

Metal Bulletin
Events

5th 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



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



Our Vision





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

The background of the slide is a collage of gemstones. The top right corner shows a cluster of blue sapphires. The bottom right corner shows a cluster of red rubies. The text 'Sapphire Gemstone' is overlaid on the blue sapphire section.

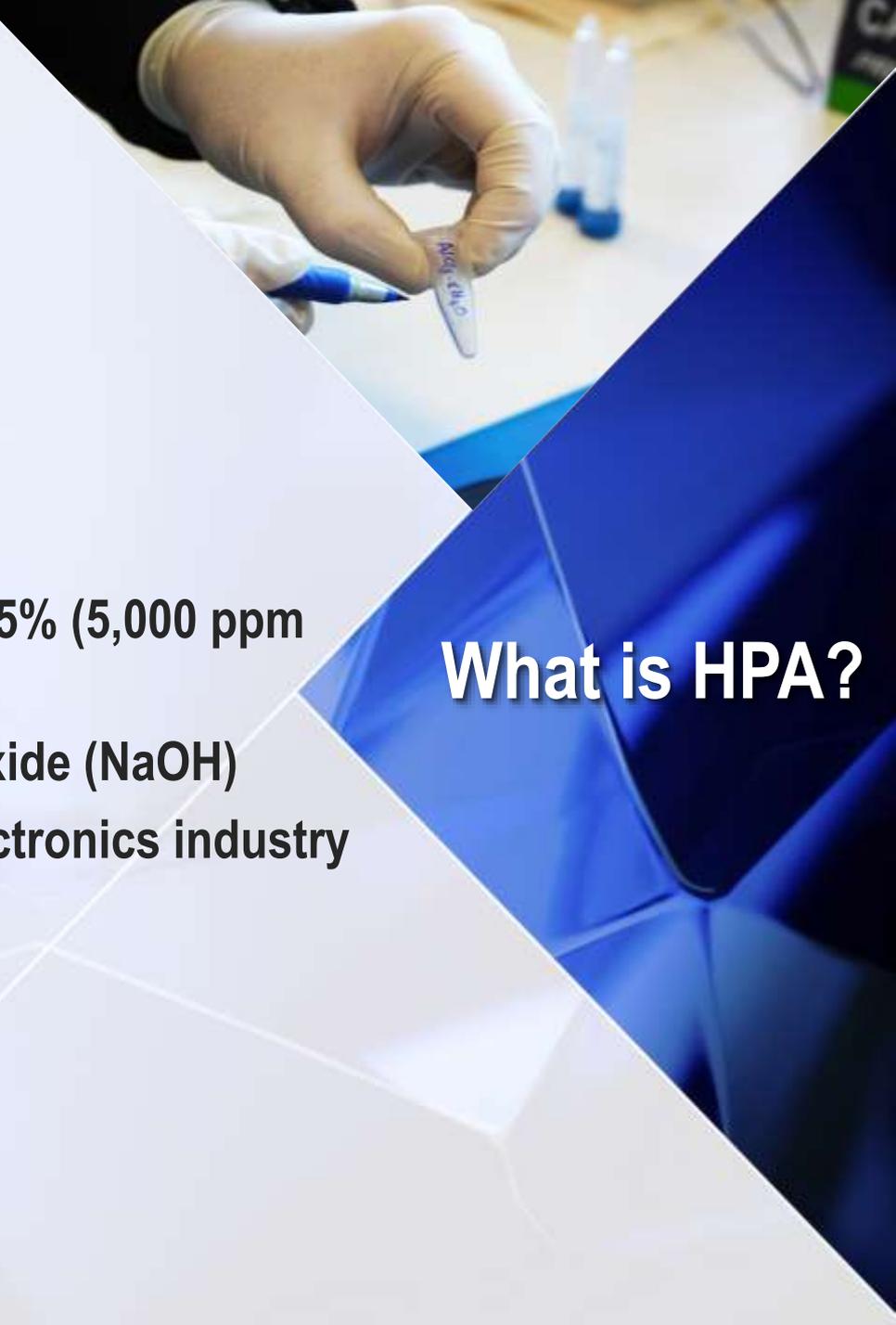
**Sapphire
Gemstone**



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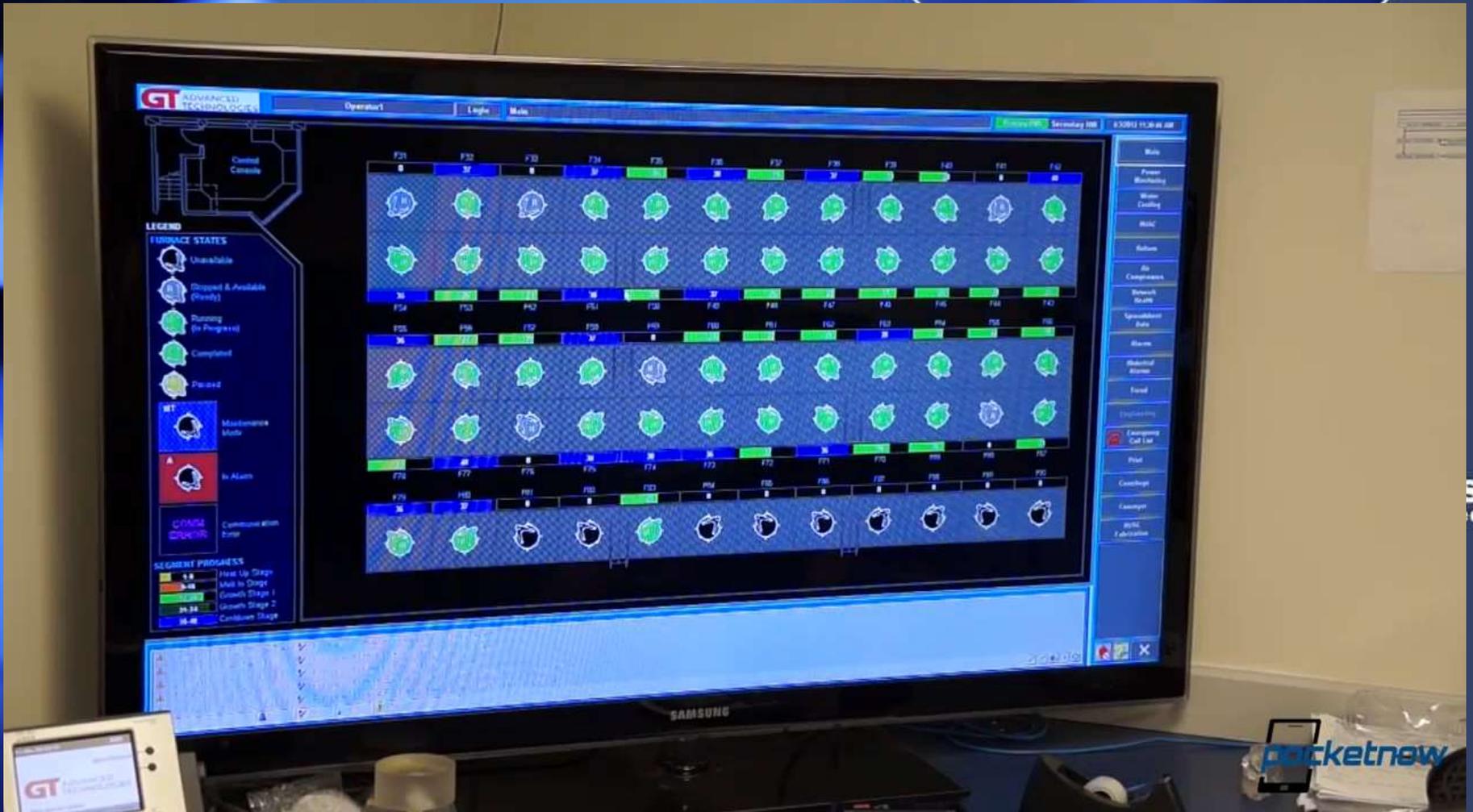
- Purified alumina (Al_2O_3)
- Greater than 99.99% (4N) purity
- Max impurities of 100ppm
- Smelter Grade Alumina (SGA) ~ 99.5% (5,000 ppm impurities mainly sodium)
- Bayer Process uses sodium hydroxide (NaOH)
- Sodium impurity is problem for electronics industry

SGA – Smelter Grade Alumina



What is HPA?

Sapphire Glass Production





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**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

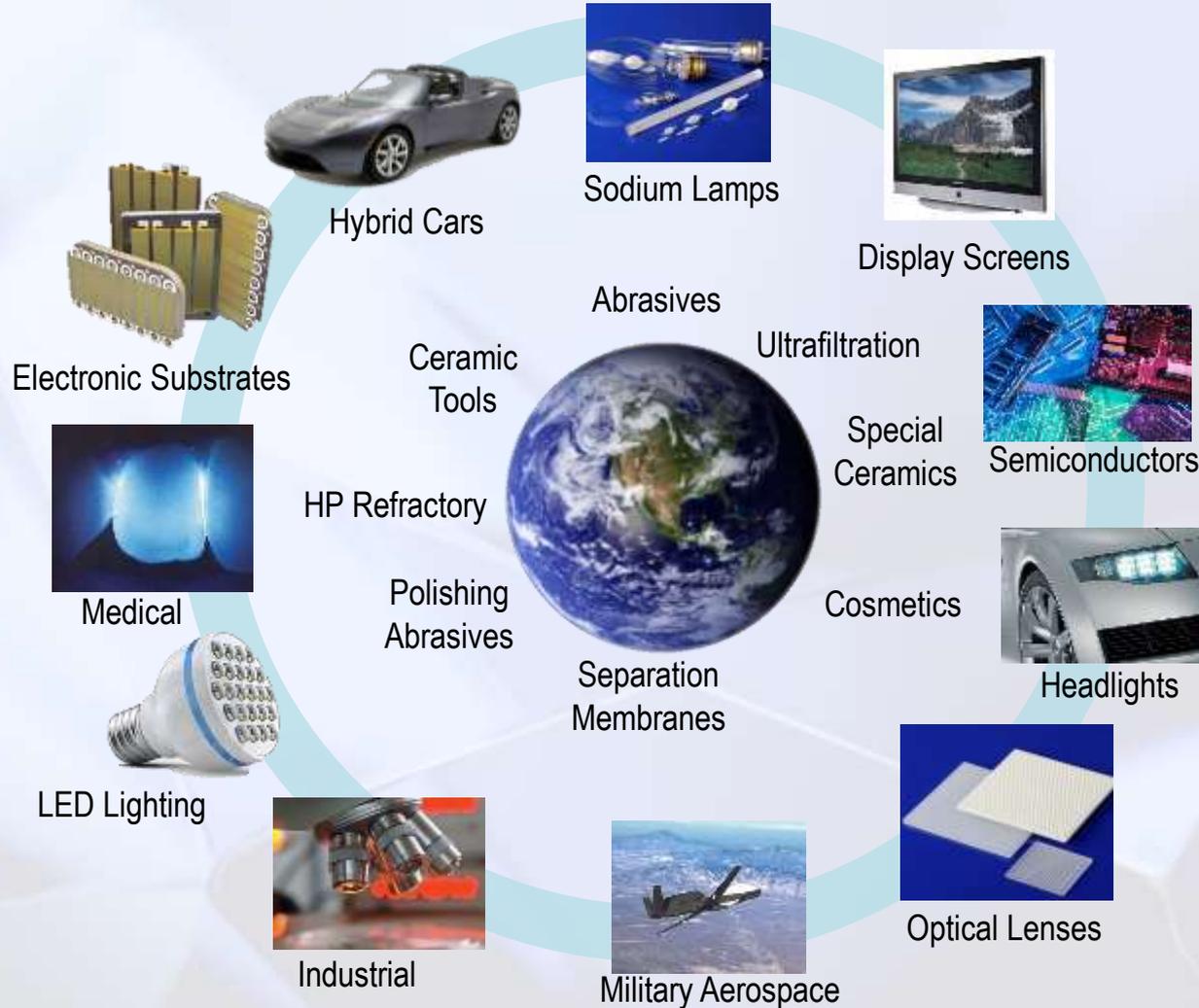
HPA substrate for LEDs

**High Price
for Purity**



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Welcome to the World of HPA





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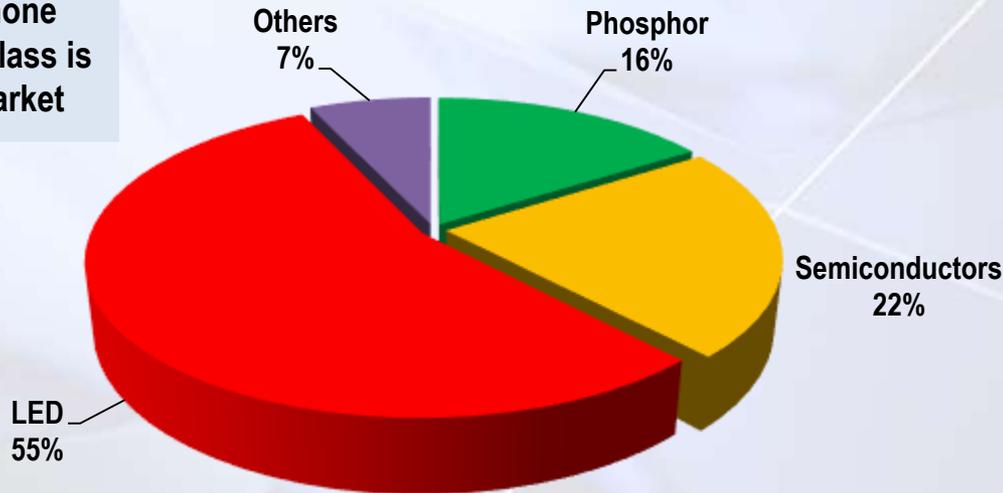


**High Purity
Alumina
Applications**



**Uses of HPA
99.99% 4N**

Smartphone
sapphire glass is
a new market



Light Emitting Diodes (LEDs)





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Technavio Research

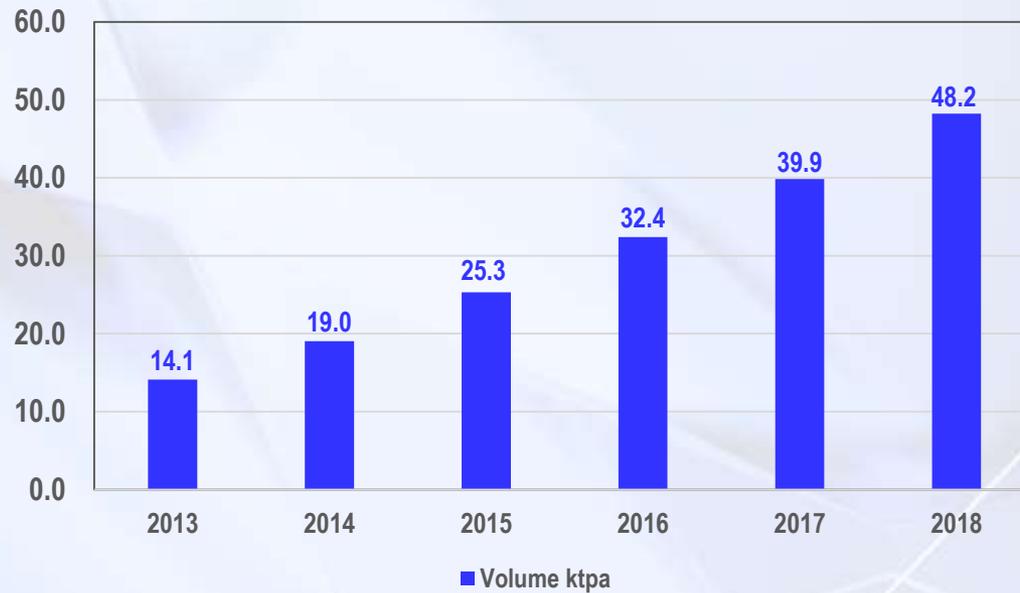
- Global HPA demand 19,040tpa in 2014
- Expected to increase to 48,230tpa by 2018
- Growing at a CAGR of 28%

**Demand
for HPA**



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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**



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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



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sapphire
glass



iPhone 7

apple watch
& iphone 7

INTERNATIONAL BUSINESS TIMES

AU 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



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- Estimate 30g¹ 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

Non-scratch sapphire glass

**HPA
Demand from
Smartphones**

Sapphire glass in smartphones

Sapphire Glass Scratch Test



Stone wall

New Foxconn plant reported to make sapphire displays for iPhones

2014/11/25 22:54:27



LIST

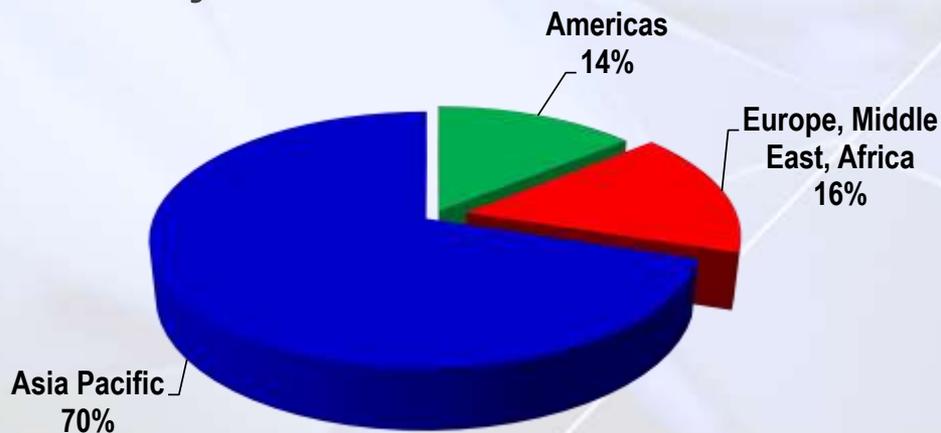
Taipei, Nov. 25 (CNA) Taiwan's Foxconn Technology Group, a major supplier of Apple Inc.'s iPhones and iPads, has decided to build a new factory in China to produce sapphire displays for next-generation iPhones, according to a Chinese media report.

**More
Sapphire
Display
Factories**



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- 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



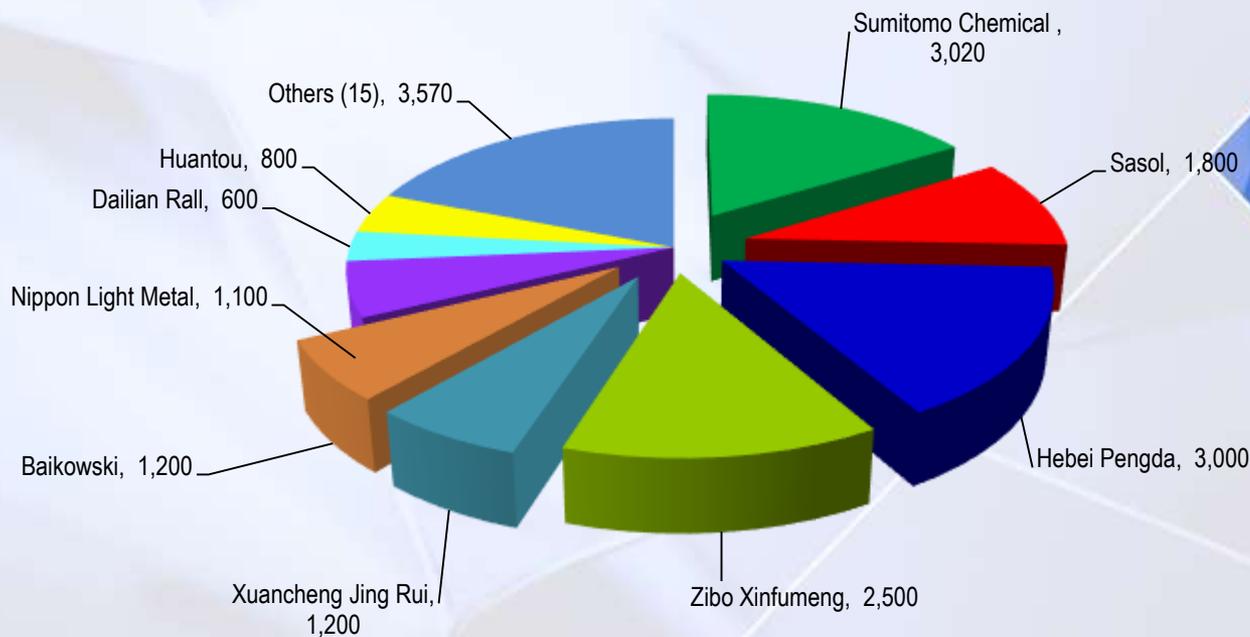
HPA
Geographic
Demand





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



**Current HPA
Producers**



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Altech's Differentiation

Current HPA Producers



Bauxite

Alumina Refinery



Smelter Grade Alumina 99.8%

Alumina Smelter



Aluminium Metal

Aluminium Dissolution



99.99% HPA

US\$2,000 per tonne



Aluminous Clay

ALTECH HPA PLANT

One Single Process Step



99.99% HPA



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

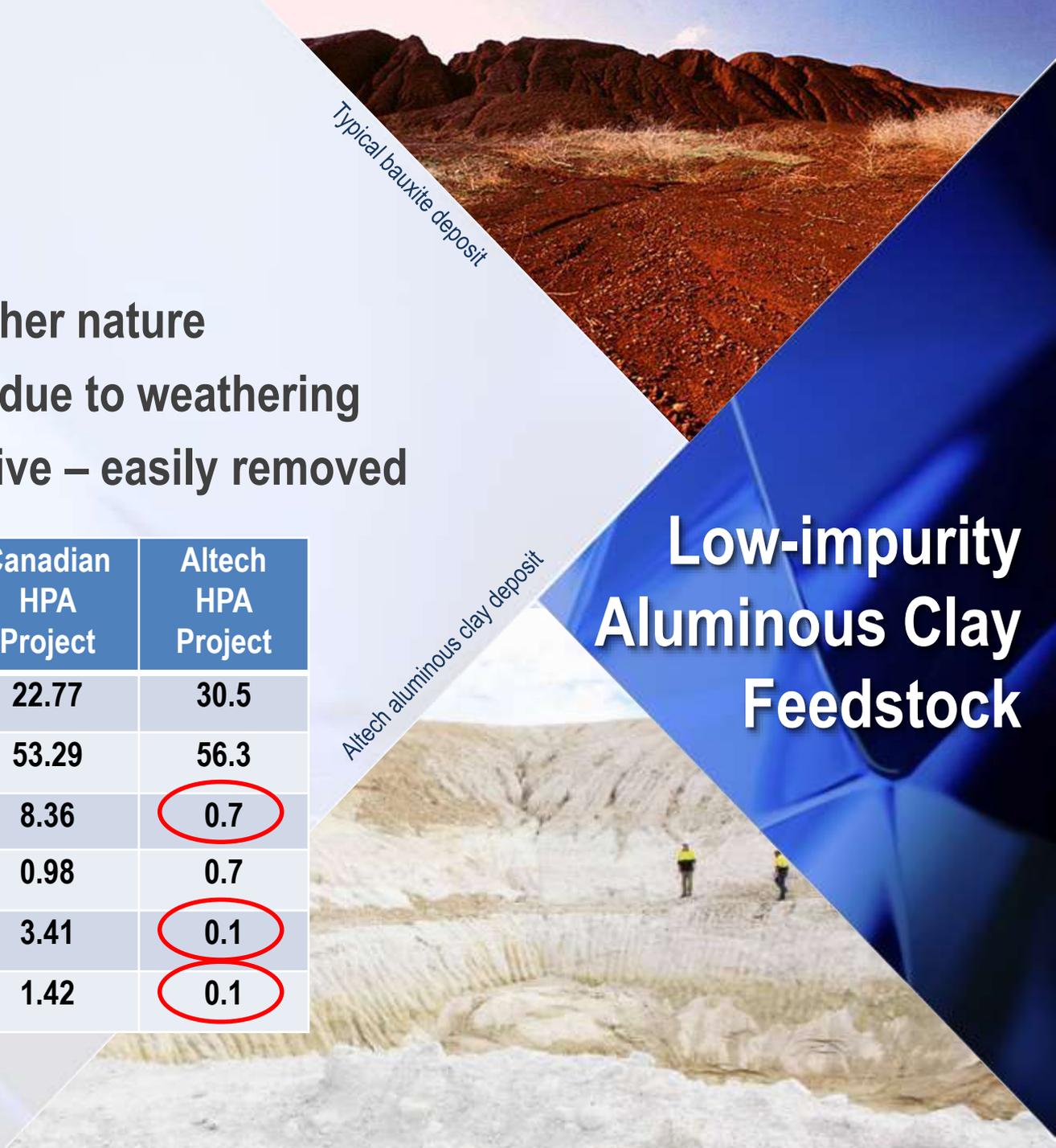
	Bauxite Darling Range *	Canadian HPA Project	Altech HPA Project
Al ₂ O ₃ (%)	34.5	22.77	30.5
SiO ₂ (%)	21.5	53.29	56.3
Fe ₂ O ₃ (%)	21.2	8.36	0.7
TiO ₂ (%)	2.00	0.98	0.7
K ₂ O (%)	0.24	3.41	0.1
NaO (%)	0.005	1.42	0.1

Typical Mean Analysis

Typical bauxite deposit

Altech aluminous clay deposit

**Low-impurity
Aluminous Clay
Feedstock**





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- **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



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- 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





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



**Altech
Business
Strategy**

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



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- **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**

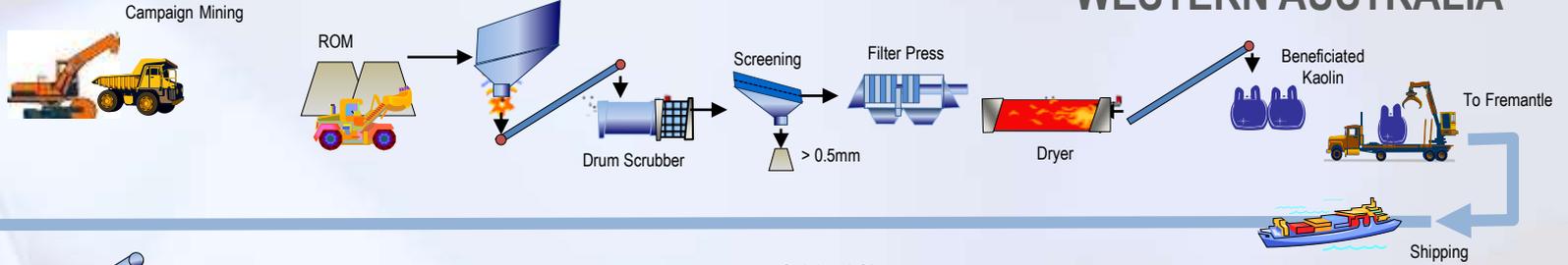




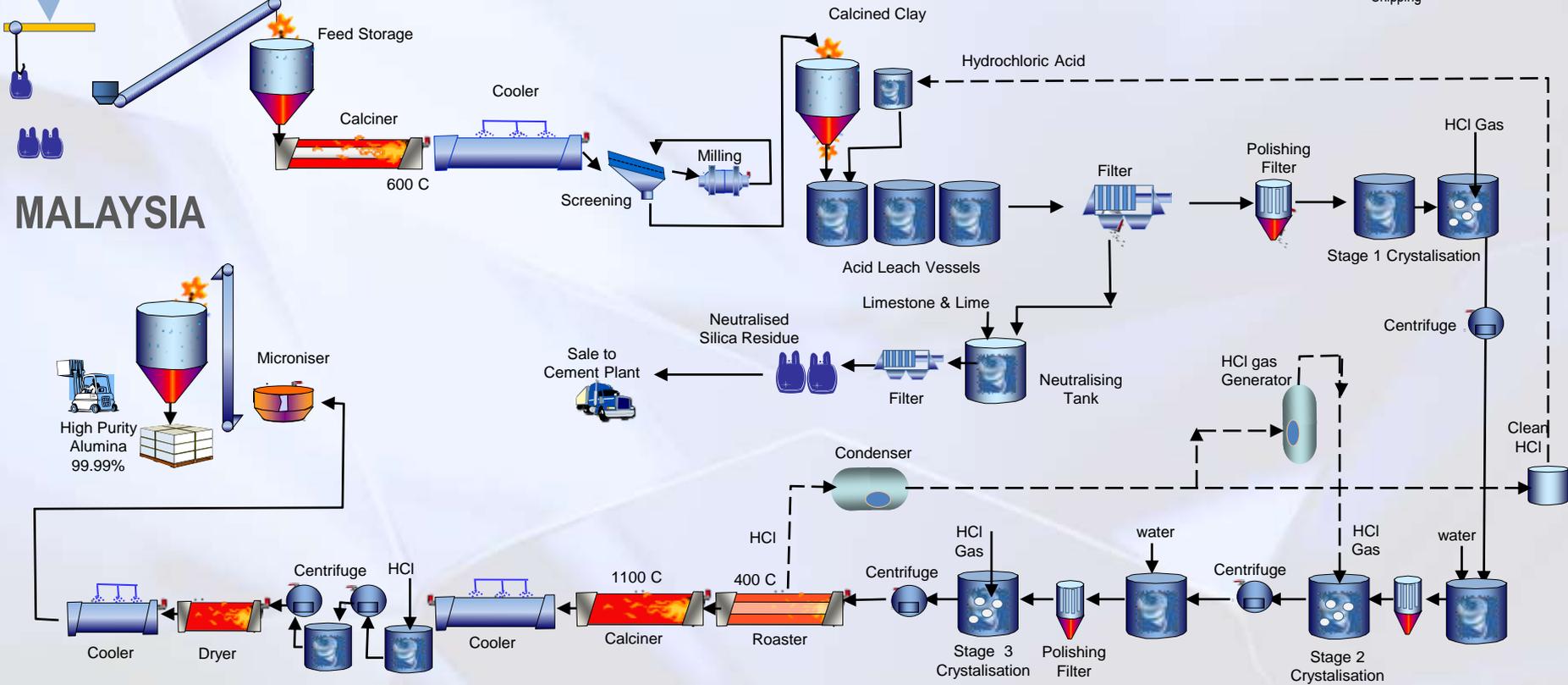
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Altech HPA Process

WESTERN AUSTRALIA



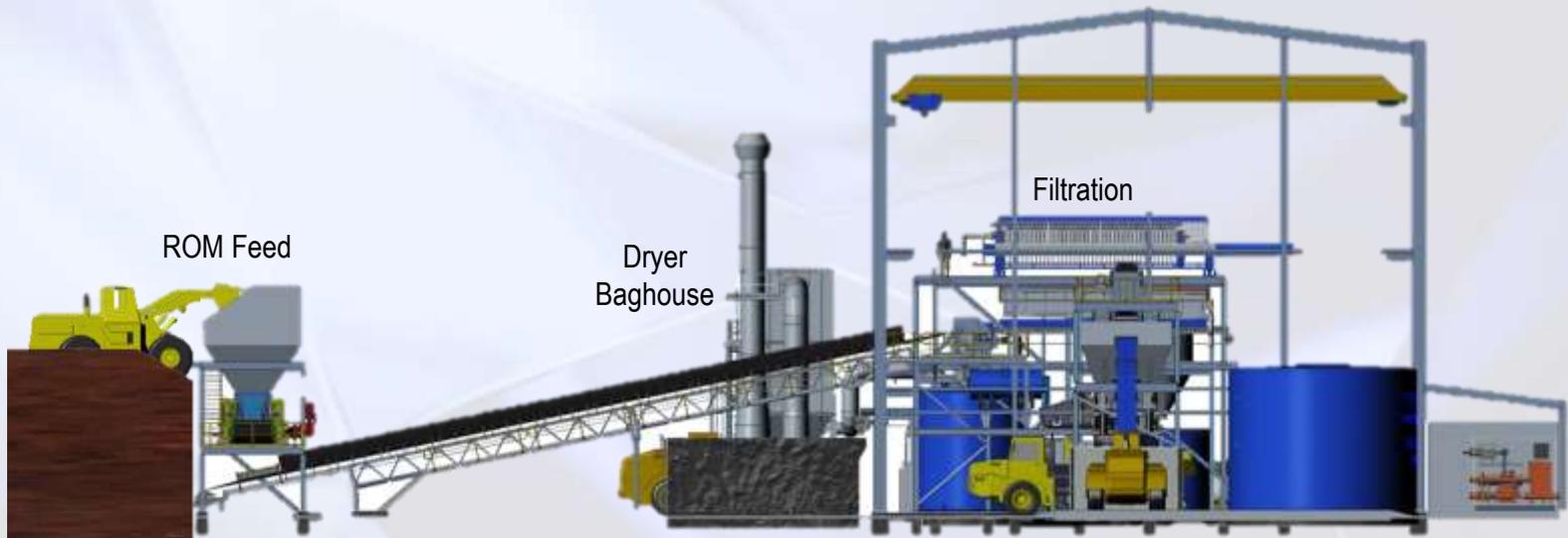
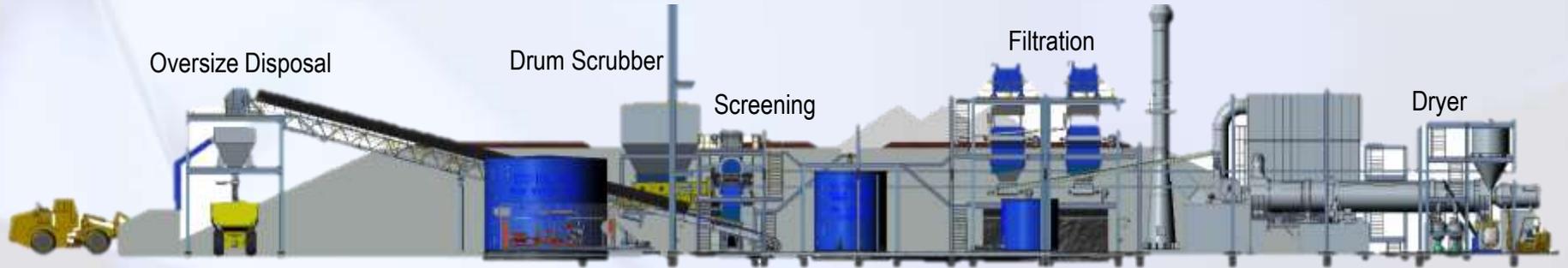
MALAYSIA



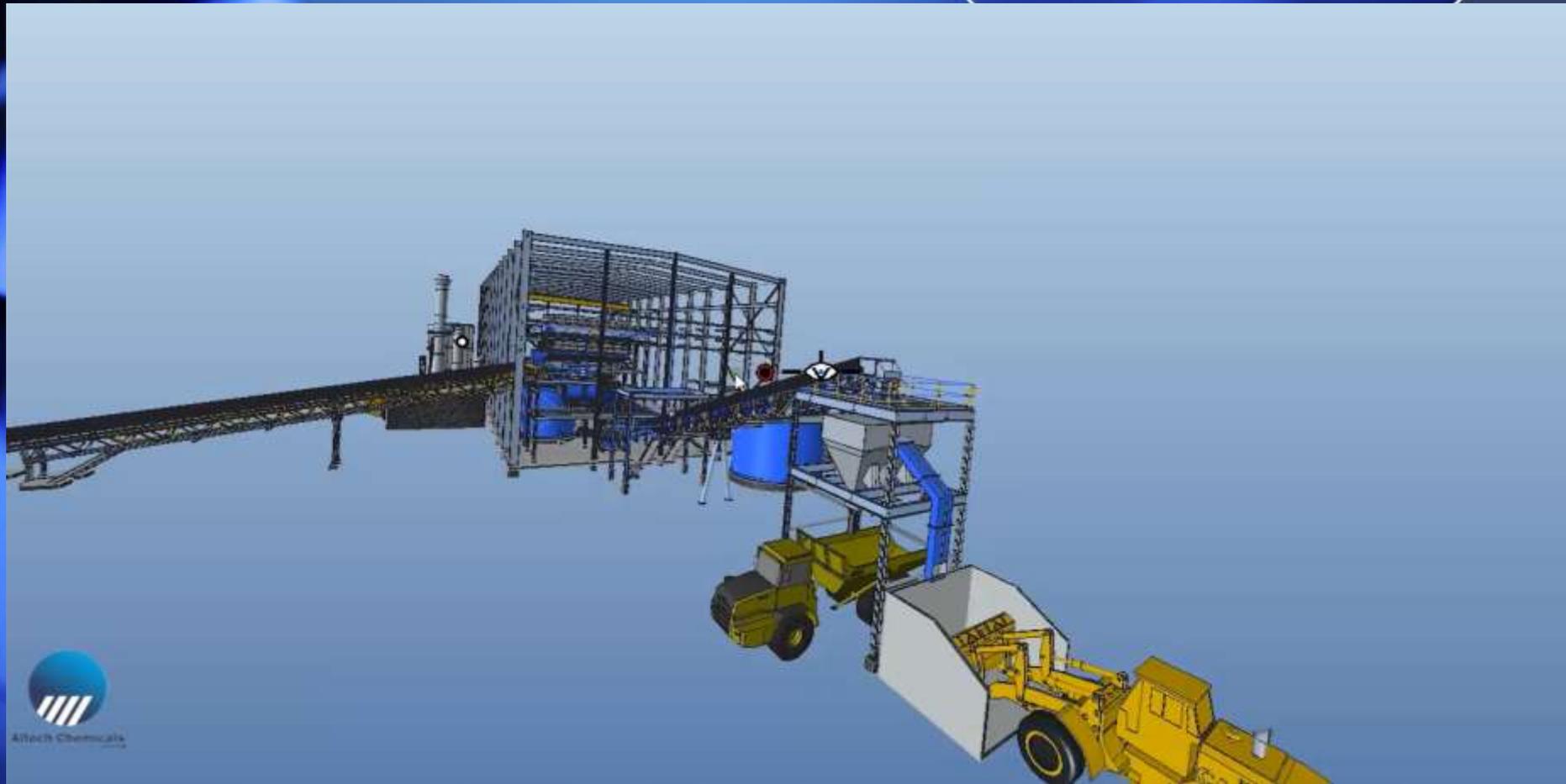


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Meckering Plant



Meckering Plant



Atach Chemicals



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Beneficiated Kaolin Shipping

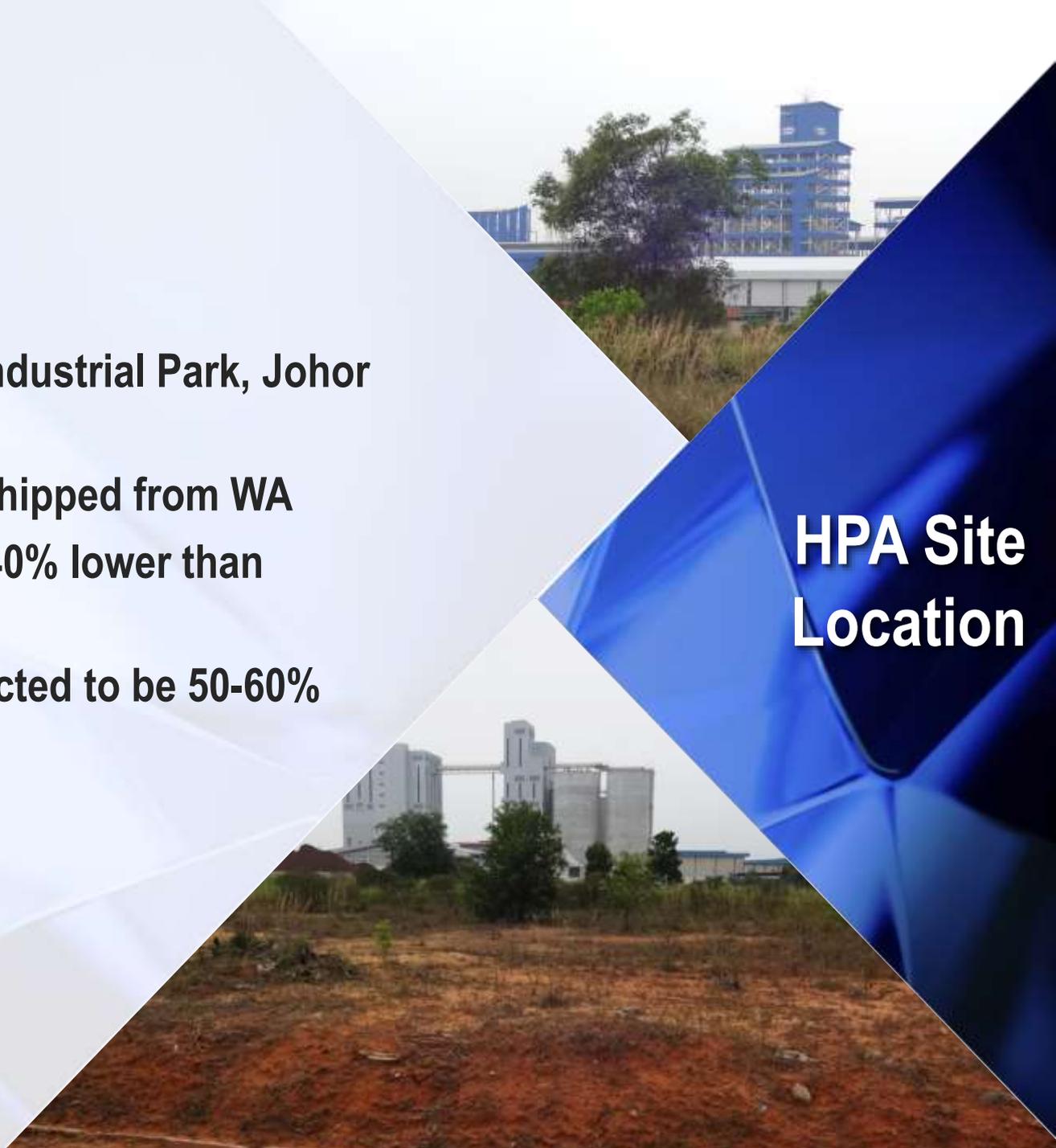




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- **Tanjung Langsat Industrial Park, Johor Bahru (Malaysia)**
- **Kaolin feedstock shipped from WA**
- **Operating costs ~40% lower than Australia**
- **Capital costs expected to be 50-60% lower**

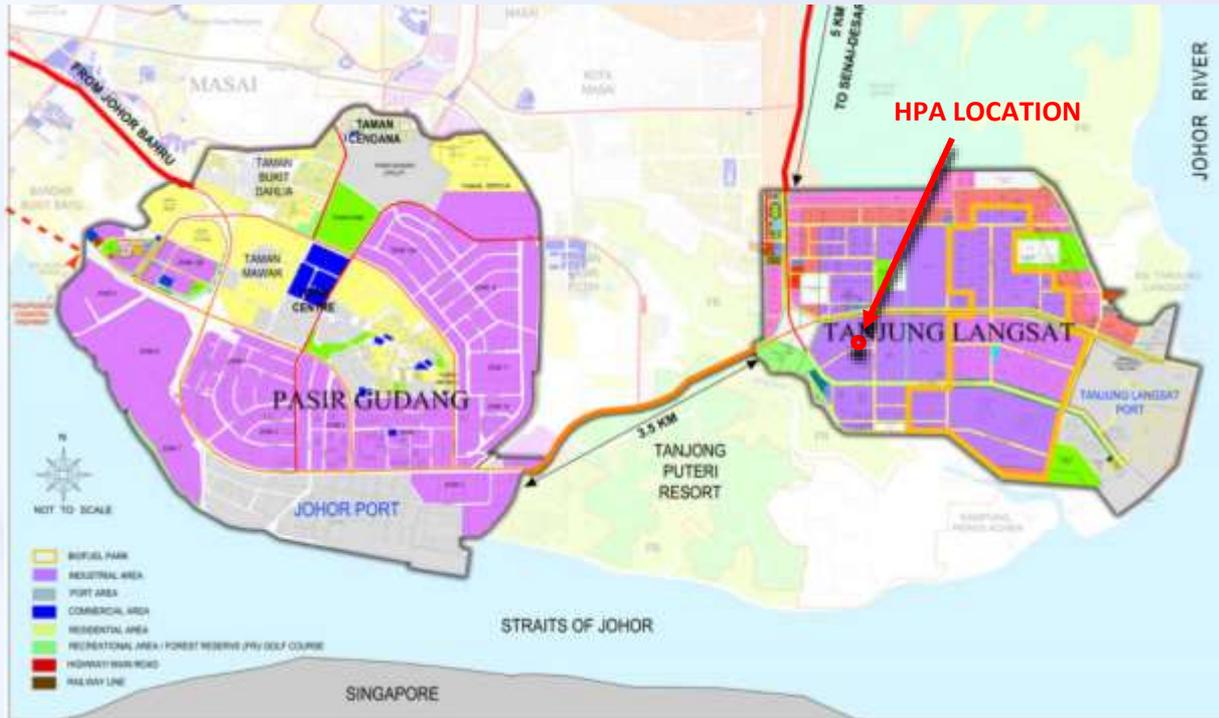
**HPA Site
Location**





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Malaysian HPA Operation



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

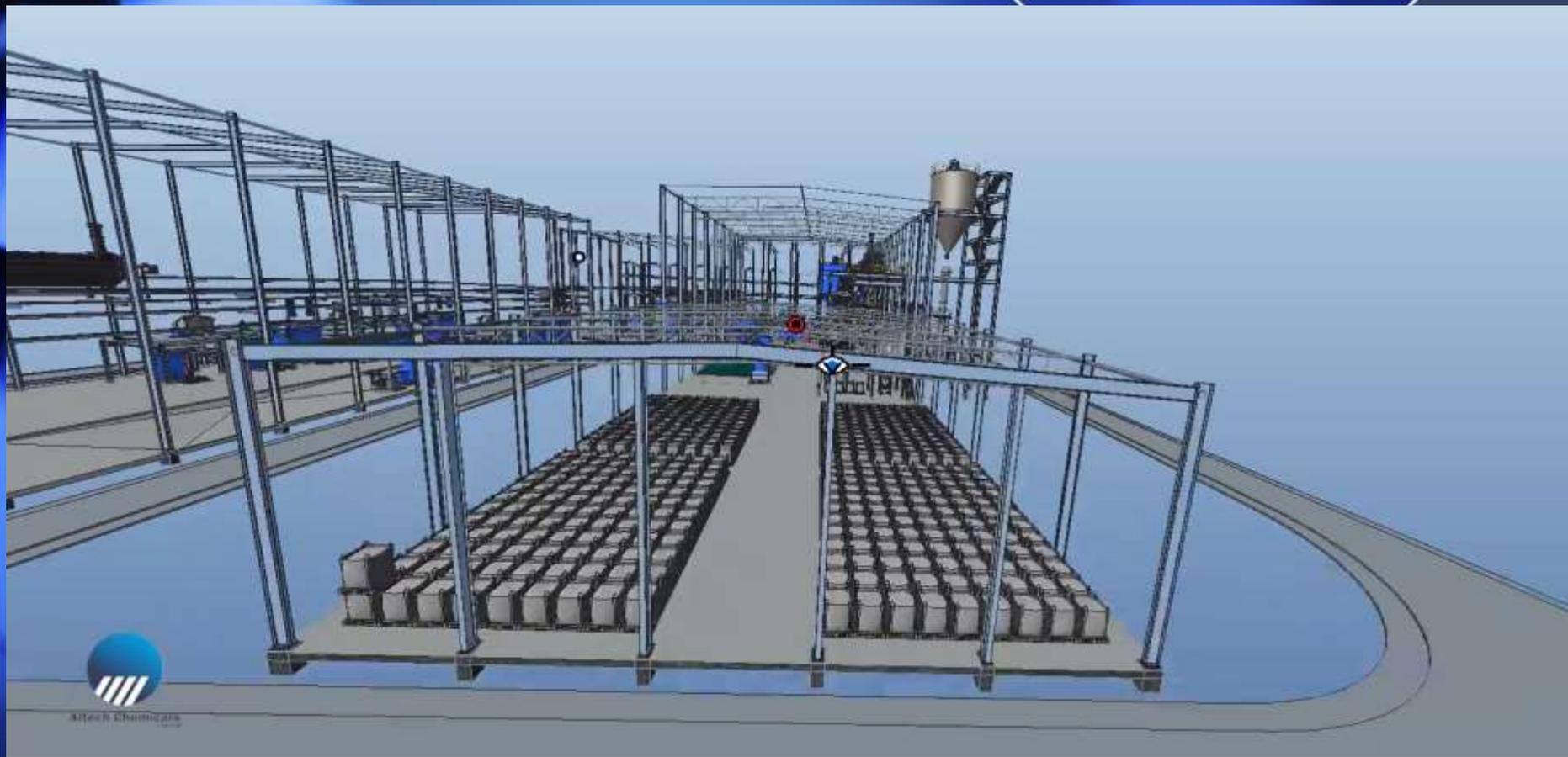


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Malaysian HPA Operation



Malaysia HPA Plant



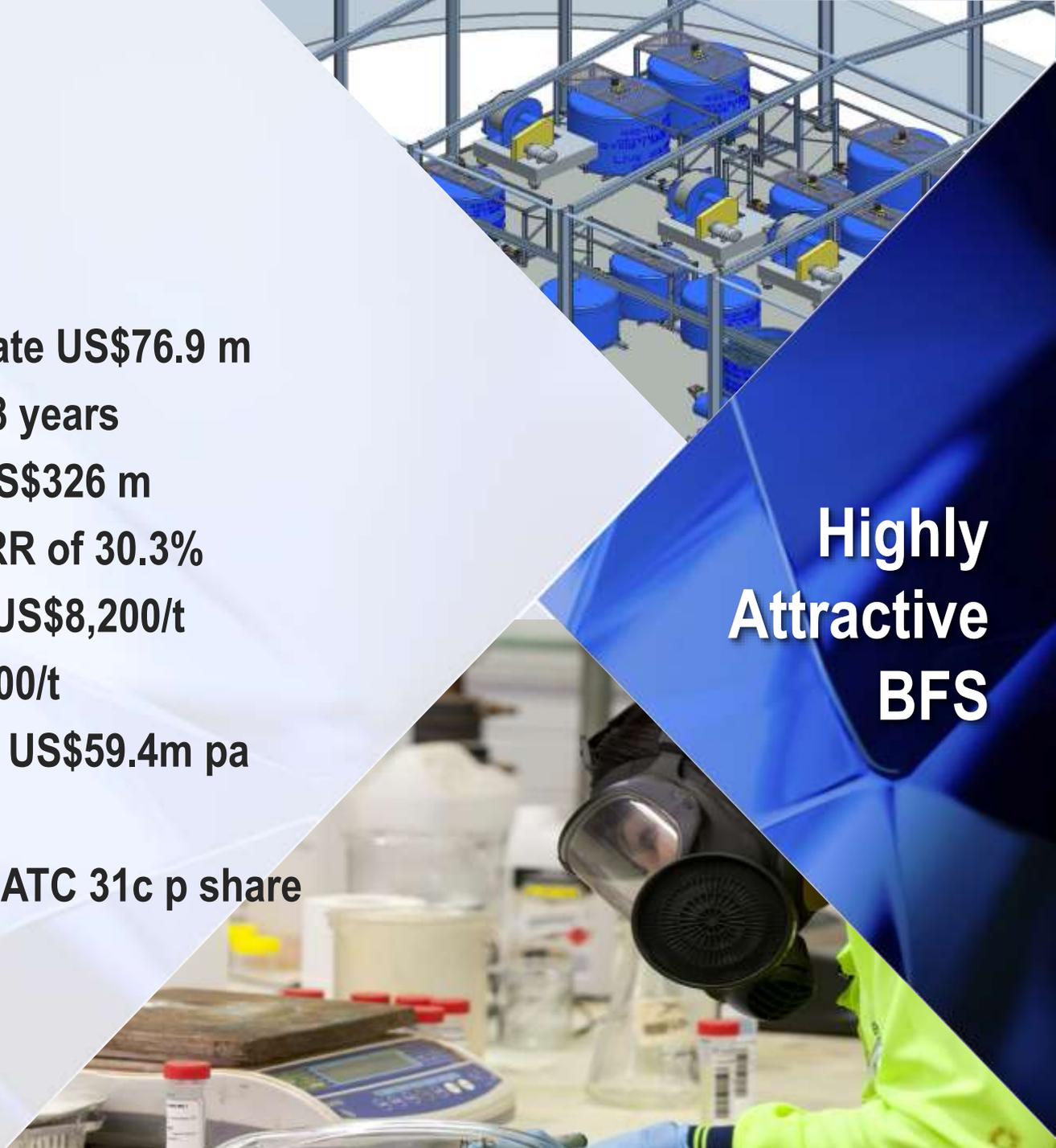


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- **Capital cost estimate US\$76.9 m**
- **Payback period 3.8 years**
- **Pre-tax NPV₁₀ of US\$326 m**
- **Highly attractive IRR of 30.3%**
- **Operating cost of US\$8,200/t**
- **Margin of US\$14,800/t**
- **Operating profit of US\$59.4m pa**

- **Breakaway values ATC 31c p share**

**Highly
Attractive
BFS**





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“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**

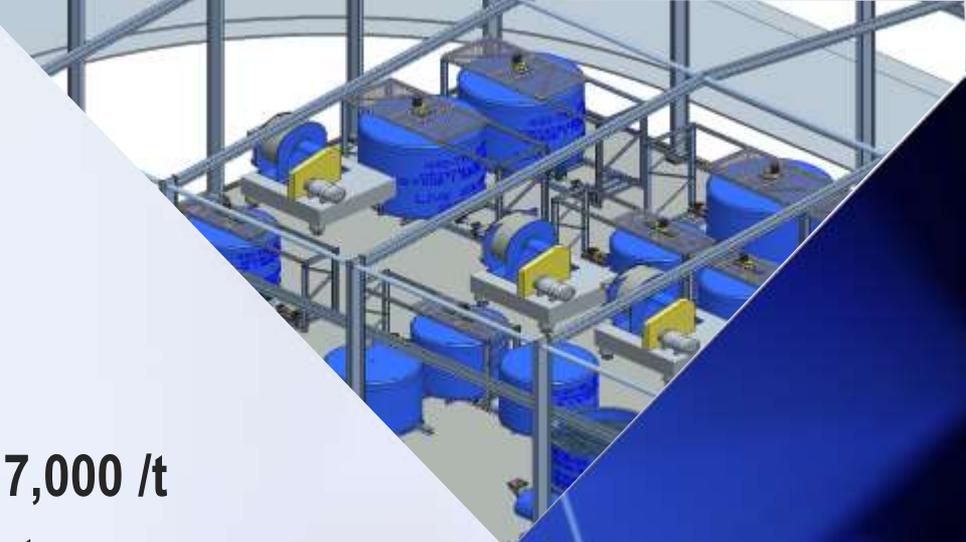




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- **Breakway - competitors US\$14-17,000 /t**
- **Bottom quartile for operating costs**
 1. **We own our feedstock**
 2. **Large scale economy 4,000 tpa – one train**
 3. **Main reactant HCl re-used**
 4. **Minimal impurity removal costs**
 5. **Plant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

**Bottom
Quartile
for Op Costs**





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- **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**

The background of the slide is a collage of images. The top right shows a 3D rendering of industrial tanks and piping. The bottom right shows a close-up of a person in a lab coat using a pipette in a laboratory setting. The text 'Project Finance Phase' is overlaid on a blue diagonal band.

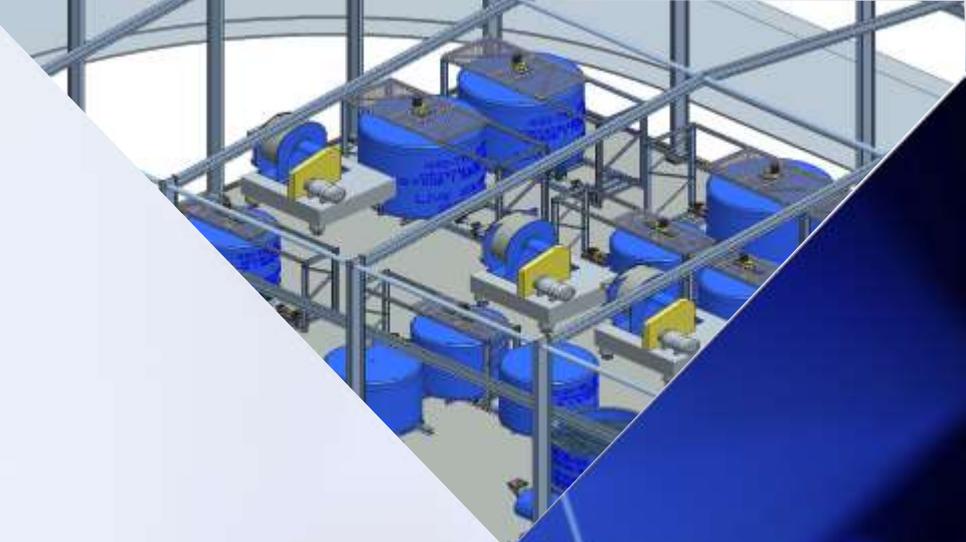
Our Potential Customers





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





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Right Place
Right Time
Right Feedstock
Right Technology



Thank you



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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.