ISACYCLE™

Eliminate landfill and transform residual waste into safe and valuable products with ISACYCLE™

ISACYCLE™ repurposes the world's most flexible smelter to help you transform residual waste, including e-scrap, into saleable commodities ... all for half the cost of traditional incinerator technology.

GLENCORE TECHNOLOGY

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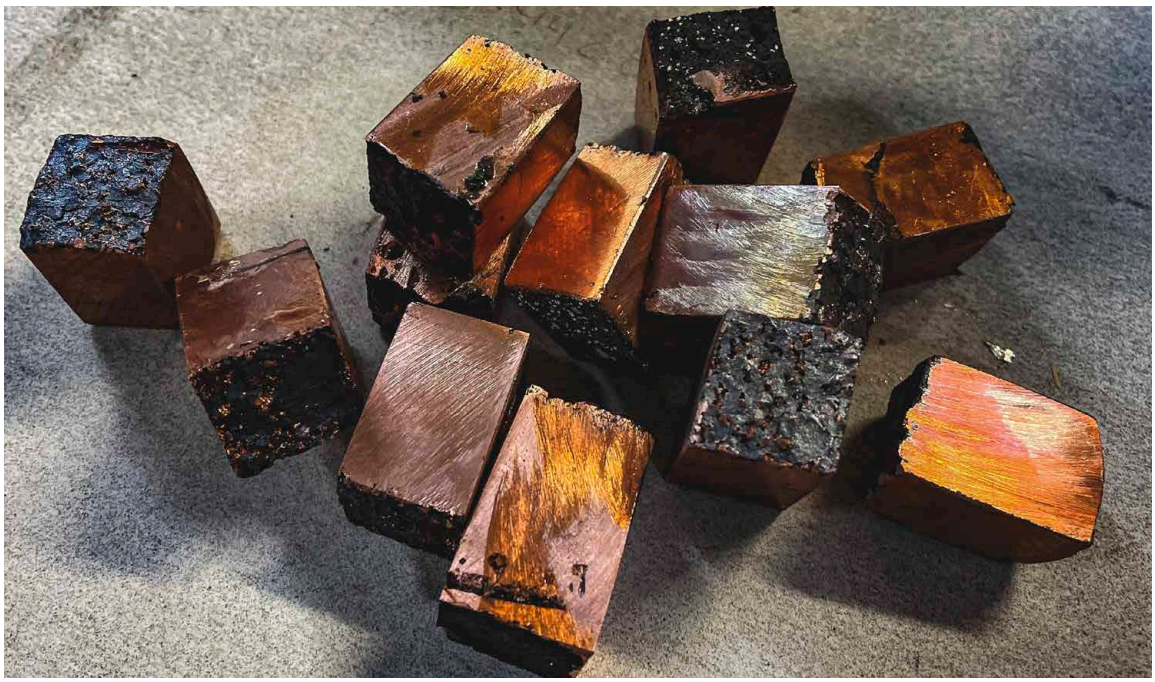
ISACYCLE™ Resource Recovery has been tested in Australia, proven in large-scale European operations, and is now available in sizes that are suitable for both large and small waste treatment facilities.



ISACYCLE™ applies a leading base-metal processing technology, ISASMELT™, to solve a major gap in the waste treatment sector:

- It converts waste into safe products by treating it in a controlled and customised urban plant.
- It allows you to monetise valuable metals by recovering them as a separate product.

Most importantly, it reduces risk and capital by taking a proven technology to an urban mining context; and is available in multiple sizes to suit your facility's feed volume and feed type.

ISACYCLE™

For more:
glencoretechnology@glencore.com.au
Tel +61 7 3833 8500

ISACYCLE™ Resource Recovery is a technology that's ready to apply to private-sector or public-sector waste treatment facilities.

As governments evolve their environmental planning, they're increasingly asking facilities to help achieve bold landfill diversion objectives.

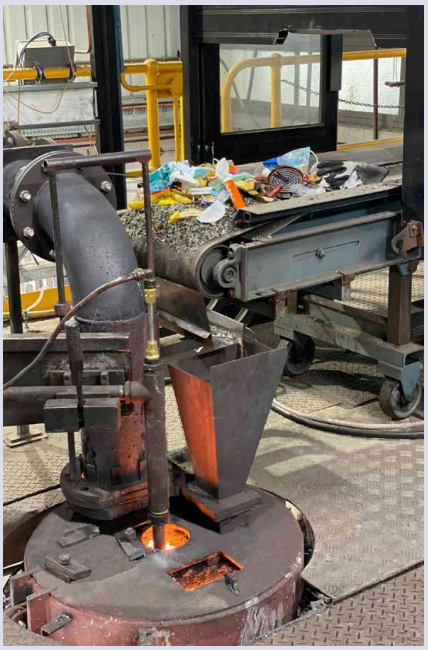
While conventional incinerators can reduce landfill, they fall short of the objectives being increasingly expected by society:

- They cannot control the process 'reactions' to generate dense and homogeneous products within tight specifications.
- They cannot operate at the temperatures required to transform residual waste into safe and useful products.
- They cannot be economically viable on their own.

ISACYCLE™ is a small-scale controlled smelter technology for the urban environment to treat and monetise residual waste.

- ISACYCLE™ reduces waste volume to hit the most ambitious targets.
- It transforms unavoidable waste into a safe products like road-base that locks elements into a dense glass-like product.
- ISACYCLE™ reclaims from waste the metals that can be recycled and sold.

It achieves all these in a plant roughly half the size and half the cost of 'traditional' incinerator technologies.



How ISACYCLE™ works

The core parts of your ISACYCLE™ Resource Recovery plant are an upright cylindrical reactor and a lance which is submerged into the molten bath to inject air and oxygen.

Your waste facility's material is fed into the furnace through the top. The injection of air and oxygen creates a highly turbulent bath, and this gives rapid reactions and excellent heat transfer.

Importantly, these reactions are autogenous, or self-sustaining, so no further energy input is needed.

The off gases from reactions pass into a waste heat boiler where the heat is captured to make energy, and the cooled gases pass through to a baghouse for removal of dust, the gases then enter a small scrubber for cleaning.

During the smelting process, the liquid level in the furnace can rise and fall, but the lance is raised and lowered automatically so that the lance tip is always where it needs to be. This helps gives you tight control over the furnace reactions.

After reaction, the molten products of the ISACYCLE ™ are tapped from the bottom of the furnace by automated machinery.

There is no greenwashing with ISACYCLE™ – 100% of the product and emissions can be identified, measured and transformed or captured.

The intense environmental scrutiny afforded to the mining sector means your ISACYCLE™ is a technology firmly rooted in environmental accountability.

What does ISACYCLE™ produce?

ISACYCLE™ reduces the volume of feed and transforms it through controlled reactions to generate valuable outputs.

ISACYCLE™ outputs:

- **Slag that encases residual and inert elements**
- **Recovered metal dust**
- **Recovered metal alloys**
- **Clean off-gas**
- **Steam**

The slag is an aggregate that will vary in composition according to what your waste feed includes, but it can be used as a simple construction aggregate or road base. It can safely be landfilled, because under the controlled smelting conditions it becomes locked in the slag and passes TCLP.

The metal alloys you extract will depend on the waste feed but will largely be composed of copper, which can be re-purposed or sold.

Smelter vs incinerator

ISACYCLE™ is not a waste to energy Incinerator.

Waste to energy incinerators may look new or sound environmentally favourable, but they combust waste in an unsophisticated way. While they have improved, they still fall short of acceptable outcomes in a number of critical areas.

They can reduce the volume of waste and can capture energy, but they cannot transform waste into useful products, and they cannot control the composition of these products. This is because they are limited in their temperature range and cannot be controlled adequately.

Instead, ISACYCLE™ is a reactor like a 'real' smelter. It is the product of extensive innovation. The ISACYCLE™ chemically transforms waste and can be tightly controlled. In doing so it creates safe aggregates, separates valuable metals into useful products and beats the challenges that incinerators continue to have.

Proven for 30 years. ISACYCLE™ is based on the ISASMELT™ technology developed in Australia at Mount Isa Mines.

More than 14 million tonnes of feed are processed each year in 13 plants across Australia, USA, Germany, Belgium, Zambia, Peru, and Kazakhstan. The technology is proven to be highly flexible so a plant can change feed composition and feed rates comfortably. It has a small footprint so it can be installed in any location, near existing infrastructure and feed sources – and its environmental performance is world class.

ISASMELT™

The global push to ESG and ‘net zero’

The world’s waste recycling sectors and governments are pursuing improved performance and transparency in the treatment of waste and its impact on society and the environment.

Non-financial ESG metrics are already driving more business decisions for leading multinationals like Tesla, Apple, and Google.

Governments and companies want an innovative waste treatment process that:

- Produces valuable and refined end products with existing markets
- Generates by-products with sustainable end uses
- Is highly energy and cost efficient
- Is economically feasible, pays its own way and costs less than existing methods
- Operates at high temperature to destroy any toxic or hazardous components in the solid waste
- Has been proven, minimising project risk, and
- Is socially acceptable and environmentally responsible.

ISACYCLE™ delivers this with less capital than a traditional, and less effective, incinerator.

What’s more, ISACYCLE™ is closer to net-zero than any similar technology. The chemical reactions in your ISACYCLE™ produce heat, which drives the process, without the need for additional fuel.

This plays a key part in ISACYCLE™ being designed, built, and operated with a net-zero objective in mind.

How we work with you

The project timeline that delivers your ISACYCLE™ is similar in duration to a traditional incinerator project. But what it delivers you is much more.

Just like a mining smelter project, we’re responsible for delivering you process and chemical guarantees.

So, we take the discipline and detail that allows us to improve a mining operation’s performance and apply that to your waste treatment plant’s performance. **There are 5 steps:**

1. Review process options (6 weeks)

- Outline your project requirements and feed materials
- Build the probable flowsheet options for you
- Outline performance factors like product specifications and plant sizing

Deliverable: the best option selection

2. Review economics and technical information (10 weeks)

- Establish the permit requirements and process description
- Build a major equipment list, duty specifications and plant layout
- Refine the likely CAPEX to +/- 30%

Deliverable: a report with financial, process, and equipment estimates

3. Analyse the project viability and establish the technical design (3 months)

- 3D model, plant arrangements, and automation philosophy
- Refine the likely CAPEX to +/- 15%
- Provide data required to submit the environmental permit

Deliverable: data required for environmental and financial approval

4. Manage detailed engineering, supply of equipment & materials (6–18 months)

- Approved for construction drawings
- Equipment supply

Deliverable: your facility is constructed

5. Test individual items and test run the plant systems (3 months)

- Client training at an existing ISACYCLE™ facility
- Supervision of construction
- Pre-commissioning
- Cold and Hot Commissioning
- Plant Operation

Deliverable: handover to your fully functioning ISACYCLE™

ISACYCLE™

How to begin your ISACYCLE™ project

Contact Glencore Technology’s pyrometallurgical team today. We take your waste treatment facility’s performance as seriously as a mining operation seeking to increase recoveries and adhere to strict environmental oversight.

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Glencore Technology

Glencore Technology develops innovative products that help mining operations extract more from their flowsheet. ISASMELT™, IsaKidd™, IsaMill™, Jameson Cell and Albion Process™ have been developed in the real world and proven in more than 500 operations across every continent.

Many of our technologies have been developed and proven at our own sites, like ISASMELT™ and IsaMill™, which were pioneered by Mount Isa Mines and helped revolutionise mining and smelting processes all over the world.

Our approach is premised on a technology partnership to provide a full product and service offering, including process flow design, engineering, equipment supply, commissioning and operational expertise, and ongoing process and maintenance support.

Glencore

Glencore is one of the world's largest global diversified natural resource companies and a major producer and marketer of more than 90 commodities. The Group's operations comprise around 150 mining and metallurgical sites, oil production assets and agricultural facilities. With a strong footprint in both established and emerging regions for natural resources, Glencore's industrial and marketing activities are supported by a global network of more than 90 offices located in over 50 countries.

Glencore's customers are industrial consumers, such as those in the automotive, steel, power generation, oil and food processing sectors. We also provide financing, logistics and other services to producers and consumers of commodities. Glencore's companies employ around 146,000 people, including contractors.

Glencore is proud to be a member of the Voluntary Principles on Security and Human Rights and the International Council on Mining and Metals. We are an active participant in the Extractive Industries Transparency Initiative.

CONTACT

Glencore Technology Pty Limited
ABN 65 118 727 870

Level 29, 180 Ann Street
Brisbane QLD 4000
Australia

T. +61 7 3833 8500
E.glencoretechnology@glencore.com.au

Chile · T. +56 2 2342 9078
Vancouver · T. +1 604 601 2070
South Africa · T. +27 11 772 0555

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