CASE STUDY

Alpha HPA

World-first alumina purification process meets booming industry demand

Image courtesy of Alpha HPA

> **Every AI data centre generates enormous amounts of heat. As a result, most large data centres don't operate at 100% capacity to avoid the risk of overheating.**

One way to address this challenge is through improved thermal packaging, which moves heat more efficiently away from the AI chips to keep the hardware cool. High-purity alumina is rapidly becoming the preferred material for carrying heat away from chips to a data centre's cooling system.

Alpha HPA is a Queensland-based company that produces ultra-high-purity alumina through its proprietary solvent extraction purification technology, ideal for use in applications such as thermal packaging, semiconductor manufacturing, pharmaceuticals and lithium-ion batteries.

In thermal packaging, Alpha HPA's high-purity alumina is used in the heat-conductive packaging that surrounds semiconductors in AI data centres, with end users across Korea, Japan, Taiwan and the US.

For the same electricity input, a data centre could run closer to full capacity, instead of the limits many operate at today. “The higher the purity of the alumina packaging, the better for the operator of the data centre,” Mr Rimas Kairaitis, Executive Director and Chief Commercial Officer at Alpha HPA said. High-purity alumina also forms components inside semiconductor fabrication equipment itself.

“As semiconductors become more advanced, the purity requirement becomes extreme,” Mr Rimas Kairaitis explained.

Demand for Alpha HPA’s material is rising, driven by the push towards more advanced semiconductors and, above all, AI data centres. “It’s definitely the dominant area of growth, and starting to swamp everything,” Mr Rimas Kairaitis said.

Alpha HPA’s scale up is occurring in stages to meet the growing industry demand. Its Stage One facility in Gladstone produces around 360 tonnes of high-purity aluminium materials a year and qualifies as a trusted supplier to the semiconductor, AI data centre, pharmaceutical and lithium-ion battery industries. Stage Two is currently under construction in Gladstone and will lift output to just over 10,000 tonnes a year, with production starting late next year and full capacity by 2029. “It will potentially be the world’s largest facility of its kind,” Mr Rimas Kairaitis said.

Staying onshore was a deliberate choice for Alpha HPA, even though the company acknowledges it could have built the same operation overseas, at similar industrial sites in Canada or Indonesia. “We’re Team Australia,” Mr Kairaitis said.

“It is a story of Australian-owned and developed IP being commercialised in Australia.”

That choice was reinforced by a practical advantage in Gladstone. Alpha HPA’s chemical process has a strong process synergy with the neighbouring Orica facility that supplies the high-volume nitric acid and ammonia its refining depends on.

Looking further ahead, Alpha HPA expects to expand within five years, with a possible Stage Three built on or near the same site. Mr Rimas Kairaitis says a recent increase in demand from the semiconductor sector adds to its expanding sales pipeline as construction of Stage Two continues.

The company described how few specialised supply chain participants exist worldwide and how technically difficult the sector is to break into from scratch. “We have a big opportunity in Australia in the semiconductor sector,” Mr Kairaitis said, adding that in high-purity alumina specifically, “we are ahead, and we need to support it.”

Image courtesy of Alpha HPA Stage One Facility. Steven Wade Photography (2025): www.stevenwade.photos