Cautionary Statement

This presentation contains forward looking statements that are subject to risk factors associated with, amongst other things, the economic and business circumstances occurring from time to time in the countries and sectors in which Johnson Matthey operates. It is believed that the expectations reflected in these statements are reasonable but they may be affected by a wide range of variables which could cause actual results to differ materially from those currently anticipated.
JM Executive Board

• Neil Carson - Chief Executive
• Robert MacLeod - Group Finance Director
• Larry Pentz - Executive Director, Environmental Technologies
• Bill Sandford - Executive Director, Precious Metal Products
Other Senior Management

- John Walker Division Director, Emission Control Technologies
- Neil Whitley Division Director, Process Technologies
- Nick Garner Division Director, Fine Chemicals
- Geoff Otterman Division Director, Catalysts, Chemicals and Refining
- Linky Lai General Manager, Emission Control Technologies, China
- Henry Liu Commercial Director, Emission Control Technologies, China
- Peng Zhang Sales Director, Power Plant Industries, China
- Wolfgang Schuettenhelm Director, Worldwide Power Plant Industries
- Andrew Wright Managing Director, Syngas and Gas to Products
- David Tomlinson President, Davy Process Technology
- Vikram Singh Country Head (AMOG) - China
- Robert Huang Territory Executive China - Refinery & Gas Processing, AMOG
- Andy Hiles Senior Vice President, Davy Process Technology
- Atul Shah Vice President, Oxo Alcohols, Davy Process Technology
- Mark Sutton Vice President, Methanol, Davy Process Technology
Other Senior Management

- Elaine Shao  Office Manager, Johnson Matthey Shanghai
- Helen Zhou  General Manager, Catalysts and Chemicals, China
- John Chen  Commercial Director, Catalysts and Chemicals, China
- Robert Bullen-Smith  Managing Director, Chemical Products
- Jian Zhang  Managing Director, Alfa Aesar Synmax
- Barry Singelais  President, Global Research Chemicals
- Ian Godwin  Director, Investor Relations
- Sally Jones  Public Relations Manager
Programme

11.00 Overview and Interim Management Statement (Neil Carson)
11.05 Johnson Matthey in China (Neil Carson)

Environmental Technologies in China
11.15 Introduction and Overview (Larry Pentz)
11.20 Emission Control Technologies in China (John Walker)
11.25 Mobile Emissions Control – Light Duty and HDD (Linky Lai)
11.55 Stationary Emissions Control – Power Plant Industry (Peng Zhang)
12.15 Questions
12.35 Lunch in The Atrium
1.20 Process Technologies in China (Neil Whitley)
1.25 Syngas Catalyst Growth in China (Andrew Wright)
1.55 Licensing Technology in China (David Tomlinson)
2.25 Questions
2.45 Process Technologies Break Out Sessions
Programme

3.15 Coffee Break

**Precious Metal Products Division**

3.25 Operations in China (Bill Sandford)
3.35 The Chinese Jewellery Market (Bill Sandford, Elaine Shao)
4.05 Catalysts and Chemicals Business in China (Helen Zhou, John Chen)
4.35 Questions
4.55 Coffee Break

**Fine Chemicals Division**

5.05 Fine Chemicals Division and Research Chemicals Business in China (Nick Garner, Jian Zhang)
5.20 Summary and Wrap up (Neil Carson)
5.30 Q&A
6.00 Drinks Reception (Le Café du Marché)
7.00 Dinner
Interim Management Statement

• Summary results for third quarter of 2009/10

  • Sales excluding precious metals 9% ahead
  • Operating profit* 10% up on last year
  • Profit before tax* 20% higher than last year
  • Cash generation continued to be strong

* Before amortisation of acquired intangibles
## Estimated Light Vehicle Sales and Production

for the three months to 31st December 2009

<table>
<thead>
<tr>
<th></th>
<th>Quarter ended 31st December</th>
<th></th>
<th></th>
<th>Change</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>2009 millions</td>
<td>2008 millions</td>
<td></td>
<td>%</td>
</tr>
<tr>
<td>North America</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sales</td>
<td>3.1</td>
<td>3.0</td>
<td>+3.3</td>
<td></td>
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<tr>
<td>Production</td>
<td>2.7</td>
<td>2.7</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Total Europe</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Sales</td>
<td>4.3</td>
<td>4.6</td>
<td>-7.0</td>
<td></td>
</tr>
<tr>
<td>Production</td>
<td>4.7</td>
<td>4.1</td>
<td>+14.6</td>
<td></td>
</tr>
<tr>
<td>Asia</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sales</td>
<td>8.0</td>
<td>6.4</td>
<td>+25.0</td>
<td></td>
</tr>
<tr>
<td>Production</td>
<td>9.5</td>
<td>7.6</td>
<td>+25.0</td>
<td></td>
</tr>
<tr>
<td>Global</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Sales</td>
<td>14.7</td>
<td>12.7</td>
<td>+15.7</td>
<td></td>
</tr>
<tr>
<td>Production</td>
<td>17.7</td>
<td>14.7</td>
<td>+20.4</td>
<td></td>
</tr>
</tbody>
</table>

Source: IHS Global Insight
Interim Management Statement

• Environmental Technologies
  • Sales (ex pms) 22% ahead of last year and slightly ahead of the second quarter. Operational leverage and good cost control resulted in operating profit more than 30% ahead in quarter.
  • Emission Control Technologies’ sales ahead of last year in North America, Europe and Asia. China continues strong performance. Global car production 20% up in third quarter compared with last year and 22% up on Q2 2009/10.
  • HDD sales in North America slightly ahead of last year due to small pre-buy ahead of US 2010 legislation.
  • Process Technologies’ performed well in third quarter with steady growth in ammonia and methanol catalyst sales. DPT secured two further contracts, both in China. Others in the pipeline.
Interim Management Statement

• Precious Metal Products

  • Profits, as expected, lower than Q3 last year. Quarter saw steady improvement in platinum group metal prices. Demand for fabricated products and precious and base metal catalysts and chemicals steady in quarter and now showing signs of recovery

• Fine Chemicals

  • Sales slightly lower in third quarter but operating profit in line with last year. API sales broadly in line with last year but sales of research chemicals slightly lower
Outlook for Fourth Quarter of 2009/10

- Environmental Technologies expected to continue to make progress. Light duty vehicle production expected to remain stable but impact of end of government incentives uncertain. Short term prospects for HDD remain subdued.

- Precious Metal Products will benefit from increased commission income and higher profits from refining and recycling business if higher pgm prices are maintained.

- Fine Chemicals performing in line with expectations but its results will be slightly impacted by restructuring of speciality contract research and manufacturing services business.

- Overall, group results for the full year are expected to be slightly ahead of current market consensus expectations.
Johnson Matthey in China

• Investing in the growing markets of the Asia region and especially in China is a key element of our strategy

• Fixed assets:
  • First investment in 2000/01 £5m
  • By 2007/08 £11m
  • By end 2009/10 £40m
  • Further expansion to follow

• Today we have:
  • Five manufacturing plants
  • Two distribution centres
  • Ten sales offices

• ~ 400 employees

• Much of our business served by JM operations outside China
Environmental Technologies in China

Larry Pentz
Executive Director
Environmental Technologies in China
Overview

• ET sales ex pms in China of £85m (2008/09)
• Strong vehicle sales, market share growth and tightening regulations in light duty
• Short to medium term opportunities for power plant catalyst sales and HDD
• Energy security and changing fuel specifications benefit AMOG
• DPT benefits from a growing chemical industry
Emission Control Technologies in China

John Walker
Division Director, Emission Control Technologies

Johnson Matthey
Emission Control Technologies in China

• A rapidly growing vehicle market:
  • 13.5 million vehicles sold in 2009
  • 44% increase over 2008
• Tightening emission regulations for light vehicles
• HDD regulations requiring catalyst fitment in the world’s largest truck market
• NOx control mandated on all new power plant construction
• Adding capacity to meet demand:
  • Doubled autocatalyst capacity in 2009
  • Start up of plate type SEC catalyst plant in 2010
Emission Control Technologies in China

Light Vehicle Production

<table>
<thead>
<tr>
<th>Million vehicles</th>
<th>2008</th>
<th>2009</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>8.6</td>
<td>12.5</td>
<td>45</td>
</tr>
<tr>
<td>Asia</td>
<td>28.7</td>
<td>28.4</td>
<td>-1</td>
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<tr>
<td>Europe</td>
<td>21.2</td>
<td>16.8</td>
<td>-21</td>
</tr>
<tr>
<td>N America</td>
<td>12.6</td>
<td>8.5</td>
<td>-32</td>
</tr>
<tr>
<td>GLOBAL</td>
<td>68.2</td>
<td>59.2</td>
<td>-13</td>
</tr>
</tbody>
</table>

- China continues at rapid pace despite global economy
- It is now the largest single country for sales of automobiles
- Growth expected to continue
Emission Control Technologies in China

- Market is predominantly gasoline vehicles
- Engine size on average is 1.4 - 1.5 litres
- Environmental regulations, hence catalyst technology, lags Europe and US
- Pricing consistent with global average for light duty, flow through (non-filter) catalysts
- Catalyst product and application development done outside China
- Production cost base:
  - Materials
  - Manufacturing costs
- JM is growing share in a growing market
Emission Control Technologies in China
Mobile Emissions Control – Light Duty and HDD

Linky Lai
General Manager
## Agenda

1. Emission Control Technologies in China
2. China market key highlights
3. Business plan and strategy
4. China business growth potential
Emission Control Technologies in China

- Production started in July 2001. Wholly owned
- Land size
  - Current 23,500 m²
  - A further 30,000 m² purchased in June 2008 (with existing building)
- Capacity
  - Current:
    • Approximately 5 million autocatalysts per year
    • TWC, HDD SCR and DOC lines
  - Future:
    • Catalyst ageing and testing facilities under construction. Due for completion in September 2010
- Around 170 employees
ECT China
Nationwide Presence

Beijing
• ECT sales office
• Over 25 car companies
• More than 10 LDD and HDD customers

Shanghai
• ECT production and sales office
• Over 10 car companies
• VW and GM both have JVs in area

Chongqing
• ECT sales office
• Over 10 car companies and more than 35 motorcycle OEMs

Guangzhou
• ECT sales office
• Over 10 car companies and 25 motorcycle OEMs
## China Economy

### Key Highlights

<table>
<thead>
<tr>
<th></th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
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<tbody>
<tr>
<td>Cars sold</td>
<td>5,270k</td>
<td>5,707k</td>
<td>8,469k</td>
</tr>
<tr>
<td>CPI %</td>
<td>4.8</td>
<td>5.9</td>
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<tr>
<td>GDP %</td>
<td>11.4</td>
<td>9.0</td>
<td>8.7</td>
</tr>
<tr>
<td>USD/RMB</td>
<td>7.30</td>
<td>6.82</td>
<td>6.83</td>
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</tbody>
</table>
China Major JV / OEM Affiliation

**VW**
- 60% FAW-VW Engine
- 40% FAW-VW
- 50% SH-VW Engine
- 50% Shanghai VW
- 50% FAW-VW
- 50% JMC

**TOYOTA**
- 51% Shihua
- 50% Tianjin-Toyota Engine
- 50% Tianjin-Toyota
- 50% Daihatsu
- 50% FAW Daihatsu
- 50% Guangzhou Toyota
- 50% Jingdong Toyota Engine
- 50% Guangzhou Honda

**BMW**
- 50% Brilliance BMW

**HONDA**
- 66% Guangzhou Export JV
- 50% Dongfeng Honda
- 50% Dongfeng Honda Engine
- 50% Honda

**PSA**
- 50% JMC

**FORD**
- 35% JMC
- 25% CFM
- 20% Jiangling
- 12.5% Isuzu
- 20% Ssangyong
- 20% Daewoo
- 20% Shanghai GM
- 20% SH-GM engine

**FAW GROUP**
- 50% FAW
- 50% FAW Group

**SHANGHAI AUTOMOTIVE (SAIC)**
- 50% Changfeng
- 50% Fujian Auto
- 50% BAIC
- 50% Dongfeng Motor

**DONGFENG MOTOR**
- 50% Changfeng Motor
- 50% Southeast Motor
- 50% BBDC
- 50% BJ-Hyundai

**HYUNDAI**
- 50% Hyundai

**FIAT**
- 50% Chery
- 50% FIAT

**TOYOTA**
- 50% Brilliance Toyota

**GM**
- 50% FAW-VW Engine
- 50% FAW-VW
- 50% SH-VW Engine
- 50% Shanghai VW
- 50% FAW-VW
- 50% JMC

**MAZDA**
- 33.4% No Equity
- 35% JMCG (41%) & Public (26%)

**FORD**
- 35% JMC
- 25% CFM
- 20% Jiangling
- 12.5% Isuzu
- 20% Ssangyong
- 20% Daewoo
- 20% Shanghai GM
- 20% SH-GM engine

**CFM**
- 50% No Equity

**CHANGAN**
- 50% Changan
- 50% Changan Ford Mazda
- 50% Changan Suzuki

**SUZUKI**
- 50% No Equity

**ISUZU**
- 50% No Equity

**SUZUKI**
- 35% No Equity

**NM**
- 25% No Equity

**Nissan**
- 40% No Equity

**Yulon-Nissan**
- 40% No Equity

**BAIC**
- 25% No Equity

**PSA**
- 50% JMC

**FORD**
- 35% JMC
- 25% CFM
- 20% Jiangling
- 12.5% Isuzu
- 20% Ssangyong
- 20% Daewoo
- 20% Shanghai GM
- 20% SH-GM engine

**BFMC**
- 50% No Equity

**NAC**
- 50% No Equity

**MG**
- 25% No Equity

**NAC**
- 25% No Equity
Vehicle Sales in China

(1) In k units
(2) Source: China automotive association and IHS Global Insight
China Vehicle Sales 2000 - 2009

(1) In k units
(2) Source: China automotive association and IHS Global Insight
## China Emissions Legislation

### Light Duty Gasoline

<table>
<thead>
<tr>
<th></th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
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<tr>
<td>China - Beijing</td>
<td>Euro 3</td>
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<td>Euro 4</td>
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<tr>
<td>China - Shanghai</td>
<td></td>
<td>Euro 3</td>
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<tr>
<td>China - Nationwide</td>
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<td>Euro 2</td>
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### Heavy Duty Diesel

<table>
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<tr>
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<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>China - Beijing</td>
<td>Euro III</td>
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<td>Euro IV</td>
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<tr>
<td>China - Shanghai</td>
<td>Euro II</td>
<td>Euro III</td>
<td></td>
<td></td>
<td></td>
<td>Euro IV</td>
</tr>
<tr>
<td>China - Nationwide</td>
<td>Euro II</td>
<td>Euro III</td>
<td></td>
<td></td>
<td></td>
<td>Euro IV</td>
</tr>
</tbody>
</table>
China Automotive Industry is Undergoing Fundamental Shifts

- Joint ventures are doing very well but growth will slow in the longer term
- Locals are doing extremely well (Geely, BYD, Changan, Great Wall etc.) supported by improving R&D capabilities
- Sales slowing down in mega cities. Local brands are more recognised in second tier cities
- Car models are changed more frequently than in any other part of the world
- Merger and consolidation
- Fierce competition leading to higher demands on suppliers from OEMs
Johnson Matthey’s Business Strategy
Addressing the Shift in the China Automotive Industry

• State of the art technology to all customers
• Growing share with local companies
  • Providing industry leading customer service and support to their programmes
  • Increasing our local technical support and infrastructure
• Providing lowest cost solutions as legislation tightens
Johnson Matthey
Growing Market Share in China

Estimated Market Share 2008/09

Source: Johnson Matthey Estimates
Summary

• Focused on long term, profitable growth in China
• Sales ex pms growth should continue to be strong
• We will deliver:
  • Best quality products in China
  • Tailored service to all OEMs
  • Preferred employer in China
  • Superior business growth

Delivering Service. Delivering Growth.
Virtual Tour of China Autocatalyst Plant
Agenda

1. Johnson Matthey’s power plant industries business
2. SCR catalyst market for coal fired power plants in China
3. New investment – SCR catalyst plant in China
4. Current developments in SCR catalysts
5. Summary
Johnson Matthey’s Power Plant Industries

Catalysts for reduction of nitrogen oxides (NOx) in power generation industry

Decades of experience in SCR catalyst / systems R&D and manufacturing

Johnson Matthey’s catalysts are installed in more than 500 fossil fired power plants worldwide

JM is the only supplier of both plate type and extruded honeycomb catalysts
JM PPI Locations Worldwide

Germany (Redwitz)
- Sales
- Engineering
- Service
- Manufacturing

USA (Alpharetta)
- Sales
- Engineering
- Service

China (Shanghai)
- Sales
- Service
- Manufacturing (from 2010)

China (Beijing)
- Sales

Malaysia (Kuala Lumpur)
- Sales
Catalyst Products

- **Plate type catalyst**
  - For high dust flue gas applications and special applications (coal fired power plants, industrial process plants, oil refinery power plants, etc.)

- **Extruded honeycomb catalyst**
  - For low dust flue gas applications (plants firing high grade coal, oil or gas; waste incineration plants, diesel applications, etc.)
JM Reference Projects in China
PPI Development in China

- Reference projects summary
  - Installed capacity: >14,000 MW
  - Catalysts sold: >10,000 m³
  - Treated flue gas volume: >23,700,000 Nm³/h
  - Orders received since 2007: >300 million RMB

- Market position in China
  - No. 3 position achieved despite a later market entry (2007)

- Large customer base:
  - Members of the ‘Big Five’ power generation group
  - Main boiler manufacturers
  - Most active SCR general contractor companies
NOx Emission Control for Power Plants
A Growing Market in China
Power Plant NOx Emissions Control in China

• Market drivers:
  • China is the world’s largest coal producer and consumer
  • 75% of power plants in China are coal fired
  • Total installed coal fired power plant capacity ~ 680 GW in 2010
  • ~ 280 GW new coal fired power plants to be installed by 2015
  • Big power groups aim to achieve an environmental friendly image

• Regulation drivers:
  • Ministry of Environmental Protection (MEP) of PRC requires new and existing power plants to be equipped with NOx removal system
  • Official regulation expected to be effective in 2010/2011
  • Emission limit is 200 mg NOx/Nm³ exhaust (same as European ELV)
Power Plant NOx Emissions Control in China

- Technology drivers:
  - JM is the only supplier able to produce both plate type and honeycomb SCR catalysts for power plant applications
  - Plate type catalysts are particularly suitable for coal with high ash content (typical for China)
  - Numerous successful reference applications
Estimation of China SCR Catalyst Market Size

- Since 2008 new power plants have been required to install SCR systems.
- Existing power plants are required to be retrofitted with SCR.
- After all power plants have been fitted with SCR catalysts, the market will be driven mainly by reloads and replacement.
Estimation of China SCR Catalyst Market Size

£ million

- New Power Plant
- Retrofit
- Reload
New Investment in China

JM’s SCR Catalyst Plant
New Investment in China
JM’s SCR Catalyst Plant

• Plate type SCR catalyst plant
  • Location: Songjiang, Shanghai
  • Plant area: 20,000 m²
  • Capacity: 9,000 – 10,000 m³ / year
  • Employees: 108
  • Start up: Spring 2010

• All permits in place
• Plant will operate to JM Quality and EHS standards
• JM’s experienced ECT Shanghai management team will be responsible for the new production plant
Current Development of SCR Catalysts

• Catalyst development for power plant and industry applications:
  • SCR catalysts for high ash applications – Chinese high ash coals and lignite coal applications
  • Further development of low SOx catalysts
  • Mercury oxidation capabilities of SCR catalysts
  • Investigation of ammonia bisulphate (ABS) formation – minimum operation temperature
  • SCR catalyst for biomass applications (e.g. co-firing) – GHG-initiative
  • SCR catalysts for a variety of other industrial applications
Summary

**SCR Technology**
- Well established technology for NOx emissions control
- Successfully proven in Europe and USA
- Plate type catalyst superior in high dust applications

**NOx Emissions Regulation in China**
- NOx emissions control on its way to being enforced by MEP of China
- Regulations / standards similar to Europe and USA
- Promising market demand for SCR catalysts

**JM Activities in China**
- Successfully entered the Chinese market
- Investing to improve our SCR catalyst market position for the power plant industry in China
- Chinese customers will benefit from JM’s continuing R&D activities

- China is the most important market for JM’s Power Plant Industries SCR catalyst business
- JM is well positioned to achieve substantial growth in this rapidly emerging market
## Agenda

| 1 | Process Technologies - China Overview | - Neil Whitley |
| 2 | Syngas Catalyst Growth in China      | - Andrew Wright |
| 3 | Technology Licensing in China        | - David Tomlinson |
| 4 | **Breakout groups:**                 |                  |
|    | • Technology licensing in China      |                  |
|    | • Coal to products in China         |                  |
Process Technologies

China Overview

• Sales in China >50% up on prior year
• AMOG sales up 70% on prior year
  • Strong methanol catalyst sales
  • Sales of sour shift catalysts
  • Hero JV – additional investment in land
• DPT sales up ~ 50% on prior year with six plants licensed in 2008/09
  • Butanediol
  • Oxo alcohols
  • Methanol
• Latest projects in China
  • First world scale SNG plant at Datang
  • Oxo alcohols plant at Daqing
Process Technologies
China Overview

• Growth in China driven by:
  • Abundance of coal resources which is a strategic source of synthesis gas
  • Increasing demand for fuels and petrochemicals
  • Use of methanol as a gasoline additive
  • Tightening environmental regulations
• China demanding the best available technologies
Syngas Catalyst Growth in China

Andrew Wright
Managing Director, Syngas & Gas to Products
Synthesis Gas (Syngas) from Coal
Syngas in China

• Coal is an abundant and key strategic resource
• Energy consumption growing rapidly in China
• Increased regulations for cleaner fuels
• Greater focus on larger, more economic plants
• Emphasis on reducing emissions

Sources: BP Statistical Review of World Energy 2009
Syngas in China

- Methanol
- Ammonia
- Hydrogen
- New syngas markets in China:

Coal → Gasifier → Sour Shift → Hydrogen → Methanol → Ammonia → FT → SNG

Process Technologies offers leading products and/or technology for each of these building blocks.

Traditional markets (formaldehyde etc.):
- Gasoline blending
- Olefins
- Propylene
- DME

Diesel
Pipeline
Energy

Methanol fuel in China
Syngas in China

- China Syngas catalyst market estimated at £180 million – 11% of global market.
- Smaller uneconomic ammonia, hydrogen and methanol plants not run at full rates.
- 22 from 83 methanol projects planned or under construction are >2,000 tpd.
- JM focuses on the larger projects which accounts for more than 60% of new capacity.
- 40% of methanol plants >2,000 tpd in China uses JM / DPT technology.
- China Government is prioritising large methanol project investments.

New Methanol Capacity in China
Projects under construction or planned

- 49 plants
- 13 plants
- 12 plants
- 9 plants

Sources: Asia Chem, China Coalchem, ChinaCTL, JM internal analysis.
Methanol in China

- Shift to energy molecule
- Fuel blending – M5, M15, M85, M100
- DME for LPG substitution
- China demand forecast to double over next five years - focus on larger more efficient plants
- Catalyst volumes installed range from 50 to 250 tonnes
- New market leading JM Apico catalyst delivers strong benefits to customers
Ammonia in China

- Population growth
- Switch to larger, more efficient plants
- One third of global fertiliser market size (56 million tonnes p.a.)
- Growth rate: 1.5% p.a.
- Catalyst volumes installed range from 50 to 200 tonnes
Hydrogen in China

- Fuel specifications
- New refineries and hydrogen plants
- Hydrogen plant investment gaining momentum
- Marketing venture with Sinopec on hydroprocessing catalysts
- Catalyst volumes installed range from 60 to 200 tonnes

Source: Sinopec figures
Substitute Natural Gas in China

- China short of natural gas
- SNG can utilise natural gas pipeline infrastructure

- Potential for “clean coal”
- JM recently won the first commercial SNG plant at Datang

China gas pipeline – completed 2009
Source: China Daily, AP
Syngas Team in China

- Hero Joint Venture incorporated in 2007 to manufacture sour shift catalyst
- JM recently increased ownership to 51% and is investing in adjacent land
- Will continue to develop manufacturing capability in China
- Beijing sales and technical service office established in 2006
- High quality technical and professional staff
## JM Syngas in China

<table>
<thead>
<tr>
<th>China: Economic and Social Drivers</th>
<th>Levers to meet needs</th>
<th>JM Capability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel growth</td>
<td>Methanol fuel blending, DME</td>
<td>Lead methanol licensor: large scale, leading edge flowsheets</td>
</tr>
<tr>
<td>Plastics consumption increasing</td>
<td>Produce plastics via MTO / MTP</td>
<td>As above</td>
</tr>
<tr>
<td>Fuel growth and tightening regulations</td>
<td>New capacity and improved refineries including hydrogen plants</td>
<td>Technology and catalyst know how, market leader in industrial gas segment</td>
</tr>
<tr>
<td>Expanding food supplies for growing population</td>
<td>Increase size of new ammonia plants</td>
<td>Strong ammonia licensor with Uhde, deep operating experience, local manufacturing</td>
</tr>
<tr>
<td>Expand sources of hydrocarbon to meet GDP growth</td>
<td>Monetise coal</td>
<td>Local sour gas manufacturing and market leadership</td>
</tr>
<tr>
<td>Reducing dependence on imported natural gas</td>
<td>Build SNG facilities</td>
<td>Only catalyst supplier with &gt;20 years operating experience</td>
</tr>
</tbody>
</table>
Licensing Technology in China

David Tomlinson
President, Davy Process Technology
Growth of China Petrochemical Industry

<table>
<thead>
<tr>
<th>Ethylene Production</th>
<th>1978</th>
<th>2006</th>
<th>2011 (Forecast)</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>0.4</td>
<td>8</td>
<td>18</td>
</tr>
<tr>
<td>World</td>
<td>33</td>
<td>121</td>
<td>156</td>
</tr>
<tr>
<td>China %</td>
<td>1%</td>
<td>7%</td>
<td>12%</td>
</tr>
</tbody>
</table>

Source: China Government sources

Plants using DPT technologies

<table>
<thead>
<tr>
<th>Plants</th>
<th>1978</th>
<th>2006</th>
<th>2011 (Estimated)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All technologies</td>
<td>2</td>
<td>6</td>
<td>22</td>
</tr>
</tbody>
</table>

- First licences 1978 – oxo alcohols
- Growth in licensing reflects expansion of petrochemical industry and coal utilisation
Locations of Plants and Licences in China

- METHANOL
- OXO ALCOHOLS
- BUTANEDIOL
- OTHERS: NDA, DMF, EA, SNG, THF
Licensing Components

- Licence contract (phased and running royalty)
- Basic engineering package
- Supply of proprietary equipment
- Supply of catalyst
- Commissioning services

- Underpinned by ongoing investment in process improvement and development of the IP portfolio
- Strong market share resulting from this investment
Chinese Design Institutes (CDIs)

- DPT has worked with ten CDIs nominated by the end user:
  - China Chengda Engineering Company Ltd
  - Sinopec Ningbo Engineering Company Ltd
  - China Tianchen Chemical Engineering Corporation
  - China Tianjin Chemical Engineering
  - China Hualu Engineering Company
  - China Petrochemical Engineering Company
  - China Huanqiu Contracting and Engineering Corporation
  - East China Engineering Science & Technology
  - Sedin Engineering Company Ltd
  - Sinopec Shanghai Engineering Company Ltd

- Basic engineering package workscape has been tailored to suit CDIs
- DPT retains a minimum scope of work to ensure technology reliability, plant safety and DPT reputation
High Proportion of Staff Familiar with China Market

- Key departments involved in licensing and delivery of projects
  - Business management, marketing and business development
  - Process
  - Engineering
  - Project management
  - (140 people out of DPT total 220)

- 90% have worked on projects for China
- 60% have made (short and long) business visits
Oxo Alcohols

- World market:
  - 7 mtpa Butanols, 2EH
- Growth:
  - 3% p.a.
- Drivers:
  - Local market growth, propylene feedstock
- Uses:
  - Solvents, plasticisers
- DPT / Dow licensed capacity in China:
  - 1.8 mtpa
- Market share (licensed technology) 2000 – 2010:
  - Global 100% China 100%
- Marketing and technology strengths:
  - Upgrading and expansion of initial projects
  - Large capacity plants; latest processes
Methanol

- **World market:**
  - 50 mtpa (20% fuels)

- **Growth:**
  - Chemicals 2.5% p.a., fuels 30% p.a.

- **Drivers:**
  - Fuel use; MTO

- **Uses:**
  - Chemicals, MTO, fuels

- **JM licensed capacity in China:**
  - 10 mtpa

- **Market share 2000 – 2010:**
  - Global 40% China 40%

- **Marketing and technology strengths:**
  - Large capacity plants
  - Use of gasified coal and acetylene off gas as feedstocks
  - Product for fuel and MTO use
Butanediol (BDO)

- **World market:**
  - 1.8 mtpa
- **Growth:**
  - 6% p.a.
- **Drivers:**
  - End use growth, raw materials in Middle East
- **Uses:**
  - Spandex fibres, industrial plastics, solvents
- **Licensed capacity in China:**
  - 230 ktpa
- **Market share 2000 – 2010:**
  - Global 50% China 55%
- **Marketing and technology strengths:**
  - Improved co-product flexibility (THF and GBL)
  - Use of coal based benzene feedstocks
Marketing Success in China

- Market leading technologies worldwide
- Long history of licensing in China
- Good project delivery
  - Working with Chinese Design Institutes
  - Proven track record / repeat business
- Maintained value of technologies
- Continued improvement of technologies
  - Increased plant capacities
  - Improved raw material and energy efficiencies
  - Flowsheets for China feedstocks
  - Product spectrum for market needs
- Growing respect in China for international principles protecting intellectual property
Latest Plant Using DPT Technology in China

Bluestar (Nanjing) 55 ktpa BDO plant
- Effective contract November 2006
- Start up May 2009 - acceptance July 2009
Precious Metal Products Division – Operations in China

Bill Sandford
Executive Director
PMPD in China

Two key activities:

• JM Shanghai
  • Chemicals and catalysts
  • Chemical, petrochemical and pharma industries

• JM Hong Kong / Shenzhen
  • Resale of other PMPD products
  • Pgm trading and marketing

• Represents 8% of total PMPD sales ex pms
PMPD Hong Kong

- Regional HQ for business in SE Asia
- Six offices in four countries
- Three major functions
  - JM group product resale
  - Pgm trading and distribution
  - Pgm marketing
PMPD Hong Kong
JM Group Product Resale

- Products made in Europe, USA and Korea
- Sales, warehousing and distribution in Hong Kong, Shenzhen and Shanghai
- Major product groups
  - Metallurgical products (Noble Metals)
  - Colour Technologies
  - Emerging markets e.g. fuel cells
PMPD Hong Kong
Metallurgical Products

• Products made in UK and USA
• Pgm alloys for industrial applications
  • Nitric acid catalysts, glass furnaces, medical etc.
• Catalysts for N₂O destruction
• Competitors – Heraeus, local Chinese, in-house mfr
PMPD Hong Kong
Colour Technologies

- Products developed and manufactured in Maastricht and Korea
- Enamels and inks for automotive glass
  - Became world’s largest market in 2009
  - Technology and quality are key
  - Competitors – Ferro, Okuno, Pemco, local Chinese
- Large range of decorative products
  - Large number of local Chinese competitors
PMPD Hong Kong
Pgm Trading

- Gives JM 24-hour coverage
- Trading in US$ and local currency
- China has become major consumer of all Pgms
  - Biggest demand market for both Pt and Pd
PMPD Hong Kong
Platinum Demand 2009

Pt Demand by Region (m oz)

China Pt Demand by Application (m oz)

Total China Market 2.05m oz
PMPD Hong Kong
Palladium Demand 2009

Pd Demand by Region (m oz)

China Pd Demand by Application (m oz)

Total China Market 1.5m oz
PMPD Hong Kong
Pgm Marketing

- Part of our Anglo Platinum relationship
  - JM is Anglo’s Marketing Agent
- Market research
- Market development
The Chinese Jewellery Market

Bill Sandford
Executive Director
Elaine Shao
Office Manager, JM Shanghai
Platinum Jewellery
Early Success Factors

• Perceived as being western, fashionable, young
• Helped by one child policy
• Preference for “white” jewellery
• High purity
• Strict control on gold fabrication
• Higher manufacturing margins
Johnson Matthey’s Role

- Early 1990s - market evaluation, early marketing
- Lobbying for quality standards
- Support for jewellery testing centres
- Support for Pt listing on Shanghai Gold Exchange
- Technical training for manufacturers
- Provision of local metal stocks / trading
- Measurable sales began in 1993
Market Features

• Good quality, high purity, quality assured
• Lightweight, affordable, low mark-up
• Metal intensive
• Aspirational
• Price sensitive market
• Large, well financed manufacturers / retailers
Ongoing Market Development

- Coordination with Platinum Guild International (PGI)
  - Funded by major Pt producers
  - JM a sponsor
- PGI China established 1997
- Consumer marketing campaigns launched
Platinum Jewellery Demand – China
Purchase of new metal by manufacturers

PGI China established in 1997
JM active in China jewellery from early 1990s
World Platinum Demand

- Jewellery 40% total demand in 2009
- China biggest jewellery market
- Price sensitive – provides support when industrial demand slows
- Sales in 2009 up 900k oz
Growing Consumer Base

- Population 1.34 billion
- Middle class population estimated at 100 - 250 million
- Urban population 575 million in 666 cities
- Continuing high savings rates
- Majority of sales in 1st and 2nd tier cities
- Significant scope for further market penetration
The Platinum Jewellery Industry in China
Future Market Drivers

- Chinese economic growth
- Manufacturing premiums
- Marketing – expanding the customer base
- Platinum price
Catalysts and Chemicals Business in China

Helen Zhou, General Manager
John Chen, Commercial Director
Agenda

1. China site history and development
2. Organisation
3. Operations
4. Platinum group metal (pgm) chemicals review
5. Sponge nickel catalyst review
6. Summary
History
Catalysts and Chemicals China

• 1980s – Johnson Matthey established sales office in Hong Kong
  • Covers all JM products
• 1990s – development / commercial visits in China
  • JM established sales office in Shanghai
• 2002 – constructed chemicals manufacturing plant to support ECT and external markets
  • Expanded market development / commercial visits to support future growth of pgm and base metal catalysts in China
• 2005 – Established trading company in Shanghai to distribute edible oil and oleochemical catalyst products
• 2008 – New pgm chemicals manufacturing facility opened on Shanghai site
• 2009 – Nickel catalyst plant commissioned on the chemicals site
Shanghai Site Bird’s-eye View
Songjiang – 40km from Shanghai city centre
Catalysts and Chemicals Manufacturing
China

General Manager
Helen Zhou

- Sales / Marketing
- HR / Admin
- Manufacturing
- Engineering
- QA and EHS
- Finance

- Pgm Chemicals Production
- Sponge Nickel Catalyst Production
Operational Focus

- Products and processes transferred from JM USA
- Optimisation in China – two way technology transfer
- Modern, highly efficient factory
  - Meets highest international specifications
  - Consistent with JM Sustainability 2017
- Recruit high quality staff
  - 104 employees
  - 65% with first degree or higher
- Train, motivate and encourage employees
  - 5% staff turnover
  - Chinese industry 14.2%, Chemical industry 10.7%
Catalysts and Chemicals Manufacturing

- **Platinum group metal (pgm) chemicals**
  - Full range of platinum, palladium and rhodium based products
  - Simple binary salts (e.g. platinum nitrate, palladium chloride, rhodium iodide)
  - Pgm coordination complexes and organometallic compounds

- **Sponge nickel catalysts**
  - Nickel in highly activated form
  - Used as catalyst for hydrogenation reactions
  - Wide range of catalyst types
Pgm Chemicals Production Trend

Volumes CAGR 38% in past 6 years
## Market Growth – 2009

<table>
<thead>
<tr>
<th>Industry</th>
<th>Growth (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automotive*1</td>
<td>43.9</td>
</tr>
<tr>
<td>Petroleum*2</td>
<td>6.4</td>
</tr>
<tr>
<td>Chemicals*3</td>
<td>7.4</td>
</tr>
<tr>
<td>Pharma*4</td>
<td>23.0</td>
</tr>
</tbody>
</table>

1. IHS Global Insight
2. China Petroleum and Chemical Industry Association
3. Wind, Bloomberg, Yuanta research September 2009
China Chemicals Market

- Pgm chemicals for autocatalysts
- Plating for decorative and electronic applications
- Catalysts and catalyst precursors for petroleum, petrochemical, chemical and pharma industries
- Others – aerospace, electronics
- Competitors
  - Heraeus, Umicore
  - Sino-Platinum, Grikin + numerous local Chinese

Markets by Revenue

- Automobile: 65%
- Plating: 14%
- Chemicals: 11%
- Others: 10%
## Chemical Catalysts and Precursors

<table>
<thead>
<tr>
<th>Pgm Salt</th>
<th>Application</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pt</td>
<td>Petroleum</td>
<td>Gasoline</td>
</tr>
<tr>
<td>Rh</td>
<td>Acetic acid</td>
<td>PVA / plastics</td>
</tr>
<tr>
<td>Rh</td>
<td>Oxo alcohols</td>
<td>Plasticisers</td>
</tr>
<tr>
<td>Pd</td>
<td>Pharma</td>
<td>APIs</td>
</tr>
</tbody>
</table>
Sponge Nickel Products and Technologies

- Products – sponge nickel
  - Often promoted by other metals
  - Catalyst tailored for discrete chemical reactions
- Used as hydrogenation catalyst in a range of processes
- Products and process transferred from JM Tennessee, USA
- Plant commissioned in Q4 2009
- Johnson Matthey only western manufacturer in China
China Sponge Nickel Market 2010

- Hydrogenation catalyst
- Polyol – current largest market, will grow 10.6% in 2010*1
- Pharma and Fine Chem – growing 24%*2. Largest sector in 2011
- Variety of chemical and speciality chemical application

- Competitors
  - WR Grace, Evonic
  - Dalian Toyouger + other locals

---

1. Global Insight forecast China
2. Bloomberg, Yuanta research Sept 2009
Supported Catalysts

- Resale of supported catalysts made by Johnson Matthey in Europe and USA
- Active metals can be pgm or base metals
- Variety of support materials
  - Carbon, alumina, silica etc.
- Used in the pharma, chemical and petroleum industry
- Market growing quickly
  - Chinese pharma industry expected to be the world’s fifth largest market in 2010 and the world’s largest by 2040
Virtual Tour of Catalysts and Chemicals, Shanghai
Summary

- Invested in strong manufacturing presence and management infrastructure at the Shanghai site
- Established capability to manufacture a wide range of products tailored to local requirements
- The business has shown good growth over last few years
- The markets for our products are expected to grow strongly offering significant growth opportunities in the future
- Plans under consideration to expand operations
- Strong team of highly qualified and motivated staff
- Quality, product development and strong relationships key to success in this market
Fine Chemicals Division

Nick Garner
Division Director
## Agenda

1. Fine Chemicals Division Overview
2. Fine Chemicals developments in Asia
3. Research Chemicals in Asia - Yantai
Fine Chemicals Division

• Division formed April 2009
• Comprises Research Chemicals and the Active Pharmaceutical Ingredients (API) businesses:
  • Macfarlan Smith – Edinburgh
  • Pharmaceuticals Materials and Services – NJ and MA, USA

FC Sales ex pms 2008/09

- China 2.5%
- ROW 97.5%

FC Sales ex pms 1H 2009/10

- Macfarlan Smith 38%
- Research Chemicals 26%
- Pharmaceuticals Materials and Services 36%
Research Chemicals

- Catalogue range of 30,000 products. Grown from 11,000 in 1995
- Catalogue sizes (over 80,000 items). Usually shipped same or next day from stock in all markets
- Sell to academic, industrial, R&D, high tech, analytical, and pharma accounts
- Business has averaged double digit operating profit growth since 2000
Research Chemicals

- Current products are inorganics, organics and metals (not life science)
- Research Chemicals’ new global web site (www.alfa.com) launched in October 2009
- Bulk or custom items represent a minority of transactions but account for a significant percentage of sales
Fine Chemicals in Asia

Beijing
• RC China Head office

Tianjin
• RC Distribution Centre

Seoul
• RC Sales Office

Yantai
• RC Manufacturing Facility

Hyderabad
• RC Distribution Centre Opening 2010

Chennai
• RC Sales Office
Research Chemicals in Asia

- Research Chemicals’ major focus to develop Asian markets

- Asia sales approx 15% of Research Chemicals’ total sales
- Particular emphasis on the Chinese and Indian markets
  - Distribution centre in Tianjin close to key markets of Beijing and Shanghai
  - New bonded warehouse and distribution centre opening 2010 in Hyderabad
  - New manufacturing facility opened end 2009 in Yantai
Alfa Aesar Synmax
Yantai China Laboratories and Pilot Plant

Jian Zhang
Managing Director
Location: Yantai, Shandong Province

- Coastal city southeast of Beijing and north of Shanghai
- One hour flight from Beijing or Shanghai
- Located in YEDA - Yantai Economic and Technical Development Zone
- Low cost but desirable location in general proximity to resort areas
Virtual Tour of Alfa Aesar Synmax, Yantai
Strategy: The Kilo Lab

• In-house manufacture of current product range at lower cost
• Manufacture hundreds of new and competitor listed products
• Develop new and interesting processes to make products for new markets
• Keep opportunities, quality control and intellectual property in-house
Strategy: The Pilot Plant

- Opportunities to expand bulk capabilities to supply external customers and for in-house manufacturing of intermediates for wider JM group
- 100 to 2,000 litre capacity - presents enhanced capability to supply
- Keeps opportunities, quality control, and intellectual property in-house
- Ensures batch efficiency via scaling up and low cost (local) raw materials
- Low overheads allow highly competitive pricing
World Class Chemistry

- Alfa Aesar Synmax Board Member, Guomin Zhang, former Head of the Chinese Chemical Society
- Team leaders with decades of experience and >100 literature references
- Knowledge to perform and manage several hundred types of reactions
- Excellent local and national contacts with diverse chemistry knowledge
Sales and Marketing

• Yantai products will be offered via global catalogue and established sales network
• Sales and marketing will be managed by Alfa Aesar regional facilities
• Alfa Aesar regional bulk sales teams will convert quotes into orders for Yantai
Research Chemicals Growth Strategy
Building on Strengths and Synergies, Keeping Costs Low

• Strategy enables us to address opportunities which we were unable to pursue in the past
• Low cost materials and low overheads enables competitive pricing
• Local presence strengthens our position in Chinese research / chemicals industry
• Johnson Matthey’s global reach allows us to leverage our capabilities
Wrap Up and Q&A

Neil Carson
Chief Executive

Johnson Matthey
## Glossary

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABS</td>
<td>Ammonia bisulphate</td>
</tr>
<tr>
<td>AMOG</td>
<td>Ammonia, Methanol, Oil and Gas</td>
</tr>
<tr>
<td>API</td>
<td>Active pharmaceutical ingredient</td>
</tr>
<tr>
<td>BDO</td>
<td>Butanediol</td>
</tr>
<tr>
<td>C&amp;C</td>
<td>Catalysts and Chemicals</td>
</tr>
<tr>
<td>CDI</td>
<td>Chinese Design Institute</td>
</tr>
<tr>
<td>CH₄</td>
<td>Methane</td>
</tr>
<tr>
<td>CH₃OH</td>
<td>Methanol</td>
</tr>
<tr>
<td>CO</td>
<td>Carbon monoxide</td>
</tr>
<tr>
<td>CO₂</td>
<td>Carbon dioxide</td>
</tr>
<tr>
<td>COS</td>
<td>Carbonyl sulphide</td>
</tr>
<tr>
<td>CPI</td>
<td>Consumer price index</td>
</tr>
<tr>
<td>DME</td>
<td>Dimethyl ether</td>
</tr>
<tr>
<td>DMF</td>
<td>Dimethyl formamide</td>
</tr>
<tr>
<td>DOC</td>
<td>Diesel oxidation catalyst</td>
</tr>
<tr>
<td>DPT</td>
<td>Davy Process Technology</td>
</tr>
<tr>
<td>EA</td>
<td>Ethyl acetate</td>
</tr>
<tr>
<td>2EH</td>
<td>2-ethyl hexanol</td>
</tr>
<tr>
<td>ECT</td>
<td>Emission Control Technologies</td>
</tr>
<tr>
<td>EHS</td>
<td>Environment, Health and Safety</td>
</tr>
<tr>
<td>ELV</td>
<td>Emission limit value</td>
</tr>
<tr>
<td>ET</td>
<td>Environmental Technologies Division</td>
</tr>
<tr>
<td>FC</td>
<td>Fine Chemicals Division</td>
</tr>
<tr>
<td>FT</td>
<td>Fischer-Tropsch</td>
</tr>
<tr>
<td>GBL</td>
<td>gamma Butyrolactone</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross domestic product</td>
</tr>
<tr>
<td>GHG</td>
<td>Greenhouse gas</td>
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<tr>
<td>GTL</td>
<td>Gas to liquids</td>
</tr>
<tr>
<td>GW</td>
<td>GigaWatt</td>
</tr>
<tr>
<td>H₂</td>
<td>Hydrogen</td>
</tr>
<tr>
<td>H₂S</td>
<td>Hydrogen sulphide</td>
</tr>
<tr>
<td>HDD</td>
<td>Heavy duty diesel</td>
</tr>
<tr>
<td>JM</td>
<td>Johnson Matthey</td>
</tr>
<tr>
<td>JV</td>
<td>Joint venture</td>
</tr>
<tr>
<td>LDD</td>
<td>Light duty diesel</td>
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<tr>
<td>LPG</td>
<td>Liquefied petroleum gas</td>
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<tr>
<td>Abbreviation</td>
<td>Description</td>
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<tr>
<td>MEP</td>
<td>Ministry of Environmental Protection</td>
</tr>
<tr>
<td>MTO</td>
<td>Methanol to olefins</td>
</tr>
<tr>
<td>MTP</td>
<td>Methanol to propylene</td>
</tr>
<tr>
<td>MW</td>
<td>MegaWatt</td>
</tr>
<tr>
<td>NDA</td>
<td>Natural detergent alcohol</td>
</tr>
<tr>
<td>N$_2$O</td>
<td>Nitrous oxide</td>
</tr>
<tr>
<td>NOx</td>
<td>Nitrogen oxides</td>
</tr>
<tr>
<td>OEM</td>
<td>Original equipment manufacturer</td>
</tr>
<tr>
<td>Pd</td>
<td>Palladium</td>
</tr>
<tr>
<td>PGI</td>
<td>Platinum Guild International</td>
</tr>
<tr>
<td>Pgm</td>
<td>Platinum group metal</td>
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<tr>
<td>Pms</td>
<td>Precious metals</td>
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<tr>
<td>PMPD</td>
<td>Precious Metal Products Division</td>
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<tr>
<td>PPI</td>
<td>Power plant industry</td>
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<tr>
<td>PRC</td>
<td>People’s Republic of China</td>
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<tr>
<td>PT</td>
<td>Process Technologies</td>
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<tr>
<td>Pt</td>
<td>Platinum</td>
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<tr>
<td>R&amp;D</td>
<td>Research and development</td>
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<tr>
<td>RC</td>
<td>Research Chemicals</td>
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<tr>
<td>RMB</td>
<td>Renminbi</td>
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<tr>
<td>ROW</td>
<td>Rest of the world</td>
</tr>
<tr>
<td>Rh</td>
<td>Rhodium</td>
</tr>
<tr>
<td>SCR</td>
<td>Selective catalytic reduction</td>
</tr>
<tr>
<td>SEC</td>
<td>Stationary emission control</td>
</tr>
<tr>
<td>SNG</td>
<td>Substitute natural gas</td>
</tr>
<tr>
<td>SOx</td>
<td>Oxides of sulphur</td>
</tr>
<tr>
<td>Syngas</td>
<td>A mixture of hydrogen and carbon oxides</td>
</tr>
<tr>
<td>THF</td>
<td>Tetrahydrofuran</td>
</tr>
<tr>
<td>Tpd</td>
<td>Tonnes per day</td>
</tr>
<tr>
<td>TWC</td>
<td>Three way catalyst</td>
</tr>
<tr>
<td>ZnO</td>
<td>Zinc oxide</td>
</tr>
<tr>
<td>ZnS</td>
<td>Zinc sulphide</td>
</tr>
<tr>
<td>YEDA</td>
<td>Yantai Economic and Technical Development Zone</td>
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</table>