

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

## Company Presentation

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



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Limited

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- **Sapphire gemstone**
- **Purified alumina ( $\text{Al}_2\text{O}_3$ )**
- **99.99% (4N) purity or greater**
- **Smelter Grade Alumina (SGA) ~ 99.5%**  
**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**  
**US\$9,000 per t**



**High Purity  
Alumina**  
HPA 99.99% (4N)  
**US\$27,000 per t**  
**US\$40,000 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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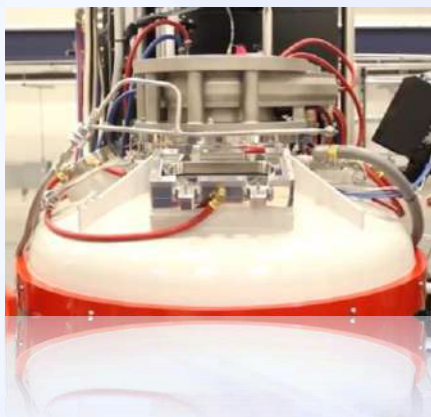
# LEDs & LITHIUM-ION BATTERIES

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Sapphire Furnace (2,000 °C)



Sapphire Crystal Boule



Sapphire Wafer LEDs



Nano Powder



Separator Coatings



LITHIUM ION BATTERIES





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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**



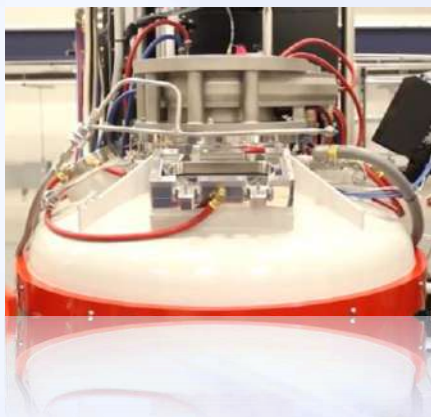
# LEDs & LITHIUM-ION BATTERIES

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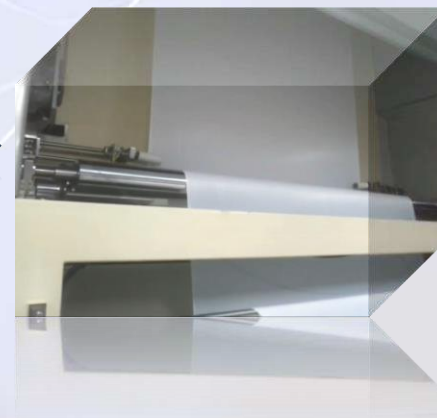
Sapphire Wafer LEDs



Nano Powder



Separator Coatings

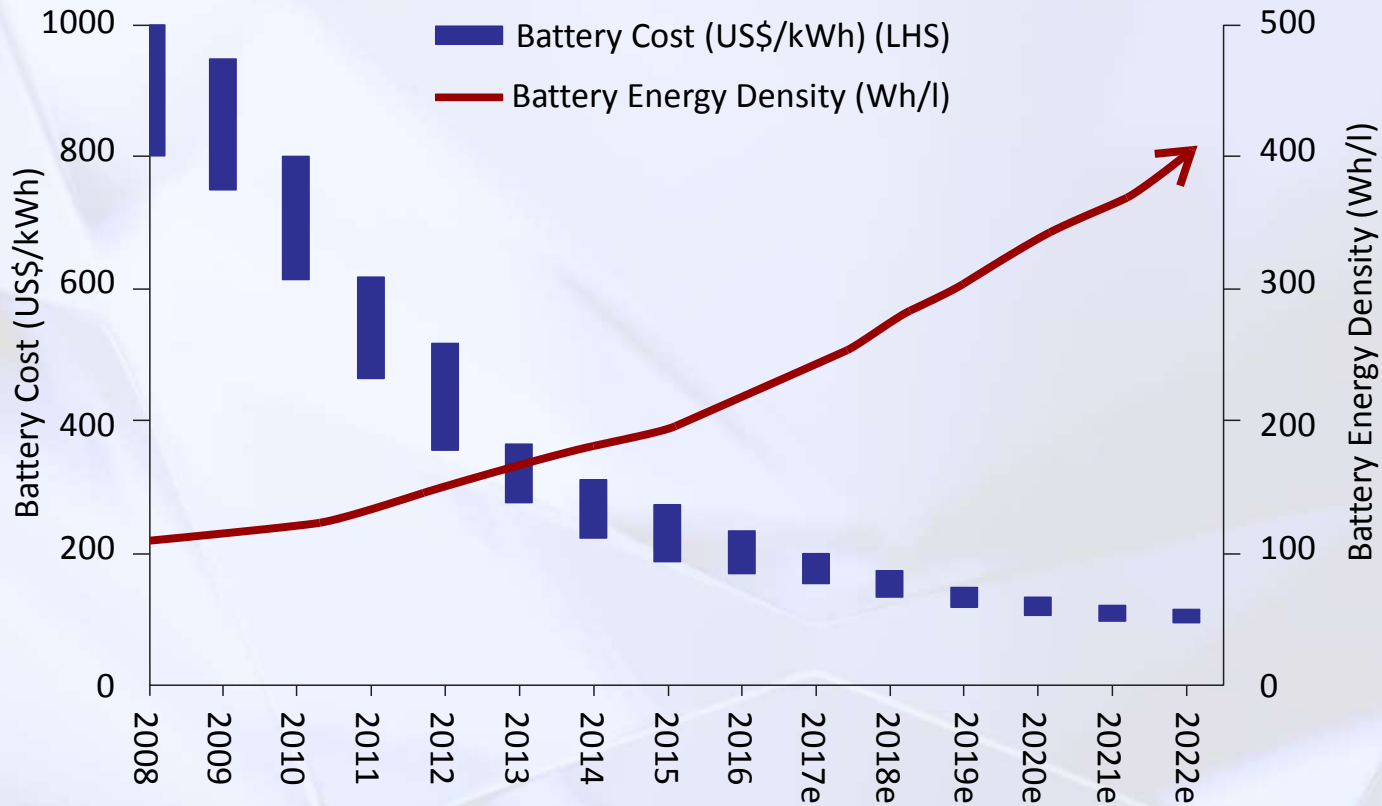


LITHIUM ION BATTERIES





# Battery Energy Density



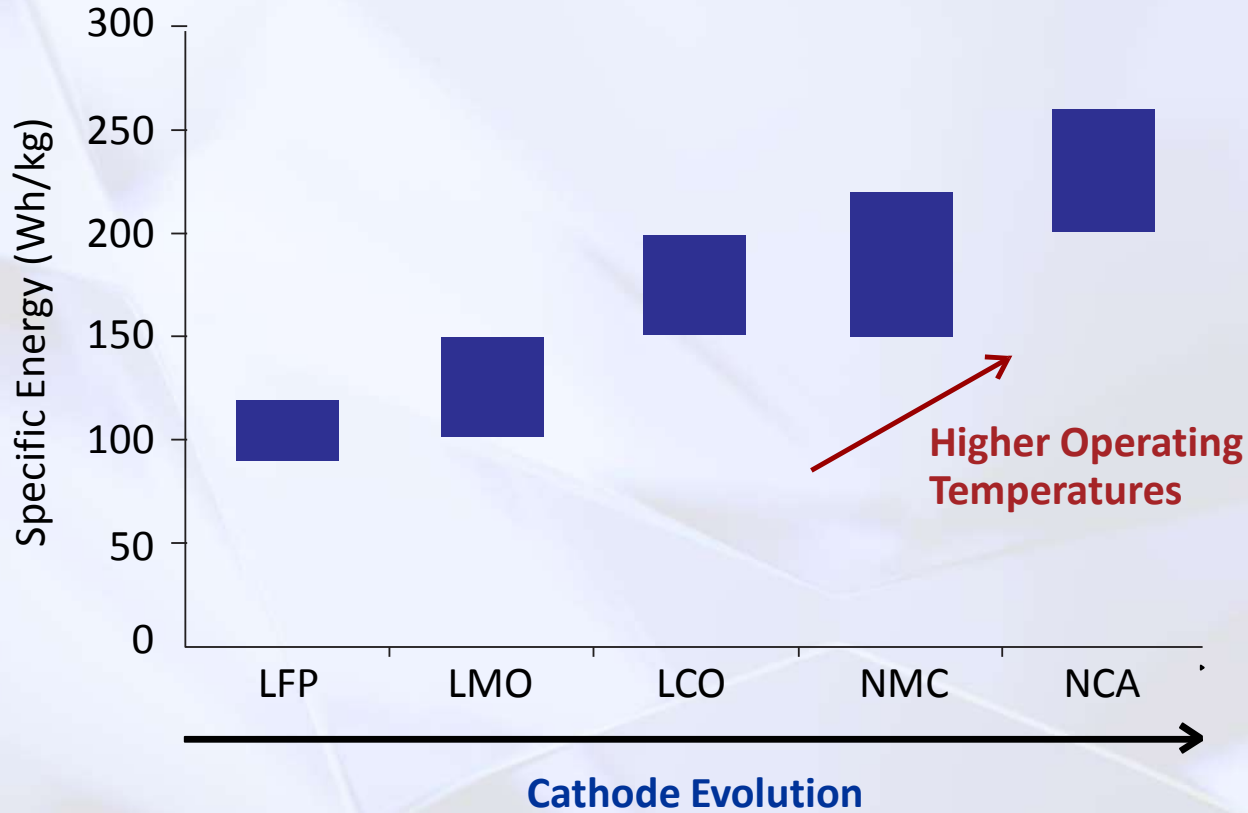
**Battery costs are reducing due to increased energy density**





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# Battery Energy Density vs Temp



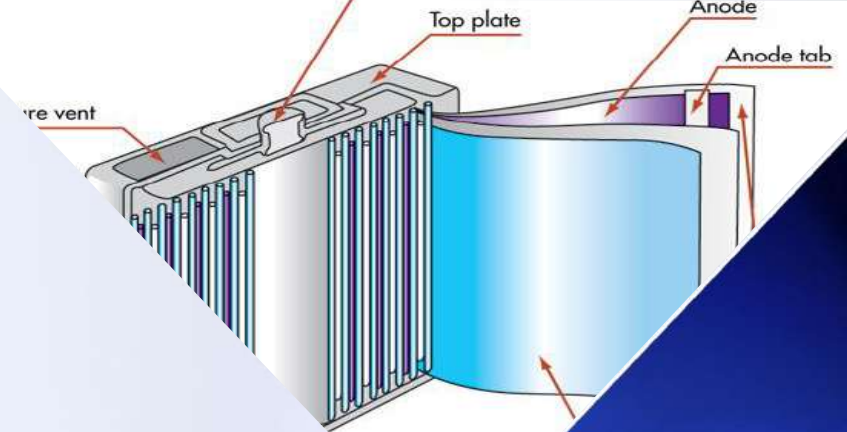
Cathode changes – higher operating temperatures

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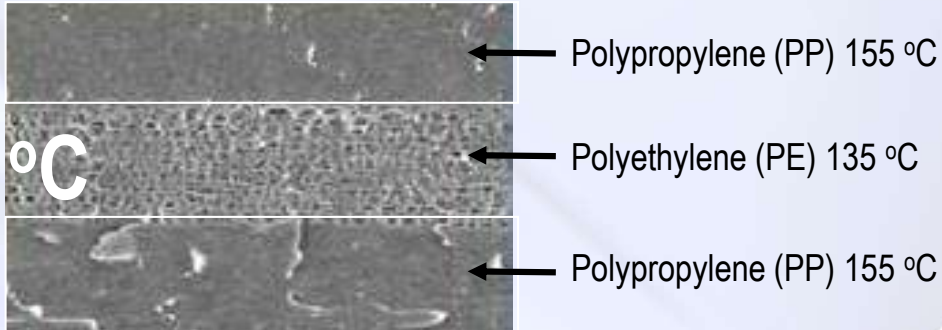




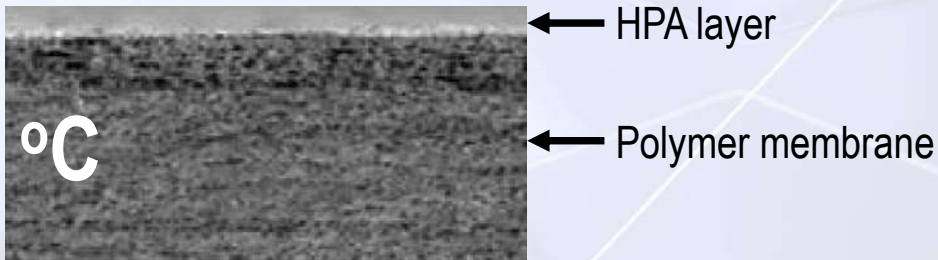
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### Normal Polymer Separators



<135 °C



>200 °C

### HPA Coated Separators (HPACS)

HPA required for higher temps

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### W Scope Sales Data % Sales of HPA coated separators



# HPA Coated Separators



**Japanese separator manufacturer reports  
40% HPA coated separators  
12% only 24 months ago**

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# Capex Plans of Battery Manufacturers

Battery makers	CAPEX Plans
<b>LGC</b>	Increasing production capacity to 50-70GWh by 2020 and to 32GWh in Nanjing in 2023.
<b>Panasonic</b>	Set up a new EV battery joint venture with Toyota. Full-fledged volume production of battery that has 50x capacity of that of HV to commence from the 1 <sup>st</sup> half of 2020.
<b>Samsung SDI</b>	Planning to increase production capacity to 30GWh by 2020.
<b>SK Innovation</b>	Aiming at annual production capacity of 20GWh by 2022.
<b>CATL</b>	Planning to increase production capacity to 50GWh by 2020.
<b>Northvolt (Sweden)</b>	Newly investing US\$4 billion to achieve 32GWh production capacity.

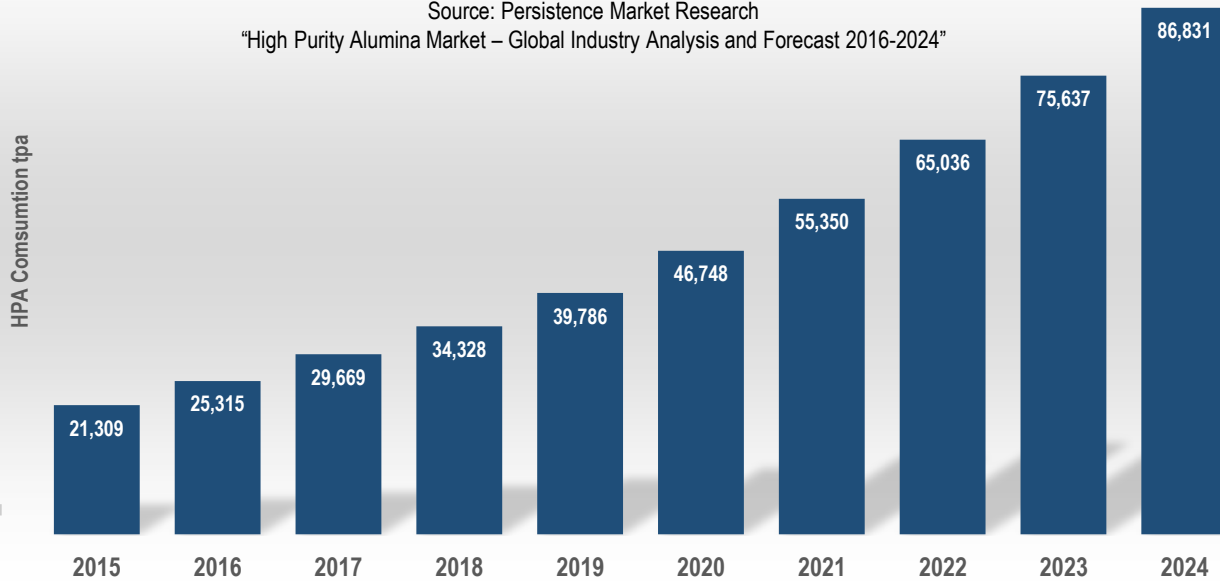




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## Global High Purity Alumina Forecast 2016 -2024

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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## Other Separator Forecast 2018

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

- 1.6 kg HPA (US\$100) for average EV car (40 KWh)
- CRU most bullish on separator HPA growth
- Ave forecast of 43k tpa HPASC by 2025 (9.5 times ATC plant)



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**Total HPA  
Forecast  
(inc LEDs)  
2018**

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 92 k tpa by 2025 (20 times ATC plant)**
- **No incumbent expansions announced**
- **New entrants 4-5 years behind**
- **Demand will outstrip supply**

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# Sapphire Glass Scratch Test

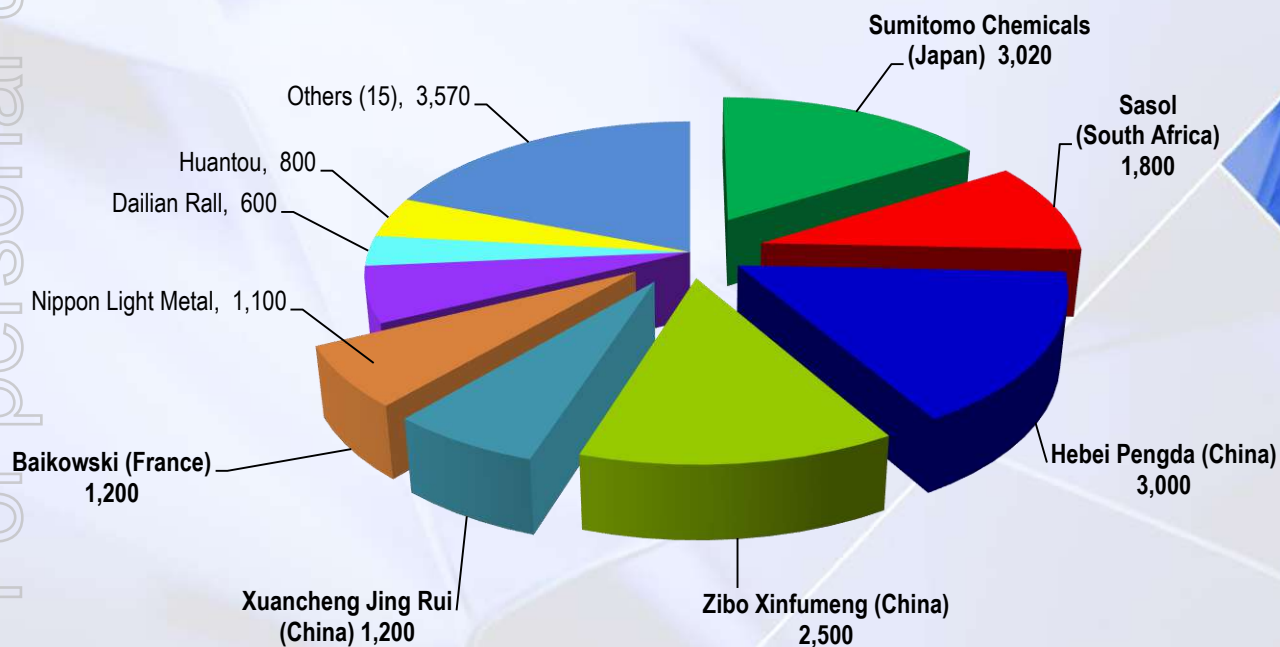


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- HPA producers – Chemical companies  
China (3), Japan (2), South Africa (1) France (1)



# Current HPA Producers



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# 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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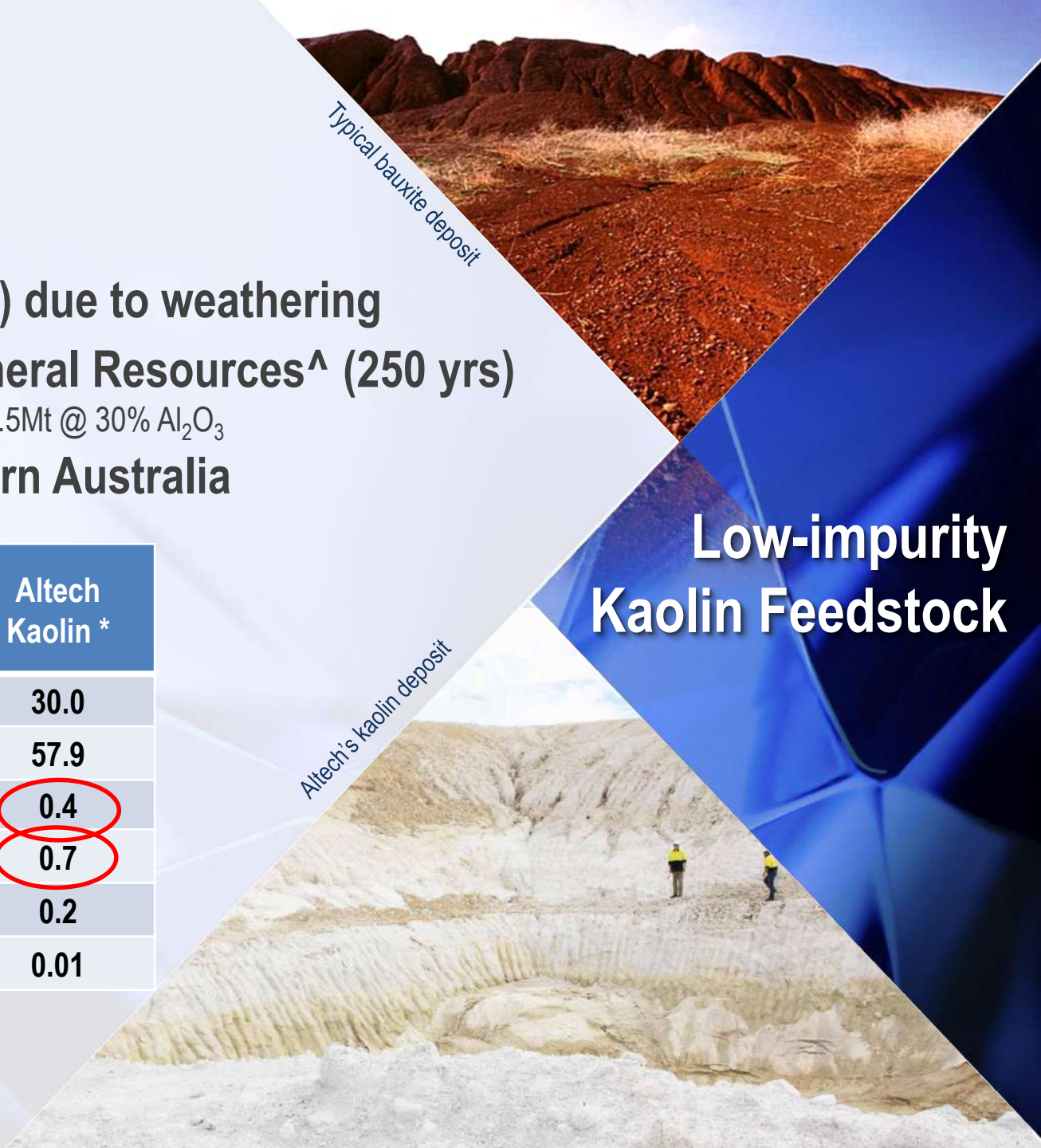


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Typical bauxite deposit



Altech's kaolin deposit



**Low-impurity  
Kaolin Feedstock**

- **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>
- **Deposit in Western Australia**

%	Bauxite Darling Range*	Altech Kaolin *
Al <sub>2</sub> O <sub>3</sub>	34.5	30.0
SiO <sub>2</sub>	21.5	57.9
Fe <sub>2</sub> O <sub>3</sub>	21.2	0.4
TiO <sub>2</sub>	2.00	0.7
K <sub>2</sub> O	0.24	0.2
NaO	0.005	0.01

\* Beneficiated Kaolin in FIDS

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

## Meckering Kaolin Deposit in West Aust







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**ALTECH CHEMICALS**



- **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**
- **5-10 year corporate tax free**
- **No radioactive waste – chemical park**

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

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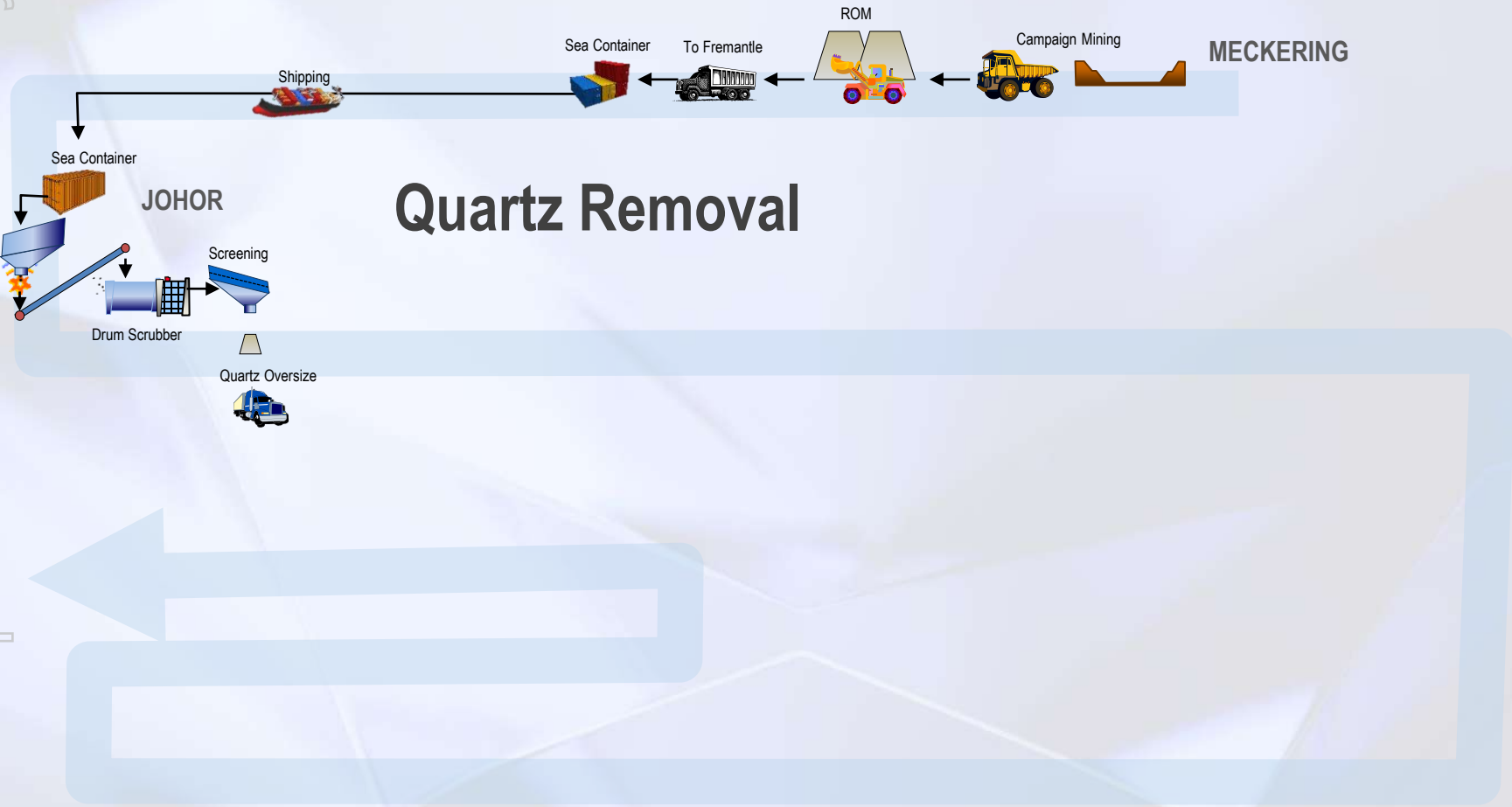




# Altech's Patented HPA Process

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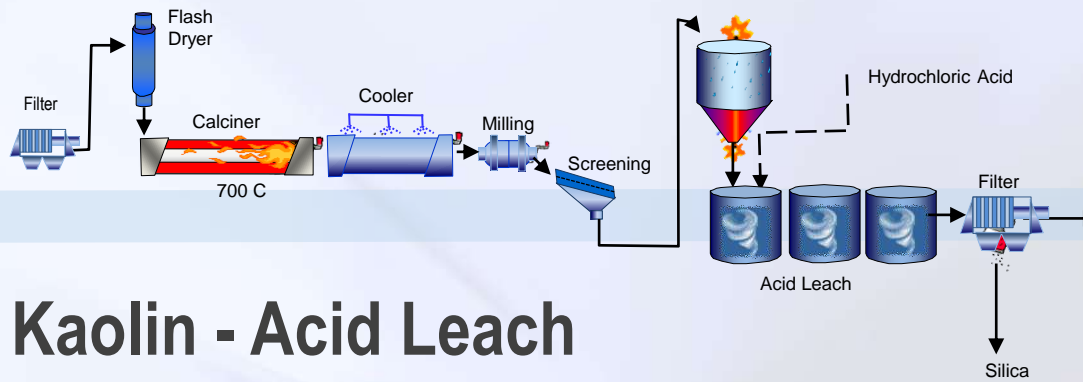
## Quartz Removal





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# Altech's Patented HPA Process



## Meta Kaolin - Acid Leach

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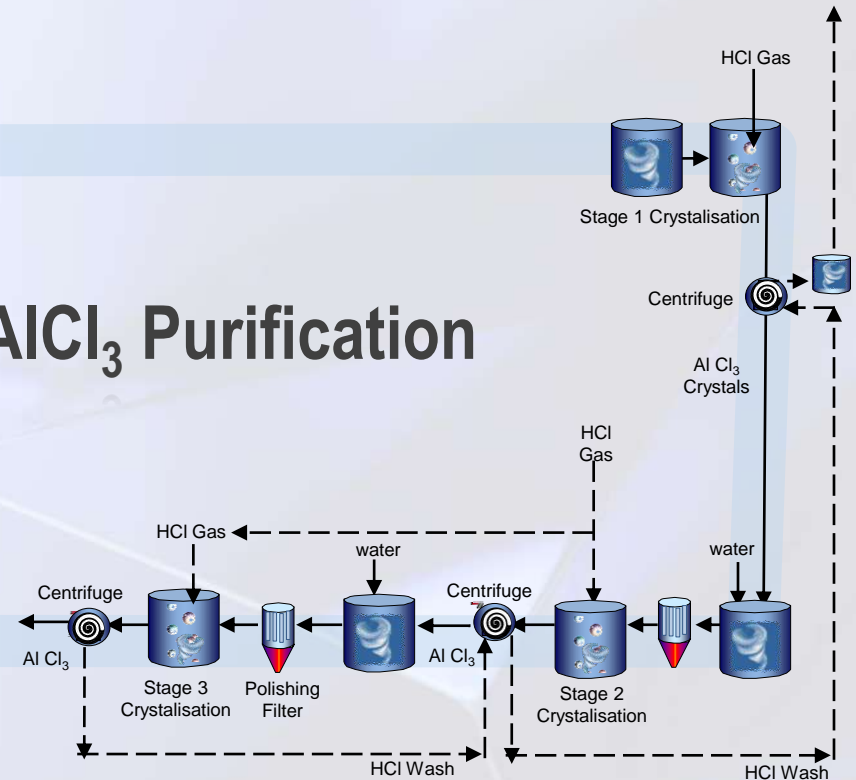


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# Altech's Patented HPA Process

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## $\text{AlCl}_3$ Purification

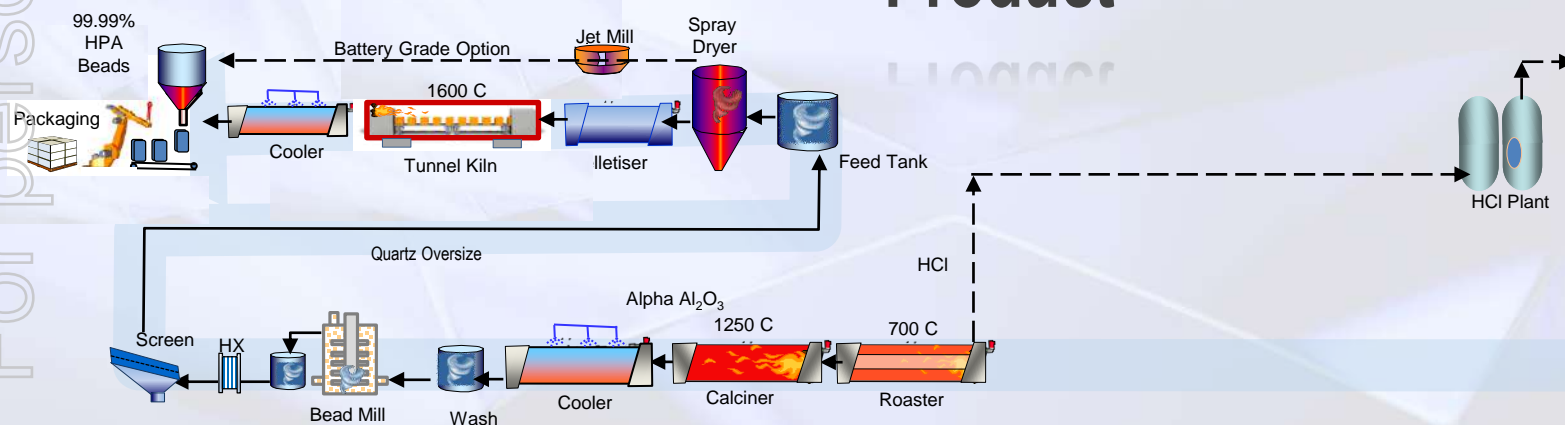




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# Altech's Patented HPA Process

## Roasting & Final Product



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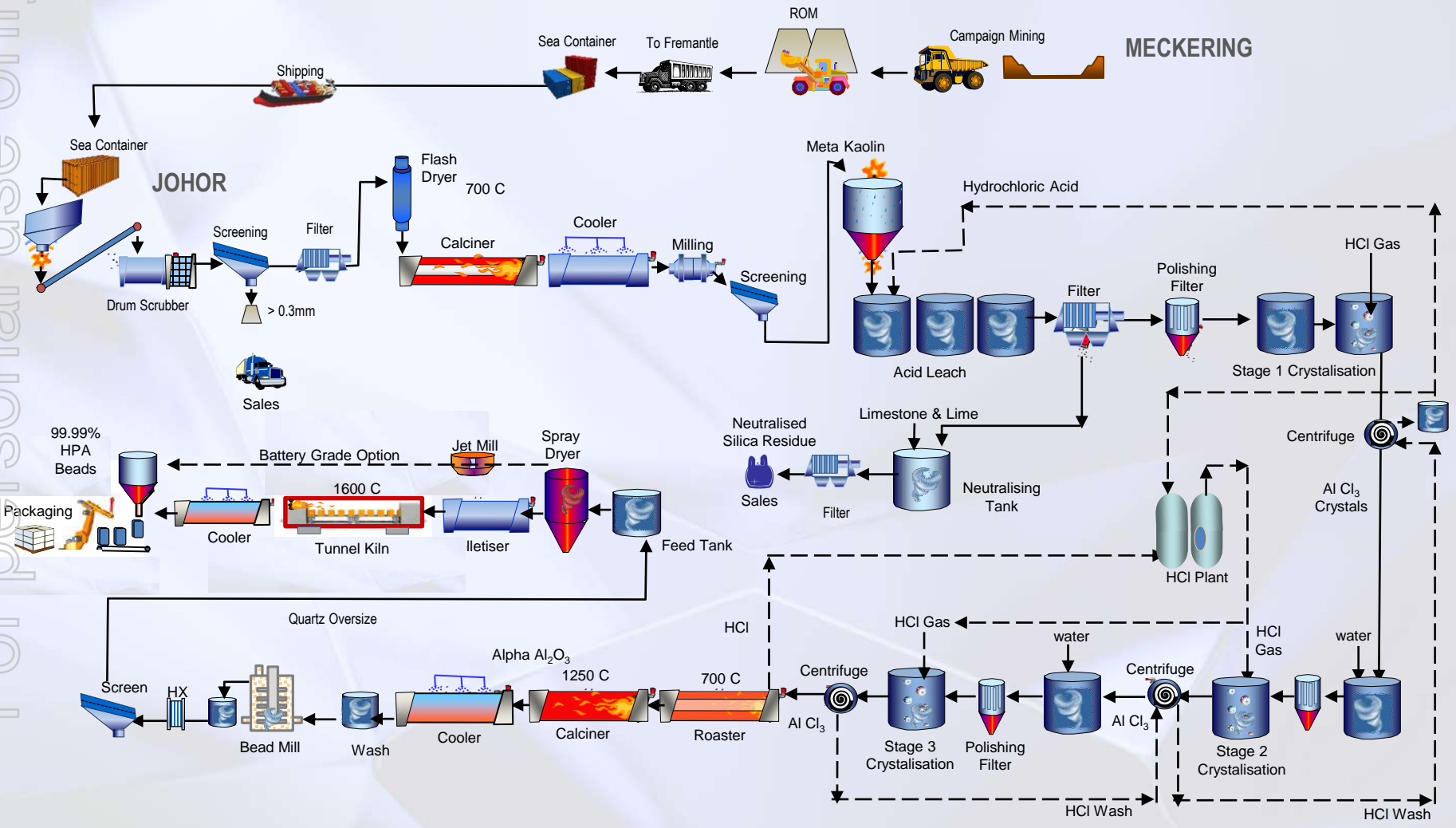




# Altech's Patented HPA Process

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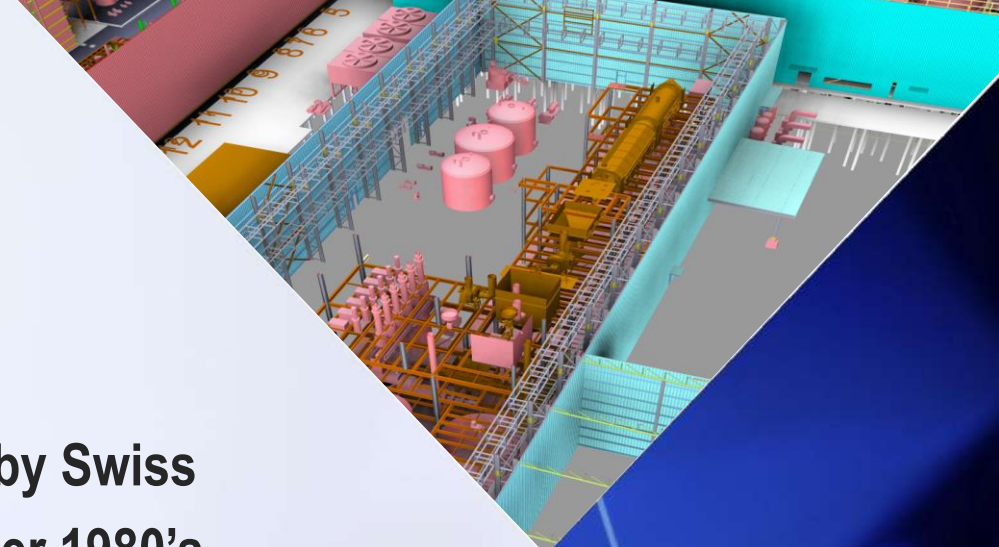


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- **Chemistry established in 1900s by Swiss**
- **US Gov & Alcoa developed further 1980's**
- **No demand for HPA in 1980's**
- **New HPA growth demand (LEDs LIBs)**
- **Altech applied open chemistry to Meckering**
- **Very successful, disruptive, lowest cost**
- **Two patents established for processing technology**

**Established  
Proven  
Chemistry**

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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%**
- **Capex US\$298 m**

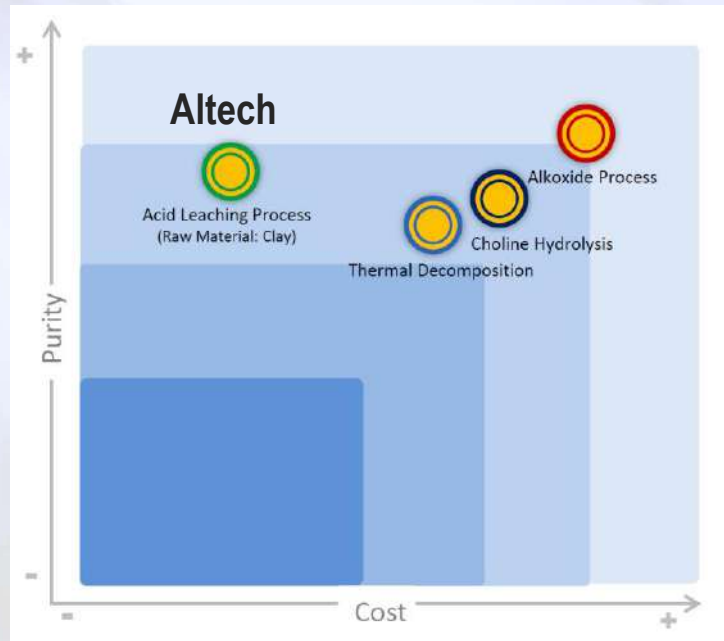
## **Current Case Economics**

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- **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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 **Mitsubishi Corporation**



- **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 mil equity**

**SMS**  **group**

**Lump Sum  
Turn Key  
Contract**

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- Lots of “fat” in design assumptions
- Using 79% instead 90% Utilisation
- Using 60% instead 90% Recovery
- Using 30% instead 34% head grade
- 3 Yr ramp up instead of 2 Yr
- Possibility of 6,000 tpa

**Aiming to  
Under-promise  
Over-deliver**

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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**

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## Three work streams

### 1) Subordinated mezzanine debt

- Term sheet received of US\$90m

} Proceeding to internal approval

### 2) Equity work stream

- Lead - Petra Capital

### 3) Possible JV Partner

- Partial project sell down

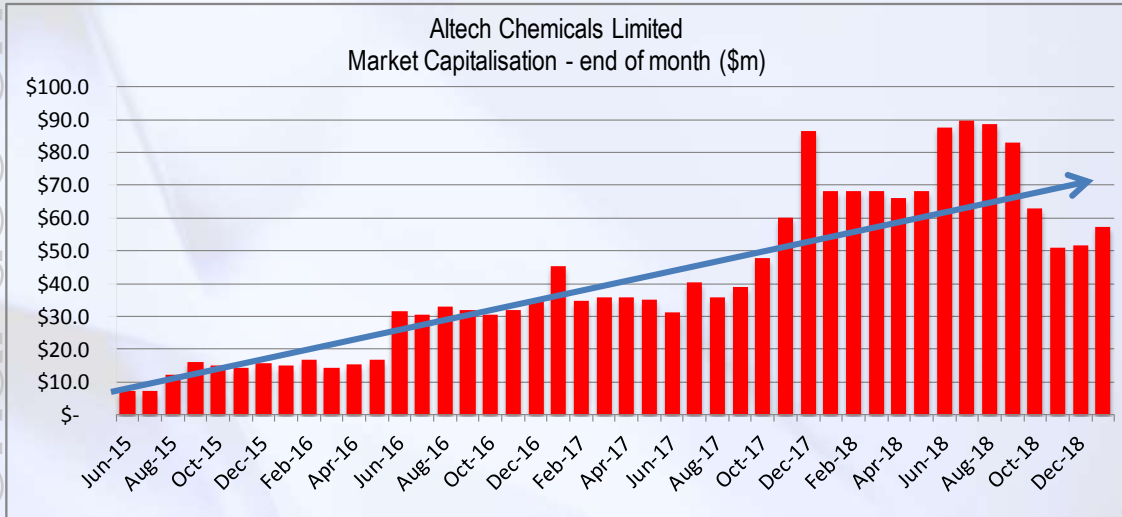
} Various parties in dataroom

**Advancing  
Final Stage  
Funding**

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**Altech  
Growth  
Performance**

- **900% steady market cap growth (4 years)**
- **Ave trade value \$2k/day to \$350k/day**
- **Mar Cap \$60m - 572 m shares**
- **Cash - \$4 m, No debt**

**ASX**





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- Australian Company
- Kaolin mine
- Aust Technology



Australia

- Malaysian HPA plant
- Major shareholder
- Tax incentives



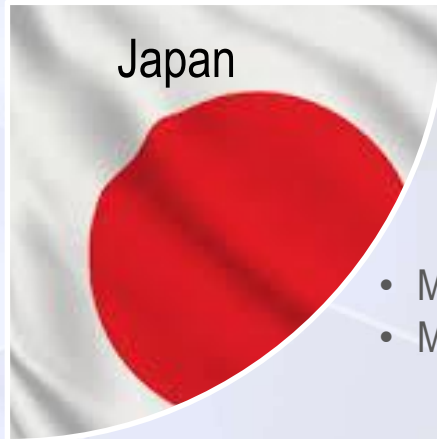
Malaysia

- German debt (KfW)
- EPC contract (SMS)
- Frankfurt dual listing



Germany

- Mitsubishi offtake
- Major markets



Japan

**Global  
Quality  
Partners**

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# **HIGH PURITY ALUMINA PROJECT**

**Altech Chemicals Sdn Bhd**



## **Stage 1 Construction Commences**





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Altech Chemicals Sdn Bhd

# GRAND OPENING CEREMONY

8<sup>TH</sup> AUG 2018







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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.

The mezzanine debt facility terms referred to in this ASX announcement are indicative in nature; are non-binding; and contain the general terms of proposed a transaction. Any future commitment for the facility will be subject to and is contingent upon all internal approvals of the financial institution as well as the completion of detailed due diligence (including but not limited to HPA market, legal and technical due diligence) and legally binding documentation and senior lender agreement. There is no certainty that the mezzanine project debt finance will be approved or that a transaction will be concluded based on what is contemplated in the term sheet. The Company makes no representations or warranties whatsoever as to the outcome of the mezzanine debt finance process.

## **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.