Environmental Report 2001

Nordkalk

Environmental Report

Nordkalk extracts and refines limestone. The environmental impact of these operations is continuously monitored and evaluated in accordance with the company's environmental policy, which covers the whole of Nordkalk. In this report we give an account of the influence that our operations have on the environment together with the measures that have been taken or are planned to reduce any adverse effects.

Nordkalk aims at sustainable development, and the environmental implications of this are taken into account in the company's strategic planning. Products and processes are developed so that the environmental impact of the company's extraction and refining operations are kept to a minimum. Careful and diverse monitoring leads to an increased awareness of environmental matters; in order to achieve sustainable development improvements are necessary all the time. Nordkalk's environmental plans form part of the company's annual and strategic planning. Environmental work is monitored continuously by means of regular inspections. Responsibility for production-related environmental matters lies with the division managers while Nordkalk's environmental director supervises the policy to ensure that it is complied with throughout the company.

In addition to the environmental measures taken in production, Nordkalk also participates in environmental training programmes for its customers. When drawing up contracts with entrepreneurs and sub-contractors Nordkalk requires an assurance that its demands on environmental policy will be met. The sub-contractors are checked regularly in this connection by means of environmental audits.

The main principles of Nordkalk's environmental policy

Values and aims

- sustainable development with man as the focus of attention
- environmental legislation and regulations must be complied with
- environmental impact of operations to be identified
- information about development, measures and results

Continuous improvement

- environmental impact taken into account when developing products and processes
- environmental plans form part of strategic planning and cover environmental aspects, aims and investments
- investment plans include an evaluation of the environmental impact of the investments
- environmental work is audited on a regular basis

Landscaping in the quarry is started by planting trees.

Catastrophe drills are organised regularly. The picture was taken during a drill at Lappeenranta, Finland.

Advances in environmental management

During the year operations in Sweden were awarded an ISO 14001 certificate for their environmental management system. This means that from this year all Nordkalk's production plants in Finland and all operations in Sweden have environmental certificates.

In the year 2000 Nordkalk joined the agreement about saving energy signed between the Confederation of Finnish Industry and Employers and the Finnish Ministry of Trade and Industry. The agreement covers Nordkalk's three largest production sites in Finland: Pargas, Lappeenranta and Tytyri. The aim is more efficient use of energy and a reduction in costs. Long-term and systematic efforts to reduce energy consumption are a good way to reduce environmentally harmful emissions. Those production plants not covered by the agreement are also striving to follow the same principles and reduce their consumption of energy. Nordkalk has instigated an energy analysis in order to chart the use of energy at both production plants and in offices.

At Lappeenranta, Finland, the environmental report covering the entire factory area, including Nordkalk's neighbours has been updated.

Nordkalk is participating in the Pro Archipelago Sea project, the aim of which is to improve the state of the Archipelago Sea. The programme has been drawn up in cooperation with the Southwest Finland Environment Institute, the Regional Council of Southwest Finland and the local Labour and Economic Development Centre. Nordkalk is also part of the working group "Industry, Traffic and Air Pollution", which started a study of the industrial storm water and its environmental impact. In addition, Nordkalk is one of the main sponsors of the WWF Mermaid project. The aim of the project is to improve the state of the whole Baltic Sea. With production facilities around the Baltic Sea Nordkalk is fully aware of its responsibility regarding both emissions and effluents.

Training and resources

In Finland Nordkalk has charted the personnel's attitude towards the environmental management system and how it operates in practice. As a result of the study a training programme has started that focuses on the main parts of the system and the demands on the environmental situation at Nordkalk's different production sites. The programme will be further developed during the present year. When the environmental system was introduced in Sweden initially some 100 persons were given training in environmental questions.

Internal auditing courses were organised for 13 persons in Finland and 9 in Sweden, with the intention of involving more people in environmental questions and facilitating the process of developing the environmental management system.

The number of personnel in the environmental department increased by one, bringing the total up to four persons. In addition, there is one person at each plant who is responsible for co-ordination of environmental matters at the site.

Production processes and their impact on the environment

The majority of Nordkalk's plants are situated in towns and conurbations, which means that the surroundings place great demands on the operations. Nordkalk extracts and refines limestone on nearly 30 locations in Finland, Sweden, Estonia and Poland.

The most disturbing aspects of Nordkalk's production are noise, vibration, dust and different forms of discharges. In addition to these there is also the problem with surplus stone and other by-products from the production processes together with environmentally hazardous waste. The last consists primarily of different forms of waste oils that are collected and treated in accordance with current legislation and regulations. At the calcite and wollastonite flotation plants in Lappeenranta the use of water is also an important environmental aspect.

Close to Storugns on Gotland there is a nature reserve, which restricts to some extent the quarrying of limestone there. Nordkalk's operations in Lappeenranta lie partly within a protected area for ground water; this means increased responsibility and extra control of operations. The quarrying of limestone at the Vesterbacka quarry at Vimpeli in Finland is covered by the Decree for the Protection of Natural Copses and the Ancient Monuments Act.

Extraction and rough handling

Limestone is mined from the bedrock in either quarries or underground mines. It is then transported for preliminary crushing and sorting, after which it goes on to be further processed. These operations give rise to vibration, noise and dust.

The quarries change the appearance of the landscape in a very obvious manner. In addition to the stone that is actually used, surplus stone is often produced as a by-product. To some extent this can be used for making macadam but some has to be deposited in large dumps that are eyesores on the landscape. Ground water seeps by way of cracks in the bedrock down into the mines. Added to this, in the quarries there is also the problem of seepage of surface water. This may affect the ground water level in the area.

Production of quick lime
Crushed and sorted limestone is heated to some 1000°C in a rotating or shaft kiln. The limestone ($CaCO_3$) is broken down into calcium oxide, i.e. quick lime (CaO), and carbon dioxide (CO_2). Coal, oil and gas are used as fuels, and the gases that result contain oxides of nitrogen (NO_x), carbon dioxide (CO_2) and sulphur dioxide (SO_2) in varying amounts.

The process also causes dust. To reduce the amounts of dust the flue gases from the kilns are passed through electric or textile filters with a high degree of separation. There are no discharges into waterways from the lime-burning process.

Quick lime is in granular or powder form and is sifted into different fractions or ground. The end-products are used in the manufacture of iron and steel, in processing sulphide ore, in making paper pulp, and for cleaning drinking and waste water. Flue gases from coal-fired power stations are also cleaned with quick lime.

Production of slaked lime
The lime is slaked by adding water to quick lime. The calcium oxide reacts with the water and is transformed to calcium hydroxide ($Ca(OH)_2$), i.e. slaked lime, which is a dry, light-coloured and powder-like flour. In the course of manufacturing slaked lime heat and steam are discharged into the atmosphere. Thanks to efficient dust-reducing, however, the release of particles is negligible.

Slaked lime is used for cleaning drinking and waste water, for purification of flue gases and in the building material industry, for example.

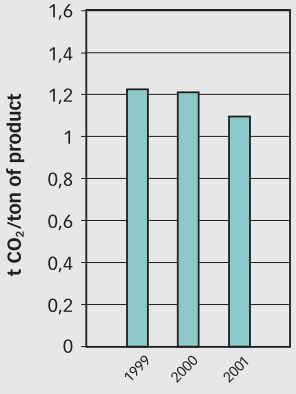
Carbonate products
Carbonate products include limestone, i.e. calcium carbonate ($CaCO_3$), which is crushed, ground and sifted. The grinding of the limestone is a dry process and consequently dust is the main source of environmental impact at the grinding plants. The dust can, however, be controlled by using a closed process and cleaning the discharged air with filters.

The products are used for soil improvement in order to neutralise acidity, for cleaning flue gases in coal-fired power plants, for alkalising water, in animal feeds and as fillers in asphalt, paper and plastics, for example.

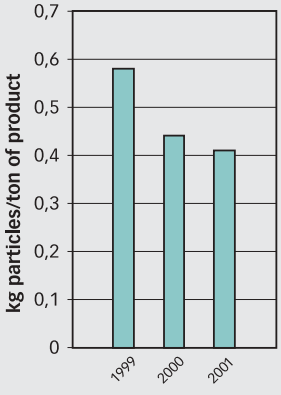
Other production
Nordkalk refines calcite and wollastonite from the quarry in Lappeenranta. The processed calcite is further refined for use as paper pigment.

Specific Emissions in Air

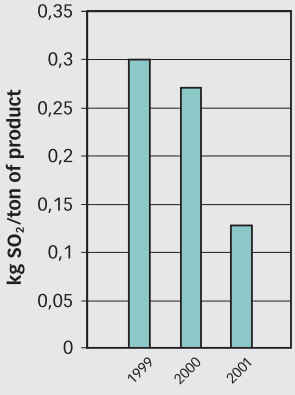
Quick lime



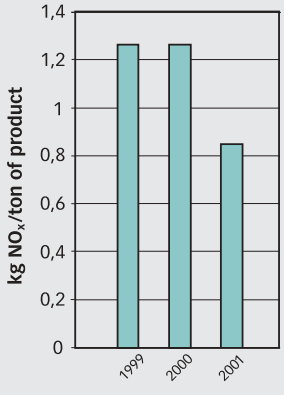
CO_2 specific emissions



emission of particles



SO_2 specific emissions



NO_x specific emissions

At Pargas, Finland, quick lime is produced by burning limestone in a rotating kiln.

The new grinding plant at Wolica, Poland, was opened in June 2001.

Environmental measures at production plants

Different development projects are under way all the time at Nordkalk's production plants, and monitoring and control systems are subject to steady improvement. Production in Poland has increased greatly by reason of the acquisition of the limestone company Miedzanka in the southern part of the country and the start of the nearby mill at Wolica. As a result total emissions have risen and measures to counter these are planned.

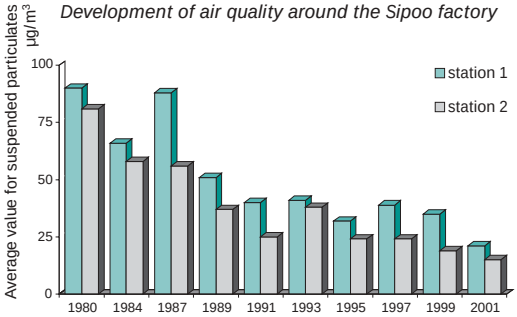
Dust is one of the most important environmental aspects of Nordkalk's operations and measures to reduce dust emissions are subject to continuous review. Most of the plants participate in the dust programme at their respective sites. In many places protective walls have been built and trees planted. On dry days in summer sprinkling measures are used to reduce the amounts of dust.

The effect of the measures introduced is followed up continuously. For example, at Sipoo, Finland, measurements have shown that the amount of airborne dust round the plant has fallen markedly. At Siikainen the whole annual output is crushed during the autumn months in order to reduce dust and noise during the rest of the year. This also reduces the fuel consumption.

The environmental management systems have led to safer handling of waste oil and better refuse sorting. The use of surplus stone is included in the environmental programme for the quarries and mines.

In 2001 the total invested in environmental measures with no demands on profitability was 2.8 million.

Development of air quality around the Sipoo factory



Source: Water and Air Protection Association for Itä-Uusimaa and Porvoonjoki River

During the past year the following steps to reduce the burden on the environment have been taken:

Air

Traffic planning in the factory area at Vimpeli, Finland, has been improved in order to reduce dust and increase safety.

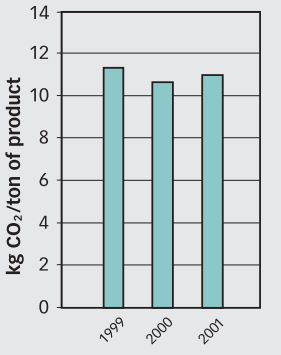
Some 6,000 m^2 of the entrance to the factory site at Vampula, Finland, have been asphalted.

At Storugns on Gotland Nordkalk has invested in a sweeping machine, asphalted areas and increased sprinkling in order to reduce fine particles and consequently the amount of dust. Kalkproduktion Storugns AB has also reduced the fine particles in the burnt lime to make it less dusty to handle.

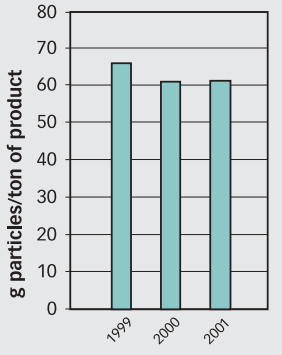
The Louhi plant has invested in methods that make it possible to fill disused parts of the mine with waste products. This markedly reduces the dust and also means that the waste stone areas above ground level do not need to be extended.

Carbonate products

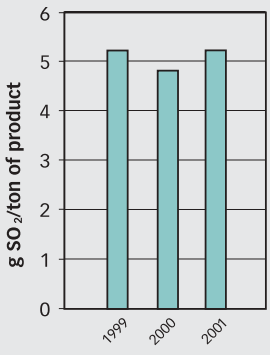
The diagrams are based partly on measurements, partly on calculations. The data has been assembled since Nordkalk adopted its environmental management system. As far as carbonate products are concerned, the rising trend depends partly on the product mix, which requires more energy than before.



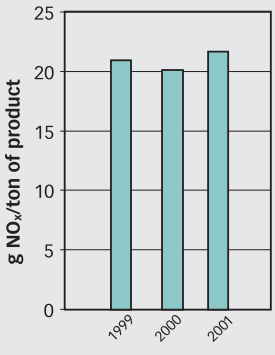
CO_2 specific emissions



emission of particles



SO_2 specific emissions



NO_x specific emissions

The reconstruction of the Uddagården plant in Falköping, Sweden, has reduced the environmental impact of the operations.

Nordkalk is known throughout the world as a leading expert in liming lakes.

New electric filters were installed in the kilns at Raahe and Pargas, Finland. These will considerably reduce the dust.

At Lappeenranta the sifting plant and packing line for burnt lime have been equipped with new filters. New filters have also been installed at Vampula.

At Slawno in Poland a new crushing line was built. This will reduce the adverse effect on the environment around the factory area.

Noise

At Köping in Sweden new compressors have been introduced which reduce a large amount of the noise.

At Storugns improvements are continuously being made to reduce the amount of noise made by the machines and equipment. Great weight is also attached to reorganising work routines so that both the personnel and the environment are subjected to as little noise as possible. The noise measurements made in recent years show a marked improvement.

The reconstruction of the Uddagården factory has led to less noise.

Water

At Lappeenranta the oxidation basin has been dredged. Nordkalk has also commissioned a study of the ground water with follow-up and installed an oil separator in the outlet dike for water from the new waste stone area.

Nordkalk's subsidiary Suomen Karbonaatti has invested in a storage basin for surplus calcite and in control of the water that is pumped out.

In Poland Miedzanka provides water to nearby households, as does also Tytyri in Finland. Miedzanka has built a new sewage treatment plant.

Energy

Reconstruction of the compressor hall at Köping has led to lower consumption of energy and made it possible to recycle heat.

Additional training of kiln operators has led to savings in the burning process.

Waste heat from the lime kilns in Pargas, Lappeenranta, Tytyri and Louhi is recycled and used in production and distributed as distant heating to households.

Reconstruction of the Uddagården plant in Sweden has meant reduced energy consumption.

Waste and by-products

At Lappeenranta it has been possible to increase the use of flotation tailings for rehabilitating refuse sites. Some of the carbon dioxide from the kiln's flue gases is used for the precipitation of PCC.

Large quantities of surplus stone have been crushed for use as asphalt filler at Tytyri.

The disused subterranean mine areas at Tytyri are an important end-deposit for waste materials from power stations such as fly ash, for example.

Sales of dust from the electric filters from the lime kilns at Pargas, Lappeenranta, Tytyri and Louhi have almost doubled during the past year. At Köping in Sweden the entire annual output of filter dust was sold.

Quarry landscaping

Surplus stone deposited at quarries has been covered with soil and trees planted at Pargas and Vampula. On the shore of the lime plant at Sipoo trees have also been planted. At Storugns on the island of Gotland landscaping is planned as part of production, and the work continues as quarrying proceeds.

The landscaping of the old industrial refuse site at Lappeenranta continued. Restoration of the site began in the year 2000 in accordance with the provisions of Nordkalk's environmental permit. The work continued in 2001 and planting was started. The entire process of landscaping is expected to be completed by the end of 2003.

Tests with vegetable oils

At Storugns on the Swedish island of Gotland experiments have been carried out for some years with easily degradable vegetable oils. These have proved, however, to damage the gaskets and pumps in the hydraulic system, causing increased maintenance costs and leakage. It has therefore been necessary once more to adopt mineral oil in trucks and loading machines. The company that leases the machines to Nordkalk and the manufacturer are, however, looking for environmentally friendly alternatives.

Products for environmental care

Nordkalk develops and markets products for environmental use. Using different limestone-based applications it is possible to anticipate and solve different environmental problems. Sales of these products increased somewhat last year; they now account for 13 per cent of Nordkalk's total turnover.

Nordkalk Velox is a product that promotes more effective composting and counters the smell that arises when treating refuse and wastewater. Nordkalk Velox is well adapted to treating biowaste and different kinds of sewage and industrial sludge in composts and open pit composting.

A new line of products, Nordkalk Filtra, has been evolved for filtering sewage. This type of limestone filter makes it possible to purify the water even in cases where traditional methods are not suitable.

Water courses become acidic as a result of air pollution above all. Liming helps to restore the quality of the water to the level prior to acidification. The long-term work carried out by Nordkalk over a period of decades has brought it world renown as a leading expert in liming lakes and water courses. Sweden has the world's most comprehensive publicly financed programme for liming, and as a specialist Nordkalk participates in developing the programme and putting it into practice.

Emissions

FINLAND		1996	1997	1998	1999	2000	2001
emission in air[1]:	CO_2 (t)	350 000	561 950	593 732	638 979	670 079	658 396
	particles (t)	394	387	349	347	464	453
	SO_2 (t)	87	158	175	68	122	90
	NO_x (t)	464	415	514	468	514	444
emission in water:	solid material (t)	24		14	16	80	51
	BOD_7 ATU (t)	4		3	2	8	5
by-product:	filter dust (t)	31 700	41 716	37 902	41 863	46 681	45 195
	* utilized (t)	20 100	20 589	16 730	27 071	29 592	29 632
	slaking residue (t)	21 500	19 986	25 709	21 108	20 425	19 191
	* utilized (t)	11 000	11 786	14 949	12 739	13 174	6 605
	waste stone (t)	921 850	1 290 936	1 443 681	1 122 884	1 454 576	1 328 901
	* utilized (t)	500 800	811 956	953 242	829 746	1 148 527	1 005 718
	refining waste (t)	127 900	171 196	185 760	119 183	119 922	115 637
	* utilized (t)	22 158	24 628	19 287	15 000	25 000	65 746
environmentally hazardous waste:	oils+greases (t)	93	43	53	49	58	50

SWEDEN		1996	1997	1998	1999	2000	2001
emission in air[1]:	CO_2 (t)	291 000	344 551	475 243	385 248	437 790	385 733
	particles (t)	113	92	101	135	99	37
	SO_2 (t)	43	61	205	162	128	38
	NO_x (t)	485	545	705	644	682	389
by-product:	filter dust (t)	33 580	33 303	34 727	27 547	23 637	30 980
	* utilized (t)	29 580	29 578	30 421	23 057	18 317	29 638
	slaking residue (t)		2 200	1 705	1 390	1 599	1 600
	* utilized (t)		2 200	1 705	1 390	1 599	593
	waste stone (t)	5 940	10 803	14 003	39 814	52 343	33 759
	* utilized (t)		10 803	14 003	39 814	52 343	25 759
	washing sludge (t)	70 000	0	0	26 022	26 028	26 000
	kiln waste (t)	4 700	4 463	2 051	1 899	2 695	3 100
	* utilized (t)					500	0
environmentally hazardous waste:	oils+greases (m^3)	39	26	46	59	54	750[2]

ESTONIA		1999	2000	2001
emission in air[1]:	CO_2 (t)	28 959	25 502	25 303
	particles (t)	350	127	153
	SO_2 (t)	2	2	2
	NO_x (t)	21	19	19
by-product:	filter dust (t)	0	1 500	240
	* utilized (t)	0	1 500	240
	kiln waste (t)	480	480	200
	process waste (t)	71 300	30 500	31 179
	* utilized (t)	71 300	30 500	0
environmentally hazardous waste:	oils+greases (m^3)	0	5	5

POLAND[3]		1999	2000	2001
emission in air[1]:	CO_2	75	706	9 264
	particles (t)	0,40	5,80	19,00
	SO_2 (t)	0,15	0,47	6,00
	NO_x (t)	0,15	1,43	24,00
by-product:	process waste (t)	1 265	2 300	331 944
environmentally hazardous waste:	oils+greases (m^3)	not noticed	not noticed	21

1) The tables are a summary of measured and calculated figures.

2) As a consequence of a change in the law, Storugns must be ready to accept waste oil from the ships visiting the harbour.

3) The increased emissions arise from the considerable expansion of the operations after the acquisition of the limestone company Miedzianka and after the grinding plant at Wolica was brought into use.

Counting of Emissions in Air

Emissions of sulphurdioxide (oil vessel)

$M_s = 0.02 \times s \times M_a$ (t/a)

where M_s = emission of sulphurdioxide (t/a)
s = sulphur content of fuel
M_a = fuel consumption (t/a)

Emissions of particles (oil vessel)

$M_h = 0.04 \times Q \times M_a/1000$ (t/a)

where M_h = emission of particles (t/a)
Q = emission of particles (70 mg/MJ, if not measured)

Emissions of carbondioxide
Burning of limestone releases theoretically 0,78 t CO_2/ t CaO.

CO_2 emission coefficients

Fuel	kg CO_2/GJ
petrol	69,3
diesel, light oil	74,1
heavy oil, waste oil	77,4
liquid gas	63,1
coal	94,6
coke	108,0
anthracite	94,6
natural gas	56,1
blast-furnace gas	252,0
coking plant gas	40,5
peat	106,0

Thermal value of fuel

Fuel	thermal value
coal (GJ/t)	29,0
fuel oil (GJ/t)	42,0
liquid gas (GJ/t)	46,4
natural gas (MJ/m^3)	36,0
coking plant gas (MJ/m^3)	17,0

Emissions of nitric oxide

Fuel	NO_x coefficient (mg/MJ)
heavy oil	150
light oil	150
natural gas	100
liquid gas	100

PAINOPRISMA OY

Hundred-year liming contract

In 1998, when Partek celebrated its one-hundredth anniversary, a liming project to improve the quality of the water in the Alinenjärvi lake system was started at Nokia in Finland together with the town of Nokia and the Pirkkala Environment Centre.

The acidification of Alinenjärvi began in the 1970´s when air pollution was at its worst. The aim is to neutralise the acidity of the lakes and maintain as a even a quality of the water as possible. In 1998 two of the lakes in the upper part of the system, Ylinenjärvi and Kalliojärvi, were treated with lime.

Since the liming measures were taken, the quality of the water has developed as expected. The pH value and alkaline characteristics of the water are monitored each spring and autumn, and the quality of the water has been maintained at a good level. Last year's results show that the pH value and alkaline quality of the water have fallen somewhat, as expected. The uppermost lake in the system, Ruokejärvi, in particular has been shown to have a strong acidifying effect on the other lakes further downstream. Consequently, in October 2001 Ruokejärvi was treated with lime in addition to the liming measures already taken. Future measurements will show how this affects the other lakes and if and when new steps need to be taken.

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