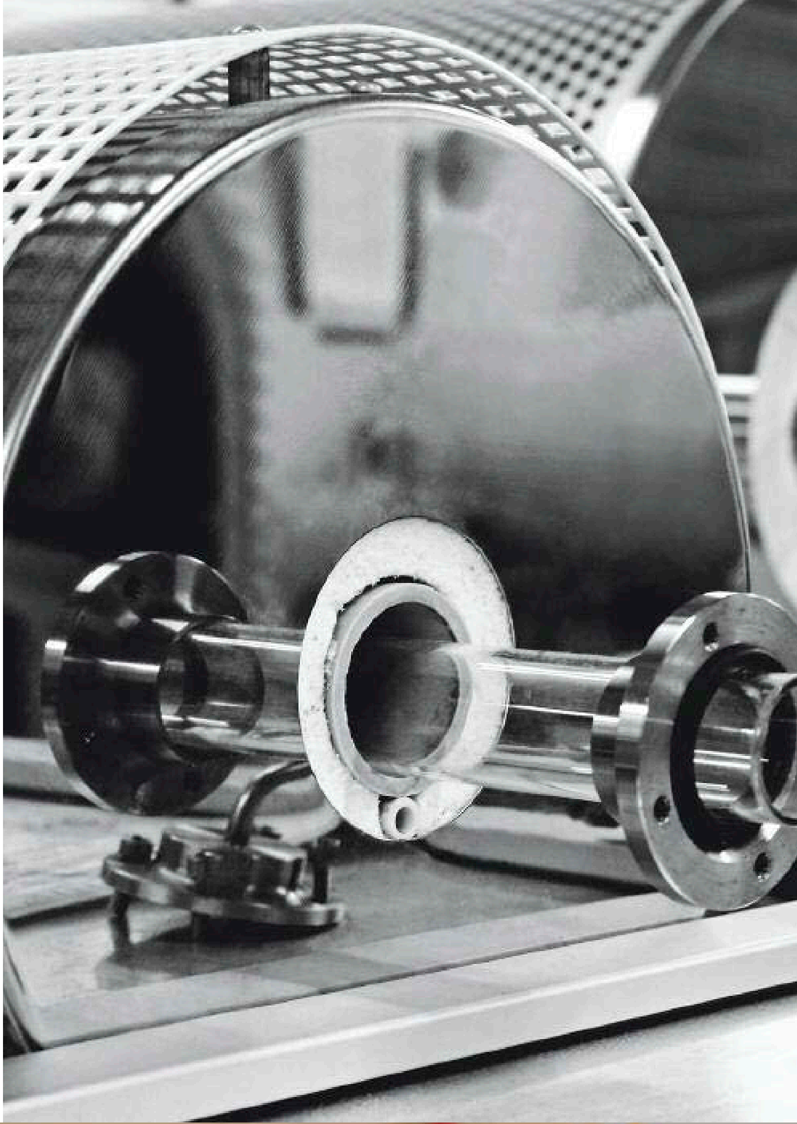
5. Environment



495

thousand tonnes CO_2 equivalent, total global warming potential

9%

reduction in waste to landfill

ENVIRONMENT

SUSTAINABLE TECHNOLOGIES for today and for the future

Battery Materials for a Greener Future

Our business is built around sustainable technologies and using our expertise to find solutions that optimise the use of natural resources and protect the environment. One of our new business areas is battery technologies, where innovation could unlock the broader commercialisation of fully electric, zero emission vehicles.

We are investing in R&D to create the next generation of battery technologies that will benefit the planet and fuel our business growth. One of the newest additions to our growing network of technology centres, the Johnson Matthey research facility in Singapore, is exploring battery materials, tapping into the pool of talent that the country offers and strengthening our position in Asia. Research scientist Suzi Deng from the Singapore Technology Centre talks about her work.

What is your role at the Singapore Technology Centre and what projects are you working on?

I am a chemist by background and I'm working on new battery technologies. Battery cells consist of a number of different component materials. On the one hand, I am looking at how to optimise the formulations and synthesis of these components. On the other, I am also investigating how the components work together so we can maximise the synergies between them to deliver better material performance.

Could you tell us something about the performance of lithium-ion batteries and the current technology challenges?

What you need in an electric vehicle is a battery that provides power density (for acceleration) and energy density (which allows the vehicle to run for a reasonable distance). Lithium-ion, or Li-ion, is the most promising technology available today. Li-ion batteries have power and energy densities sufficient for hybrid electric vehicles and plug-in hybrids, but the energy density (needed for distance) must be improved if they are to meet customer expectations for fully electric vehicles. Furthermore, these batteries have to last 10 to 15 years, their cost has to be controlled and they need to be safe to use in all conditions. It is great to be working on developing new technologies to tackle these challenges.

As a scientist, how do you see the future of batteries?

Pressures on the environment have forced us to think about how we generate energy and adopt more sustainable approaches. Interest in the use of batteries is not only confined to transport. Improvements in battery technologies will also make it easier and cheaper to store on the grid the electrical power that is generated by renewable energy sources such as solar panels and wind turbines. The result would be less reliance on power sources such as oil, gas, coal and nuclear.

A lot of effort has been put into battery research and I hope this will accelerate a solution for batteries that can be used in both electric vehicles and for grid energy storage. Other battery technologies that we will be working on and have potential for the future include aluminum-ion and sodium-ion batteries, which are conceptually similar to Li-ion. This will enable the wider use of these power sources by smoothing their fluctuating output – as it's not always sunny or windy – to match the varying customer demand. There's certainly a lot happening in the area.

Suzi Deng

Environment

Performance Summary

		2015	2014	% change
Energy consumption	thousands GJ	**5,360**	5,015[1]	+7
Total global warming potential	thousand tonnes CO_2 equivalent	**495**	463[2]	+7
Total acid gas emissions	tonnes SO_2 equivalent	**394**	405	-3
Total VOC emissions	tonnes	**154**	209	-26
Total waste	tonnes	**106,494**	121,594	-12
Total waste to landfill	tonnes	**3,482**	3,819	-9
Water consumption	thousands m^3	**2,529**	2,564	-1

[1] Restated to include energy derived from the combustion of bottled gases at a small number of sites.

[2] Restated to include Scope 1 manufacturing process derived emissions and emissions due to the combustion of bottled gases.

At Johnson Matthey we make a major contribution to protecting the environment. We do this by responsibly managing the resources we use, the way we operate our businesses and through the effect of our products and services on the environment.

A key element of our business is the application of our expertise in chemistry to turn natural resources into value adding sustainable technologies for our customers. For example, our process catalysts that improve resource efficiency and our emission control catalysts for vehicles both have a positive impact on the environment. We invest heavily in R&D to support the development of the next generation of products with sustainability benefits and are proud to say that 89% of the products that we manufacture fit this category.

We operate in a world where increased demand for key resources and critical raw materials can expose the group to the risk of price volatility and even the availability of resources. So we apply our technical expertise to mitigate these risks.

We do this in three ways. Firstly, we develop products which deliver the same performance but have a lower content of critical raw materials – for example, we reduce the proportion of rare earth materials in our emission control catalysts and refinery additives. Secondly, we develop products that can be manufactured in a less resource intensive way. One example is our compact catalysed soot filter product for diesel cars. Finally, we develop products that enable our customers to lower their own environmental footprint; this is something that our process catalysts do.

Our Sustainability 2017 and Manufacturing Excellence programmes are well established, enabling us to increase resource efficiency within our own operations, generating cost savings for our business today and helping to improve our environmental performance and conserve resources for the future.

Read more on the environmental benefits of our products at www.matthey.com/sustainability/products.

Improving Our Processes and Performance

In our Sustainability 2017 programme, we set ourselves a series of tough targets to improve environmental performance. We state that we want to cut our carbon intensity by half, achieve zero waste to landfill and halve the key resources per unit of output consumed (compared with baseline data from 2007) by 2017. We identified natural gas, electricity and water as our most significant resources in the context of how available these resources are now and will be in the future (taking into account factors such as accessibility, geopolitical conditions and infrastructure), together with costs and the quantities we use. To help us to meet our targets and aspirations, we have in place long term environmental improvement plans, and performance indicators have been agreed.

Work to achieve our targets is done at business and site level. Each of our businesses sets internal reduction targets which are formally reviewed as part of the annual budget process to ensure that they are aligned with the Sustainability 2017 and Manufacturing Excellence programmes and are contributing to the group's goals. In addition to process improvement efforts, efficiency and longevity of equipment are considered in purchasing decisions and for large capital expenditure projects.

At group level, we have well established policies, systems and processes in place to manage environmental performance and help us realise continuous improvement. All our major manufacturing sites are required to maintain certification to the ISO 14001 environmental management system as a means of setting, maintaining and improving standards. The group also requires new or acquired sites to achieve ISO 14001 certification within two years of beneficial operation or acquisition. The battery systems business, acquired in October 2012, has now achieved ISO 14001 and all other recent acquisitions are on track to achieve accreditation this year.

Go online for full details of our policies and strategies at www.matthey.com/sustainability.

Read more on our Sustainability 2017 progress on page 2.

Environmental Performance

Johnson Matthey undertakes a comprehensive annual review of group environmental performance which covers all manufacturing and R&D facilities. Data is presented for a five year period for ten environmental indicators on page 187 of this report. Year on year performance is highlighted on the following pages.

We recorded decreases in seven of our ten environmental indicators this year whilst at the same time growing our business. This is the result of our ongoing Sustainability 2017 and Manufacturing Excellence programmes which aim to reduce our impact on the environment. There were increases in three indicators; energy consumption, total global warming potential (GWP) and emissions of oxides of nitrogen (NOx), primarily as a result of expansion in production at our facility in Savannah, USA. This plant has almost doubled its production capacity, leading to an increase in energy consumption. The additional facilities were designed to minimise water use, reduce waste and emissions to air, and they have proved to be very successful in these areas.

Johnson Matthey's sales excluding precious metals (sales) grew by 5% in the year. Eight of our ten indicators (all but energy consumption and total GWP) reduced relative to the rate of growth of the group's sales, demonstrating the positive impact of our efforts.

There were no significant fines and no non-monetary sanctions for non-compliance with environmental laws and regulations in the year.

Energy Consumption

The group's total energy consumption increased by 7% to 5,360 thousand GJ, which represents a 2% increase relative to sales. This was primarily caused by an increase in natural gas consumption due to the expansion of our manufacturing facilities at Savannah in the USA. Total electricity usage relative to sales declined by 1% although natural gas used increased 4% relative to sales. Of the energy consumed in 2014/15, 64% arose from direct sources (i.e. various fuels and natural gas combusted by the group) and 35% from consumed electricity generated by a supplier. 1% was generated locally from zero carbon sources.

Energy consumption for 2014 has been restated to include energy derived from the combustion of bottled gases at a small number of sites and which had been included in prior years' data.

Global Warming Potential

We report greenhouse gas emissions from process and energy use and convert the total group energy use to tonnes of carbon dioxide (CO_2) equivalent using national and regional conversion factors for each emission source as appropriate. The group's total GWP is based on the following (as defined by the greenhouse gas protocol www.ghgprotocol.org):

- Scope 1 emissions (generated by the direct burning of fuel, predominantly natural gas, and process derived CO_2 emissions).
- Scope 2 emissions (generated from grid electricity and steam use at our facilities).
- Scope 3 emissions from the losses associated with transmission and distribution of electricity.

In 2014/15 emissions of CO_2 derived from our manufacturing processes reached a level which we determined to be material and so we have included it in our Scope 1 emissions for the first time. We have also restated our total GWP for 2014 to include such manufacturing process derived emissions and also to include emissions due to the combustion of bottled gases at a small number of sites. This caused our total GWP for 2013/14 to increase compared to the total GWP reported in the 2014 annual report.

In 2014/15 the group's total GWP increased by 7% to 495 thousand tonnes CO_2 equivalent. This increase is principally due to an increase in the Scope 1 emissions at our Savannah site, as its new production facility came on line this year. Relative to sales, our total GWP increased by 2%. The breakdown of the group's total GWP is shown in the table below.

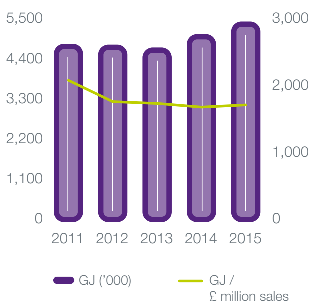
Total Global Warming Potential

	2015 thousand tonnes CO_2 equivalent	**2015 % of total GWP**	2014 thousand tonnes CO_2 equivalent [1]	2014 % of total GWP
Scope 1	**208**	**42%**	184	40%
Scope 2	**261**	**53%**	253	55%
Scope 3 (from electricity transmission and distribution)	**26**	**5%**	26	5%
Total global warming potential	**495**	**100%**	463	100%

[1] Restated to include manufacturing process derived emissions and emissions due to the combustion of bottled gases.

Energy Consumption

GJ ('000) GJ / £ million sales

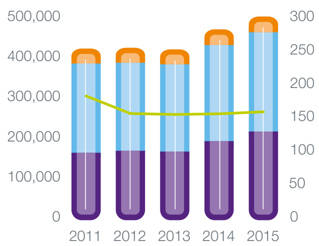


	GJ ('000)	GJ / £ million sales
2011	4,749	2,083
2012	4,726	1,764
2013	4,648	1,737
2014	5,015[1]	1,682
2015	**5,360**	**1,715**

[1] Restated.

Total Global Warming Potential

Tonnes CO_2 equivalent Tonnes / £ million sales



	Tonnes CO_2 equivalent ('000)	Tonnes / £ million sales
2011	415	182.0
2012	417	155.7
2013	413	154.3
2014	463[1]	155.3
2015	**495**	**158.3**

[1] Restated.

Scope 1 emissions Tonnes CO_2 equivalent
Scope 2 emissions Tonnes CO_2 equivalent
Scope 3 emissions from electricity supply Tonnes CO_2 equivalent
Tonnes / £ million sales

Environment continued

Although we consumed more natural gas than electricity, natural gas has lower carbon intensity than grid electricity and thus represents a lower proportion of GWP.

We do not report fully on our Scope 3 emissions. However, the emissions we report from electricity consumed at our facilities include Scope 2 emissions from electricity generation and Scope 3 emissions caused by transport and distribution losses in electricity grids. In terms of other Scope 3 emissions, those from travel by employees on company business are not material. The majority of our products are high value but low volume and so the carbon associated with their transportation is low, relative to other carbon intensity figures. The majority of our Scope 3 emissions relate to the extraction and / or production of purchased materials and outsourced activities such as waste disposal. We continue to quantify these Scope 3 emissions by conducting life cycle analysis studies of our major product categories and by improving our knowledge of our role in the value chain.

Other Emissions

Emissions from our operations are generated from a number of sources including combustion processes, materials handling and chemical reactions and are typically licensed by local regulations. All sites monitor emissions to ensure compliance with these regulations and set their own absolute targets aimed at reducing significant emissions as part of their local environment, health and safety improvement plans.

In 2014/15, our total emissions of acid gases decreased by 3% to 394 tonnes sulphur dioxide (SO_2) equivalent. Relative to sales these emissions also decreased, by 7%.

In 2014/15, our emissions of oxides of nitrogen (NOx) increased by 3% to 497 tonnes and total SO_2 emissions decreased by 31% to 46 tonnes. This is mainly due to a change in product mix at our Savannah, USA plant.

Waste

The group generated 106,494 tonnes of waste during the year, down 12% in absolute terms. Waste to landfill also decreased in the year, down 9% to 3,482 tonnes.

Achieving zero waste to landfill by 2017 is one of the group's Sustainability 2017 targets and our focus has been to reduce, reuse and, where possible, recycle. Our facilities worldwide evaluate their waste beyond simply a material destined for disposal and increases this year were offset by initiatives to reduce their landfilled waste, such as waste to energy opportunities.

Water Consumption

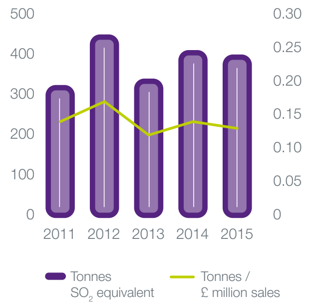
During the year, water consumption decreased by 1% compared with 2013/14 to 2.5 million m^3; relative to sales, water consumption decreased by 6%. Of the total water used by the group, 89% was supplied by local municipal water authorities and 11% was abstracted.

Total effluent remained constant at 1.7 million m^3, despite a recalculation of our 2013/14 data due to one site not reporting last year. There is some natural year on year fluctuation in our effluent data as we have some sites in geographical locations where rainwater run off from our buildings is included in effluent metering.

The chemical oxygen demand (COD) test is commonly used to indirectly measure the amount of organic compounds in water and is a useful measure of water quality. In 2014/15 the group discharged organic chemicals equivalent to a COD of 422 tonnes into water courses, as regulated by local emission limits at each manufacturing facility, a decrease of 3% on the previous year.

Total Acid Gas Emissions

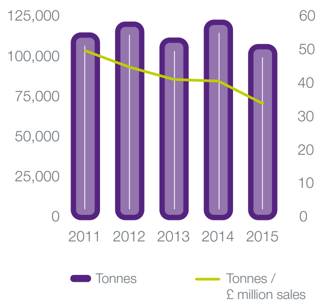
Tonnes SO_2 equivalent — Tonnes / £ million sales



	Tonnes SO_2 equivalent	Tonnes / £ million sales
2011	318	0.1395
2012	444	0.1658
2013	334	0.1248
2014	405	0.1359
2015	**394**	**0.1260**

Total Waste

Tonnes — Tonnes / £ million sales



	Tonnes	Tonnes / £ million sales
2011	113,671	49.86
2012	120,363	44.94
2013	110,448	41.27
2014	121,594	40.79
2015	**106,494**	**34.08**

Next Generation Diesel Emission Control

Diesel engines have low carbon dioxide (CO_2) emissions and good fuel economy. As such, they will play an important role in helping Europe meet its target of reducing fleet average CO_2 emissions to 95 g/km by 2020. However, diesel engines also produce harmful oxides of nitrogen (NOx) emissions that need controlling.

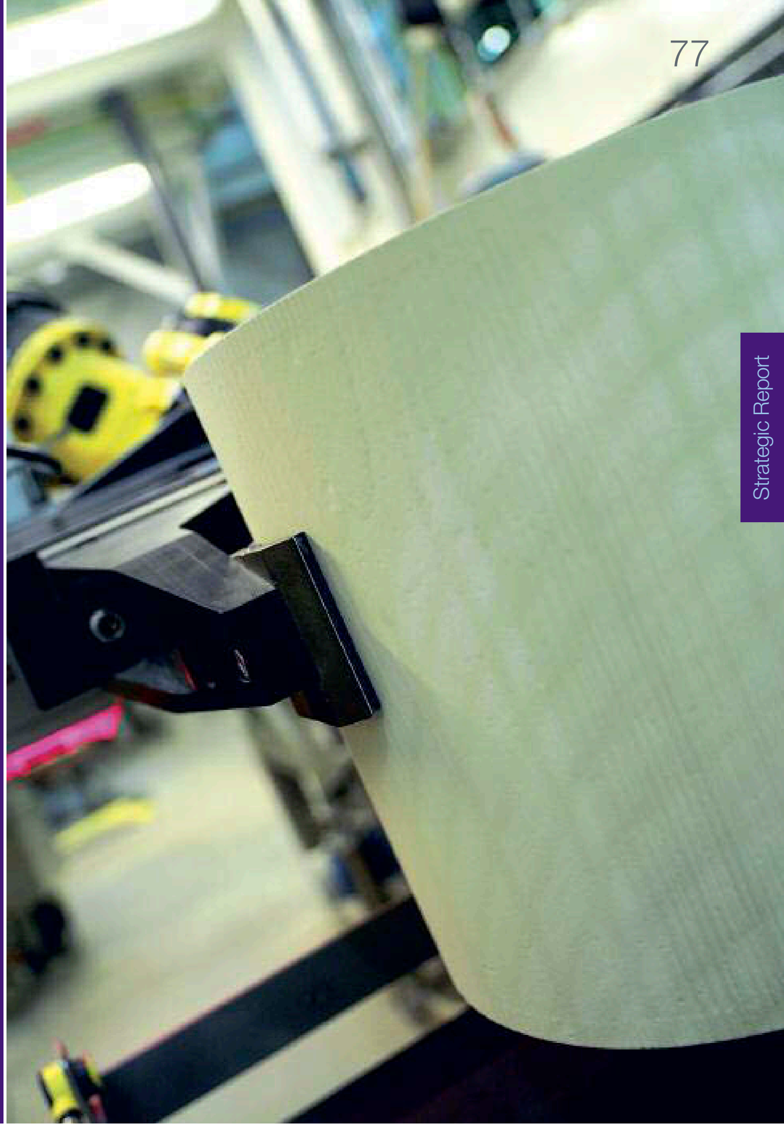
Selective catalytic reduction (SCR) technologies are used to cut these emissions. Johnson Matthey has been instrumental in developing more efficient SCR systems by improving catalyst design and choice of active materials.

In an SCR system, urea is injected into the exhaust and decomposes to ammonia, which in turn reduces NOx to harmless nitrogen gas. The SCR coating can be applied directly to the filters that are already fitted to control particulate matter, allowing for a more compact emission control system. We call this SCRF® technology.

There are challenges though; not all cars have room for a urea tank and the SCR process is not as effective below 200°C. Johnson Matthey has developed NOx adsorber catalysts (NACs) which are a useful alternative that can be used to trap NOx at lower temperatures for later conversion once the catalyst has heated up.

In the future, we expect diesel cars to combine NAC and SCRF® technologies into a more robust system that can effectively convert NOx over the widest possible range of driving conditions. This will help vehicles meet ever tightening legislation.

Today, our diesel technologies cut NOx emissions levels to 90% below those legislated for ten years ago. We are continuing our focus to develop increasingly effective emission control solutions to create value for our customers and to protect our planet for the future.

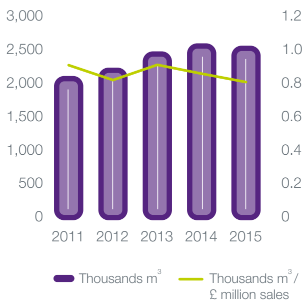


Environmental Awareness

Johnson Matthey has a robust and effective management system which requires all sites to report environmental incidents to the group's environment, health and safety department. During 2014/15 no significant spillages to the environment of raw materials, intermediates or products have been reported by the group.

We also assess emerging environmental regulations and legislation that may have an impact on our operations. In 2014, the UK Energy Savings Opportunities Scheme (ESOS) was introduced in response to the 2012 EU Energy Efficiency Directive (EED). During the coming months we will be working to ensure that our UK operations comply with this regulation and we are assessing the implications of the EED on our other European operations.

Water Consumption



	Thousands m³	Thousands m³ / £ million sales
2011	2,076	0.911
2012	2,201	0.822
2013	2,444	0.913
2014	2,564	0.860
2015	**2,529**	**0.809**

The Strategic Report was approved by the board on 3rd June 2015 and is signed on its behalf by:

Robert MacLeod
Chief Executive