

**Altech Chemicals Limited ASX: ATC FRA:A3Y**

**Company Presentation**  
**June 2018**

**Iggy Tan**  
**Managing Director**



**Altech Chemicals**  
Limited

**World leading producer of  
high purity alumina (HPA)**



**4,500 tonnes pa**

**Our Vision**





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- Sapphire gemstone
- Natural form of high purity alumina (HPA)  $\text{Al}_2\text{O}_3$
- Formed by mother nature like diamonds
- Colour from impurities
- Nearly as hard as diamond (Mohs 9)

**Sapphire  
Gemstone**







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- Purified alumina ( $\text{Al}_2\text{O}_3$ )
- 99.99% (4N) purity or greater
- Smelter Grade Alumina (SGA) ~ 99.5% (5,000ppm impurities, mainly sodium)
- Bayer Process uses sodium hydroxide (NaOH)
- Sodium impurity is a problem for sapphire and lithium batteries

**What is HPA?**



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



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



**High Purity  
Alumina**  
HPA 99.99% (4N)  
**US\$27,000 per t**



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

**Our Target Business**

4N HPA produces synthetic sapphire glass

HPA substrate for LEDs

**High price  
for purity**

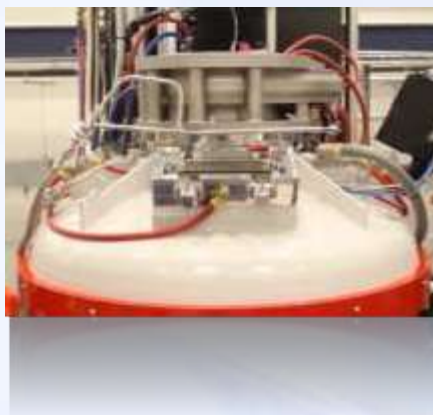


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# LEDs & LITHIUM-ION BATTERIES



Sapphire Furnace (2,000 °C)



Sapphire Crystal Boule



Sapphire Wafer LEDs



Nano Powder



Separator Coatings



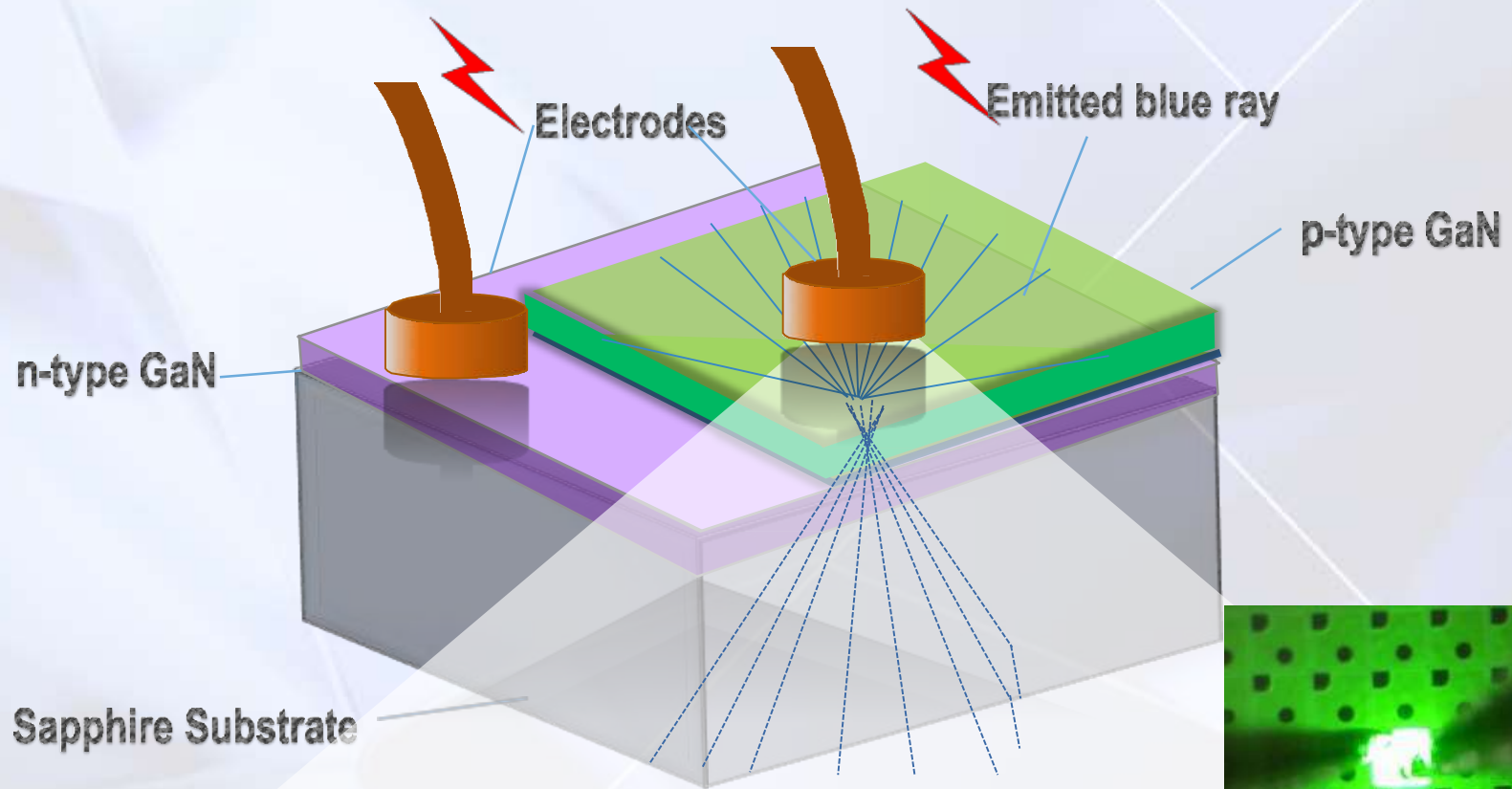
LITHIUM-ION  
BATTERIES





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# Light Emitting Diode







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# LED Expansions

**Osram opens \$440M Malaysian plant amid world's widening clamor for LED chips (UPDATED)**

NOVEMBER 24, 2017 BY RAHUL1

Energy Efficient Lighting Market  
Rising at a CAGR of 13.4% from  
2016 to 2024, will reach to US\$15  
bn by 2024

LED UPSTREAM | LED APPLICATIONS |

ARTICLE COMMENTS (0) RELATED CONTENT

PRINT EMAIL

## **Sanan Optoelectronics to set up LED production base in southeastern China**

*Siu Han, Taipei; Adam Hwang, DIGITIMES [Thursday 7 December 2017]*

The largest China-based LED epitaxial wafer and chip maker Sanan Optoelectronics has announced it will invest CNY33.3 billion (US\$5.03 billion) to set up an LED production base in Quanzhou, southeastern China.

**Xiamen Changelight Purchases AIXTRON MOGVD Technology to Expands ROY LED Production**



# Sapphire Glass

Vertu TI luxury smartphone



## HTC U Ultra

- February 2017
- Sapphire crystal display

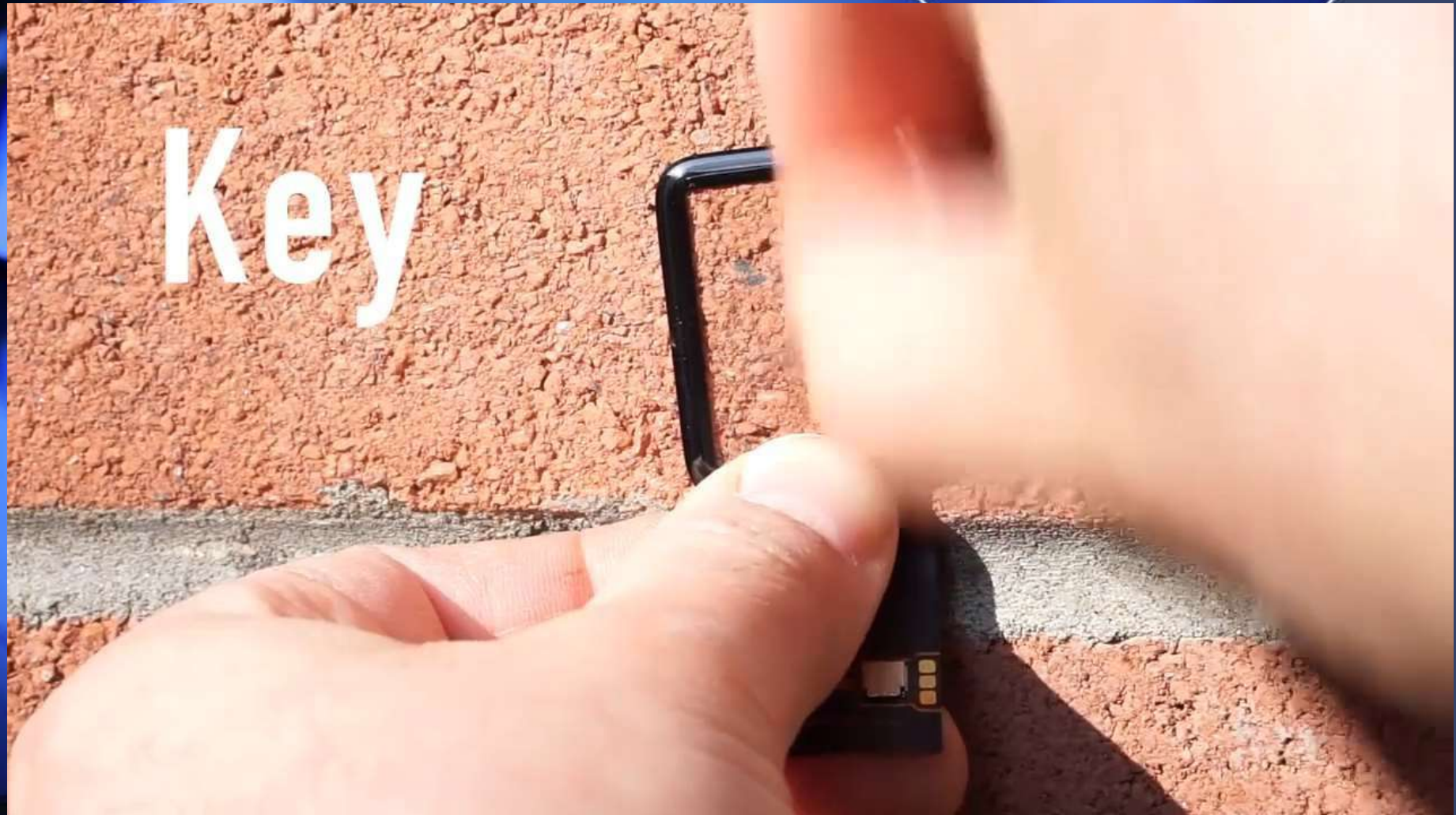


## iPhone

- Sapphire crystal lens
- Finger print recognition

**Smartphone  
sapphire screen**

# Sapphire Glass Scratch Test

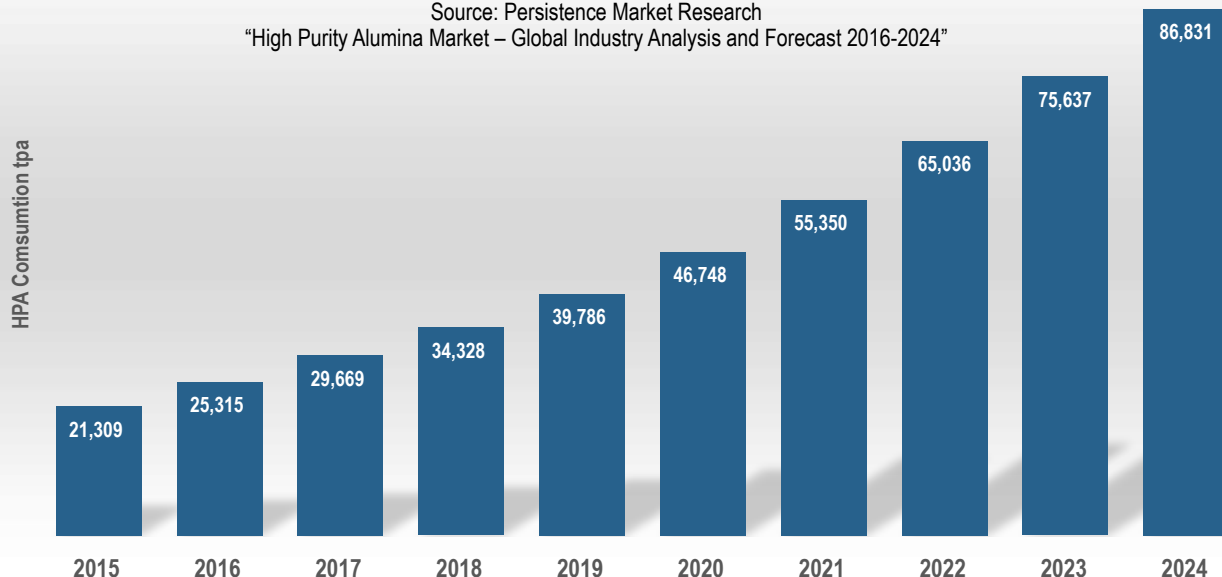




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## Global High Purity Alumina Forecast 2016-2024

Source: Persistence Market Research  
"High Purity Alumina Market – Global Industry Analysis and Forecast 2016-2024"



**Demand  
for HPA**

- 13 times ATC's 4,500 tpa required to meet growth
- Global LED demand increase to 4.1 B units by 2024 (2015: 864 million)

Source: Navigant Research "LED Lighting: Global Outlook"



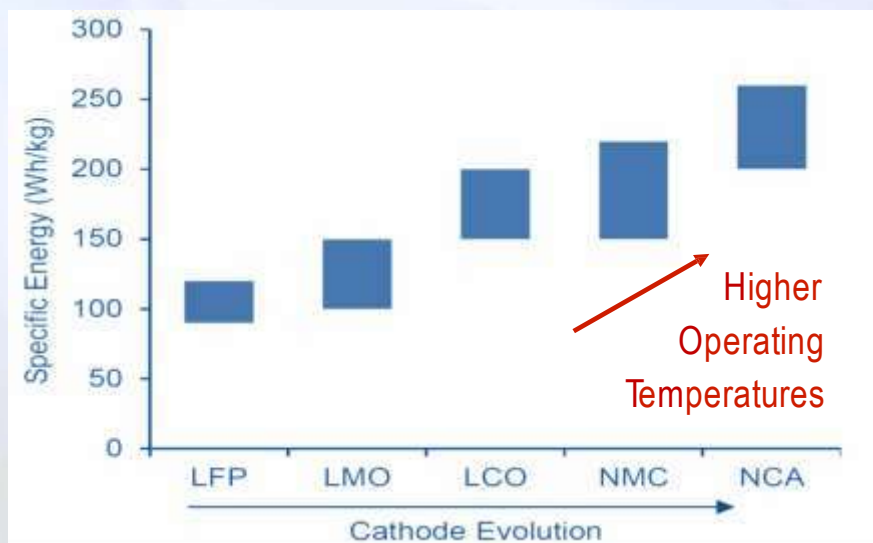


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# Battery Energy Density vs Temp



**Battery costs are reducing due to increased energy density**

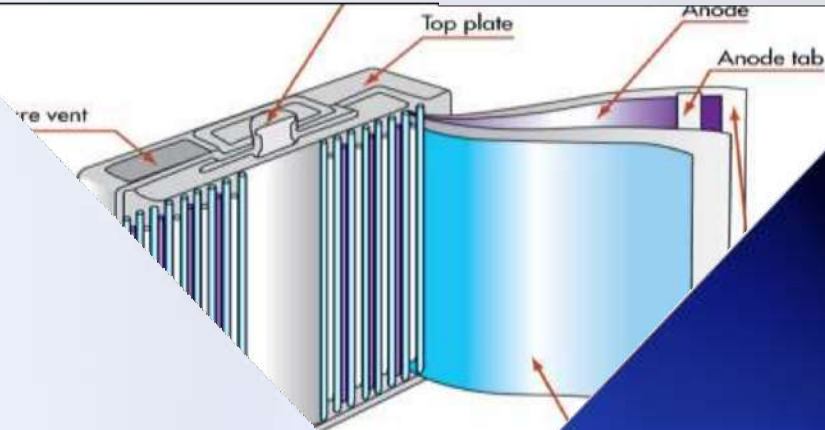


**Cathode changes increases energy density**

**Consequence – higher operating temperatures**

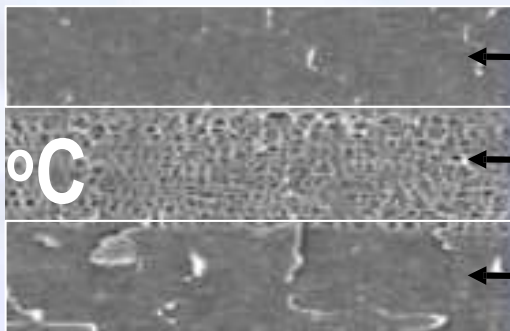


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## Normal Polymer Separators

**<135 °C**

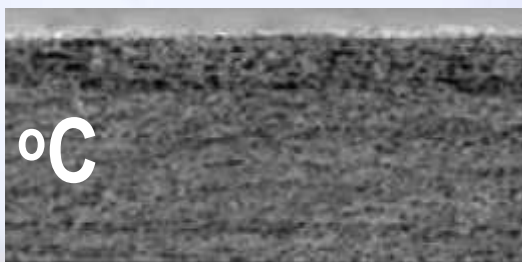


← Polypropylene (PP) 155 °C

← Polyethylene (PE) 135 °C

← Polypropylene (PP) 155 °C

**>200 °C**



← HPA layer

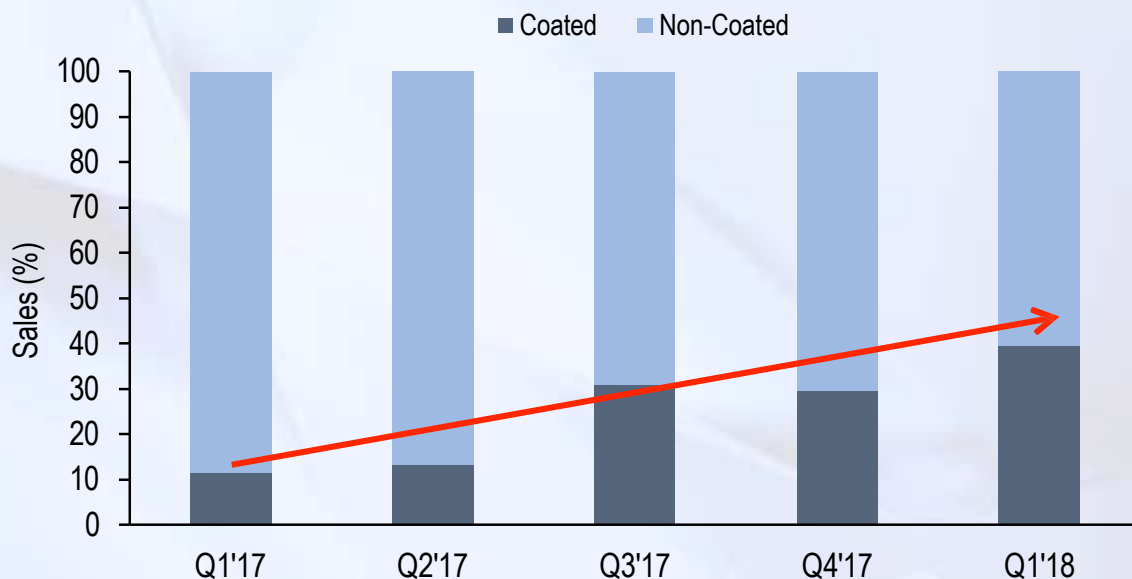
← Polymer membrane

HPA Coated Separators (HPACS)

**HPA  
required  
for higher  
temps**

# HPA Coated Separators (HPACS)

W Scope Sales Data



**Japanese separator  
manufacturer reports  
40% HPA coated separators  
11% only 12 months ago**

- **HPA coated separator rapid penetration rates**

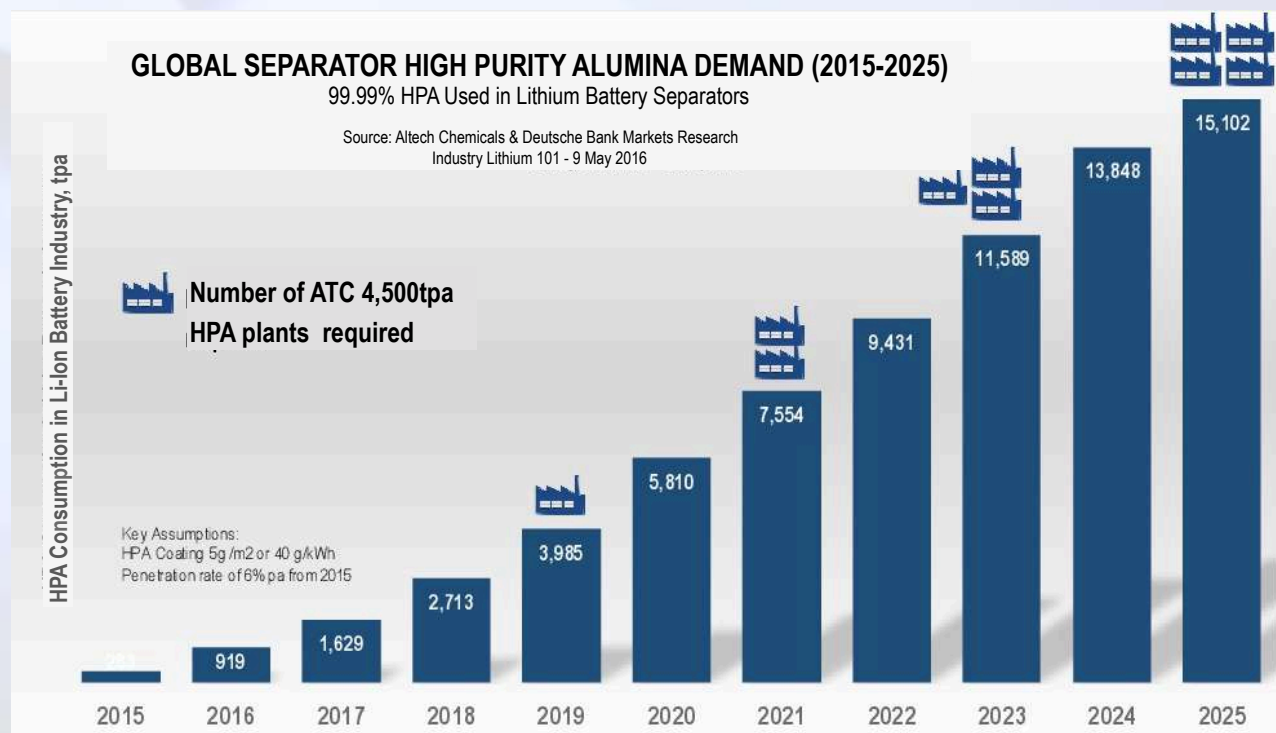




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- 1.6kg HPA for average EV car (40 KWh)
- 6.4kg HPA for EV Bus (160 kWh)



**Altech  
Separator  
HPA  
Forecast**

# HPA Separators Demand Forecasts

Organisation	HPA Separators Demand Forecast 2025 (tpa)	Equivalent Number of Altech HPA Plants
Altech Chemicals	15,102	3.4 x
Petra Capital (mid case)	37,500	8.3 x
CRU	76,000	16.9 x
Average	42,867	9.5 x

- CRU even most bullish on separator HPA growth
- Ave forecast of 43k tpa HPASC by 2025 (9.5 times ATC plant)

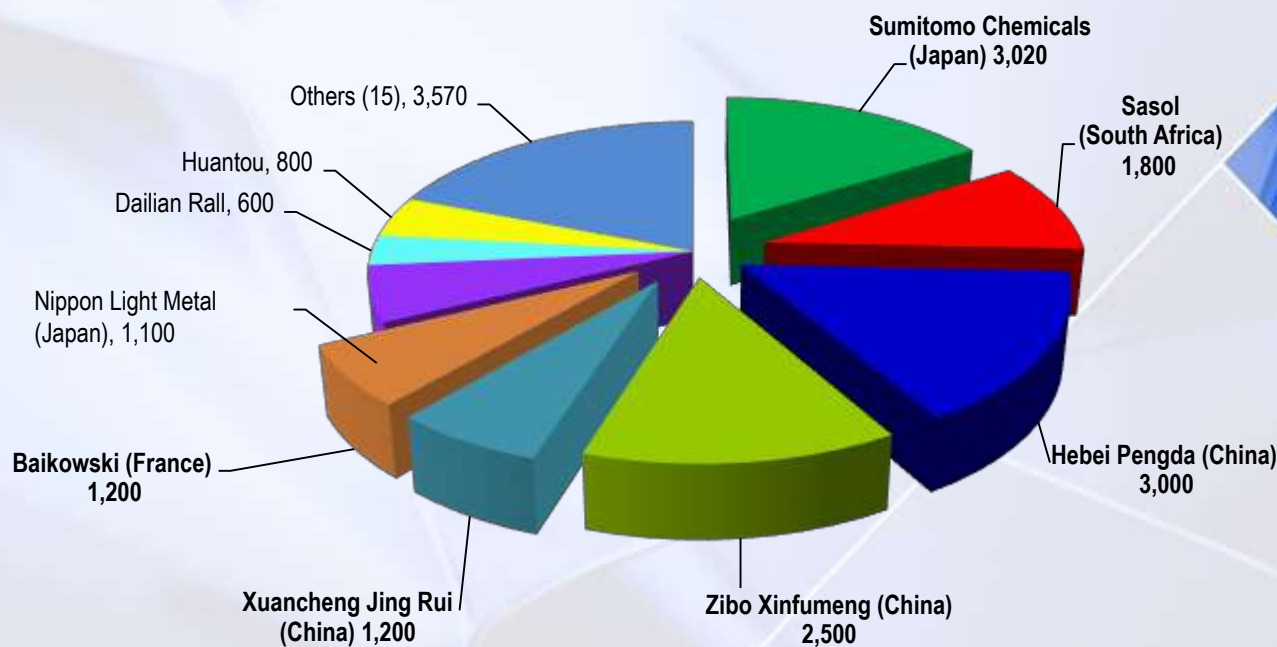
## Total HPA Demand Forecast (inc LEDs)

Organisation	Total HPA Demand Forecast (tpa) 2025	Equivalent Number of Altech Plants
Persistence	62,519	14 x
Petra Capital	122,000	27 x
CRU Consulting	92,900	20 x
<b>Average</b>	<b>92,473</b>	<b>20 x</b>

- **Ave forecast of 92k tpa by 2035 (20 times ATC plant)**
- **No incumbent expansions announced**
- **New entrants 4-5 years behind**
- **Demand will outstrip supply**



- HPA producers – Chemical companies  
China (3), Japan (2), South Africa (1) France (1)



**Current HPA  
Producers**

# Altech's Differentiation

Current HPA Producers



Bauxite

Alumina  
Refinery



Smelter Grade Alumina  
99.5%

Alumina  
Smelter



Aluminium Metal  
~US\$3,000 per tonne

Aluminium  
Dissolution



99.99% (4N)  
HPA



Kaolin  
(aluminous clay)

ALTECH HPA PLANT

One Single Process Step



99.99% (4N)  
HPA



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Typical bauxite deposit

- Very low iron (Fe) due to weathering
- 12.7Mt JORC Mineral Resources<sup>^</sup> (250 yrs)
  - Measured Resources 1.5Mt @ 30% Al<sub>2</sub>O<sub>3</sub>
  - Indicated Resources 3.3Mt @ 30% Al<sub>2</sub>O<sub>3</sub>
  - Inferred Resources 7.9Mt @ 29.1% Al<sub>2</sub>O<sub>3</sub>
- Deposit in Western Australia

%	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

Altech's kaolin deposit

**Low-Impurity  
Kaolin Feedstock**

\* Typical Mean Analysis

<sup>^</sup> JORC (2012) Mineral Resources (refer ASX Announcement 11 October 2016); the Company is not aware of any new information or data that materially affects the information included in this announcement and confirms that all material assumptions and technical parameters underpinning the estimates continue to apply and have not materially changed.





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- Mining approval granted
- Works approval granted
- Simple free dig mining
- Campaign mining, 2 months for 3 years of feed
- Then simple sea container loading operation
- Fremantle to Johor easy shipping

## **Meckering Kaolin Deposit in West Aust**





- Chemical-zoned industrial park
- 60% lower operating costs
- HCl plant nearby
- Services, natural gas, electricity, water
- Access to 17<sup>th</sup> largest container port
- Environmental approval completed
- 5-10 year corporate tax free



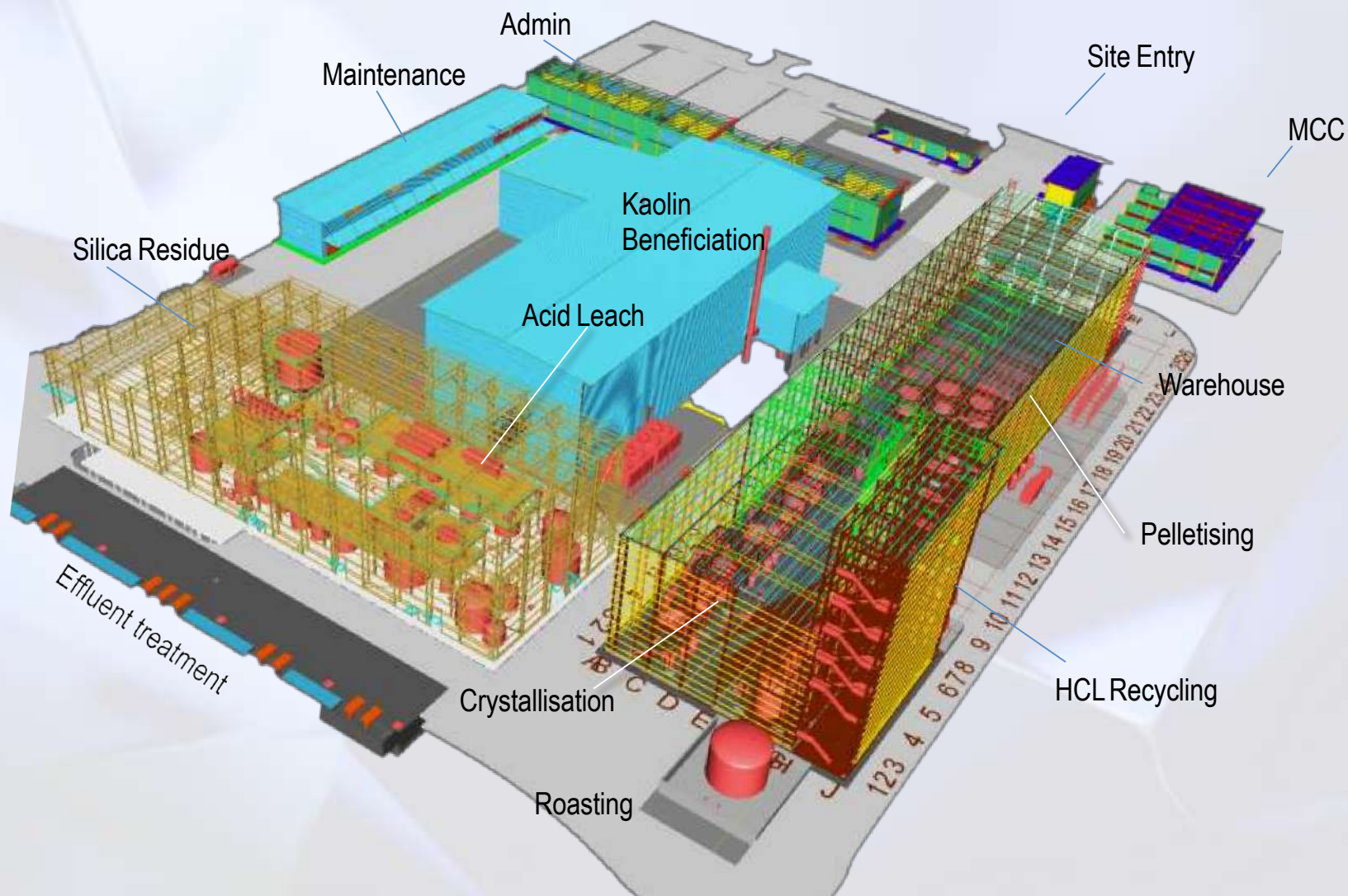
**HPA Plant to  
be in Johor,  
Malaysia**





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# Johor HPA Plant

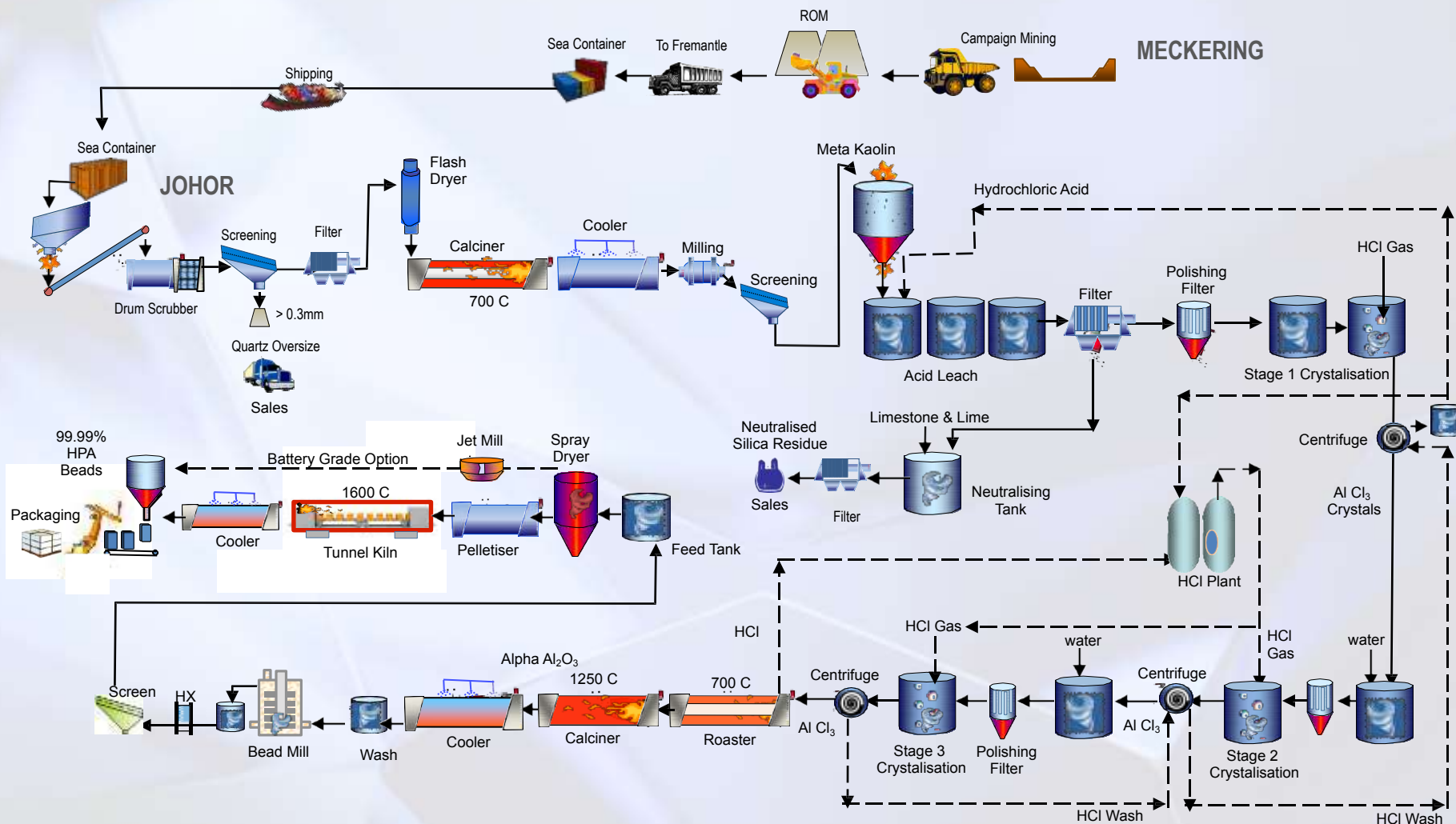






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# Altech's HPA Process

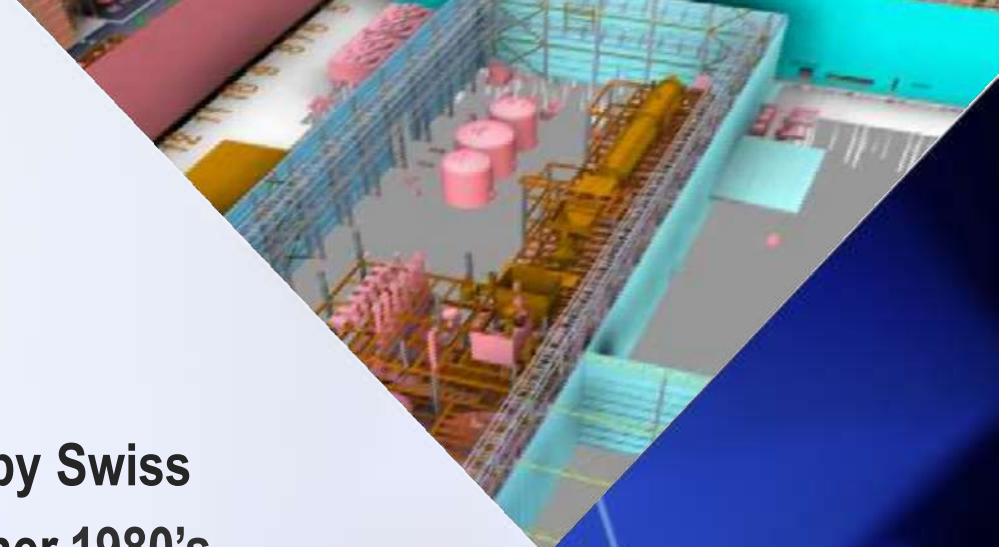






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- Chemistry established in 1900s by Swiss
- US Govt & Alcoa developed further 1980's
- Limited demand for HPA in 1980's
- New HPA growth demand (LEDs, LIBs)
- Altech applied open chemistry to Meckering
- Very successful, disruptive, lowest cost
- Two patents for processing technology
- New entrants – possible breach of Altech patents



**Established  
Proven  
Chemistry**

# Managing Technical Risks

## Lab Pilot Work



	Typical/Testwork	Current Design
Utilisation	90%	79%
Recovery	90%	60%
Ramp Up	2 Years	3 Years
Feed Rate	34% Al <sub>2</sub> O <sub>3</sub>	30% Al <sub>2</sub> O <sub>3</sub>
Eng Design Margin	+15-20%	+20-30%

**Conservative design assumptions  
reduces technical risks and builds robustness**





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- Pre-tax NPV<sub>7.5</sub> US\$ 505 million
- Payback (full rate) 3.9 years
- EBITDA US\$ 76 million p.a.
- Capital cost US\$ 298 million
- Production Costs - US\$ 9.90/kg
- LT Sale Price - US\$ 26.9/kg
- Gross Margin – 63%

# Final Investment Decision Study FIDS





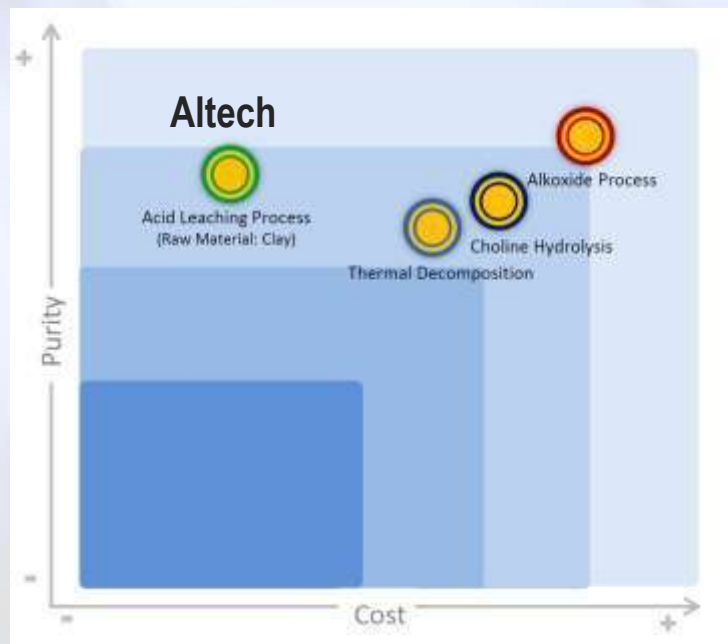
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- Current price in Japan - US\$ 40.0/kg
- Pre-tax NPV<sub>7.5</sub> US\$ 1.1 billion
- Internal Rate of Return (IRR) 33%
- Payback (full rate) 2.2 years
- EBITDA US\$ 133 million p.a.
- Production Costs - US\$ 10.50/kg
- Sale Price - Gross Margin – 74%

## Current Case Economics



- **Competitors**
  1. We own our feedstock
  2. Main reactant HCl re-used
  3. Plant in low cost country (Malaysia)



**Bottom  
Quartile  
for Op Costs**



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- Off-take sales agreement with Mitsubishi
- First 10 years of HPA operations
- Secures sales for HPA plant production
- Exclusive global distributor
- Experienced with HPA
- Strategic priority: lithium-ion batteries




**Mitsubishi**  
**10 year**  
**off-take**



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- **SMS group German EPC contractor**
- **Lump sum turn key contract**
- **Completion and cost risk**
- **Throughput guarantee**
- **Process & quality guarantee**
- **Third largest user of ECA finance**
- **Committed US\$ 15 million equity**

**SMS**  **group**

**SMS**  **group**



**Lump Sum  
Turn Key  
Contract**



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- Debt funding with KfW IPEX-Bank
- Total debt of US\$ 190 million
- US\$ 170 million export credit finance
- 50% of plant – German suppliers
- Low interest, long tenure
- Best debt in the world

**Debt  
Funding  
Successful**





## Three work streams

### 1) Subordinated mezzanine debt

- Target of US\$90-120m mezz debt
- First term sheet received of US\$90 m

### 2) Equity work stream

- Lead - Petra Capital

### 3) Possible JV Partner

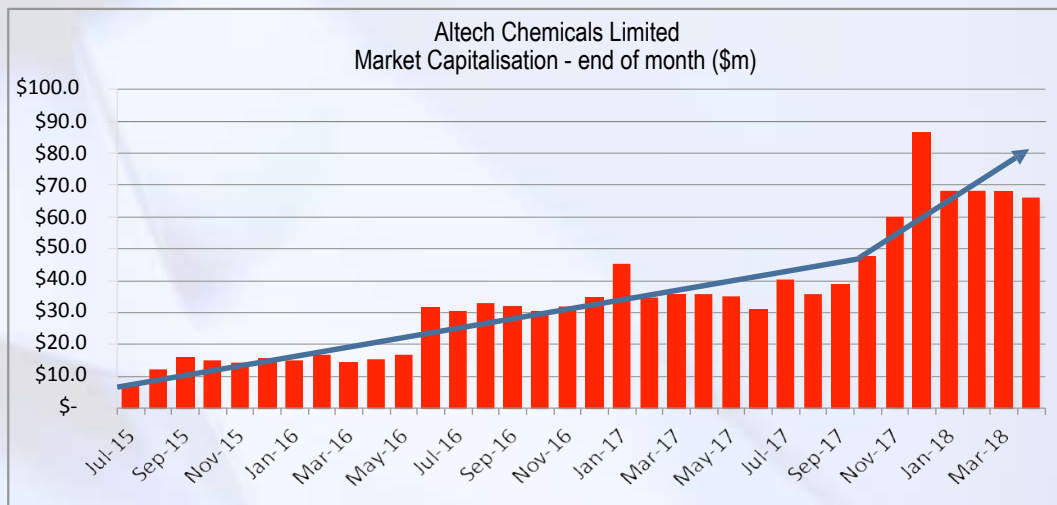
- Partial project sell down



**Advancing  
Final Stage  
Funding**



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- 10 x steady market cap growth (3 years)
- Ave trade value \$2k/day to \$350k/day
- 350% increase in shareholders to 2,500
- \$7 m cash end March 2018, no debt
- 426 m shares on issue

**Altech  
Growth  
Performance**

ASX



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*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 Persons Statements – Meckering Kaolin Deposit**

The information in this announcement that relates to Mineral Resources and Ore Reserves is extracted from the report entitled "Maiden Ore Reserve at Altech's Meckering Kaolin Deposit" released on 11 October 2016; the report is available to view on the Company's website [www.altechchemicals.com](http://www.altechchemicals.com). The Company confirms that it is not aware of any new information or data that materially affects the information included in the original market announcement and, in the case of estimates of Mineral Resources and Ore Reserves, that all material assumptions and technical parameters underpinning the estimates in the relevant market announcement continue to apply and have not materially changed. The Company confirms that the form and context in which the Competent Person's findings are presented have not been materially modified from the original market announcement.