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Gladstone company taking centre stage in AI revolution, providing a critical mineral to cool computer chips

By Glen Norris

Manufacturing

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Alpha HPA's processing plant with the Rio Tinto and Orica facilities in the background. (Supplied: Alpha HPA)

In short:

Gladstone's Alpha HPA is set to become one of the world's biggest producers of a critical mineral known as high purity alumina (HPA).

HPA is set to become one of the key materials required to cool high-powered computer chips in AI data centres.

What's next?

Alpha HPA is set to double its workforce over the next year as it ramps up production.

Gladstone is one of Queensland's industrial hubs, but now it is also playing a key role in the global AI industry as it pumps out a critical mineral needed to cool high-performance chips used by some of the world's biggest tech companies.

High performance chips inside data centres power AI and are used by the likes of the likes of NVIDIA, Intel and Amazon.

But with high computing power comes increased heat that threatens to stall further growth.

To cool them, large modern data centres need powerful air conditioning systems as well as lots of water. Some large centres require up to 19 million litres per day of water, equivalent to the amount used by a town populated by 10,000 to 50,000 people.



Alpha HPA's processing plant aims to be at the cutting edge of the Ai revolution. (Supplied: Alpha HPA)

High-purity alumina produced by rapidly expanding Gladstone-based company Alpha HPA is used in modern chips, also known as semiconductors, to help conduct heat away from critical components.

Alpha HPA employs about 130 people and is building the world's biggest production facility to refine high purity alumina, using chemicals from Orica and alumina feedstock from Rio Tinto.

It plans to almost double that workforce over the next year.

What is high purity alumina?

The white substance, which has the consistency of icing sugar, plays a critical role in drawing heat away from the chips that are powering AI, which is projected by UN Trade and Development to be multi-trillion dollar sector by the 2030s.

The competitive geopolitical battle for critical minerals like HPA has supercharged Alpha HPA's expansion, allowing it to attract millions of dollars in federal and state government funding and financing support.



Alpha HPA's high purity alumina pictured with a semiconductor. (Supplied: Alpha HPA)

Alpha HPA managing director Rob Williamson said HPA was poised to replace silica as a thermal management material in advanced chips, which he said could unlock a huge potential market.

"It's like an engine in your car, if it runs too hot, performance drops and components fail," he said.

"Computer chips are no different. There is an optimal operating temperature and once you exceed it, performance is impacted."

QUT professor of technology management and strategy Robert Perrons said even several years ago, modern computer chips were generating more heat output per square unit of area than a steam iron.

"They've continued to get worse," Professor Perrons said.

"The number of calculations that we're asking these chips to perform is just getting astronomical. As a consequence, a lot of heat is generated.

"How to manage that excess heat has become an extremely important one in chip design. That's where HPA comes into play because it is great at being an insulator and has much higher thermal conductivity."

Phineas Glover is head of APAC ESG and Sustainability at UBS, an investment bank which evaluates sectors and industries.

He said the growth of AI was pushing data centres and chips to their "physical limits".

"Heat is becoming a major constraint on computing performance," he said.

"We also will need to invest in advanced cooling equipment. But none of this is going to tackle the thermal bottleneck on its own."

Mr Glover said thermal inefficiency can lead to higher energy expenditure, greater cooling load and growing operational risk.



Alpha HPA managing director Rob Williamson says computer chips do not operate as well when their optimal temperature is exceeded. *(Supplied; Alpha HPA)*

He said the success of the technology would be a "positive development for Australia."

"The country already plays an important role in supplying materials for the energy transition and AI."

"HPA represents a move downstream into high-specification, value-added materials that directly enable advanced technologies."

Last year, Alpha HPA received \$30 million from the Queensland Government's critical minerals and battery technology fund, provided through the Queensland Investment Corporation (QIC).

That followed a \$400 million financing package from the Federal



Government's Export Finance Australia and the Northern Australia Infrastructure Facility.

UBS analyst Phineas Glover says the success of high purity alumina could be a positive development for Australia. *(Supplied: UBS Securities)*

The company has already commenced commercial sales to semi-conductor manufacturers in Asia and the US, with letters of intent to provide up to 4000 metric tonnes of HPA per annum.

The company started as a nickel miner in New South Wales after developing a process to extract HPA from ore but relocated to Gladstone in 2021 so it could access chemicals from Orica and feedstock from Rio Tinto to operate its proprietary technology.

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