Alpha HPA

ASX: **A4N**
ASX Announcement
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(9 pages by email)

REPORT ON ACTIVITIES FOR THE QUARTER ENDED 31 MARCH 2019

HIGHLIGHTS

MODIFIED FEEDSTOCK SIGNIFICANTLY IMPROVES HPA FIRST PRE-FEASIBILITY STUDY (PFS)

- **Simplified flow sheet and higher aluminium feed grades**
- **Project CapEx reduced by A$17M to A$198M (US$149M)**
- **Unit OpEx reduced to A$6,830 (US$5,123) per tonne HPA***
- **Annual Free Cash Flow (FCF) increased to A$265M (US$199M)**

PRE-PILOT SOLVENT EXTRACTION RUN DELIVERS VERY STRONG RESULTS

- **1st phase of the Pre-Pilot Solvent Extraction (SX) run using modified feedstock completed**
- **Major process improvements confirmed with stable SX conditions and strong impurity rejection**
- **Aluminium extraction averaged 93%, peaking at 99%**
- **Final SX liquor substantially higher purity than any previous SX testwork**

HPA MARKETING

- **HPA end-user trip to China completed in March with further end-user visits continuing in May**
- **HPA end-users (battery separator manufacturers) confirm strong HPA demand driven by 4 to 6 times capacity expansion through by 2022**
- **Technical exchange commenced with HPA samples sent to end-users**

PROJECT SITE SELECTION AND REAGENT SUPPLY

- **Evaluation of potential project sites expanded from Newcastle to include Gladstone and WA**
- **Site selection process being run in parallel with discussions with potential reagent supply and by-product off take counterparties**
- **An application to purchase reservation has been lodged on a suitable land parcel within the Gladstone State Development Area**

PILOT PLANT AND DFS

- **Pilot Plant assembly well advanced at the Company's Brisbane facility in readiness for June start-up**
- **A number of key engineering steps completed in DFS**

* After by-product credits

PRE-FEASIBILITY STUDY UPDATE

Background

On 20 November 2018, Alpha HPA Limited ('the Company'), announced the findings of the Pre-Feasibility Study (PFS) on the HPA First Project. The HPA First Project is the application of the Company's licensed proprietary solvent extraction (SX) and refining technology to process aluminium derived from an industrial chemical feedstock into High Purity Alumina (HPA).

The PFS described a technically robust project and delivered a compelling business case.

A full project description and summary of material assumptions and modifying factors is detailed in the Company's PFS announcement dated 20 November 2018.

In Part 18 of the PFS announcement, the Company noted a significant opportunity identified during the PFS regarding the modification of the chemical feedstock. During the March quarter the Company completed a technical and financial assessment of this opportunity as described below.

Feedstock Modification

During the March quarter the Company completed a number of detailed batch scale SX tests using the modified feedstock.

Key findings of the testwork were as follows:

- The modified feedstock allows for a higher grade aluminium feed, which translates to reduced tank and pipe sizing, with attendant CapEx reductions.
- The modified feedstock presents a far more stable process, with rapid extraction of aluminium and rapid SX phase separation of the loaded organic from the feed solution.
- The modified feedstock also provides for a simplified flow sheet, with an increase in the production of higher value by-product B, and the elimination of by-product A. A simplified flow sheet using the modified feed is shown as Figure 1, below.
- In-house analysis has confirmed a very-high aluminium extraction to >95%.

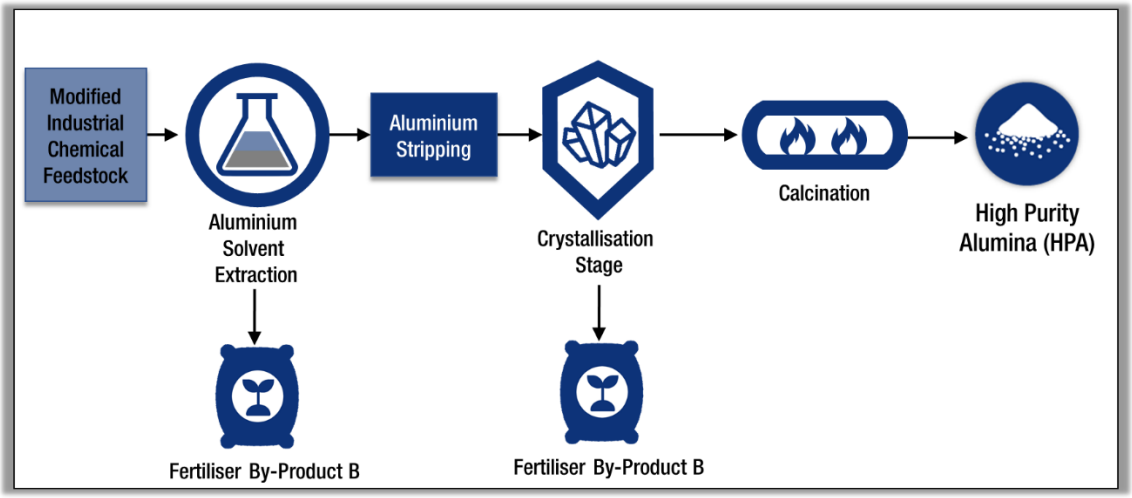

Figure 1: HPA First - Simplified Process Flow Sheet with modified feedstock

PFS Update

Based on these very encouraging batch SX results, the Company adopted the modified feed and completed PFS level design and costings and updated the PFS accordingly, with the following highlights:

- Total Project CapEx reduced by A$17M to **A$198M (US$149M)**, due largely to the removal of significant plant rendered redundant by the adoption of the modified feed.
- Although the reagent cost increases with the modified feed, this is more than offset by increased by-product sales revenue, providing for an approximate 20% net reduction in unit operating cost, down to **A$6,830 (US$5,123)** per tonne of HPA after by-product credits.
- An increase of A$17.6M in annual free cash flow (FCF) to **A$265M (US$199M).**

The refreshed PFS findings of the HPA First Project are summarised in the table below alongside the November 2018 results:

HPA First Project	November 2018		PFS Update March 2019	
Key Project Parameters	A$	US$	A$	US$
A$/US$ Exchange Rate	0.75		0.75	
HPA Production (t/y)	10,200		10,200	
HPA Price Assumption ($/t HPA)	$33,333	$25,000	$33,333	$25,000
Annual Revenue (including by-products)	$384 million	$288 million	$413 million	$310 million
Annual Average Cash Operating Cost	$131 million	$98 million	$143 million	$107.5 million
Unit Cash Cost accounting for by-products ($/t HPA)	$8,538	$6,403	$6,830	$5,123
Annual Free Cash Flow (FCF)	**$247 million**	**$185 million**	**$265 million**	**$199 million**
Annual EBITDA	$248 million	$186 million	$266 million	$200 million
Aluminium Feedstock Processed (t/y)	65,753		20,400	
Pre-Production Capital Cost	$215 million	$161 million	$198 million	$149 million
Capital Intensity (CapEx $ per tpa HPA)	$21,043	$15,783	$19,417	$14,563

The upcoming pilot plant program due will operate on the modified feed, with a view to adopting the modified feed for the CY19 Definitive Feasibility Study (DFS) and the commercial facility.

The modified plant design was confirmed in an interim SX mini-rig (cut down pilot scale) program, to supply mass-balance information to the pilot plant installation as discussed below.

'PRE-PILOT' SOLVENT EXTRACTION RUN

Background

As a follow-on of the adoption of the modified aluminium feedstock, Alpha HPA Limited ('the Company' or 'Alpha HPA') has completed a 'pre-pilot' solvent extraction (SX) run to set the key process parameters for the pilot plant operation. The SX run was conducted on a continuous 24 hour basis using the in-house SX mini-rig to simulate the commercial facility.

The pre-pilot SX run was conducted in 2 x 3 day phases, with results from the first phase now received.

Results

The first phase of the pre-pilot SX run on the modified feedstock confirmed a major advance in physical and chemical process stability, with immediate strong aluminium extraction with minimum operator involvement.

Results confirmed record aluminium extraction (reaching 99%) and the best impurity rejection recorded from any previous testwork.

Key results of the testwork were as follows:

- Aluminium extractions averaged 93%, peaking at 99% at stable operation.
- The purity of the Advanced Electrolyte (AE) averaged 99.98% purity, peaking at 99.99% purity. The AE is the liquor which proceeds to the crystallisation stages, where the product is further purified. This is a very significant improvement on AE purity when compared to previous testwork, and indicative of further improvements in HPA purity from most recent HPA purity results of 99.994%. Of particular note is that the elemental impurities in the AE, are all very low or below detection limits, notably:
    - Sodium (Na) < 1ppm
    - Gallium (Ga) <2.6ppm
    - Magnesium (Mg) <3ppm
    - Calcium (Ca) <2ppm

PILOT PLANT

The pilot plant equipment list was finalised in March 2019 with key equipment components including SX vessels, hosing and pumps having now arrived on site. At the time of this report the pilot plant is steadily being assembled at the Company's dedicated facility in Brisbane. With the adoption of the modified feedstock and the requirement for an interim mini-rig SX campaign, the Pilot Plant is now scheduled to commence operation in early June 2019.

Figure 2: Solvent Extraction cells for the pilot plant installed

Figure 3: Pilot plant filters

INTERIM WORKS

In parallel to the Pilot Plant assembly, the Company undertook completing a number of key interim tests required to maximise the technical confidence of the upcoming pilot and DFS. These works included, but were not limited to:

- Front end optimisation studies.
- In-house manufacture of low-impurity reagent for the crystallization stage.
- Materials of construction testing.
- HPA morphology study.
- Filtration testing.
- Crystalliser optimisation.

Further details of these interim works are outlined below:

Front end optimisation studies: This work is now complete and informed the PFS costings update released to the ASX on 7 March 2019.

In-house manufacture of low-impurity reagent for the crystallisation stage: During the November 2018 crystallisation and HPA refining testwork, impurities with the final HPA product (99.994% purity) were largely found to have been introduced by minor volume reagents which are used in the process. In response, testwork to manufacture higher-purity versions of these reagents in-house has been completed, with very significant reductions in key impurities. This is expected to translate to further purity in the final HPA. This process mimics the process at commercial scale, and will also be implemented in the upcoming HPA First pilot plant.

Materials of construction testing: This work is designed to test a range of potential materials of construction for structural and chemical integrity when immersed in the likely range of process solutions and temperatures proposed for the commercial HPA First process. Materials under test include a full range of stainless steel and fibre reinforced plastics. The stainless coupons are variously stressed/welded and stamped to simulate construction treatment. This work is now nearing completion and will inform the materials of construction for the final DFS design and provide DFS level support for final plant costings.

HPA Morphology study: As the HPA First process is unique in producing HPA via a wet chemical purification process, the process is able to adjust chemical settings in the process to modify the physical characteristics of the final HPA (being particle size, specific surface area and density). This allows the process to be 'tailored' for any varying specifications required by end-users. The Morphology study is being completed which will allow Alpha HPA to adjust its process accordingly and deliver bespoke HPA specifications as required by end users.

Filtration testing: Testwork on the filter products within the process is now complete. This work will inform process flows and filter sizing in the DFS and the commercial plant.

Key findings from the interim works program will be incorporated into the pilot campaign and included in the final DFS report which remains on track for completion and delivery in CY19.

DFS

DFS work has commenced where it is not restricted by ongoing test work. Work completed includes:

- Draft Process Flow Diagrams have been generated.
- RFQs have been prepared for issued to all suppliers where major equipment specifications are known.

PROJECT SITE SELECTION AND REAGENT SUPPLY

The HPA First PFS (ASX: 20 November 2018 and 7 March 2019) was predicated on a Project site based in Newcastle NSW, due to proximity to skills, logistics and reagent supply. The review of potential Project sites has now expanded to include Gladstone Sate Development Area (SDA) as well as potential sites in WA.

Each of the sites under evaluation have potential access to reagents and an existing market for the fertiliser by-product produced as part of the Company's licensed proprietary SX process.

Alpha HPA is in discussions with a number of strategic counterparties with regard to the purchase of land, key process reagents and sale of the dominant fertiliser by-product. The outcome of these discussions will significantly dictate the final Project Site selected.

As part of this process, Alpha HPA has lodged an application to reserve the purchase of a suitable land parcel within the Gladstone SDA.

HPA END-USER MARKETING

In December 2018, the Company completed two marketing trips to South East Asia to meet with direct HPA offtake counterparties, as well as market intermediaries and battery industry advisors. The visits consolidated two positive findings relevant to the Company's HPA First Project, namely:

- Both existing and new-entrant electronic vehicle (EV) battery separator manufacturers are committing large scale capital expenditure on battery separator facilities this calendar year to be positioned to meet the Government mandated Chinese EV battery demand; and

- The purity and morphology of the HPA produced by the Company's process is well suited to battery separator applications and is considered to be a desirable product, particularly with the volumes and CapEx requirement as set-out on the HPA First PFS.

During March 2019, the Company completed a marketing visit to China meeting three significant battery separator manufacturers (HPA end-users), electronic vehicle (EV) car manufacturers as well as separator coating machinery manufacturers.

The trip has strongly affirmed EV and EV materials (including HPA) demand, with each of the separator manufacturers visited confirming between 4 to 6 times manufacturing capacity expansion through to 2022. In many cases, supply chains, including for HPA, are yet to be filled as capital expenditure across the entire Chinese battery/EV industry is being brought forward to access Chinese Government subsidies.

As a result of the trip, Alpha HPA has commenced a technical exchange with each of the HPA end users, with HPA samples to be provided on completion of the current 'pre-pilot' testwork, followed by larger (2 to 5kg) HPA samples generated during the pilot program.

Follow on end-user visits are planned for May and June, including the European and USA markets.

COLLERINA PROJECT
(100% Alpha HPA and subject to commodity split agreement)

No exploration activities were completed during the quarter.

WONOGIRI PROJECT – INDONESIA
(45% Alpha HPA)

Work on advancement of the AMDAL study (environmental impact study) for the Randu Kuning gold-copper deposit and associated aggregate deposit continued with a short hiatus prior to the Indonesian elections.

The Company successfully had its request to suspend its licence until January 2020 approved to allow it to complete the AMDAL.

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Competent Persons Statement (Process Development Testwork)

Information in this announcement that relates to metallurgical results is based on information compiled by or under the supervision of Dr Stuart Leary, an Independent Consultant trading as Delta Consulting Group. Dr Leary is a Member of The Australasian Institute of Mining and Metallurgy (AusIMM). Dr Leary has sufficient experience to the activity which he is undertaking to qualify as a Competent Persons under the 2012 Edition of the 'Australasian Code for reporting of Exploration Results, Mineral Resources and Ore Reserves'. Dr Leary consents to the inclusion of the technical data in the form and context in which it appears.

For further information on testwork results and processes see ASX announcements dated 17 April 2019, 7 March 2019, 4 December 2018, 20 November 2018, 6 September 2018, 31 August 2018, 9 July 2018, 30 April 2018, 26 April 2018, 21 March 2018, 6 March 2018, 21 February 2018, 8 December 2017, 30 November 2017, 29 November 2017, 24 November 2017 and 13 November 2017.

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