2013

ENVIRONMENTAL REPORT

Environment and Health & Safety

aalborgportland

CEMENTIR HOLDING

OVERVIEW 2013

P10

RESOURCE-EFFICIENT PARTNERSHIP

514,000 tonnes
of alternative fuels and raw materials recycled

P12

ENERGY SAVING

76 million kWh
saved through energy projects

P14

ATMOSPHERIC EMISSIONS

11%
lower NO_X emission per tonne of cement
– equal to **226 tonnes**

1%
lower CO_2 emission per tonne of cement
– equal to **17,078 tonnes**

P18

WASTE

69%
reduction in waste landfilled on site

P24

ENVIRONMENTAL TECHNOLOGY

6.1m EUR
invested in climate and environmental improvements

P31

SUSTAINABLE DISTRIBUTION

71%
of cement distributed by ship

S34

HEALTH & SAFETY

10%
reduction in reported accidents with days lost

P39

ENVIRONMENTAL LEVIES

10.2m EUR
paid in 2013

P39

SOCIAL CONTRIBUTION

34m EUR
of value added went to society

CONTENTS

ENVIRONMENTAL REPORT 2013 – TARGET GROUP

The Aalborg Portland Environmental Report 2013 is intended to provide interest groups with a straightforward insight into the company's principal environmental impacts and health & safety activities and into the measures being taken to realise ongoing improvements.

The report also outlines how the environmental management system is used and is evolving. Environmental Report 2013 conforms to the statutory regulations.

The interest groups are:

Customers, employees, suppliers, present and future investors, financial institutions, insurance companies, public authorities, neighbours, political groups and non-governmental organisations.

Environment, energy and health & safety in 2013

Environmental Report 2013 is the Management's report on Aalborg Portland's principal activities and continued efforts in the environment, energy and health & safety area for the company's Danish cement production and storage terminals.

2013 was a good year for Aalborg Portland even though the production of cement during this period was again at a low level relative to the factory's overall production capacity. Production and sales were on the same level as in 2012, whereas emission of NO_X has decreased by 64% in the last five years against the 2009 level. The decrease is due to the focused investment in NO_X cleaning equipment for and greater use of biofuel as a substitute for fossil fuels such as coal and petcoke.

Aalborg Portland has given strong focus to use of alternative fuels and raw materials for many years. In 2013, 97,250 tonnes of alternative fuel were used, which included industrial waste, meat and bone meal, and dried sewage sludge from the City of Aalborg.

Through the years the targets set have been successively raised in order to achieve greater use of alternative fuel manufactured from industrial waste. The recycling of waste is strongly in keeping with the Danish Government's wish for a resource-efficient society and to make waste a resource. Recently, the Management of Aalborg Portland approved investment of EUR 5.4m aimed at making it possible to use even more alternative fuel.

In 2013, 417,000 tonnes of alternative raw materials were used, including fly ash from power stations and sand from dredging operations in the Limfjord at Hals Barre and Løgstør Rende. As part of the established symbiosis whereby the power station Nordjyllandsværket is supplied with chalk slurry for its desulphurisation equipment, Aalborg Portland received 29,000 tonnes of desulphurisation gypsum in return. This will be recycled together with 30,000 tonnes of the cement plant's own desulphurisation gypsum.

Projects performed in the period 2009-2013 as part of the focus on improving the energy efficiency of existing production equipment have provided an annual saving on electricity and fuel of 245 million kWh, equivalent to the annual electricity consumption of 61,000 households. Among the projects implemented and concluded in 2013 were: Installation of a new clinker cooler for Kiln 87, changeover from electricity to district heating for heating of buildings, and reduction in consumption of compressed air.

Going forward, focus will continue to be given to reducing energy consumption by more efficient use of electricity and fuel. Aalborg Portland will in this way contribute to achieving the Government's increased goals – set out in the agreement between the Minister for Climate and Energy and the grid and distribution companies – for Denmark's future energy conservation efforts.

Based on the Environmental Impact Assessment carried out and granting of environmental approval for the use of microfiller waste to modulate the landscape parallel with chalk excavation, a start was made on this project in 2013. This means that microfiller is now being recycled as a resource and that the factory's need for landfill is significantly reduced. This valuable environmental initiative is providing rehabilitation of chalk pit to serve the population of Aalborg as a local recreational amenity for water sports and other leisure activities – Rørdal Søpark – when excavation is complete.

In keeping with the Danish Government's wishes to transition to more renewable forms of energy, Aalborg Portland is currently carrying out an Environmental Impact Assessment with a view to installing wind turbines on the company's land at Bredhage. A part of the City of Aalborg's wind energy plan, the project ultimately envisages wind power producing around 40% of the plant's annual power consumption, equivalent to the annual electricity consumption of around 25,000 households.

Waste heat from cement production has been recycled environmentally for many years as a source of district heating for the residents of Aalborg. In 2013 the heat supplied was equivalent to the annual heat consumption of 21,500 households, and focus is currently placed on developing new ways of expanding this recycling in future.

Aalborg Portland has an informal working environment in which the employees feel a responsibility and strive energetically to make things work. The sometimes hectic working climate and the constant changes remain a challenge. It is therefore

vital that we continue to use the available resources and knowledge to maintain and improve our existing work routines – this is an ongoing process.

The Health & Safety Organisation has an important part to play in this at a day-to-day level by actively involving the employees in ongoing improvements to the work environment. Many accidents and injuries can be avoided by safe planning and organisation of the workplace, but the biggest danger factor is the individual employee's behaviour.

In 2013, increased attention was therefore given to improving our behaviour and safety culture, among other things through provision of factory-wide training, increased risk assessment and behavioural changes. These are vital to our efforts to reduce the number and seriousness of accidents in our workplace.

Through a stable, long-term and future-oriented policy on environmental levies by which the politicians wish to safeguard against anti-competitive green taxes in Denmark, we at Aalborg Portland will be able to continue the environmental investments which send a clear signal of our strong commitment to energy efficiency, the environment, climate and health & safety. This commitment benefits the company and its employees and is therefore wholly in keeping with the wishes of the Danish Government and the community for a sustainable society.

Michael Lundgaard Thomsen
Managing Director, Nordic Cement
April 2014

HRH CROWN PRINCE FREDERIK AND ENVIRONMENT MINISTER IDA AUKEN VISITED AALBORG PORTLAND

On 16 September, HRH Crown Prince Frederik of Denmark and former Danish Minister for the Environment Ida Auken came to North Jutland to visit companies that have demonstrated exceptional consideration for the environment in their production operations.

Aalborg Portland's Rørdal plant was chosen for its longstanding dedication to sustainable production and focus on energy saving.

GENERAL INFORMATION

Name and address
Aalborg Portland A/S
Nordic Cement
Rørdalsvej 44
P.O. Box 165
9100 Aalborg
Denmark
Tel. +45 98 16 77 77
E-mail: cement@aalborgportland.com
Internet: www.aalborgportland.com

Environmental supervisory authority
Ministry of the Environment,
Environmental Protection Agency Aarhus

Industrial sector
Raw materials processing

Main activity
Production of cement for the domestic and export market

List item
3.1. a) Production of cement clinker in rotary kilns with an output capacity of more than 500 tonnes/day (s)

Company reg. no.
14 24 44 41

Production unit no.
1.002.952.999

NACE code
23.51 – Production of cement

Land register title nos.
1a, 1k, 1l, 1m, 1n, 1p,1o Rørdal, 9a, Ø. Sundby and 9a, 10g, 11a, 16i, 17l, 21h, Uttrup under Aalborg Jorde

Significant secondary activities
K212. Facilities for temporary storage of non-hazardous waste prior to recycling or disposal with a waste feed capacity of 30 tonnes per day.

Ownership
Aalborg Portland A/S is 75% owned by Cementir España S.L., Spain and 25% owned by Globo Cem S.L., Spain. The ultimate owner is Caltagirone S.p.A., Italy.

Management
Environment, energy, quality and health & safety:
Michael Lundgaard Thomsen, Managing Director
Jesper Høstgaard-Jensen, Production Director
Preben Andreasen, Environment & Energy Manager
Birgit Jensen, Quality, Health & Safety Manager

Principal environmental approvals

10 October 2012
Recycling of microfiller for rehabilitation of chalk pit.

10 October 2012
Permit for excavation of chalk.

10 October 2012
Changed conditions for changed use of alternative fuels and raw materials.
Environmental approval for co-combustion of non-hazardous waste on Kiln 85.
Changed emission limits and continuous measurement of mercury on Kilns 85 and 87.

19 November 2010
Use of tyre chips as fuel on Kiln 87.

7 April 2010
Use of meat and bone meal as fuel on Kiln 76.

18 December 2009
General environmental approval and review – comprising environmental approval of expanded activities at recycling site and review of older environmental approvals.

CERTIFICATIONS

The management system for quality, environment, health & safety and energy is certified by Bureau Veritas Certification.

Aalborg Portland is certified in accordance with the following standards:
ISO 9001 – since 1 March 1989
ISO 14001 – since 3 July 1998
OHSAS 18001 – since 9 September 2002
ISO 50001 – since 4 September 2013

In addition, the company's environmental management system has been EMAS-registered since 2 March 2000.

6 December 2006
Approval of transitional plan for on-site landfill.

6 December 2006
Approval of closure plan for tip.

28 July 1992
Establishment of on-site landfill.

29 November 1991
Final permission for water extraction.

29 June 1990
Permission under the Environmental Protection Act to send waste water to the municipal treatment plant.

Aalborg Portland is not covered by the Ministry of Environment's regulations for the safe storage, handling and transport of materials which may give rise to serious environmental hazard in the event of accident.

Auditors' report and EMAS verification
KPMG has expressed an opinion with a reasonable level of assurance on the Environmental Report for 2013 presented by the Management of Aalborg Portland. The report has also been verified by Bureau Veritas according to the EMAS declaration, cf. page 40.

Brief qualitative description
The Environmental Report for 2013 covers Aalborg Portland's cement factory situated at Rørdalsvej 44, 9220 Aalborg Øst, Denmark.

Aalborg Portland is one of Denmark's leading industrial companies with 326 employees. There are also a considerable number of subcontractors working at Aalborg Portland, which creates an added social contribution.

The factory and chalk pit cover a total of 320 hectares, of which the chalk pit comprises 200 hectares. In addition to cement production facilities there are two on-site landfills, one of which is now filled up and closed, and a recycling site.

The principal cement products are:
BASIS® cement, **RAPID**® cement, **AALBORG WHITE**® cement, **MESTER**® **AALBORG** cement and **LOW ALKALI SULPHATE RESISTANT** cement.

Additionally, other types of cement are produced for export.

Production output in 2013 totalled 1.8 million tonnes, around 40% of which was exported.

In the course of production there was environmental impact from emission of flue gases, waste products, waste water, surface water and cooling water.

The present Environmental Report covers the period 1 January - 31 December 2013.

The next Environmental Report will be issued not later than April 2015.

ENVIRONMENTAL VISION, ENVIRONMENTAL AND ENERGY POLICY

Environmental vision statement:
Aalborg Portland is committed to being a responsible company promoting sustainable development

The policy set out below applies to the Aalborg cement plant and to storage terminals in Denmark.

Our policy is to:

- Respect statutory legislation and relevant official requirements. If a limit is exceeded we will inform the authorities and prepare remedial action plans.
- Promote sustainable development and cleaner technology within the scope of economic feasibility.
- Set pro-active targets for our future work and review our targets once a year at the Management's seminar established for that purpose.
- Support our customers in achieving their environmental targets by developing and helping to develop sustainable cements and concrete products which improve the life cycle of concrete.
- Protect the environment by reducing emissions and consumption of energy and raw materials per tonne of cement product through energy efficiency measures, energy management and other means.
- Inform our suppliers and subcontractors of relevant procedures and requirements.
- Adopt an active and open approach towards communication, knowledge and dialogue with customers, employees, authorities, neighbours, organisations and other collaboration partners.
- Educate and motivate our employees to ensure that we live up to the requirements contained in our policies, targets and action plans.
- Oppose introduction of further anti-competitive environmental levies and work for a reduction of the existing burden.

To realise these objectives we will:

- Maintain and develop a process management system covering external environment, energy and CO_2. The system is certified according to ISO 14001, ISO 50001 and the Danish Energy Agency's supplementary requirements hereto and is registered under the EMAS scheme.
- Publicise our policy, targets, action plans and results in the form of an annual Environmental Report.
- Formulate and use indicators as guidance mechanisms to achieve defined targets.
- Assess our products, facilities and significant renovation projects in relation to the scope of this policy, and support energy-efficient procurement and sustainable project engineering.
- Be an active collaboration partner in Danish environmental and energy policy by utilising alternative raw materials and fuels.

SUSTAINABLE DEVELOPMENT

Aalborg Portland is committed to promoting sustainable development based on the following principles:

- Environment shall be an integral part of the development in the company's activities, including reduction of the company's environmental footprint.
- Our environmental activities shall be anchored through participation of all employees and in dialogue with the community.
- Environmental indicators shall signal sustainable development.
- Production and economic growth shall take place without relative increase in energy consumption, emissions, use of chemicals, creation of waste, and other consumption of resources for the individual products.
- Resource-efficiency shall be promoted by means such as substitution of non-renewable resources and introduction of new technologies.
- The global perspective shall be invoked by CO_2 emissions trading, Joint Implementation, the Clean Development Mechanism and other means.

MANUFACTURE OF CEMENT

The manufacturing process for grey and white cement is essentially identical but there are variations in the kiln configuration. The section "Kiln process" below describes the semi-dry process for the production of grey cement.

SOURCING OF RAW MATERIALS

Cement is manufactured chiefly using the natural raw materials chalk and sand, which are the key components in all cements produced at Aalborg Portland. The chalk is excavated from the company's on-site chalk pit, while the sand is quarried at Sandmosen and dredged from the Limfjord at Hals Barre and Løgstør Rende, which also helps keep the fjord navigable.

INITIAL PROCESSING OF RAW MATERIALS

Production starts with the chalk being processed in a slurry drum while the sand is ground in sand mill. The two ingredients are then mixed to form a slurry.

KILN PROCESS (GREY CEMENT)

The slurry is injected into a dryer-crusher together with fly ash. In the dryer-crusher the material is converted with the help of hot flue gases into raw meal. This is conveyed via a separating cyclone to the cyclone preheaters where it is heated to 750° C.

In the calciners the raw meal material is further heated to 900° C, releasing the carbon dioxide. The material subsequently enters the 74-metre long rotary kiln where it is gradually heated to a temperature of 1500° C to form cement clinker. The clinker is then cooled in the clinker cooler.

The heat for the kiln process is provided by coal, petcoke and alternative fuels, including waste products, dried sewage sludge and meat and bone meal.

HEAT RECOVERY

In 2013, heat recovered from the kiln process during production of white cement and supplied to the City of Aalborg was sufficient to meet the annual heat consumption of 21,500 households.

GRINDING IN CEMENT MILL

After stockpiling in the clinker store the clinker is ground in the cement mill to a fine powder to which a few percent of gypsum is added to produce the types of cement required.

PACKING AND DISTRIBUTION

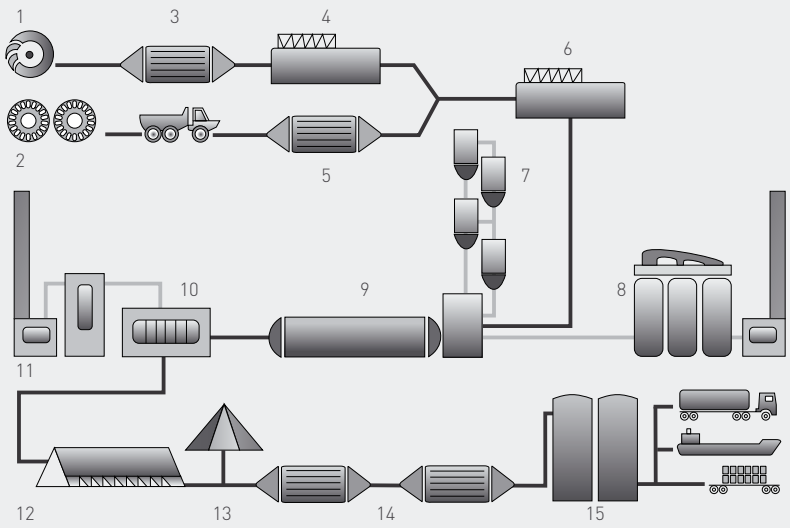
The cement is distributed in bags or in bulk by road or ship.

A QUALITY PRODUCT

The finished cement product is ready for use in building projects of all sizes worldwide. Cement is a quality product which is used in concrete, mortar etc. and adds strength, stability and long durability to buildings and structures.

FROM RAW MATERIALS TO CEMENT

1. Chalk excavator
2. Sand dredger
3. Slurry drum
4. Chalk slurry
5. Sand mill
6. Finished slurry
7. Cyclone tower
8. Electrostatic precipitator
9. Rotary kiln
10. Clinker cooler
11. Electrostatic precipitator
12. Clinker store
13. Gypsum store
14. Cement mills
15. Cement silos



AALBORG PORTLAND'S PRODUCTS

Aalborg Portland manufactures both white and grey cement, quality products which are distributed in bags and in bulk to the domestic and export market.

Aalborg Portland's cements are subject to Bureau Veritas Certification, which ensures that the products conform to the requirements of product standard EN 197-1 and are therefore CE-labelled.

Cements manufactured for the Danish market include the following:

BASIS® cement
Suitable for pre-cast concrete units and concrete products.

RAPID® cement
Suitable for ready-mixed concrete, pre-cast concrete units, concrete products, floors and screeds. Also suitable for masonry mortars, including lime cement mortars, used in building and rendering etc.

LOW ALKALI SULPHATE RESISTANT cement
Specially developed for concrete used for civil engineering structures such as bridges or constructions in contact with sulphate-bearing groundwater.

BASIS® AALBORG cement
Suitable for general concreting and construction work on building sites, such as foundations, floors, masonry, rendering etc.

MESTER® AALBORG cement
Suitable for lime cement mortars used in construction, pointing, rendering, roofing etc.

AALBORG WHITE® cement
General-purpose cement, but the preferred choice when the specification calls for white or pigmented concrete.

SUSTAINABLE PRODUCTION OF CEMENT AND CONCRETE

Aalborg Portland is engaged in development of a variety of cements for the future.

The aim is to create cements which can ultimately be produced with less energy consumption and in some cases with up to 30% less CO_2 emission.

In 2013, Aalborg Portland continued its activities to develop cements and concretes which, viewed over a life cycle, will contribute to reducing society's emission of CO_2 and other environmental impacts.

These activities included research projects together with the universities of Aalborg, Aarhus, Copenhagen and Trondheim, the Technical University of Denmark, and knowledge institutions outside Denmark. The purpose is to develop cements that can be produced with far less CO_2 emission than today. The projects are supported by the Danish National Advanced Technology Foundation and the Danish Council for Strategic Research. Results achieved in 2013 included laboratory production of a concrete with good properties using an experimental CO_2-reduced cement.

In December 2013, the Manufacturing Academy of Denmark (MADE) was set up as an ambitious partnership between leading industrial companies and academia to promote Denmark's future as a manufacturing nation. Aalborg Portland is participating with Aalborg University in "Smart City, Aalborg", a project to study how tomorrow's sustainable cement production can be shaped against the background of synergies with the community at large.

It will be exciting in the years ahead to follow the development of the cements and concretes of the future.

PRODUCT INFORMATION

It is possible to read about our products on www.aalborg.portland.dk. Current product data can be downloaded from the website and extranet.

Product declarations
Product declarations exist for all products and contain the name of the cement, CE label, declaration intervals for properties covered by criteria in the cement standard, and other properties important to our customers.

Safety data sheets
Safety data sheets provide more precise description of risks which may exist when working with the product. They also state precautions to be taken and protection to be worn. All the sheets conform to the new Classification, Labelling and Packaging (CLP) regulations and can be found on our website.

REACH
Indicates pre-registration of cement with the European Chemicals Agency (ECHA). Our website contains a large number of number of downloadable certifications for management systems, environment, health & safety, etc.

ENVIRONMENTAL AND ENERGY MANAGEMENT

Aalborg Portland has an integrated process management system defining the flows and procedures relating to all company processes. The system complies with the criteria contained in our certification standards:

ISO 14001, EMAS III, ISO 50001, OHSAS 18001, Working Environment Authority Executive Order No. 87, ISO 9001, Maritime Authority regulation No. 6 of 9 October 2002 on bulk carriers, Safety Technical Authority quality control guidelines for electrical work and installation, ISPS regulations on security of port facilities against terrorism, and DS/EN 197-1/-2 on quality of cement products.

The integrated nature of the system is important to the individual employee as the approach is "process-oriented" whether the context is environment, energy, quality or health & safety".

The system control structure is based on a vision, policies, targets and action plans.

MANAGEMENT'S ASSESSMENT

The Environment & Energy Group performs ongoing supervisory follow-up on the environmental and energy management system, including progress on activities in the general action plan.

For assessment of health & safety, see page 32.

In October 2013, a Management seminar was held to review and define policies, targets and action plans for 2014 with regard to environment, climate and energy.

Management's assessment in March 2014 included the following significant elements:

- External and internal auditors have performed audit and internal control of the CO_2 plan approved by the Danish Energy Agency for 2013-2020.
- Aalborg Portland's CO_2 emission for 2013 has been verified by Bureau Veritas Certification and can therefore be reported to the quota register in March 2014 so that corresponding emission quotas can be cancelled by 30 April 2014.
- External verification of the EMAS report was performed in March 2013 and external audit of the environmental and energy management system was performed in May.
- The Environment & Energy Group has held three meetings as part of its follow-up on the environmental management system. These included two status follow-ups on principal environmental and energy targets.
- Follow-up and discussion of status of climate and environmental targets for 2013 in general environmental action plan.
- Discussion and assessment of energy efficiency agreement with the Danish Energy Agency for the period 2013. A new agreement model relating to energy efficiency and possible contribution to payment of PSO levy is awaited.

INTERNAL AUDIT

Certification brings with it obligations – one is internal audit of process management. Importance is attached to the audit process and its results having value for the company.

Audit is an interplay between the individual departments of Aalborg Portland and the internal audit group, which consists of seven auditors with differing background competencies.

The annual plan for internal audit provides for regular, scheduled inspections to ensure that our process management:

- Conforms to what has been planned and agreed.
- Conforms to the requirements defined in the standards.
- Is implemented efficiently.
- Is maintained at all levels of the organisation.

Discrepancies and improvement recommendations arising from all audits carried out are retained in an action plan, and discrepancies are recorded for further processing.

In 2013, in addition to internal audit of the CO_2 plan and energy management, local focus was placed on the terms of the company's general environmental approval and permits and other requirements in decisions from authorities.

This relates, among other things, to supervision of fuel and raw material stores, factory landfills, and the chalk pit including recycling works arising from rehabilitation.

The three audit processes in 2013, with particular focus on environmental terms, has yielded good response for addressing discrepancies raised and ensuring ongoing improvements.

PRINCIPAL ENVIRONMENTAL IMPACTS

Cement manufacture calls for significant consumption of raw materials and energy and thereby gives rise to a number of direct environmental impacts in the form of the emission of flue gases, waste products, noise, waste water etc. Additionally there are external, indirect environmental impacts arising from product distribution, excavation and processing of fuels and raw materials, and production of electricity by power stations.

Materiality criteria

The starting point with regard to materiality is the "PRTR list" – the list of pollutants and emission thresholds required to be reported to the European Pollutant Release and Transfer Register. In the work with environment and energy the principal direct and indirect environmental impacts have been charted and selected according to the following criteria:

- Dispersion of substances, and climate and environmental impact.
- Large volumes and costs.
- Terms of environmental approvals, and consideration for neighbours.
- Optimising of raw material resources.
- Recycling of wastes from other industries.
- Potential for energy savings.
- Transport to and from the factory.
- Product development – research into sustainable production of cement and concrete.

The nature of the production process and the fact that the cement plant is situated well away from its closest neighbours means that Aalborg Portland does not consider smell a relevant factor for environmental reporting. No emissions are made to the ground.

Environmental approval

The environmental impacts are regulated by Aalborg Portland's environmental approvals and permits, which cover terms for operation, including:

- Terms of emission for all principal sources of atmospheric pollution: kilns, cement and coal mills, cooler stack and boiler plant.
- Terms of emission for factory noise.
- Management and reporting of serious operating issues and accidents.
- Raw material and fuel stores.
- On-site landfills.
- Emission of process waste water, cooling water, rainwater, etc.

Compliance with the terms of the approval together with the everyday environmental work at the plant are instrumental in ensuring that no material nuisance is caused to neighbours.

Environmental and energy performance

Follow-up on our environmental and energy work is effected among other things using selected key performance indicators for grey and white cement production. These indicators are relative figures in which consumption and emission are set against production.

Reference is also made to "Material flows – key performance indicators 2013" on pages 22-23, showing developments for the past five years.

KEY PERFORMANCE INDICATORS	Unit	2009	2010	2011	2012	2013
Grey cement production						
Energy	GJ/tTCE	4.43	5.07	4.61	4.29	4.28
CO_2	Kg/tTCE	745	809	792	764	760
NO_X	Kg/tTCE	2.14	0.97	0.64	0.63	0.58
White cement production						
Energy *	GJ/tTCE	6.86	7.12	6,96	6.59	6.48
CO_2 *	Kg/tTCE	1,133	1,124	1,154	1,139	1,124
NO_X *	Kg/tTCE	2.74	2.42	2.11	1.54	1.25

* Adjusted for heat recovered and supplied to Aalborg's district heating system.
Adjustment relating to CO_2 and NO_X is calculated according to the 125% thermal efficiency method for district heating.

THE RESOURCE-EFFICIENT PARTNERSHIP

Aalborg Portland converts wastes and by-products into cement and district heating. The company focuses on promoting sustainable development by basing large parts of its cement production on recycling material flows from society and industry in a resource-efficient partnership.

Wastes and homogenous by-products from other industries can there be reused and recycled as fuel and raw materials in production of cement.

In addition, waste heat from flue gases is recovered and supplied to Aalborg's district heating system before the gases are released through the stacks. In this way, the overall environmental impact is reduced significantly.

By reusing and recycling fuels and alternative raw materials in cement production, wastes and by-products are utilised to the full. All constituents are consumed and no new wastes are created. High temperatures and exceptional process conditions make cement kilns ideal for using alternative fuels and raw materials. At the same time, the flue gases are effectively cleaned inside the kiln system in filters and scrubbers so that no further pollution is caused.

In 2013, Aalborg Portland used 514,000 tonnes of alternative fuels and raw materials in producing 1.8 million tonnes of cement. This replaced an equivalent volume of natural raw materials and fossil fuels that would have had to be sourced in Denmark or imported. Aalborg Portland has the capacity to handle 700,000 tonnes of alternative fuels and raw materials annually.

Society and industries

Power stations

Navigation channels
Sulphuric acid – factory
Recycled paper – factory
Recycled aluminium – factory
Biomass-fired plants
Collection schemes
Daka Bio-Industries
Sewage treatment plants

▶ Waste product

- Fly ash and desulphurisation gypsum
- Sand
- Iron oxide
- Paper sludge
- Aluminium by-products
- Dross
- Industry waste
- Meat and bone meal
- Dried sewage sludge

▶ Cement production

Consumption of alternative fuels and raw materials

▶ Cement and district heating with climate and environmental improvements

- Recycling of alternative fuels and raw materials
- Utilisation of waste from other industrial production
- Lower CO_2 and NO_X emission
- Fewer ultimate wastes and smaller quantities
- Lower overall environmental impact

RAW MATERIALS

Cement is manufactured using raw materials from natural resources, such as chalk, sand and gypsum. In order to limit impact on reserves of these materials, Aalborg Portland in 2013 replaced 12% of these natural resources with wastes and by-products from other industries and from society. In this way, these alternative raw materials are utilised as a resource.

Aalborg Portland began using fly ash – a waste product from power stations – more than 30 years ago. A number of additional alternative raw materials have subsequently been included in production.

SAND FROM DREDGING

Sand dredgers keep the navigation channels at Hals Barre and Løgstør Rende in the Limfjord open for the passage of ships. This is a community service in which Aalborg Portland plays a part. The sand removed would otherwise be dumped in the Kattegat and is used instead by Aalborg Portland to replace quarried sand. This avoids damage to both the marine environment and the landscape. Aalborg Portland's position next to the Limfjord also provides an effective logistical solution as the dredgers can dock next to the plant and pump the sand into settling tanks ashore to dry.

DESULPHURISATION GYPSUM

Gypsum produced by desulphurisation of flue gases is used as an additive in cement manufacture. It is sourced both from Aalborg Portland itself and locally from the power station Nordjyllandsværket and is used to replace natural gypsum and anhydrite mined in Morocco and Canada. In this way, long-haul consignment of gypsum by sea is reduced.

The local partnership between Aalborg Portland and Nordjyllandsværket is a good example of industrial symbiosis. Aalborg Portland supplies chalk slurry to the power station for its desulphurisation and receives desulphurisation gypsum in return.

A specially developed road transporter delivers the slurry to the power station and returns with the desulphurisation gypsum. This halves the number of road journeys that would otherwise be necessary.

FLY ASH

Fly ash, a mineral product resulting from generation of heat and power at coal-fired power stations, has been recycled at Aalborg Portland since the 1970s.

In cement production, fly ash replaces natural clay which would otherwise have to be sourced in Denmark.

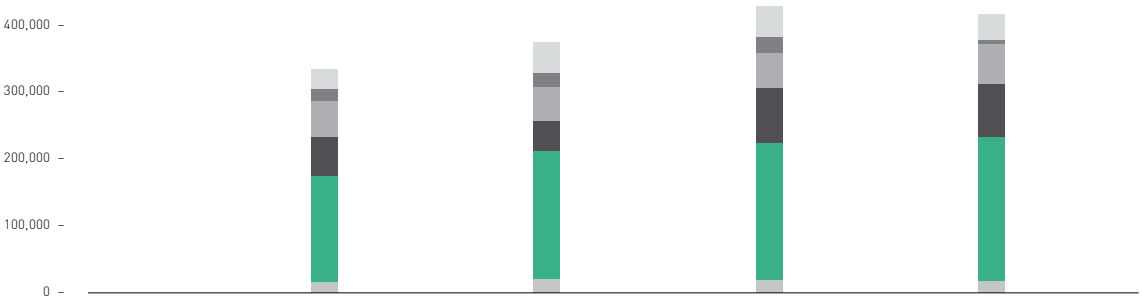
PAPER SLUDGE

Paper sludge is a by-product of the manufacture of recycled paper. Consumption of paper sludge at Aalborg Portland fell in 2013 due to closure of the supply factory in Denmark.

IRON OXIDE

A by-product from the manufacture of sulphuric acid, iron oxide is a necessary source of iron for production of grey cement.

Alternative raw materials / tonnes - 2010-2013



	2010	2011	2012	2013
Iron oxide	30,182	45,331	44,728	41,769
Papir sludge	17,897	22,186	24,845	5,492
FDG gypsum	52,407	52,853	55,022	58,680
Sand	57,728	43,489	81,311	79,980
Fly ash	158,949	189,990	204,148	213,176
Other	15,318	20,541	18,027	17,592

The fall in the overall consumption of alternative raw materials in 2013 was chiefly due to reduced use of paper sludge. The supplier, Dalum Papir, has closed down and Aalborg Portland is now using its final stock of paper sludge.

ENERGY

Cement production is energy-intensive and requires large amounts of fuel and electricity.

The replacement of fossil fuels, such as coal and petcoke, with alternative fuels began in the early 1990s. In 2013, alternative fuels, including combustible waste products, provided 32% of the energy used for producing grey cement.

WASTE IS ENERGY

Recycling of waste contributes to a resource-efficient society. Instead of being disposed of in landfills the waste can be utilised as a valuable resource by replacing coal and petcoke as fuel in cement production.

In contrast to when waste is burned in an incineration plant, no new by-products are created. All the input material is integrated in the cement chemistry and in the finished cement product.

Waste-based fuel is also instrumental in reducing emission of CO_2, NOx, SO_2 etc. in the flue gases, and content of biomass is recycled and benefits the global climate. For example, meat and bone meal is considered wholly carbon-neutral, and the biomass carbon in mixed industrial waste used to replace fossil fuel typically comprises 30-40%.

DRIED SEWAGE SLUDGE AND CHEAP DISTRICT HEATING

Dried sewage sludge is a carbon-neutral biofuel supplied from the City of Aalborg and used to replace coal and other fossil raw materials. In return, Aalborg Portland supplies waste heat from cement production as inexpensive district heating to the city's residents.

The supply of waste heat makes a significant contribution to Aalborg's district heating system, corresponding at maximum production to the annual heat consumption of some 36,000 households.

Aalborg Portland was re-awarded the contract to receive dried sewage sludge from Aalborg in 2012. Sending the sludge to Aalborg Portland instead of north Germany reduces sludge transport by road from 800 km to 8 km.

FUEL CONSUMPTION

Total relative fuel consumption (GJ per tTCE) has fallen by more than 9% on 2011 due to a number of focused energy initiatives in 2012 and 2013. These projects have generated annual fuel savings of more than 178 million kWh, equal to the annual power consumption of 44,500 households.

The projects include transition to mineralised operation on white cement kilns, which results in more readily combustible raw materials and more stable kiln operation.

In addition, the following fuel economy projects were implemented in 2013 on Kiln 87:

- Cooler replacement has provided more efficient clinker cooling and a saving on energy.
- Installation of Advanced Process Control system has led to reduced energy loss.
- Optimisation of start-up burner.
- Waste air from cooler sent to Coal Mills 4 and 5.

ELECTRICITY

Electrical power is vital to cement plant operation. Consumption in 2013 was 241,742 MWh.

The distribution of electricity consumption is shown in the graph on next page.

The principal consumption units are the kilns and cement mills.

The consumption of electricity consists of power for the equipment base load and a variable power consumption which is dependent on the size of production at the main units.

In 2009, when the economic slowdown impacted in earnest, production and variable power consumption decreased but the base load for the equipment did not decrease correspondingly. The overall relative power consumption therefore began rising and peaked in 2010.

With a slight rise in production in 2011, but also with an improvement in efficiency and a reduction in the both base load and the variable consumption, the relative power consumption has fallen by 11% since 2010.

ENERGY SAVING

Aalborg Portland puts strong focus on saving energy – both electricity and fuel. Intensive efforts have been made over many years to find energy savings in the cement plant's power and fuel consumption.

In recent years, added focus on improving energy efficiency in the existing production equipment has led to projects which have delivered energy savings of more than 245 million kWh in the period 2009-2013. This is equivalent to the annual power consumption of 61,000 four-person households, equal to the population of Denmark's second-largest city, Aarhus.

Annual energy savings from economy projects in 2013 amount to 76 million kWh. These projects are listed on pages 26-27.

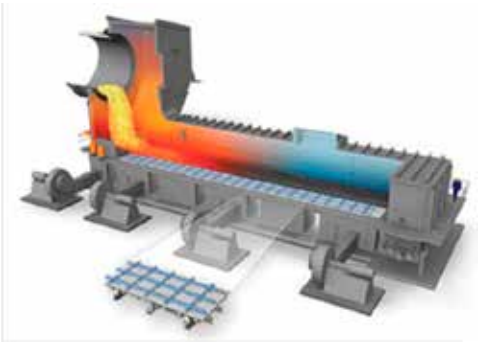
One of these projects is described in depth below. Begun in 2012 and completed in 2013, a significant energy saving has been documented.

REPLACEMENT OF CLINKER COOLER ON KILN 87

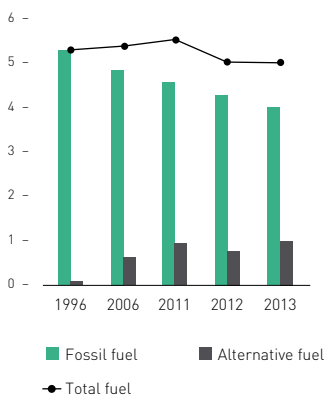
With the advance in clinker cooler technology, far more efficient coolers now exist that are capable of transferring more heat from the clinker to the kiln combustion air.

The clinker cooler functions as a heat exchanger in which hot kiln clinker with a temperature of approx. 1,450° C is cooled on a grate by means of air from a set of cooler fans. In this way, the clinker is cooled to approx. 110° C while the air is heated at the same time. The air from the front section of the cooler is drawn up into the kiln shell (secondary air), the air from the middle section of cooler is drawn through two tertiary tubes into each calciner (tertiary air), and the air from the rear cooler section is exhausted as waste air.

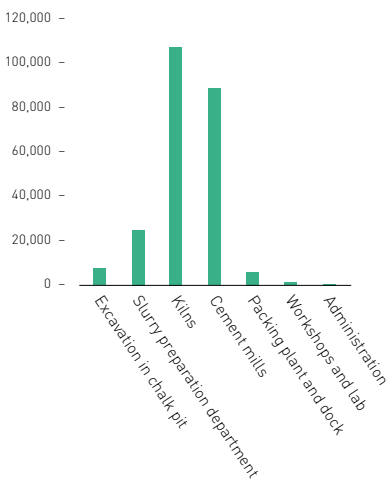
After calculating the savings potential, two grates of the existing clinker cooler were replaced by a new cooler grate supplied by F.L.Smidth. The new cooler technology is far more efficient at transferring heat from the clinker to the cooler air, and this has reduced cooler loss to 52.2 kCal/kg clinker. The annual energy saving has been documented as 72,500 mWh based on investment of EUR 2.3m.



Consumption of fossil and alternative fuel - GJ per tTCE

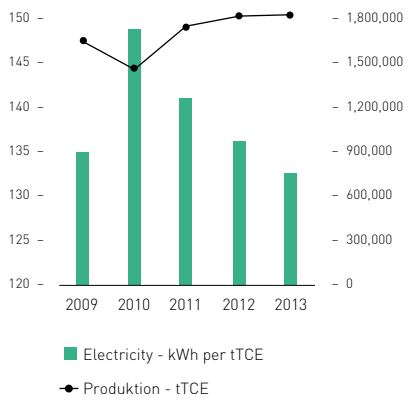


Distribution of electricity in 2013 by consumption points - MWh



Electricity - kWh per tTCE

Production - tTCE



ATMOSPHERIC EMISSIONS

Aalborg Portland has a number of emission sources, ranging from large stacks to small workshop extractors.

The company has a total of around 400 discharges which necessitate cleaning of the air. This task is performed by various types of filters.

The contents of the largest stacks are recorded on an ongoing basis by means of devices which continuously meter the relevant concentrations.

In addition, samples are regularly taken for further analysis.

The sampling and analysis functions are performed by an independent accredited laboratory.

FLUE GASES

CO_2

Relative CO_2 emission fell by 1% on 2012 and by 7.5% on 2010, primarily due to reduced fuel consumption resulting from improvement projects on Kiln 87 and the white cement kilns.

NO_X

In the period 2004-2007 more stringent emissions meant that cleaning equipment was developed and fitted to all kilns.

As a result, relative emission has fallen by 76% on 2003. In 2013 alone there was a fall of 11% due to combination of optimised NO_X cleaning and increased input of NO_X-reducing alternative fuel.

On the grey cement kilns, NO_X is being reduced by injection of ammonia water. Since 2011 this has led to an increase in emission of ammonia (NH_3) within the limits specified in the environmental approval.

SO_2

Relative emission has fallen over the years but increased in 2013, principally due to consecutive breakdowns sustained during the year by two of five scrubber pumps on Kiln 76.

CO

Installation of mixing air equipment for reducing NO_X emission from the white cement kilns means that operation takes place closer to the threshold for formation of CO. The relative CO level has therefore increased.

Dust

Relative dust emission increased on 2012. The primary source is the Kiln 87 cooler, where the dust concentration, expressed as an average daily level over the year, increased to 4.4 mg/Nm^3 in 2013 from a low of 0.01 mg/ Nm^3 in 2012. The emission limit for the cooler stack is 30 mg/Nm^3.

Complaints prompted by dust emission due to operating issues are described on page 30.

EMISSION LIMITS

Aalborg Portland's environmental approval dating from 2009, which was amended in 2012 to meet stricter kiln emission standards (BAT), contains operating and limit criteria.

The emission limits for NO_X, CO and dust were exceeded 14 times in 2013. These cases were notified to the Environmental Protection Agency in the monthly reports.

The table on the next page shows the five main sources of air pollution, the related emission limits, and Aalborg Portland's current average emission levels.

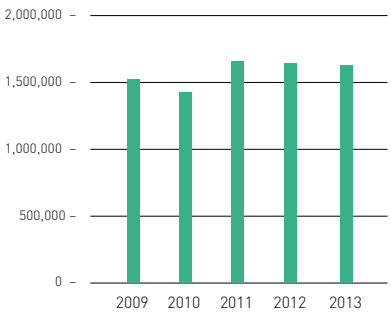
NO_X, SO_2 and dust emissions are determined by averaging continuously recorded data.

Aalborg Portland's limits are average daily emissions per 24-hour period.

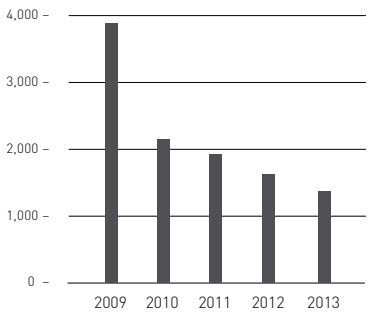
For clarity the table shows the average daily level over the year.

Atmospheric emissions - CO_2 og NO_X

CO_2 - absolute figures - tonnes

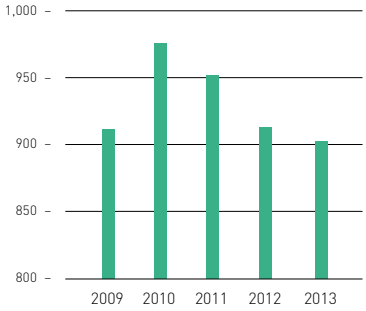


NO_X - absolute figures - tonnes

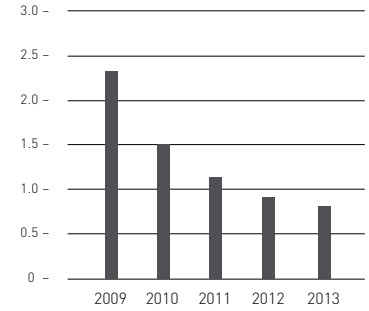


	CO_2	NO_X
2009	1,513,917	3,881
2010	1,420,067	2,153
2011	1,683,864	1,945
2012	1,658,029	1,621
2013	**1,647,199**	**1,401**

CO_2 - relative figures - kg/tCE



NO_X - relative figures - kg/tCE



	CO_2	NO_X
2009	910.3	2.3
2010	976.6	1.5
2011	953.2	1.1
2012	911.9	0.9
2013	**902.5**	**0.8**

Limits and levels during operation – the five main sources

All values are stated in mg/Nm^3 dry flue gas at 10% oxygen content

	NO_X		**SO_2**		**Støv**	
	Limit *	Averaged level 2013 **	Limit *	Averaged level 2013 **	Limit *	Averaged level 2013 **
Heat recovery kiln 73/79	550	270	375	14	25	0.06
Heat recovery kiln 74/78	650	230	425	210	25	3.00
Heat recovery kiln 76	500	95	250	126	25	0.11
Kiln 85	750	797 ***	500	71 ***	35	11 ***
Kiln 87	400	168	10	0,15	25	10

* Daily average according to 2012 environmental approval
** Daily average over the year
*** The data relate to 2009. The limit value for NO_X was 800 mg/Nm^3

NOISE

The noise at Aalborg Portland comes from a large number of stationary sources, both indoors and outdoors, and from internal traffic.

The noise sources include stacks, kilns, cement and coal mills, belt conveyors, fans, ships loading and unloading, lorries, and excavation and rehabilitation operations in the chalk pit.

An off-site noise survey for Aalborg Portland was performed in 2006. GPS was used to determine the location of all noise sources, improving the data on which the noise calculations are based.

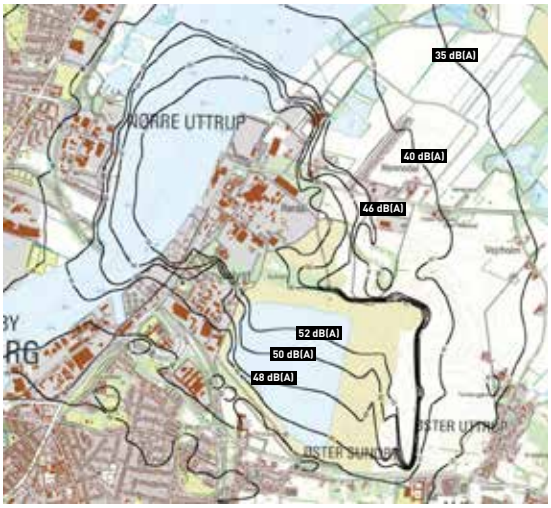
The noise survey was last updated in 2012 as part of the EIA for the factory and chalk pit.

The survey found that with all units operating at maximum (worst case scenario), the noise limits in the general environmental approval were complied with.

The factory's noise contribution is considered to be below the theoretical maximum because of the rare concurrence of operation for all machines and production remains below the level at the start of the economic slowdown in 2009.

In 2013, in the south-east corner of the chalk pit, work began on the construction northwards of a noise embankment to screen the village of Øster Uttrup from the sound of digging operations.

An attempt has been to reduce the noise made by the excavator buckets unloading chalk on to the belt conveyor. A final solution has not yet been found and implemented as the durability of the noise suppression material is subject to heavy wear and tear during unloading.



Noise map in dB(A) – evening conditions

NOISE IN URBAN AREAS

In June 2013, the Environmental Protection Agency completed a noise survey and action plan for Aalborg Portland and the adjacent urban area of Sølyst.

The EPA's view is that the existing strategy for reducing factory noise should continue, i.e. that tougher noise limits should not be imposed but that continued focus should be placed on possible abatement measures.

Aalborg Portland puts ongoing focus on finding new means of reducing equipment noise.


Establishment of noise embankment in the chalk pit adjacent to Øster Uttrup.

WATER

Water is used for a variety of processes in cement production and also for cooling production equipment.

Aalborg Portland obtains technical water for production from on-site wells drilled in a limestone aquifer situated outside of designated drinking water areas. A number of solutions to supply water and to limit consumption have been introduced over the years and are described below.

Aalborg Portland is licensed to extract a total of 5.2 million m^3 of water annually. In 2013, 3.8 million m^3 was extracted as equivalent loading of the water resource. This included 1.2 million m^3 from material excavated below the water level in the chalk pit.

The remaining 2.6 million m^3 included 1.7 million m^3 obtained from 15 on-site wells close to the factory, and 0.9 million m^3 obtained by lowering of groundwater around Kilns 76 and 85.

Relative water consumption fell by 9% compared with 2012, which was principally due to reduced need for groundwater lowering.

GROUNDWATER LOWERING FOR COOLING

Over the years, local lowering of the groundwater level has proven an effective solution for keeping basements, underground passages and conveyor systems dry. At the same time more than 800,000 m^3 of this water is used for cooling the compressor plant. Cooling water in the form of groundwater would otherwise have to be extracted specifically for this purpose.

SPLIT SUPPLY SYSTEM

Following bacterial contamination of drinking water in 1998 the water supply was split into two systems, one for drinking water and one for technical water. Technical water is used for production purposes. In 2013, drinking water was piped to the factory from the Aalborg municipal supply system after pesticide residues were detected in two of Aalborg Portland's drinking water wells. The trend in both wells is towards a falling concentration which is approaching compliance with the 0.1µg/litre limit for drinking water.

RECYCLING OF FILTRATE WATER

Filtrate water arises in the heat recovery and flue gas desulphurisation system. Up until 2004 this water was released into the Limfjord. At the same time, high production levels meant that water extraction had almost reached the limit of 5.2 million m^3. The effective solution was – and still is – to recycle filtrate water in cement production. In 2005, 460,000 m^3 of technical water that would otherwise need to be extracted from the water resource was replaced in this way, and equivalent water emission into the Limfjord ended at the same time – a win-win situation. In 2007, when production was at a high level, the recycling of filtrate water reached 520,000 m^3, but has since fallen to 249,000 m^3 in 2013 when production was lower.

REMEDIATION WELLS COMBAT CONTAMINATION

In 2007, three remediation wells were sunk to protect the factory's water supply from contamination by trichloromethane and tetrachloromethane originating from land formerly leased by Aalborg Portland to the Danish military. The contaminated water is used in the factory for technical purposes. The remediation wells proved highly effective as early as 2008.

In 2013, the remediation wells will continue to operate as hitherto, since the level of tetrachloromethane in the remediation wells still exceeds the maximum concentration for drinking water of 1 µg/litre.

HARVESTING OF SURFACE WATER

In 2013, approx. 10,000 m^3 of surface water was harvested from the storage site adjacent to the slurry preparation department and used in slurry production. The extraction of technical water was thereby reduced correspondingly.

MONITORING PROGRAMME

Since 1991 an external company has been performing yearly hydro-geological surveys and analyses of water quality. Ongoing reporting provides an overview of developments, thereby ensuring effective protection and use of the water resource.

SURFACE WATER AND WASTE WATER

Aalborg Portland discharges waste water into the public sewer system. Surface water and cooling water are discharged directly into the Limfjord. The waste water is passed through the municipal treatment plant before entering the Limfjord.

Waste water and surface water that may contain mineral oils and sand are passed through on-site sand filters and oil-water separators at Aalborg Portland.

WASTE AND WASTE PRODUCTS

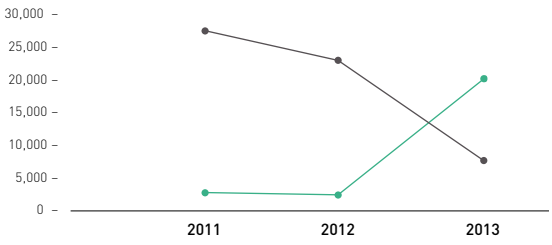
Waste is sorted close to source into bins, skips and oil and chemical stations located around the factory. The waste is recycled in accordance with municipal regulations or landfilled on site.

More than 98% is non-hazardous waste, the remainder being characterised as hazardous oil and chemical waste and mixed waste to off-site landfill.

WASTE STRATEGY REALISED

2013 saw a marked transition at Aalborg Portland – away from landfill towards increased recycling. Landfill waste was thus reduced by more than 69%, cf. page 20.

Waste – from landfill to recycling - Tonnes



	2011	2012	2013
Recycling	2,732	2,209	20,113
Landfill	27,230	23,117	7,683

WASTE – amount in tonnes	2009	2010	2011	2012	2013
TOTAL WASTE	**23,714**	**28,937**	**30,256**	**25,655**	**28,052**
UTILISED NON-HAZARDOUS WASTE	**4,297**	**4,250**	**2,888**	**2,432**	**20,307**
Recycling	3,800	3,670	2,732	2,209	20,113
Microfiller from kilns	-	-	-	-	16,235
Sweepings	-	-	-	-	1,403
Sand and grate material	2,441	2,366	1,187	1,079	235
Building waste	499	222	173	37	92
Metals	634	662	1,148	610	555
Paper and cardboard	4	11	4	15	13
Glass	-	-	0.5	-	0.2
Plastics	-	-	23	4	703
Electronic scrap	3	5	0.02	6	0
Other combustible	219	404	196	458	876
Incineration	497	580	156	223	194
Mixed combustible	471	561	141	209	180
Municipal collection	26	19	16	14	14
UTILISED HAZARDOUS WASTE	**274**	**125**	**138**	**106**	**62**
Oil	271	124.3	134	102.5	55.2
Chemicals	3	0.4	4	3.5	7.0
DISPOSAL OF NON-HAZARDOUS WASTE					
On-site landfill	**19,109**	**24,464**	**27,221**	**23,094**	**7,210**
DISPOSAL OF HAZARDOUS WASTE					
Off-site landfill	**34**	**98**	**9**	**23**	**473**

LAND USE AND BIODIVERSITY

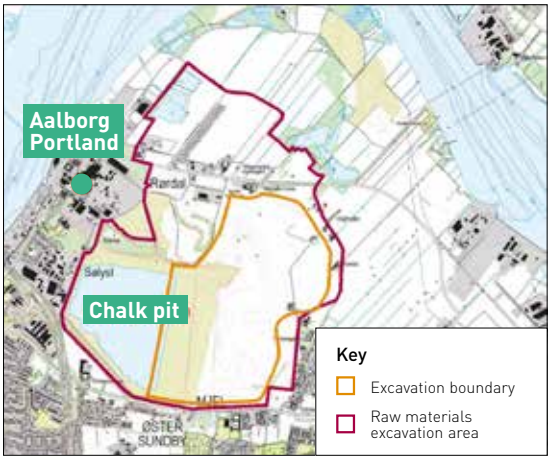
Biodiversity means variation or diversity in nature.

Land used for production, buildings, storage and landfill is thus important to the biodiversity of the land which Aalborg Portland owns in the Rørdal area.

The distribution of land use at Aalborg Portland is as follows:

The total site area is 1,200 hectares, which includes 197 hectares used for cement production. The other 1,003 hectares are a mosaic of lakes, woods, meadows, salt marshes, fallow and farmland. 84% of Aalborg Portland's land therefore provides good scope for biodiversity.

Aalborg Portland land in Rørdal area (ha)	**1,200**
Factory	120
Active chalk quarry	61
Landfill site	12
Iron oxide facility	4
Total land used	**197**



FOCUS ON CHALK PIT – EXCAVATION PERMIT

The chalk pit lies close to the factory and will cover around 240 hectares when fully utilised. An important part of the chalk pit will be the lake, which with its azure colour is typical of lakes in chalk quarries.

Aalborg Portland is licensed to dig for chalk in the Rørdal area within the zone designated in the raw materials plan for North Jutland. The permit is valid for the next 38 years, until 2052, when excavation in the chalk pit is expected to be completed.

The excavation permit was renewed by the City of Aalborg on 8 November 2012 after an Environmental Impact Assessment and a public enquiry which produced no objections.

REHABILITATION PLAN

The rehabilitation plan is intended to develop the chalk pit as a recreational area offering a variety of leisure and sporting activities. It is envisaged that the lake will be used for sailing, waterskiing, diving and bathing, and that the areas adjoining the lake will be used for hanggliding, mountainbiking, jogging, walking etc.

The basic principle of the plan is that the steep slopes, mainly on the western and northern periphery of the chalk pit, together with the areas close to the lake, will remain as they are. The chalk will therefore be left exposed, in time becoming colonised by the unique vegetation characteristic of chalky areas.

In two adjacent areas (Stages 1 and 2), banks and terraces may be established in the chalk pit as so-called "recycling works", cf. more details on pages 20-21.

UTILISATION OF CHALK PIT – RECYCLING OF WASTE PRODUCT

The project to use microfiller, a kiln by-product, for rehabilitating the chalk pit started successfully in 2013. Statistics show that in 2013 the volume of waste landfilled at Aalborg Portland fell significantly and that the volume of waste recycled increased correspondingly by almost 18,000 tonnes. The recycling of waste is in keeping with the Government's resources policy which is aimed at substituting waste for natural raw materials. The need to find capacity for new public landfills is simultaneously reduced.

The chalk pit will in time take on a more exciting aspect as "Rørdal Lake Park", a recreational area with banks, terraces and chalk lake where the local urban population can pursue a variety of leisure and sporting activities.

The project is in conformity with the addendum to the urban area development plan, the EIA and the chalk pit rehabilitation plan, and provides for creation of banks and terraces constructed of microfiller, so-called "recycling works" (Stages 1 and 2).

The Environmental Protection Agency has granted environmental approval for both stages and as the terms of the approval are met the project has now started.

Stage 1 consists of an embankment in the northern part of the chalk pit which will be backfilled with six layers of microfiller behind adjacent earth banks, cf. figure on page 21.

When the microfiller is in place (60,000 m^3) the surface will be capped with topsoil and grassed. Trees may also be planted to create variety in the recreational area. Together with Stage 2 (200,000 m^3), use of microfiller for landscape modulation will be possible for the next 10 years.

Within the same EIA process Aalborg Portland has been licensed to excavate chalk from the existing pit until 2052.

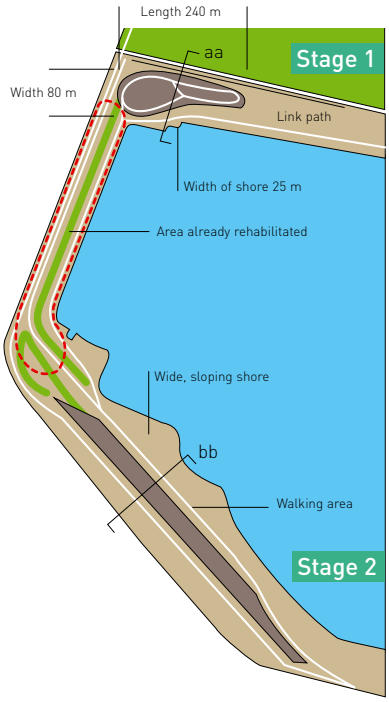
REHABILITATION OF CHALK PIT WITH MICROFILLER

Stages 1 and 2 lie in the northern and western section of the chalk pit which has already been worked and partially rehabilitated.

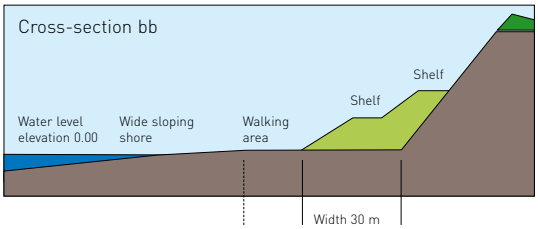
Stage 1
The purpose of the embankment is to create a natural transition between the area at the transfer station and the lakeside. It will also block the factory from view and act as a partial noise barrier between the factory and the public access area planned for the northern and western part of the chalk pit.

Stage 2
This consists of construction of terraces in the western part of the chalk pit with the same method as Stage 1 using 200,000 m³ of microfiller.

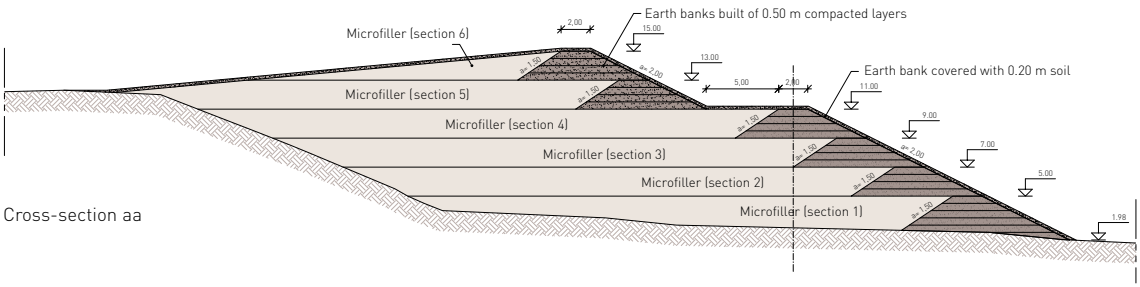
The terraces would be suitable for a variety of sporting activities, such as mountainbiking, jogging and hanggliding. A system of paths could be created and more permanent amenities established.



Stage 2



Schematic for construction of embankment with microfiller (Stage 1)



MATERIAL FLOWS

Key performance indicators 2013 – Aalborg Portland cement plant

The material flows are stated using both absolute figures and relative values as key performance indicators.

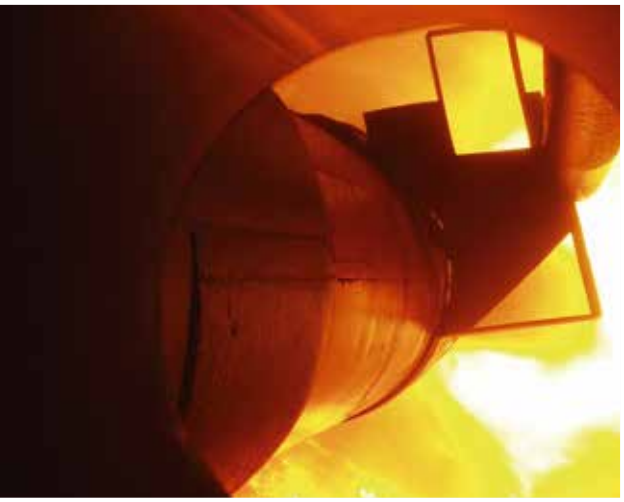
The absolute volumes are determined as tonnes in the wet state. The relative volumes are based on the quantity (kg) of materials in the wet state used to make one tonne of Total Cement Equivalent (tTCE), which is a standard unit for production. This is obtained by calculating the equivalent cement tonnage if all clinker had been processed into cement.

The relative values thus enable year-on-year comparison of the material flows independent of any variations in size of cement production, changes in clinker stocks and sales of clinker.

INPUT

	Absolute figures – tonnes *					Relative figures – kg * / tTCE				
	2009	**2010**	**2011**	**2012**	**2013**	**2009**	**2010**	**2011**	**2012**	**2013**
COMBUSTION AIR										
(O2, N etc.)	539,210	454,032	570,452	557,128	543,819	324.2	312.3	322.9	306.4	298.0
RAW MATERIALS										
Chalk	2,615,372	2,400,904	2,937,540	2,939,060	2,963,408	1,572.6	1,651.2	1,662.9	1,616.4	1,623.7
Water	2,664,025	2,688,259	3,057,496	3,052,623	2,782,798	1,601.8	1,848.8	1,730.8	1,678.8	1,524.7
Sand	111,416	110,626	128,047	106,838	107,246	67.0	76.1	72.5	58.8	58.8
Gypsum	32,951	21,646	31,469	32,769	29,778	19.8	14.9	17.8	18.0	16.3
Other	24,568	31,253	29,885	39,442	27,013	14.8	21.5	16.9	21.7	14.8
Packaging	1,169	1,091	1,101	1,003	1,027	0.7	0.8	0.6	0.6	0.6
RECYCLABLES										
Fly ash	186,721	158,949	189,990	204,148	213,176	112.3	109.3	107.5	112.3	116.8
Sand **	62,742	57,728	43,489	81,311	79,980	37.7	39.7	24.6	44.7	43.8
FGD gypsum	25,201	52,407	52,853	55,022	58,680	15.2	36.0	29.9	30.3	32.2
Paper sludge	25,619	17,897	22,186	24,845	5,492	15.4	12.3	12.6	13.7	3.0
Iron oxide	32,374	30,182	45,331	44,728	41,769	19.5	20.8	25.7	24.6	22.9
Other	33,143	15,318	20,541	18,027	17,592	19.9	10.5	11.6	9.9	9.6
Total	**365,800**	**332,481**	**374,390**	**428,081**	**416,689**	**220.0**	**228.6**	**211.9**	**235.5**	**228.3**
FUELS										
Coal	45,713	78,285	54,679	36,150	46,265	27.5	53.8	31.0	19.9	25.3
Petcoke	186,145	161,393	204,211	213,894	191,767	111.9	111.0	115.6	117.6	105.1
Fuel oil	6,239	8,435	7,222	5,615	4,689	3.8	5.8	4.1	3.1	2.6
Alternative fuel	88,552	68,080	83,022	81,899	97,250	53.2	46.8	47.0	45.0	53.3
Total	**326,649**	**316,193**	**349,133**	**337,558**	**339,972**	**196.4**	**217.4**	**197.7**	**185.6**	**186.3**
	(MWh)	(MWh)	(MWh)	(MWh)	(MWh)	(kWh/tTCE)	(kWh/tTCE)	(kWh/tTCE)	(kWh/tTCE)	(kWh/tTCE)
ELECTRICITY	**224,528**	**216,419**	**249,188**	**247,241**	**241,742**	**135.0**	**148.8**	**141.1**	**136.0**	**132.5**
INTERNAL RECIRCULATION										
Microfiller	122,810	95,768	110,453	107,376	115,816	73.8	65.9	62.5	59.1	63.5
Water	332,336	301,468	323,654	242,299	249,433	199.8	207.3	183.2	133.3	136.7
Own FGD gypsum	24,366	29,947	22,969	27,190	29,641	14.7	20.6	13.0	15.0	16.2
Recycling of clinker/raw meal	33,229	14,715	30,749	17,253	21,287	20.0	10.1	17.4	9.5	11.7
Recycling of cement from silo cleaning	736	1,311	609	268	753	0.4	0.9	0.3	0.1	0.4
District heat from heat recovery	(GJ) 26,779	(GJ) 28,992	(GJ) 21,055	(GJ) 24,278	(GJ) 21,197	(MJ/tTCE) 16.1	(MJ/tTCE) 19.9	(MJ/tTCE) 11.9	(MJ/tTCE) 13.4	(MJ/tTCE) 11.6

* Determined with water content of materials. ** Changed to wet tonnes as values for previous years were stated in the dry state.



OUTPUT

	Absolute figures – tonnes *					Relative figures – kg * / tTCE				
	2009	**2010**	**2011**	**2012**	**2013**	**2009**	**2010**	**2011**	**2012**	**2013**
FLUE GASES										
CO_2	1,513,917	1,420,067	1,683,864	1,658,029	1,647,199	910.3	976.6	953.2	911.9	902.5
NO_X	3,881	2,153	1,945	1,621	1,401	2.3	1.5	1.1	0.9	0.8
SO_2	877	680	620	504	587	0.53	0.47	0.35	0.28	0.32
CO	1,244	1,113	1,068	1,372	1,678	0.75	0.77	0.60	0.75	0.92
Dust	69	35	52	62	81	0.04	0.02	0.03	0.03	0.04
NH_3	-	-	18	28	38	-	-	0.01	0.02	0.02
HCl	10	13	5	2	2	0.006	0.009	0.003	0.001	0.001
Hg	0,07	0,03	0,02	0,01	0,04	0.000045	0.000022	0.000010	0.000004	0.000020
PRODUCTS										
Cement	1,575,211	1,553,003	1,810,647	1,798,013	1,796,553	947.1	1,068.1	1,025.0	988.8	984.3
Clinker ***	76,267	-87,935	-32,514	19,591	12,839	45.9	-60.5	-18.4	10.8	7.0
Filler ***	1,881	-149	2,373	2,016	1,026	1.1	-0.1	1.3	1.1	0.6
Chalk slurry to power station (Nordjyllandsværket)	13,847	16,203	10,230	4,358	10,109	8.3	11.1	5.8	2.4	5.5
Total	**1,667,206**	**1,481,122**	**1,790,736**	**1,823,978**	**1,820,528**	**1,002.4**	**1,018.6**	**1,013.7**	**1,003.1**	**997.4**
Adjustment	-	-	-	-	-	-2.4	-18.6	-13.7	-3.1	2.6
Total Cement Equivalent	**1,663,126**	**1,454,043**	**1,766,561**	**1,818,293**	**1,825,146**	**1,000.0**	**1,000.0**	**1,000.0**	**1,000.0**	**1,000.0**
Packaging	1,169	1,091	1,101	1,003	1,027	0.7	0.8	0.6	0.6	0.6
WATER										
Water Steam	984,264	1,149,406	1,361,524	1,317,884	1,371,187	591.8	790.5	770.7	724.8	751.3
Cooling water, incl. Kiln 85 groundwater	2,311,365	2,086,319	2,256,291	2,358,260	2,216,054	1,389.8	1,434.8	1,277.2	1,297.0	1,214.2
Groundwater lowering (Kiln 76)	135,067	157,937	313,446	272,284	96,102	81.2	108.6	177.4	149.7	52.7
Waste water	38,377	27,612	38,588	33,820	27,813	23.1	19.0	21.8	18.6	15.2
HEAT RECOVERY FOR DISTRICT HEATING	(GJ) **1,139,729**	(GJ) **1,177,344**	(GJ) **1,204,501**	(GJ) **1,045,751**	(GJ) **1,072,975**	(MJ/tTCE) **685.3**	(MJ/tTCE) **809.7**	(MJ/tTCE) **681.8**	(MJ/tTCE) **575.1**	(MJ/tTCE) **587.9**
WASTE ****										
Recycling	3,800	3,670	2,732	2,209	20,113	2.3	2.5	1.5	1.2	11.0
Incineration	497	580	156	223	194	0.3	0.4	0.1	0.1	0.1
Landfill	19,143	24,562	27,230	23,117	7,683	11.5	16.9	15.4	12.7	4.2
Oil and chemical waste	274	125	138	106	62	0.2	0.1	0.1	0.1	0
Total	**23,714**	**28,937**	**30,256**	**25,655**	**28,052**	**14.3**	**19.9**	**17.1**	**14.1**	**15.3**

*** Incl. sales and change in stocks. **** Waste volumes are classified into hazardous and non-hazardous wastes on page 18 with indication of whether the materials are utilised or disposed of.

INVESTMENTS IN CLIMATE AND ENVIRONMENTAL IMPROVEMENTS

Aalborg Portland has continuously made significant investments in improved climate and environmental technology and health & safety. In the period 2009-2013 a total of EUR 20.6m has been invested in a wide range of projects to improve environmental technology.

In 2013, Aalborg Portland invested a total of EUR 6.1m in climate and environmental improvements, including energy-saving projects, and in accident prevention and health & safety.

Investment projects in 2013 included:

- Completion of change to more energy-efficient clinker cooler on Kiln 87.
- Change to energy-efficient flue gas fans on Kiln 87.
- Reduction of compressed air consumption – primarily by replacing silo aeration with mechanical agitation.
- Change to LED lighting in dock and slurry preparation department.
- Change from electric heating to internal district heating in dock.
- Minimised steam consumption for internal heat production.
- Start of Advanced Process Control system for Cement Mills 2 and 7/10.
- Preventive safety – check and replacement of hand rails and gratings.

Additionally investment in projects to improve environmental technology also included:

- New input materials in the form of raw materials and alternative fuels, as more fully described on pages 11-13.
- Use of more sustainable products in research projects with universities etc. to develop cements of the future, as more fully described on page 7.

Aalborg Portland continues to plan initiatives that will reduce the levels of consumption and emission and have a positive knock-on effect on environment. These initiatives are governed by the environmental action plan. See targets, activities and results on pages 26-27.

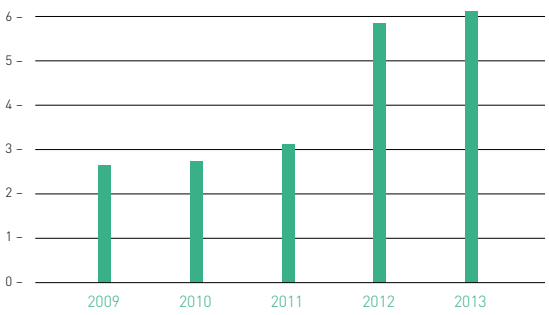
PREVENTIVE MAINTENANCE

The cost of maintaining production plant totalled EUR 3.2m in 2013. Preventive maintenance in the form of filter replacement has positive impact on e.g. dust emission. Similarly, reducing the ingress of false air caused by leaks in the kiln system has positive impact on energy consumption.

Strong focus is also placed on production reliability in order to meet the target set. For example, replacement of kiln lining bricks as and when necessary minimises the number of unscheduled kiln stops.

Preventive maintenance leads to stable and optimal operation of production plant and cleaning systems, thereby also minimising environmental impact.

Investments in climate and environmental improvements - EURm



ENVIRONMENT AND ENERGY TARGETS – ACTIVITIES AND RESULTS

TARGETS 2013	STATUS 2013	TARGETS 2014
ELECTRICITY SAVING – Strategy 2011-2015 Continued focus on reduction of base power load and on power-saving measures.		Continued focus on reduction of base power load and on power-saving measures.
The 2013 target is to implement power-saving measures, including for base load equipment, aimed at achieving annual savings of 2,500 MWh.	Target achieved. The following projects have been implemented, giving annual power savings of 3,421 MWh: • 450 MWh – Change to energy-efficient flue gas fans on Kiln 87. • 1,193 MWh – Reduction of compressed air usage to four locations i.a. by replacement of silo aeration with mechanical agitation. • 377 MWh – Change to LED lighting in dock and slurry preparation department. • 1,401 MWh – Change from electrical heating to district heating in dock.	The 2014 target is to introduce power-saving measures, including for base load equipment, to achieve annual savings of 3,100 MWh. Implement the following projects: • Advanced Process Control system for Cement Mills 2 and 7/10. • Replace one-string operation by two-string operation with SK7 production.
The target is to reduce the specific variable power consumption by 7% in 2015 against 118 kWh/tTCE in 2010.	Target achieved – the specific variable power consumption was reduced to 108 kWh/tTCE, a fall of 8.5% against 2010.	The target of reducing the specific variable power consumption in 2015 by 8% against 118 kWh/t TCE in 2010 is unchanged as new electricity-powered equipment is expected to be installed in 2014 that will lead to reduction in CO_2 emission.
Reduce the base load by 5% in 2015 against 45,856 MWh in 2011.	Target achievement date is 2015. The base power load for 2013 was 44,600 kWh, a fall of 2.7% against 2011.	Reduce base power load by 5% in 2015 against 45,856 MWh in 2011.
RENEWABLE ENERGY The target is ultimately to replace 40% of power consumption with renewable energy from wind turbines installed on Aalborg Portland's land.	Aalborg Portland's land is covered by the wind turbine plan approved by the City of Aalborg on 7 October 2013 with an addendum to the urban area development plan. The concrete project is subject to EIA and to authority approval.	The target is ultimately to replace 40% of power consumption with renewable energy from wind turbines installed on Aalborg Portland's land. The 2014 target is to embark on the EIA process, detailed planning of the wind park project, and obtaining planning permission.
ALTERNATIVE FUEL The target is ultimately to replace minimum 40% of the fuel energy used for grey cement production (Kiln 87) by alternative fuel, thus reducing CO_2 emission. The 2013 target is to replace 35% of the fuel energy for Kiln 87.	32% was replaced in 2013. The target was not reached due to 1st quarter problems with the conveyor system for alternative fuel and thus also the feed to Kiln 87. Design work carried out on "Project to increase use of alternative fuel on Kiln 87". See target for 2014.	The target is ultimately to reduce CO_2 emission by using alternative fuel to replace min. 60% of the fuel energy for grey cement production (Kiln 87) and min. 20% of the fuel energy for white cement production (Kiln 74, 76 and 78). The 2014 target is to replace 42% of fuel energy for Kiln 87 and 4% for the white cement kilns. A conveyor system will be installed to supply alternative fuel to Kiln 87's two calciners and main burner. An external grant has been received which supports equipment conversion from fossil fuels to renewable energy. The full impact will not be registered until 2015.
FIREFIGHTING WATER Implement project for collecting firefighting water from fire risk areas in case of fire.	Target achieved. A collecting tank has been established and contingency procedures updated.	

Target achieved Target not achieved

Six out of nine environmental and energy targets were achieved in 2013.

TARGETS 2013	STATUS 2013	TARGETS 2014
FUEL SAVINGS		
The 2013 target is to implement measures to achieve an annual fuel saving equivalent to 60,000 MWh.	Target achieved. The following projects were executed, providing annual fuel savings of 72,656 MWh: • 72,500 MWh – Replacement of clinker cooler on Kiln 87. • 156 MWh – Minimisation of steam consumption for internal heat production.	The 2014 target is to introduce measures to achieve an annual fuel saving equivalent to 4,800 MWh by introducing two-string rather than one-string production of SK7 clinker.
CO_2 REDUCTION		
Continued focus on reducing CO_2 emission via increased use of biofuel and ultimately developing new cements.*		Continued focus on reducing CO_2 emission via increased use of biofuel and ultimately development of new cements.*
Reduce CO_2 emission from grey cement production by 3% against 765 kg CO_2/tTCE in 2012.	CO_2 emission from grey cement production reduced to 760 kg CO_2/tTCE. The target was not wholly achieved, the fall being 0.6% against 2012, due to a smaller biomass fraction in alternative fuel and feed problems on Kiln 87 in 1st quarter 2013.	Target unchanged: Reduce CO_2 emission from grey cement production by 3% against 765 kg CO_2/tTCE in 2012.
Reduce CO_2 emission** from white cement production by 2% against 1,139 kg CO_2/tTCE in 2012.	CO_2 emission** from white cement production reduced to 1,124 kg CO_2/tTCE. The target was not wholly achieved, the fall being 1.3% against 2012, due to lower than planned heat recovery for district heating.	Target unchanged: Reduce CO_2 emission** from white cement production by 2% against 1,139 kg CO_2/tTCE in 2012.
NO_X REDUCTION		
Reduce specific NO_X emission by 4% against 0.89 kg/tTCE in 2012 by continuing to optimise NO_X scrubbing and by increased use of NO_X-reducing alternative fuel.	Target achieved. Specific NO_X emission fell to 0.77 kg/tTCE, equal to 14%, at full transition to production of mineralised white cement clinker and optimised NO_X cleaning.	Reduce specific NO_X emission by 2% against 0.77 kg/tTCE in 2013 by continuing to optimise NO_X cleaning and increased use of NO_X-reducing alternative fuel.
WASTE		
Increase the use of filler by inclusion in consumption and further develop the product range. Thereby reduce landfill volume by 12,000 tonnes against 2012 (23,094 tonnes), a reduction of 52% .	Target achieved. 7,210 tonnes of waste were landfilled on site, a fall of 69% against 2012, which was due to use of filler for chalk pit rehabilitation.	Reduce landfill volume by 3,700 tonnes against 2013 (7,210 tonnes) – a reduction of 51% - by continued reuse of filler for construction works and by recycling various waste fractions.

* **Research projects** promoting climate-friendly and sustainable development are described on page 7 in "Sustainable production of cement and concrete".
** Adjusted by proportion of CO_2 relating to heat recovered and supplied to Aalborg for district heating. The adjustment is based on the 125% thermal efficiency method.

CONTINGENCY PLANNING – WHEN AN ACCIDENT OCCURS

On 18 September 2013 Aalborg Portland's contingency planning was called upon when oil leaked into the Limfjord from a dockside fuel tank. A plan specifying who is to do what in such cases proved crucial for containing the problem and avoiding more serious damage.

The leak was the result of a string of unfortunate circumstances. The prime cause is believed to have been corrosion in the tank condensate system. This allowed oil to reach the condensate valve which was open by mistake. In order to forestall such an eventuality the tank is located in a compound with a concrete floor. Unfortunately, a drain valve used to evacuate rainwater from the compound was also open by mistake, allowing oil to flow into the fjord.

It is tempting to quote Murphy's Law: "What can go wrong will go wrong". The oil tank was actually on the point of being emptied and decommissioned along with three other tanks in the dock. Its withdrawal has now taken place and notified to the authorities at the start of January 2014.

SEQUENCE OF EVENTS

At 11 a.m. on 18 September, while a ship's cargo of fly ash from Italy was being inspected in the dock at Aalborg Portland, oil was spotted in the water between the ship and dockside. In line with the established contingency procedure the staff on the factory gate were alerted and the emergency services in Aalborg were notified at once.

The emergency services were quickly on the scene and deployed floating booms to contain the oil and prevent it from spreading further into the Limfjord.

Aalborg Portland called in three road tankers to suction oil from the Limfjord.

The emergency services notified the Danish Navy which sent out a reconnaissance aircraft. This spotted a 2.5 km long oil slick in the fjord. The Navy also sent its environmental inspection ship, METTE MILJØ, to monitor conditions in the fjord.

Together with the emergency services an investigation was launched into the source of the leak, and outlet pipes from both ship and factory were examined. After initial inspection that yielded no results, inspections were conducted at fuel oil tanks 1-4, revealing the leak in tank 4 and an open valve.

Oil was present outside tank 4 on the concrete floor of the joint compound for tanks 3 and 4. The drain pipe from the compound leads to a valve which had been left open to allow rainwater to flow into the fjord. This valve is normally supposed to be shut and only opened under supervision to evacuate rainwater from the compound.

The incident was reported to the Environment Protection Agency the same day in accordance with Aalborg Portland's operating terms and procedures.

Aalborg Portland called in a further road tanker to recover the oil lying in the compound and to clear and clean the drain pipe.

Oil suctioned from the fjord, the compound and the drain pipe was sent to the local collecting station for disposal.

Oil samples were taken from the Limfjord and the compound by the City of Aalborg's environmental duty officer to confirm the source of the oil leak. The result of the analysis were received the following morning, 19 September, and revealed a significant similarity between the samples.

Local news media were admitted to the dock area and briefed by the head of the emergency services and by the Environment and Energy Manager of Aalborg Portland.

Based on information supplied by the Navy, Aalborg emergency services have subsequently declared that the Limjord clean-up operation is over.

SHORT-TERM MEASURES TO PREVENT SIMILAR ACCIDENTS

- The tank compounds have been placed under ongoing supervision and all tanks are subject to additional external inspection over and above the regular inspections.
- The condensate valve has been immobilised to prevent accidental opening.
- Access to the valve draining the compound has been blocked to prevent accidental opened.

These measures will remain in force until all four tanks have been emptied, cleaned and decommissioned.

RISK ASSESSMENT

The incident prompted consideration of the speed and efficiency of the response and whether similar leakages of fluid could occur elsewhere at the factory. The contingency procedures are deemed to have functioned satisfactorily.

During the performance of internal audit in 2014, focus will again be placed on assessing the risk of critical incidents resulting in environmental pollution.

Oil leak from tank 4

Oil leak viewed from the air

Floating boom at dock

ENVIRONMENTAL DIALOGUE

In order to ensure and strengthen ongoing environmental dialogue with interest groups, Aalborg Portland engages in the following significant activities:

- Continuous contact with central and local environmental authorities in Denmark and the EU as legislative proposals and regulations that will affect the company are continuously being developed.
- Inclusion of environmental data from suppliers via supply contracts which embrace environment.
- Publication of Environmental Report 2013 – due mid-April 2014.
- Aalborg Portland received 100 visits and a total of 1,268 guests in 2013. Visitors received an environmental briefing and had opportunity to ask questions.
- Staff from Aalborg Portland address external seminars and meetings.
- Aalborg Portland's Environmental Reports for current and previous years are available on the company's website. The English and Danish reports for 2012 were downloaded 534 times in 2013.
- Staff in the departments participate in Energy & Environmental Focus Teams.

The Environmental Report is sent to numerous interested parties nationally and internationally, including neighbours, owners, authorities, politicians, the Danish Society for Nature Conservation, customers and suppliers.

The report is also available in the factory to all staff and is published on our website.

In order to ensure the best possible motivation and dialogue with internal and external stakeholders concerning our environmental activities, we invite viewpoints and recommendations for improvements from all quarters.

OPERATING ISSUES

Aalborg Portland's procedures for dealing with operating issues and breakdowns are defined in our process management system and the terms of our general environmental approval. This ensures that all relevant authorities are involved in resolving issues that may lead to environmental pollution or risk thereof.

The number of dust emissions at Aalborg Portland resulting in complaints increased from nine to 19. These emissions principally related to operating issues on Kiln 87 which suffered several brief precipitator breakdowns. Diffuse dust from the clinker store combined with strong wind also prompted complaints.

There was one case of oil discharge into the Limfjord, cf. also pages 28-29.

Numer of releases resulting in complaints

	2009	2010	2011	2012	2013
Dust	14	14	11	9	19
Noise	1	2	0	1	0
The Limfjord	0	1	1	0	2
Other	0	0	0	0	0

REQUIREMENTS TO SUPPLIERS

Aalborg Portland's general contracts with suppliers have been amended to include a description of our systematic focus on environment, energy and health & safety, including our certified management systems.

Aalborg Portland also makes clear that it attaches importance to partnerships with certified suppliers who are environmentally and socially aware. We reserve the right to perform audits of relevant environmental and health & safety aspects relating to the partnership. Three supplier audits are planned for 2014.

New suppliers are subject to assessment prior to contract signature.

SUSTAINABLE DISTRIBUTION

In 2013 the distribution of cement from Aalborg Portland comprised the consignment of approx. 1.8 million tonnes to domestic and export customers.

Our influence on export distribution is principally restricted to the choice of distribution by ship, and this part of the distribution may therefore be termed an indirect environmental impact.

In the domestic market, however, we have better opportunity for influencing the environmental impacts of distribution in the form of exhaust emissions, road wear, etc. We therefore also have a responsibility for conducting our distribution in a sustainable manner.

In 2013, 71% of our cement was distributed by ship and 29% by road.

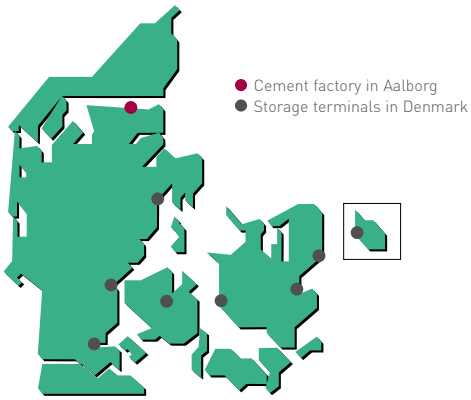
All our cement production takes place in Aalborg, from which the bulk of production is transported by ship to our eight Danish storage terminals strategically positioned nationwide. Onward distribution to the customer is by road.

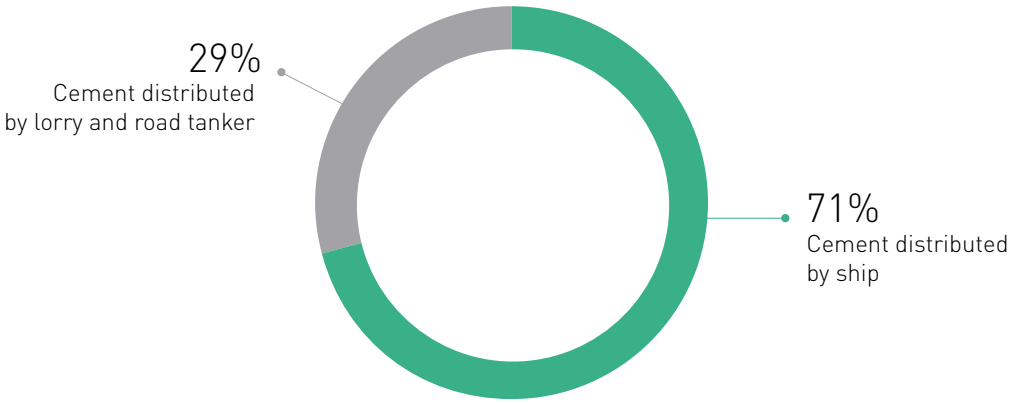
The average distance from terminal to customer is just 65 km, which means we avoid long-haul distribution by heavy road tankers.

This strategy continued in 2011 with establishment of a storage facility in Aabenraa for white cement destined for export to the European market. This facility removes 2 x 270 km of road transport from the motorways of Jutland as the product is now carried to Aabenraa by ship, a more sustainable mode of distribution.

Some road haulage is contracted out to third parties. Customers in northern Jutland are supplied direct from Aalborg. Distribution of all bagged cement also takes place from Aalborg.

Aalborg Portland's focus on use of alternative fuel represents an indirect CO_2 benefit as this can be sourced locally and therefore travels a much shorter distance than coal, petcoke and oil.





HEALTH & SAFETY

WHAT IS A GOOD WORK ENVIRONMENT?

Work environment is an interplay of the conditions, relationships and influences we humans work under, including also the technical and social development of the workplace. Collectively, this contributes to the safety and to the physical and psychological health of the individual employee in the short and longer term.

A good work environment improves productivity and is the key to strong competitiveness in the form of job satisfaction, wellbeing, low sick leave and high flexibility. This means satisfied employees, customers and shareholders.

The legislation governing the work environment demands that work must be able to be done in a manner which is wholly defensible in health & safety terms. The following must be created:

- A safe and healthy work environment which is at all times in keeping with technical and social developments in society.
- A platform whereby companies can resolve health & safety issues themselves with guidance from the social partners and with guidance and supervision from the Working Environment Authority.

The stresses we may be exposed to as employees or inflict upon others in the performance of work may be:

- Physical, chemical, ergonomic, biological, social, psychological, etc.

Both Management and the Health & Safety Organisation have an active role – and thus also a major responsibility – for providing a good work environment.

This is an ongoing process to which the individual employee's engagement and responsibility also make significant contribution. We therefore give priority to a high degree of employee involvement in this process.

MANAGEMENT'S ASSESSMENT

Management's QHS (Quality, Health & Safety) assessment was held on 27 February 2014. It took stock of 2013 and defined the direction and targets for 2014.

HEALTH & SAFETY ORGANISATION

Health & Safety Organisation elections were held in spring 2013, for the first time with electronic voting.

General meetings of the organisation are convened at least twice yearly – around the summer holiday and at the annual meeting/health & safety discussion in December. The annual meeting assesses the past year and focuses on providing input and improvement recommendations for the subsequent year.

The Health & Safety Committee meets quarterly. At the first meeting each year the Committee defines goals for the year ahead based on input at the annual health & safety discussion.

The individual Health & Safety Groups hold ad hoc meetings throughout the year.

The annual meeting discussed accident statistics (cause/type/time/seniority) and reviewed the year as a whole. The work of the meeting was performed in groups. There were two main themes for the day: Proposals for health & safety goals for 2014 and "The way to more pro-active health & safety work". The meeting proved highly rewarding and produced much constructive input for future work.

HEALTH & SAFETY POLICY

Aalborg Portland is committed to producing quality products which meet customer requirements and expectations. Work environment is an integral part of everyday operations and there is constant focus on improvement.

Guidelines

All activities shall at all times be carried out in compliance with legislation and with our internal health & safety guidelines.

Our employees

Aalborg Portland will create the best possible framework for a safe and healthy work environment within the scope of technical and economical feasibility and using the best available solutions and methods.

Aalborg Portland will ensure that all employees are trained and motivated to work actively to improve the work environment.

The individual employee is required to assist in improving health & safety in and around the performance of their work.

External contractors

Aalborg Portland recognises its responsibilities and obligations towards external contractors working in the production environment.

Society

Alborg Portland adopts an open and active role in relations with employees, authorities, customers, suppliers, organisations and other partners.

Policy, targets and objectives

The Health & Safety Organisation sets targets for the year ahead at its annual meeting. Recommended targets are discussed at the Management's assessment which establishes the final targets for the year.

Health & safety policy is updated regularly and at least every two years.

Six out of nine targets were achieved in 2013.

TARGETS 2013	STATUS 2013	TARGETS 2014
ACCIDENTS Target < 10 reported accidents. Max. 18 accidents per million working hours.	Target achieved. Nine reported accidents and an accident rate (accidents per million working hours) of 15.7.	**ACCIDENTS** Target: < 8 reported accidents. Max. 14 accidents per million working hours.
PSYCHOLOGICAL WORK ENVIRONMENT Establish a contingency system and support procedures for the individual employee.	Target achieved. Wellbeing policy and support tools created and implemented. Strong focus on preventive activities.	**PSYCHOLOGICAL WORK ENVIRONMENT** Improved psychological work environment through focus on prevention. Target: Fewer stress cases than in 2013.
SIGNAGE Update all signage throughout the factory with a view to increased safety.	Target achieved. All factory signage cleaned/ replaced.	**SAFETY CONSCIOUSNESS AND AWARENESS AND COMPLIANCE WITH SAFETY REGULATIONS** Increase health & safety awareness. Target: 10% improvement on the score from "Safety Culture 2013".
SAFETY COURSE Strengthen safety culture by holding an internal safety course for all employees (100% attendance).	Target achieved. Internal safety course held for all employees. Course in future to be held every two years with changing focus areas.	**SAFETY COURSE** Strengthen safety culture by providing an internal safety course for all employees. Target: 100% attendance.
WORKPLACE ASSESSMENTS (WA) Introduce rolling WA system.	Target not achieved. Rolling system not introduced – deferred until 2014 due to change of priority.	**ROLLING WORKPLACE ASSESSMENTS** Plan for workplace assessments within individual processes. Target: Define and implement method.
SAFETY GUIDELINES Update all safety guidelines in SAP (100%).	Target not achieved. All safety instructions were to have been updated by end.2013. Due to higher than expected complexity, particularly in respect of safety locking, implementation has been deferred until week 12 of 2014.	**SAFETY GUIDELINES** Update all safety guidelines in SAP (100%) Establish plan for ongoing update. Target: 100% completion.
ERGONOMICS Provide two sessions offering professional advice on planning of office workplaces.	Target achieved. Ergonomic advice sessions were offered in spring and autumn. Attendance was 100% on both occasions and a repeat is being considered in 2014.	**HEAVY LIFTING** (musculoskeletal disorders) Train an internal team to implement/give guidance on WA in this area. Target: Train team.
TRAFFIC SAFETY Maintain traffic infrastructure (as per plan) to ensure optimal and safe transit at all outdoor locations. Establish rolling plan for 2013, 2014 and 2015.	Target not achieved. Plan formulated but activity not initiated in 2014. There were 10 reported accidents in 2012. Target achieved.	**TRAFFIC SAFETY** Maintain traffic infrastructure (as per plan) to ensure optimal and safe transit at all outdoor locations. Target: Initiate project so that rolling plan can be introduced from 2015-2020.

Target achieved Target not achieved

ACCIDENTS AND PREVENTION

In 2013, there were nine "reported" accidents, i.e. accidents resulting in more than one day's leave, a fall of 10%. The relatively low number was due to strong awareness on the part of both the Health & Safety Organisation and the employees, combined with intensified preventive focus – a development expected to continue. A total of 13 less serious accidents were reported that did not result in days off work.

Average accident frequency for the year (number of accidents per million working hours) was 15.7. Average days lost per accident was 3.3.

The accident rate for the six winter months was virtually the same as the previous year and was chiefly due to slippery surfaces and access roads.

The psychological work environment was again very much influenced by changes and the relatively high pace of everyday work, and this led to formulation of a wellbeing policy and support tools. The objective is to enable preventive action to be taken as early as possible and to improve the chances of employees helping both themselves and their co-workers.

In 2013, as a pro-active initiative to prevent musculoskeletal disorders, ergonomic workplace reviews were offered for both office and factory personnel.

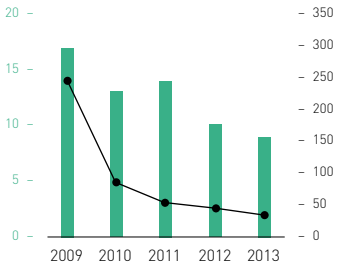
A motivation/wellbeing survey was implemented in 2013 and will be followed up with a fresh survey in 2014.

Overview of injuries	Number	%
Head excl. eyes	1	4.5
Eyes	3	13.6
Back, incl. spinal column and vertebrae	3	13.6
Large parts of the body	1	4.5
Upper limbs	7	31.8
Lower limbs	4	18.2
Other injury	3	13.6
Total 2013	**22**	**100**

	2009	2010	2011	2012	2013
Accidents reported to the Working Environment Authorities					
Number of accidents reported	17	13	14	10	9
Number of days lost	244	87	52	47	30
Accident frequency / Time lost – Hourly paid and salaried employees					
Accident frequency – accidents per one million working hours	26.9	20.8	22.1	17.9	15.7
Time lost – hours lost per 1,000 working hours	2.9	1	0.6	0.6	0.4
Accident frequency / Time lost – Hourly paid employees					
Accident frequency – accidents per one million working hours	56.0	44.4	48.8	32.2	36.5
Accident frequency – accidents per one million working hours (stone, clay and glass industries)	27.8	29.6	24.0	19.2	*
Time lost – hours lost per 1,000 working hours	5.9	2.3	1.3	1.3	0.9

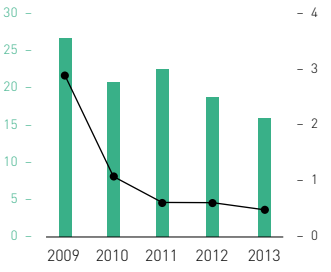
* Data not available

Accidents reported to the Working Environment Authorities



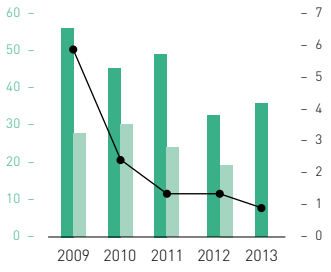
Number of accidents reported
Number of days lost

Accident frequency / Time lost Hourly paid and salaried employees



Accident frequency – accidents per mill. working hours
Time lost – hours lost per 1,000 working hours

Accident frequency / Time lost Hourly paid employees



Accident frequency – accidents per mill. working hours
Accident frequency (stone, clay and glass industries)
Time lost – hours lost per 1,000 working hours

WELLBEING POLICY

Our policy on wellbeing is intended to promote health, wellbeing and job satisfaction in the workplace and thereby prevent stress.

At Aalborg Portland we recognise that there must be balance between work and home life as contented employees work more efficiently take less sick leave and deliver good, high quality results to the benefit of both the company and their co-workers.

Aalborg Portland's aim is to provide a good physical and psychological work environment and a workplace in which our people can feel content and secure at all times, even when the workplace is busy and subject to change.

Our goal is that all employees should feel part of the team with a common task and with a collective responsibility for each other and for the results that must be achieved.

Core values

All employees are expected to treat others physically and verbally with the same respect and consideration that they themselves wish to receive from others.

Our behavioural platform is provided by Aalborg Portland's five core values:

- Grow with passion for effectiveness
- Integrated diversity
- Act with concrete simplicity
- Rigorous flexibility
- Accountability for the future

Activities promoting wellbeing

The individual manager is responsible for ensuring that balance exists between tasks and resources so that the physical and psychological work environment and other matters of importance to the employee's work situation form part of an ongoing dialogue with the employee.

Aalborg Portland has a number of tools available that are instrumental in supporting wellbeing, including:

- Competence development
- Annual performance appraisals
- Workplace Assessment – survey of physical and psychological work environment
- Pensions & Health insurance
- Various information channels
- Joint Consultative Committee, Health & Safety Committee, etc.
- Sick leave and retention policy
- Alcohol and smoking policy
- Motivation survey
- Subsidised staff association, internal clubs and societies
- Get well flowers for employees who are ill
- Stress management (contingency measures and plan for return to work)
- Part-time work option (based on individual assessment).

On joining Aalborg Portland, employees are urged to take out an insurance policy (Mølholm Behandlingsforsikring), which among other things covers psychological help and treatment for alcohol abuse.

Bullying and harassment

The Management of Aalborg Portland strongly distances itself from all forms of bullying and harassment. Such behaviour is not compatible with our values and may therefore have repercussions for the employment of those involved in such behaviour.

Bullying is when one or more persons regularly and over a long period of time, or repeatedly in a gross manner, subject one or more other persons to offensive actions which the latter find hurtful or degrading. The offensive actions only become bullying, however, when the persons targeted cannot defend themselves effectively. It is therefore important that the employee concerned makes protest or seeks help in making protest.

Teasing which is viewed as amicable by both parties and isolated disputes are not considered bullying or harassment.

Part-time working

Some employees may find it necessary to take a temporarily cut in working hours with a corresponding reduction in pay. The possibility for part-time working is subject to individual evaluation and must be discussed with the employee's immediate superior.

Smoking and alcohol

Aalborg Portland is a non-smoking environment. Smoking is only permitted outdoors where it is not signposted as prohibited due to the risk of fire. Reference is made to the company's smoking policy.

Consumption of alcohol is not considered conducive to professionalism and wellbeing at Aalborg Portland and only non-alcoholic beer is therefore available in the company's canteens.

Follow-up

Follow-up on wellbeing is performed by means of the following tools:

- Annual performance appraisals
- Motivation surveys
- Sick leave statistics

The follow-up also extends to the number of employees with agreement on gradual return to work.

FACTORY EMERGENCY CORPS

Aalborg Portland's Emergency Corps continued its three-year programme in 2013 with an evacuation drill, emergency drill and two-day intensive in-house training seminar. The seminar was a combination of theory and practice. Collectively, these initiatives enable us to maintain an efficient emergency resource.

ONLINE RISK MANAGEMENT PROJECT

In 2013, partnered by an external supplier, we embarked on a major online risk management project designed to deliver a revised contingency plan for the factory and silos. This is a pro-active initiative consisting of the following phases: Analysis, Prioritisation/Planning and Implementation. The Analysis phase (survey) was concluded in 2013 and the schedule has been set for the next two phases.

SAFETY GUIDELINES AND WORKPLACE SAFETY INSTRUCTIONS

We have a large number of safety guidelines to enable us to operate, maintain, repair and clean our production equipment efficiently. A revision of all guidelines was begun in 2013 and is expected to be completed at the start of 2014. The safety guidelines are available to both employees and external contractors and compliance is mandatory.
KEMI, our online chemicals database which ensures that all chemicals are registered with the suppliers' instructions, is continuously updated. This data forms the basis for the formulation of workplace safety instructions (WSI). This ensures that:

- We use only substances and materials that are evaluated and approved
- Users have the full and necessary workplace safety instructions and therefore also the right personal protection
- We have an overview of the usage and quantities of individual substances and materials.

THE CONSTRUCTION PRODUCTS REGULATION

The Construction Products Directive (89/106/EEC) was replaced on 1 July 2013 by the Construction Products Regulation (305/201/EU) and has necessitated a Declaration of Performance (DoP) for our cements. This also prompted us to ensure that the revision of our safety data sheets in accordance with REACH and CLP (new hazard labelling) is in compliance with the legislation.

TRAINING SEMINAR – SAFETY CULTURE 2013

2013 saw the implementation of our first internal health & safety seminar for all production employees. The purpose of the seminar, which is mandatory and will be repeated annually, is to increase motivation to achieve a better work environment. The seminar was a success, and the evaluation shows that there exists plenty of room for improvement in our daily working.

EXTERNAL CONTRACTORS

Meetings are held quarterly with external contractors. It remains imperative to maintain focus on external contractors, pursue close dialogue with them and jointly create improvements.

In case of major tasks, including kiln shutdowns, close contact takes place with external contractors on the coordination of safety work. Many accident situations are thereby prevented or pre-empted, something which is widely appreciated by the contractors. This close dialogue frequently gives rise to recommendations for improvements that may lead to concrete initiatives which subsequently benefit both parties.

SAFETY FILM AND WELCOME FOLDER

Aalborg Portland's safety film can still be viewed on YouTube in three languages (English, Danish and German). Suppliers can therefore access the film at home and view it before arriving on site. A welcome folder containing key information on our company is also issued.

HEALTH CHECK FOR NIGHTSHIFT PERSONNEL

In 2013, all nightshift personnel were offered a health check (health profile). The findings revealed a need for focus to be placed on stress situations, excessive job pressure, healthy diet, smoking and exercise. An action plan has been formulated and will be introduced in 2014.

EUROPEAN RESTART A HEART DAY

On the occasion of European Restart a Heart Day on 7 October 2013 some 80 employees attended a diploma training course, held at Aalborg Portland, on how to use a cardiac defibrillator.

FITNESS

The Aalborg Portland fitness centre remains popular with many employees and it is still possible to obtain guidance from an instructor. There are also badminton courts which are also well used.

In 2013, as in previous years, employees from Aalborg Portland took part in the annual relay race "DHL-stafetten".

DIET

Our canteen dietary concept of a healthy buffet from which our employees can compose a good and wholesome meal of their choice remains a success. Campaigns of 1-3 days' duration on a variety of themes are also held. In 2013, focus was again placed on low-fat products.

SMOKING

Aalborg Portland's smoking policy prohibits both indoor smoking and use of e-cigarettes. Courses in stopping smoking are available to all employees.

INCLUSIVE LABOUR MARKET

Aalborg Portland's sick leave and retention policy is closely observed. This ensures that employees who for various reasons are required to take frequent or prolonged sick leave are contacted so that we are able to retain their services.

In 2013, annual performance appraisals were again held with all personnel. Topics discussed included wellbeing, psychological work environment and the need for training leading to new skills and qualifications.

Collaboration between the HR function and the Health & Safety Organisation was strengthened further in 2013. There are many "interfaces" between the two bodies, particularly in the area of psychological work environment, and coordination is good. Sick leave policy is another area of common interest. This ensures that the situation of the individual employee is addressed as early as possible, which in turn ensures a positive process throughout.

MEASUREMENT AND CALCULATION OF MATERIAL FLOWS

The information used in compiling this Environmental Report was obtained from Aalborg Portland's environmental database which receives raw data from a variety of recording systems.

The methods of measurement used in conjunction with data capture are described below:

- Raw materials, recyclables and fuels are determined by flow meters and weighing devices installed in the production process.
- Water consumption is measured by water meters.
- Electricity consumption is measured by kWh meters.
- Packaging is calculated from inventory statements.
- CO_2 emission for 2009-2013 is determined according to the approved CO_2 plan for Aalborg Portland and verified externally.
- NO_X, SO_2, CO, HCl, NH_3 and dust emission from kilns is determined by continuous metering in exhaust stacks. The same applies to dust concentrations in discharges from cement and coal mills, while air volumes from these sources are based on sampling.
- Hg quantity is calculated by continuous measurement of kiln air volumes and Hg concentration samples from yearly performance measurements.
- Products are determined by weighing and calculation. District heating production is measured by calorimeter.
- Wastes are determined by weight on weighbridge and annual statements from external waste receivers.
- Cooling water is calculated on the "water balance principle" in which the following flow-metered outputs – steam, groundwater lowering at Kiln 76 and waste water (sanitation water and washing water) are deducted from measured inputs: water consumption, groundwater lowering and water content in materials and fuels.
- Combustion air is calculated indirectly by deducting the input side of the materials flow from the output side.
- Accidents and time lost are determined from data reported to the Working Environment Authority.
- Noise calculation is performed by an accredited external firm based on measurement at source and subsequent computation.

Continuous emission and flow gauges and weighbridges are subject to regular inspection and calibration by DANAK accredited companies.

FINANCIAL HIGHLIGHTS AND SOCIAL CONTRIBUTION

ENVIRONMENTAL LEVIES

Environmental levies increased from EUR 5.7m in 2011 to EUR 10.2m in 2013. A significant rise of 78% due to increased NO_X and PSO levies.

It now appears that the basic allowance for the so-called NO_X levy in Denmark, which was strongly increased in 2011, has been revised. Aalborg Portland is expecting a partial repayment of the NO_X levy for the period 1 July 2012 to 31 December 2013.

While the decision on the basic allowance is positive for Aalborg Portland, the additional costs represented by the increase in the NO_X levy still remain. Added to this is a substantial burden arising from the PSO levy. These Danish levies thus continue to pose a considerable disadvantage for Aalborg Portland in competition with other European companies, which are not subject to these charges.

78%

increase in Aalborg Portland's environmental levies from 2011-2013

The company has incurred the following direct environmental levies:

EURm	2011	2012	2013
PSO levy	1.7	3.2	3.5
NO_X levy	0.3	2.1	3.9
Waste levy	1.7	1.5	0.4
Electricity levy	0.5	1.0	0.7
Energy levy	0.7	0.6	0.9
Raw materials levy	0.5	0.6	0.5
Sulphur levy	0.2	0.1	0.3
Total	**5.7**	**9.1**	**10.2**

ENVIRONMENT, HEALTH & SAFETY

As well as investments in environmental improvements, operating expenses, environmental levies and expenses relating to the Health & Safety Organisation, Aalborg Portland also funds operating expenses for the Environment & Energy Unit and the Health & Safety Unit, which totalled EUR 0.5m in 2013.

SOCIAL CONTRIBUTION

Aalborg Portland's cement production in Denmark is of significant economic importance to the nation.

In 2013, Aalborg Portland's value added was calculated as EUR 81m.

Of this, EUR 34m (42%) went to society in the form of VAT, company tax, other taxes and employee income tax. EUR 18m (22%) went to the employees in the form of wages and pension contributions (after tax). EUR 25m was transferred to the company's equity.

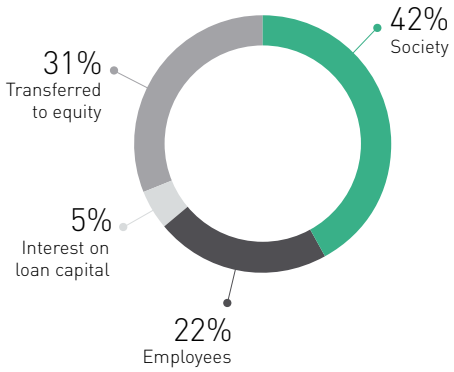
A social contribution is also created through our subcontractors involved in transport, maintenance, facility management etc. at Aalborg Portland.

EUR 34m

of the value added went to the public sector in 2013, corresponding to an increase of 7%

Distribution og value added

EURm	2011	2012	2013
Net sales	180	185	188
Spent on materials, services, depreciation, etc.	105	94	107
Value added	**75**	**91**	**81**
Society	29	32	34
Employees	19	16	18
Interest on loan capital	1	2	4
Transferred to equity	0	40	25
Dividend to the owner	26	0	0
Total	**75**	**91**	**81**



INDEPENDENT AUDITORS' REPORT

TO THE STAKEHOLDERS OF AALBORG PORTLAND A/S

We have performed an assessment of the Environmental Report 2013 presented by the Management for the activities of Aalborg Portland A/S in Aalborg, which is prepared in accordance with the statutory regulations on environmental reports and in accordance with the measurement and calculation of material flows described.

The Management of Aalborg Portland A/S is responsible for the Environmental Report 2013. Our responsibility is to express an opinion on the Environmental Report 2013 based on our assessment.

BASIS OF OPINION

We have conducted our work in accordance with the International Standard on Assurance Engagements and further requirements pursuant to Danish legislation on auditors. The work has been performed with the aim of expressing our opinion with a reasonable level of assurance.

Based on an assessment of materiality and risk, our work has comprised analyses, inquiries to the Management and accredited certification company, spot checks of systems, data and underlying documentation, including checks on whether the stated guidelines for recording and measuring data have been applied. We have assessed whether the accounting policies chosen by the Management are appropriate and whether the estimates made by the Management are reasonable, and we have assessed the overall presentation of the Environmental Report, including compliance with the statutory regulations on environmental reports.

We utilised audit as well as environmental specialists in the performance of our work. We believe that the work performed gives an adequate basis for our opinion.

OPINION

In our opinion the Environmental Report 2013 for the activities of Aalborg Portland A/S in Aalborg is presented in accordance with the statutory regulations on environmental reports and in accordance with the measurement and calculation of material flows described.

Aalborg, 2 April 2014

KPMG
Statsautoriseret Revisionspartnerselskab

Hans B. Vistisen
State Authorised
Public Accountant

Steffen S. Hansen
State Authorised
Public Accountant

EMAS REGISTRATION

Verifier
Bureau Veritas Certification

Accreditation no.
DANAK DK-V Reg. 6002

Report verification and validation date
19 March 2013

TERMINOLOGY

Alkali
Alkalis used at Aalborg Portland are sodium and potassium compounds.

Alternative fuels
Combustible waste products which replace fossil fuels and consist of a reprocessed fuel product, meat and bone meal, dried sewage sludge and tyre chips.

BAT
EU documents describing the Best Available Technique in different sectors. Used as basis for environmental approvals.

Cement clinker
Intermediate product that results from the burning of slurry in kilns and is ground to produce cement.

Cement mill
Facility which grinds cement clinker to cement.

CO
Carbon monoxide. A result of incomplete burning of fossil fuel. Converted in the atmosphere to CO_2.

CO_2
Carbon dioxide. Formed by burning of fuel and calcining of chalk. CO_2 emission is calculated according to EU guidelines.

dB(A)
Noise is measured in decibels, dB(A), which is a logarithmic scale. For example, the noise from leaves rustling in the wind is around 20 dB(A). The noise level in an ordinary living room is around 40 dB(A), in offices 60-65 dB(A), on a street with normal traffic 80-85 dB(A) and from a pneumatic drill approximately 100 dB(A).

EMAS
Eco-Management and Audit Scheme. EU scheme for the registration of environmental management systems.

Emission
Release of noise or gas. In flue gas emission the volumes released are metered continuously, except for CO_2 – see under CO_2.

Environmental Impact Assessment (EIA)
EU directive prescribing that installations having material potential environmental impact cannot be established until the procedure in the directive has been implemented, including preparation of an EIA Report, holding of a public inquiry, etc.

Filtrate water
Waste water formed in heat recovery boilers by condensation of flue gases.

Flue gas desulphurisation gypsum (FDG)
Gypsum formed by the desulphurisation of flue gases.

Fly ash
Material produced by scrubbing of flue gases in an electrostatic precipitator.

Fossil fuel
Coal, petcoke, oil and natural gas.

GJ
Gigajoule, a unit of energy equal to 1,000 MJ.

HCl
Hydrogen chloride.

Hg
Mercury.

Household energy consumption
Average annual consumption per household is:
Electricity: 4000 kWh. Space heat: 50 GJ.

IPL
System for handling Aalborg Portland's Workplace Assessments.

Iron oxides
Iron-containing residues from production of sulphuric acid and steel.

ISO 14001
Standard issued by the International Standards Organisation with guidelines for establishment and maintenance of environmental management systems.

ISO 50001
Standard with guidelines for establishment of energy management systems.

Life Cycle Analysis (LCA)
Method for assessing the environmental and other impacts which a product has on its surroundings from raw material extraction until final product disposal.

Material flows
Description of the resources which Aalborg Portland uses in the production of cement, the volumes which are produced, and the emissions and discharges which the production entails – see pages 22-23.

Microfiller
A filler material with particle size < 50 µm.

NH_3
Ammonia.

NO_X
Nitrogen oxides. Formed by combustion of fossil fuel. Contributory cause of acid rain.

OHSAS 18001
International guideline for establishment and maintenance of health & safety management systems.

ORW
One-sided Repetitive Work (ORW) is work where the same operation is repeated at intervals of seconds or minutes. ORW can give rise to physical or psychological problems in the workplace.

Petcoke
A low-ash coke by-product from the refining of crude oil into petrol.

Process management system
Aalborg Portland's system that ensures that the handling of all matters relating to environment, energy, quality and health & safety at the company takes place in a uniform manner and in accordance with policies, targets, guidelines and rules.

PRTR
European Pollutant Release and Transfer Register.

PSO levy
Levy obligating purchase of green electricity.

Pyrite ash
See iron oxides.

Raw meal
Cement clinker and incompletely burned raw materials. Raw meal may result from e.g. kiln stoppage.

SO_2
Sulphur dioxide. Formed by combustion of fossil fuel. Contributory cause of acid rain.

Substitution
Replacement of a raw material by a waste product. For example, fly ash substituted for clay.

tTCE
tonne Total Cement Equivalent. A standard unit for the production which is obtained by calculating the equivalent cement tonnage if clinker sales and changes in clinker stocks had been processed into cement. Each type of clinker is therefore multiplied by a factor that expresses addition of other materials for production of cement.

WA
Workplace Assessment

Environmental Report 2013
Environment and Health & Safety

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