



British Lime Association

Sixth sustainable development report

September 2016



FOREWORD

This is our sixth sustainable development report as the British Lime Association and we are proud of our continuing progress. We have continued to invest heavily through very challenging economic conditions to make UK lime production both efficient and sustainable. In 2015, annual UK lime and dolime sales were approximately 1.2 million tonnes – over 20% below pre-recession levels.

Lime is used extensively as a flux for removing impurities in the production of iron and steel and until recently about 35% of all industrial production was used in that way. Thus, the downturn and closure of some steel operations has had serious financial implications for our members, which are traditionally located in rural areas with limited employment opportunities. Lime sales in 2016 are expected to fall to 1.1 million tonnes as a result.

Producers have made significant technical improvements to their processes, and we report here on initiatives to reduce environmental impacts. The sector has taken positive actions as a result of the steel crisis and is seeking out innovative products and markets, especially in relation to water and effluent treatment, soil stabilisation and use of hydraulic lime in road binders.

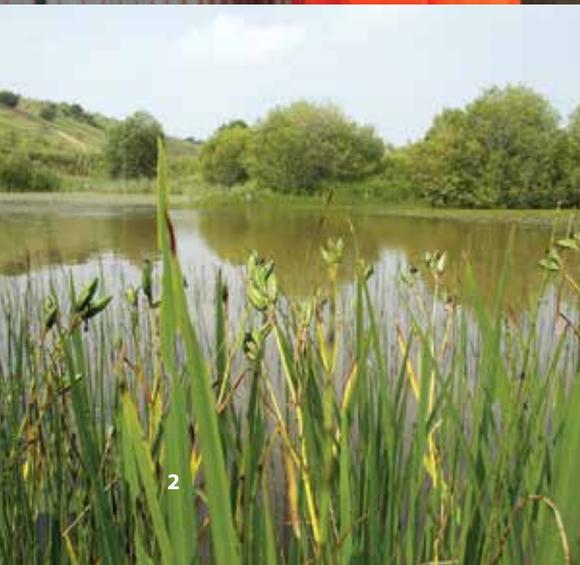
EU ETS reform is the other significant threat to the industry. The sector has suffered from direct and indirect additional costs induced by the scheme, bringing an increase in production costs of at least 30% on the GVA. It is vital that the Phase IV post 2020 EU ETS is reformed so that full carbon leakage protection is provided in the absence of a robust, and fully implemented, global climate change commitment. There also needs to be provision compensation for the increasingly important indirect costs of EU ETS in electricity prices.

The industry has been leading the way in health and safety practices in recent years and has introduced leadership initiatives that are being shared to improve the working environment. This has included workshops, incident report sharing and inter-site peer reviews with the aim of achieving zero harm.

Lime is critical to the delivery of the Government's plans to build more homes and renew national transport and energy infrastructure, as well as repairing and maintaining local roads, schools and hospitals.

Following the EU referendum result, the lime sector has urged Government to take the necessary steps so that the UK remains an attractive place for inward and domestic investment and that both the steel and construction sectors regain their previous momentum. We need to minimise uncertainties by encouraging and boosting both public and private investment and by building confidence as the top priority. Resilient and continuous supplies of essential mineral products such as industrial and dolomitic lime will be critical to this.

Richard Stansfield, Chairman, British Lime Association



KEY ACHIEVEMENTS

KEY ACHIEVEMENTS RELATIVE TO 2011 BASE YEAR

✓ 79%

Reduction in SO₂ emissions for high calcium lime production

✓ 48%

Reduction in Point Source Dust emissions for dolomite

✓ 76%

Reduction in SO₂ emissions for dolomite production

✓ 40%

Reduction in overall Lost Time Incidents

✓ 30%

Reduction in total waste for lime disposed to landfill

✓ 9.6%

Reduction in CO₂ emissions for dolomite production

✓ 64%

Reduction in NOx emissions for high calcium lime production

✓ 20%

Increase in waste-derived fuel for dolomite production

HOW WE MAKE LIME

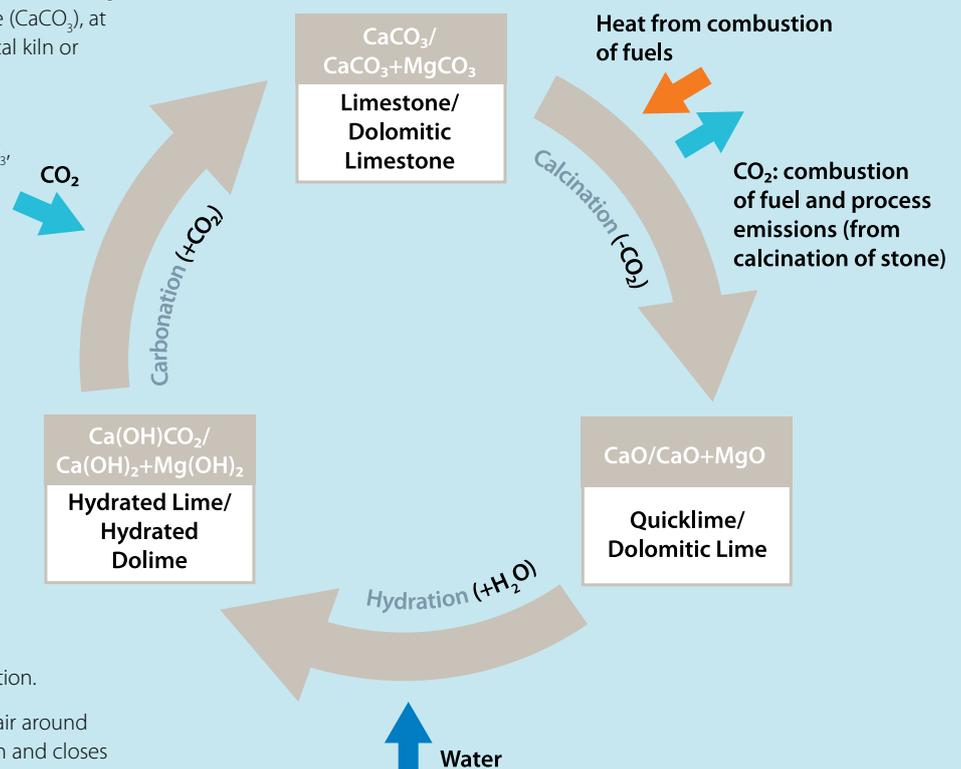
There are two types of lime made in the UK; high calcium lime and dolomite. High calcium lime is produced from burning limestone or chalk, which is calcium carbonate (CaCO₃), at temperatures of up to 1400°C in either a vertical kiln or horizontal rotary kiln.

Dolomite is produced from burning dolomitic limestone, which consists of CaCO₃ and MgCO₃, at temperatures of around 2000°C in long rotary and preheater rotary kilns.

The key performance indicators relating to the production process have been separated into the two types of lime in this report due to the substantial differences between the two methods of manufacture.

When limestone, chalk (CaCO₃) or dolomitic limestone (CaCO₃, MgCO₃) rock is heated to high temperatures inside a kiln a chemical reaction is triggered that releases carbon dioxide (CO₂) from the rock. The released carbon dioxide is called 'process CO₂' and makes up around 75% of the CO₂ generated from high calcium lime production and 53% from dolomitic lime (dolime) production.

Over its lifetime, lime reabsorbs CO₂ from the air around it. This natural process is known as carbonation and closes the link in the lime cycle.



CARBON MANAGEMENT

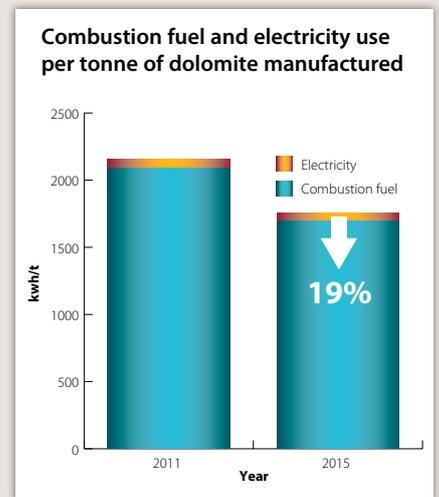
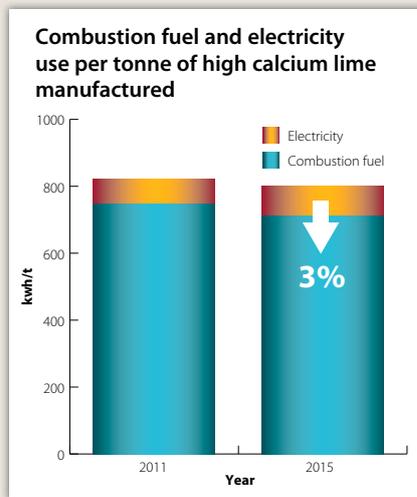
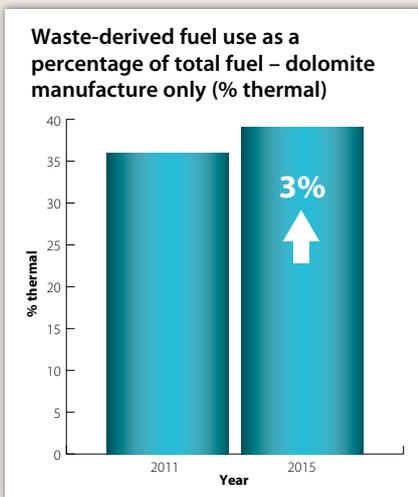
CO₂ mitigation and energy efficiency measures

All BLA members participate in UK and European carbon and energy efficiency schemes as well as holding environmental management certification. They have invested heavily in energy efficiency measures and process optimisation. In the past few years, lime producers have spent over £10 million on improvements to their manufacturing process for environmental gain.

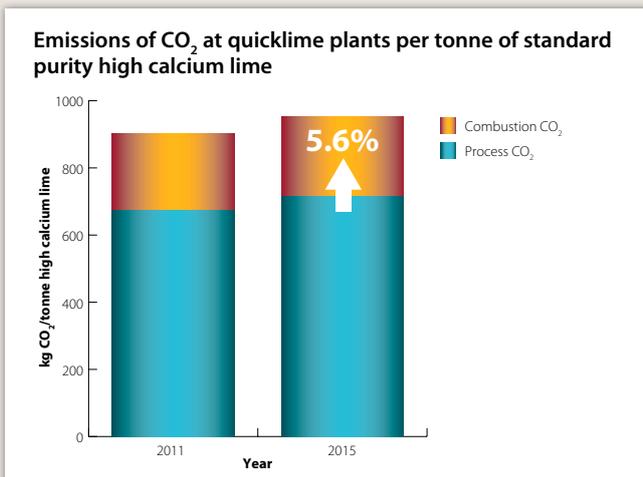
Where possible, alternative fuels are used to

replace fossil fuels. In 2015, the dolomitic lime industry substituted 44% of total fuel used for production with alternative fuels derived from waste products. Meanwhile, one lime company operates a hugely effective anaerobic digestion facility to generate 12,000MWh/year electricity using energy crops supplied by a consortium of local farmers. This helps to control energy costs, reduce carbon footprint and reduce reliance on grid electricity.

One major restriction the lime industry experiences with fossil fuel replacement is the high quality specification required for products that are used for pharmaceuticals and drinking water purification. This means that high calcium lime producers are technically constrained to using only the cleanest, highest quality fuels. Producers will continue to research and develop possibilities for fuel replacement in the future that do not compromise the quality of their end-products.



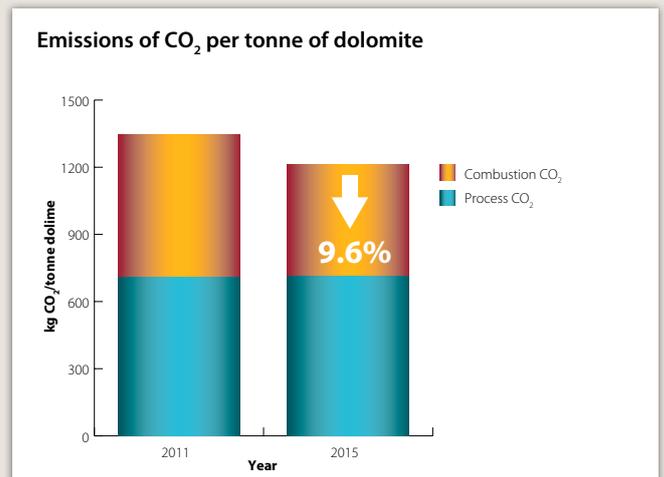
High calcium lime



Total CO₂ emissions per tonne have increased by 5.6% between 2011 and 2015. Whilst combustion emissions remained fairly stable, process emissions have increased slightly due to market demands requesting an increase in products containing higher quicklime content.

Improvement actions including the automation of the kiln controls, kiln charging modifications, quality control checks and improved reliability of the burners/lances have been introduced to reduce the fuel consumption and subsequently lower CO₂ emissions.

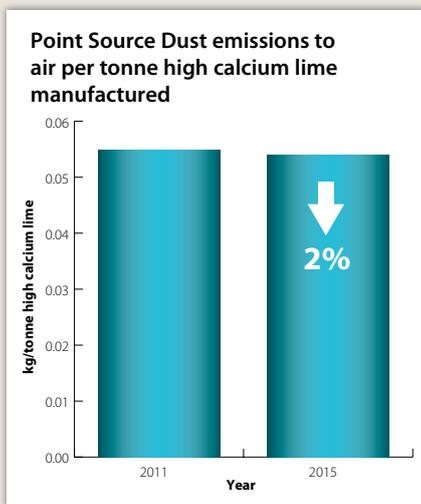
Dolime



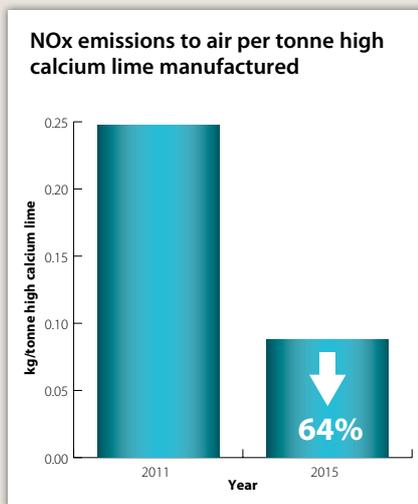
CO₂ emissions have decreased by 9.6% in total. This is very encouraging and is a direct result of positive changes to the dolime manufacturing process. The conversion of a long rotary kiln (LRK) to a preheater (PRK) type unit has achieved a reduction in energy per tonne from 10 to 6GJ/t at a Lhoist dolime plant at Whitwell in Derbyshire. The increased fuel efficiency has allowed the business to produce more products whilst using less energy to complete the process along with lower CO₂ emissions and reduced production times.

EMISSIONS TO AIR (excluding CO₂)

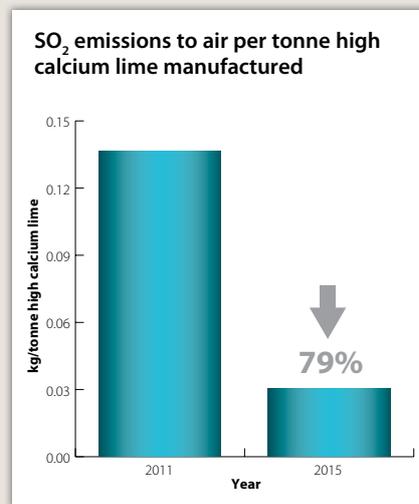
High calcium lime



Dust emissions from high calcium lime production have decreased by 2% since 2011. Implementation of measures in the Industrial Emissions Directive that members have undertaken will see further decreases in the years ahead.

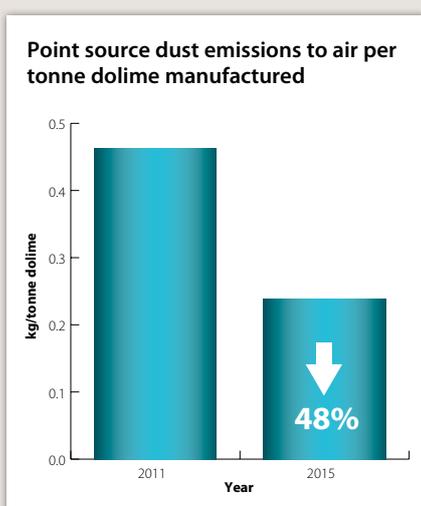


NOx emissions have decreased by 64% between 2011 and 2015. Once again, the change away from less efficient rotary kilns (more heat energy and particulate emissions) has been one of the key factors. All production emissions are governed by the Industrial Emissions Directive and thus obtaining environmental permits is based on a commitment to Best Available Technique improvements for the sector as outlined in this directive. Crucially, all site emissions remained below the permitted limits for lime plants as regulated and audited by the Environment Agency.

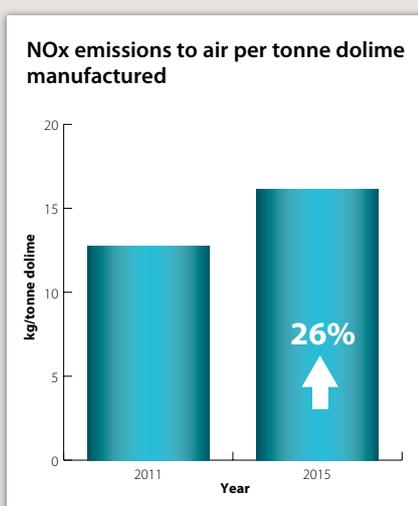


Encouragingly, SO₂ emissions generated from high calcium lime manufacture have decreased by 79% since 2011. This is as a result of the sector proactively managing its emissions and making changes to their manufacturing processes to achieve dramatic reductions.

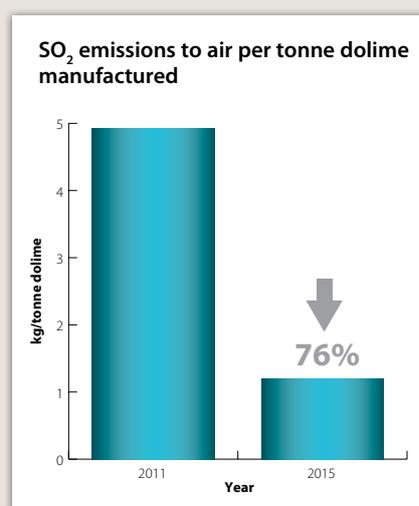
Dolime



Dust emissions from dolime production have decreased by 48% since 2011. Further improvements to raw material screening techniques and electrostatic precipitators have helped in this reduction.



There is, however, an increase in NOx emissions – this is a reflection of a change in the dolomitic lime product sales mix being produced (a higher ratio of products such as sintered and ULCD products that produce higher NOx emissions were sold).

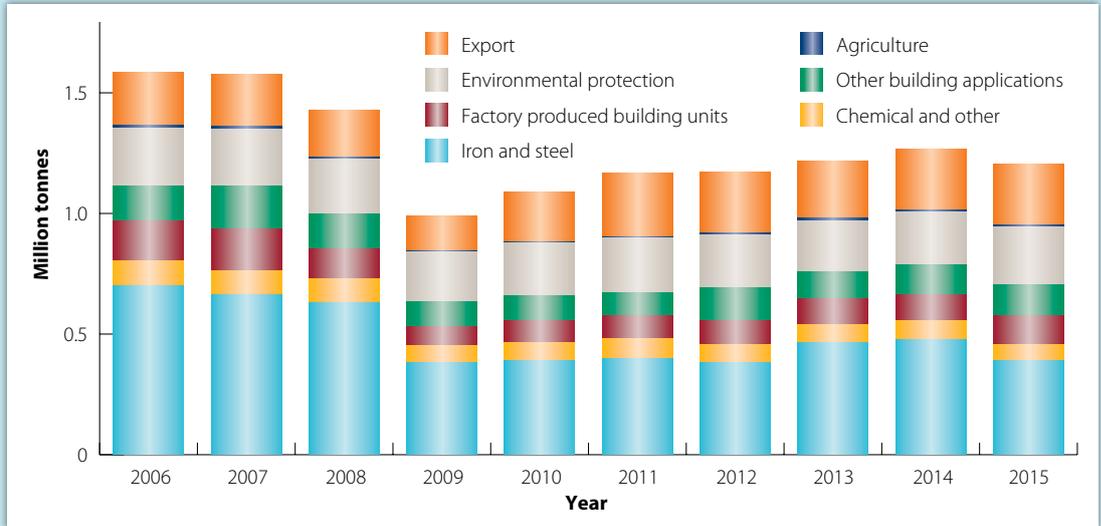


SO₂ emissions from dolime production have decreased hugely by 76% since 2011. This is due to a combination of further investment in production equipment and optimisation of the fuel mix that is used to feed the production process.

FUTURE DEVELOPMENTS

Future developments in the lime sector

The plot opposite shows the sales trends since 2006. The sector is resilient, bouncing back from the 2008 global recession with exports (~21% of total sales) and environment protection applications now coming to the fore in the face of declining sales into iron and steel.



Lime under the Emissions Trading Scheme

Lime is one of the most energy-intensive industries, with energy costs representing 40% of total costs. In that sense, it is subject to potential carbon leakage, especially to neighbouring EU countries. Access to reasonably priced carbon and energy is crucial in order to operate in the EU and to maintain our industry's competitiveness.

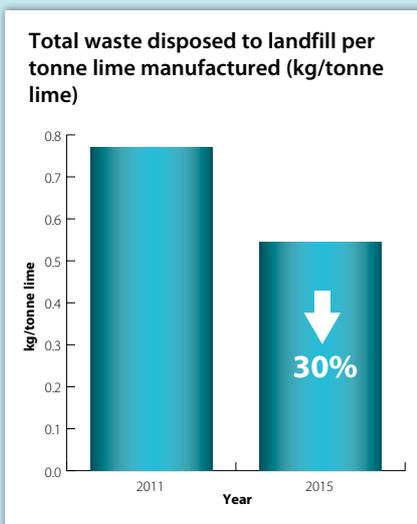
For the upcoming Phase IV post 2020 scheme, the lime sector should therefore remain on the list of sectors exposed to

international competition, with best performers receiving 100% carbon leakage protection. This implies that:

- No direct and indirect costs should be borne by UK installations in sectors at risk of carbon leakage;
- Sufficient free allocations should be foreseen to ensure 100% protection for the sectors exposed to carbon leakage.

There should be no discrimination between

carbon-intensive industries emitting only reducible CO₂ and those emitting both reducible and irreducible CO₂. Considering the chemical properties of lime, the industry cannot lower its irreducible emissions (68%). It has already made considerable efforts to lower the reducible emissions and today, the majority of lime production plants use vertical lime kilns, which are amongst the most efficient and operate close to the thermodynamic minimum to produce lime.



Minimising waste and reducing waste sent to landfill is a high priority for the lime sector. Producers strive to use landfill as the last resort for waste disposal, and this is illustrated in the 30% reduction they achieved between 2011 and 2015.



BLA Conference 2017

A BLA conference themed around 'road construction' and featuring talks from prominent industry experts covering items such as soil stabilisation, land remediation and lime in hydraulic road binders and asphalt is scheduled for early autumn next year.

MANUFACTURING INNOVATION

The industry continues to innovate and has introduced technical improvements as evident by the case studies below.

CASE STUDY

Switched reluctance (SR) high torque drives

Singleton Birch uses semi-mobile MMD roll crushers at its lime works in North Lincolnshire. Typical of crushers, there is a high peak power demand.

Traditionally over-sized induction motors were necessary to handle this peak power, which is inefficient. As the crushers move further from the power supply, the cables become longer, increasing power loss.

To combat these issues the company has purchased the latest technology SR motor drives that are also used in electric cars, mining shovels and dump trucks. Unlike standard induction motors, power is delivered to windings in the stator (case) rather than the rotor. A sophisticated electronic controller is combined. Higher torque characteristics result, producing peak power through a smaller motor which counteract power loss as cable length increases, delaying capital expenditure.

Thus, higher torque reduces crusher stalls, fewer units of electricity are consumed while flat torque curves allow unlimited drive speed change without performance loss.



CASE STUDY

Reducing electricity consumption

The Lhoist Hindlow plant in Derbyshire has been improving its electricity consumption by a programme of replacing key electric drive motors with more efficient variable speed drives.

It has also looked at the control strategy used to operate the fans in the most energy efficient way whilst supporting the kiln production requirements.

The kiln process area is the most energy intense area for both gas and electricity, with the combustion and cooling air blower fans some of the largest drives on site.

Using a third party to assess the consumption and potential savings, the investment delivered annual savings of around 1.94 million kWh and a CO₂ saving of 1,017 tonnes.

CASE STUDY

Improvements in transporting lime by rail

At Tarmac's site at Tunstead in Derbyshire, new box wagons from Freightliner have been utilised with a significant amount of recycled material from coal hoppers that had recently been made redundant by the national decline in coal.

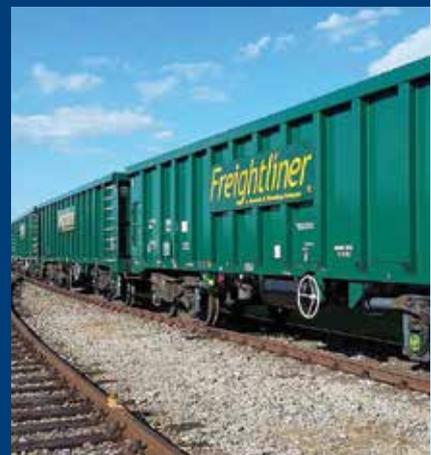
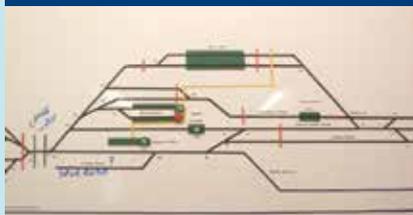
This creative approach made it possible to bring redundant assets back to life and reduce waste.

Additionally, some onsite rail management procedures have helped to improve safety. There is a continual need to manage the sidings area to control train movements and monitor stationary rolling stock and rail maintenance. A suggestion by one of the rail operatives has led to the introduction of visible display boards within the rail section at Tunstead. This makes sure all persons working in the rail area can easily see who else is on site, what task they are carrying out, which locomotives are in operation, which rolling stock is under repair and what permits are open.

A line drawing has been designed of the track layout in the sidings and affixed to a magnetic visual display board.

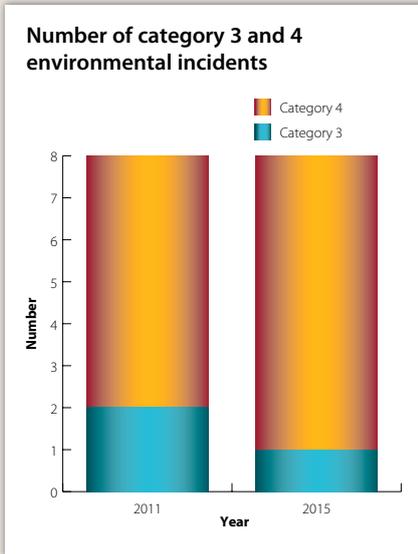


Each maintenance team member, visitor or contractor is issued a numbered coloured magnet which is identified on the issued permit and placed on the track layout. This gives immediate visibility of persons in the area and has greatly improved the management processes for this area.



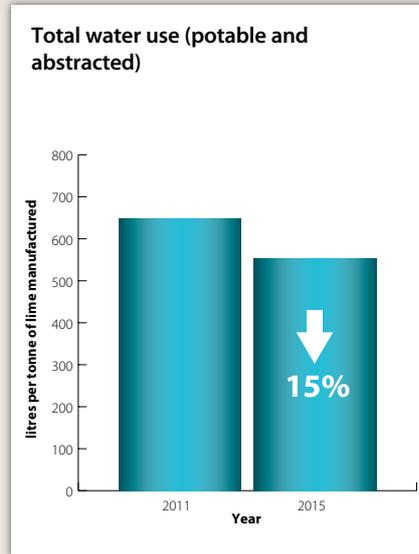
ENVIRONMENTAL MANAGEMENT

Environmental management



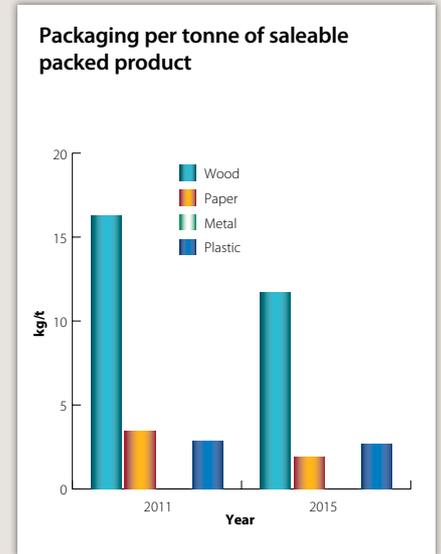
In 2015, there were no enforcement notices, formal cautions or prosecutions. The number of environmental incidents has remained consistently low over the past few years. The majority of all incidents were Category 4 incidents, that are “a non-compliance that has no potential to have an environmental impact”², as defined by the Environment Agency.

Water resource efficiency



The lime sector is reducing water year-on-year – between 2011 and 2015, total water consumption decreased by 15%. This has been achieved through activities such as wheel washing and dust suppression.

External packaging materials



The use of external packaging materials continues to decrease; minimising the amount of external product packaging (especially wood and plastic) not only reduces costs but helps promote a less wasteful industry.



CASE STUDY

Efficient use of materials

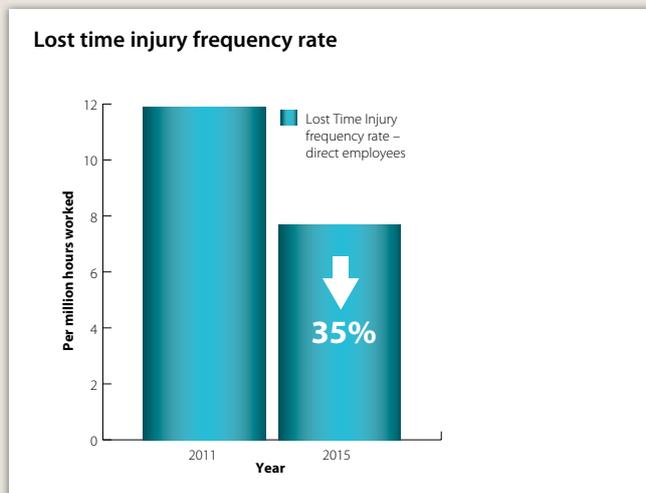
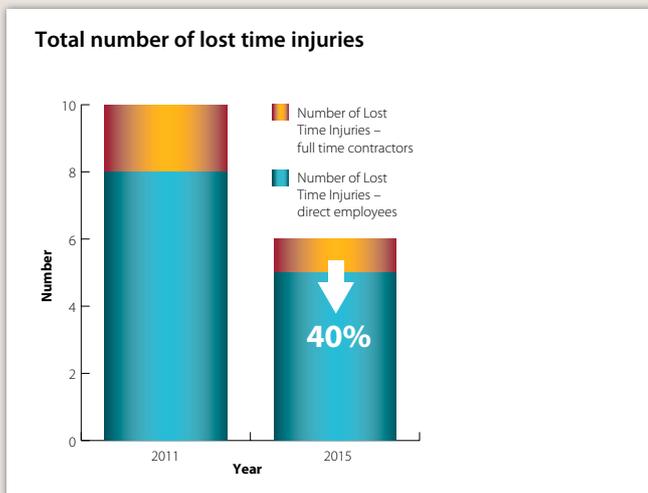
Lhoist has always used a mining waste tip to dispose of fines from the dolime process. Since 2010, it has looked into other options in order to maximise raw materials use and generate an income from a by-product of dolime production.

The decline in steel manufacturing within the UK has focused the dolime team on recycling the fines material into another saleable product.

The dolime kiln fines, which were normally disposed of via the mining waste tip, are now being used as one of the constituent ingredients of a key product. Aside from reducing the onsite waste disposal by 75% since 2013, this has increased the energy efficiency of the kiln by allowing more products to be manufactured for the same volume of feed stone and energy input.

HEALTH AND SAFETY

Health and safety



Statistics

The health and safety of employees and contractors is the top priority for the UK lime industry – all companies have a target of zero incidents. Accordingly, the excellent improvements by the sector over the past few years are evident by the significant reduction in recorded incidents throughout the sites.

The UK lime industry has reduced the number of Lost Time Injuries for direct employees and contractors by 40% between 2011 and 2015 (data collected from BLA members only). Furthermore, there has been a 35% reduction in the Lost Time Injury frequency rate (direct employees, BLA Members only).

Health and safety workshops & peer reviews

The latest in a series of BLA inter-site peer reviews took place at Singleton Birch in March with supervisors and ground staff from all members in attendance. Feedback was very positive with good discussion within the groups and 'common themes' identified.

The BLA also held a recent Health & Safety Workshop at the Lhoist site at Whitwell in Derbyshire with operators and ground staff present from all



members companies. The session focused on on-site transportation measures with viewpoints shared on ways in which the industry could improve pedestrian/vehicle segregation and avoid any potential incident hotspots throughout all sites.

Further workshops and peer reviews are already planned over the next year.

Wider health and safety strategies

The lime sector is part of the Mineral Products Association (MPA), which was the first trade association to sign up to the Health and Safety Commission's Hard Target and has a huge range of specific programmes and resources to help with the task, see the sustainability microsite: <http://www.mineralproducts.org/sustainability/>

The MPA has created a whole family of "Safer by" initiatives, which focus on a range of key issues, including machinery and plant design, staff competence and sharing knowledge industry-wide.

The new, comprehensive 'MPA Driver's Handbook' – launched at Hillhead 2016 – puts every aspect of best practice in one place. It has been developed by members as a tool for drivers of all industry delivery vehicles to help them understand and manage the risks that they face and can create when driving and operating vehicles for work.

The industry is also committed to ensuring that local residents, especially children, are aware of the dangers of entering a quarry unsupervised. An annual "Stay Safe" campaign delivers this important message. Find out more at http://www.mineralproducts.org/youth_playsafe01.htm

http://www.mineralproducts.org/youth_playsafe01.htm

The MPA has also launched a Cycle Safe campaign which aims to prevent collisions between cyclists and Large Goods Vehicles (LGVs) by raising awareness of how to cycle and drive as safely as possible. For more information, see http://www.mineralproducts.org/feature_cycle_safe.htm.

The MPA Health and Safety Awards encourage good practice and are strongly supported by lime member companies. Find out more at www.safequarry.com.

HEALTH AND SAFETY

CASE STUDY

Emergency preparedness

Good planning leads to good responses. At Tarmac's Hindlow site an emergency exercise with Derbyshire and Staffordshire Fire Services was conducted in late 2015. A serious fire was simulated in the staff amenities area using a smoke generating machine.

Three casualty dummies were located between two different rooms on the first floor and a member of the Hindlow team was used as a simulated casualty stranded



by smoke near a first-floor window. Five Fire and Rescue appliances from both Derbyshire and Staffordshire attended site along with a number of other support vehicles and personnel.

Chris Reay (Hindlow Plant Manager), who organised the event, said: "There were some very positive outcomes. We confirmed that our local arrangements worked well and there were good communications between the emergency services and our site teams. We also identified some areas where we can make improvements. Safety is our number one priority and we work

hard to prevent accidents and incidents but it is reassuring to know there are good emergency plans in place. Our thanks go to the fire services for their support."



CASE STUDY

Silo isolation logic – safety simulator

Isolation of equipment to ensure maintenance work is undertaken safely can be very simple if a single type of isolation is required.

However, in complex operations, a number of electrical and mechanical isolation points and types are required.

This causes operational personnel a challenge in understanding the sequence

of isolations required for differing plant shutdown scenarios. Over the years, many avoidable fatalities and injuries resulting from incorrect isolation have occurred across different industries.

With this in mind, four apprentices from Singleton Birch's Engineering Department were tasked with designing and delivering a plant isolation logic simulator.

The solution delivered consists of three liquid silos, an overflow sump, pipework, valves and a logic touchscreen computer control.

The simulator has been used to train and test Singleton Birch's operational personnel in their ability to safely isolate the correct sequence of valves from prescribed scenarios. Further demonstrations will be offered across MPA member sites in order to share best practice.



LIME IN THE COMMUNITY

Working in the community

Lime production facilities are located in rural areas of the UK and provide jobs for the local population, both directly and indirectly, through local supply chains.

Wherever the location, lime companies tend to have a deep-rooted social and historical

connection to their regions. As well as helping to support the local economy, regular engagement with the local community through liaison meetings is important in maintaining positive community relationships. To this extent, 19 such

meetings (seven with the Environment Agency) were held during the year. Furthermore, throughout the year, most major sites participated in public open days or the sponsorship of local educational and exhibition events or social activities.

CASE STUDY

Building community relationships

Lhoist's dolomite plant in Whitwell, Nottinghamshire has been working with the local community to help resolve a safety issue. Due to cuts in Government funding, the county council had to review its services and determined that the school next to the site no longer met the required criteria for a school crossing patrol (SCP).

However, the school is located directly next to the Lhoist dolime plant and the Tarmac-owned quarry. Both companies

have a history of working with the local community on improvement projects and decided to jointly contribute an annual amount over the next five years which will fully support the employment of a new SCP.

HGVs go to and from the site daily and use the local roads to access the site. It is therefore a fundamental part of the sustainable development plan to work closely with local communities, ensure local safety and secure future business needs.



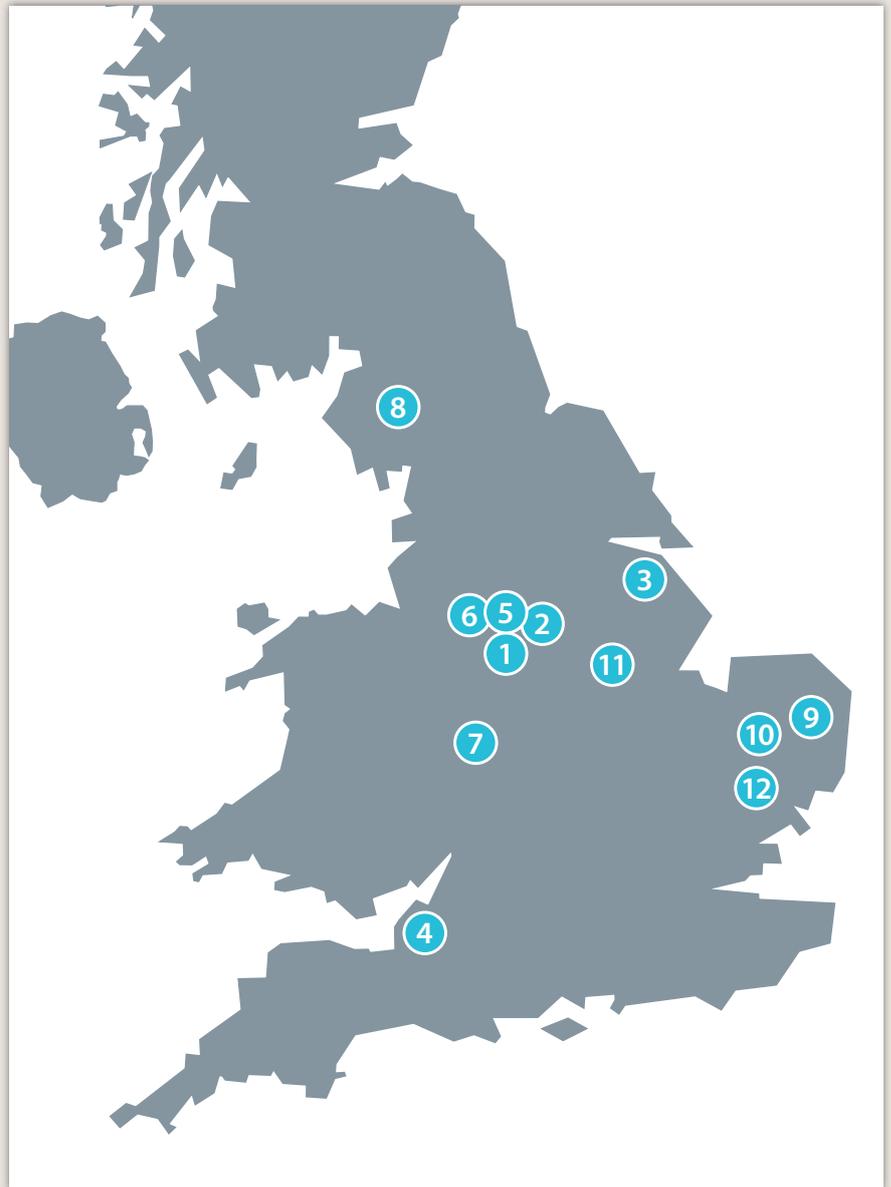
LIME PLANTS

BLA members

Factory/site owner	Location
	Buxton 1
	Whitwell 2
www.lhoist.co.uk	
	Melton Ross 3
	Batts Combe 4
www.singletonbirch.co.uk	
	Tunstead 5
	Hindlow 6
www.tarmac.co.uk/limesolutions.aspx	

BLA associate members

Factory/site owner	Location
	Birmingham 7
	Shapfell 8
	Norwich 9
	Norfolk 10
	Notts 11
	Suffolk 12



NOTES

1 Standard purity stated for lime (94.5%) is sourced from the EU Commission Decision of 27 April 2011 "determining transitional Union-wide rules for harmonised free allocation of emission allowances pursuant to Article 10a of Directive 2003/87/EC of the European Parliament and of the Council", Page 37 Available: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:130:0001:0045:EN:PDF>

2 Environment Agency's Compliance Classification Scheme (CCS):

Category 1 incident defined as "a non-compliance which would have the potential to have a major environmental impact".

Category 2 incident defined as "a non-compliance which would have the potential to have a significant

environmental impact".

Category 3 incident defined as "a non-compliance which would have the potential to have a minor environmental impact".

Category 4 incident defined as "a non-compliance which has no potential to have an environmental impact".