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AMMG UPDATES PROCESS DESIGN FOR HPA CHEMICAL PROJECT

Highlights

- AMMG's process uses well-established hydrochloric acid leach (HCL) method
- Main advantage is the simple recovery of acid, reducing operating costs
- HCL process ideal for Meckering aluminous clay deposit
- Process utilises conventional, off-the-shelf plant and equipment
- Process covered by AMMG's patent application

Australia Minerals and Mining Group Limited (ASX: AKA) (AMMG/the Company) is pleased to provide further detail of its proposed process plant design targeting 3,000 tonnes per annum (tpa) high purity alumina (HPA) operation. The Company has previously reported that laboratory test work afforded the successful production of HPA at 4N (99.99%) quality. The Company recently announced the commencement of a Bankable Feasibility Study (BFS) with a target production capacity that would position the Company as one of the top three HPA producers in the world.

Managing director, Iggy Tan said that the Company's chief design philosophy is to minimise the technology risk by utilising proven "off-the-shelf" plant and equipment. For example, the leaching technology is conventional, the kilns are standard rotary kilns; and the evaporative crystallisers are "off-the-shelf" units commonly used in the chemical industry. "The plant has been designed with operability in mind but with the ultimate focus on achieving quality product at 99.99% (4N) HPA. The Company has patent applications for the process we have developed. The unique part of the patent application is the process design coupled with the processing plant we have developed to produce 4N HPA product based on our low-impurity aluminous clay deposit", Mr Tan said.

Processing Technology

The Company's HPA process is a hydrochloric acid leach (HCL) process with effective acid recovery. The main advantage of this processing technology is the simple recovery of acid, which is re-used at the front-end of the process, thereby reducing operating costs. The HCL process is a conventional, proven and robust chemical process that has existed since the early 1980's. The process was tailored to and highly supported by AMMG's extensive aluminous clay deposit. The raw material contains low levels of impurities and high alumina content. This high-quality feedstock facilitates the production of a very pure alumina product, offering the Company a competitive advantage amongst the global HPA space.

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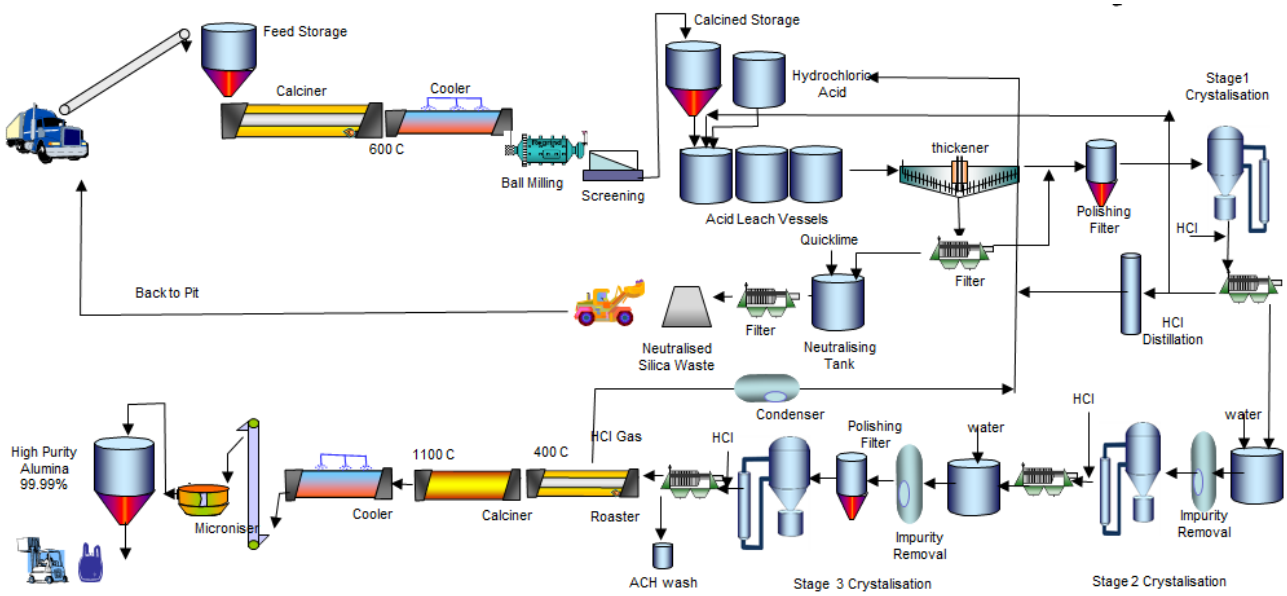
HPA CHEMICALS PLANT

Calcination

Aluminous clay ore delivered from Meckering, stored in on-site storage bins, is transferred to the calcination area. The aluminous clay is calcined at around 600˚C in an indirect rotary kiln to convert the clay crystal structure to a more reactive form. The kiln is indirectly fired by natural gas with associated cyclone and bag-house to collect off-gas fines. The calcine from the rotary kiln is cooled, ball-milled and screened to less than 300 micron particle size.

Figure 1 – The Company's Proposed HPA Chemical Process Flowsheet



Acid Leaching

During the leaching process, the calcine is mixed with recycled wash liquor containing hydrochloric acid (HCl) at up to 36% w/w in a jacket-heated, glass-lined steel mixing tank. The leach reaction is exothermic and the oxide components (except silica) are converted to soluble chlorides, producing a high concentration of aluminium chloride ($AlCl_3$) solution. The slurry from the first leach reactor cascades via overflow to each of three subsequent reactors where temperature is maintained by jacket-cooled water flow. Water cooled condensers above the reactors condenses HCl vapours and returns the condensate to the reaction vessels. The vent gas from the condensers is scrubbed in the gas scrubbing plant to remove residual traces of HCl.

Residue Filtration

The leached slurry is mixed with diluted flocculant and discharges by gravity into a thickener where solids are allowed to settle before being pumped to leach residue filtration. The silica residue slurry is filtered by a vertical plate and frame filter where silica residue filter cake is discharged. The filter cake (primary silica) is re-slurried and neutralised with milled limestone and hydrated lime. The neutralised silica residue slurry is filtered once again and disposed of back at the Meckering mine site. The thickener overflow (pregnant liquor solution, known as "PLS") discharges to a tank feeding a polishing filter to remove any ultra-fine silica solids ahead of aluminium chloride hexahydrate ($AlCl_3 .6H_2O$ also known as "ACH") crystallisation.

Crystallisation

During the first stage of crystallisation, the PLS is fed to an evaporative crystalliser where the liquor is heated through a glass-lined shell and tube heat exchanger and flashed off releasing water vapour. As the solution concentrates, a proportion

of ACH crystallises out of solution as fine crystals. The evaporated liquor at around 35% w/w solids is pumped to a tank where the acid concentration is increased by the addition of 36% w/w HCl. The solubility of aluminium chloride is unique in that it becomes less soluble with increasing acid concentration and the increased acid concentration drives further and final ACH crystallisation. The ACH slurry is pumped to a vertical plate and frame filter where ACH crystals are separated from the mother liquor. The resultant ACH filter cake is washed using saturated ACH wash liquor (from stage 2 and 3 crystallisation) to remove any residual acid and impurities.

The ACH filter cake is transferred to a slurrying tank where the ACH crystals are dissolved in ultra-pure water and then fed to the second crystallisation circuit. This dissolution process makes it possible to release residual impurities, which may have become trapped in the crystals during the first crystallisation. The ACH liquor is treated in an impurity removal unit to further remove any dissolved minor impurities. Like the first stage crystallisation, the ACH liquor is concentrated in an evaporative crystalliser, acid added, and crystallised ACH filtered and finally washed to remove any residual acid and/or impurities. The third stage of crystallisation is identical to the second but with a final polishing filter before the evaporative crystalliser.

ACH Roast and Calcination

The purified ACH cake is heat treated in two stages via natural gas fired rotary kilns. The first stage involves heating the ACH to around 400˚C in order to decompose the ACH to a mixture of basic aluminium chlorides (oxychlorides) and alumina. Most of the chloride is liberated as HCl but a portion remains with the solids. The partially-calcined solids fall directly into the second rotary kiln that then heats the solids further to remove the remainder of the HCl and water (H_2O) to produce highly pure alpha (α) alumina (Al_2O_3), in other words, HPA. The HPA discharges to a cooler and is then fed directly to a fine grinding mill to produce product with a particle size of less than 10 micron. The milled HPA is bagged into 20kg plastic-lined paper bags (See Figure 2) and stored for dispatch to customers.

Figure 2 – Proposed HPA Product Packaging from HPA Chemicals Plant

HCl Recycle

HCl acid requirements for leaching and crystallisation are met by distilling process spent low concentration HCl solution in a distillation column. The main advantage of AMMG's process is the recovery of the majority of the HCl and the recycling of HCl to the front-end of the plant. All plant effluent is collected and neutralised before proper disposal. All vent gases and vapours around the plant are also scrubbed and neutralised before discharge. The process is designed to meet all stringent environmental standards and limits associated with Australian Standards.

Summary

- The process outlined above utilises well-established, proven and low-risk technology and equipment that has been around for many years;
- The cost of production is expected to be highly competitive on a global scale due to the relative simplicity of the process
- The cost of capital to develop a plant is expected to be significantly lower than comparable sized plants due to the simplicity of the process and the fact that all the key elements of the process are available as "off the shelf" components.

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About AMMG (ASX: AKA)

AMMG is aiming to become one of the world's leading suppliers of 99.99% (4N) high purity alumina (HPA) (Al_2O_3), which is the major source material for scratch-resistant artificial sapphire glass, used in the next generation of smartphones and portable tablet devices. HPA is also used in the production of LED's, abrasives, ceramics and a growing range of high-performance electronic applications. The global HPA market is approximately 20,000tpa and is expected to double over the coming decade.

Current HPA producers use an expensive and highly processed feedstock material such as aluminum metal to produce HPA quality product. AMMG is one of only two companies in the world that report the ability to produce 4N HPA directly from an ore feedstock, such as aluminous clay. AMMG employs a well-established processing technology to extract HPA from a low-impurity aluminous clay feedstock sourced from the Company's 100%-owned Meckering project in Western Australia.

AMMG has produced test quantities of 4N HPA product and is now advancing a Bankable Feasibility Study (BFS) to develop a full-scale 3,000tpa production facility. AMMG is a chemical processing group focused on creating a high-margin product to meet the growing global demand for the next generation of high-performance electronic applications.

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 our 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.