

### Presentation to Analysts / Investors

Johnson Matthey Process Technologies, Teesside 29th / 30th January 2008





### **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.

Johnson Matthey



## **Overview and Trading Update**

Neil Carson Chief Executive





### **JM Executive Board**

- Neil Carson Chief Executive
- John Sheldrick Group Finance Director
- Dr Pelham Hawker Executive Director, Process Technologies and Fine Chemicals & Catalysts
- Larry Pentz Executive Director, Emission Control Technologies
- David Morgan Executive Director, Corporate Development and Central Research



### **Other Senior Management**

- Neil Whitley Division Director, Process Technologies
  - Andrew Wright Managing Director, Syngas & Gas to Products
- Dr John Dunleavy

- Dr David Tomlinson
- Graeme McGregor
- Ian Godwin Dir
- Dr Sally Jones

- Managing Director, Refineries & Gas Processing
- President, Davy Process Technology
- Finance Director, Process Technologies
- Director, Investor Relations
- Public Relations Manager



### Programme

- 09.00 Overview and Interim Management Statement (Neil Carson)
- 09.20 Process Technologies Opportunities in Energy (Pelham Hawker)
- 09.40 Process Technologies (Neil Whitley)
- 10.10 Coffee Break
- 10.20 Ammonia, Methanol, Oil and Gas (Andrew Wright and John Dunleavy)
- 11.00 Davy Process Technology (David Tomlinson)
- 11.30 Tour of Billingham Site
- 13.00 Lunch
- 13.45 Depart by coach for Davy Process Technology, Stockton-on-Tees
- 14.00 Introduction to the DPT Technology Centre (David Tomlinson)
- 14.15 Tour of the Technology Centre
- 15.00 Wrap Up and Q&A
- 15.15 Depart by coach for Darlington Station



### Interim Management Statement

- Strong third quarter
  - Sales for continuing businesses up 18%
  - Sales excluding precious metals up 23%
  - Operating profit up 17%
- Environmental Technologies Division well ahead of third quarter of last year
  - Emission Control Technologies benefits from good growth in sales of autocatalysts in Asia and of heavy duty diesel products
  - Process Technologies sees good demand for syngas catalysts and high energy prices drive demand for new process technology
- Precious Metal Products Division benefits from high pgm prices and good growth in its manufacturing businesses
- Fine Chemicals & Catalysts Division well ahead of third quarter of last year with continued good growth in the US



### Interim Management Statement

- Investment in new plants in Macedonia and the USA
- Argillon
- Share buy-backs
- Outlook encouraging despite some signs of weakness in North
  American car market
- Fourth quarter of last year benefited from trading profits on minor pgms which are not expected to be repeated at the same level this year. Consequently profit growth in fourth quarter of this year will be lower than in the third quarter
- However, we expect profit before tax for the full year to be towards the top end of current market expectations



### **Environmental Technologies Division Overview**

£m	1H 2007	1H 2006*	%
Revenue	1,055	843	+25
Sales excluding precious metals	541	384	+41
Operating profit	65.2	57.0	+14

\* At 2007 exchange rates

- Emission Control Technologies (ECT)
- Process Technologies (PT)
- Fuel Cells





### The Catalyst Market

**Total Sales \$13.8 billion** 



Source: The Catalyst Group Intelligence Report 2006

Source: Freedonia World Catalyst Report 2007



### **Opportunities in Energy**

Pelham Hawker Executive Director, Process Technologies and Fine Chemicals & Catalysts





## Opportunities in Energy : Global Energy Themes

- Energy demand and supply
- Impact of oil and gas price
- Increasing use of gas and coal
- Tightening environmental regulations
- Investments in oil, gas and coal



### **Energy Demand and Supply**

- Strong demand from developing economies particularly Asia:
  - Power consumption
  - Automotive and transport fuels
  - Petrochemicals
  - Domestic uses
- China is 50% of all Asia / Pacific hydrocarbon demand
- China approaching 20% of world demand (17% 2006)

#### Growth in Hydrocarbon Demand in China



■ Oil ■ Gas ■ Coal ■ Total HC demand Source: *BP Statistical Review of World Energy 2007* 



### Energy Demand and Supply

- Oil supply nearing the peak
- Oil is more difficult and costly to extract
- 'Dirtier' oil requires more refining
- Gas and coal forecast to grow



#### World Primary Energy Demand by Fuel

Source: IEA 2006



### Energy Demand and Supply

- Energy security concerns for major economies
  - China increasing number of coal projects with restrictions on gas
  - US higher LNG imports and utilising lower quality crude oil
  - US and Canada extracting higher volume of tar sand sources of oil
  - Nuclear, biofuels and alternative energy growing but small
  - Oil and gas supply concerns in the Middle East and FSU



### Regional Primary Energy Consumption Pattern 2006

■ Oil ■ Natural Gas ■ Nuclear Energy ■ Hydroelectricity ■ Coal

Source: BP Statistical Review of World Energy 2007



### Impact of Oil and Gas Price

- High oil price improves refinery margins and encourages investment
- Increased oil exploration activity
- Opportunities created for gas projects although gas prices also rising
- High oil and gas prices feed through into power, fuel and petrochemical prices
- High oil price encourages investments in new gas and coal based projects



Energy Prices (rebased to 100)

Source: BP Statistical Review of World Energy 2006



### Increasing Use of Gas and Coal

- \$40 per barrel makes alternative sources economically viable
  - Processing dirtier crude
  - Increased number of tar sands projects
  - Many 'gas to product' schemes under review
    Methanol, DME, MTO, MTP, GTL
  - Coal to chemicals in China and the US



### Increasing Use of Gas and Coal

• Gas (Syngas) to Products

**Traditional Applications** 

- Methanol
   Wood preservative, vinyl paint, resins, adhesives, MTBE
  - Desulphurising fuels, chemical processes, fuel
    - Fertiliser, pharmaceuticals, chemical intermediates

New Energy Sources

Hydrogen

Ammonia

- Gas to Products -
- Clean Coal
- Low Carbon

- Methanol (direct, biodiesel, DME, MTO) Fischer-Tropsch diesel
- CO<sub>2</sub> sequestration
  - Syngas from biomass
  - Carbon sequestration and flare elimination



### **Tightening Environmental Legislation**

- CO<sub>2</sub> emissions forecast to grow significantly particularly in Asia
- Impurities require capture
  - Sulphur
  - NOx
  - Mercury
  - Chlorides
  - CO<sub>2</sub>
- Regulations will continue to tighten globally

China's Growth in Domestic Product (GDP) and CO<sub>2</sub> Emissions for Fuel Combustion





### Investments in Oil, Gas and Coal

- Increased investment in hydrocarbon extraction and refining
- Strategic energy planning is increasing the investment in alternative feedstock projects particularly tar sands, gas and coal
- China developing numerous coal to product projects attractive above \$40 per barrel
- Syngas and methanol projects well above historical growth levels helped by high methanol prices
- Demand for new hydrogen capacity to meet tighter fuel sulphur specifications



### **Process Technologies**

Neil Whitley Division Director, Process Technologies





### Process Technologies - Programme

- History of Process Technologies
- Growth of Process Technologies
- Strengths of the business
- Well placed for growth
- Detailed review of key businesses, markets and technologies
  - Syngas & Gas to Products
  - Refineries & Purification

Andrew WrightJohn Dunleavy

Davy Process Technology

- David Tomlinson
- Tour of Billingham and Stockton research and technology development facilities



### History of Process Technologies

- November 2002 JM acquired the ICI catalyst business for £260 million
  - Ammonia, Methanol, Oil and Gas (AMOG)
    - Syngas & Gas to Products
    - Refineries & Purification
  - Chiral and Oleochemical catalysts \*
  - Tracerco
  - Vertec
- Increased investment in manufacturing, research and process technology
- February 2006 JM acquired Davy Process Technology for £41 million
- April 2007 formation of Process Technologies
- \* Now within the Fine Chemicals & Catalysts Division



### Process Technologies Overview

£m	1H 2007	1H 2006*	%
Sales excluding precious metals **	113	105	+8
Operating profit	19.2	17.5	+10

- \* At 2007 exchange rates
- \*\* Including Fuel Cells
- AMOG and DPT: 10 15% growth expected
- Tracerco: 5 8% growth expected (process diagnostics, taggants and specialist measurement)
- Vertec: 3 5% growth expected (Ink and polymer catalysts)



H1 2007/08 Sales by Business



## Strengths of the Business

Key market positions where we are leaders

- Methanol #1
  - Over half of global methanol production uses JM catalysts. 55% of global production also uses JM technology
- Hydrogen #1
  - Over one third of global hydrogen production uses JM catalysts. Largest catalyst supplier and highest growth with industrial gas companies
- Ammonia #2
  - Around a quarter of global ammonia production uses JM catalysts. Strong growth in new plants with Uhde collaboration
- Gas
  - Strong niche position in gas streams that need removal of sulphur and mercury
- Reforming
  - Widest portfolio of steam reforming technology
- Oxo alcohols #1
  - 90% of butanol and 2EH licence market in LP Oxo technology in collaboration with Dow



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### Strengths of the Business

- A strong catalysis and process technology company
- Research
  - Billingham and Sonning
- Technology Development
  - Billingham and Stockton
- Manufacturing
  - Manufacturing excellence in Clitheroe and Panki
- Catalyst scale up
  - Manufacturing Science Centre
- Engineering
  - Process design scale up ability
- Technical support
  - Experience and quality of operational process engineers





### Strengths of the Business – Geographical Reach



Engineering and Licensing centres x 2 (London, Billingham)

2006/07 Sales by Region (by destination)





- Gas (and Coal) to Products
- Refineries

- China
- Tightening environmental regulations





Gas and Coal to Products

- JM has strong technology and product position
- Excellent, long term customer relationships
- Increasing opportunities in gas and coal
- Competitors Haldor Topsoe, Sud Chemie, Lurgi, BASF





### Refineries

- JM has strong position in hydrogen at many refineries
- Tightening specification for sulphur in fuel driving need for more hydrogen
- Exploring options to grow in other refinery catalyst applications – Sinopec
- Well placed in growing gas polishing and mercury removal markets
- Competitors Grace, Albermarle, UOP, BASF, Haldor Topsoe, Sud Chemie, Axens

Key Catalysts & Technologies FCC & Additives Hydrotreating Hydroprocessing Pressure Swing Adsorption

Refinery Hydrogen (JM) Refinery Purification (JM)



### China

- Significant investment in gas and coal petrochemicals
- In 2007 JM won three Oxo alcohol projects and two methanol projects in China
- Joint venture to manufacture sour shift catalysts
- Hydroprocessing catalysts with Sinopec







'Coal based chemical sector to grow rapidly' – 18/9/07

Qilu Oxo plant, China



Tightening environmental regulations

- Hydrogen
- Mercury and sulphur removal
- Gas heated reformers 30% less CO<sub>2</sub>
- CO<sub>2</sub> sequestration
- Glycerol to propylene glycol





Mercury removal vessels



### Key Businesses

- Ammonia Methanol Oil and Gas (AMOG)
  - Syngas & Gas to Products
    Andrew Wright
  - Refineries & Purification John Dunleavy
- Davy Process Technology David Tomlinson



### Syngas & Gas to Products

Andrew Wright Managing Director





### Activities

- Syngas
  - Develop, manufacture and supply catalysts, process technology and services for the efficient conversion of natural gas or naphtha to ammonia, methanol or hydrogen.
- Gas To Products
  - Develop process technologies and catalysts that support the emerging gas and coal to products markets

#### H1 2007/08 Sales by Business





### **Continued Growth**

- Exciting times in methanol
- Higher growth in ammonia due to fertilisers for biodiesel
- Hydrogen growth exceeds
  expectation
- Interest continues in new gas and coal to products schemes
- JM well placed for longer term gas to liquids

#### JM Potential Methanol Projects Database





### Syngas: What is it?



JM& Johnson Matthey

### Methanol

- ~\$350 million installed value catalyst market
- Continued growth in methanol catalyst sales
- High methanol price, coal feedstock and new downstream use stimulates investment in methanol production
- Significant project activity in China although slowing slightly

#### **Global Methanol Capacity Additions/Deletions**



Source: CMAI



Oman methanol plant commissioned in 2007

### JM& Johnson Matthey

## Hydrogen

- ~\$575 million installed value catalyst market
- Growth driven by tightening fuel specifications
- Hydrogen considered an important utility
- Hydrogen as utility for tar sands and coal to products facilities
- JM well placed with industrial gas suppliers – fastest growing market segment
- Catalyst and technology development programmes with leading customer in this sector





### Ammonia

- ~\$1.2 billion installed value catalyst market
- Growth driven by GDP growth and fertilisers for biodiesel
- Trend towards investment in regions with large gas or coal reserves
- Strong relationship with Uhde yields six new ammonia plant projects

**Turkmenistan** Started up – 2005

QAFCO IV, Qatar Started up – 2005

EFC 2, Egypt Started up – 2006

AlexFert, Egypt Started up – 2006

Helena, Egypt Started up – 2007

MOPCO, Egypt Start up 2008



## **Reforming Technology Opportunities**

- Gas heated reformer (GHR) technology developments ongoing
- Lower capital cost, improved energy efficiencies and 30% lower CO<sub>2</sub> emissions
- Offshore projects emerging and opportunity from GHR due to reduced weight and plant size – 2013 onwards
- Unique materials demonstration unit and new syngas generation pilot plant





GHR at Coogee, Australia



### Gas and Coal to Products

- Increasing activity in gas and coal schemes driven by continued high oil price and energy security concerns (China, United States)
- Environmental pressure continues to encourage new schemes
- GTL development slower than anticipated but industry watching current projects
- JM has developed strong FT catalyst manufacturing technology
- Other technologies growing more rapidly. Medium term opportunities starting with MTO / MTP / DME



### **Carbon Sequestration**

- Sequestration technologies available and project feasibilities completed
- Schemes currently viable when CO<sub>2</sub> injected to enhance oil recovery
- Aim to supply technology into a project within three years
- Technologies offer carbon reduction potential for customers



Source: www.bp.com



### Catalyst Manufacturing at Clitheroe





### **Refineries & Purification**

John Dunleavy Managing Director





### Activities

### • Refineries

 Develop, manufacture and supply catalysts and absorbents for refineries to produce on purpose hydrogen and remove harmful impurities. Supply other catalysts that utilise the technical and geographic strengths of the business

### Gas Purification

 Develop, manufacture and supply absorbents and reactor technology that remove trace levels of sulphur, mercury and other impurities from natural gas or process streams

#### H1 2007/08 Sales by Business





### **Refineries & Purification Sales**

- Focused on the oil refining sector
  - Providing catalysts for on purpose hydrogen plants
  - Absorbent products to remove sulphur, chlorides and mercury
- Currently working with Sinopec in the hydroprocessing market
- JM currently niche player with potential to grow
- Gas purification grows as new plants come on stream
- Gas purification growth driven by tightening mercury legislation



JM niche purification sales

JM catalyst sales

## **Refinery Catalyst Market**

- Refineries increasingly require 'on purpose' hydrogen

Hydrogen Claus **High RON** Naphthą Isom LIGHT LIGHT NAPHTHA NAPHTHA NAPHTHA REFORMER NAPHTHA HEAVY NAPHTHA REFOR MATE \_ HYDROTREATER UNITS (NHT) KEROSENE KEROSENE **EAVY** NAPHTHA DIESEL LIGHT DIESEL NAPHTHA ATMOSPHERIC ATMOSPHERIC GAS OII GAS OIL CRUDE VAC COKER HYDROCRACKER UNITS DIESEL Sweetening KEROSENE HCO DIESEL LCO ECC OLEFINS ALKYLATE ALKY. ECC FLUID NAPHTHA FCC VACUUM CAT. FEED CATALYTIC GAS OIL FEED HYDROTREATER LIGHT CRACKER Gasoline YCLE OIL (LCO) (CFHT) (FCC) Polygas Blend HEAVY Oxygenates CYCLE OIL (HCO) VAC Ether LCO RESID SLURRY DIESEL DIESEL OIL HYDROTREATER DIESE COKER (DHT) NAPHTHA COKER COKER DIESEL UNITS COKER SLURRY GAS OIL OIL COKE



### **Gas Purification - Sulphur**

- Long track record in capturing low levels of sulphur
- Offer significant operational support to customers who have low manning on site
- Growth in regions with low sulphur levels in gas streams which require "polishing" in order to meet pipeline specifications
- Cradle to grave catalyst system





BP Cats sulphur removal terminal



### **Gas Purification - Mercury**

- Growing issues with mercury in gas streams
- Serious process safety concerns in aluminium heat exchangers
- Real concerns for health of operators and downstream customers if not captured
- Mercury captured and recycled



Mercury at gas processing plant



Mercury damage in heat exchanger



### **Davy Process Technology**

David Tomlinson President



Johnson Matthey

### Activities

- Develop process technologies for the oil, gas, petrochemical and chemical industries
- License proprietary technologies to clients worldwide
- Operate strategic alliances with major companies including Dow and BP
- Design, build and operate mini pilot plant test facilities
- Execute collaborative and custom R&D projects



#### H1 2007/08 Sales by Business





Licensing and Sales Process Development Process Engineering Front-end Engineering Project Management Quality Assurance Technology Development Pilot Plant Design and Construction University Links Health and Safety Reviews



### **Core Technologies**

- Gas conversion
- Methanol
- Oxo alcohols
- Butanediol
- Natural detergent alcohols
- Ethyl acetate
- Amines



### Licensing Components

- Licence contract (containing the fee, process guarantees and limitation of liabilities)
- Basic engineering package
- Supply of proprietary equipment
- Supply of catalyst
- Services (plant start up and commissioning assistance)

Underpinned by ongoing process improvement and Development of the IP portfolio

## DPT – Methanol

- DPT: 34 plants in 17 countries over last 37 years
- Global market 38 million t.p.a. 2.5% growth for chemical use (equal to one or two new plants per year)
- Also new uses of methanol creating much faster growth:
  - Automotive fuel (directly)
  - LPG blendstock (DME)
  - Methanol to olefins
  - Methanol to gasoline
  - Diesel substitute (DME)
  - New feedstocks for methanol coal and waste gas
- Competitors Lurgi, Haldor Topsoe, Mitsubishi



MHTL M5 plant Trinidad



### DPT – Oxo Alcohols

- DPT / Dow Low Pressure Oxo process has captured more than 90% of butanol and 2EH licence market
- Global market of :
  - Butanol (2007) 4.5 million t.p.a. growing at 3% p.a.
  - 2EH (2007) 2.8 million t.p.a. growing at 2.5% p.a.
- Growth from solvents, coatings, PVC, plasticisers and detergents
- China and India net importers of butanol and 2EH
- 'Competitors' Eastman and BASF (operate own technology)



Jilin Oxo plant China



### DPT – Butanediol (BDO)

- Global market for BDO (2006) 1.2 million t.p.a. growth 5 - 6%
- China market demand growing at 50k t.p.a. and currently importing 100k t.p.a.
- Middle East demand due to cheap butane feedstock
- Half new plants use owner's technologies (BASF market leader, Mitsubishi and Lyondell)
- Half will purchase licences
  - Competition from Lurgi and Conser





**Tonen butanediol plant** 



## **DPT – New Technologies**

### • Gas to Liquids

- Favourable conditions for investment
- Technical and cost issues in the industry
- Medium term opportunity
- BP / DPT fixed bed FT technology
- BP / DPT AJT slurry phase technology
- Glycerol to propylene glycol
- Dimethyl ether



BP GTL pilot plant (Alaska)



## **Tour of Billingham**





## Tour of DPT Technology Centre





### Wrap Up and Q&A

Neil Carson Chief Executive



### JM& Johnson Matthey

### Glossary

2EH	2-Ethyl hexanol
AJT	Advanced jet loop technology
AMOG	Ammonia, Methanol, Oil and Gas
BDO	Butanediol
CO	Carbon monoxide
CO <sub>2</sub>	Carbon dioxide
CV	Calorific value
DME	Dimethyl ether
DPT	Davy Process Technology
ECT	Emission Control Technologies
FSU	Former Soviet Union
FT	Fischer-Tropsch
GHR	Gas heated reformer
GTL	Gas to liquids
GTP	Gas to products
H2S	Hydrogen sulphide
HC	Hydrocarbons

Ηg	9
LN	١G
LF	РG
LF	o Oxo
Τe	echnology
M	TBE
ГЛ.	TO
111	
IVI	IP
N	2
N	GLs
N	Ͻх
О	rg S
Pg	gm
P	Г
Sy	/ngas
t.p	).a.

Mercury Liquefied natural gas Liquefied petroleum gas DPT / Dow low pressure technology for production of oxo alcohols from olefins Methyl tert-butyl ether Methanol to olefins Methanol to propylene Nitrogen Natural gas liquids Nitrogen oxides Organic sulphur Platinum group metal Process Technologies A mixture of hydrogen and carbon oxides Tonnes per annum

# JMX Johnson Matthey