JM Executive Board

Neil Carson - Chief Executive
John Sheldrick - Group Finance Director
Larry Pentz - Executive Director, ECT
Dr Pelham Hawker - Executive Director, PCT and Pharmaceutical Materials
David Morgan - Executive Director, Corporate Development, Central Research and Ceramics
# Other Senior Management

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paul Framp</td>
<td>Managing Director, ECT Europe</td>
</tr>
<tr>
<td>Antoine Bordet</td>
<td>General Manager, ECT Northern Europe</td>
</tr>
<tr>
<td>Dr David Prest</td>
<td>Global Director, Heavy Duty Diesel</td>
</tr>
<tr>
<td>Simon Christley</td>
<td>Division Finance Director, ECT</td>
</tr>
<tr>
<td>Dr Martyn Twigg</td>
<td>Technology Director, ECT Europe</td>
</tr>
<tr>
<td>Ian Godwin</td>
<td>Director, Investor Relations</td>
</tr>
<tr>
<td>Dr Sally Jones</td>
<td>Public Relations Manager</td>
</tr>
<tr>
<td>Time</td>
<td>Event</td>
</tr>
<tr>
<td>-------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>9.00</td>
<td>Welcome and trading update (Neil Carson)</td>
</tr>
<tr>
<td>9.15</td>
<td>Environmental Catalysts and Technologies and the Global Light Duty Market (Larry Pentz)</td>
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<td>9.45</td>
<td>Coffee break</td>
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<td>10.00</td>
<td>ECT Europe (Paul Framp) and The Diesel Filter Market in Europe (Antoine Bordet)</td>
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<tr>
<td>10.30</td>
<td>Heavy Duty Diesel (Dr David Prest)</td>
</tr>
<tr>
<td>11.15</td>
<td>Tour of Autocatalyst Technical Centre</td>
</tr>
<tr>
<td>12.15</td>
<td>Tour of Autocatalyst and Catalysed Soot Filter manufacturing facilities</td>
</tr>
<tr>
<td>13.15</td>
<td>Lunch and visit wrap up Q&amp;A</td>
</tr>
<tr>
<td>14.15</td>
<td>Depart by coach for Royston Station</td>
</tr>
</tbody>
</table>
Current Trading

• Trading in the second half progressing well

• Catalysts Division continues to deliver good growth

• ECT benefiting from increased sales of heavy duty diesel catalysts following the introduction of new emissions regulations in Europe and North America

• PCT has also achieved good growth with strong sales of synthesis gas catalysts and a good contribution from Davy Process Technology

• Precious Metal Products had strong third quarter with continuing favourable conditions in the pgm markets
Current Trading

• Pharmaceutical Materials is also ahead of last year with continued recovery in its US business

• Sale of Ceramics Division agreed for approximately €226 million in cash. The proceeds will be used to buy back shares and fund bolt-on acquisitions

• The disposal of Ceramics will be slightly dilutive to earnings this year and the US dollar has weakened further since our Interim Results

• Despite these adverse effects, the outlook for the year remains encouraging, with growth in earnings per share (excluding the profit on disposal of Ceramics) expected to be slightly better than the 9% achieved in the first half
Larry Pentz, Executive Director
Environmental Catalysts and Technologies
Agenda

• ECT Overview - Larry Pentz
• Global Light Duty Market - Larry Pentz
• European Region - Paul Framp
• The LD Diesel Market in Europe - Antoine Bordet
• Heavy Duty Diesel - David Prest
Environmental Catalysts and Technologies
Markets and Products

Markets

LIGHT DUTY APPLICATIONS
- petrol OEMs (Original Equipment Manufacturers)
- diesel OEMs
- aftermarket

HEAVY DUTY DIESEL APPLICATIONS
- OEMs
- retrofit

STATIONARY SOURCE EMISSIONS CONTROL
- power industry
- process industry
- internal combustion engine converters
Markets and Products

**Products**

- Flow through components
  - three way catalyst (TWC)
  - diesel oxidation catalyst (DOC)
  - selective catalytic reduction (SCR)
  - NOx absorber catalyst (NAC)

- Systems of catalyst components
  - continuous regenerating trap (CRT®)
  - catalysed CRT® (CCRT®)
  - SCRT® (SCR + CRT)
  - EGRT® (EGR + CRT)

Particulate filters
also known as diesel particulate filters (DPF) and catalysed soot filters (CSF)
Catalysts Division - 2006/07 Half Year Results

- Profits up 9%
- Both ECT and PCT achieve good growth
Catalysts Division – 2006/07 Half Year Results

Sales £996m

Sales excl. Precious Metals £458m

Operating Profit £70.8m
### Substrate Costs

<table>
<thead>
<tr>
<th>Component</th>
<th>Cost Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autocatalyst</td>
<td>£3 - £10</td>
</tr>
<tr>
<td>CSF</td>
<td>£100 - £120</td>
</tr>
<tr>
<td>HDD</td>
<td>Flow through £60, Filter system £300</td>
</tr>
</tbody>
</table>
Global Network

- Detroit, USA
- Wayne, USA
- Queretaro, MEXICO
- Pilar, ARGENTINA
- Royston, UK
- Sonning, UK
- Brussels, BELGIUM
- Krasnoyarsk, RUSSIA
- Koryo, KOREA
- Shanghai, CHINA
- Delhi, INDIA
- Kuala Lumpur, MALAYSIA
- Kitsuregawa, JAPAN
- Germiston, RSA
- Curitiba, BRAZIL

12 Manufacturing Sites
7 Technology Centres
Current Investment in Growth

- Diesel Test Cells
- CSF Plant
- New Test Cells
- HDD Test Cell
- Korea Plant
- Japan Expansion
- Russia Plant
- RSA Expansion
- Diesel Plant
Autocatalysts - Global Market Share

Revenues excl.
Precious Metals
Available market

- BASF: 31%
- JM: 25%
- Umicore: 13%
- Other: 31%
Emission tightening continues around the world

Emphasis on particulate removal offers significant new opportunity in the light duty segment today

Focus on NOx reduction in the next rounds of legislation will require additional emission control

On road, heavy duty diesel volumes begin series production in the second half of 2006/07

Further tightening of on road and the start of off road HDD continues into the next decade

Locomotive, marine and small engine legislation offer incremental opportunity beyond 2010

Expectation – double digit growth for the foreseeable future
Global Light Duty Market
Global Light Duty Vehicle Production

Vehicle Market Dynamics

- Moderate global growth
  - 2005-10 CAGR 2.9%
- Strong regional growth in China, India, E.Europe

Source: Global Insights & JM Forecasts
Vehicle Market Dynamics

- Diesel growth remains in EU
  - NA < 10% in 2010
- Petrol stable growth
- Other fuel technologies will have limited impact

Global Production by Fuel Type

<table>
<thead>
<tr>
<th>Year</th>
<th>Hybrid</th>
<th>Other</th>
<th>Petrol</th>
<th>Diesel</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>0.34</td>
<td>1.73</td>
<td>47.35</td>
<td>14.87</td>
</tr>
<tr>
<td>2006</td>
<td>0.49</td>
<td>2.15</td>
<td>48.68</td>
<td>15.91</td>
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<tr>
<td>2007</td>
<td>0.80</td>
<td>2.29</td>
<td>49.57</td>
<td>16.64</td>
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<tr>
<td>2008</td>
<td>1.11</td>
<td>2.36</td>
<td>50.67</td>
<td>17.29</td>
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<tr>
<td>2009</td>
<td>1.36</td>
<td>2.52</td>
<td>51.13</td>
<td>17.94</td>
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<tr>
<td>2010</td>
<td>1.46</td>
<td>2.48</td>
<td>51.83</td>
<td>18.44</td>
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</tbody>
</table>
Light Duty – Market Opportunities

- Diesel particulate filters
- NOx removal
- Asia market growth (and market share growth)
- Continuous PGM thrifting
Estimate Europe Filter Demand

Filters (m)

2005  06  07  08  09  2010
US Potential Diesel Demand

US Pick Up Truck Market
2.9 m/annum

Current System - Petrol
TWC
TWC
TWC

Future System - Diesel
SCR
SCR
DOC
Filter
Light Duty – Market Opportunities

- Diesel particulate filters
- NOx removal
- Asia market growth (and market share growth)
- Continuous PGM thrifting
Environmental Catalysts and Technologies

SCR Opportunity

- Tightening NOx requirements (US Tier 2, Euro VI) will require additional aftertreatment
- OEMs currently running NOx removal development programs
  - SCR is the most likely product
  - Lean NOx Trap (LNT) could be used on smaller vehicles
- Timing of market is difficult to predict (and will there be any advanced incentive programs)
- Significant incremental volume for the light duty market
Light Duty – Market Opportunities

- Diesel particulate filters
- NOx removal
- Asia market growth (and market share growth)
- Continuous PGM thrifting
Paul Framp, Managing Director
ECT Europe
Our business is:

“Developing, Manufacturing and Selling catalysts for the removal of pollutants from the exhausts of internal combustion engines.”

Converting

CO \rightarrow CO_2

HC \rightarrow CO_2, H_2O

NOx \rightarrow N_2, O_2

C (soot) \rightarrow CO_2
Our Principal Light Duty Customers

- Volkswagen
- Audi
- Ford
- Land Rover
- Volvo
- Renault
- PSA Peugeot Citroën
- Fiat
- GM
- Toyota
- Porsche
Environmental and Legislative Pressures
Honda’s Advert, “Hate Something…Change Something”
Mercedes Re-branding of Diesel as “Bluetec”
Environmental Catalysts and Technologies
European Region

Global Network

- Detroit, USA
- Wayne, USA
- Queretaro, MEXICO
- Pilar, ARGENTINA
- Gothenburg, SWEDEN
- Royston, UK
- Sonning, UK
- Brussels, BELGIUM
- Krasnoyarsk, RUSSIA
- KOREA
- Shanghai, CHINA
- Delhi, INDIA
- Kuala Lumpur, MALAYSIA
- Kitsuregawa, JAPAN
- Germiston, RSA
- Curitiba, BRAZIL

12 Manufacturing Sites
7 Technology Centres
Environmental Catalysts and Technologies

European Region

Our Definition of Europe

5 Manufacturing Sites
- Pilar, ARGENTINA
- Germiston, RSA
- Royston, UK
- Sonning, UK
- Brussels, BELGIUM
- Gothenburg, SWEDEN
- Curitiba, BRAZIL

4 Technology Centres
- Krasnoyarsk, RUSSIA

January 2007
Total European Catalysts Sales (m units)

Source: CEFIC Ecostats
ECT Pricing Model

Price

Time
Catalyst Total Cost

The diagram illustrates the total cost of catalysts over time, broken down into PGM cost, manufacturing cost, and raw materials and substrate cost. The bars represent the cost units at different time intervals.
Increasing Unit Margins

• Continuing legislative pressure has allowed continuing increases in net revenues on standard technologies

• Metal thrifting and part or whole substitution of Pd for Pt has allowed OE buyers to demonstrate system cost improvements, while our unit margins increase

• Same process is now underway on catalysed soot filters

• And further new technologies in NOx control between now and 2014

• … but worth noting that the swing to diesel, with more expensive filter substrates, larger scale pieces, and more use of platinum, has increased the unit sales price of catalysts…
Environmental Catalysts and Technologies
European Region

Royston Fastcat

- Established 2000
- Nominal capacity 3m catalysts
- New CSF plant output 850k filters
- 291 employees
Brussels

• Established 1990

• Close to Brussels airport

• Nominal capacity 4m catalysts

• New Heavy Duty Diesel line

• 274 personnel
Germiston, South Africa

- Established 1991
- Close to Johannesburg airport
- Grown rapidly since 2000
- Nominal capacity 7.5m
- New Volvo Powertrain business
- 570 employees
Pilar, Argentina

- Pilar established 1997

- Close to Buenos Aires and airport

- Nominal capacity 1m pieces

- 65 employees
Russia

- New facility under construction at Krasnoyarsk
- A JM company, located on the secure site of a Russian PGM company
- In production by end of 2007
- Starting capacity of 1m units
Gothenburg Engine Test Centre

- Diesel engine test centre at Gothenburg

- 8 engine test cells, for HDD and LDD applications

- 31 employees
Royston Technology Centre

- Established 1970s
- Laboratories, engine test facilities, vehicle test facilities
- Purpose of the technology group is to design catalysts for internal combustion engines, and then tailor the catalyst to the individual application
- Very high direct interaction with customers
- 159 employees, mostly PhDs
Antoine Bordet
General Manager, Northern Europe
The Diesel Filter Market in Europe
The Diesel Market in Europe

- Diesel vehicles are very popular in Europe
  - Better fuel economy
  - Equivalent (if not better!) driving performance

- 50% of light duty vehicles sold are diesel

- Concerns about particulate matter emitted by diesel
The Diesel Market in Europe

Current European penetration at 50%
Belgium 73.4%, Spain 70%, France 70%.
Germany at 44%, UK at 38%, Italy at 59%:

Potential for further market growth

Main diesel manufacturers are JM customers

No of diesel vehicles manufactured in Europe (m units)

2007
Health Effects of Particulate Matter

- The clear consensus of the scientific and environmental communities is that particulate matter (PM), and particularly ultra fine particles, cause serious hazard to human health.

- It is “officially” estimated, by the EPA and the EU, that PM pollution causes up to 50,000 deaths per year in the US and 200,000 deaths per year in Europe.

- The studies implicate particulate matter from a large variety of sources, but the greatest concerns arise from fossil fuel combustion processes (domestic, industrial and transport).
The Diesel Filter Market

- All diesel cars currently require a catalyst (Diesel Oxidation Catalyst)
- All diesel cars in Europe will require a filter by 2010, but market exists before legislation comes into place
- We are currently making 1 million units out of 3 million cars fitted
- European light duty diesel car and light truck sales will be at least 9m units by 2010
- We are investing in new capacity
CSF = catalysed soot filter
How A Coated Filter Works
Palladium has now been used in series production for diesel products for a while

JM introduced palladium into DOCs in 2004 and into coated filters in 2006

Pt:Pd ratios are still in the order of 25% – 33% Pd

However, palladium is not used in all formulations
First manual production lines purchased and assembled in 2004
Followed by Major Investment, Royston CSF Line 1

- Investment for half million capacity in 2005
- Further investment in 2006 to double capacity to 1m units per year
- We believe that we are class leaders in achieving precision dosing of PGM in filters, in terms of mass tolerance and spatial distribution
• The market for CSFs grew more rapidly than anyone was expecting

• Our factory is now full and quite congested

• We are building a new factory next door to add capacity

• The new factory will be more spacious and more efficient
Further Investment in CSF Capacity

- Further CSF capacity now being constructed at Royston and in South Africa to provide capacity for 2m filters

- New plants on stream 2007

- Further legislation for diesel will require NOx aftertreatment. This will further increase the number of catalyst bricks per car from the end of the decade

- ..and strong possibilities for diesel growth in the USA….
Dr David Prest
Heavy Duty Diesel
1. Today’s HDD market
2. Legislation, technologies & market solutions
3. Developing OE markets
4. Non road market
5. Retrofit market
6. Manufacturing
7. Summary
Two Market Segments in Each Region

Generally vehicles >6 tgvw
On road and non road applications

• **OE**
  - Regulatory compliance
  - Technical approval by OE
  - Includes option-fit
  - Supply chain via system integrators / canners

• **Retrofit**
  - Local legislation
  - Approval by verifications
  - Incentives and restrictions for users
  - Supply chain via agents or direct
### Major Vehicle OEMs – regulated markets

<table>
<thead>
<tr>
<th>Company</th>
<th>Vehicles ('000)</th>
</tr>
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<tbody>
<tr>
<td>DaimlerChrysler (incl. Mercedes, Fuso, Freightliner, Sterling)</td>
<td>214</td>
</tr>
<tr>
<td>Volvo group (incl. Renault VI, Mack)</td>
<td>112</td>
</tr>
<tr>
<td>Paccar (incl. Kenworth, Peterbilt, DAF)</td>
<td>93</td>
</tr>
<tr>
<td>International</td>
<td>85</td>
</tr>
<tr>
<td>Ford</td>
<td>61</td>
</tr>
<tr>
<td>MAN</td>
<td>50</td>
</tr>
<tr>
<td>Iveco</td>
<td>48</td>
</tr>
<tr>
<td>GM</td>
<td>42</td>
</tr>
<tr>
<td>Isuzu</td>
<td>36</td>
</tr>
<tr>
<td>Toyota / Hino</td>
<td>36</td>
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</tbody>
</table>

*Note: Major engine OEMs include Cummins, Caterpillar*

Source: JD Power. Quantities are 2007 sales forecasts ('000 vehicles). Scope: >6 tonnes
OE Annual Vehicle Sales

'000 vehicles

2003 2004 2005 2006 2007 2008 2009 2010 2011

Source: JD Power. Scope: >6 tonnes
OE On Road Market

No of Vehicles (>6t) in million:
- WEU
- USA
- Japan/Korea
- India/China/Brazil
- Rest of World

2005:
- WEU: 0.5
- USA: 1.0
- Japan/Korea: 0.5
- India/China/Brazil: 0.5
- Rest of World: 1.0

2010:
- WEU: 0.5
- USA: 1.0
- Japan/Korea: 0.5
- India/China/Brazil: 0.5
- Rest of World: 1.0

Source: JD Power & Johnson Matthey

No of Vehicles (>3.5t) in million:
- WEU
- USA
- Japan/Korea
- India/China/Brazil
- Rest of World

2005:
- WEU: 0.5
- USA: 1.0
- Japan/Korea: 0.5
- India/China/Brazil: 0.5
- Rest of World: 1.0

2010:
- WEU: 0.5
- USA: 1.0
- Japan/Korea: 0.5
- India/China/Brazil: 0.5
- Rest of World: 1.0

Source: JD Power & Johnson Matthey
The Controlled Pollutants

- Carbon Monoxide (CO)
- Hydrocarbons (HC)
- Nitrogen Oxides (NOx)
- Particulate Matter (PM)
### On Road Regulation Development

<table>
<thead>
<tr>
<th>Region</th>
<th>New Models</th>
<th>All Models</th>
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<tbody>
<tr>
<td><strong>Europe</strong></td>
<td></td>
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<tr>
<td>Euro 4</td>
<td>01-Oct-05</td>
<td>01-Oct-06</td>
</tr>
<tr>
<td>Euro 5</td>
<td>01-Oct-08</td>
<td>01-Oct-09</td>
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<tr>
<td><strong>United States</strong></td>
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<td>US2007</td>
<td>01-Jan-07</td>
<td>01-Jan-07</td>
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<tr>
<td>US2010</td>
<td>01-Jan-10</td>
<td>01-Jan-10</td>
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<td><strong>Japan</strong></td>
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<td>Short Term</td>
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<td>2.5-12t</td>
<td>01-Oct-03</td>
<td>01-Oct-03</td>
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<td>12t +</td>
<td>01-Oct-04</td>
<td>01-Oct-04</td>
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<tr>
<td>New Long Term</td>
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<td>2.5t+</td>
<td>01-Oct-05</td>
<td>01-Oct-05</td>
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<tr>
<td>Japan Diesel 09</td>
<td>31-Dec-09</td>
<td>31-Dec-09</td>
</tr>
<tr>
<td><strong>China</strong></td>
<td></td>
<td></td>
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<tr>
<td>Beijing - Euro 4</td>
<td>2008</td>
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</tr>
<tr>
<td>Rest of country - Euro 4</td>
<td>2010</td>
<td></td>
</tr>
<tr>
<td><strong>India</strong></td>
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<td></td>
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<tr>
<td>Major cities</td>
<td>2010 (or earlier?)</td>
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<tr>
<td><strong>South Korea</strong></td>
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<tr>
<td>Euro 4</td>
<td>01-Jan-06</td>
<td>01-Jan-08</td>
</tr>
<tr>
<td><strong>Brazil</strong></td>
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<td></td>
</tr>
<tr>
<td>Euro 4</td>
<td>2009</td>
<td></td>
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</tbody>
</table>

#### Diagram

- **PM (g/kW-hr)**: 0.00, 0.02, 0.04, 0.06, 0.08, 0.10, 0.12, 0.14, 0.16, 0.18, 0.20
- **NOx (g/kW-hr)**: 0.0, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0

**Key Notes:**
- **Japan NST**
- **Japan NLT**
- **US 2002 3/4**
- **EU 3**
- **US 2007**
- **EU 5**
- **EU 4**
- **Japan Diesel 09**
- **US 2010**

*January 2007*
### Johnson Matthey’s Technology Toolbox

<table>
<thead>
<tr>
<th>Technology</th>
<th>CO</th>
<th>HC</th>
<th>PM</th>
<th>NOx</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOC – Diesel Oxidation Catalyst</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>CRT® – Continuously Regenerating Trap (DOC + filter)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>CCRT® – Coated CRT (DOC + coated filter)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>SCR – Selective Catalytic Reduction</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>EGR – Exhaust Gas Recirculation</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>NAC – NOx Adsorber Catalyst</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>SCRT® (SCR + CRT)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>EGRT® (EGR + CRT)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Environmental Catalysts and Technologies
Heavy Duty Diesel

{Johnson Matthey's Technology Toolbox}
Different technologies in different markets

Euro 4
US07
Japan NLT

Note: "DPF" includes DOC + DPF (CRT®), DOC + CSF (CCRT®) and CSF - only
Competitors include:

- Argillon
- BASF
- Frauenthal
- Haldor Topsoe
- Heesung Engelhard
- NE Chemcat
- Tokyo Roki
- Umicore
### HDD (on road)

<table>
<thead>
<tr>
<th>Year</th>
<th>Europe</th>
<th>USA</th>
<th>Japan</th>
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<tbody>
<tr>
<td>2004</td>
<td>SCR</td>
<td>EGR</td>
<td>EGR</td>
</tr>
<tr>
<td>2005</td>
<td>EGR + DPF</td>
<td>EGR + DPF</td>
<td>SCR + DPF</td>
</tr>
<tr>
<td>2006</td>
<td>SCR + DPF</td>
<td>SCR + DPF</td>
<td>EGR + DPF</td>
</tr>
<tr>
<td>2007</td>
<td>EGR + DOC</td>
<td>SCR + DPF</td>
<td>SCR + DPF</td>
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<tr>
<td>2008</td>
<td>SCR + DPF</td>
<td>SCR + DPF</td>
<td>SCR + DPF</td>
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<tr>
<td>2009</td>
<td>SCR + DPF</td>
<td>SCR + DPF</td>
<td>SCR + DPF</td>
</tr>
<tr>
<td>2010</td>
<td>SCR + DPF</td>
<td>SCR + DPF</td>
<td>SCR + DPF</td>
</tr>
<tr>
<td>2011</td>
<td>SCR + DPF</td>
<td>SCR + DPF</td>
<td>SCR + DPF</td>
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<tr>
<td>2012</td>
<td>SCR + DPF</td>
<td>SCR + DPF</td>
<td>SCR + DPF</td>
</tr>
<tr>
<td>2013</td>
<td>SCR + DPF</td>
<td>SCR + DPF</td>
<td>SCR + DPF</td>
</tr>
</tbody>
</table>

Note: "DPF" includes DOC + DPF (CRT®), DOC + CSF (CCRT®) and CSF - only
HDD Technology Evolution

DOC  SCRT®
Environmental Catalysts and Technologies
Heavy Duty Diesel

OE On Road Market

Source: JD Power & Johnson Matthey

No of Vehicles (>6t)

No of Catalyst bricks
## OE On Road Developing Markets

<table>
<thead>
<tr>
<th>Major OEMs – sales including developing markets</th>
<th>'000 vehicles</th>
</tr>
</thead>
<tbody>
<tr>
<td>DaimlerChrysler (incl. Mercedes, Fuso, Freightliner, Sterling)</td>
<td>372</td>
</tr>
<tr>
<td>Volvo group (incl. Renault VI, Mack)</td>
<td>184</td>
</tr>
<tr>
<td>TELCO <em>(India)</em></td>
<td>154</td>
</tr>
<tr>
<td>DongFeng <em>(China)</em></td>
<td>131</td>
</tr>
<tr>
<td>Paccar (incl. Kenworth, Peterbilt, DAF)</td>
<td>117</td>
</tr>
<tr>
<td>First Auto Works (FAW) <em>(China)</em></td>
<td>110</td>
</tr>
<tr>
<td>Ford</td>
<td>110</td>
</tr>
<tr>
<td>International</td>
<td>105</td>
</tr>
<tr>
<td>Isuzu</td>
<td>100</td>
</tr>
<tr>
<td>Scania</td>
<td>92</td>
</tr>
<tr>
<td>Toyota / Hino</td>
<td>81</td>
</tr>
<tr>
<td>Iveco</td>
<td>79</td>
</tr>
<tr>
<td>MAN</td>
<td>75</td>
</tr>
<tr>
<td>China National Heavy Truck Corporation (CNHTC) <em>(China)</em></td>
<td>58</td>
</tr>
</tbody>
</table>

New Market Opportunities

**BRAZIL** *(120k engines in 2010: DC, VW, Ford, Scania, ~5 smaller players)*
- Euro 4 regulations introduced from 2009
- SCR expected to be the technology of choice
- Fuel quality issues preclude use of filters

**CHINA** *(480k engines in 2010: DongFeng, FAW, CNHTC, >15 others)*
- Euro 4 regulations begin to come in from 2010
- SCR expected to dominate
- Some filters and oxidation catalyst systems (niche)

**INDIA** *(225k engines in 2010: TELCO, Ashok Leyland, Eicher, ~5 smaller players)*
- Fuel quality essential for market introduction
- Regulation expected in major cities first
- Timetable for regulation not yet finalised
## World Diesel Fuel Standards

### Sulphur Content in ppm

<table>
<thead>
<tr>
<th>Country</th>
<th>Year 2005</th>
<th>Year 2006</th>
<th>Year 2007</th>
<th>Year 2008</th>
<th>Year 2009</th>
<th>Year 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>European Union</td>
<td>50</td>
<td>10</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USA</td>
<td>500</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>350 for Beijing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brazil</td>
<td>500</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>India (11 Major Cities)</td>
<td>350</td>
<td></td>
<td></td>
<td></td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>India</td>
<td>500</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>50</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Korea</td>
<td>50</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **500 ppm**
- **50 ppm**
- **Less than 30 ppm**
Non Road Regulation Development

Regulation is by engine power. The chart and table show information for 100kW engines, eg construction. Limits for larger engines are tighter and implemented sooner; those for smaller engines less stringent and later.

<table>
<thead>
<tr>
<th>Europe</th>
<th>New Models</th>
<th>All Models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage IIIB</td>
<td>Jan 2011</td>
<td>Jan 2012</td>
</tr>
<tr>
<td>Stage IV</td>
<td>Oct 2013</td>
<td>Oct 2014</td>
</tr>
<tr>
<td>United States</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tier 4a</td>
<td>Jan 2011</td>
<td>Jan 2012</td>
</tr>
<tr>
<td>Tier 4b</td>
<td>Jan 2014</td>
<td>Dec 2014</td>
</tr>
</tbody>
</table>
## OE Non Road Market

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Vehicles ('000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kubota</td>
<td>400</td>
</tr>
<tr>
<td>Yanmar</td>
<td>300</td>
</tr>
<tr>
<td>Caterpillar (inc Perkins)</td>
<td>200</td>
</tr>
<tr>
<td>John Deere</td>
<td>180</td>
</tr>
<tr>
<td>Case New Holland / Iveco</td>
<td>150</td>
</tr>
<tr>
<td>Deutz</td>
<td>150</td>
</tr>
<tr>
<td>Cummins</td>
<td>140</td>
</tr>
<tr>
<td>Mitsubishi</td>
<td>100</td>
</tr>
<tr>
<td>Isuzu</td>
<td>80</td>
</tr>
<tr>
<td>Komatsu</td>
<td>50</td>
</tr>
<tr>
<td>Volvo</td>
<td>40</td>
</tr>
<tr>
<td>JCB</td>
<td>40</td>
</tr>
</tbody>
</table>

- 2/3 size of on road market
- Smaller average engine size

Source: Ricardo & Johnson Matthey
Many large cities have air quality problems.

Heavy duty vehicles make a significant contribution to emissions because the emissions per vehicle mile are higher and they have a high annual mileage.

Source: GLA – Mayor’s Air Quality Strategy Document

% Contribution of heavy duty vehicles to emissions in Greater London

PM10

NOx
Typical Retrofit Opportunities

USA
National, state and city programmes introduced from 2000 onwards, some provide funding, others make retrofit mandatory. Approximately 160,000 diesel engines (including 5,000 school buses) are estimated to have been fitted with aftertreatment since retrofit programmes began.

Netherlands LEZ
Filter retrofit subsides for city buses from 2000. Approximately 1,000 filter retrofits to buses.

London LEZ
Funding for retrofit first introduced in 2000. Approximately 14,000 vehicles retrofitted, including around 4,000 London buses.

Seoul
Retrofit subsidies from 2005 in Seoul and surrounding area. Potentially 500,000 vehicles to be retrofitted over five year period.

Chile
TranSantiago retrofit scheme implemented 2006. Up to 2,000 city buses to be retrofitted.
• Market for OE on road established in EU, US and Japan
• Major new opportunities in China, India, Brazil start from 2009
• New sector of non road starts from 2011
• Retrofit market continues, though lumpy
• JM has full technology capability
• Market size $700m (excl. PGM) by end 2008
• Market potential $3bn (excl. PGM) by 2014
• JM in leading position globally
HDD Manufacturing Technology