

## FRB SUCCESSFULLY TESTS ENERGY-EFFICIENT ROTARY KILN 70% REDUCTION IN ENERGY CONSUMPTION

### HIGHLIGHTS

- Following extensive internal trials and independent reports from Sunward, FRB's self-developed electrical rotary kiln has demonstrated remarkable energy savings. The kiln, currently under patent application, showcases a groundbreaking reduction in energy consumption
- Compared to conventional kilns, which typically require more than 300 kWh<sup>1</sup> per tonne of feed, FRB's pilot kiln operates at only 80-100 kWh per tonne — delivering an impressive 70% energy savings. This translates to a cost reduction of USD30 per tonne of product, or 5% of total production costs<sup>2</sup>
- Kiln design is highly scalable, with expectations for further energy savings as it moves from pilot to full-scale production due to economies of scale
- FRB has initiated the process to patent this innovative kiln technology internationally, while also laying the groundwork for commercialising the technology in China and beyond.
- Since its last ASX announcement with respect to the Plant on 12 September 2024, the Company has already received inquiries from both international and Chinese firms interested in adopting this energy-efficient solution for manganese-related processing.
- In addition, FRB's technical team has begun designing an electrical kiln tailored for higher temperature operations such as lithium spodumene processing, expanding the potential applications of this breakthrough technology.

**Firebird Managing Director, Mr Peter Allen, commented:** *"Our industry-leading sulphate technical team in China are always looking to improve our proposed production processes, with a strong focus on reducing our already impressive cost profile to produce high-purity manganese sulphate."*

*"The results from testing are very impressive and has demonstrated the exciting potential of the calcining kiln to move Firebird further down the cost curve and shows the huge competitive advantages we continue to build by establishing operations in China. We will continue to progress this technology, with Sunward and Firebird expecting further energy savings on industrial production scale kiln. Both teams are also very excited by the potential use in a wide range of other industries."*

*"The high calibre of our development partners in China, including Sunward, reinforces our commitment and the robust in-country support we have in becoming a near-term, highly competitive cost producer of manganese sulphate."*

<sup>1</sup> 300kWh per tonne of feed quoted to Hunan Chemical Engineering Design Institute, design and engineering company responsible for company's Manganese Sulphate Feasibility Study, design and engineering

<sup>2</sup> Refer ASX announcement dated 7th May 2024 for full OPEX details

**Firebird Metals Limited (ASX: FRB, Firebird or the Company)** is pleased to announce the successful completion of trials on the pilot scale calcining kiln. Results from the trials are highly encouraging and outline the future potential of the calcining kiln to further reduce the Company's already impressive low-cost profile. The pilot scale calcining kiln was installed at Jinshi High-Tech Industrial Park, located in Jinshi, Hunan Province, China (see ASX announcement dated 12 September 2024.)



***Image 1:** Pilot Scale Calcining Kiln at Hunan Firebird Battery Technologies (HFBT) Plant in Hunan Province, China*



***Image 2:** Calcining Kiln with temperature gauges highlighted*

The kiln has potential uses in a wide ranging of mineral processing, the Company has filed for international patents and, since the Company's last announcement (12 September 2024), has already received inquiries from both China and internationally. The agreement gives Sunward the right to market and sell in China with Firebird to receive a 5% of revenue commission, with Firebird retaining responsibility for international sales and marketing.

## **Key Observations and Findings from Trial**

**Design Principle:** A core design principle of the calcining kiln is the efficient transfer of energy from the outer tube to the inner tube. This should be evident through a measurable temperature differential between the inner and outer tubes at corresponding points along the kiln.

**Temperature Monitoring Setup (refer image 2):** Eight temperature gauges are installed on the outer tube of the kiln. Gauges 1-4 monitor the temperature of the inner tube, while gauges 5-8 measure the temperature of the outer tube.

There are an additional six measurement points located within the heating section, ensuring that the temperature in the calcining zone remains consistently around 850 degrees Celsius.

As a principle of physics, temperature can decrease exponentially over a short distance. Currently, there is insufficient insulation material for a very short distance, which presents an opportunity for significant improvement in kiln performance by addressing this issue.

The heating system of the pilot scale kiln was equipped with 80 kWh coils with actual energy usage averaged only 8kWh (10% of its capacity). This indicates a substantial margin for optimisation and efficiency enhancement.

**Test Results:** The test data clearly demonstrates a significant temperature difference between the inner and outer tubes, validating the effectiveness of the energy transfer design.

According to the test data, the self-developed manganese ore roasting kiln consumes 80-100 kWh of electricity per tonne of manganese powder roasted, which is 70% more energy-efficient compared to conventional roasting kilns.

The calcining kiln also uses approximately 5 cubic meters of circulating water, achieving the desired results. Due to the smaller size of the test kiln, the heat loss per unit of processed material is higher and both Firebird and Sunward expect that the energy-saving performance of the industrial-scale kiln will be even greater.

The Company's experience with other similar industry peers indicates that other kilns typically consume over 300 kWh per tonne of material processed. Quotes received by Hunan Chemical Engineering Design Institute<sup>3</sup> from reputable suppliers have confirmed these figures. The seemingly simple innovation and design of the calcining kiln, which was created by the HFBT team showcases the Company's commitment to advancing technology and efficiency and the sector leading capabilities of the team. The potential applications for this technology are numerous, and may open new avenues for energy savings and operational improvements across various sectors.

**This announce has been approved for release by the Board.**

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<sup>3</sup> Hunan Chemical Engineering Design Institute, design and engineering company responsible for company's Manganese Sulphate Feasibility Study, design and engineering

## About Firebird Metals Limited

Firebird Metals is an advanced manganese developer focused on combining mining and downstream processing with a dedication to the advancement of the EV battery sector.

The Company is currently progressing its unique China-focused lithium manganese iron phosphate (LMFP) battery strategy, which will develop Firebird into a near-term producer of high-purity, battery-grade manganese sulphate, a key cathode material in LMFP batteries for electric vehicles.

Execution of this strategy will place Firebird at the forefront of manganese sulphate production, at a time when the use and demand for manganese in batteries continues to rapidly grow. Due to the low number of ASX-manganese developers and increasing use of LMFP by car manufacturers, Firebird considers that it is in a strong position to benefit from this growing market and deliver significant value to its shareholder base.

The Company also owns 100% of its project portfolio, located in the renowned East Pilbara manganese province of Western Australia, which boasts a total Resource of 234Mt<sup>4,5</sup>, with exciting exploration and development growth upside. The portfolio is led by the flagship Oakover Project, which holds a Mineral Resource Estimate<sup>1</sup> of 176.7 Mt at 9.9% Mn, with 105.8 Mt at 10.1% Mn in an Indicated category.

The Company's other key Project is Hill 616 which provide Firebird with compelling growth opportunities. Hill 616 contains an Inferred Mineral Resource<sup>2</sup> of 57.5Mt at 12.2% Mn and shares similar geological traits to Oakover.

The Company is committed to generating sustainable long-term value and growth for stakeholders, through the implementation of best practice exploration methods while prioritising the well-being, health and environmental protection of its employees and communities it operates in.

## JORC Compliance Statement

This announcement contains references to Mineral Resource Estimates, which have been reported in compliance with Listing Rule 5.8 and extracted from previous ASX announcements as referenced.

The Company confirms that it is not aware of any new information or data that materially affects the information previously reported and that all material assumptions and Technical parameters underpinning the Mineral Resource Estimates continue to apply and have not materially changed.

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<sup>4</sup> See ASX announcement dated 23 March 2023: Indicated Resource of 105.8Mt at 10.1%; Inferred Resource of 70.9Mt at 9.6% for global Resource of 176.7 Mt at 9.9% Mn.

<sup>5</sup> See ASX announcement dated 1 December 2021: Inferred Resource of 57.5 Mt at 12.2% Mn.