to make methanol.

With CRecTech's catalyst, bio-

gas can be converted to synthesis gas in the correct proportion and purity, skipping the upgrading and conditioning steps. The process also takes place at a lower temperature, saving energy.

Scaling up

Towards the end of 2025, CRecTech will hold a funding round and expand its headcount in preparation for scaling up production.

It aims to create a pilot system that can generate 30 tonnes of methanol a year, followed by a commercial-scale demonstration facility by 2028.

The facility is likely to be located in Malaysia or Indonesia and use palm-oil effluent – a waste by-product of palm oil production – to create 5,000 to 10,000 tonnes of methanol a year.

“It will be a first-of-a-kind demonstration of our technology at a commercially relevant scale,” said Dr Lim.

“And once we can show that, what we'll do is scale and multiply

the same system... in parallel to other biomass sites.”

In the long term, the company may help to power more than just ships.

While CRecTech is currently focused on supplying green methanol to the maritime sector, it will consider other opportunities in the future, said the founders.

This is because methanol and synthesis gas have numerous industrial applications, such as the production of plastics, sustainable aviation fuel and various chemicals.

This is the first of a two-part series on maritime startups that have won awards in Port Innovation Ecosystem Reimagined at Block71's (Pier71) SmartPort Challenge.

Pier71 is NUS Enterprise and the Maritime and Port Authority of Singapore's joint startup incubator and accelerator programme.

Entries for the SmartPort Challenge 2025 close on Jul 14 at 11.59 pm.