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ENVIRONMENTAL REPORT 2012 - TARGET GROUP

Aalborg Portland's Environmental Report 2012 is intended to provide interest groups with straightforward insight into the company's principal environmental impacts and health & safety work and into the measures being taken to implement ongoing improvements.

The report also outlines the way in which the company's environmental management system is used and the direction in which it is moving. Environmental Report 2012 conforms to the statutory regulations.

Our stakeholders 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 2012

The Environmental Report 2012 is the Management's report on the principal activities relating to Aalborg Portland's cement production and storage terminals in Denmark and on the continuing efforts taking place in the areas of environment, energy and health & safety.

In October 2012, the Danish Nature Agency, after application from Aalborg Portland, issued a municipal plan supplement and EIA (Environmental Impact Assessment) relating to expansion of Aalborg Portland. The supplement safeguards Aalborg Portland's planning options for expanding and modifying the factory for many years ahead. The City of Aalborg at the same time granted permission for recovery of chalk from the existing quarry until 2052, at which time available resources in the Rørdal area will have been fully excavated. Together with the excavation permit a rehabilitation plan has been formulated for the chalk pit which targets the use of the area for local recreational purposes when excavation is no longer required.

Going forward, these permissions, together with increased political support for maintaining the competitiveness of the cement industry in Denmark, are important components in Aalborg Portland's long-term planning and future investment.

In 2012, due to the continued economic slowdown, cement production at Aalborg Portland was again below the factory's capacity. Although production was slightly higher than in 2011, the specific emissions of CO_2 , NO_X and SO_2 decreased. This was due to the continued focus on reducing and restructuring energy consumption and introducing alternative raw materials. These measures are leading to falling emissions per tonne of cement, and considerable focus will continue to be placed on these activities in strategy and action plans in order to enhance the factory's environmental performance.

The added focus placed in recent years on improving the energy efficiency of the existing production plant led in the period 2008-2012 to the implementation of electricity and fuel projects that deliver a saving of 169 million kWh, equivalent to the annual power consumption of 42,000 households.

In years ahead, continued strong focus will be given to reducing energy consumption through more efficient use of electricity and fuel. By these means Aalborg Portland will contribute to achieving the Danish Government's increased energy savings target as formulated in the agreement between the Danish Climate, Energy and Building Minister and the grid and distribution utilities.

In 2012, waste heat recycled from Aalborg Portland's production process was again used to provide district heating for the residents of Aalborg. The heat supplied corresponded to the annual electricity consumption of 21,000 households and this recycling can be expanded in the future.

In keeping with the Danish Government's desire to switch to more renewable energy forms Aalborg Portland has applied to be included in the forthcoming municipal plan for wind turbines, as the company's land at Bredhage would be ideal for such purposes. Aalborg Portland's application has now been embodied in the City of Aalborg's wind turbine plan, and work can therefore continue on the possibilities of realising this project along with its economic and environmental benefits.

In 2012, Aalborg Portland maintained strong focus on the possibilities of using alternative fuels and raw materials as replacement for fossil fuels (coal, petcoke and oil) and natural raw materials. Industrial waste, meat and bone meal and dried sewage sludge from the City of Aalborg were all used in the production of cement. Alternative raw materials utilised in 2012 included 423,000 tonnes of fly ash from power stations, sand dredged at Hals Barre and Løgstør Rende to keep the Limfjord navigable, and paper sludge from Dalum paper works. A symbiosis has also been established whereby Aalborg Portland sup-

Going forward increased political support for maintaining the competitiveness of the cement industry in Denmark will be an important component in Aalborg Portland's long-term planning and future investment

plies chalk slurry to the desulphurisation equipment at the power station Nordjyllandsværket and takes the 28,000 tonnes of gypsum produced in the desulphurisation process. Besides this gypsym, Aalborg Portland recycled 27,000 tonnes of gypsum from its own desulphurisation plant. These recycling activities are instrumental in help to conserve the world's available stocks of natural materials and fuels, thereby contributing to a resource-efficient society.

The human factor is critical to safety in the work place. Accordingly, Aalborg Portland's Health & Safety organisation has an important part to play at a day-to-day level, and our employees are actively involved in ongoing H&S improvements. Many acci-

dents and injuries can be prevented by planning and organising a safe work place, but the key element is individual employee behaviour. Focus is therefore being given to improving our safety culture by means such as increased risk assessment and behavioural change. These activities are crucial to enabling us to continue reducing the number and the seriousness of accidents in the work place.

Kjeld Pedersen Managing Director, Nordic Cement May 2013



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.dk

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, $1\overline{l}$, 1m, 1n, 1p,1o Rørdal, 9a, \emptyset . Sundby and 9a, 10g, 11a, 16i, 17l, 21h, Uttrup under Aalborg Jorde.

Significant secondary activities

K212. Facilities intended for temporary storage of non-hazardous waste prior to recycling or disposal with an input capacity of 30 tonnes of waste 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

The Environment & Energy Group:
Kjeld Pedersen, 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

Order on changed conditions for changed use of alternative fuels and raw materials.

Environmental approval for co-combustion of non-hazardous waste in Kiln 85.

Order on changed emission limits and continuous measurement of mercury on Kilns 85 and 87.

19 November 2010

Use of tyre chips as fuel in Kiln 87.

7 April 2010

Use of meat and bone meal as fuel in Kiln 76.

18 December 2009

General environmental approval and review comprising environmental approval of expansion of activities at recycling site and review of the company's older environmental approvals.

6 December 2006

Approval of transitional plan for on-site landfill.

6 December 2006

Approval of closure plan for tip.

5 November 2004

Permit for excavation of chalk.

28 July 1992

Establishment of landfill site.

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 Danish Ministry of Environment's regulations for the safe storage, handling and transport of materials that can cause serious environmental hazard in the event of accident.

Certifications

Aalborg Portland has been certified according to ISO 9001 since 1 March 1989 and ISO 14001 since 3 July 1998, and has been EMAS-registered since 2 March 2000. The company has further been certified according to OHSAS 18001 since 9 September 2002.

Auditor's report and EMAS registration

KPMG has expressed an opinion with a reasonable level of assurance on the Environmental Report for 2012 presented by the Management of Aalborg Portland. The report has been verified by Bureau Veritas according to the EMAS declaration, cf. page 40.

Brief qualitative description

Environmental Report 2012 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 324 employees.

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

The company's 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.

Output in 2012 totalled 1.8 million tonnes, around 42% of which was exported.

In the course of production, flue gases, waste products, waste water, surface water and cooling water were released which impact the environment.

The Environmental Report covers the period 1 January - 31 December 2012.

The next Environmental Report will be issued no later than April 2014.

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 taxes and work for a reduction of the existing burden.

To realise these objectives we will:

- Maintain and develop a process management system covering environment, energy and CO₂.
 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, including reduction of environmental footprint, shall be an integral part of the development in company activities.
- Our environmental activities shall be anchored through participation of all employees and 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 use 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 CO₂ 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 a 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 raw meal 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, which then travels to 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 2012, heat recovered from the kiln process during production of white cement was supplied to the City of Aalborg and was sufficient to meet the annual heat consumption of 21,000 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

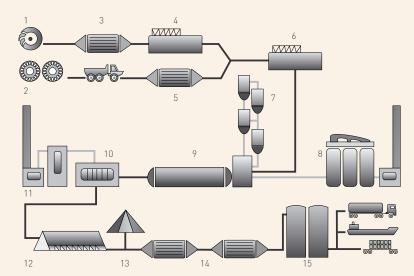
Cement is distributed in bags or in bulk by road or ship.

A quality product

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

From raw materials to cement

- 1. Chalk excavator
- 2. Sand dredger
- 3. Slurry drum
- 4. Chalk sludge
- 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 products are subject to Bureau Veritas Certification, which ensures the cements conform to the requirements of product standard EN 197-1 and are therefore CE-marked.

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, 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.

Product information

Information about our products can be found on www.aalborg. portland.dk. Current product data can be downloaded from our website and extranet.

Product declarations

Product declarations have been prepared for all products and specify the name of the cement, CE marking, and declared interval for properties for which requirements exist in the cement standard, as well as further properties important to Aalborg Portland's customers.

Safety data sheets

Safety data sheets describe more precisely such risks as may be associated with working with the product. They also state the precautions that should be taken and the protection that should be worn. All safety data sheets conform to the new Classification, Labelling and Packaging (CLP) regulations and can be found on our website.

Cement of the future

Aalborg Portland is engaged in developing several types of cement for the future.

The aim is eventually to create cements which can be manufactured with lower energy consumption, and in some cases with up to 30% less CO_2 emission.

In recent years Aalborg Portland has participated in a variety of research projects together with the Technical University of Denmark, the universities of Aalborg and Aarhus, and other players. This research is continuing.

The projects cover:

- Testing of concrete incorporating new types of cement resulting from the Supplementary Cementitious Materials (SCM) project.
- Preparation of environmental product declarations for Aalborg Portland's cement products.
- The LowE-CEM project in which research is taking place into long-term possibilities for low-energy cements, and therefore even greater CO₂ reductions than in the SCM project. Project focus is also on the quality and durability of the cements of the future.
- Concrete recycling the environmental benefits of concrete recycling, including uptake of CO₂ in pulverised concrete, are being investigated via life-cycle analysis.

Going forward, it will be exciting to follow the development of the cements of the future.



REACH

Denotes that cement is pre-registered with the European Chemicals Agency (ECHA). Aalborg Portland's website contains a number of downloadable certificates pertaining to management systems, environment, health & safety, etc.

EIA of factory and chalk pit

Planning for the future

Based on an application made by Aalborg Portland, an Environmental Impact Assessment (EIA) involving the City of Aalborg, the Nature Agency and the Environmental Protection Agency was initiated on December 2010.

A multi-phased and open process with public involvement through consultation with citizens, authorities and other interests, the EIA culminated in a municipal plan supplement and EIA report approved by the authorities on 10 October 2012 with no objections from the public.

In September 2011, in order to equip the company for both current and future challenges, Aalborg Portland filed a project application opening the way for expansion and changes in the company and in production.

The changes and expansions consist of three components, all geographically positioned within the company's existing factory and excavation area:

- Use of greater quantity of alternative fuels and raw materials in existing and future kilns
- Continued excavation of chalk in the chalk pit, and defined rehabilitation of the areas excavated, including with microfiller
- Establishment of a new cement kiln with ancillary facilities.

Conclusions

In a non-technical summary from the EIA it was the conclusion of the Nature Agency that:

"Implementation of the project may take place within the existing local plans, and excavation of chalk may take place within the zone designated for this purpose in the Raw Materials Plan for North Jutland.

Implementation of the project may take place subject to compliance with the requirements relating to e.g. noise and atmospheric emissions contained in the existing general environmental approval. However, continuous assessment will be made of whether the noise can be reduced further when this is technically feasible and economically reasonable in relation to the expected reduction in noise.

Environmental approval must be sought for establishment of certain of the new facilities, and permission must also be obtained for excavation of raw materials in the chalk pit as the existing permission expires at the end of 2012. Implementation of the project will not materially influence nature areas either close to or at a greater distance from the company.

It can therefore be concluded that implementation of the project will not materially increase Aalborg Portland's influence on the environment."

During the same administrative process Aalborg Portland was granted permission to excavate chalk from the existing chalk pit until 2052.



Environmental and energy management

Aalborg Portland has an integrated process management system defining the flows and procedures in all company processes. The system satisfies the requirements of the company's certification standards, which are currently:

DS/EN ISO 14001, EMAS III, OHSAS 18001, Working Environment Authority Executive Order No. 87, ISO 50001, DS/EN 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 for the individual employee as thought and action are "process-oriented" whether the situation relates to environment, energy, quality or health & safety.

The cornerstones of the management system are vision, policies, targets and action plans.

Management's assessment

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

For assessment of health & safety, see "Health & Safety" on page 32.

In June 2012, a seminar was held at which policies, targets and action plans for 2013 relating to environment, climate and energy were reviewed and defined.

Key points from the assessment included:

- Internal and external auditors have audited and performed internal control of the CO₂ monitoring plan for 2012 approved by the Energy Agency.
- The factory's CO₂ emission for 2012 was verified by Bureau Veritas Certification and can therefore be reported to the quota register in March 2013 so that corresponding emission quotas can be cancelled by 30 April 2013.
- The EMAS report was externally verified in March 2012. The environmental and energy management system was externally verified in May.
- Four meetings of the Environment & Energy Group were held as part of follow-up on the environmental management system, including two progress meetings concerning the principal environmental and energy targets.
- Follow-up and progress on 2012 climate and environmental targets in the general environmental action plan were discussed.
- Discussion of evaluation relating to the expired energy efficiency agreement with the Energy Agency for the period 2010-2012.



Principal environmental impacts

The manufacture of cement involves significant consumption of raw materials and energy and therefore gives rise to a number of direct environmental influences in the form of emission and discharge of flue gases, waste products, noise, waste water, etc.

Materiality criteria

In our environmental and energy work the principal environmental influences are mapped and selected according to the following criteria: Large volumes/large costs, diffusion and impact, terms in environmental approval, and consideration for neighbours. The starting point is the PRTR list of pollutants and emission thresholds that must be reported to the European Pollutant Release and Transfer Register (PRTR).

Due to the nature of the production process and the fact that the cement plant is situated a long way from the closest neighbours, Aalborg Portland does not consider odour relevant for environmental reporting. There is no discharge to the ground.

Environmental approval

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

• Terms of emission for all material sources of atmospheric pollution, comprising kilns, cement and coal mills, cooler stack and boiler plant.

- Terms of emission for factory noise.
- Requirements for handling and reporting serious operating disruptions and accidents.
- Requirements for operation of raw material and fuel stores.
- Requirements for operation of on-site landfills.
- Discharge of process waste water, cooling water, rainwater, etc.

Compliance with the requirements in the environmental approval, combined with the day-to-day environmental work at the plant, is instrumental in ensuring that no significant nuisance is caused to neighbours.

Environmental and energy performance

As follow-up on our environmental and energy work, significant key performance indicators have been selected relating to production of grey and white cement. These indicators are relative figures expressing consumption and emission in relation to production.

See also pages 22-23 "Material flows – key performance indicators 2012", showing developments for the past five years.

KEY PERFORMANCE INDICATORS	Unit	2008	2009	2010	2011	2012
Grey cement production						
Energy	GJ/tTCE	4.39	4.43	5,07	4.61	4.29
CO ₂	Kg/tTCE	769	745	809	792	764
NO _X	Kg/tTCE	2.01	2.14	0.97	0.64	0.63
White cement production						
Energy *	GJ/tTCE	6.59	6.86	7.12	6.96	6.59
CO ₂ *	Kg/tTCE	1,062	1,133	1,124	1,154	1,139
NO _x *	Kg/tTCE	3.26	2.74	2.42	2.11	1.54

^{*} Adjusted for heat recovered and supplied to Aalborg's district heating system. The adjustment relating to CO₂ and NO_X is based on the 125% thermal efficiency method for district heating.

The resource-efficient partnership

Aalborg Portland converts wastes and waste products to cement and district heating. The company actively promotes sustainable development by basing significant parts of its cement manufacture on the recycling of flows of materials from society and industry in a resource-efficient partnership.

Waste materials and homogenous by-products from other industries are recycled and used as fuel and raw materials in manufacture of cement. In addition, heat is recovered from factory flue gases and supplied to Aalborg's district heating system. In this way the overall environmental impact is significantly reduced.

By recycling fuels and alternative raw materials in the manufacture of cement, wastes and by-products are fully utilised. All the constituents are consumed and no new waste products are generated. High temperatures and distinctive process conditions mean that cement kilns are well suited to the use of alternative fuels and raw materials. In addition, filters and scrubbers inside the kiln system provide effective cleaning of flue gases, avoiding additional pollution from the factory.

In 2012, Aalborg Portland's production facilities used 505,000 tonnes of alternative fuels and raw materials to manufacture 1.8 million tonnes of cement. This replaced an equivalent volume of natural raw materials and fossil fuels that would otherwise have had to be excavated in Denmark or imported. Aalborg Portland has an annual capacity for 700,000 tonnes of alternative fuels and raw materials.









Society and industries

Waste product

Cement production

Cement and district heating with climate and environmental improvements

Power stations

Navigation channels

Sulphuric acid – factory

Recycled paper - factory

Recycled aluminium - factory

Fly ash and desulphurisation gypsum

Sand

Iron oxide

Paper sludge

Aluminium-contain. by-products

Biomass-fired plants

Dross

Collection schemes Industry waste Daka Bio-Industries Meat and bone meal

Sewage treatment plant Dried sewage sludge Consumption of alternative fuels and raw materials

- Recycling of alternative fuels and raw materials
- Utilisation of waste from other industrial production
- Lower CO₂ 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, including chalk, sand and gypsum. In 2012, in order to limit impact on stocks of natural raw materials, Aalborg Portland replaced 12% of these materials by alternative raw materials in the form of by-products and wastes from other industries and from society.

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

Dredged sand

Sand dredgers keep the navigation channels at Hals Barre and Løgstør Rende in the Limfjord open for the passage of ships, a task which benefits society and in which Aalborg Portland plays a part. The dredged sand, which would otherwise be dumped in the Kattegat, is substituted for excavated sand in cement manufacture, thus avoiding damage to both the marine environment and the landscape. Aalborg Portland's position next to the Limfjord also provides an effective logistical solution: sand dredgers dock alongside the factory and pump the sand into settling basins ashore for de-watering.

Flue gas desulphurisation gypsum

Gypsum produced by the removal of SO_2 from flue gases is also used in the manufacture of cement. This material is obtained from Aalborg Portland's own pro-

duction process as well as locally from the power stattion Nordjyllandsværket and is substituted for natural gypsum mined in Morocco and Canada. In this way the number of long maritime shipments is limited.

The local partnership between Aalborg Portland and Nordjyllandsværket is a good example of industrial symbiosis. Aalborg Portland supplies the power station with chalk slurry for desulphurisation and is in turn supplied with the desulphurised gypsum product.

A special road transporter has been developed that delivers the chalk slurry to the power station and also brings back the FDG gypsum. This halves the number of journeys made.

Fly ash

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

In cement manufacture, the fly ash replaces the natural clay material which would otherwise have to be excavated in Denmark.

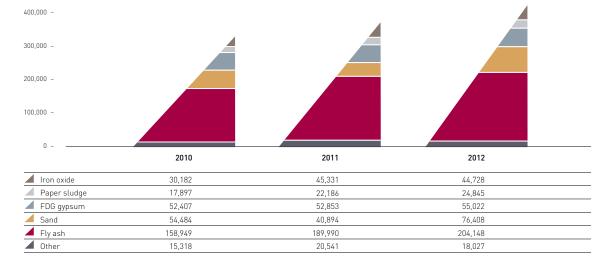
Paper sludge

Comes from the manufacture of recycled paper.

Iron oxide

A by-product of the manufacture of sulphuric acid.

Alternative raw materials - tonnes



Energy

Manufacturing cement calls for large quantities of fuel and electricity, which represent the energy used in the production process.

Replacement of fossil fuels, such as coal and petcoke, by alternatives began in the mid-1990s. In 2012, alternative fuels in the form of combustible waste products amounted to 24% of total energy input.

Waste is energy

Recycling of waste contributes to a resource-efficient society. Instead of being dumped in landfills, waste can be substituted for coal and petcoke in the manufacture of cement.

Unlike with combustion in waste incineration plants, no by-products are created in the form of slag as all the input materials are integrated in the cement chemistry and in the finished cement product.

Waste-based fuel also helps reduce emission of CO_2 , NO_X , SO_2 , etc. in flue gases, and content of biomass benefits global climate activities. For example, meat and bone meal are considered completely carbonneutral, and in mixed industrial waste the proportion of biomass used to replace fossil fuels is typically 30-40%.

Dried sewage sludge and cheap district heating

Dried sewage sludge supplied from the City of Aalborg treatment plants is used as a carbon-neutral biofuel to replace coal and other fossil raw materials. In return, Aalborg Portland supplies the residents of Aalborg with cheap district heating based on waste heat recovered from production.

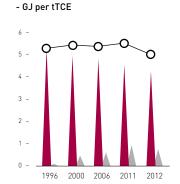
The heat supplied makes a significant contribution to the city's district heating system, which at maximum production corresponds to the annual consumption of some 36,000 households.

Now that Aalborg Portland has won back the contract to receive sludge from the Aalborg East treatment plant as from 2012, there is also a saving on motorway transport – 8 km instead of 800 km to north Germany.

Fuel consumption

There was a fall in total relative fuel consumption (GJ per tTCE) of more than 8% compared with 2011, which was due to a number of targeted energy measures in 2012. These included transition to mineralised operation on the white cement kilns, which led to easier combustibility of raw materials and more stable kiln operation. In addition, the following fuel economy projects were implemented on Kiln 87:

- Optimisation of start-up burners
- Advanced Process Control system

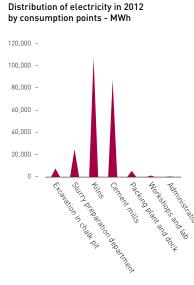


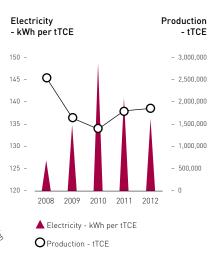
Alternative fuel

Fossil fuel

OTotal fuel

Fossil fuel relative to alternative fuel





Electricity

Electricity is vital to cement plant operation. In 2012, electricity consumption at Aalborg Portland was 247,241 MWh, distributed as shown on the opposite page.

The principal consumption points are the kilns and cement mills.

The consumption of electricity comprises base power load for the machinery and variable power consumption, which depends on whether the main machinery is producing cement.

In 2009 when the economic slowdown impacted in earnest, production and variable power consumption fell, but the base load for the machinery did not decrease correspondingly. The total relative power consumption therefore started rising and peaked in 2010.

With a slight increase in production in 2011, combined with activities to reduce both base load and variable consumption, the relative power consumption has fallen 8.6% since 2010.

Energy saving

Aalborg Portland is focused on saving energy – both in the form of electricity and fuel – and intensive efforts have been made over many years to reduce power and fuel consumption in the production of cement.

Activities in recent years, with added focus on improving the energy efficiency of existing equipment, have resulted in the implementation of projects in the period 2008-2012 that have yielded power and fuel savings of 169 million kWh, equivalent to the annual power consumption of 42,000 households.

The progress of economy projects introduced in 2012 is stated in pages 26-27.

One of these projects is described in more detail below.

Optimisation of start-up burners on Kiln 87

This project identified a potential energy saving by optimising the start-up burners on Kiln 87 by using preheated combustion air from the kiln cooler instead of cold cooling air. This will provide an annual energy saving of 11,300 MWh.

Start-up burner function

Each of the calciners for Kiln 87 is equipped with an oil start-up burner for heating purposes and for igniting the fossil fuel during the initial phase of kiln start-up. These start-up burners, which were installed in the early 1990s and have since created a number of starting problems that have led to delays, consist of a burner with an oil nozzle, flame monitor, ignition lance and primary air fan.

The overall design of the start-up burner installation has made it extremely difficult to remove the burner when its work is complete. As a result, the primary fan has been run continuously in order to cool the burner which would otherwise be damaged by the heat inside the calciner (approx. 940° C).

Start-up burner modification project

In order to optimise the start-up burner installation and allow the primary fan to be stopped during normal operation a number of modifications have been made:

- Modification of oil installation to provide the correct oil pressure and temperature
- A new flame monitor and controller
- A damper and closing mechanism enabling the burner to be pulled out safely
- Modification of primary air pipeline enabling the burner can be pulled out.

With these modifications it is now possible to stop the primary fans for both start-up burners during normal operation by disconnecting the air duct, pulling out the burners and closing the damper so that cold air is no longer blown into the calciners by the primary fan.

Project results

An annual energy saving of 11,300 MWh has been achieved by:

- Replacing cold combustion air with preheated combustion air from the clinker cooler = thermal energy saving
- Stopping the primary fan during normal operation = electrical energy saving.

In addition, a smaller thermal energy saving has been achieved by avoidance of delayed starts, along with an associated saving of electrical energy for the primary fan.

Atmospheric emissions

At Aalborg Portland there are a number of atmospheric emission sources, principally chimneys and fans. These sources range from large chimney stacks to small emissions such as extraction from workshops.

The factory has a total of around 400 emissions requiring conditioning. This conditioning is performed by a variety of filters.

The contents of the largest chimney stacks are monitored on an ongoing basis as there are measuring devices continuously metering the concentration of certain elements.

In addition, a number of discharges are regularly sampled and analysed to further document the contents. Sampling and analysis are performed by an accredited laboratory.

Flue gases

CO_2

Relative CO_2 emission decreased 4% compared with 2011. This was primarily due to decreased fuel consumption as a result of improvement projects on Kiln 87 and the white cement kilns.

N0_x

In the period 2004-2007 all kilns were fitted with newly developed scrubbers to satisfy heightened emissions criteria. As a result, relative emission has fallen 73% against 2003. In 2012 alone, optimised scrubbing led to a NO_X decrease of 19%. On the grey cement kilns NO_X is being reduced by injecting ammonia water, leading to an increase in NH_3 discharge which remains within the limits specified in the environmental approval.

S0₂

Relative emission has fallen over the years, and de-

creased by 20% in 2012 compared with 2011. This has primarily been achieved through one-string kiln operation on shared scrubber equipment, enabling the full capacity for two kilns to be used for desulphurising the flue gases. The sulphur content in the fuel mix has also been reduced.

CO

Establishment of air mixing equipment to reduce NO_X emission from the white cement kilns means that operation is closer to the CO formation threshold, hence the increase in relative CO level.

Dus

Relative dust emission is unchanged from 2011. Complaints relating to dust emissions caused by operational malfunctions are described on page 30.

Emission limits

The environmental approval from 2009, which in accordance with BAT requirements underwent mandatory amendment in October 2012 with stricter emission standards for kilns, specifies criteria and limit values for operations.

In 2012 the emission limits were exceeded in 12 cases, six involving SO_2 , four involving CO and two involving dust. These cases were notified to the Environmental Protection Agency in the monthly reports.

The table below shows the five main sources of air pollution from cement plants, the related emission limits and Aalborg Portland's current average mission levels. Emissions of dust, NO_X and SO_2 are determined by averaging continuously recorded data.

Limits stated are mean values per 24-hour period. For clarity the table shows the averaged daily level for the year.



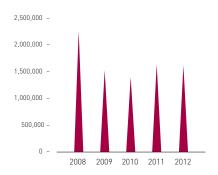




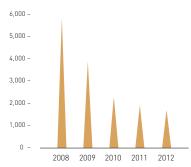


Atmospheric emissions - CO_2 and NO_X

CO₂ - absolute figures - tonnes

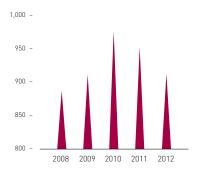


 NO_X - absolute figures - tonnes

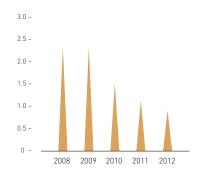


2012	1,658,029	1,621
2011	1,683,864	1,945
2010	1,420,067	2,153
2009	1,513,917	3,881
2008	2,235,680	5,876
	▲ CO ₂	▲ NO _X

 CO_2 - relative figures - kg/tTCE



 $\ensuremath{\mathsf{NO}_X}\xspace$ - relative figures - kg/tTCE



2012	911.9	0.9
2011	953.2	1.1
2010	976.6	1.5
2009	910.3	2.3
2008	876.3	2.3
	▲ CO ₂	▲ NO _X

Limits and levels during operation – the five main sources

All values are stated in mg/Nm3 dry flue gas at 10% oxygen content

		NO _X		SO ₂		Dust
	Limit *	Averaged level 2012**	Limit *	Averaged level 2012 **	Limit*	Averaged level 2012**
Heat recovery kiln 73/79	550	200	375	57	25	0.2
Heat recovery kiln 74/78	650	313	425	209	25	1.8
Heat recovery kiln 76	500	169	250	9.6	25	0.03
Kiln 85	750	797 ***	500	71 ***	35	11.0 ***
Kiln 87	400	125	10	1.3	25	7.8

- 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/Nm³

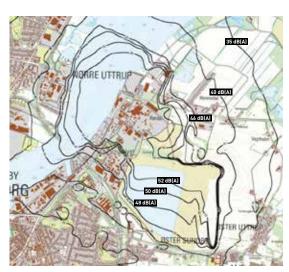
The noise from Aalborg Portland originates from a large number of stationary sources, both indoors and outdoors, including from on-site traffic.

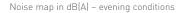
The noise sources include chimneys, kilns, cement and coal mills, belt conveyors, fans, ships at dock, lorries, and excavation and remediation operations relating to the chalk pit.

An external noise survey was performed at Aalborg Portland in 2006. The position of all noise sources was mapped by GPS, which has improved the data on which the noise calculations are based.

The noise map was last updated in February 2012 as part of the EIA for factory and chalk pit. With all equipment operating at maximum output (worst case scenario), noise measurements taken at all locations were found to be in compliance with the company's general environmental approval.

The factory's noise contribution is considered to be below the theoretical maximum due to continued







Water

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

Aalborg Portland obtains water from on-site wells in a limestone aquifer situated outside designated drinking water areas. A number of pipeline arrangements have been implemented over the years, including to limit consumption. These are discussed below.

Aalborg Portland has a permit to extract a total of 5.2 million m³ of water annually. In 2012, 4.2 million m³ was extracted as equivalent loading of the water resource. This included 1.2 million m³ recovered below the water table in the chalk pit from chalk dug by deep-excavator.

The remaining 3 million m³ includes 1.8 million m³ taken from 15 on-site wells close to the factory, and 1.2 million m³ from groundwater lowering around Kilns 76 and 85.

Relative water consumption fell 3% compared with 2011. This was principally due to reduced need for groundwater lowering as a result of reduced rainfall in the Aalborg area in 2012.

Groundwater lowering/equipment cooling

Local lowering of the groundwater table has over the years shown to be an effective solution for maintaining basements, underground passages and transport systems at Aalborg Portland in dry condition. At the same time almost 900,000 m³ of this water is used for cooling the compressor plant, for which groundwater would otherwise have to be extracted specifically.

Separated water systems

Following bacterial contamination of the drinking water in 1998 the factory's water supply was separated into two systems, one for drinking water and one for technical water. Technical water is used for production purposes.

Recycling of filtrate water

Filtrate water originates in the heat recovery and desulphurisation system that removes SO_2 from the flue gases to produce gypsum. Until 2004 this water was discharged into the Limfjord.

High levels of production meant that the water extraction limit of 5.2 million m³ was also being reached.

The effective solution was, and still is, to recycle the filtrate water to points of application in cement produc-

tion. In 2005, this saved 460,000 m³ of technical water that would otherwise have had to be extracted from the company's own wells. The corresponding discharge of water into the Limfjord ceased at the same time. A win-win situation. In 2007, when production was at a high level, the saving reached 520,000 m³, but fell to 242,000 m³ in 2012 at lower production.

Remediation wells protect against contamination

In 2007, three remediation wells were established to safeguard the factory's water supply from contamination by trichloromethane and tetrachloromethane originating from land formerly leased from Aalborg Portland by the Danish military. The contaminated water is used for technical purposes in the factory.

The remediation wells proved highly effective as early as 2008, and analyses from adjacent test wells showed that levels of trichloromethane and tetrachloromethane were now with safe limits. This remained the case in 2012 but as the level of tetrachloromethane in the remediation wells still exceeds the maximum for drinking water of 1 μ g/litre, pumping from the remediation wells will continue as hitherto.

Harvesting of surface water

In 2012, around 12,000 m³ of surface water was harvested from the storage area next to the slurry preparation department and used in slurry production. This reduced the extracted volume of technical water by an equivalent amount.

Monitoring programme

Since 1991 an external company has performed a series of hydro-geological measurements and analyses of water quality. Ongoing reporting provides an overview of developments. This ensures effective protection and use of water resources.

Surface water and waste water

Aalborg Portland sends waste water to the public sewer system. The water is released into Limforden after passing through the municipal treatment plant. Surface water and cooling water are released directly into the Limfjord.

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

Waste and waste products

Waste is sorted as closely to the source as possible and placed in bins, skips and oil and chemical stations around the factory. The waste is used for recycling and combustion in accordance with the City of Aalborg's regulations or landfilled on-site.

More than 99% is non-hazardous waste. The remainder is characterised as hazardous in the form of oil and chemical waste and mixed landfill waste.

The relative volume of waste decreased 17.5% compared with 2011 as recycling of microfiller from white cement kilns to grey cement kilns increased and white cement production fell. This resulted in a fall in landfilling on-site at Aalborg Portland.

Recycling of waste products in the chalk pit

In accordance with the municipal plan supplement and EIA and the chalk pit rehabilitation plan, provision exists for establishment of banks and terraces constructed of microfiller in two defined stages, 1 and 2. The Environmental Protection Agency has issued an environmental approval for this, and the project is expected to start when conditions in the approval have been met.

A waste product from the scrubbing of kiln flue gases at Aalborg Portland, microfiller is primarily recycled for use in blended cements, or by outside companies as for example aggregate in asphalt production. Residual volumes of microfiller have hitherto been land-filled on-site at Aalborg Portland but can in future be recycled in rehabilitation of the chalk pit.

Stage 1 of the rehabilitation consists of an embankment in the northern part of the chalk pit which will be backfilled with microfiller behind connecting earth banks in six layered sections, cf. figure on the opposite page. When the microfiller is in place (60,000 m³), the surface will be topped with soil and seeded with grass. Trees may also be planted.

Please refer to the section 'Land use and biodiversity' on page 28 for more information concerning the idea and basic principle for rehabilitation of the chalk pit.

WASTE – amount in tonnes	2008	2009	2010	2011	2012
TOTAL WASTE	23,919	23,714	28,937	30,256	25,655
UTILISED NON-HAZARDOUS WASTE	4,243	4,297	4,250	2,888	2,432
Recycling	3,629	3,800	3,670	2,732	2,209
Sand and grating material	1,443	2,441	2,366	1,187	1,079
Building waste	894	499	222	173	37
Metals	751	634	662	1,148	610
Paper and cardboard	2	4	11	4	15
Glass	-	-	-	0.5	_
Plastics	-	-	-	23	4
Electronic scrap	4	3	5	0.02	6
Other combustible	535	219	404	196	458
Incineration	614	497	580	156	223
Mixed combustible	581	471	561	141	209
Municipal collection	33	26	19	16	14
UTILISED HAZARDOUS WASTE	224	274	125	138	106
Oil	220	271	124.3	134	102.5
Chemicals	4	3	0.4	4	3.5
DISPOSAL OF NON-HAZARDOUS WASTE					
On-site landfill	19,357	19,109	24,464	27,221	23,094
DISPOSAL OF HAZARDOUS WASTE					
Off-site landfill	95	34	98	9	23



Rehabilitation of chalk pit with microfiller

Stages 1 and 2 are in the northern and western parts of the chalk pit which have already been quarried out and partially rehabilitated.

Stage 1

The purpose of the embankment is to establish a natural transition between the area at the transfer station and the bank of the lake. The embankment will also screen off sight of the factory and act as a partial noise barrier for the public access area envisaged in the northern and western part of the chalk pit.

Stage 2

Consists of establishing terraces in the western part of the chalk pit that can accommodate 200,000 $\rm m^3$ of microfiller constructed on the same principle as for Stage 1.

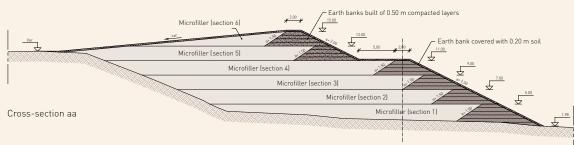
The terraces are envisaged used for a variety of sporting activities, such as mountainbiking, jogging and hang gliding. A system of paths is envisaged for the terraces, and general amenity areas may be established.



Walking area

Width 30 m

Schematic for construction of embankment with microfiller (Stage 1)



Water level elevation 0.00 Wide sloping shore

Material flows

Key performance indicators 2012 - Aalborg Portland cement plant

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

The absolute volumes are calculated 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. The latter 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		Abso	olute figures :	- tonnes *		/	Relati	ve figures – l	kg * / tTCE	
	2008	2009	2010	2011	2012	2008	2009	2010	2011	201
COMBUSTION AIR										
(02, N etc.)	766,094	542,622	457,277	573,047	562,031	300.3	326.3	314.5	324.4	309.
02, 11 010.)	, , , , , , ,	0 12,022	107,277	070,017	002,001	000.0	020.0	011.0	021.1	007
RAW MATERIALS										
Chalk	3,922,933	2,615,372	2,400,904	2,937,540	2,939,060	1,537.6	1,572.6	1,651.2	1,662.9	1,616
Water	3,256,522	2,664,025	2,688,259	3,057,496	3,052,623	1,276.4	1,601.8	1,848.8	1,730.8	1,678
Sand	130,133	111,416	110,626	128,047	106,838	51.0	67.0	76.1	72.5	58
Gypsum	46,389	32,951	21,646	31,469	32,769	18.2	19.8	14.9	17.8	18
Other	33,263	24,568	31,253	29,885	39,442	13.0	14.8	21.5	16.9	21
Packaging	1,720	1,169	1,091	1,101	1,003	0.7	0.7	0.8	0.6	0
RECYCLABLES										
Fly ash	273,656	186,721	158,949	189,990	204,148	107.3	112.3	109.3	107.5	112
Sand	159,335	59,330	54,484	40,894	76,408	62.5	35.7	37.5	23.1	42
FGD gypsum	64,564	25,201	52,407	52,853	55,022	25.3	15.2	36.0	29.9	30
Paper sludge	49,537	25,619	17,897	22,186	24,845	19.4	15.4	12.3	12.6	13
ron oxide	60,406	32,374	30,182	45,331	44,728	23.7	19.5	20.8	25.7	24
Other	54,905	33,143	15,318	20,541	18,027	21.5	19.9	10.5	11.6	9
Total	662,403	362,388	329,237	371,795	423,178	259.7	218.0	226.4	210.4	232
FUELS Coal Petcoke	140,928 214,391	45,713 186,145	78,285 161,393	54,679 204,211	36,150 213,894	55.2 84.0	27.5 111.9	53.8 111.0	31.0 115.6	19. 117.
-uel oil	12,681	6,239	8,435	7,222	5,615	5.0	3.8	5.8	4.1	3.
Alternative fuel	100,468	88,552	68,080	83,022	81,899	39.4	53.2	46.8	47.0	45.
Total	468,468	326,649	316,193	349,134	337,558	183.6	196.4	217.4	197.7	185
Electricity	(MWh) 323,733	(MWh) 224,528	(MWh) 216,419	(MWh) 249,188	(MWh) 247,241	(kWh/tTCE) 126.9	(kWh/tTCE) 135.0	(kWh/tTCE) 148.8	(kWh/tTCE) 141.1	(kWh/tT0

 $^{^{}st}$ Determined with water content of materials.





OUTPUT 		Abso	olute figures	– tonnes *		1	Relat	ive figures –	kg * / tTCE	
0011 01	2008	2009	2010	2011	2012	2008	2009	2010	2011	2012
FLUE GASES										
CO ₂	2,235,680	1,513,917	1,420,067	1,683,864	1,658,029	876.3	910.3	976.6	953.2	911.9
NOx	5,876	3,881	2,153	1,945	1,621	2.3	2.3	1.5	1.1	0.9
SO ₂	1,397	877	680	620	504	0.55	0.53	0.47	0.35	0.28
CO	1,792	1,244	1,113	1,068	1,372	0.70	0.75	0.77	0.60	0.75
Dust	175	69	35	52	62	0.07	0.04	0.02	0.03	0.03
NH ₃	_	-	-	18	28	-	-	-	0.01	0.02
HCl	31	10	13	5	2	0.012	0.006	0.009	0.003	0.001
Hg	0.15	0.07	0.03	0.02	0.01	0.000057	0.000045	0.000022	0.000010	0.000004
PRODUCTS										
Cement	2,494,021	1,575,211	1,553,003	1,810,647	1,798,013	977.5	947.1	1,068.1	1,025.0	988.8
Clinker **	52,862	76,267	-87,935	-32,514	19,591	20.7	45.9	-60.5	-18.4	10.8
Filler **	-353	1,881	-149	2,373	2,016	-0.1	1.1	-0.1	1.3	1.1
Chalk slurry to power station	າ			,	•					
(Nordjyllandsværket)	6,004	13,847	16,203	10,230	4,358	2.4	8.3	11.1	5.8	2.4
Total	2,552,534	1,667,206	1,481,122	1,790,736	1,823,978	1,000.5	1,002.5	1,018.6	1,013.7	1,003.1
Adjustment	-	-	-	-	-	-0.5	-2.5	-18.6	-13.7	-3.1
Total Cement Equivalent	2,551,346	1,663,126	1,454,043	1,766,561	1,818,293	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0
Packaging	1,720	1,169	1,091	1,101	1,003	0.7	0.7	0.8	0.6	0.6
	· · · · · · · · · · · · · · · · · · ·	,	·	,	· · · · · · · · · · · · · · · · · · ·					
WATER										
Water Steam	1,366,972	984,264	1,149,406	1,361,524	1,317,884	535.8	591.8	790.5	770.7	724.8
Cooling water, incl. Kiln 85 groundwater	2,848,735	2,311,365	2,086,319	2,256,291	2,358,260	1,116.6	1,389.8	1,434.8	1,277.2	1,297.0
Groundwater lowering			, , .	,,		,	,	,	,	
(Kiln 76)	204,824	135,067	157,937	313,446	272,284	80.3	81.2	108.6	177.4	149.7
Waste water	44,271	38,377	27,612	38,588	33,820	17,4	23.1	19.0	21.8	18.6
HEAT RECOVERY FOR DISTRICT HEATING	1,432,350	(GJ) 1,139,729	(GJ) 1,177,344	1,204,501	(GJ) 1,045,751	(MJ/tTCE) 561.4	(MJ/tTCE) 685.3	(MJ/tTCE) 809.7	(MJ/tTCE) 681.8	(MJ/tTCE) 575.1
WASTE ***										
Recycling	3,629	3,800	3,670	2,732	2,209	1.4	2.3	2.5	1.5	1.2
Incineration	614	497	580	156	223	0.2	0.3	0.4	0.1	0.1
Landfill	19,452	19,143	24,562	27,230	23,117	7.6	11.5	16.9	15.4	12.7
Oil and chemical waste	224	274	125	138	106	0.1	0.2	0.1	0.1	0.1

^{**} Incl. sales and change in stocks. *** Waste volumes are classified into hazardous and non-hazardous wastes on page 20 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 climate and environmental improvements and in health & safety. In the period 2008-2012 a total of EUR 17.9m has been invested in a wide range of environmental technology improvement projects.

In 2012, Aalborg Portland invested a total of EUR 5.9m in climate and environmental improvements, including energy-saving projects, accident prevention and health & safety initiatives.

Investment projects in 2012 included:

- An advanced process control system to provide optimised energy management for Kiln 87
- Optimisation of start-up burners on Kiln 87
- Increase in alternative fuel for Kiln 87
- Recycling of waste air from Kiln 87 cooler to Coal Mills 4 and 5
- Preparation for switch to energy-efficient fans for Kiln 87
- Mineralised white cement clinker improved combustibility
- Centralised fire warning system for electrical equipment rooms, and replacement of RCCBs

A total of EUR 4.1m was also invested in maintenance of production plant. Maintenance in the form of filter replacement can have a preventive effect on e.g. dust emission, and can benefit energy consumption by limiting intake of false air from leaks during kiln operation.

Strong focus is also given to production reliability. For example, replacing kiln lining bricks whenever necessary helps meet production targets by minimising the number of unscheduled kiln stops.

These activities result in stable and optimal operation of production plant and cleaning systems, thereby minimising environmental impacts.

Environment

As well as funding investments in environmental improvements, operating costs, green taxes and the running of the Health & Safety Organisation, Aalborg Portland also funds operating costs for the Environment & Energy Unit and the Health & Safety Unit. These operating costs totalled EUR 0.5m in 2012.

Environmental taxes

Environmental taxes increased from EUR 5.7m in 2011 to EUR 9.1m in 2012, a significant rise of 60% due to increased NO_X and PSO levies.

Advanced Process Control system

Aalborg Portland has installed an Advanced Process Control system (APC) on Kiln 87. By making ongoing adjustments to the kiln process the system has reduced kiln heat losses to the main exhaust stack and reduced the power consumption of the flue gas fans. The documented annual energy saving is 12,300 MWh.

The APC receives data via an interface from the existing control system (SDR) and sends calculated setpoints back to the SDR. The APC functions on the basis of various 'step-tests' on Kiln 87 and can predict how the process will react to various changes. This enables the setpoints to be changed more frequently, more quickly and more precisely than with conventional adjustment.

The Advanced Process Control system on Kiln 87 is capable of performing the following actions:

- Stabilising all important temperatures (bottom cyclone, calciner and kiln) by adjustment of calciner fuel, swivel damper and kiln fuel
- Stabilising and increasing the tertiary air temperature via cooler control
- Reducing HAF fan speed in order to reduce excess air volume
- Reducing the temperature in the separator cyclone by adjusting cut-off gate and HAF speed
- Reducing over-burning of the clinker in the kiln via stabilisation.

The project results have been documented by the following energy savings:

- Heat losses to the main stack via flue gases have been reduced by 9,777 MWh annually.
- Power consumption to the exhaust fans has been reduced and power saving is 2,523 MWh annually.

60%

increase of Aalborg Portland's environmental taxes

EURm	2012	2011
The Parent Company has paid the following direct environmental taxes:		
PS0	3.2	1.7
NO _X	2.1	0.3
Waste	1.5	1.7
Electricity	1.0	0.5
Energy	0.6	0.7
Raw materials	0.6	0.5
Sulphur	0.1	0.2
	9.1	5.7

Electricity saving by reduced compressed air usage for aeration of slurry basins 2 and 3

This project targets a reduction in base power load. Prior to the modification of aeration for slurry basins 2 and 3 there used to be a compressor operating inside both basins.

Modifications to other basins and slurry silos in 2011 showed that homogenisation of slurry can be satisfactorily accomplished using less air consumption than hitherto.

The modifications to basins 2 and 3 comprised installing hydraulically operated changeover valves downstream of the compressors so that both basins can be supplied by only one compressor. The air volume for each basin has therefore been reduced by half. The valves change over every five seconds so that passage is only open to one basin at a time.

Since the modification there has only been one com-



Environment and energy targets – activities and results

TARGETS 2012 STATUS 2012 **TARGETS 2013 ELECTRICITY SAVING** - Strategy 2011-2015 Continued focus on power-saving measures and Continued focus on power-saving measures and reduction of base power load. reduction of base power load. The 2012 target is to implement power-saving U Target achieved. In 2012, the following projects The 2013 target is to implement power-saving measures, including for equipment operating on generated annual power savings of 3,761 MWh: measures, including for equipment operating on base load, aimed at annual savings of 1,000 MWh. base load, aimed at annual savings of 2,500 MWh. • 2,523 MWh/year - Reduced power consumption by exhaust fans due to installation of APC system on Kiln 87 • 522 MWh/year - Reduced compressed air consumption in slurry basins 2 and 3 • 369 MWh/year - Repair of compressed air leaks • 241 MWh/year - Reduced power consumption in server room in admin. building • 86 MWh/year - Power shutdown to cement tanker site • 20 MWh/year - Switch to LED lighting in canteen and conference room Heightened target: Reduce the specific variable • Target achieved – the specific variable power Heightened target: Reduce the specific variable power consumption by 4% in 2015 against 118 consumption was reduced to 110.9 kWh/tTCE, a power consumption by 7% in 2015 against 118 kWh/tTCE in 2010. fall of 5.8% against 2010. kWh/tTCE in 2010. Reduce the base power load by 5% in 2015 against Reduce base power load by 5% in 2015 against The target must be achieved in 2015. Base power 45,856 MWh in 2011. load for 2012 was 45,555 kWh, a fall of 0.7% 45,856 MWh in 2011. against 2011. WIND TURBINES - RENEWABLE ENERGY Aalborg Portland has contacted the City of Aalborg The ultimate target is to replace 40% of power regarding inclusion of the company's land in the consumption by renewable energy from wind wind turbine plan. turbines established on Aalborg Portland's land. ALTERNATIVE FUEL The ultimate target is to replace minimum 40%25.6% was replaced in 2012. The ultimate target is to replace minimum 40% of Expansion of the outdoor storage facility is perof the fuel energy for grey cement production the fuel energy for grey cement production (Kiln (Kiln 87) by alternative fuel, thus reducing CO₂ mitted in the area covered by the local plan 87) by alternative fuel, thus reducing CO2 emiswithout prejudice to nature regulations, subject emission. Investigate possibility of expanding sion. The final form of the approved project is still storage capacity. to environmental and fire technology approval. under discussion. The remainder of the project is being reviewed in the light of changed marked conditions for waste In 2013 the target is to replace 35% of the fuel resources. energy for Kiln 87. FIREFIGHTING WATER In 2012 a project proposal was formulated for Implement project for harvesting firefighting water harvesting water for firefighting. in areas of fire risk

Research projects promoting climate-friendly and sustainable projects are described on page 7 in "Cement of the future".



U Target achieved 😕 Target not achieved

TARGETS 2012 STATUS 2012 TARGETS 2013 FUEL SAVING The 2012 target is to implement measures to Target not achieved as the cooler replacement The 2013 target is to implement measures to achieve annual fuel savings of 150,000 MWh. project was not completed in 2012. The following achieve annual fuel savings of 70,000 MWh. projects carried out in 2012, generated annual fuel savings of 105,712 MWh: • 80,600 MWh/year - Mineralised operation on white cement kilns • 11,300 MWh/year - Optimisation of start-up burners on Kiln 87 • 9,777 kWh/year - Reduced heat loss due to APC system on Kiln 87 • 2,425 MWh/year - Excess air from Kiln 87 cooler to Coal Mills 4 and 5 • 980 MWh/year - Reduced heat consumption in • 630 MWh/year - Steam shutdown to cement tanker site CO₂ REDUCTION Continue focus on reducing CO₂ emission by CO2 emission from grey and white cement pro-Continued focus on reducing CO₂ emission by increased use of biofuel and ultimate developduction was reduced by a total of 68,378 tonnes increased use of biofuel and ultimate development of new cements. ment of new cements. by replacing fossil fuel with biofuel. Reduce CO₂ emission from grey cement produc-U Target achieved. CO₂ emission from grey cement Reduce CO₂ emission from grey cement production by 2% against 792 kg CO₂/tTCE in 2011. production was 764 kg $CO_2/tTCE$, a fall of 3.5% tion by 3% against 764 kg CO₂/tTCE in 2012. against 2011. Reduce CO2 emission* from white cement pro-😕 Target not fully achieved, as the consumption of Reduce CO2 emission* from white cement production by 3% against 1,154 kg CO₂/tTCE in 2011. duction by 2% against 1,139 kg CO₂/tTCE in 2012. CO2-neutral meat and bone meal and the production of district heat were lower than planned. CO2 emission* from white cement production was 1,139 kg CO₂/tTCE, a fall of 1.4% against 2011. NO_X REDUCTION Reduce the specific NO_X emission by 6% against • Target achieved. The specific NO_X emission fell to Reduce the specific NO_X emission by 4% against 1.10 kg/tTCE in 2011 by continued optimisation of 0.89 kg/tTCE - a decrease of 19% - by transition 0.89 kg/tTCE in 2012 by continued optimisation of to production of mineralised white cement clinker scrubbing and by increased use of NO_X -reducing scrubbing and by increased use of NO_X-reducing alternative fuel. and NO_X optimised scrubbing. alternative fuel. WASTE Increase the application of filler materials by Target not achieved, as 23,094 tonnes of waste Increase the application of filler materials by recycling in building works and by further-develwere landfilled on-site at Aalborg Portland, recycling in building works and by further-develalthough this was a fall of 15.2% against 2011. oping the product range. oping the product range. The fall would have been greater but allocation Thereby reduce the on-site landfill volume by 9,295 Thereby reduce the on-site landfill volume by of filler for recycling of microfiller in chalkpit tonnes against 2011 (27,221 tonnes), a reduction 12,000 tonnes against 2012 (23,094 tonnes), a rehabilitation could not start in 2012 as planned. of 34%. reduction of 52%.

^{*} Adjusted by heat recovered and supplied to Aalborg's district heating system. The adjustment for CO2 is based on the 125% thermal efficiency method for district heating.

Land use and biodiversity

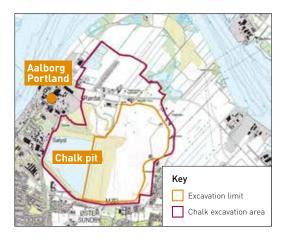
Biodiversity means variation or diversity in nature.

Areas used for production and buildings, storage and landfill have significance for the biodiversity which exists in other areas owned by Aalborg Portland in the Rørdal area.

The breakdown of land use is as follows:

Aalborg Portland's total land ownership amounts to 1,800 ha, which includes 197 ha used for cement production. The remaining 1,603 ha comprises a mosaic of lakes, woods, meadows, salt marshes, fallow and farmland. 89% of Aalborg Portland's land therefore offers good scope for biodiversity.

Aalborg Portland land (ha)	1,800
Factory	120
Active chalk quarry	61
Landfill site	12
Iron oxide facility	4
Total area used	197



Focus on the chalk pit – excavation permit

The chalk pit is situated close to the factory and will cover around 240 ha when fully utilised. An important part of the chalk pit will be the lake whose azure-blue colour is typical of waters in chalk excavations.

Aalborg Portland has a permit to excavate chalk in the Rørdal area within the zone designated in the Raw Materials Excavation Plan for North Jutland. This permit covers the next 40 years, until 2052, when chalk pit excavation is expected to be completed. The permit was renewed by the City of Aalborg on 8 November 2012 after a public enquiry, at which there were no objections, and preceding EIA process – see next page.

Chalk pit rehabilitation plan

The rehabilitation plan envisages development of the chalk pit as a recreational area for a variety of leisure and sporting amenities, the lake being used for sailing, waterskiing, diving and bathing, and the areas surrounding the lake potentially being used for hanggliding, mountainbiking, jogging, walking and similar activities.

The basic principle of the rehabilitation is that the steep slopes around the perimeter of the chalk pit, particularly to the west and north, will remain as they are. The chalk will therefore be left exposed and in time will therefore become colonised by the special vegetation characteristic of chalky areas.

In two defined areas (Stages 1 and 2), banks and terraces may be established as "recycling facilities", cf. also section on "Waste" in pages 20-21, where natural raw materials will as far as possible be replaced by wastes and waste products in accordance with the objects clause of the Danish Raw Materials Act.



New chalk excavation permit

By Peter Pedersen, land surveyor, City of Aalborg

In summer 2011, Aalborg Portland contacted the City of Aalborg to discuss a new excavation permit to replace the existing 10-year permit due to expire at the end of 2012.

Where the City of Aalborg was concerned it was clear from the start that one of the requisites for the new permit was an Environmental Impact Assessment. Aalborg Portland rapidly arrived at the same result and enlisted the assistance of Rambøll. It was clear that Aalborg Portland's other expansion requirements, including a new kiln, also necessitated an EIA.

After meetings attended by Aalborg Portland, the City of Aalborg, the Environmental Protection Agency, the Nature Agency and Rambøll it was quickly decided to focus on one rather than two EIAs. Realising an EIA project containing so many diverse elements pertaining to nature, environment, planning etc. in around 12 months demands positive collaboration, respect for mutual competencies, the right resources, observance of deadlines, and so on.

It was evident from early on that the players involved – representing Aalborg Portland, the authorities and the consultants – were committed to delivering a successful project – on time, and with a high degree of professionalism.

Through the determined efforts of all parties, a combined EIA was successfully approved, environmental approvals were obtained and a new excavation permit was issued. In my opinion, this positive outcome was principally due to competent teamwork. As the representative of a public authority it was gratifying to be involved in a partnership infused with professional respect, confident that everybody was working in the same direction. There were important

and complex discussions and challenges along the way, but the focus was always on finding a successful solution.

In considering the issue of a new excavation permit the point of departure for the City of Aalborg was that excavation has already been taking place for many years in a well-defined area which is a designated regional excavation zone. A factor in determining the length of the permit was that the company performing the excavation has invested heavily in production machinery. The length of the permit corresponds to the time it is expected to take to fully excavate the area – and in this way a clear statement has also been made in relation to neighbours etc.

The excavation at Rørdal is changing the landscape radically and irrevocably. As a public authority, the City of Aalborg must ensure optimal utilisation of the raw material resource, but at the same time ensure consideration for neighbours, nature and environment. Besides the terms of the permit, this has been done by defining requirements for an excavation plan and a rehabilitation plan.

In our rehabilitation requirements we have chosen to focus on both nature and recreational use. Considerable potential exists for both. The quarry will therefore be left with relatively steep chalk slopes and large surfaces uncapped with earth and soil, as is otherwise usual in such rehabilitations. The lake itself and its close environs simply "cry out" for recreational use. Chalk slopes and surfaces provide good "development" opportunities for flora and fauna.

The City of Aalborg regards the excavation at Rørdal as an ongoing dynamic development which has now been placed within a long-term overall framework. In support of this, the excavation and rehabilitation plan will be subject to review at three-yearly intervals to ensure that the City and the company are continuously on "track".

Environmental dialogue

In order to ensure and strengthen ongoing environmental dialogue with stakeholders and interested parties, Aalborg Portland conducts the following important activities:

- Continuous contact is maintained 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.
- Involvement of environmental data from suppliers via supply contracts which cover environment.
- Environmental Report 2012 will be published at mid-May 2013.
- In 2012, Aalborg Portland received 101 visits totalling 1,518 individuals. The visitors were given 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 2011 were downloaded 991 times in 2012.
- Staff in the departments participate in Energy & Environmental Focus Teams.

The Environmental Report is sent to a large number of interested parties nationally and internationally, including neighbours, owners, authorities, politicians, the Danish Society for Nature Conservation, customers and suppliers. A total of some 600 copies are distributed. The report is also available to all staff in the factory and is published on our website.

To optimise motivation and dialogue with internal and external stakeholders regarding our environmental activities, all parties are urged to voice opinions and suggest improvements to our reporting.

Operational disturbances

Aalborg Portland's procedure for dealing with operational disturbances and breakdowns is described in the process management system and the terms of the general environmental approval. This ensures that all relevant authorities are consulted in finding solutions to problems that may lead to environmental pollution or risk thereof.

The number of dust release incidents from Aalborg Portland resulting in complaints fell by two to a total of nine. Such complaints usually follow precipitator problems.

Numer of releases resulting in complaints

	2008	2009	2010	2011	2012
Dust	19	14	14	11	9
Noise	2	1	3	0	1
The Limfjord	0	0	1	1	0
Other	0	0	0	0	0

Requirements to suppliers

Aalborg Portland's general contracts with suppliers have been amended with a clause describing systematic activities relating to environment, energy and health & safety, including the company's certified management systems.

Aalborg Portland also makes it clear that importance is placed on partnerships with suppliers who are certified and who are environmentally and socially aware. Aalborg Portland reserves the right to audit relevant environmental and health & safety issues relating to partnerships with suppliers. Three supplier audits are planned for 2013.

Prior to contract signature, new suppliers are assessed for compliance with performance specifications relating to materials and fuels.

Sustainable distribution

In 2012, product distribution involved the handling of some 1.8 million tonnes of cement for transport to the domestic and export markets. Our influence on export transport is chiefly limited to the choice of ship as the medium of carriage, and this part of the transport may therefore be designated an indirect environmental impact.

However, in our domestic market we have better possibilities for exercising influence on the environmental impacts of transport in the form of exhaust emissions, road wear, etc. We therefore also have a responsibility for ensuring that our distribution takes place in a sustainable manner.

In 2012, 72% of our cement was distributed by ship and 28% by road tanker or lorry.

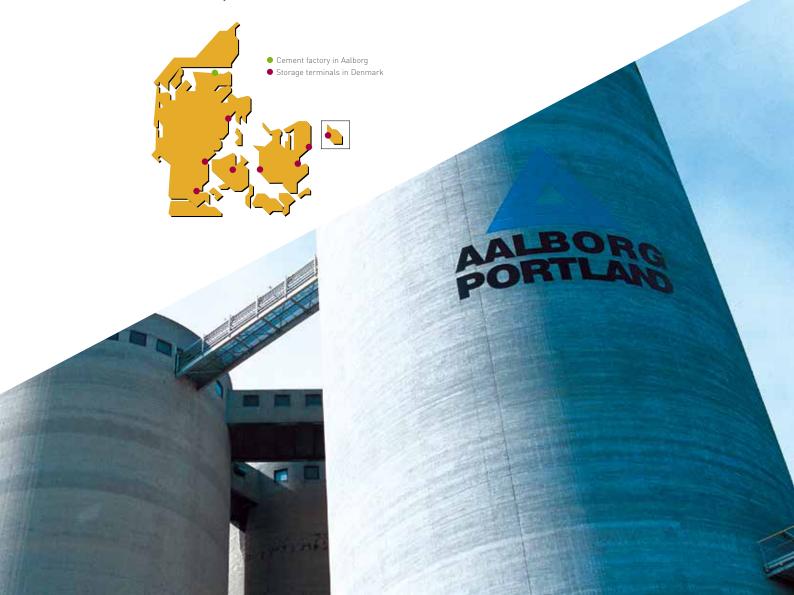
All cement manufacture takes place in Aalborg, from which the bulk of production is transported by ship to our eight Danish storage terminals strategically positioned nationwide. Onward transport to the customer is by road.

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

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

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 fuel is locally sourced and therefore travels a much shorter distance than coal, petcoke and oil.



Health & Safety

A positive working environment strengthens productivity and is the key to strong competitiveness in the form of low sick absence, high level of job satisfaction, well-being and flexibility. This brings benefits to management, employees and – not least – customers.

Aalborg Portland's integrated management system is based on quality across the board, including health & safety, hence the term "QHS" (Quality, Health & Safety). Health & safety is thus an intrinsic part of the overall management system, and at the operational level it plays a key role in the everyday lives of our people.

Our H&S organisation has an active role and thus also a considerable responsibility for continuously improving health & safety, supported by the positive collaboration and backing of the individual employee.

A safe and healthy workplace demands a targeted commitment. At Aalborg Portland this commitment is supported by a training plan for the H&S organisation.

Management's assessment

Management's QHS assessment was held on 11 February 2013 and included all relevant input from the organisation.

At the annual meeting of the H&S organisation, targets were proposed for 2013 and these were presented at the Management's assessment. The targets were adopted, and the direction was therefore set for H&S activities in 2013, cf. page 35.

Annual meeting of H&S organisation

The annual H&S meeting included a retrospective on activities in 2012, both in general terms and specifically relating to accidents. Statistics were presented stating accident causes, types and dates and the length of service of the victims. We repeated the success of forming small work groups, which focused on teambuilding and 5S (one of the tools designed to contribute to a tidier, more orderly – and thus also safer – workplace. Effective collaboration across the H&S organisation is key to everyday preventive work.

H&S organisation elections will be held in March 2013. Electronic voting is expected as this is considered more efficient.

Health & Safety policy

Aalborg Portland is focused on manufacturing quality products that live up to the requirements and expectations of the customer. Health & Safety is an integral part of the company's existence and continuous efforts are made to realise improvements.

Guidelines

All activities must always be conducted in accordance with relevant legislation, and in accordance with internal company guidelines that ensure a continued safe and healthy workplace. The point of departure – at all times – is Aalborg Portland's core values: Grow with passion for effectiveness, Integrated diversity, Act concrete simplicity, Rigorous flexibility, Accountability for the future.

Our employees

Aalborg Portland is committed to creating the best possible framework for a safe and healthy workplace, wherever technically and economically feasible, by using the best available solutions and methods. We are committed to ensuring that all our employees are trained and motivated to work actively to improve the working environment.

All employees are therefore responsible for helping to improve 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

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

Policy, targets and objectives

The H&S organisation establishes targets for the year ahead at the annual health & safety meeting. Health & safety targets are discussed at the Management's assessment where the final targets for the period are set. H&S policy is updated on an ongoing basis and at least every two years.

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



Accidents and prevention

In 2012 there were 10 "registered accidents", i.e. accidents resulting in more than one day off work. The relatively low number was due to strong awareness on the part of both H&S organisation and employees, combined with intensified preventive work – a development expected to continue. A total of 18 "ordinary accidents" were reported, i.e. accidents of a superficial nature not leading to time off work.

Accident frequency (number of accidents per one million working hours) averaged 18 for the year. Average days lost per accident was 4.7.

2012 saw the installation of information screens displaying ongoing H&S developments. The aim is to heighten focus and day to day dialogue on H&S issues, including the learning process and exchange of experience.

Psychological health & safety is strongly influenced by the sometimes turbulent working day. In 2012, two stress seminars were therefore held to give employees greater insight into the processes at work when we feel stressed by everyday tasks – and how we can prevent and deal with such situations which affect ourselves and our co-workers.

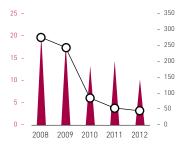


List of accidents	Number	%
Head excl. eyes	4	16%
Eyes	2	8%
Neck incl. vertebrae and spine	2	8%
Back, incl. vertebrae and spine	2	8%
Body and organs	1	4%
Upper limbs	7	28%
Lower limbs	5	20%
Other injury	2	8%
Total 2012	25	100%

	2008	2009	2010	2011	2012
Accidents reported to the Working Environment Authorities					
Number of accidents reported	20	17	13	14	10
Number of days lost	287	244	87	52	47
Accident frequency / Time lost – Hourly paid and salaried employees					
Accident frequency – accidents per one million working hours	20.4	26.9	20.8	22.1	17.9
Time lost – hours lost per 1,000 working hours	2.2	2.9	1	0.6	0.6
Accident frequency / Time lost - Hourly paid employees					
Accident frequency – accidents per one million working hours	33.2	56	44.4	48.8	32.2
Accident frequency – accidents per one million working hours					
(stone, clay and glass industries)	25.5	27.8	29.6	24.0	*
Time lost – hours lost per 1,000 working hours	3.8	5.9	2.3	1.3	1.3

^{*} Data not available

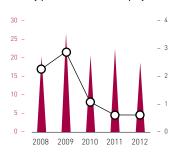
Accidents reported to the Working Environment Authorities



Number of accidents reported

O Number of days lost

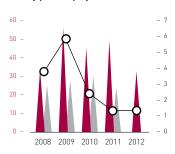
Accident frequency / Time lost Hourly paid and salaried employees



Accident frequency – accidents per mill. working hours

OTime 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)

OTime lost - hours lost per 1,000 working hours



TARGETS 2012	STATUS 2012	TARGETS 2013
WORKPLACE ASSESSMENT SURVEY		WORKPLACE ASSESSMENTS
Complete Workplace Assessment survey and input action plans into IPL before 1.7.2012.	Action plans prioritised. Target achieved.	Implement system of rolling Workplace Assessments.
WORKPLACE ASSESSMENT SURVEY		EDOGNIGNIOS
Minimise One-sided Repetitive Work – (ORW activity relative to results of Workplace Assessment survey).	The survey has shown that corrective measures are needed. Two sessions are therefore planned in 2013 targeted at individuals with needs – but also open to all.	ERGONOMICS Provide two sessions giving professional assistance with organisation of office workplaces.
SICKNESS ABSENCE		FACTORY TRANSIT SAFETY
Max. 2.8 sickness absence in 2012 (excl. long-term sick).	U Current status – target for 2012 achieved.	Maintain transit routes (as per plan) to ensure optimal, safe movement in all external areas (roads and open spaces). Rolling plan for 2013, 2014 and 2015.
ACCIDENTS		ACCIDENTS
Aalborg Portland is committed to reducing the number of accidents. The 2012 target is max. 12 registered accidents.	U There were 10 registered accidents in 2012.	The 2013 target is max. 10 registered accidents.
Max. 19 accidents per one million working hours.	18 accidents per one million working hours.	Max. 18 accidents per one million working hours.
SAFETY CULTURE		PSYCHOLOGICAL HEALTH & SAFETY
In order to strengthen safety culture and team spirit, provide supplementary training for all H&S organisation members in 2nd half 2012.	Target achieved. Teambuilding focused on safety culture was provided for all H&S organisation members.	Set up contingency plans and procedures for supporting the individual employee.
SAFETY CULTURE		SAFETY CULTURE
In order to strengthen safety culture, prepare an annual H&S plan.	U Target achieved. An annual plan was formulated for all H&S activities.	Strengthen the company's safety culture by providing an internal safety seminar for all employees [100% attendance].
		SAFETY CULTURE
		Update all safety instructions (100%).
		SIGNAGE
		Update all signage throughout the factory with view to improving workplace safety.

U Target achieved Target not achieved

Safety management system

The plan for Aalborg Portland's safety management system was implemented at the start of 2011, and the three-year exercise programme is being followed. In 2012, a major joint exercise was carried out based on a situation of heightened alert in Denmark with the factory's normal emergency staff occupied with other tasks. The exercise was coordinated by Aalborg Portland, the Safety Management Committee and the Danish Emergency Management Agency. Some 50 people took part in a highly productive exercise which yielded a number of useful improvement proposals that will be implemented in our organisation.

Safety guidelines

Safety guidelines are the procedures set up to ensure that day-to-day maintenance, repair and cleaning tasks are performed in a manner entirely conducive to health and safety. The guidelines are available for consultation by both company personnel and external contractors.

Workplace safety instructions / Safety data sheets

2012 saw the implementation of an online database system which ensures that all chemicals are registered on the basis of safety data sheets provided by the supplier. Based on these data, workplace safety instructions (WSI) are prepared. These ensure that we only use materials and substances that are evaluated and approved, that users possess the necessary, adequate WSI's (and therefore also the right protective equipment), and that we have an overview of the use of the individual substances and materials, including the quantities of these substances and materials.

Aalborg Portland's own safety data sheets have been updated in accordance with REACH and CLP (new hazard labelling system). They are therefore in compliance with legislation and are available on our website.

Legislation database

In order to ensure that we are always up to date with legislation a legislation database was established in 2012 targeted specifically at our industry.

Workplace Assessments

Our survey of Workplace Assessments was completed in 2012. A number of points relating to the action plans were finalised, the remainder being carried over to 2013.

Collaboration between the HR function and the H&S organisation was further strengthened in 2012. Much of what appears on a Workplace Assessment is HR-related, including issues concerning psychological health and safety, stress, etc. The coordination between both functions is good, and policy on sick absence is similarly a joint issue. This ensures that the individual employee's situation is addressed at the earliest possible stage in what is a positive process from start to finish.

External contractors

When discussing health & safety issues it is important to continue maintaining focus on external contractors. Aalborg Portland's safety film is required viewing for external contractors before they start work – and must be seen at least once annually.

Ahead of major tasks, including kiln shutdowns, there is close contact with external contractors on the coordination of safety work. Many accident situations are thereby prevented or pre-empted, and many external contractors voice strong satisfaction with this arrangement. The close dialogue frequently gives rise to improvement suggestions that can lead to concrete initiatives benefiting both parties.

Safety film and welcome folder

In 2012, Aalborg Portland's safety film was uploaded to YouTube in several languages (English, Danish and German). Our suppliers can therefore access the film in their own company and view it before arrival at Aalborg Portland. A welcome folder containing key information about our company is also issued.

Fitness

The Aalborg Portland fitness centre continues to be used by many employees and guidance remains available from an instructor. In addition, there are badminton courts which are likewise very popular.

Aalborg Portland urges its employees to participate in activities which promote healthy living. In 2012, 65 employees from Aalborg Portland, divided into 13 teams, participated in the nationwide DHL relay race.

Diet

The canteen concept of a healthy buffet from which the employee can compose a good and nourishing meal of his own choice remains a success. Theme campaigns of 1-3 days' duration are also staged. In 2012 – in partnership with the Canteen Committee – the canteen gave further focus to low-calorie products.

Smoking

Aalborg Portland's smoking policy has just been updated. As well as all smoking indoors, e-cigarettes are now also prohibited.

Anti-smoking courses are available to all employees.

Inclusive labour market

With a view to retaining individuals who have valid reasons for frequent or prolonged absence from work, Aalborg Portland adheres strictly to its policy of contacting and holding discussions with such employees.

In 2012, performance reviews were again held with both salaried and hourly-paid employees. Topics discussed included well-being, health & safety, and the need for training leading to new skills and qualifications.





Measurement and calculation of material flows



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

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.
- CO₂ emission for 2008-2012 is determined according to the approved CO₂ emission plan for Aalborg Portland and verified externally.
- NO_X, SO₂, CO, and HCl as well as 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

Socio-economic contribution

Aalborg Portland's cement production in Denmark is of significant national economic importance.

In 2012, Aalborg Portland's value added was calculated as EUR 91m. Of this, EUR 32m, [35%], went to society in the form of VAT, company tax, other taxes and employee income tax. EUR 16m, [18%], went to the employees in the form of wages and pension contributions (after tax). EUR 40m was transferred to the company's equity.

Distribution of value added

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

EUR 32m

of the social contribution went to the public sector in 2012, corresponding to an increase of 10%



Society	35%
Employees	18%
Interest on loan capital	2%
Transferred to equity	45%



Independent auditor's report

To the stakeholders of Aalborg Portland A/S

We have performed an assessment of the Environmental Report 2012 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 2012. Our responsibility is to express an opinion on the Environmental Report 2012 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 2012 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, 19 April 2013

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 date

9 April 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 Technology 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

Grinds cement clinker into cement.

CO

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

CO₂

Carbon dioxide. Formed by burning of fuel and calcining of chalk. ${\rm CO}_2$ emission is calculated according to EU guidelines.

dB(A)

Noise is measured in decibel – 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 established by EU regulation.

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 systems with potential environmental impact may not 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 generated in the heat exchangers of the heat recovery facility by condensing of vapour from flue gases.

Flue gas desulphurisation gypsum (FDG)

Gypsum formed by the desulphurisation of flue gases.

Fly ash

Material resulting from cleaning of flue gases in an electrostatic precipitator.

Fossil fuel

Coal, petcoke, oil and natural gas.

GJ

Gigajoule = 1,000 MJ

HCl

Hydrogen chloride.

Hg

Mercury

IPL

System for handling Aalborg Portland's Workplace Assessments.

Iron oxides

Iron-containing residues from production of sulphuric acid.

ISO 14001

Standard issued by the International Standards Organisation that contains guidelines for designing and maintaining environmental management systems.

ISO 50001

Standard dealing with guidelines for establishment of energy management systems.

Life Cycle Analysis (LCA)

Method for assessing the environmental and other impacts of a product on its surroundings from extraction of raw materials until final 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

Specially produced filler material with particle size < 50 μm .

NH₃

Ammonia.

NOx

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

OHSAS 18001

International guideline for development 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 mental problems in the workplace.

Petcoke

 $\ensuremath{\mathsf{A}}$ low-ash coke by-product from the refining of crude oil into petrol.

Process management system

Aalborg Portland's system that ensures that all environmental, energy, quality and health & safety issues in the company are dealt with consistently and in accordance with policy, targets, guidelines and rules.

PRTR

European Pollutant Release and Transfer Register.

PSO charge

Levy obligating purchase of green electricity.

Pyrite ash

See iron oxides.

Raw meal

Cement clinker and incompletely burned raw materials. May result from e.g. kiln stoppage.

S0₂

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 production output, obtained by calculating the equivalent cement tonnage if all the clinker had been processed into cement.

WA

Workplace Assessment

