

INDUSTRY FACTSHEET

The circular economy of steel-making

Minimising waste and ensuring resources remain in use for as long as possible are key to achieving a sustainable circular economy.

Over the years, technology and innovation has enabled the steel making industry to minimise waste and maximise resource use through capturing value from by-products generated by the steelmaking process. These 'co-products' can be reused within the industry or used by other industries and wider society.

New Zealand Steel captures around 80% of the co-products generated at its steelmaking plant at Glenbrook where locally sourced iron sand is used to produce 650,000 tonnes of steel a year.

This results in over 500,000 tonnes of solid and gaseous by-products, most of which are either re-used or recycled on site or sold for use by other industries.

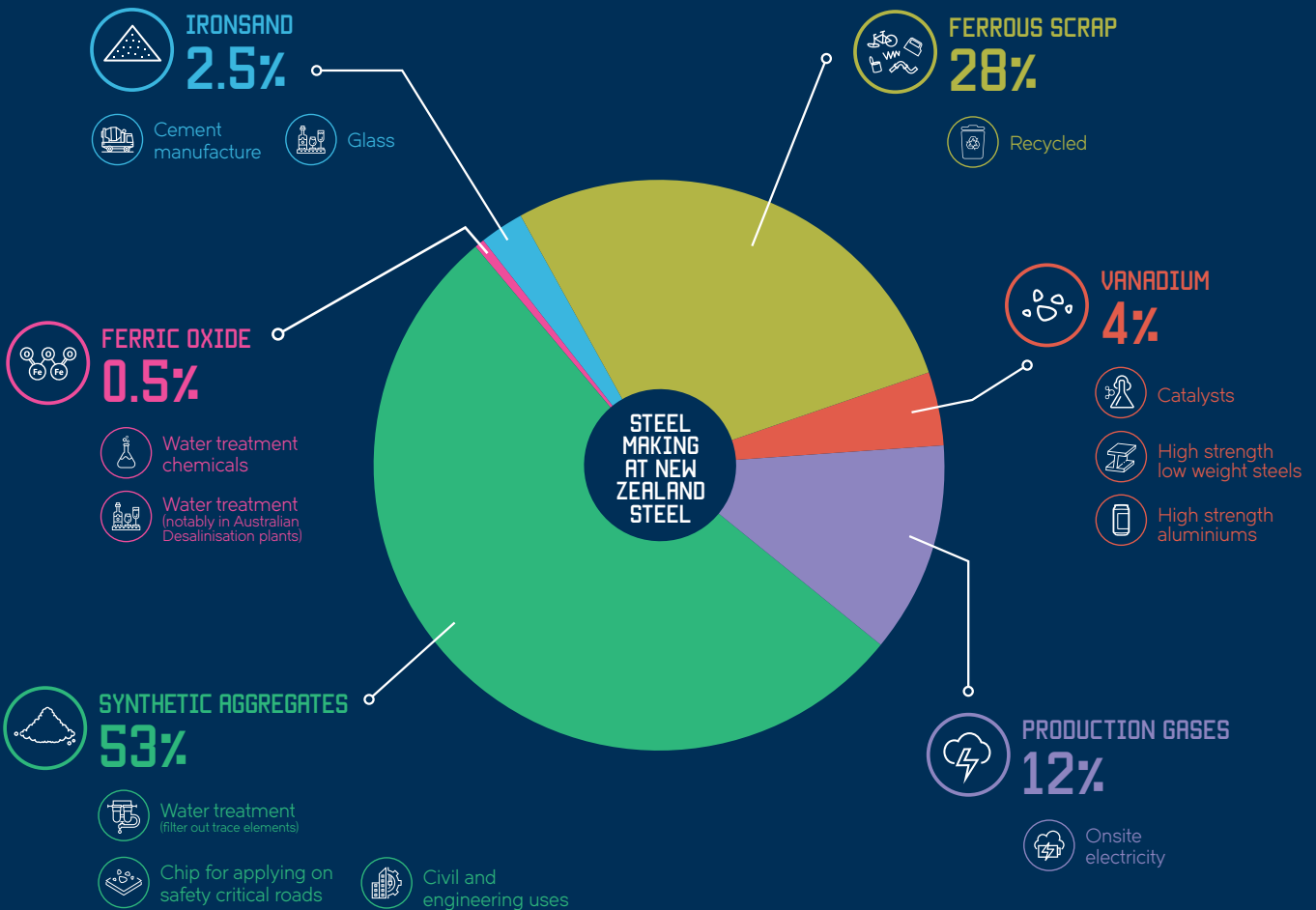
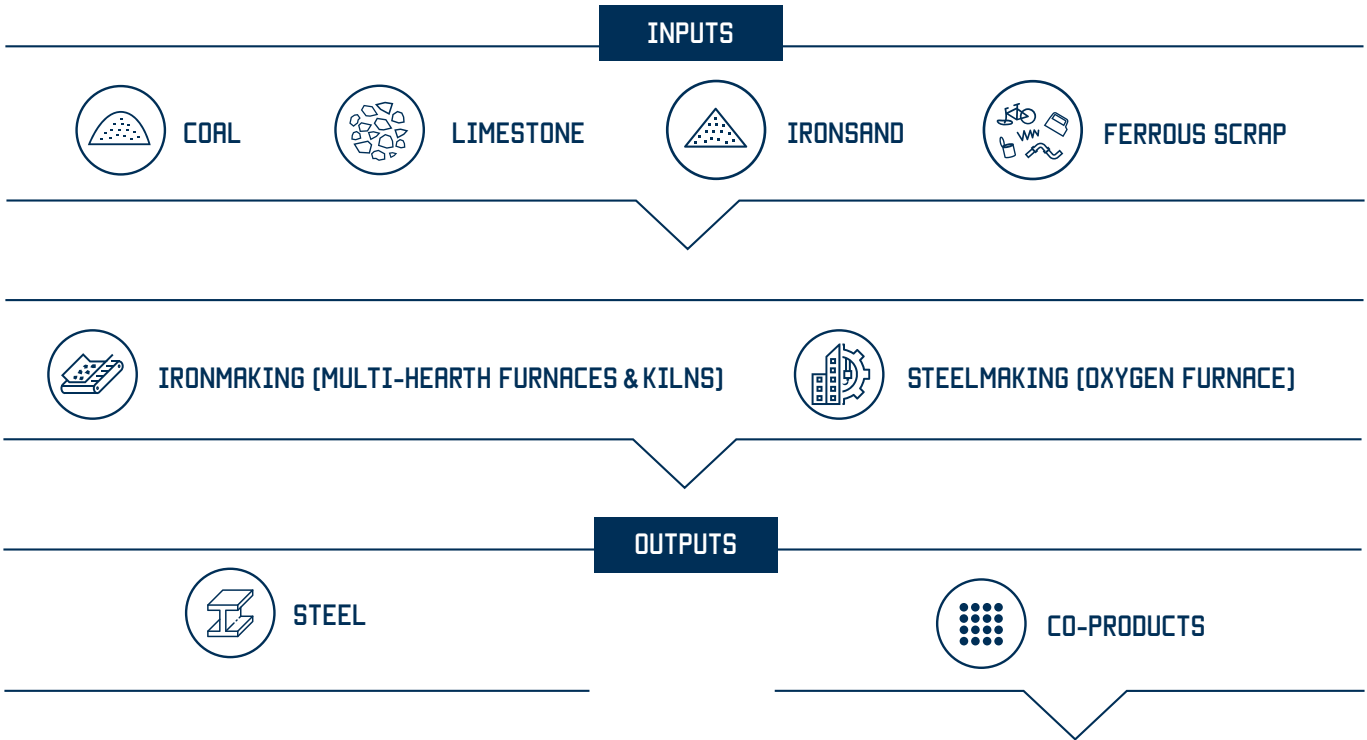
As well as maximising resource use, reducing waste to landfill and reducing CO2 emissions, these initiatives have genuine wider environmental benefits. Many of these co-products are good substitutes for materials that would otherwise need to be mined or quarried – such as aggregates for roading applications.

Sale of co-products, as valuable resources for other industries, is also economically sustainable, providing an additional income stream while supporting the circular economy.



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New Zealand Steel co-products and their uses



A closer look

Solid co-products

Of the total volume of co-products produced at New Zealand Steel each year, up to 200,000 tonnes are recycled internally in support of steel production, and over 250,000 tonnes are utilised by other industries in support of the products that they provide.

Production gases

New Zealand Steel cogenerates more than 500GWhrs of electricity every year on site through capturing and recycling hot process gases from the iron-making process.

The cogeneration facility was introduced in 1987. It involves combusting waste gases from the ironmaking multi-hearth furnaces to heat boilers. This superheated steam then drives two turbines to produce electricity. In 1997, a second cogeneration plant was introduced to harness gases from the ironmaking rotary kilns and melter.

This means New Zealand Steel cogenerates up to 60% of its annual electricity usage on site.

As well as reducing the company's power bill, cogeneration reduces demand on the national electricity grid.

CASE STUDY

Wastewater treatment

New Zealand Steel's melter slag has been used to enhance local wastewater treatment processes for more than 25 years.

A by-product of New Zealand Steel's unique ironmaking process using ironsand, melter slag has valuable uses as a filter medium in water drainage and treatment systems.

Extensive research has been undertaken into its capacity to remove undesirable elements, including phosphorous, and some heavy metals.

The Waiuku Wastewater Treatment Plant, located in Waiuku township near Auckland, New Zealand,

was upgraded in 1993 with the addition of large filter beds filled with New Zealand Steel's melter slag aggregate.

The use of melter slag as a filter aggregate in these applications has proven to be an effective, low cost method of significantly improving water quality. For example, at Waiuku, the filter aggregate removes 77% of the total phosphorus.

Subsequently, wastewater treatment plants in Ngatea and Pāroa have also been developed using New Zealand Steel's melter slag as a filtration medium.

CASE STUDY

Helping keep New Zealand roads safe

NZTA is focused on keeping our roads safe and that includes providing skid resistant surfacings that maintain performance over extended periods.

That involves using chip aggregates in the surfacing mix that resist polishing and thus improve skid resistance.

NZTA has found that while there are some natural rock aggregates that perform well in safety critical roads where high skid resistance is required, synthetic materials such as New Zealand Steel's 'Glenbrook Melter Aggregate' (GMA) outperform the natural aggregate in many cases.

In 2019, the NZTA updated their M6 specifications for sealing chip to allow use of New Zealand Steel's GMA because of its

improved long-term skid resistance – particularly on curves.

What is melter aggregate?

Melter aggregate is a premium synthetic aggregate produced by New Zealand Steel for a number of applications including the aforementioned road surfacing and water treatment. This "synthetic rock" is produced from the elements remaining from the Ironsand once the recovery of the iron component is complete. Separation occurs in the Melter at elevated temperatures – typically greater than 1,450 C – with the molten slag (as it is called when in the molten form) being collected in 15 tonne ladles, poured into specially constructed cooling pits and force cooled with recycled water.