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**Technology is Critical to the Future**

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**Cativa®**
A world leading methanol carbonylation technology for the production of acetic acid, with lowest capital and variable costs

**BP PTA**
A world leading PTA technology with clear capital, operating and environmental advantages

**PX**
A world leading PX technology with the lowest variable and capital cost

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Technology deployed at:
- 1 wholly owned site in Europe
- 5 JVs in Asia
- 2 third party licenses

Assessment on-going for deployment of Cativa® XL and SaaBre technologies

Technology deployed at:
- 3 wholly owned sites in Europe and the US
- 1 wholly owned in Indonesia
- 1 JV in China
- 1 JV in Taiwan

Latest generation technology, BP PTA, deployed at Zhuhai #3, China

3 third party licenses granted

Technology deployed at:
- 3 wholly owned sites in Europe and the US

Significant next generation technology in development

2 third party licenses sold

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**BP’s latest breakthrough technology for the production of Acetic Acid**
BP PTA Technology

- BP is a PTA industry leader with 50 years of investment and commitment
- BP PTA is the lowest cost commercially proven technology available today
- BP PTA licensing offer
- BP PTA, latest generation PTA technology deployed at Zhuhai
- Advantages of licensing a commercially proven technology
- Exclusive Alliance with Technip for FEED
- There is more: BP PTA +
50 year History of BP in PTA

- TA process invented by Mid-Century
- Patent for PX into PTA
- First PTA unit at Decatur
- AMOCO acquired the technology
- PTA production in Geel, Belgium
- First PTA plant in Asia - CAPCO
- World’s largest PTA plant at Cooper River
- PT AMI JV in Merak
- SPC in Korea
- Zhuhai-I
- Zhuhai-2
- Zhuhai-3
- JBF License
- Geel Expansion
- Expansion


Technology development
US & Europe as manufacturing center
Asia growth
Asia balanced
China expansion

Total PTA Capacity = 79 mtepa, ~ 7 mtepa BP owned (100% or JV)

- A leader in PTA technology, manufacturing excellence and licensing
- Licensed +45* PTA plants globally, ~ 13 mtepa (9.5 mtepa operational)

* Excludes the three licenses signed since 2012 and MCI licensed capacity

Data Source: PCI 4Q 2015 PX & Derivatives Demand Supply Report
BP PTA – the most advantaged commercially proven technology

**Commercially Proven Technology**

- Track record of successful technology development, commercialisation and flawless project execution - deployed at company owned sites, most recently Zhuhai, China
- 50 years of owner / operator experience & licensing successes
- Long term commitment, in-house investments +$200m
- Material R&D spend with a staff of 150 scientists, ~ 200 Patents, progressive technology innovation

**BP PTA – Distinction par excellence with high reliability and availability (compared to conventional PTA technology)**

<table>
<thead>
<tr>
<th>$100 – 120m Lower Capital Costs</th>
<th>$60/te Lower Variable Costs = $75m/year for 1.25 mtepa</th>
<th>Distinctive Environmental Performance</th>
</tr>
</thead>
</table>
| Reduced ISBL footprint, capacity per metre square efficiency improved by 400% | Exothermic heat recovery and integration  
  - Recycle process stream  
  - Operation optimisation expertise | 65% lower GHG emissions  
  75% lower water discharge  
  95% lower solid waste disposal |
| 30 % less equipment (160 fewer pieces of equipment) | | |
BP PTA Technology Licensing Offer

BP – Distinctive Licensing offer

- Proven technology at Zhuhai 3
- 50 years of operator experience
- Access to:
  - Extensive technical support services
  - Capability / best practices
  - Knowledge management
  - Continuous improvement
  - Ongoing technology development
  - Extensive patent portfolio
- Delivered through BP’s exclusive strategic alliance with Technip

Licensing Success – BP has won three licenses since the decision to re-enter licensing business
# BP PTA Technology: Zhuhai journey from 2000 to 2015

## 350 to 600 ktepa

### Focus on capital Costs
- Major process simplification
- 40% fewer pieces of equipment
- 40% smaller plot plan
- 75% less process wastewater
- 40% less solid waste

Demonstrated at Zhuhai 1 and CAPCO 6, JVs – (2003)

Some parts of Technology implemented at existing PTA assets

## 900 to 1100 ktepa

### Lowest capital and variable cost PTA plant in the world – single train
- Capitalize on economies of scale
- Additional plot plan reduction
- Over 50% reduction in fuel
- Net generator of electricity

Technology allows more local sourcing of equipment

50 % reduction in GHG

## 1,250 ktepa

### Further process simplification – lowest cost producer in the world

Product on-spec within **24 hours**

**100% Operating rates**

**99.2% Reliability**

Variable cost already lowest in the world and still reducing through optimization

## 25% reduction in Capital cost compared to conventional technology

## 44% reduction in variable costs vs. Zhuhai1

## 33% reduction in variable costs vs. Zhuhai2
PTA Technology - Driving Capital Efficiency

Engineering, Procurement, and Construction Normalized Costs

- Generating scale advantage
- Reduced Equipment count
- Improved Plot Plan Efficiency: Capacity per square metre
- Local Equipment Sourcing

- BP evolving PTA technology
- Other PTA technology

15% local equipment
60% local equipment
85% local equipment

- Z1 X
- C6 X
- Z2 SOX
- Z3 BP PTA

Cost per Capacity (USD/kte) vs. Plant Capacity (kte)
Inherently Safe Design (ISD) principles applied at Zhuhai 2 & 3

- Enhanced Oxidation Reactor Safety System
- Automation & Process Simplification
- Reduced Caustic Washing
- Fully HAZOPed Design & PSV Sizing
- Fewer on-site Chemicals
- Elimination of Titanium Combustion Hazard
Zhuhai 2 has been consistently operating safely at >95% Reliability

Utilisation at Zhuhai 2 is > 90% due to low costs whilst most of China is at ~ 80% through downturn

10% increase in Utilisation for 1.25 mtepa = +130 ktepa
Advantages of a commercially proven technology

Z2, Z3, and BP PTA+ all maintain an advantage over any new & unproven technology.

BP actual advantage is likely to be higher given new technology risks.

Based on BP experience and industry data, new technology will have a $15/ton higher VC for at least 3 years until new technology issues are resolved.
## New Technology Commercialization Risks

<table>
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<tr>
<th></th>
<th>Proven Technology</th>
<th>New/Unproven Technology</th>
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<tbody>
<tr>
<td><strong>Startup Duration</strong></td>
<td><strong>(Median)</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 month</td>
<td>4 months</td>
</tr>
<tr>
<td><strong>Startup Duration</strong></td>
<td><strong>Variability</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>85% within 6 months</td>
<td>85% within 14 months</td>
</tr>
<tr>
<td><strong>Initial Operability</strong></td>
<td><strong>After Startup</strong></td>
<td></td>
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<tr>
<td></td>
<td>93+%</td>
<td>60%</td>
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</table>

- On average, each new step reduces operability by 14 percent in months following the initial start up period.
- Facilities with three or more new steps are at a much higher risk of outright failure.
- At $100/ton margin, every month of delayed startup is >$10m loss.

Data Source: IPA report for BP on New Technology Commercialization Risks, 2000
BP / Technip Alliance

- Alliance since 1999 and applies to fully owned/JVs plants/third party licenses applications
- 8000 ktepa of PTA based upon BP technology engineered by Technip over 20 projects
- Technip develops on an exclusive basis the FEED to be included in the BP License Package
  ⇒ Fully integrated BP/Technip Team
  ⇒ A Technip “PTA Village” which is preserved to maintain and improve expertise
  ⇒ Injection in the FEED package of the Technip EPC experience
- Supporting BP with engineering of R&D ideas within a technology continuous improvement framework
- Technip could provide, if selected by licensee as (BP preferred) EPC contractor, schedule and cost advantages, technical integrity assurance and risk management adapting to any “local” requirement
BP PTA Enhancements: BP PTA+

- BP PTA+ is the next generation of PTA technology beyond Zhuhai #3

- Current variable cost improvement is > $10/ton over Zhuhai #3, further extending BP’s advantage over other technologies

- BP PTA+ is a series of incremental engineering evolutions of the Zhuhai #3 technology

- BP PTA+ also incorporates equipment improvements based on learnings from Zhuhai#3

- BP PTA+ will be the standard BP License offer at the end of Q1 2016.

- BP is 10+ years and 2 generations of technology ahead.

All changes to the proven technology will further lower variable costs!
Summary

- Global PTA industry is experiencing a protracted down-turn due to overcapacity in Asia; **cost leadership** is critical to be competitive in the long term

- **Distinctive technology offered by experienced owner, operator and licensor:**
  - Commitment to the PTA industry and technology
  - Capital **cost advantage of $100 – 120m compared to conventional technology**
  - Variable **cost advantage of $60/te, $75m/year compared to conventional technology**
  - Distinctive environmental performance
  - Technical Services, knowledge management, continuous improvement
  - Licensing offer is a “proven technology” that is in operation today at Zhuhai, China
BP PTA – Advantaged Proven Technology

IOCL Conclave,
Mumbai, February 2016