



Orkla - Environmental Report 1998

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THIS IS ORKLA

Orkla is the second largest listed company in Norway in terms of market capitalisation. The Orkla Group has three core business areas: Branded Consumer Goods, Chemicals and Financial Investments. From the 1980s up to the present the Group has been one of Norway's fastest growing businesses. Operating income has increased from NOK 1.2 billion in 1982 to NOK 30.8 billion in 1998. 54 % of Orkla's operating income and 51 % of employment were generated outside Norway in 1998.

The Branded Consumer Goods area accounts for close to 80 % of Group operating income and comprises food, beverages, snacks, biscuits, chocolate, confectionery, detergents, personal products/cosmetics, newspapers and magazines. This business area wishes to consolidate its position as the leading supplier of branded consumer goods to Nordic households. Future growth will primarily be achieved through greater focus on the most successful product groups and through gradual expansion outside the Nordic region, largely into selected markets in Eastern Europe.

The Chemicals area, which includes Borregaard's production of specialty chemicals, fine chemicals and ingredients, is Orkla's most international business. The company has production facilities on every continent except Australia, and holds strong global positions in its selected niches. This business area accounts for approximately 20 % of total Group operating income. Focus is on specialisation and adaptation to customer needs of highly processed products which have good profitability and global development potential.

Orkla holds one of Norway's largest equity portfolios, with a market value as of 31 December 1998 of NOK 12.6 billion. The Financial Investments area accounts for approximately 25 % of total Group assets.

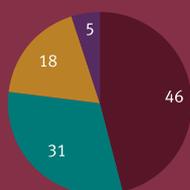
KEY GROUP FIGURES

	1998	1997	1996
Operating income (NOK mill.)	30,819	30,970	25,998
Operating profit before OIE* (NOK mill.)	2,132	2,432	1,896
Operating profit (NOK mill.)	1,797	2,613	1,916
Profit for the year after tax (NOK mill.)	1,378	2,562	1,752
Replacement and environmental expenditure (NOK mill.)	1,843	1,738	1,203
Total assets (NOK mill.)	38,775	36,865	26,496
Total man-years	23,709	23,378	18,277

* Other income and expenses

OPERATING INCOME BY GEOGRAPHICAL AREA

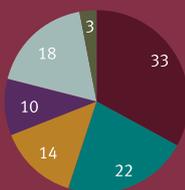
- Norway 46 %
- Other Nordic countries 31 %
- Other European countries 18 %
- Other 5 %



Total operating income
NOK 30,819 million

OPERATING INCOME BY BUSINESS AREA

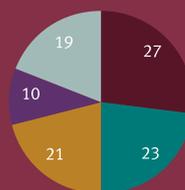
- Orkla Foods 33 %
- Orkla Beverages 22 %
- Orkla Brands 14 %
- Orkla Media 10 %
- Chemicals 18 %
- Other 3 %



Total operating income
NOK 30,819 million

OPERATING PROFIT BEFORE OIE* BY BUSINESS AREA

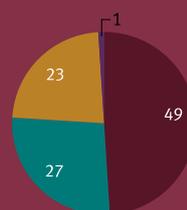
- Orkla Foods 27 %
- Orkla Beverages 23 %
- Orkla Brands 21 %
- Orkla Media 10 %
- Chemicals 19 %



* Other income and expenses
Operating profit before OIE
NOK 2,132 million

MAN-YEARS BY GEOGRAPHICAL AREA

- Norway 49 %
- Other Nordic countries 27 %
- Other European countries 23 %
- Other 1 %



Number of man-years 23,709

- Adverse environmental effects for which we are responsible will be reduced through genuine, forward-looking solutions.
- We strive to achieve the highest possible quality - technical and operational - in all our efforts to address environmental issues.
- Environmentally sound operations are a prerequisite for future profitable growth. Our expertise and experience must be used to manufacture products that are preferred because they combine utility and environmental benefits.
- Product development, production, distribution, consumption and re-use of Orkla's products must be adapted to meet the goal of long-term sustainable development.
- We will pursue a policy of openness and active dialogue in our environmental efforts.
- Each business area sets its own environmental goals, establishes systems and control procedures and is responsible for implementation and reporting.

Orkla's environmental policy

Orkla works in a broad range of fields to contribute towards environmental improvements. More efficient use of energy, raw materials and packaging, cleaner processes, environmentally sounder products, a life-cycle approach, reduced emissions and waste and more recycling and reuse of materials are all ways of reducing the environmental impact of processes and products.

This report provides information about the most important environmental measures implemented by Orkla's business areas in 1998. The Group's efforts to achieve environmental improvements are a continuous process, as new challenges lead to new experience and results. Environmental measures will continue to have high priority at Orkla in the years ahead and will require considerable resources.

ENVIRONMENTAL EFFORTS AT ORKLA

Orkla's environmental policy provides basic guidelines for all the companies in the Orkla Group and summarises the priorities that must govern their day-to-day work on environmental issues. This policy is defined in *Goals and Values*, a document which is known to all employees as the corporate "constitution" and which emphasises that the environmental perspective is an important dimension of all Orkla's operations.

The main responsibility for environmental efforts at Orkla lies with the management of each business area. Although several problems are common to all companies in the Group – such as energy use, the use of certain types of packaging, minimising waste and economising on transport – most challenges are unique to individual business areas. Consequently, it is at this level that the problems must be identified, prioritised and solved.

THE GROUP'S INTERNATIONAL OPERATIONS

The Group's international operations have expanded rapidly in recent years, and Orkla currently has production plants in more than 20 countries. In principle, wherever we are in the world, we must meet the same environmental standards as in our main countries. In cases where this is clearly unrealistic – primarily in countries with old-fashioned technology and serious environmental problems – we may become involved if our activities will help to achieve a major improvement in local environmental conditions. All local requirements must always be complied with.



Focus on the environment

Orkla continued to focus on environmental improvements in 1998. Several projects with a positive impact on the external and internal environment were completed.

Below we have focused on three projects and described them in greater detail. The first article takes a closer look at Orkla Brands' continuous efforts over a period of several decades to manufacture detergents that are taking increasing account of environmental considerations. The second article gives an overview of the environmental effect of the long-term investments made in the Chemicals area's lignin business. Our third example, which appears on page 15, describes the Chemicals area's development and start-up of a copper recovery plant.

Other projects are described in the reports on the individual business areas.

DETERGENTS AND THE ENVIRONMENT

Lilleborg is Norway's largest manufacturer and marketer of detergents and has therefore long been committed to incorporating environmental considerations into its product development. Through its own

Lilleborg seeks to ensure that as many of its products as possible qualify for the official Swan eco-label. The liquid hand dishwashing detergent Sunlight was awarded the Swan label in 1998.

The Nordic Eco-labelling Board determines the criteria for the Swan eco-label. The main emphasis is on preventing the adverse effects that detergents in waste washing water may have on the environment, and ensuring that the detergents are effective cleaning agents, as defined in tests carried out by consumer organisations.



product development and close cooperation with the British-Dutch company Unilever, Lilleborg focuses continuously on making its products environmentally sounder without decreasing their efficiency.

Biodegradable surfactants. Around 1970, on its own initiative, Lilleborg began to use only soft surfactants, which are biodegradable. In the late 1980s, the company went one step further and is now using surfactants that are completely degradable in a shorter period of time. Lilleborg is therefore well in advance of expected future official requirements.

Phosphates. In the early 1970s, the quality of the water in a number of watercourses and lakes, largely in connection with high inputs of phosphates, was a prominent public concern. Since phosphates are an important ingredient in detergents, much of the attention was focused on Lilleborg. Even though only a very small portion of the overall inputs of phosphates stemmed from detergents, Lilleborg initiated a process aimed at reducing the level of phosphates over time. Suitable alternatives were used to replace phosphates as they became available, and the phosphate level was reduced in several stages from 34 % in 1970 to 12 % in 1986.

By 1986, Lilleborg had made such headway in its efforts to develop equally effective phosphate-free detergents that the company promised the authorities that it would eliminate the use of phosphates in all laundry detergents in the course of 1988, well before the official ban on phosphates became effective on 1 February 1990. Lilleborg went even further and eliminated phosphates from its dishwasher detergent, Sun, in 1991, even though the use of phosphates has never been prohibited in this area.

Washing at low temperatures. In 1983 Lilleborg began to add TAED, a substance that activates the bleaching agent in powder detergents, making it possible to wash clothes clean at lower temperatures. It was possible to achieve the same effects at 60° as previously at 90° and correspondingly at 40° rather than 60°.

Concentrated detergents (micropowders). Lilleborg launched its first concentrated laundry detergent in 1990. It was based on a production process that made it possible to manufacture the washing powder without using unnecessary subsidiary components. With the introduction of micropowders, doses could be halved. Concentrated detergents offered three environmental benefits:

- reduced emissions of chemicals
- approximately two thirds less packaging
- energy savings on transport

Packaging. Lilleborg has long given priority to finding environmentally sounder packaging solutions and has succeeded in significantly reducing the volume of packaging per unit, largely thanks to micropowders. In 1990 Lilleborg introduced refills for its liquid detergents, and in 1993 refill bags of micropowder were launched. Savings have also been achieved by reducing the weight of plastic bottles for most products.

Environmental labelling. When the Nordic Swan Label was established as official eco-label at the beginning of the 1990s, Lilleborg supported this scheme. The company was the first to market a detergent bearing the Swan label in Norway. Since then,

Lilleborg has obtained the Swan label for leading brands in all categories of detergents. To qualify for the Swan label, products must satisfy stringent environmental and functional criteria.

Health and safety. Lilleborg products are based on formulations designed to pose the least possible threat to health and safety. For instance, as a result of the company's own long-term product development work, Sun was reclassified from a corrosive product to a product that is not harmful to health, at the same time as it was made more effective and less damaging to china, crystal etc. For products that are harmful to health, such as Klorin and Salmi, Lilleborg introduced childproof screw tops for bottles in 1989.

Since 1993/94 Lilleborg has also launched a number of products specifically designed for persons with sensitive skin. Ingredients such as dyestuffs and fragrances that may cause an allergic reaction have been eliminated from these products, which are recommended by the Norwegian Asthma and Allergy Association.

Other chemicals. Lilleborg continuously seeks to make use of environmentally sounder substances in its products. For instance, optical whiteners were phased out in 1993, perborate was replaced by percarbonate as bleaching agent in 1996 and great care is exercised in choosing the preservatives used in liquid detergents

In the years ahead, Lilleborg will continue its active efforts to reduce the environmental effects of processes and products, while improving their efficiency.

ENVIRONMENTALLY SOUND LIGNIN-BASED PRODUCTS FROM BORREGAARD

Borregaard is the world's largest manufacturer of lignin-based products. In 1998, Borregaard LignoTech had 12 factories in Norway, Sweden, Finland, Germany, Switzerland, England, Spain, USA, China and South Africa. These factories produced a total of 400,000 tonnes of lignin products which were sold to more than 70 countries. Almost all the production volume was sold outside Norway.

Lignin, the raw material used by Borregaard LignoTech, is renewable. Approximately 30 % of a

tree consists of lignin. This material is released during the production of pulp and is recovered in the form of lignosulphonate. Lignosulphonate is modified chemically and in other ways to manufacture a broad range of bulk and specialised products, which are sold in the form of a powder or liquid. These products are used as additives in a large number of processes and products.

Lignin-based products have two main areas of application. They are used as dispersing agents to regulate the flow properties of water/powder mixtures such as concrete, drilling mud, textile dyestuffs, gypsum wall board and ceramics. They are also used as binding agents, where lignin is utilised in the manufacture of coal and peat briquettes, animal feed pellets and paper sizing. Lignin as a dust binding agent is an environmentally-friendly alternative to the traditional use of salt on roads.

Lignin-based products are in themselves environmentally sound. They are derived from a renewable raw material, they are biodegradable and non-toxic, and they thus are advantageous compared with many synthetic competitors.

Lignin-based products have favourable environmental effects, particularly when used as dispersing agents, which account for the bulk of sales. One example is concrete, where the use of lignin as an additive makes it possible to utilise cement more efficiently, since the cement content may be reduced without impairing the quality of the concrete. Lignin also keeps concrete workable even when less water is added, resulting in concrete that is stronger and pours more evenly.

The production of cement involves substantial emissions of CO₂. By reducing the consumption of cement, lignin reduces CO₂ emissions. Based on the principles in a report prepared by Det Norske Veritas, it is estimated that Borregaard LignoTech's global sales of lignin products for use as additives for concrete admixtures in 1998 are equivalent to a reduction in CO₂ emissions of approximately 3 million tonnes.

Thanks to the use of lignin-based products in formulas for crop protection chemicals, solvent-based systems can be replaced with environmentally sounder water-based systems.

If lignin additives are used in the production of gypsum wall board, the water content of the gypsum dispersion can be reduced, leading to a significant reduction in the energy used to dry the boards.

In some cases as a result of lignin production sulphite liquor which was previously discharged to water is now used in industrial production. The manufacture of lignin-based products itself has little adverse effect on the environment. Most factories either have closed processes which do not involve discharges to water or treat their waste in biological purification plants. Most of the plants also remove the dust in the exhaust from the drying systems. Active efforts are being made to further reduce emissions.

Borregaard is continuing to expand its activities in the lignin sector. At the beginning of 1999, Borregaard LignoTech started its twelfth lignin plant, located in South Africa, in cooperation with a local pulp producer. The products will mainly be used in concrete.

Since its modest start in Norway in 1967, Borregaard has become the world's largest lignin producer and spends more on research and development than any other company in this sector. As a result of organic growth, acquisitions and joint ventures, Borregaard LignoTech now has 12 production plants on every continent except Australia. An extensive network of sales offices covers the most important geographical markets. The company's numerous production facilities ensure flexibility and the ability to supply goods as required, at the same time reducing the need for energy-intensive transport.



Orkla Foods

The Orkla Group's food business comprises Stabburet, Procordia Food, Beauvais, Felix Abba, the International Division, Abba Seafood and the Industry Division. Orkla Foods is a leading developer, marketer and manufacturer of pizza, ready meals, fruit and berry-based products, sauces, preserved vegetables, seafood, processed potatoes and bakery ingredients. Around 89 % of operating income is derived from the Nordic market, where Orkla Foods has 32 production plants. Orkla Foods also has production facilities in Austria, Estonia, Poland and the Czech Republic. The company plans to expand gradually into selected markets in Central and Eastern Europe.

KEY FIGURES

	1998	1997	1996
Total operating income (NOK million)	10,238	10,094	10,527
Operating income outside Norway (NOK million)	6,189	5,889	6,339
Operating profit before OIE* (NOK million)	579	655	608
Replacement and environmental expenditure (NOK million)	552	313	348
Total man-years	6,534	6,346	6,494
Man-years outside Norway	4,102	3,986	3,893

*Other income and expenses

ENVIRONMENTAL POLICY

A coherent, long-term approach is a key concept in Orkla Foods' environmental efforts.

Orkla Foods believes that targeted, effective efforts to protect the environment contribute towards added value for the company's products and thus towards growth and profitability. According to Orkla Foods' environmental policy, which was adopted in 1997, operations must be based on the life-cycle prin-

iple. Orkla Foods is therefore focusing on gradually improving its management of natural resources and reducing any adverse environmental effects that its activities and products may create.

As far as is technically possible and financially justifiable, the company must choose raw materials, packaging, production methods and sources of energy that have the least possible negative impact on the environment.

ENVIRONMENTAL RISK

Orkla Foods' factories do not release hazardous chemical environmental toxins to water, air or soil. Studies show that none of the factories pose any major risk to the environment, and nor do the raw materials and packaging used in production processes. In the event of accidents, however, there may be leaks of ammonia gas from refrigeration plants. The technical design of the refrigeration plants helps to minimise such risk. Moreover, emergency drills to deal with such situations are held regularly.

STATUS, GOALS AND CHALLENGES

Consumers are showing a growing interest in where raw materials originate, how products are manufactured and what Orkla Foods is doing to reduce adverse environmental effects. To a greater extent than before, therefore, customers expect Orkla Foods as their supplier to take responsibility for the environment and implement well-documented environmental protection measures.

The main purpose of environment-related work at Orkla Foods is to ensure that consumers and customers can safely choose the company's branded products and concepts, also from an environmental point of view.

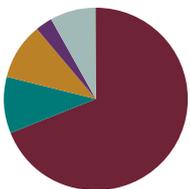
In 1998 Orkla Foods carried out an analysis of the environmental status of its Nordic divisions and identified six areas on which future environmental efforts will be focused:

- Consumer and customer relations and communication of environmental issues
- Legal aspects of environmental issues, including discharge permits and monitoring programmes
- Emissions to air, soil and water and treatment of residuals
- Use of raw materials, water and energy and the environmental effects of production processes
- Choice of packaging materials and sorting of waste packaging at source
- Choice of technology for the storage and transport of raw materials and products

Each division is responsible for environmental efforts in relation to its own operations. In keeping with Orkla Foods' environmental policy, divisions and factories have drawn up specific goals and environmental action plans, which must be coordinated with other production, quality and financial goals. The divisions' environmental coordinators and the factories' environmental technicians assist management in day-to-day environmental efforts. An environmental network headed by a central staff at Orkla Foods has also been established. The company's environmental status is reviewed each year by the divisions' board of di-

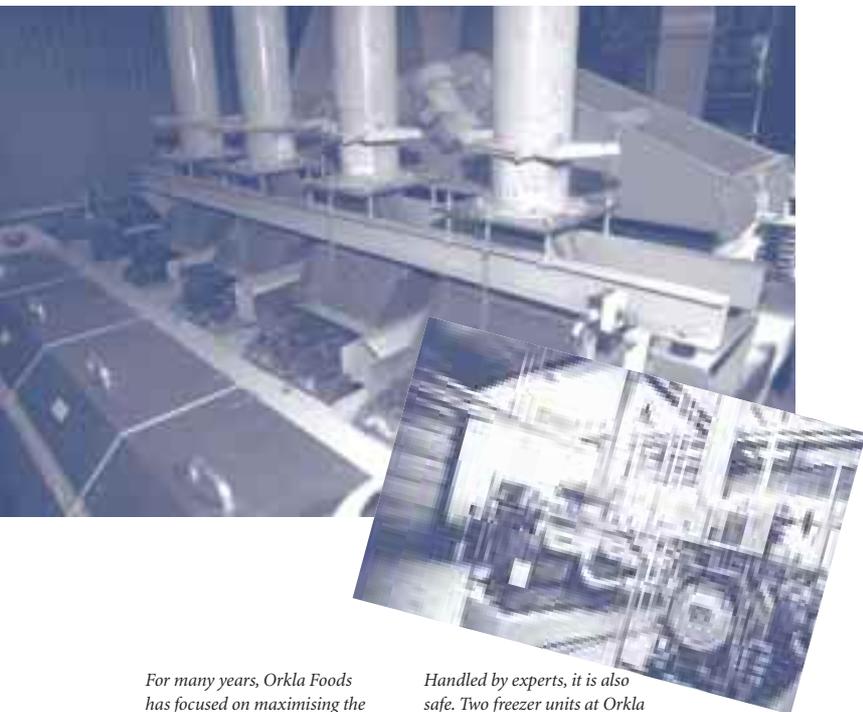
ORKLA FOODS IN THE NORDIC REGION BREAKDOWN OF PRODUCTION WASTE

- Organic waste used for animal feed or biogas 69 %
- Organic waste used for soil enrichment 10 %
- Waste sorted at source for recovery of raw materials and energy 10 %
- Organic waste sent to deposits 3 %
- Other waste sent to deposits 8 %
- Hazardous waste 0.1 %



Total amount of waste: 63,700 tonnes. About 96 % of organic waste is used in the production of animal feed and biogas. Only 4 % is sent to deposits.

Each year Orkla Foods produces approximately one billion units of packaged food. Much of it is packed in non-returnable glass containers, amounting to a total weight of about 36,000 tonnes for Orkla Foods' Nordic businesses in 1998. Orkla Foods focuses continuously on reducing the amount of material used in each packaging unit. The company also participates actively in all the waste collection and recovery enterprises in Norway and Sweden. In 1998 the recovery rate for non-returnable glass packaging in Norway and Sweden was close to 80 %, which is among the highest in Europe. The picture is from the plant of Norsk Glassgjenvinning at Fredrikstad.



For many years, Orkla Foods has focused on maximising the energy-efficiency of its cold storage and freezer plants. In parallel with these efforts, the use of ozone-depleting chlorofluorocarbons has been phased out. These chemicals have been replaced either by other synthetic refrigerants which do not deplete the ozone layer or by ammonia.

Ammonia is a natural refrigerant with excellent thermodynamic properties. It does not deplete the ozone layer, nor does it cause a greenhouse effect.

rectors. No decision has yet been made concerning the introduction of environmental management systems for the company as a whole.

In the field of food safety, modern gene technology is an issue with clear environmental ramifications. Orkla Foods has adopted a restrictive, wait-and-see policy as regards the use of genetically modified raw materials and ingredients. Comprehensive surveys of the company's suppliers show that none of Orkla Foods' products at present require labelling indicating that they contain genetically modified raw materials and ingredients.

PRODUCTION, USE OF RESOURCES AND WASTE

Production at most of Orkla Foods' Nordic factories is subject to official permits which set maximum limits for emissions to water and air.

An environmental analysis of five selected factories was carried out in 1998, which showed that cost savings can be achieved through the more efficient use of water and energy. The analysis will therefore be followed up by specific measures in the next two years.

Approximately 64,000 tonnes of waste are generated during the production process, of which some 52,000 tonnes are organic waste such as vegetable and potato peelings and fish waste. More than 85 % of the organic waste is used in the production of animal

feed and biogas, and the latter is in turn used as fuel for vehicles and for heating. The biogas produced covers the total energy requirements of approximately 600 one-family houses.

About 6,400 tonnes of total waste, chiefly packaging, are sorted at source for re-use or use in energy production. Only 0.06 % of the total waste is hazardous waste, which is sent for recycling or destruction.

Of Orkla Foods' total energy consumption of approximately 440 GWh in 1998, about 43 % was based on electricity and about 29 % on natural gas. The factories' overall environmental impact is therefore relatively minor.

BAKERS

Bakers, which has 14 plants for the manufacture of bakery products, is Norway's largest bakery group. The companies in the group generate a very low level of emissions to the environment. Bakers implements preventive measures, for instance through the companies' working environment committees, to achieve its HSE goals. Bakers also participates in the voluntary deposit schemes for packaging that are organised by private industry, and all the companies are linked to schemes for sorting waste at source.

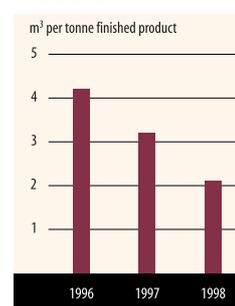
The production of bakery goods is relatively energy-intensive. Several companies reduced their consumption of steam in 1998 by investing in new equipment to upgrade the rising process. Investments were also made to purchase new and upgrade existing ventilation systems in order to retain waste heat generated by production processes, thereby also contributing towards improving the working environment. Substantial investments in new lorries have paid off in the form of reduced fuel consumption and a lower level of emissions.

Priority was given in 1998 to strengthening Bakers' position as preferred supplier of safe food by focusing on the companies' quality assurance and quality control systems and internal control procedures pursuant to food legislation.

In 1999, Bakers will continue to reduce energy consumption in its production processes and further develop its quality assurance and quality control system. Projects will also be carried out to reduce transport packaging and optimise the rate of utilisation of cartons and pallets.

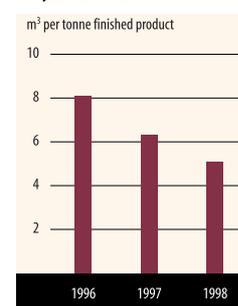
Handled by experts, it is also safe. Two freezer units at Orkla Foods' Stabburet plant in Fredrikstad, for instance, were converted to ammonia, the last in 1997. The photograph shows the compressor room of one of these facilities. The plants have had no technical problems and energy consumption has dropped by about 40 %. Good results have also been achieved at other Orkla Foods' freezer plants, to a large extent thanks to the dedicated efforts of the operators, combined with a programme to build up company expertise.

**PROCordia FOOD
WATER CONSUMPTION AT THE
VANSBRO PLANT**



A new network for the jet water washing of machinery has halved water consumption since 1996.

**PROCordia FOOD
WATER CONSUMPTION AT THE
FÄRJESTADEN PLANT**



Increased recirculation of water for washing vegetables contributed significantly towards a 37 % reduction in specific water consumption since 1996.

Orkla Beverages

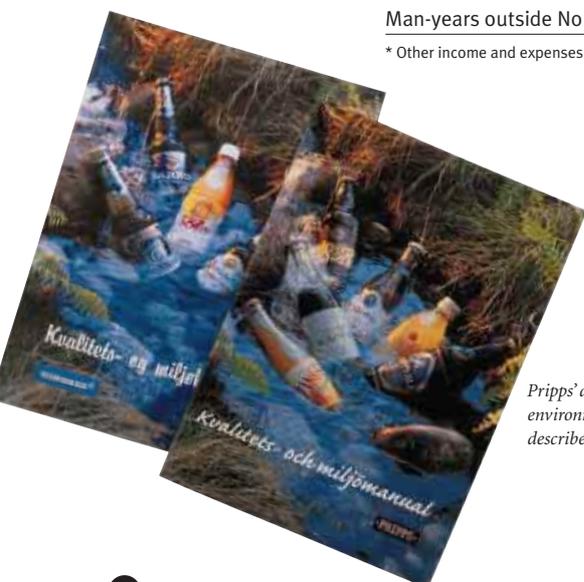
With Pripps Ringnes, Orkla Beverages is the largest player on the Swedish and Norwegian beer and water markets and number two on the carbonated soft drinks market. The company has ten production plants and two smaller mineral water plants in the Nordic region.

Through its 50 % interest in Baltic Beverages Holding, Orkla Beverages is market leader in the beer market in Russia and the Baltic States and has a strong position in Ukraine. BBH comprises eleven production units.

KEY FIGURES

	1998	1997	1996
Total operating income (NOK million)	6,741	7,656	3,265
Operating income outside Norway (NOK million)	4,089	4,554	1,912
Operating profit before OIE* (NOK million)	508	799	300
Replacement and environmental expenditure (NOK million)	431	313	180
Total man-years	7,457	7,685	3,102
Man-years outside Norway	4,828	4,441	1,673

* Other income and expenses



Pripps' and Ringnes' quality and environmental systems are described in separate manuals.

ENVIRONMENTAL POLICY

Pripps Ringnes' goal is to meet consumer demand for quality beverages of high international standard.

All industrial activity affects the environment and Pripps Ringnes aims to continuously reduce the environmental impact of its industrial operations by:

- Establishing a coherent approach to reducing the environmental impact of its products
- Being aware of the environmental dimension when selecting raw materials, instruments, processes, packaging and distribution systems
- Engaging in development to increase knowledge of the environmental impact of its activities
- Ensuring that all its activities comply with national legislation
- Engaging in active environmental efforts as a basis for long-term profitability and competitiveness.

MANAGEMENT TOOLS

One of the essential elements of Pripps Ringnes' improvement process is an integrated quality assurance management system which includes factors relating to health, safety and the environment. A software programme for quality assurance, Q-data, has recently been introduced. The system is based on ISO 9001 principles and is used in the entire Nordic organisation.

Four of ten production plants in Sweden and Norway have ISO 9001 or 9002 certification. The quality assurance systems at the other plants conform to certification standards.

A decision has been made to apply for ISO 14001 environmental certification at the plants owned by AB Pripps Bryggerier in the first half of 1999. This system is also being implemented at Ringnes a.s and is described in a separate "Quality and Environment Manual".

EMISSIONS TO AIR

Mainly due to the loss of production volumes, total energy consumption per unit produced rose 23 % in 1998. Although specific energy consumption increased, there was no increase in emissions of greenhouse gases. There has been a swing towards using renewable energy sources and choosing fuel with a high combustion value and low sulphur content.

EMISSIONS TO WATER

Pripps Ringnes' production plants for beer and carbonated soft drinks have a relatively moderate environmental impact. The challenge lies in reducing emissions of organic substances, such as product residue, label fibres, glue and detergents.

The total quantity of effluents was at the same level as in 1997. However, in terms of the amount per unit produced, the quantity of effluents and the quantity of organic substances in the effluents rose substantially in 1998. This was mainly due to the lower production volume (-21%) and the increased amount of product residue in returnable bottles, particularly bottles with screw tops. Continuous efforts are being made to reduce emissions.

ENVIRONMENTAL DATA PRIPPS RINGNES (NORWAY AND SWEDEN)

	1998	1997	1996
Production of beer, carbonated soft drinks and water (1000 l)	806,200	1,019,000	995,211
Energy consumption - oil, gas, electricity (kWh per 1000 l product)	363.6 *	300.6	314.8
Effluents			
Water (m ³ per 1000 l product)	3.21 *	2.40	2.75
COD (kg per 1000 l product)	7.2 *	6.2	5.8
Emissions to air**			
CO ₂ (kg per 1000 l product)	43.8	52.8	55.2
SO ₂ (kg per 1000 l product)	0.058	0.057	0.06
NO _x (kg per 1000 l product)	0.041	0.050	0.052
Waste to recycling (tonnes)	14,800	20,400***	12,800

* Higher values due to reduced production (-21%)

** Estimated values

***Replacement of 0.35 l bottles with 0.33 l bottles in Norway.

BY-PRODUCTS AND WASTE

Continuous efforts are being made to improve the utilisation of input factors and recycle and utilise by-products and waste. The current system for sorting at source functions well. The amount of waste sent for recycling increased by about 15 % in comparison with 1996.

PACKAGING

As regards packaging, the main focus is on re-use, recycling, weight reduction and reductions in environmentally hazardous substances. The environmental aspect is an important requirement in relation to Pripps Ringnes' suppliers.

The collection systems in Sweden and Norway have been developed to receive all product packaging. In 1997, the beverages industry in Norway introduced pool systems for various types of bottles and crates. Cooperation has been established within the industry and with the retail trade with a view to establishing a recycling system for non-returnable packaging similar to the system that is already operating in the pioneering country, Sweden, where the percentages of cans and one-time plastic bottles returned were 90 % and 80 % respectively in 1998. This system will be implemented on 3 May 1999.

A new crate for all types of beer was introduced in Norway. The crate has been adapted to the euro-pallet, which means that one type of pallet can be replaced. The re-use and recycling systems that are operating in Norway and Sweden provide excellent, environmentally sound control and are ranked as the most effective in the world.

PERCENTAGE RETURNED

	1998	1997	1996
Glass bottles ¹⁾	97	98	98
Returnable plastic bottles ¹⁾	98	98	98
Cans ²⁾	90	91	95
Non-returnable plastic bottles ²⁾	80	73	77

¹⁾ Sweden and Norway

²⁾ Sweden

DISTRIBUTION

Pripps Ringnes is in the process of introducing major changes in its warehousing structure. The purpose is to improve the utilisation of warehouses at produc-

tion plants, shorten turnover times, improve load planning and reduce overall costs and energy consumption. However, the loss of franchise products and consequent drop in volume dispatched in 1998 has led to less efficient distribution and counteracted these effects.

THE WORKING ENVIRONMENT

Internal monitoring systems for health, safety and the environment are well established and are based on common criteria for Pripps companies and Ringnes companies respectively.

Sickness absence rose slightly in 1998, probably because of the manpower cuts the companies have been carrying out in connection with the loss of franchise products in Sweden and Norway and the general rationalisation process. Otherwise, there was focus on sickness absence in connection with an absenteeism project that was carried out at Ringnes in cooperation with the Norwegian National Insurance Administration. Although the project did not lead to any measurable reductions in total sickness absence, the process had beneficial ripple effects. It is regarded as positive that the line management involves itself in the situation of long-term absentees in an effort to bring them back to active employment.

Ringnes Oslo, which has a large proportion of immigrant employees, has implemented a feasibility study in connection with the multi-cultural community at Ringnes Gjelleråsen and there are plans for continuing this project in 1999.

In order to improve working conditions, Ringnes has been focusing on improving the skills of operators and line managers. The purpose of this project is to reduce errors and thereby costs, and consequently improve the working environment for all concerned.

BALTIC BEVERAGES HOLDING (BBH)

The East European business is still expanding rapidly and BBH currently comprises eleven production plants. Production has increased from 606 million litres in 1997 to 913 million litres in 1998.

Aldaris in Latvia achieved ISO 9001 certification in 1998. The question of adapting SAKU in Estonia and Baltika in St. Petersburg to the ISO standard is currently being considered. A natural continuation of this process is to implement further environmental improvements in the brewery processes. At the other breweries, process equipment, quality and environmental monitoring are being continuously improved, with focus on reducing emissions of organic substances and increasing capacity.

ENVIRONMENTAL ACTIVITIES IN 1999

- ISO 14001 certification of Pripps
- Further energy optimisation, particularly to offset the negative effects that the loss of franchise products is having on environmental parameters
- Reduction of water consumption
- Reduction of waste being deposited
- Process optimisation to reduce emissions of organic substances
- Active promotion of eco-friendly packaging systems.



Unmanned trucks transport empty bottles to the production line and return with finished products for storage in the high-stacked warehouse. This has led to environmental improvements and fewer injuries.

Orkla Brands

Orkla Brands consists of companies that manufacture and market detergents, personal products and cosmetics, household textiles, cod-liver oil, biscuits, snacks, chocolate and confectionery. Orkla Brands' main businesses are located in Norway, Sweden, Finland and Denmark. Orkla Brands constitutes a branded goods group within which the individual companies benefit from synergy effects in several important areas. Health, safety and environment are one such area.

KEY FIGURES

	1998	1997	1996
Total operating income	4,273	4,146	4,213
Operating income outside Norway (NOK million)	1,234	1,156	1,239
Operating profit before OIE* (NOK million)	456	458	431
Replacement and environmental expenditure (NOK million)	161	282	209
Total man-years	2,615	2,837	2,905
Man-years outside Norway	899	962	1,069

* Other income and expenses



Refills offer significant savings on packaging. In the case of liquid soaps, refills now account for as much as 60-70 % of sales, which is high by international standards.

In recent years Orkla Brands has focused strongly on coordinating and organising its HSE activities. New guidelines were prepared in 1997 and implemented in 1998. One of the consequences of these guidelines is that all the factories set HSE targets and prepare plans for further environmental improvements. In 1998, special emphasis on reducing waste at the factories brought good results.

DETERGENTS, PERSONAL PRODUCTS AND COSMETICS

Lilleborg, which is engaged in the detergents, personal products and cosmetics business, has been working for several years to make its products and packaging environmentally sounder (see also theme article p. 2).

In many categories, Lilleborg has been first on the market to have products bearing the official Swan ecolabel. In 1998, Lilleborg launched the first hand dishwashing liquid with the Swan label on the Norwegian market.

Asthma and allergies are a growing problem and consequently Lilleborg has produced several products that contain no colouring or perfume which are recommended by the Norwegian Asthma and Allergy Association. In 1998 the range was extended to include liquid laundry products and hand dishwashing products.

The growing proportion of concentrated detergents has led to a substantial reduction in the use of chemicals.

One of the main objectives of the environmental programme is to reduce packaging consumption. In the case of certain personal and cosmetics products, refills now account for 60-70 % of sales. This is very high by international standards. For example, refills for Dove and Lano liquid soaps have led to a 42 % saving on packaging. The transition to micropowders in recent years has reduced packaging consumption by 67 %.

In the case of transport packaging, the transition from cardboard to plastic film for several personal products has already led to a 70-tonne reduction in the consumption of corrugated cardboard. Work is now in progress to apply this process to toothpaste and detergents. The industrial detergent business aims to increase the re-use of packaging, particularly for larger units.

Production of personal products and cosmetics takes place at Ello in Kristiansund. The company received a new discharge permit for emissions to water in 1997. Emission levels were well below the permitted limits throughout 1998.

The new detergent factory was built in close proximity to the existing factory at Ski outside Oslo and opened in autumn 1997. Much of 1998 was spent on increasing capacity to the planned level. Substantial investments have been made in environmental safety and advanced environmental technology, including a plant for recycling all waste water from the process. During the start-up period, which has taken longer than planned, discharges of waste water have been above the company's own targets but within the limits stipulated in the temporary licence from the State Pollution Control Authority (SFT). However, these discharges have created problems for the municipal treatment plant. The problems were significantly re-

duced towards the end of the year. Active efforts are being made to reduce discharges to the same level as before the new factory came on line. Measures have been implemented to reduce noise from the factory.

CHOCOLATE/CONFECTIONERY

Nidar in Trondheim produces chocolate and confectionery. This business is not required to have discharge permits for emissions to air and water.

Nidar has a well-developed bacteriological laboratory which analyses samples of raw materials, finished products, machines and premises in order to ensure that all products distributed on the market are pure. The production processes have been analysed according to the HACCP method to ensure control of critical factors relating to food safety.

Nidar has converted and replaced a number of cooling units in order to save water and energy. The amount of waste deposited and sent for incineration was reduced by 29 % in 1998.

BISCUITS

This business area comprises Göteborgs Kex in Sweden, Sætre in Norway and Kantolan in Finland. None of these factories are required to have discharge permits. No genetically modified raw materials were used in 1998 and the biscuits area aims to continue to avoid such raw materials. The number of products based on organically-grown raw materials was increased by three varieties in Sweden and one in Norway.

A larger proportion of product packaging now provides information about how it should be sorted at source.

In 1998 Göteborgs Kex produced an environmental report which identifies all the factors that affect the environment and proposes environmental targets and action plans.

SNACKS

The snacks business has production plants in Denmark, Norway and Lithuania. Production at Give in Denmark was moved to the main plant in Sønderød in January 1999. KiMs aims to avoid genetically modified raw materials. Effluents from all the plants were within the mandatory limits in 1998.

KiMs' factory at Skreia achieved EMAS certification in 1997. In 1998 the plant entered into cooperation with the municipal authorities in connection with the cleaning of process water. This will eliminate the risk of excessive discharges to a vulnerable local river.

The Lithuanian factory was taken over in 1997. In 1997-98 effluents were analysed in order to evaluate the necessity of cleaning the processing water. The analysis showed that the measures that had already been implemented were adequate.

COD-LIVER OIL

Peter Möller produces cod-liver oil and concentrated Omega-3 products in Oslo. As a result of its focus on process development, the company currently produces the purest cod-liver oil on the market and its products satisfy the strictest international environmental standards.

In 1998 water consumption was reduced by more than 10 %, among other things by changing over to air cooling and increasing recycling. The company has replaced approximately 140 m³ of fuel oil with biofuel, which is a by-product of its own production. Waste fat that was formerly deposited is now sold externally as biofuel. In 1998 several measures were implemented in connection with the collection, treatment and inspection of waste water.

In November 1998 the factory was inspected by the Norwegian Board of Health in accordance with the pharmaceutical requirements of Good Manufacturing Practice and received final approval in February 1999. In 1998 Peter Möller was also re-certified under ISO 9001.

PLANS FOR JOINT MEASURES AT ORKLA BRANDS IN 1999

Waste projects

- Increase internal and external recycling of product and packaging waste
- * Reduce amounts of waste to be deposited

Management systems

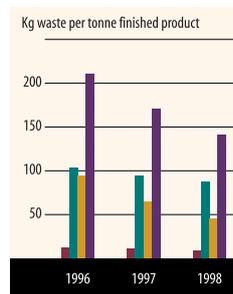
- Improve current quality assurance systems and implement environmental systems (ISO 14001 and EMAS) at certain factories which do not already have them.



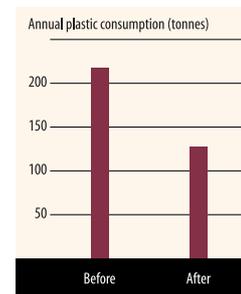
In February 1999, Peter Möller was granted a permit to manufacture pharmaceuticals by the Norwegian Board of Health, thereby satisfying the Good Manufacturing Practice (GMP) standards. The main difference from past operations is that the filling and packaging line has now been isolated and has a ventilation system that ensures clean air and an even temperature. The room can only be accessed through sluices where personnel and visitors must don protective suits. Here Erik Lien is on his way to take samples for control.

WASTE FROM ORKLA BRANDS' FACTORIES

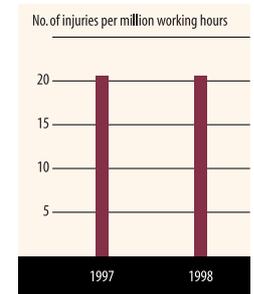
- Recycled packaging waste
- Recycled waste from production and raw materials
- Waste deposited
- Total waste



LIQUID SOAP PLASTIC CONSUMPTION BEFORE AND AFTER THE INTRODUCTION OF REFILL PACKAGING



H-VALUES AT ORKLA BRANDS' FACTORIES*



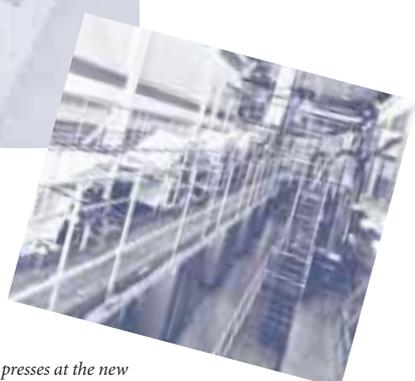
* Factory employees

Orkla Media



In 1998 Hjemmet Mortensen Trykkeri installed one of Norway's largest, most advanced computer-to-plate systems for its offset printing press. The system will also serve the new printing press that is scheduled to become operational in the first half of 2000, and offers significant environmental benefits. Film, which contains silver, and developers, which must currently be sent for destruction, will be phased out of the production process. New production technology involves the use of thermal plates and an environmentally friendlier developer. Here Kjell Hornkjøl removes a plate from the developing line.

The printing presses at the new Orkla Trykk printing plant are operated individually in that the printing units are linked in pairs by a common drive motor. The motors are synchronised by a computerised control system, thereby eliminating drive shafts, gears and clutches. The system is programmed so that only the drive motors necessary to carry out the job in hand are set in operation. With production varying from four pages of tabloid format to up to 48 pages of full format, this flexibility is a key factor in reducing energy consumption.



Orkla Media is Norway's second largest privately-owned media company with businesses in the newspaper, magazine and direct marketing sectors.

Orkla Newspapers' 22 newspapers in Norway and Sweden have a total circulation of approximately 400,000. Orkla Media is the second largest media company in Poland with businesses in the newspaper and newspaper printing industry. In 1998 Orkla Media expanded its operations in Eastern Europe through the acquisition of three regional newspapers in Lithuania and Ukraine. The company owns interests in 15 newspapers with a total circulation of approximately 770,000.

Orkla Media owns 50 % of Hjemmet Mortensen, Norway's largest publisher of family and specialised magazines with a total weekly circulation of approximately 800,000. Orkla DM is the largest player in the direct marketing sector in the Nordic region with operations in Norway, Sweden and Denmark.

Orkla Media also has strategic interests in electronic publishing companies that target the consumer market.

KEY FIGURES

	1998	1997	1996
Total operating income (NOK million)	3,153	2,569	2,220
Operating income outside Norway (NOK million)	781	406	290
Operating profit before OIE* (NOK million)	208	204	175
Replacement and environmental expenditure (NOK million)	296	361	121
Total man-years	3,761	3,133	2,673
Man-years outside Norway	1,539	1,042	802

*Other income and expenses

PRODUCTS AND PRODUCTION PROCESSES

The newspaper and magazine business consists of the collection and processing of information, as well as pre-press, printing and distribution. The business encompasses daily newspapers, newspapers that are printed a few times a week, periodicals, magazines, illustrated weeklies, printed matter and direct advertising mail. Furthermore, Orkla DM has core expertise dedicated to operating and maintaining databases that target both the consumer and corporate markets.

ENVIRONMENTAL IMPACT

Paper recycling is an environmental challenge for the newspaper and magazine industry. In 1998, the process of collecting paper for recycling was completed in most of the municipalities in Norway. Between 60 and 70 % of the newsprint and magazine paper in Norway is now recycled. Norske Skog's new de-inking plant is scheduled to become operational in the the year 2000.

ENVIRONMENTAL POLICY AND GOALS

Orkla's environmental policy lays down general guidelines for the environmental performance of the companies in the Orkla Group. Environmental goals, policies, management systems and monitoring routines have been established for the larger media companies. Ongoing environment-related efforts in Orkla Media's companies focus on emissions management, the use of photochemicals, waste, paper and energy consumption, exposure to noise and dust and transport.

INVESTMENTS IN AND COORDINATION OF PRINTING PLANTS

In the past few years, the newspaper printing industry in Norway has undergone significant restructuring and coordination. Coupled with changes in the production process, this has been beneficial to the environment. Investments have also been made in pre-press technology, new printing plants and new rotary presses.

Orkla Trykk's NOK 310 million printing plant came on line in 1998. All of Orkla Medias' newspapers in the counties of Buskerud, Telemark and Vestfold are now printed at the new plant. The newspaper pages are transferred digitally from the newspapers to the plant, and advanced computer-to-plate (CTP) technology has replaced the filmsetting process and production of page films that have posed an environmental challenge to the industry. The printing of Østlandets Blad located on the east shore of the Oslo Fjord has been transferred to Avisenes Rotasjonstrykkeri in Fredrikstad. This plant now receives electronically transmitted pages from Østlandets Blad, Moss Avis and Fredriksstad Blad thus reducing transport requirements. New technology in the other printing plants is also generating environmental benefits.

In Poland, substantial sums have been invested in modern newspaper printing plants in Warsaw and Poznan, which are scheduled to be completed in May/June 1999. Orkla Media's printing business in Poland also includes a new plant currently under construction in Opole, and established newspaper printing plants in Wroclaw, Bydgoszcz and Bialystok. Newspaper production is subject to strict official environmental standards for waste management, exposure to noise and dust and emissions management.

Hjemmet Mortensen Trykkeri (HMT) has decided to invest in CTP technology, a new offset press and new finishing technology. The entire plant is due to be completed in 2000, and will replace the existing rotogravure press that has been an environmental challenge.

Environmental investments and the coordination of printing operations will reduce transport-related CO₂ emissions and will lead to lower energy consumption. Furthermore, the percentage of waste and the use of chemicals and liquids to produce texts and images will be reduced as a result of the digitilisation.

WASTE

Over 90 % of newspaper circulation in Norway goes to regular subscribers, whereas the number of regular magazine subscribers is considerably lower. A scheme has been established for collecting unsold magazines from retail outlets and recycling them. In Poland, the proportion of subscribers is relatively low. Reducing the proportion of returned newspapers, i.e. the difference between the number of copies printed and the number sold, is an environmental objective.

Waste is a major environmental and financial challenge. Waste occurs primarily in connection with the initial printing of each publication and varies according to the number of copies printed, the use of colour and the level of automation. The waste percentage at Orkla Newspapers' plants now averages between 8 and 15 %. At HMT, the waste percentage is currently approximately 19 %. This is due to the industry's high standards of print quality and the necessity of trimming the pages after printing. At Orkla Media's newspaper printing plants in Poland the waste percentage is about 8 %.

Due to start-up problems, Orkla Trykk did not achieve its waste percentage target in 1998. This had a negative impact on the overall waste percentage at Orkla Newspapers in 1998. Now that the teething problems seem to have been solved, reducing waste to a level of 8.9 % in the course of 1999 is a realistic objective.

PHOTOCHEMICALS, PHOTOGRAPHIC MATERIALS AND PRINTING PLATES

The company's printing plants in Poland have signed agreements that ensure the collection and destruction of all photographic material and used offset plates.

In Norway, all used photochemicals, chemical waste and scrap metal, such as used offset plates, are delivered for approved disposal through Stena Miljø.

Several publications are now testing digital cameras. Depending on the quality of the pictures, digitalisation may in time eliminate all use of chemicals in the development process.

EMISSIONS MANAGEMENT

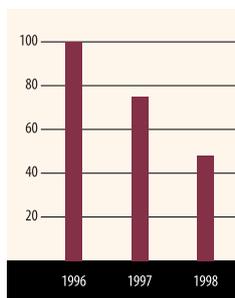
In 1998 HMT succeeded in reducing the concentration of isopropyl alcohol in the air around the offset press from 12 % to 10 %. Efforts are being made to find alternative additives for the dampening solution. The amount of CO released by HMT in 1998 was substantially lower than in 1996 and 1997 and well within the permitted limits.

ENERGY CONSUMPTION AND ENERGY EFFICIENCY

Energy consumption in the Norwegian Newspapers segment is largely based on electric power, while HMT and the Polish printing companies also use oil.

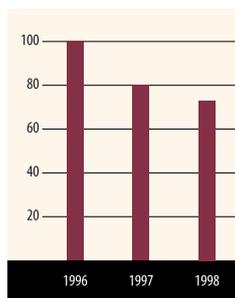
The computer-synchronised drive motors at Orkla Trykk create an energy saving of at least 10 % compared to traditional systems. At HMT, consumption of oil was reduced by close to 80 % in 1998, partly by running the boilers on electric power to a greater extent. Energy-efficiency programmes have been initiated in several Orkla Media companies.

**CONSUMPTION OF PHOTOCHEMICALS
HJEMMET MORTENSEN TRYKKERI**



Index 1996 = 100

**INTERNAL TRANSPORT COSTS
HJEMMET MORTENSEN TRYKKERI**



Index 1996 = 100

Chemicals

Orkla's chemicals business, Borregaard, is an international chemicals company that develops, produces and markets specialty products for industrial purposes.

Borregaard has three core business areas:

Specialty Chemicals, Fine Chemicals and Ingredients.

Borregaard has more than 20 production units in 12 countries and sales offices in Europe, America, Asia and Africa. In 1998 Borregaard had 2,800 employees.

KEY FIGURES

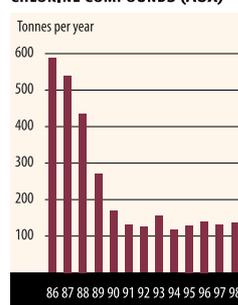
	1997	1996	1995
Total operating income (NOK million)	5,777	5,733	5,161
Operating income outside Norway (NOK million)	4,298	4,291	3,833
Operating profit before OIE* (NOK million)	402	324	441
Replacement and environmental expenditure (NOK million)	348	416	284
Total man-years	2,583	2,633	2,547
Man-years outside Norway	715	723	659

* Other income and expenses

EMISSIONS OF ORGANIC COMPOUNDS (COD) FROM SPECIALTY PULP AND LIGNIN PRODUCTION



EMISSIONS OF ADSORBABLE CHLORINE COMPOUNDS (AOX)



ENVIRONMENTAL POLICY

Borregaard regards its products and operations as being useful to society and valuable for customers, employees, shareholders and the local community. Borregaard seeks to meet high health, safety and environmental standards. Borregaard has also committed itself to the guidelines laid down in the international environmental programme Responsible Care.

Borregaard is an international company.

Although the challenges vary from one country or business to another, the same health, safety and environmental principles apply in all parts of the world where the company is involved. This report describes the guidelines and principles for Borregaard's efforts relating to health, safety and the environment. The most important challenges and activities in this area are described in the following review of the company's core business areas.

SPECIALTY CHEMICALS

Borregaard LignoTech

Borregaard LignoTech has production plants in ten countries in Europe, America, Asia and Africa. The company uses lignin, the binding agent in wood, as its raw material. This raw material is renewable and lignin products are biodegradable. At the production plant in Norway, the raw material comes from Borregaard's own cellulose factory. The other plants buy most of their raw material from local pulp mills. (See also theme article p. 3).

In some pulp mills the spent sulphite liquor is still discharged to water. Utilising lignin as a raw material therefore in itself leads to reductions in emissions. This is the case at Borregaard's lignin factory in China and at the new factory in South Africa.

Lignin products are used in concrete, ceramic products, agrochemicals, animal feed, briquetting, textile dyestuffs and oil drilling mud.

Several lignin products improve the environmental qualities of the products and processes in which they are used. For example, lignin is used as an additive in concrete to reduce the cement content and thereby reduce CO₂ emissions from cement production. Calculations show that, by reducing cement consumption, Borregaard's lignin products for the cement market lead to annual global reductions in CO₂ emissions of approximately three million tonnes. Moreover, by using lignin products in crop protection chemicals, it is possible to replace solvent-based systems with more environmentally sound water-based systems. Using lignin to bind dust is an environmentally friendly alternative to using traditional road salt. Some of the production plants for lignin products are emission-free because effluents are recycled, while effluents from other plants are cleaned in biological treatment plants.

BORREGAARD CHEMCELL

Borregaard ChemCell produces highly-purified chemical cellulose at its plant in Sarpsborg, Norway. The company uses 900,000 m³ of wood annually, which mainly comes from Norway and Sweden. Approximately half of it consists of wood chips made from waste materials from sawmills.

The company focuses on the use of the cellulose molecule for a variety of purposes. Borregaard's

specialty cellulose is used in the production of thickening agents, adhesives, paint, acetate plastics, filters and textiles. Borregaard's products are alternatives to products based on non-renewable raw materials.

Waste streams from cellulose production are used to manufacture ethanol, vanillin and lignin products. The organic waste from cellulose production is treated in a biological treatment plant which breaks down 70 % of the organic substances. The treatment plant produces methane gas which is used as an energy source, equivalent to 3,000 tonnes of oil per year.

Borregaard has introduced a new processing stage in its cellulose production which will increase the proportion of especially highly purified products. In the longer term, the new processes may lead to further reductions in emissions of organic and chloroorganic compounds (COD and AOX).

Borregaard produces strategic base chemicals for internal use and external sale. The chloralkali factory, which among other things produces sodium hydroxide and chlorine, has been converted to a mercury-free process. The converted factory is now producing at full capacity. In 1998, mercury-contaminated building materials and waste from the old process were treated and deposited in a specially-constructed bunker on the company's own site.

The sulphuric acid factory supplies SO₂ gas and thermal energy for the cellulose business. A new scrubber has substantially reduced SO₂ emissions.

FINE CHEMICALS

Borregaard Synthesis

Borregaard Synthesis has production plants in Norway, Italy, China and the US.

The factories in Norway produce intermediates for the pharmaceutical industry and the aroma chemicals vanillin and ethyl vanillin. Production is mainly based on petrochemical raw materials. However, one of the vanillin factories uses lignin as a raw material. A life-cycle analysis carried out by Batelle shows that Borregaard's unique concept for producing vanillin from lignin is an environmentally advantageous process on the whole.

Emissions of organic substances from the fine chemicals factory in Sarpsborg have now been reduced by treating all process water in Borregaard's biological treatment plant. This has halved the COD level in the waste water. Solvents and other chemicals used in the processes are largely recovered. If this is impossible, the company seeks to find alternative uses as raw materials for other products.

The business otherwise has satisfactory systems for depositing or incinerating waste at approved reception centres.

A recovery project for copper was developed and came on line in 1998. This will reduce emissions of substances containing copper and reduce the amount of waste being deposited. The recovery plant is described in more detail on p.15 of this report.

In Italy, Borregaard has a diphenol plant in Ravenna and a plant for manufacturing diphenol derivatives near Bergamo. The Bergamo factory has its own treatment plant, while the Ravenna factory uses a treatment plant belonging to a larger industrial complex close to where the factory is located.

Through several targeted measures in 1998, the fine chemicals factory that Borregaard took over in the USA in 1997 has established new, higher HSE standards.

In China, Borregaard has a 61 % interest in a factory that produces carbofuran, which is used in crop protection chemicals to increase productivity in the agricultural sector. The raw material comes from Borregaard's plant in Italy. Carbofuran is a toxic substance and Borregaard has therefore focused strongly on safety and new systems have been introduced. In 1998 the company arranged an environmental seminar which was attended by both authorities and competitors. At the seminar the company was praised for its work on environmental and safety issues.

INGREDIENTS

Denofa

Denofa's production plant for oils, fats and animal feed is located in Fredrikstad, Norway. One of the most important raw materials is soya beans. Most producing countries have started growing genetically modified soya beans. The ingredients and raw materials from these beans are now approved products within the EU and soya oil and soya flour manufacturers base their production on genetically modified beans.



The Petronas Twin Towers in Kuala Lumpur, Malaysia, which was completed in 1997, soars 451 metres high, making it the world's tallest building. A total of 428,000 m³ of concrete went into its construction. Borregaard LignoTech supplied lignin-based Borrespense dispersing agents to the concrete manufacturer. Borrespense makes it possible to reduce the volume of cement in concrete, at the same time achieving a more even pour. The concrete mixture is also more workable and can even be pumped to great heights. The water content in the concrete can also be reduced, resulting in stronger structures.

**BORREGAARD SARPSBORG
SULPHUR DIOXIDE EMISSIONS
(SO₂)**



**DENOFA
HEXANE CONSUMPTION**



1993: Production stoppage

However, Denofa's customers prefer products made from traditional beans. A system for purchasing beans from specific geographical areas, thorough monitoring of logistics and a comprehensive quality assurance system have enabled Denofa to base its production on non-modified beans.

Denofa has implemented a series of measures to limit emissions and reduce noise and dust.

ENERGY

Borregaard's total energy consumption in Norway in 1998 was 2.3 TWh, of which 1.8 TWh relates to its plant in Sarpsborg.

Borregaard's electricity consumption is partly provided for by its own supply of hydro-electric power. Denofa in Fredrikstad utilises 79 GWh of waste heat from a local waste incineration plant.

The energy sector is undergoing major changes at both national and international levels. Energy is closely associated with environmental challenges.

In this area, the operating parameters will be affected by the way in which the Kyoto Agreement is implemented, including environmental taxes. In the longer term, Borregaard must renew its production capacity for thermal energy. In the present situation, Borregaard's policy is to maintain the greatest possible flexibility in relation to its energy supplies until the future operating parameters have been clarified. Thermal energy is currently produced from oil, pyrites, bark and biogas. In 1998, Borregaard extended its contract for deliveries of pyrites to the sulphuric acid factory. Sulphuric acid production gives Borregaard a substantial contribution of CO₂-free thermal energy, and since the new scrubber came on line in summer 1997 SO₂ emissions have been significantly reduced.

SoyPass, which is used only as cow feed, is a soya meal treated according to a method patented by Borregaard LignoTech. SoyPass gives a more effective utilisation of the protein in soya meal and increases milk production by up to 8%. Moreover, nitrogen emissions are reduced, which means less pollution of the natural environment.

Production began in Europe in 1992 and the product is now manufactured at three plants in Europe and one in the US. Sales have been rising rapidly and totalled more than 200,000 tonnes in 1998, 30% higher than in 1997. The picture shows Denofa's soya plant in Fredrikstad, where SoyPass is produced.



Through Borregaard, Orkla is one of the biggest private forest owners in Norway. In cooperation with the WWF, Borregaard has been registering important habitats and biotopes in its forests. Up to now, 88% of productive forest area covering a total of 77,000 hectares has been mapped. This programme is expected to be completed in 1999.

In 1998, Borregaard signed a letter of intent with a neighbouring ferrosilicon manufacturer concerning the possible utilisation of waste thermal energy from this factory if a recovery plant is built.

At the Sarpsborg plant, bark and biogas produced a total of 89 GWh of thermal energy in 1998.

TRANSPORT AND LOGISTICS

Borregaard in Sarpsborg and Denofa's factory in Fredrikstad still transport a large proportion of their raw materials and finished products by sea. In environmental terms, this solution is preferable to road transport, but in the case of the Sarpsborg plant, it is dependent on the River Glomma being suitably equipped for use as a traffic artery. Some parts of the fine chemicals business have started delivering in bulk containers instead of smaller steel drums, thereby reducing transport requirements and packaging consumption.

The large number of decentralised production plants for lignin products reduces the need for long-distance transport of raw materials and finished products.

MANAGEMENT TOOLS

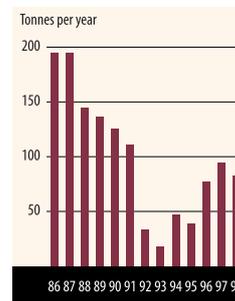
Borregaard has an integrated system for quality assurance and matters relating to health, safety and the environment. In order to ensure continuous environmental improvements, Borregaard stresses the importance of introducing environmental management systems. Several factories are working to achieve ISO 14001 certification.

Under the management system, all plants must prepare annual HSE targets based on given parameters and carry out regular registrations, deviation analyses and audits.

FUTURE CHALLENGES

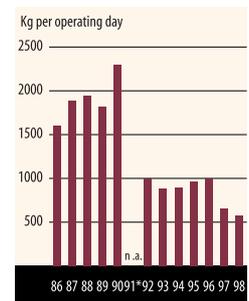
Borregaard will continue to make efforts to achieve environmental improvements in many areas. Finding a good, long-term solution for heat production in Sarpsborg will have high priority, and various systems will be examined. Work is in progress on new concepts for cellulose production that will help to increase the utilisation of waste streams from the bleaching plant and reduce emissions of organic substances (COD). Developments with respect to raw materials, i.e. timber, fish and soya beans, are being closely monitored.

DENOFA SULPHUR DIOXIDE EMISSIONS (SO₂)



1993: Soya production stoppage

DENOFA EMISSIONS OF ORGANIC COMPOUNDS TO WATER (COD)



* Biological treatment plant opened during 1991

Focus on the environment



Kjell Hystestad operates the recovery plant, in which sludge separators are key components. Copper oxide in the sludge is separated from the spent vanillin liquor and recycled. Vanillin liquor is an important raw material for Borregaard's lignin business.

RECOVERY OF COPPER FROM VANILLIN PRODUCTION

Borregaard in Sarpsborg is the world's second largest producer of vanillin. Vanillin is mainly used as a flavouring and aroma additive, but is also an important raw material in the pharmaceutical industry. Borregaard bases its manufacture of vanillin on two completely different raw materials. One of them is diphenol, a petrochemical raw material, and the other is lignosulphonate from Borregaard's production of sulphite pulp.

Lignin is the binding agent in wood, and is therefore a natural, renewable raw material. At present, Borregaard is the only company in the world that still produces vanillin on the basis of lignin. In the first step of the process, the lignosulphonate is oxidised, with copper oxide as catalyst. Until now, the bulk of the copper used has been deposited on Langøya, an island in the Oslo Fjord. Borregaard also has a permit to discharge copper to water. However, this was not a desirable situation, either from an environmental or from a financial point of view. Consequently, Borregaard has long sought alternative means of recovering the copper in order to reduce discharges and thereby both consumption and deposits.

No technology was available on the market for this purpose, and the company therefore had to develop its own process. This work began in 1994 with the support of the Norwegian Pollution Control Authority and with the help of SINTEF consultants who provided an important supplement to Borregaard's own expertise. Much of the technology involved had not been utilised in plants of this type before. Parts of the process were developed and tested in a pilot plant at SINTEF and other processing stages were run in full scale at the vanillin plant, thereby laying the foundation for the design and construction of the recovery plant, which was completed in February 1998.

The plant has rendered the vanillin factory operations more complex and there were a number of problems during the start-up period. However, production regularity is now satisfactory. The recovery plant will reduce the total amount of copper discharged by Borregaard by more than 30 %. Further optimisation will enable the company to increase vanillin production without discharges exceeding present levels.

The copper will cease to be deposited. For contingency reasons, however, the deposit scheme will be maintained in 1999, but is scheduled to be phased out completely in the course of 2000.

Total investments in the new process, including development costs, amount to over NOK 22 million.

Key health and environment figures

TRENDS IN SICKNESS ABSENCE*



* For the Group's activities in Norway

TRENDS IN H-VALUES*



* For the Group's activities in Norway

REPLACEMENT AND ENVIRONMENTAL EXPENDITURE



Data on trends in sickness absence and the number of injuries for the Group's Norwegian businesses, total replacement and environmental expenditure for the Group as a whole, and emissions from heat consumption in Norway are analysed below.

Work is in progress on the further consolidation of environmental data. Given the Orkla Group's structure and diversified product areas, developing a good numerical reporting system is a demanding process and consequently can only be achieved gradually.

OCCUPATIONAL HEALTH AND SAFETY

Total sickness absence in the Norwegian companies in the Orkla Group increased both for wage-earning and salaried employees in 1998. While this is in line with the national average for wage-earning employees, the national average for salaried employees is declining. The greatest challenges in this respect are in the Beverages area, where reduction in capacity has necessitated comprehensive restructuring. On the whole, Borregaard showed a more favourable trend than the other companies in terms both of sickness absence and injury rate. The injury rate (H-value) for Orkla's Norwegian companies as a whole was more or less on par with the previous year. In 1998 there were no serious damage to plant or equipment.

REPLACEMENT AND ENVIRONMENTAL EXPENDITURE

Replacement and environmental expenditure increased from NOK 1,738 million in 1997 to NOK 1,843 million in 1998, and covered a large number of minor and major projects. Some investments were made solely or chiefly with a view to achieving environmental improvements. These included the Chemicals area's expenditure on environmental

measures in 1997 and 1998, which totalled NOK 255 million.

However, the bulk of the investments concerned capacity expansion, rationalisation programmes, the modernisation or total replacement of plants, processes, etc. These projects also have a favourable environmental impact, in many cases on both the external and the internal environment. It is difficult to quantify the environmental proportion in this type of "combined" projects in a meaningful and consistent manner.

This report deals with both investments specifically designed to achieve environmental improvements and replacement investments that offer significant environmental benefits.

ENERGY AND THE ENVIRONMENT

Orkla's industrial production is very heat intensive. Since the Group pursues a highly flexible policy with regard to the use of oil or electricity for thermal energy production, the choice being determined on the basis of price, specific emissions will vary from year to year.

Active efforts are made in all Orkla's business areas to improve energy efficiency. Heat in waste water and flue gases is recovered through heat exchange, and energy from cooling processes is used to provide heat for other projects. Emphasis is placed on increasing day-to-day awareness of the importance of reducing energy consumption, also by cutting down on water consumption.

Borregaard in Sarpsborg, the Group's largest single energy consumer, carried out a study on future energy supplies in autumn 1998, in which considerable attention was focused on energy efficiency. One way of economising on energy would be to install a heat pump that uses waste water from the biological treatment plant. This could contribute significantly toward meeting Borregaard's future hot water requirements. Investments in new energy production units can be reduced by improving process control to even out peak periods.

Borregaard would be interested in using waste heat from a neighbouring smelting plant if a heat recovery plant is built.

EMISSIONS FROM THE GROUP'S TOTAL THERMAL ENERGY CONSUMPTION IN NORWAY

	1998	1997	1996	1995
Thermal energy (GWh)	1,873	1,759	1,778	1,771
CO₂-emissions (tonnes)	275,953	289,550	312,048	230,322
(kg per kWh)	0.147	0.165	0.176	0.130
SO₂-emissions (tonnes)	1,484	1,070	1,446	1,316
(grams per kWh)	0.79	0.61	0.81	0.74

Orkla's companies outside Norway, apart from some small businesses in Eastern Europe, had a thermal energy consumption of 870 GWh in 1998. The level of CO₂ emissions was 0.182 kg per kWh and the level of SO₂ emissions was 0.24 grams per kWh. The main reasons for the lower specific SO₂ emissions outside Norway are less use of oil, higher consumption of gas and purchase of external thermal energy, for instance from district heating networks.

Glossary/Environmental contacts

GLOSSARY

AOX:	Organic chlorine compounds (adsorbable organic halogen)	HSE:	Health, safety and environment
Biogas:	Methane produced by the bacterial decomposition of organic waste	H-value:	Number of injuries per million working hours
CO:	Carbon monoxide	ISO:	International Standardization Organization
CO₂:	Carbon dioxide	ISO 9001/9002:	Standards for quality control systems
COD:	Chemical oxygen demand	ISO 14001:	Standard for an environmental management system
DM:	Direct marketing	Isopropyl alcohol:	Organic solvent used e.g. in offset printing
EMAS:	EU's voluntary Eco Management and Audit System	MWh:	1 MWh = 1000 kWh
GMP:	Good Manufacturing Practice	NO_x:	Nitrogen oxide
GWh:	1 Gwh = 1000 MWh	SO₂:	Sulphur dioxide
HACCP:	Hazard Analysis Critical Control Points	Surfactants:	Surface active components in a detergent
Hazardous waste:	Waste that must be treated separately due to specified chemical and physical properties	TWh:	1 TWh = 1000 MWh
Hexane:	Organic solvent used e.g. to extract oil from soya beans		

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