



Innovating the way
to a resilient and
sustainable supply of
sand for concrete.

 **KAYASAND**
engineering sand for construction

[KAYASAND.COM](https://www.kayasand.com)



Kayasand plant & equipment offers a viable solution to New Zealand's concrete sand shortage.

New Zealand still depends on a diminishing supply of natural sand to make concrete.

Technological innovation means there is a better way to obtain sand and Kayasand is committed to making this technology available for the long-term benefit of New Zealanders, our environment and our construction industry.

Is there a commercially viable, economical and sustainable alternative available to natural sand?

Yes, engineered sand. However, the biggest barrier to its widespread use is the widespread belief natural sand is essential to make concrete and that it can't be replaced entirely with sand manufactured in quarries.

The reality is that the use of natural sand for concrete, asphalt and construction in general is unnecessary. In fact, the focus on natural sand often comes at the expense of pursuing more environmentally sustainable alternatives.

Internationally, manufactured sand is already an accepted economical and commercially viable replacement for natural sand in construction. Good quality manufactured sand, like that engineered using Kayasand's innovative crushing and screening technology and equipment, is often better and costs less than some natural sand. It uses aggregate sourced from quarries such as crusher dust that can be made readily available.

As an example, our sand plant in Waikato — one of our smaller V7 plants — is capable of processing 100,000 tonnes p.a. depending on the quarry. Our medium-sized plant produces about 300,000 tonnes per year and our biggest one is capable of producing 600,000 tonnes p.a. or more.

As a comparison, natural sand sales to the Auckland construction market are estimated to be a total of 720,000 tonnes p.a.

Assuming dredged sand is blended with crusher dust at a 50 – 60% ratio, the total volume of crusher dust that needs to be processed into engineered sand to supply Auckland’s construction industry is 1.2–1.4m tonnes per year.

Three Kayasand V7-120s and three V7-60s can produce enough engineered sand to replace all the concrete sand in Auckland at current concrete manufacturing rates. Our plan is to have 30 of these plants operating in Australia & NZ by 2030.

There are some limitations on the availability of crusher dust. However, this is the case with many different aggregate sizes. In fact, quarries are already expanding production so more crusher dust becomes available to meet the growing demand for concrete sand. With this increased production there can be more than enough engineered sand made to supply the NZ construction industry.

If it's not necessary to dredge or mine natural sand for concrete, why bother doing it?

What's so good about engineered sand made using Kayasand equipment?

Concrete made using sand with our innovative crushing and screening technology flows better, finishes better and binds better with cement than natural sand. The result is stronger concrete with less cement compared to natural sand. For example, independent trials show that replacing the sand in a typical 40MPa concrete mix in Auckland with sand engineered on our equipment results in a 10% reduction in cement to achieve the same strength.

We achieve this by precisely controlling the four main characteristics of sand:

- Shape
- Size
- Contaminants
- Consistency

Our one step process produces sand that is cuboidal in shape and graded to desired specifications first and every time. The levels of contaminants and fines in the finished product are controlled or removed, and there's no need to blend it afterwards.

Kayasand's engineering process provides superior results and contributes to the preservation of our precious natural resources for generations to come.

The secret is in the sand. Kayasand.





Is Kayasand technology proven?

The technology in our plants was developed 20 years ago because of a ban on dredging that severely disrupted concrete sand supply in Japan. Engineered sand from V7 plants is now routinely used in Japan as the only sand in concrete. As a result, dredging in Japan has dropped from 40 million m³ in 2000 to less than 7 million today. China now has over 240 of these V7 plants.

Australia has also started using the technology in NSW as growing restrictions on coastal sand mining have encouraged industry to look at, and adopt, alternatives.

Would Kayasand plants make a prudent financial investment?

The payback period from commissioning a Kayasand plant can be between 2 to 3 years. This depends on variables like the amount of crusher dust being processed, filler byproduct made into saleable product, the local price of sand and how much we lower operating costs.

Our use of advanced sensors and high-speed electronic control systems make our plants self-monitoring and able to operate unmanned with minimal human oversight.



Why does sand engineered using Kayasand plants create a more sustainable supply of sand for construction?

The sand made using our plant and equipment makes concrete more sustainable.

Every tonne of cement takes about 700-900kg of CO₂ to produce. Our goal is to create engineered sand of such quality that it reduces these emissions by 60kg for every cubic metre of concrete that cement is used in.

For example, if all of Auckland's concrete was manufactured this way, concrete producers could save more than 50,000 tonnes carbon emissions each year.

Plus, our plants also turn waste into saleable products, creating a truly circular economy and further reducing the industry's carbon footprint. Waste glass is recycled into premium concrete sand, concrete is recycled back into concrete, and cement substitutes are created from limestone filler and waste slag.

The perception is that natural sands make concrete better than manufactured sands. This is a myth.



High quality manufactured sands are proven to produce concrete of the highest quality, with higher strengths, durability, and consistency, enabling significant reductions in cementitious contents, costs, and carbon emissions. Kayasand technology and plants have been proven to engineer the highest quality manufactured sand with full control over particle shape, particle size distribution and consistency.



Mark Mackenzie,
Managing Director of Technicrete Pty Ltd

Mark is an accomplished concrete and aggregate technologist. Based in Australia for the last 23 years, he helps global construction companies enhance product quality and optimise processes.

In South Africa, he successfully developed processes for high-quality manufactured sands, leading to the replacement of 80–90% of natural sand in approximately 3 million m³ of concrete. This achievement was shared and implemented in various Holcim group companies. After relocating to Australia, he held the position of National Functional Manager — Technical at Hanson Australia and chaired the CCAA National Technical Committee. He made significant contributions to the review of AS1379-2007 and focused on enhancing industry skills. He also played a pivotal role in driving the development of standardised and structured training courses on concrete technology. Currently, his company Technicrete provides specialised technical consulting and advisory services.



Why is a Kayasand engineered sand plant better for the environment?

The V7 sand plant was designed from the ground up to be economically and environmentally sustainable.

Traditional processing of engineered sand for concrete often requires massive volumes of water that are expensive to clean up and generate huge amounts of sludge. Our process uses no water for washing aggregate, gives off no dust and is typically lower cost to run. No tailings or sediment ponds to maintain, or depositing clays and silts back into environment.

Our plants are designed for use in urban areas where noise and dust must be suppressed and for quarries and processing facilities where space is limited.

Engineered sand FAQ

What is engineered sand?

Engineered sand has been designed specifically to:

- replace natural sand in concrete;
- lower cement demand; and
- provide the construction industry with a more resilient and sustainable supply of sand.



It involves manufacturing sand with precise control of shaping, grading, contamination and consistency.

What is the difference between engineered sand and manufactured sand?

Engineered sand is a type of manufactured sand made to precise specifications. Its cuboidal shape, precise grading and consistency means it has less voids and is of better quality than manufactured sand.

The level of contaminants and fines in engineered sand is tightly controlled during the crushing process. As a result, it does not need blending with other sands before it can be used to make concrete.

It should not be confused with manufactured sand, and/or crusher dusts which often contain a high variability of waste products.

What are the common applications of engineered sand in the construction industry?

Engineered can be used to replace all natural sands in almost all concrete mixes and products.

For house slabs and foundations, they provide consistency and workability. In precast concrete applications (e.g., slabs and pipes), they are typically far superior to natural sands. They are also ideal for asphalt mixes and other products where consistency and predictability are necessary.

What impact does engineered sand have on the environment?

Engineered sand turns crusher dust, which in many areas is a waste byproduct, into valuable and value-added products to replace natural sands in concrete.

It makes a superior concrete from both a performance and durability perspective and reduces the cement content — a good thing as cement accounts for 8% of global emissions.

It also reduces our reliance on natural sand, preserving natural ecosystems for future generations.

Are there any specific guidelines or standards for using engineered sand in construction in New Zealand?

In New Zealand, the use of sand in construction is governed by various industry standards and guidelines. The primary organisation responsible for setting standards in construction is Standards New Zealand, a division of the Ministry of Business, Innovation and Employment.



Although there is no standard specifically for engineered sand, one important standard that might be applicable is NZS 3104:2003 "Concrete Production." This standard provides guidelines for concrete production, including aggregates such as sand. It specifies requirements for the quality and grading of aggregates used in concrete, including manufactured sand.

In addition to NZS 3104, other relevant standards or guidelines may include:

- NZS 3121:2005 "Specification for Aggregates from Natural Sources for Concrete."
- NZS 4407:2015 "Methods of Sampling and Testing Road Aggregates."
- NZS 3122:2009 "Specification for Aggregates from Natural Sources for Asphalt."

These standards provide specifications and testing methods for various types of aggregates, which may include engineered sand used in construction.

What are the largest obstacles to replacing natural sand in concrete with engineered sand?

The belief that man-made sand isn't as good quality as natural sand and the lack of incentives to find alternatives.



About Kayasand

What we do

Kayasand sand engineering plants provide an economically viable, sustainable and environmentally friendly replacement for natural sand in concrete.

Our unique and innovative technology maximises quarry yields, reduces the construction industry's dependence on natural sand and provides sand supply chain resiliency.

Sand engineered using our plants makes stronger, more durable concrete. Our goal is to use manufactured sand to reduce cement in concrete by 20% while maintaining good workability and finish.

Engineered sand has the potential to save concrete producers 6,000 tonnes of carbon emissions each year and significantly contributes to the industry achieving their carbon emissions targets by 2050.

Who we are

New Zealand has a history of developing world leading technologies for fine aggregate production. In the 1970s the Barmac VSI crusher was invented by New Zealanders Jim MacDonald and Brian Bartley. These are now commonplace in quarries around the world.

In the early 2000s, Kayasand's founder, Andi Lusty became aware of V7 crushing technology developed by Kemco in Japan. Andy immediately understood the impact it would have — he had been the managing director of companies selling Barmac VSIs for over 30 years.

Seeing the growing need for an alternative to natural sand and inspired by what he had witnessed, he founded Kayasand, named in honour of Kemco's chief engineer, Doctor Kaya.

Andy raised capital and was joined on the board by experienced investors Andrew Turnbull and Chris Sattler. Together, they set out to change the face of engineered sand in Australia and New Zealand and create a more environmentally sustainable construction industry.

In 2003, Kayasand received \$3.5 million backing from New Zealand Green Investment Finance (NZGIF) and a further \$1.8 million of private investment, to help deliver its services to the construction sector and to support its environmental and commercial aspirations. NZGIF is a Crown-owned green investment bank established to accelerate investment that helps reduce greenhouse gas emissions in New Zealand.



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