

## QUARTERLY ACTIVITIES REPORT

30 June 2018

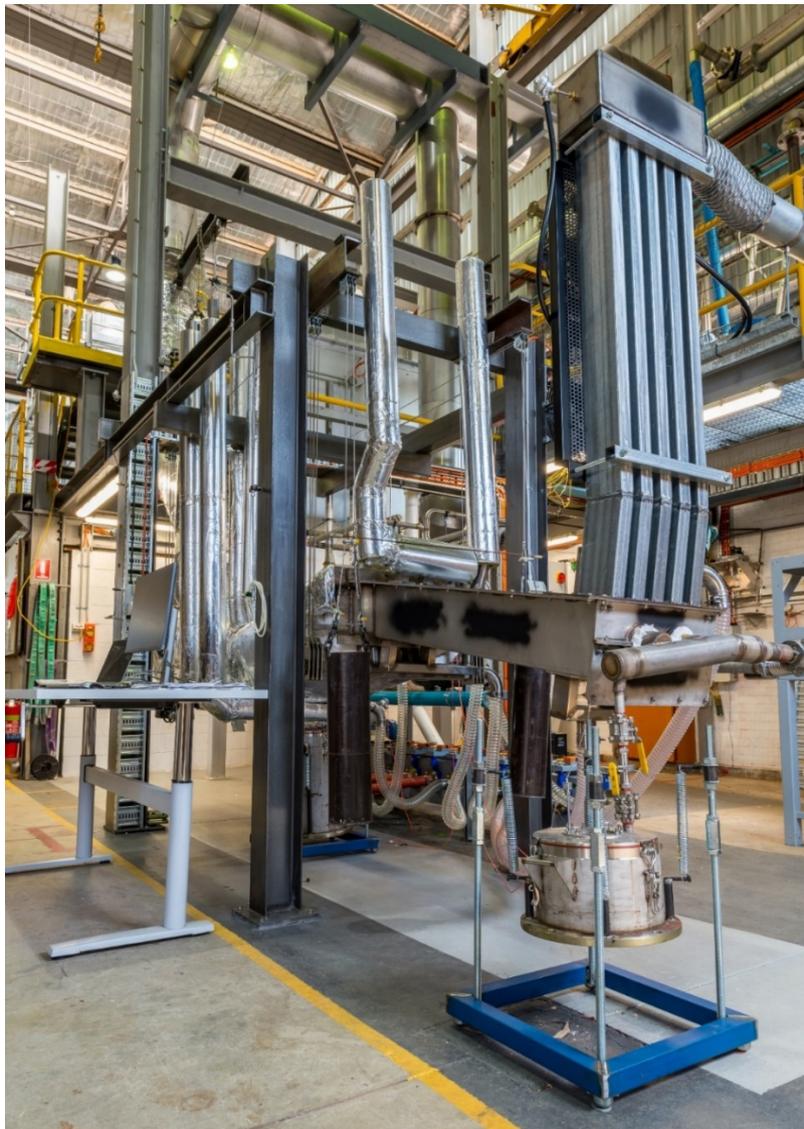
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# LATROBE MAGNESIUM PROJECT

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### 1. Fast Cycle Retorts

In May and June 2018, LMG achieved strong progress refining the operation of its Fast Cycle Retort furnace (FCR).



Developments have resolved issues involving the cracking and corrosion related to the silicon carbide (SiC) lining and the operational performance of the FCR condenser train that collects liquid magnesium and sodium which the company was experiencing in the March quarter.

## **Retort Lining**

Since the beginning of May, the FCR furnace has been heated up seven times, nearly on a weekly basis. These runs were mainly to optimise the operating performance of the furnace and the condenser train.

Simultaneously LMG also investigated the performance of SiC and alumina tiles lining the retort. LMG built a small retort approximately 0.6m high for this testing.

In the case of the SiC lining, the retort was heated up to 1250°C and vacuum was applied. It was then allowed to cool. Upon opening the retort, extensive corrosion was apparent owing to the SiC liners.

In addition, 92% and 99% alumina tiles (150mm\*100mm\*12mm) were tested under various conditions with both types of alumina tiles performing well without cracking or corrosion issues.

A replacement retort has been designed for the alumina tiles and is being built. Some parts of the existing retort will be reused.

The timetable for building and testing the new FCR furnace is summarised:

- 13 August - installing and final hot commissioning for 2 weeks
- 03 September - processing of RWE fly ash over 4 weeks

LMG believes its FCR will be superior to the horizontal retorts currently used for the Pidgeon Process in the following ways:

- Retort charge mass will be larger
- Reduction time will be greatly decreased
- Less energy usage due to more efficient heat transfer within a vertical retort
- Quality lining should greatly increase the retort's life
- The FCR offers a competitive advantage over other vertical retort designs.

These benefits should produce a significant reduction in capital and operating costs.

## **Magnesium and Sodium Condensers**

The condenser train has been designed to capture liquid magnesium and sodium. Capturing the magnesium in a liquid form and transporting it to the refinery section of the plant saves energy otherwise required to re-smelt solid magnesium crowns, and reduces the size and capital cost of the refinery.

The desired operating conditions for the metal vapour passing through the condenser train are summarised:

- Furnace is heated to 1180°C
- Magnesium begins condensing at 720-730°C, mainly to a solid at >650°C
- Operating the magnesium portion of the condenser train down to 460°C, only 0.2% of the magnesium remains in the vapour
- Sodium begins condensing at 430-445°C

- Sodium is all condensed by 190°C
- Potassium begins to condense at 250°C
- Still a tiny amount of potassium left at 100°C, at the end of the condenser train

Recent FCR test runs have achieved these desired temperature levels through the condenser train.

Once the replacement retort is installed into the FCR it will undergo a two week commissioning. This commissioning is scheduled for the last two weeks in August.

## **2. Hambach Project**

In December 2017, LMG announced that they had signed a term sheet with RWE Power AG that details how both parties will proceed with the development of a new Germany-based magnesium plant.

The up to 30,000 tonnes per annum plant is unique as the magnesium will come from the brown coal fly ash from coal mined at RWE's Hambach mine and processed through their supercritical brown coal power station near Cologne, Germany.

The project involves four stages of development:

- Conduct the vertical retort test work using the RWE fly ash
- Completion of a feasibility study
- Completion of engineering, procurement and permitting
- Construction and commissioning.

In the last quarter, LMG made a large sample of RWE fly ash to process through the FCR when it was complete. It is expected to process this fly ash through the retort in September.

## **3. Latrobe Valley Project**

The next stage of the Latrobe Valley Project is to complete the FCR test work, discussed in point 1, complete some pilot scale test work, make a large sample and then process the Yallourn fly ash through the FCR.

In January 2018, LMG and EnergyAustralia Yallourn Pty Ltd signed a Memorandum of Understanding (MoU) for Yallourn power station to supply its fly ash to LMG's proposed 3,000 tonnes per annum magnesium plant in the Latrobe Valley. The MoU allows for the expansion of the plant to 40,000 tonnes per annum.

The project involves four stages of development:

- Conduct testing of Yallourn fly ash using LMG hydromet process and Monash University's ash leaching and precipitation process
- Complete a feasibility study
- Construct a 3,000tpa magnesium plant
- Expand to a 40,000tpa magnesium plant.

Each stage of this project is conditional on the successful completion of the previous stage and the signing of formal agreements between the parties.

Since January 2018 LMG has been working with Monash University, which has been performing laboratory scale tests on the Yallourn fly ash. In May the initial results of this test work showed that this process could breakdown the magnesioferrite, the most abundant mineral in the Yallourn fly ash and extract the magnesium oxide (MgO), calcium oxide and iron oxide separately. The recovery rates achieved for each material were over 90%.

As a feed stock for LMG's fast cycle retort, the MgO grade is 25% higher than feedstock produced by alternative methods. This result is achieved mainly by the effective reduction in the high iron content in the Yallourn fly ash as well as the specific targeting of the minerals by this process.

This Monash process will replace the iron removal stage in LMG's normal hydrometallurgical process. LMG owns the intellectual property developed during this project with Monash University.

#### **4. EU Patent**

On 26 March 2018, LMG was granted a patent for all countries in the European Union for its unique hydromet process. In the June quarter, the company nominated three countries in the EU for registration being Germany, Czech and Poland. In June 2018, the patent was registered in Germany.

The Australian, USA, China and Indonesian patents have already been granted for 20 years starting from August 2011.

The process is 100% owned by LMG.

Patent application was lodged in March 2013 for India. The patent is expected to be granted later this year.

All the above countries are known to have large lignite / brown coal deposits.

#### **5. Funding**

In March 2018, LMG's Directors and its Project Director decided to provide loans to the Company to cover the costs of their monthly fees. These loans will be converted into equity in the Company upon the approval of shareholders at this year's Annual General Meeting.

In addition, two Directors of the Company have provided an unsecured lending facility to the Company of up to \$200,000. To date these facilities have not been drawn.

The Company is also holding discussions with a funder to provide up to \$2.15 million to assist with financing its 2019 activities.

The Directors believe that with the current funds available and these additional loans and the receipt of their 2018 research & development tax rebate in the September quarter, the Company will have the necessary funds to complete the FCR test work and conduct its activities required up to the construction phase of its Latrobe Valley Project.



David Paterson  
Chief Executive Officer

30 July 2018

### **About Latrobe Magnesium**

Latrobe Magnesium is developing a magnesium production plant in Victoria's Latrobe Valley and another plant near Cologne in Germany using its world-first patented extraction process. LMG intends to extract and sell magnesium metal and cementitious material from industrial fly ash, which is currently a waste stream from brown coal power generation.

LMG has completed a preliminary feasibility study validating its combined hydromet / thermal reduction process that extracts the metal. Construction is estimated to start on its initial 3,000 tonne per annum magnesium plant in the third quarter of 2019 year with production commencing 12 months later. The plant will then be expanded to 40,000 tonne per annum magnesium 18 months later. The plant will be in the heart of Victoria's coal power generation precinct, providing immediate access to feedstock, infrastructure and labour.

LMG plans to sell the refined magnesium under long-term contracts to Australian and overseas customers. Currently, Australia imports 100% of the 8,000 tonnes annually consumed.

Magnesium has the best strength-to-weight ratio of all common structural metals and is increasingly used in the manufacture of car parts, laptop computers, mobile phones and power tools.

The LMG project is at the forefront of environmental benefit – by recycling power plant waste, avoiding landfill and is a low CO<sub>2</sub> emitter. LMG adopts the principles of an industrial ecology system.