# EcoGraf Limited: Lithium-ion Battery Anode Recycling Pilot Plant

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**MODULAR RECYCLING PILOT PLANT TO SUPPORT ELECTRIC VEHICLE SUSTAINABILITY**

Diversified battery anode materials company EcoGraf Ltd. (EcoGraf or the Company) (ASX: EGR; FSE: FMK; OTCQX: ECGFF) is pleased to announce completion of the Engineering Scoping Study ('Study') for a modular recycling pilot plant to recover carbon battery anode materials.

KEY HIGHLIGHTS

- Capital cost estimated at A$5.8m for throughput of 50-100kg/hour

- State-of-the-art-facility utilising EcoGraf HFfree(TM) purification process with the design providing location flexibility

- Plant to demonstrate purification flowsheet capability, providing customers with product sample volumes for technical and commercial assessment

- Design criteria based on operating at the highest environmental standards and providing process flowsheet flexibility to evaluate various feedstocks

- Plant to provide customised solution to support the new legislation from the EU Commission, that demands increased battery recycling

- Recycling of the carbon anode material will significantly contribute to lowering battery unit costs and reducing carbon emissions.

The Study, including capital estimate, was undertaken by GR Engineering. The concept design utilised recently completed locked cycle testwork to optimise plant and equipment sizing and provides the flexibility to accommodate variations in feedstocks and locations.

Plant capability and key features include:

- Operates as a standalone facility with throughput rates based on a single shift, 5-day operating week

- Self-sufficient, except for utilities of power, gas and water

- Variable screening and treatments included in the feed to the EcoGraf HFfree(TM) purification process

- Dust and gaseous emission levels in accordance with the appropriate EU environmental standards

- Inclusion of technical office and laboratory, and

- Treatment rate using batch process.

The plant will have capability to further optimise the flowsheet, with the expected variable production scrap and black mass feedstocks, to provide larger product sample volumes for customer evaluation in the lithium-ion battery markets.

Capital Cost Estimate and Process

The Engineering Scoping Study capital cost for the modular recycling pilot plant has been estimated at A$5.8 million with an accuracy of +/-30%. The breakdown of the estimate follows:

Pilot Plant Capital Cost Estimate

| | |
|---|---|
| Process Plant & Equipment Purchase and Construction Direct Costs | $4.0m |
| Indirect Costs | $1.8m |
| Total Capital Costs | A$5.8m |

The process to recover carbon battery anode material from production waste and black mass materials follows the EcoGraf HFfree(TM) purification process that was developed to produce battery anode material from naturel flake graphite. The EcoGraf HFfree(TM) purification process is a unique, staged process where impurities are removed through the creation of new chemical compounds that are soluble in either water or chemical reagents.

All steps in the process are completed in a manner that preserves the important physical properties of the graphite spheres, such as low specific surface area, high tap density and narrow particle size distribution.

The plant will recover carbon battery anode material from production scrap, which includes both carbon slurry and cell manufacturers scrap from lithium-ion battery manufacturing. The development of product samples for evaluation is on two fronts, firstly, the / of the recovered carbon anode material back into the battery supply chain to support the circular economy and secondly, for one-off / in high value natural and synthetic industrial applications.

The Company has identified high value natural and synthetic industrial applications that require high purity carbon, to evaluate markets for the recovered carbon battery anode material, as tabulated below.

| Industrial Application Markets for Recovered Carbon Anode Material | Natural | Synthetic |
|---|---|---|
| Alkaline and zinc carbon batteries | x | x |
| Friction materials | x | - |
| Refractories | x | - |
| Carbon additives | - | x |

The pilot plant design follows the recent successful purification of production anode scrap (refer announcement dated 27 July 2021 Recycled Lithium-Ion Battery Anode Material Achieves 99.98%C) together with previous positive results from EV and battery manufacturers in the US and Europe.

The latest result from the SungEel Hitech Co. Ltd production scrap sample is in line with major lithium-ion battery manufacturer specifications.

PHYSICAL / CHEMICAL PROPERTIES

| Physical Values | |
|---|---|
| d10 | 7.7 micron |
| d50 | 15.9 micron |
| d90 | 29.1 micron |
| Tap Density | 0.99+/-0.01 g/mL |
| Chemical properties | |

| | |
|---|---|
| Carbon Content (LOI) | 99.98% |
| Al | <5 ppm |
| Ca | <15 ppm |
| Cu | <15 ppm |
| Fe | <10 ppm |
| S | <10 ppm |
| Si | <10 ppm |

Significant opportunity exists to enhance the recovered carbon anode material by blending EcoGraf high purity battery purified spherical graphite (SpG) from its Australian battery anode materials plant. The following diagram outlines the Company's vertically integrated battery anode business incorporating the lithium-ion battery anode recycling plant.

The addition of EcoGraf's recycling application, using its HFfree proprietary purification process, complements the Company's unique and vertically integrated business that meets the new age requirements for raw materials.

The Company is developing work programs with potential partners to support construction of the plant.

This announcement is authorised for release by Andrew Spinks, Managing Director.

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ENGINEERING CLEAN ENERGY

About EcoGraf

EcoGraf is building a diversified battery anode material business to produce high purity graphite products for the lithium-ion battery and advanced manufacturing markets. Over US$30 million has been invested to date to create two highly attractive, development ready businesses.

The first new state-of-the-art EcoGraf processing facility in Western Australia will manufacture spherical graphite products for export to Asia, Europe and North America using a superior, environmentally responsible HFfree purification technology to provide customers with sustainably produced high performance battery anode material. Subsequently, the battery graphite production base will be expanded to include additional processing facilities in Europe and North America to support the global transition to clean, renewable energy in the coming decade and the rapid growth in battery materials.

In addition, the Company's breakthrough recovery of carbon anode material from recycled batteries using its EcoGraf$^{TM}$ process will enable the recycling industry to reduce battery waste and use recycled carbon anode material to improve battery lifecycle efficiency.

To complement these battery graphite operations, the Company is also advancing the TanzGraphite natural flake graphite business, with development of the Epanko Graphite Project, which will supply additional feedstock for the battery anode material facilities and provide customers with a long term supply of high quality graphite products for industrial applications such as refractories, recarburisers and lubricants.

A video fly-through of this new facility is available online at the following link:

https://www.ecograf.com.au/#home-video

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