
**Department of the Environment
Community and Local Government
consultation**

**Exporting a Resource Opportunity?
Measures to Maximize Resource
Efficiency and Jobs in Ireland**

Submission by

Cement Manufacturers Ireland

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Executive Summary

The member companies of Cement Manufacturers Ireland (CMI) welcome the opportunity to comment on the recently published *'Exporting a Resource Opportunity? Measures to Maximize Resource Efficiency and Jobs in Ireland'*. CMI members would particularly like to acknowledge the extensive work carried out by the Authors of the Discussion Documents.

The Authors acknowledge the positive role of Ireland's cement kilns in the treatment of residual waste. The use of alternative fuels to replace imported fossil fuels in cement kilns is known as co-processing and it not only helps to reduce the industry's dependence on imported fossil fuels but also directly addresses many of the challenges identified in the Discussion Document.

Co-processing waste-derived fuels in the cement kilns;

- Facilitates diversion of resources from landfill
- Provides a viable alternative to waste exports
- Maximises the value extracted from indigenous resources
- Provides local efficient waste recovery infrastructure
- Reduces dependence on imported fossil fuels
- Reduces carbon emissions
- Supports local employment

The replacement of fossil fuels with alternative fuels derived from residual resources is a long-term strategic objective for CMI members. Today over 30% of the fossil fuels have already been replaced and CMI members have set an ambitious target to achieve 50% fossil fuel replacement by the end of 2017.

In 2015, over 200,000 tonnes of alternative fuels was used by CMI members, much of which was Solid Recovered Fuel (SRF) derived from residual municipal waste. Working closely with the waste industry these discarded resources are delivered to the cement plants as 'ready-to-use' fuels meeting agreed specifications. This use of alternative fuels supports the waste management and recycling industry by providing a reliable and efficient outlet for any residual wastes that are not recycled.

With current regulatory approval for approximately 340,000 tonnes of alternative fuels, and a series of current applications to permit the use of an additional 800,000 tonnes, CMI members have the potential to be the largest users of 'waste derived' fuels in Ireland. Based on experience elsewhere in Europe Ireland's cement kilns are ideally positioned to recover residual municipal waste, used tyres, sewage sludge, solvent waste and oils. Through our manufacturing process we transform these discarded resources into energy and mineral ingredients in our cement products.

In addition to fossil fuel replacement, over the last decade €300 million has been invested by CMI members in energy efficient facilities operating with Best Available Technology. In the same period and in line with the European Cement Standard (EN 197) the cement product offering in Ireland has been transformed with the manufacturing of 'eco-efficient' CEM II cement.

Taken together these three cement industry initiatives mean that the Irish construction sector has available secure supplies of certified sustainable cements, manufactured in compliance with National standards using local materials, local labour and increasingly local fuels.

Introduction

Cement Manufacturers Ireland

Cement Manufacturers Ireland was established in Ibec in 2003 and has three members in the Republic of Ireland; Irish Cement, Lagan Cement and Quinn Cement and an associate member in Northern Ireland - Lafarge Ireland.

The members of CMI support 2,000 direct and indirect jobs in Ireland. The members compete on the island of Ireland to supply cement products to the domestic construction market and are also involved in the export of cement products to other European markets. The industry has invested in modern manufacturing facilities and operates to the highest International and European standards. CMI is a member of the European Cement Association, CEMBUREAU.

The members of CMI do not operate in the waste sector, the cement industry is a manufacturing industry that has since 2007 begun sourcing waste-derived fuels to directly replace imported fossil fuels.

The Discussion Document and associated questions cover a vast array of topics from Landfill Levys and Quality Protocols to Policy and Training. CMI has confined the observations and commentary that follow to topics specifically relevant to the cement sector.

How do CMI Members Maximise Resource Efficiency?

CMI members operate in the 'resource management industry' and are part of Ireland's manufacturing sector. Our business is the transformation of local raw materials into high quality cement products, essential for the construction industry.

Our members are continuously investing and developing initiatives to improve the efficiency of our primary and secondary raw material usage. In addition, and more specifically in relation to waste management, CMI members have invested in systems to replace imported fossil fuels with alternative fuels produced from local residual wastes. We, in partnership with the waste sector have recognised the value of these discarded resources to enhance our environmental and business performance.

We are committed to growing our use of locally sourced alternative fuels. Not only is this good for our business and the environment but it is a real example of maximising resource efficiency. The use of these discarded resources in our cement kilns avoids the negative environmental impacts associated with landfill or the loss of these resources through export.

Alternative Fuels

Extreme temperatures are required to 'melt' our raw materials and this temperature is achieved through fuel combustion. Traditionally in Ireland both coal and petroleum coke (from oil refining) have been imported to fuel the cement kilns. Alternative fuels are used to replace the fossil fuels required for cement clinker manufacturing. In 2007 CMI members began investing in the equipment and systems to use locally available alternative fuels to reduce our dependence on imported fossil fuels.

CMI members, currently, have regulatory approval to replace fossil fuels with up to 340,000 tonnes of alternative fuels and have recently made the necessary applications for regulatory approval to allow for the use of an additional 800,000 tonnes of alternative fuel. This long-term strategy would allow our industry, at full production, to replace virtually all imported fossil fuels which would help enhance national energy security and substantially reduce carbon emissions. CMI members are confident of achieving this long-term goal subject to the ongoing availability of suitable alternative fuels.

In 2015, the industry achieved over 30% fossil fuel replacement using alternative fuels and CMI has set an ambitious 50% fossil fuel replacement target for the end of 2017 (see figure 1).

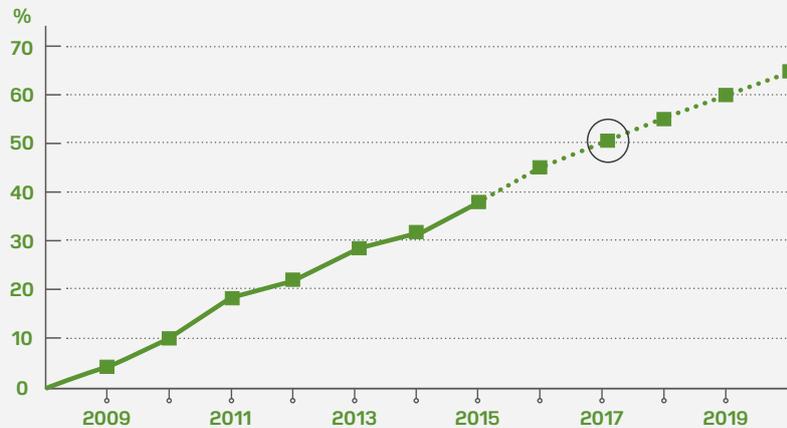


Figure 1: The graph shows the growth in the replacement of fossil fuels with alternative fuels by CMI members to date and the planned replacement rate to 2020.

Solid Recovered Fuel – SRF

SRF is the most common alternative fuel in use in Ireland. SRF is a shredded mixture of paper, plastics and fabrics derived from residual waste. In partnership with the waste industry the residual waste, which remains after the valuable recyclables have been removed, is processed to an agreed specification. The SRF is delivered to the cement kilns as a ‘ready to use’ fuel. The SRF is tested to ensure it meets the required specification and is then fired in the kilns.

Quality Control

Carefully controlling the mineral balance inside the kiln is essential in the manufacture of high quality cements. The vast majority of these minerals are sourced from local raw materials which are required for our process and they are subject to rigorous round the clock testing. Minerals also arise from fuel combustion, so close cooperation with our waste partners and investments made on both sides help to monitor and control the quality of the fuels.

Safe and Efficient

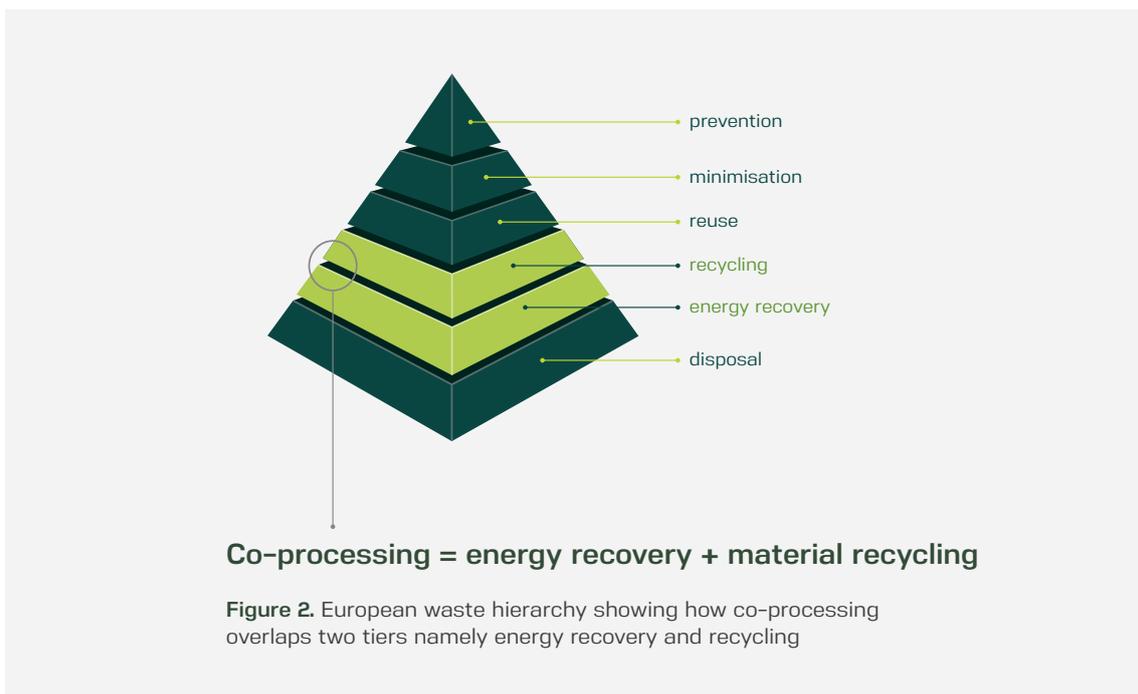
Gas temperatures inside our cement kilns exceed 2000°C. These temperatures are required, to melt the crushed rocks we use as raw materials. The fuels used to fuel our kilns are fully consumed at these extreme temperatures. Fuels are only used when the kilns are manufacturing cement clinker. The kilns are highly efficient at capturing and reusing the energy from the fuels, and in addition the mineral fraction of the fuels becomes part of our cement products. This process, unique to the cement industry is known as ‘co-processing’.

Co-processing – Unique to the Cement Industry

For more than 35 years the cement industry in Europe has contributed to the circular economy, through its recovery and reuse of discarded resources as alternative fuels. The use of alternative fuels, known as ‘co-processing’ is the recycling of materials and recovery of energy which happens in parallel inside the kiln.

Not only do these alternative fuels provide energy for the cement kiln but they also contribute raw materials to the process, a recycling element that is unique to the cement industry.

Co-processing overlaps both the energy recovery and material recycling tiers on the EU waste hierarchy (see figure 2). Energy is recovered and inside the kiln the fuel ashes are fully consumed to become part of the cement product.



In many European countries the cement industry is considered to be an essential part of national waste infrastructure, enhancing energy recovery and recycling. For example, the local cement plants in Switzerland, Germany and Sweden have actively contributed to the achievement of zero or near-zero landfill rates with high levels of recycling, energy recovery and composting. Now in Ireland too, CMI members are helping to achieve a modern efficient waste management system for the country by providing a reliable outlet for residual waste.

Exporting a Resource Opportunity?

It is clear from the Discussion Documents that the answer to the question posed in the title is 'yes'. Yes, resources are leaving Ireland. How to find viable methods of deploying those resources at home to benefit the Irish economy is the real challenge.

The cement industry in Ireland is already achieving significant benefits by deploying waste resources effectively in its cement kilns. Co-processing these resources in the cement kilns;

- Facilitates diversion of resources from landfill
- Provides a viable alternative to waste exports
- Maximises the value extracted from indigenous resources
- Provides local efficient waste recovery infrastructure
- Reduces dependence on imported fossil fuels
- Reduces carbon emissions
- Supports local employment

The Authors have identified throughout their Documents the important role that the cement kilns can play in maximising resource efficiency and supporting local jobs. In the following section CMI will provide specific comments on text quoted from the Documents.

"The processing of 'residual waste' into 'solid recovered fuel' (SRF) has the potential to support the domestic cement industry in achieving ambitious targets for substitution of imported fossil fuels with indigenous resources."

The members of CMI have ambitious long-term targets to replace virtually all fossil fuels in their plants. Currently over 30% of the heat required in our process is supplied by alternative fuels. An intermediate target of 50% fossil fuel replacement by the end of 2017 has already been announced and the members of CMI are embarking on the necessary regulatory approvals, planning and EPA licence reviews, to permit continued progress on fossil fuel replacement using indigenous resources.

"... meaning co-incineration whereby waste is used in the co-firing of cement kilns or industrial furnaces and in incineration plants producing electricity and/or heat. An increasing number of cement kilns in Ireland are now accepting waste for use as a fuel."

All three members of CMI; Irish Cement, Lagan Cement and Quinn Cement are already using alternative fuels to replace fossil fuels. Three of the four cement plants in the Republic are currently replacing fossil fuels with alternative fuels and the fourth plant has commenced the necessary applications for regulatory approval to begin using alternative fuels.

"The cement industry, which has made admirable strides in developing the use of SRF, offers the greatest potential for expanding the demand for this product. A clear timeline should be developed and communicated to the cement industry on a move towards all public procurement contracts specifying a requirement for greener cement. Allied to this, but of a more medium-term nature (and more debateable), is a move towards all construction requiring the use of greener cement. There would also be significant CO₂ reduction benefits from such a move, as well as giving a competitive first-mover advantage in Europe for Irish cement manufacturers."

The members of CMI agree that the industry has great potential to be an effective partner in the delivery of the primary goals of maximising resource efficiency and supporting local jobs.

The so called 'green' credentials of cement as proposed by the Authors extend well beyond simply using waste materials as fuel. The manufacturing of cement is a complex, high temperature chemical process producing high quality cements in compliance with National and International standards. In Ireland, NSAI carries out detailed audits of our members facilities, products and production processes.

The term 'green' has become commonly associated with a vast array of products and services. The overuse of the term has in many ways devalued it and within the cement industry the term 'sustainable' is more appropriate when describing the cement manufacturing process and cement products.

The three principle levers available to the cement industry to improve the sustainability of cement production and our products are:

1. Energy efficiency investments
2. Fossil fuel replacement and
3. Clinker Replacement

Energy efficiency investment

Over the past decade CMI members have invested over €300 million in Ireland in new and upgraded energy efficient manufacturing facilities, operating with best available technology. These investments mean that the cement industry in Ireland requires less energy to produce each tonne of cement when compared to the European average. The industry here is committed to a programme of ongoing investments.

Fossil fuel replacement

Fossil Fuel replacement is a 'win-win' with obvious environmental and economic benefits as discussed extensively throughout this submission.

Clinker Replacement

The European cement standard (EN 197) details a wide range of approved cement types. The principle component of many of the more common cements is clinker which is produced in the cement kilns at high temperature. Throughout Europe a range of naturally occurring materials or industrial by-products, can be used in specified proportions as partial clinker replacement materials. The underlying principle is that these materials either; do not require a high temperature process, eg naturally occurring mineral deposits like limestone or volcanic ash, or they are the output from another industrial high temperature process eg pulverised flyash (PFA) from coal-fired power stations or blastfurnace slag from the steel industry. The use of these materials in the local markets can help reduce the energy requirement for cement production and improve the resource efficiency of the process.

In Ireland, two materials exist locally, limestone and PFA (from Ireland's two coal fired power stations) and CMI members transformed cement production in 2006 with the introduction of eco-efficient CEM II cements incorporating limestone and/or PFA. These cements manufactured with local clinker replacement materials now account for over 80% of the cement market in Ireland. There is a risk for the cement industry being dependent on the coal-fired power stations for supplies of PFA. At some point in the future it is expected that coal will be phased out as a fuel in these power stations and availability of PFA will be impacted. The investments made by CMI members mean that the production of CEM II cements with limestone, one of Ireland's most abundant rock types, as clinker replacement is a viable, secure and long-term solution. In this case the cement industry is not dependent on another industry, it is self-reliant with direct access to these indigenous limestone reserves. CEM II cements can be considered the 'greenest' or more properly the most sustainable cements in the Irish market as they address all three pillars of sustainability, environmental, economic and social. It is the ambition of CMI members to be less dependent on imported fossil fuels and instead use indigenous alternative fuels to further improve the sustainability of the products.

Clinker replacement, a fundamental feature of modern cement production directly supports the desire to maximise resource efficiency as the industry is producing high quality cement products using suitable local resources and with less energy.

Taken together these three initiatives; energy efficiency investments, alternative fuels and clinker replacement have delivered significant improvements in the performance of the industry. The benefits achieved in the sustainability profile of the cement pass directly into the concrete made with the cement and help achieve a more sustainable Irish construction sector. Compared to other construction materials concrete is a relatively low carbon material¹ and design, orientation and location of buildings can have much more significant CO₂ reduction impacts than only considering the embodied impact of cement. A whole life-cycle assessment of the building is considered in Europe to be the most appropriate mechanism to achieve improvements in the built environment.

Cement and concrete are both technical construction materials which are subject to a series of detailed standards and regulations. In response to a specific question by the Authors there is no agreed standard for 'green' or 'greener' cement. Specifiers of cement and concrete in Ireland can already reduce the environmental impact of their projects by choosing CEM II cement over CEM I for normal construction activities. This is the most sustainable choice.

"The use of SRF waste in domestic cement kilns shows some promise, and demand should increase as the Irish and UK economies continue their recovery. Indeed, Cement Manufacturers Ireland state in its 2014 "Building a Sustainable Future for Ireland" report that "with the full availability of materials and the development of appropriate national infrastructure, it is estimated that the overall substitution rate in Ireland in the medium term could be expanded to 80%." This would be welcome from both an environmental and economic perspective."

¹ Costas Georgopoulos & Andrew Minson Sustainable Concrete Solutions, 2014. Table 2.4 Embodied carbon dioxide (ECO2) and construction materials.

Indeed there are environmental and economic benefits. There is a direct link between cement production and fuel usage. As the demand for cement recovers the members of CMI will seek to continually advance the proportion of alternative fuels used, subject to the availability of suitable fuels. Appropriate regulatory approvals are required to allow the cement plants to maximise the use of alternative fuels in place of fossil fuels and the industry currently has approvals to use up to 340,000 tonnes of alternative fuels. Over the coming 12-18 months approvals for an additional 800,000 tonnes of alternative fuels should be in place to permit further progress on achieving the environmental and economic benefits from higher fossil fuels replacement rates.

“Appendix 2... It is reported that consented energy-from-waste capacity in Ireland in 2012 amounted to 542,875 tonnes per annum, although 127,875 tonnes of this capacity had not been utilised in 2012. These figures include incineration of municipal waste and co-incineration of wastes in cement kilns.”

The aggregated figures quoted above, for consented ‘energy-from-waste’ capacity miss the opportunity to distinguish between incineration facilities and cement kilns replacing fossil fuels. The former are installed to destroy mixed municipal waste. The cement kilns on the other hand are highly efficient at extracting the energy value from fuel, are the ideal recovery option for specific wastes materials and produce no downstream solid waste requiring further processing. All this is achieved within the existing cement manufacturing infrastructure during the manufacturing of cement, an essential ingredient for any modern economy.

Papageorgiou et al, 2009² cite evidence in England that production of SRF followed by displacement of fossil fuels in cement kilns is the most advantageous energy recovery option for municipal waste. The International Waste Policy Review³ on behalf of the Department of Environment Heritage and Local Government in 2009 confirmed the superiority of cement kilns in Ireland as a treatment option for SRF derived from residual wastes.

The UK Department of Environment, Farming and Rural Affairs (DEFRA) in their June 2011 publications, *Applying the Waste Hierarchy: evidence summary*⁴ and *Guidance on applying the Waste Hierarchy*⁵ begin to address the question; ‘to what degree should waste policy distinguish between different forms of recovery?’ The DEFRA documents identify cement kilns as a superior energy recovery option for tyres and residual ‘black bag’ wastes.

Based on this analysis, the displacement of fossil fuels in the cement kilns with alternative fuels provides the highest level of energy recovery here in Ireland. The production and use of SRF is an excellent example of maximising resource efficiency. In the past these resources were either lost through export or landfilling, but now through an active partnership between the cement and waste management sectors the value of these resources can be fully recovered locally.

² Papageorgiou, A., Barton, J.R. and Karagiannidis (2009): *Assessment of the greenhouse effect impact of technologies used for energy recovery from municipal waste: A case for England*, *Journal of environmental management* Volume 90, Issue 10, Pages 2999-3012

³ <http://www.environ.ie/en/Environment/Waste/ReviewofWasteManagementPolicy/>

⁴ <http://www.defra.gov.uk/publications/2011/06/15/pb13529-waste-hierarchy-summary/>

⁵ <http://www.defra.gov.uk/publications/2011/06/15/pb13530-waste-hierarchy-guidance/>

In addition, ash residues, associated with other energy recovery technologies, are avoided in cement kilns as the mineral components of the fuels become incorporated into the cement clinker, a unique recycling advantage of co-processing in the cement industry.

Based on these principle advantages the cement kilns extract a higher proportion of the resource value from each tonne of waste than other thermal recovery options. With balanced and considered regulations the cement industry will continue to provide a superior resource recovery service for residual wastes in Ireland.

“Appendix 2... Co-incineration of waste in cement kilns offers cement producers an opportunity to have a steady cost input as part of their fuel needs rather than being dependent on global fuel price fluctuations, and also allows cement to be marketed as ‘green’.”

The intention of the Authors is rightly to encourage and reward a more sustainable approach to cement production. Certainly the progress made by CMI members through; energy efficiency investments in best available technology, fossil fuel replacement programmes and the manufacturing of CEM II cements, in line with the European Cement Standard, EN 197, has already achieved sustainability benefits for the construction sector.

Both the European cement and European concrete standards provide detailed technical guidance on the choice of local sustainable cement and concrete. Therefore, the use of the marketing term ‘green’ in relation to cement, which is open to misinterpretation, is not required and the members of CMI would respectfully request that the Authors avoid the use of this term.

“On the policy front, a recent development has been the issuance of the latest, revised National Hazardous Waste Management Plan for Ireland, to cover the period 2014-2020. This revised plan identifies a number of priorities to improve the management of hazardous waste, with objectives set out as follows:

- To prevent and reduce the generation of hazardous waste by industry and society generally;*
- To maximise the collection of hazardous waste with a view to reducing the environmental and health impacts of any unregulated waste;*
- To strive for increased self-sufficiency in the management of hazardous waste and to minimise hazardous waste export;*
- To minimise the environmental, health, social and economic impacts of hazardous waste generation and management*

The EPA identifies three overarching strategic needs in order to reduce dependency on the export of hazardous waste and increase the amount of domestic treatment:

- Expansion of recovery and treatment capacity in Ireland for waste that does not need thermal treatment or landfill (i.e. physico-chemical treatment);*
- Addressing the deficit in thermal treatment capacity in Ireland (i.e. use as fuel, co-incineration or incineration) for Irish hazardous waste currently being exported;*
- Securing of long-term disposal arrangements for hazardous waste streams not suitable for thermal treatment or recovery*

In order to achieve these goals two primary plans are set. The first is to continue to support research grants directed towards the development of hazardous waste and waste treatment technologies from concept through to pilot scale roll-out in order to support the commercial development of treatment capacity. The second revolves around the management of solvents and other wastes currently exported. It is identified that there is scope to expand on specific on-site and off-site infrastructure such as (in order of preference on the waste hierarchy) solvent recycling, fossil fuel substitution at existing appropriate sites (energy recovery and co-incineration) and purpose-built incinerators. It should also be noted that Regional Waste Management Plans support the development of up to 50kt of thermal capacity to treat hazardous waste within the country."

Solvent waste and other hazardous wastes are already being used by CMI members and the industry here is committed to expanding the range and quantity of the materials that it can accept. CMI is convinced that given appropriate quality control protocols virtually all of the solvent waste consigned for off-site (R1) energy recovery can be accommodated by its members. The 50,000 tonne thermal capacity requirement identified by the Regional Waste Management Plans already exists in the cement kilns. All that was missing during the drafting of the Regional Waste Management Plans was the regulatory approvals, but with the recent applications by CMI members the necessary approvals are expected to be in place in the coming 12-18 months. Using the existing infrastructure of the cement kilns avoids the cost and inevitable delays of building any new facilities.

"Appendix 5... Of note, therefore, is that the landfill rates in the top performing countries; Switzerland, Netherlands, Germany, Sweden, Belgium, Denmark, Norway and Austria, are less than 10% and close to 0% in many cases."

Through CMI's active participation in CEMBUREAU, the European Cement Association, our members are aware of the crucial role the cement industry plays in the countries listed above. In these and other European countries, cement plants are considered to be an essential component of the national waste management infrastructure, by helping to enhance recovery and recycling.

Alternative fuels have been used by the European cement industry for over 35 years. In 2012, the average fossil fuel replacement rate in Europe was 36%, with some countries achieving much higher levels. In Germany for example, the average replacement rate was 62%; however, some German cement plants have achieved at times 100% fossil fuel replacement. A wide range of different types of alternative fuels are used in Germany, including tyres, oils, paper pulp, plastics, animal meal, solid recovered fuel (SRF) / refuse derived fuel (RDF), wood, solvents, sewage sludge etc. Many of these same fuels also exist in Ireland and CMI members are in a position to utilize these indigenous resources safely and efficiently in the high temperature kilns, thereby assisting with the goals of maximizing resource efficiency and supporting local jobs.

Summary

The cement industry in Ireland has a long heritage. It is a manufacturing industry providing local employment, maximising resource efficiency and producing high quality cements which are essential for the Irish economy.

The members of CMI operate in a competitive European market and the vibrancy of the industry in Ireland, despite the recent severe recession, demonstrates the progress the industry has made in improving its environmental performance and competitiveness.

The industry is continually improving and the domestic construction sector today benefits from more sustainable cement products as a result of three primary cement industry initiatives and investments:

1. Energy efficient cement plants operating to Best Available Technology
2. Fossil fuel replacement programmes and
3. Clinker replacement, manufacturing CEM II cements in line with the European Cement Standard, EN 197

CMI welcome acknowledgement by the Authors of the positive contribution the cement sector plays in the recovery of residual resources. The cement industry operating in partnership with the waste sector is seeking to grow the use of alternative fuels. While a wide range of materials are suitable for recovery and reuse in cement kilns, other technologies and facilities must also be developed if Ireland aspires to having a fully integrated waste management system.

CMI also welcomes the opportunity to raise awareness of the willingness of its members to work with the waste sector, Regulators and Government Agencies to play an active role in the development of a resource efficient and self-sufficient waste management system for Ireland's current and future waste management challenges.

CMI members would urge that the unique benefits of co-processing, recovering discarded resources in Ireland's cement kilns, be recognised. Co-processing provides more than just a thermal recovery option. The parallel recycling of the mineral fractions from the fuels inside the cement kiln means no further ash is produced, a unique feature of our industry which delivers significant environmental benefits.

CMI members used 200,000 tonnes of alternative fuels in 2015. Subject to suitable quality and availability that quantity is set to substantially increase over the coming years as part of a long-term programme to improve the sustainability of our cement products.

The use of these indigenous resources, improves the sustainability and self-sufficiency of the cement plants and helps maximise resource efficiency and secure long-term local employment.

The members of CMI are willing to participate in future policy development and remain available for further discussions as the policies evolve.

Cement Manufacturers Ireland
Ibec
84-86 Lower Baggot Street
Dublin 2

T +353 (0)1 605 1500
E cement@ibec.ie
W www.cement.ie
