

# **5<sup>th</sup> Asian Bauxite & Alumina Conference**

22-23 October 2015

**Singapore Marriott Tang Plaza Hotel, Singapore**



**Iggy Tan, Managing Director, Altech Chemicals Limited**

**High Purity Alumina – Use in Non-Metallurgical Applications**





To be a world leading producer of  
high purity alumina (HPA)



Our Vision





**Altech Chemicals**  
Limited

- **Sapphire & Ruby**
- **Natural form of high purity alumina (HPA)**
- **Formed by mother nature like diamonds**
- **Colour from impurities**
- **Nearly as hard as diamond**

**Sapphire  
Gemstone**



- Purified alumina ( $\text{Al}_2\text{O}_3$ )
- Greater than 99.99% (4N) purity
- Max impurities of 100ppm
- Smelter Grade Alumina (SGA) ~ 99.5% (5,000 ppm impurities mainly sodium)
- Bayer Process uses sodium hydroxide ( $\text{NaOH}$ )
- Sodium impurity is problem for electronics industry

**What is HPA?**







**Smelter Grade  
Alumina**  
SGA 99.5%  
**\$400 per t**



**High Purity  
Alumina**  
HPA 99.9% (3N)  
**\$6,000 per t**



**High Purity  
Alumina**  
HPA 99.99% (4N)  
**\$23,000 per t**



**High Purity  
Alumina**  
HPA 99.999% (5N)  
**\$50,000 per t**

**Our Target Business**

HPA in Sapphire Crystal Glass

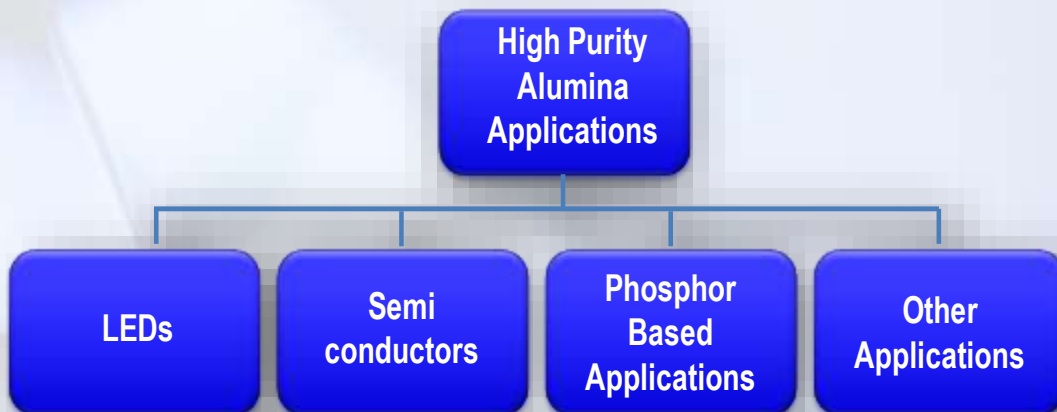
HPA substrate for LEDs

**High Price  
for Purity**

# Welcome to the World of HPA

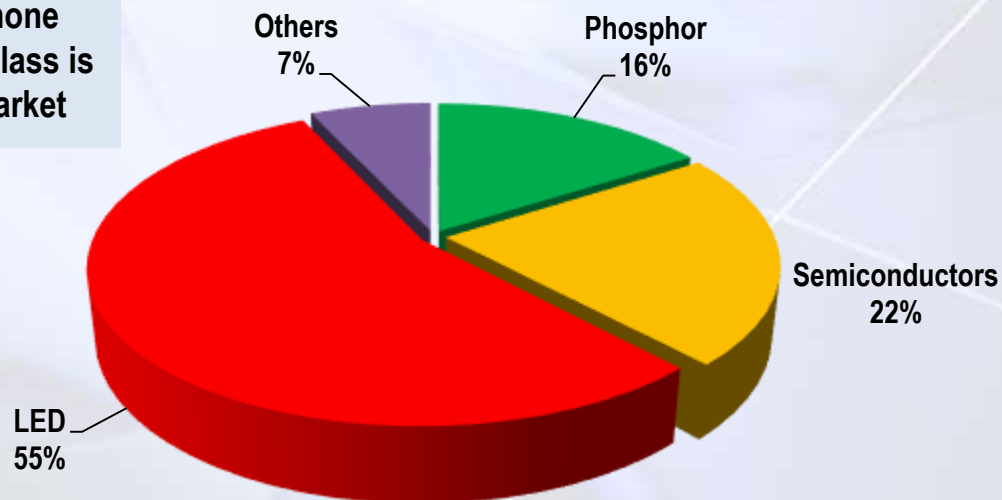






**Uses of HPA**  
**99.99% 4N**

Smartphone  
sapphire glass is  
a new market





# Light Emitting Diodes (LEDs)

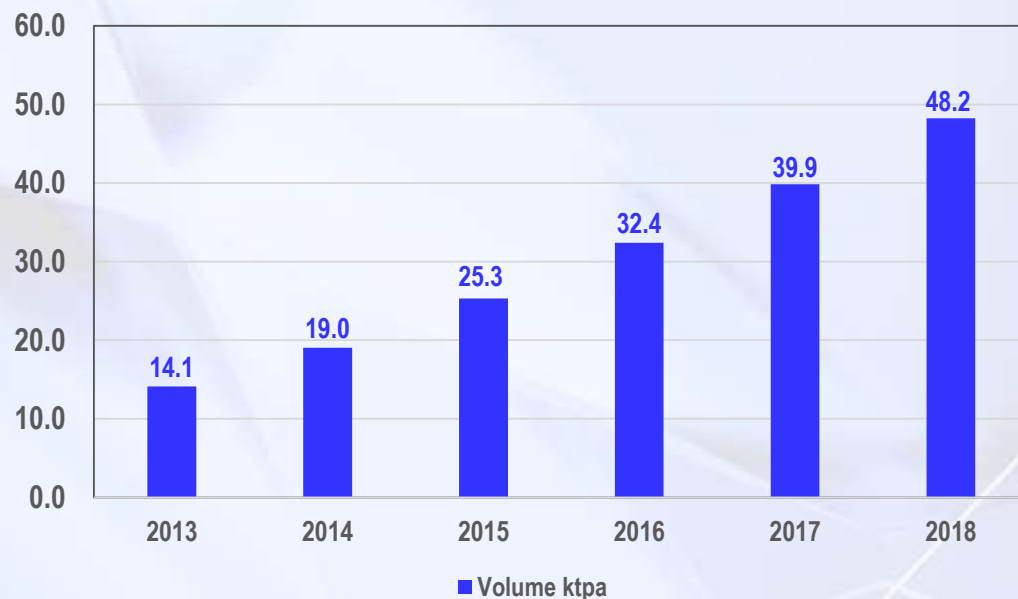


## Technavio Research

- Global HPA demand 19,040tpa in 2014
- Expected to increase to 48,230tpa by 2018
- Growing at a CAGR of 28%

**Demand  
for HPA**

## HPA Demand & Growth Forecast



Source: Technavio Research "2014-2018 Global High-purity Alumina Market"

*Global shipments of LED lamps forecast to increase from 864 m in 2015 to 4.1 billion by 2024 - Navigant Research*

Source: 'LED Lighting: Global Outlook'

**Demand  
for HPA**



Vertu TI luxury mobile phone

- High end Vertu TI with sapphire crystal screen
- Rest will follow

## Huawei beats Apple to sapphire glass smartphone

By *Reuters Staff* on Sep 7, 2014 10:11 PM  
Filed under *Mobility*

 Like  Tweet  +1  Share  0 Comments



### High-spec features for limited-edition Aspire.

Huawei Technologies has unveiled a slate of new devices meant to showcase the Chinese company's hardware technology, just days before Apple releases its highly anticipated iPhone 6 on 9 September.

Huawei, which began as a telecom equipment company in 1987, has rapidly

Smartphones  
Sapphire Crystal  
Screen

HUAWEI



**Altech Chemicals**  
Limited

sapphire  
glass



iPhone 7

apple watch  
& iphone 7

## INTERNATIONAL BUSINESS TIMES

AN EDITION | WEDNESDAY, JULY 15, 2015 AS OF 5:22 PM AEST

iPhone 7 Release Update Suggest Arrival Of Sapphire Crystal Glass, A9 Chip, 2 GB RAM, Larger Battery And More

By **Anvin Sivanandan** on March 06 2015 6:14 PM

- Estimate 30g<sup>1</sup> of HPA in phone screen
- 500 million smartphones sold per year
- If all sapphire glass technology
  - Extra 15,000tpa of HPA
  - 4 x our proposed 4,000tpa plant
- There will be a HPA supply deficit

Sapphire glass in smartphones

Non-scratch sapphire glass

**HPA  
Demand from  
Smartphones**



# Sapphire Glass Scratch Test



## New Foxconn plant reported to make sapphire displays for iPhones

2014/11/25 22:54:27



Taipei, Nov. 25 (CNA) Taiwan's Foxconn Technology Group, a major supplier of Apple Inc.'s iPhones and iPads, has decided to build a new factory in China to produce sapphire displays for next-generation iPhones, according to a Chinese media report.

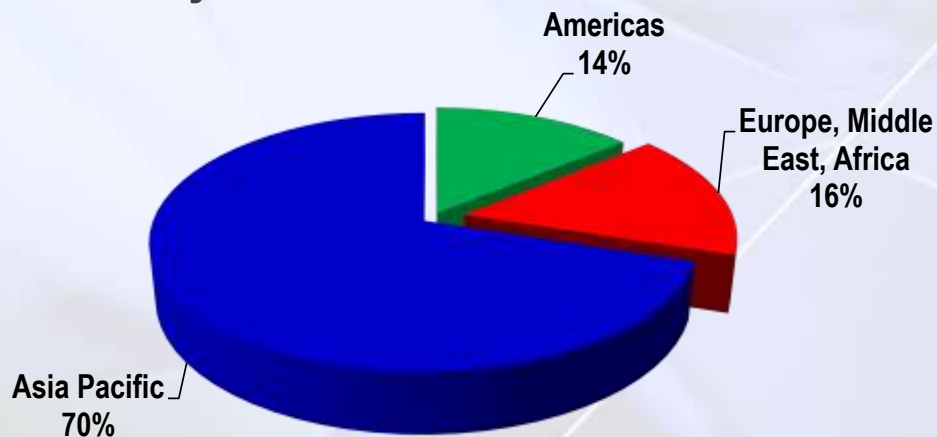
**More  
Sapphire  
Display  
Factories**





**Altech Chemicals**  
Limited

- 70% of HPA demand - Asia Pacific region (APEC)
- Region for the world's manufacturing
- Altech's HPA plant (Malaysia) well-positioned to service APEC region
- Transport, customer service, technical credibility

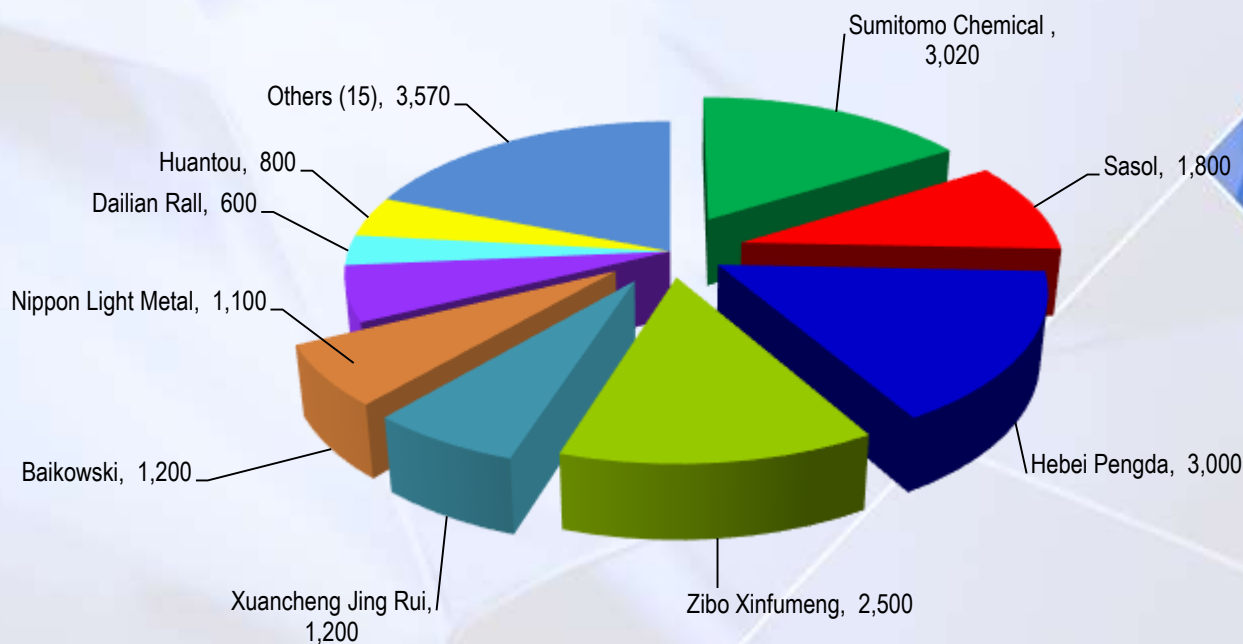


**HPA**  
**Geographic**  
**Demand**





- Six largest HPA producers
- 3 Chinese, 1 Japanese, 1 Sth African, 1 French



## Current HPA Producers

# Altech's Differentiation

**Current HPA Producers**



Bauxite

**Alumina  
Refinery**



Smelter Grade Alumina 99.8%

**Alumina  
Smelter**



Aluminium Metal

**US\$2,000 per tonne**

**Aluminium  
Dissolution**



99.99% HPA



Aluminous Clay

**ALTECH HPA PLANT**

**One Single Process Step**



99.99% HPA

- Processed by mother nature
- Very low Iron (Fe) due to weathering
- Silica is non reactive – easily removed

	Bauxite Darling Range *	Canadian HPA Project	Altech HPA Project
Al <sub>2</sub> O <sub>3</sub> (%)	34.5	22.77	30.5
SiO <sub>2</sub> (%)	21.5	53.29	56.3
Fe <sub>2</sub> O <sub>3</sub> (%)	21.2	8.36	0.7
TiO <sub>2</sub> (%)	2.00	0.98	0.7
K <sub>2</sub> O (%)	0.24	3.41	0.1
NaO (%)	0.005	1.42	0.1

Typical Mean Analysis

Typical bauxite deposit

Altech aluminous clay deposit

**Low-impurity  
Aluminous Clay  
Feedstock**





**Altech Chemicals**  
Limited

- Altech owns 100% of deposit in W Aust
- Low environmental impact
- Previously mined for kaolin – trial pit
- Low stripping ratio
- 65Mt JORC Resource
- 130kms from Fremantle Port

## Meckering Aluminous Clay Deposit





**Altech Chemicals**  
Limited

- Use a standard HCl leach process
- Developed in 1980's by alumina industry
- Couldn't compete with Bayer SGA costs
- But great at producing HPA (no sodium ions)
- However little demand of HPA in 1980s
- Demand of HPA is here today

## Altech's HPA Process



**New HPA Demand + Established Process + Great  
Deposit + Experienced People  
→ Shareholder Value**



**Altech  
Business  
Strategy**

***“the last piece of the  
puzzle is in place”***





**Altech Chemicals**  
Limited

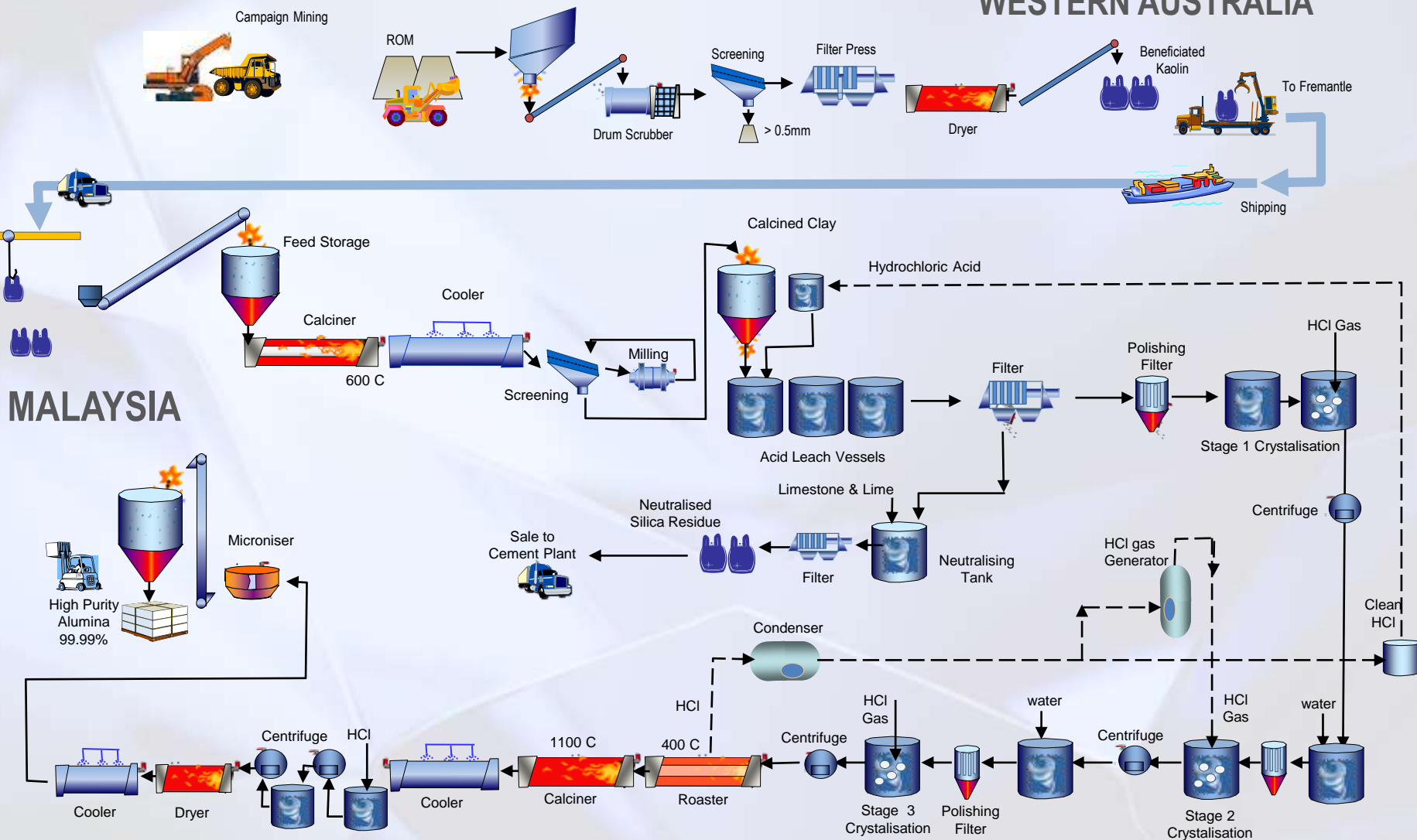
- **Started work in early 2011**
- **Many studies and testwork programs**
- **No issues about producing 99.99% HPA**
- **Supporting lab pilot plant test work**
- **Off the shelf plant and equipment**
- **Bankable Feasibility Study completed**

**Development  
Program  
To Date**



# Altech HPA Process

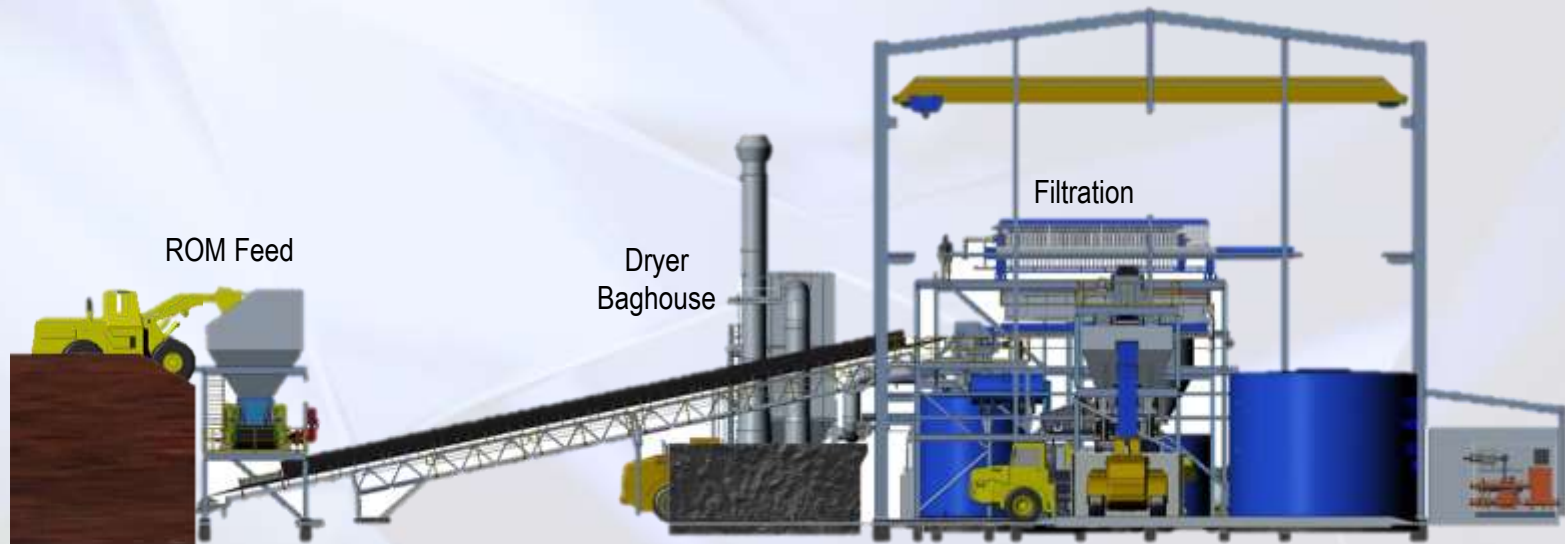
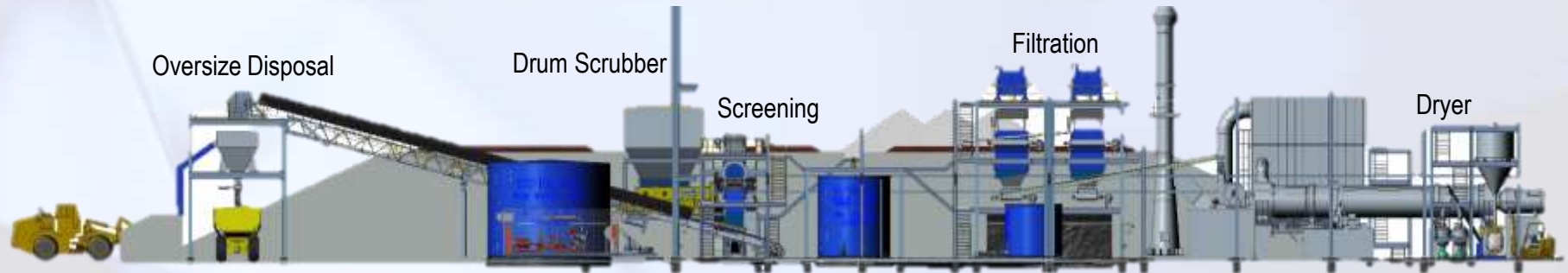
WESTERN AUSTRALIA





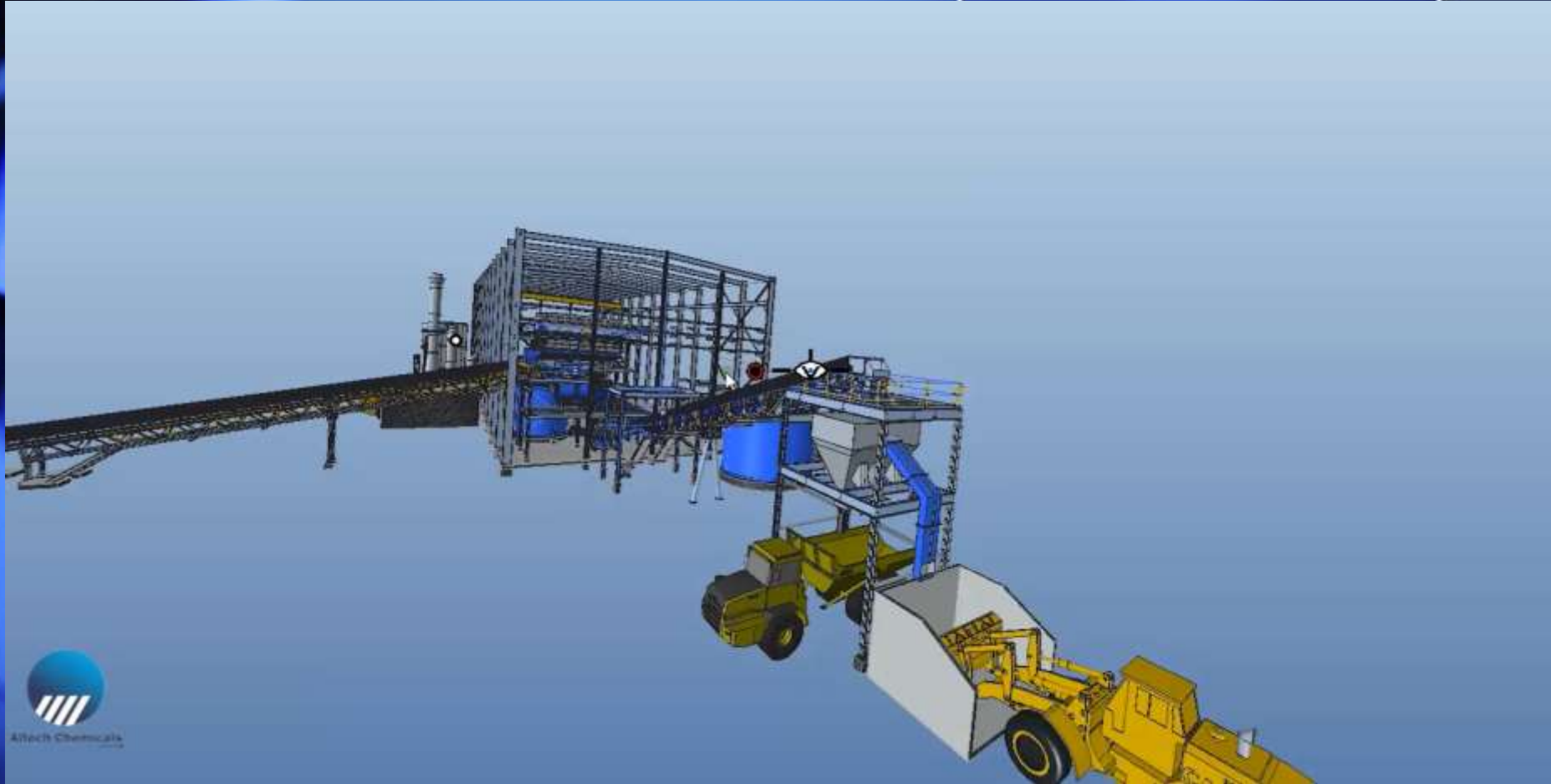
**Altech Chemicals**  
Limited

# Meckering Plant





# Meckering Plant





**Altech Chemicals**  
Limited

# Beneficiated Kaolin Shipping





**Altech Chemicals**  
Limited

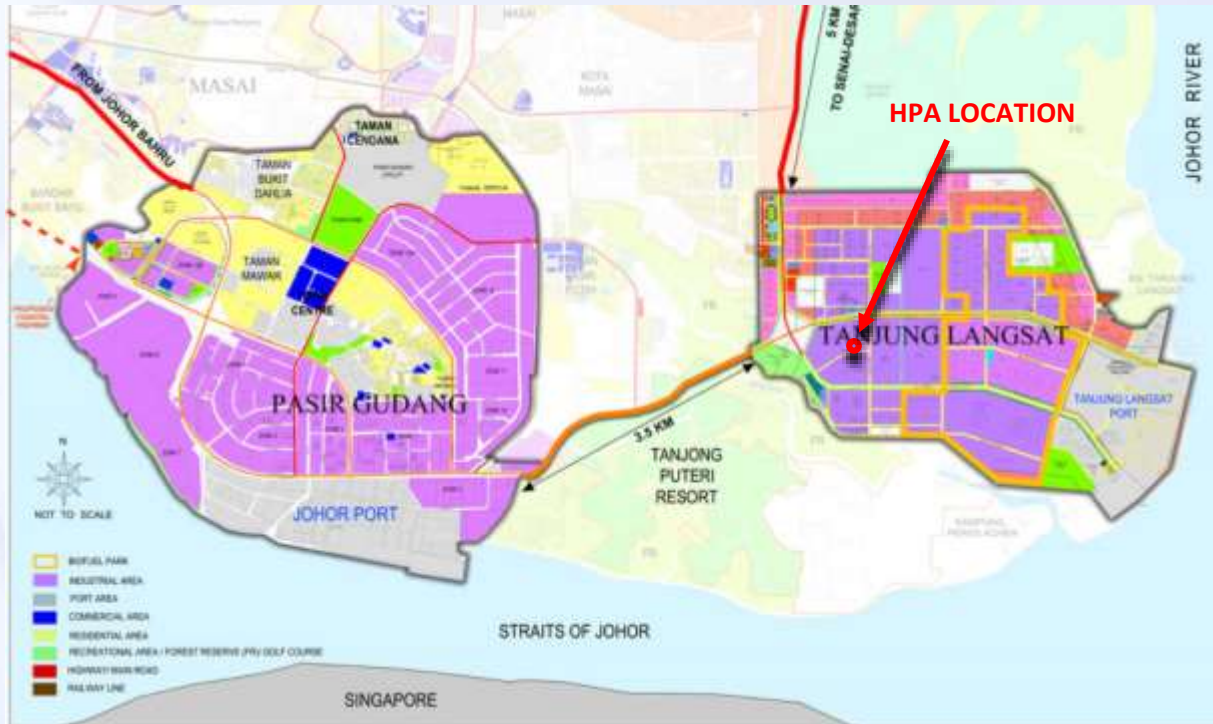
- **Tanjung Langsat Industrial Park, Johor Bahru (Malaysia)**
- **Kaolin feedstock shipped from WA**
- **Operating costs ~40% lower than Australia**
- **Capital costs expected to be 50-60% lower**

**HPA Site  
Location**





# Malaysian HPA Operation



- Hydrochloric acid, lime, power & natural gas
- International container sea-port & Singapore
- Investment incentives

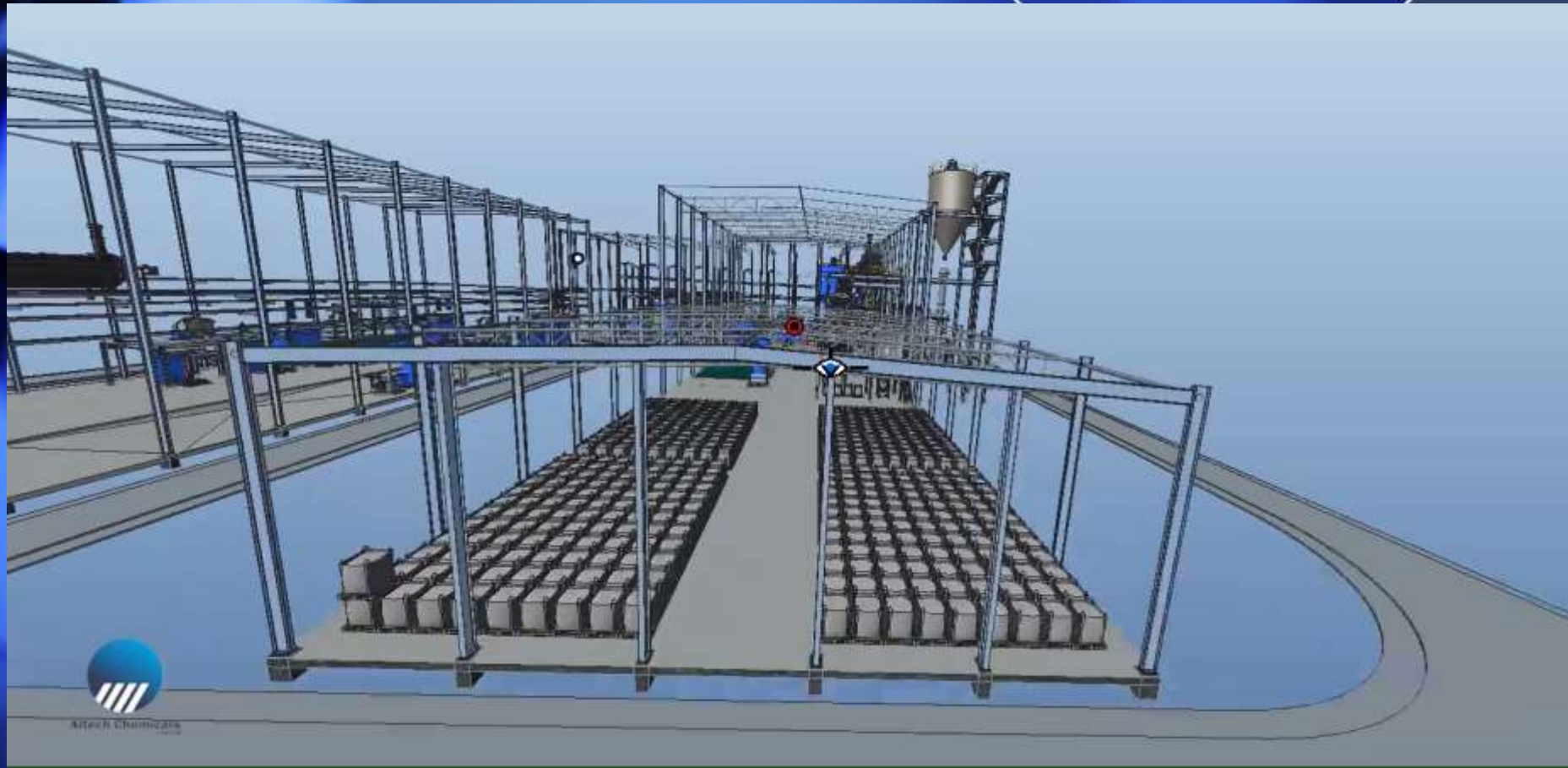


**Altech Chemicals**  
Limited

# Malaysian HPA Operation



# Malaysia HPA Plant



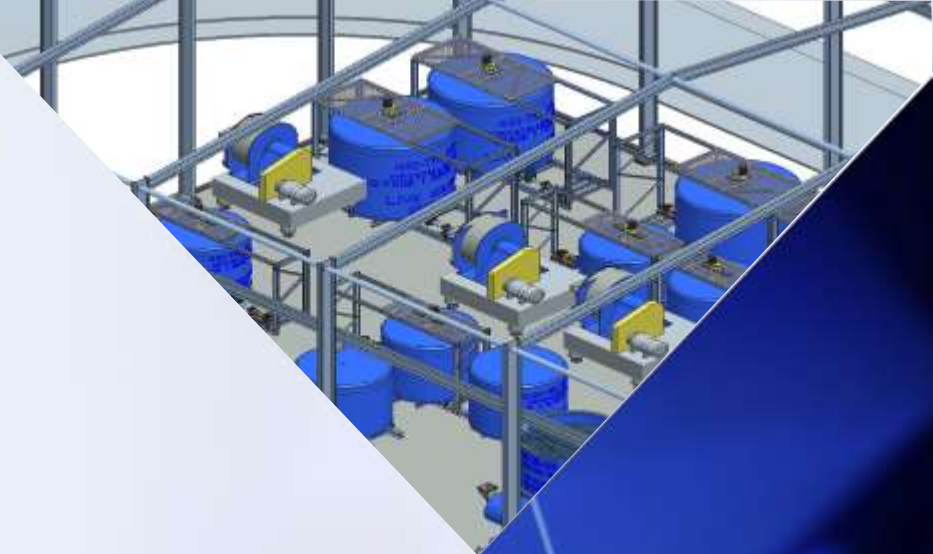




**Altech Chemicals**  
Limited

- Capital cost estimate US\$76.9 m
- Payback period 3.8 years
- Pre-tax NPV<sub>10</sub> of US\$326 m
- Highly attractive IRR of 30.3%
- Operating cost of US\$8,200/t
- Margin of US\$14,800/t
- Operating profit of US\$59.4m pa
- Breakaway values ATC 31c p share

**Highly  
Attractive  
BFS**

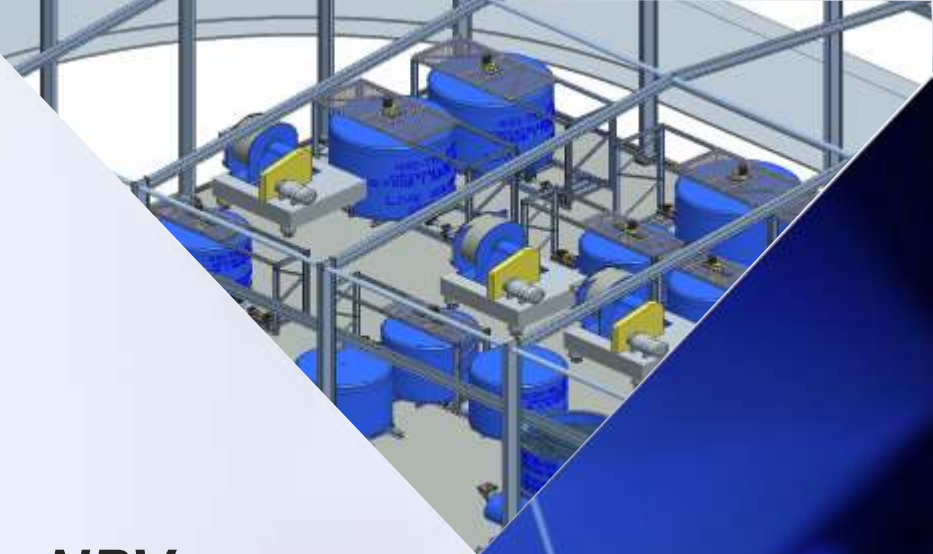




**Altech Chemicals**  
Limited

***“It is not often that you see the NPV (US\$ 326m) of a project, 4 times the multiple of the capital cost estimate (US\$77m)” Iggy Tan MD***

**Highly  
Attractive  
BFS**

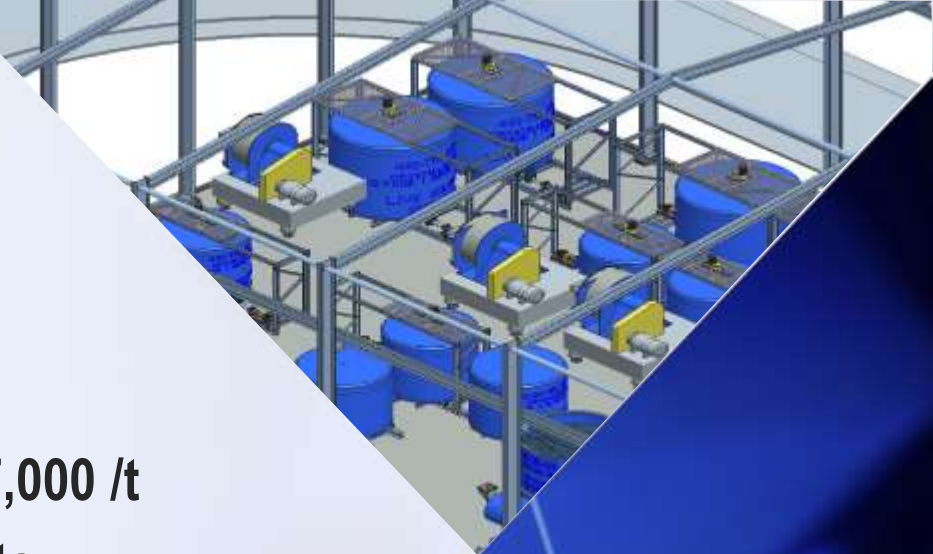




**Altech Chemicals**  
Limited

- Breakway - competitors US\$14-17,000 /t
- Bottom quartile for operating costs
  1. We own our feedstock
  2. Large scale economy 4,000 tpa – one train
  3. Main reactant HCl re-used
  4. Minimal impurity removal costs
  5. Plant in low cost country (Malaysia)

**Bottom  
Quartile  
for Op Costs**



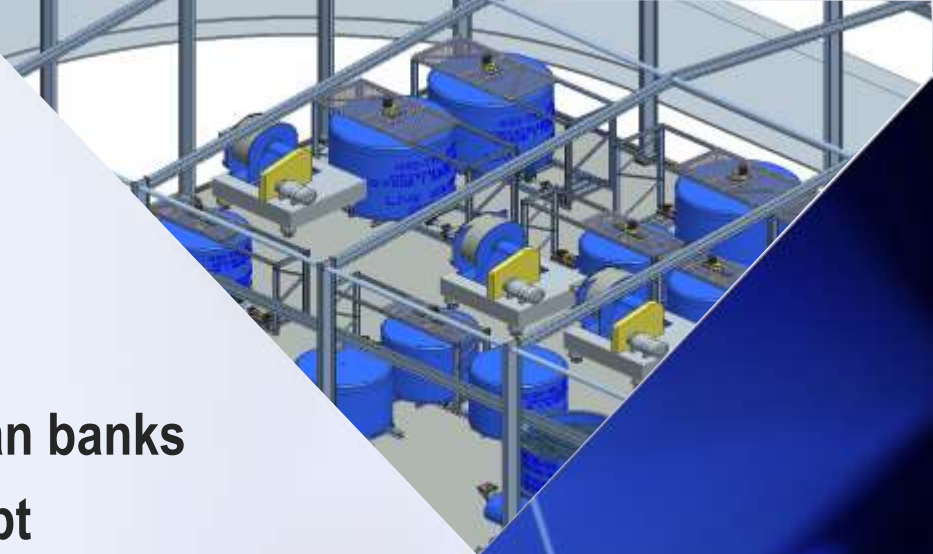




**Altech Chemicals**  
Limited

- Commenced discussions with Asian banks
- Targeting around \$55 m project debt
- Structured project finance options
- Europe based bonds
- Product off take phase
- MIDA tax incentives
- Detailed engineering & permitting

**Project  
Finance  
Phase**



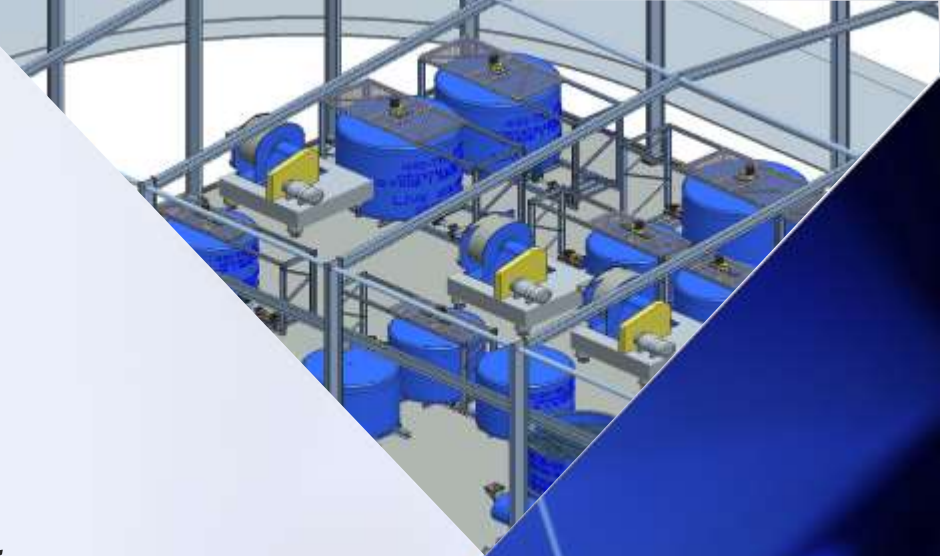
# Our Potential Customers





**Altech Chemicals**  
Limited

***“HPA will be part of the next “new age materials boom” like rare earths, lithium and graphene”*** Iggy Tan





*Right Place*  
*Right Time*  
*Right Feedstock*  
*Right Technology*



**Thank you**



### **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.

### **Competent Person Statement**

Technical information in this report is based on information compiled by Mr Michael O'Mara, B.Sc. Geology, Altech Chief Geologist and a member of the Australasian Institute of Geoscientists. Mr O'Mara has sufficient exploration experience which is relevant to the styles of mineralisation and types of deposit under consideration and to the activity which he is undertaking to qualify as a Competent Person as defined in the 2012 Edition of the 'Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves' ("JORC 2004"). Mr O'Mara consents to the inclusion in this release of the matters based on his information in the form and context in which it appears.