24 March 2021

BATTERY MATERIALS HPA COATING PLANT PRE-FEASIBILTY STUDY COMMENCED

Highlights

- Battery materials HPA coating plant pre-feasibility study commenced
- Plant to use Altech's nano layer HPA coating technology
- 10,000tpa production train for anode graphite coating
- Europe demand for anode graphite estimated at 500,000tpa by 2025

Altech Chemicals Limited (Altech/the Company) (ASX: ATC) (FRA: A3Y) is pleased to advise that its 75% owned German subsidiary, Altech Industries Germany GmbH (AIG) has commenced the pre-feasibility study (PFS) for construction of a battery materials high purity alumina (HPA) coating plant in Saxony, Germany.

The PFS will assume a phase 1 coating plant designed with the capacity to coat 10,000tpa (35tpd) of anode graphite, using Altech's alumina coating technology. The design capacity has been derived from a forecast of European lithium-ion battery plant production capacity that is estimated at ~500 GWh/a by 2025 (see Figure 1). Based on this forecast the total amount of graphite expected to be required for anode production in Europe is ~500,000tpa when all of the planned lithium-ion battery plants' reach full production. However, in determining the size of the coating plant for the PFS, AIG has conservatively assumed that only 50% of the forecast lithium-ion battery plants' will eventuate, and as such the proposed coating plant capacity of 10,000tpa would represent 4% of the overall forecast European market for anode graphite. The lay-out of the proposed coating plant at the proposed site, the Schwarze Pumpe Industrial Park in Saxony, Germany will be such that it would allow for the construction of additional materials coating capacity in the future, such as a silicon coating plant and/or additional graphite coating capacity.

The study will assume the use of 100% renewable power from the local grid with some minor on-site solar generation for buildings. The design will target green project status. It is planned that once the PFS is completed, the project will be accessed for green accreditation by the Centre of International Climate and Environmental Research (CICERO), Norway.

Battery Material Coating process

The battery material coating process consists of four stages (see Figure 2). Stage 1 is a HPA precursor production step using an alternative aluminium feedstock. It will be assumed that the HPA precursor would ultimately be supplied from Altech's HPA plant in Johor, Malaysia once operational. The option for an alternate initial precursor supply will allow the coating plant to have a development timeframe that is independent of Johor.

Stage 2 of the process is the receival of the anode battery material (graphite or silicon) in bulk bags or drums. The next step is the HPA nano layer coating process which will take place in the coating section of the plant – this is the proprietary technology that Altech has developed. The last stage in the process is finalisation of the coated material, which is then packaged in either bulk bags or drums for shipment to end users.

Figure 1 – Announced Lithium-ion battery cell production in Europe

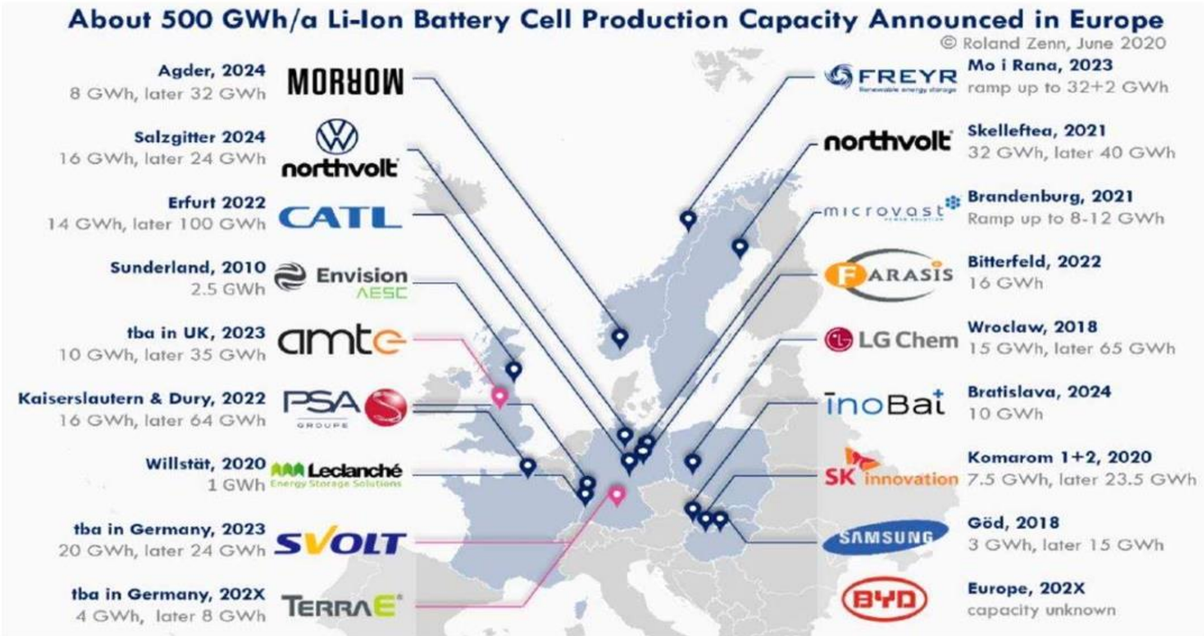
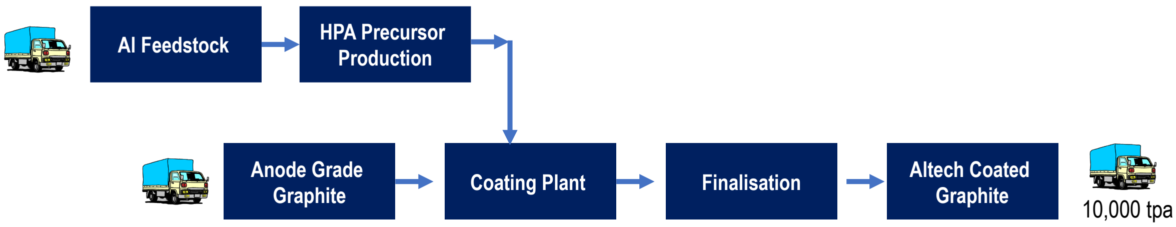


Figure 2 – Battery materials coating plant train block flow diagram



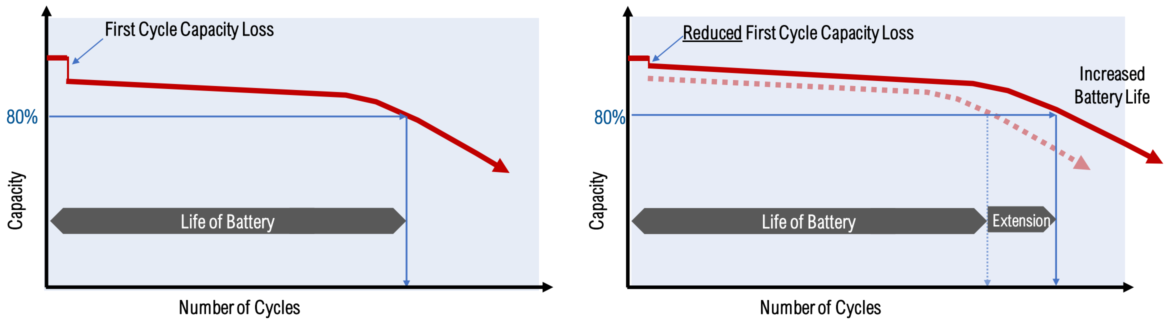
<u>Background</u>

HPA is commonly applied as a coating on the separator sheets used within a lithium-ion battery, as alumina coated separators improve battery performance, durability and overall safety. However, evolving demand for alumina within the anode component of the lithium-ion battery has been identified because of the potential positive impacts that alumina coated graphite and silicon particles may have on lithium-ion battery life and performance.

Lithium-ion battery anodes are typically composed of graphite, with some batteries currently incorporating small amounts of silicon. In a lithium-ion battery, lithium ion losses initially present as inactive layers that form during the very first battery charge cycle, the losses then compound with each subsequent battery usage cycle. Typically around 8% of lithium ions are lost during the very first battery charge cycle. This "*first cycle capacity loss*" or "*first-cycle irreversibility*" is a long recognised but as yet poorly resolved limitation that has plagued rechargeable lithium-ion batteries.

Figure 3 shows the potential increase in battery life, if the *first cycle capacity loss* can be reduced or eliminated thereby allowing more lithium ions to participate in battery operation during its life-cycle.

Figure 3 – Illustration of potential impact of reduced *"first cycle capacity loss"*



First cycle capacity loss in a lithium-ion battery is because of the consumption of lithium ions within the battery during the initial battery charging cycle. This forms a layer of material on the anode termed a *"solid electrolyte interphase"* (SEI). Predominantly the graphite particles used in lithium-ion battery anodes are uncoated as are silicon particles. However, manufacturers are now seeking to coat anode graphite particles and silicon particles with a very thin layer of alumina. Tests have demonstrated that alumina coated graphite particles have the potential to reduce *first cycle capacity loss*. In turn, this innovation can measurably increase battery energy retention, extend battery life and improve overall battery performance.

Silicon has a significant advantage over graphite for use in lithium-ion battery anodes in that it has ten times the theoretical energy capacity compared to graphite. However, limitations for silicon use in battery anodes have included particle volume expansion of up to 300% when energised, and large *"first cycle lithium loss"*. Industry believes that the encapsulation of silicon particles via the application of a nano layer of alumina can resolve these issues and be a "game changer" which would pave the way for increased lithium-ion battery energy density, lifespan and reduced first cycle lithium loss. Alumina (aluminium oxide) is extremely hard, rating as 9 on the Mohs scale, almost as hard as diamond which rates as 10 – hence its preference as a particle coating material.

Altech's nano-layer alumina coating technology is expected to improve Coulombic Efficiency (CE) (especially the CE in first cycle), cycling stability, high-rate performance and fast charging capability. The initiative also offers another potential avenue to secure a portion of future HPA production from its Johor plant at a predetermined floor price, which would support project financial close.

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About Altech Chemicals (ASX:ATC) (FRA:A3Y)

Altech Chemicals Limited (Altech/the Company) is aiming to become one of the world's leading suppliers of 99.99% (4N) high purity alumina (Al2O3) through the construction and operation of a 4,500tpa high purity alumina (HPA) processing plant at Johor, Malaysia. Feedstock for the plant will be sourced from the Company's 100%-owned kaolin deposit at Meckering, Western Australia and shipped to Malaysia.

HPA is a high-value, high margin and highly demanded product as it is the critical ingredient required for the production of synthetic sapphire. Synthetic sapphire is used in the manufacture of substrates for LED lights, semiconductor wafers used in the electronics industry, and scratch-resistant sapphire glass used for wristwatch faces, optical windows and smartphone components. Increasingly HPA is used by lithium-ion battery manufacturers as the coating on the battery's separator, which improves performance, longevity and safety of the battery. With global HPA demand approximately 19,000t (2018), it is estimated that this demand will grow at a compound annual growth rate (CAGR) of 30% (2018-2028); by 2028 HPA market demand is forecast to be approximately 272,000t, driven by the increasing adoption of LEDs worldwide as well as the demand for HPA by lithium-ion battery manufacturers to serve the surging electric vehicle market.

German engineering firm SMS group GmbH (SMS) is the appointed EPC contractor for construction of Altech's Malaysian HPA plant. SMS has provided a USD280 million fixed price turnkey contract and has proposed clear and concise guarantees to Altech for plant throughput and completion. Altech has executed an off-take sales arrangement with Mitsubishi Corporation's Australian subsidiary, Mitsubishi Australia Ltd (Mitsubishi) covering the first 10-years of HPA production from the plant.

Conservative (bank case) cash flow modelling of the project shows a pre-tax net present value of USD505.6million at a discount rate of 7.5%. The Project generates annual average net free cash of ~USD76million at full production (allowing for sustaining capital and before debt servicing and tax), with an attractive margin on HPA sales of ~63%. (Refer to ASX Announcement *"Positive Final Investment Decision Study for 4,500TPA HPA project"* dated 23 October 2017 for complete details. The Company confirms that as at the date of this announcement there are no material changes to the key assumptions adopted in the study).

The Company has been successful in securing senior project debt finance of USD190 million from German government owned KfW IPEX-Bank as senior lender. Altech has also mandated Macquarie Bank (Macquarie) as the preferred mezzanine lender for the project. The indicative and non-binding mezzanine debt term sheet (progressing through due diligence) is for a facility amount of up to USD90 million. To maintain project momentum during the period leading up to financial close, Altech has raised ~A$39 million in the last 24 months to fund the commencement of Stage 1 and 2 of the plant's construction; Stage 1 construction commenced in February 2019 with Stage 2 now underway.

Forward-looking Statements

This announcement contains forward-looking statements which are identified by words such as 'anticipates', 'forecasts', 'may', 'will', 'could', 'believes', 'estimates', 'targets', 'expects', 'plan' or 'intends' and other similar words that involve risks and uncertainties. Indications of, and guidelines or outlook on, future earnings, distributions or financial position or performance and targets, estimates and assumptions in respect of production, prices, operating costs, results, capital expenditures, reserves and resources are also forward-looking statements. These statements are based on an assessment of present economic and operating conditions, and on a number of assumptions and estimates regarding future events and actions that, while considered reasonable as at the date of this announcement and are expected to take place, are inherently subject to significant technical, business, economic, competitive, political and social uncertainties and contingencies. Such forward-looking statements are not guarantees of future performance and involve known and unknown risks, uncertainties, assumptions and other important factors, many of which are beyond the control of the Company, the directors and management. We cannot and do not give any assurance that the results, performance or achievements expressed or implied by the forward-looking statements contained in this announcement will actually occur and readers are cautioned not to place undue reliance on these forward-looking statements. These forward-looking statements are subject to various risk factors that could cause actual events or results to differ materially from the events or results estimated, expressed or anticipated in these statements.