



norden

Nordic Council of Ministers

BAT

BAT - The best available techniques to minimise environmental impact
The results of BAT activities by the Nordic Council of Ministers



BAT -
The best available techniques to
minimise environmental impact
The results of BAT activities by the Nordic Council of Ministers
ANP 2007:xxx
© Nordic Council of Ministers, Copenhagen

Members of the BAT-group:
Ulla Ringbæk, Danish Environmental Protection Agency, Denmark
Erkki Kantola, Northern Finland Environmental Permit Authority, Finland
Jóhanna Olsen, Food-, Veterinary- and Environmental Agency, Faroe Islands
Stefán Einarsson, Environment and Food Agency of Iceland
Olaug Bjertnæs, The Norwegian Pollution Control Authority, Norway
Jard Gidlund, Swedish Environmental Protection Agency, Sweden
Susanne Särs, Government of Åland, The Åland Islands

Text: Birgitte B. Nielsen, Valør & Tinge A/S
Design: Morten Constantineanu Bak
Print: NN
Date: February 2007

Introduction

The Nordic countries have a long tradition for cooperation, especially in the environmental field. This cooperation has been useful for every single Nordic country, and the Nordic countries have together been influencing international environmental policy implementation.

One of the areas in which the Nordic Council of Ministers has had great influence in the environmental area is in defining and describing BAT – Best Available Techniques.

Building upon the Nordic tradition for prevention of pollution, the Nordic countries have had many experiences to draw upon in the international negotiations about what should be seen as BAT in a given sector.

The Nordic cooperation on BAT has taken place in the BAT group, a subgroup of the PA group, the Working Group for Products and Waste. The BAT group works on a Nordic level to elaborate and disseminate information about environmentally sound production within important industry sectors.

The work of the group contributes to promoting the use of the best available techniques, BAT, particularly with an emphasis on cleaner technology within selected industrial sectors. The aim is to reduce the environmental impact as much as possible.

This booklet describes the work of the BAT group and their results in relation to both the national and international perspective. The work of the group has been disseminated through a range of publications, which are informative and useful for authorities, organisations and companies working with BAT.

Kenneth Holm
Chairman of the PA group



BAT in environmental regulation

Focusing on cleaner technology principles and BAT is part of the common Nordic mindset and all the Nordic countries have for many years had an environmental licensing system building upon these principles.

Therefore the Nordic countries were well prepared when the EU approved the IPPC Directive in 1996. IPPC is the abbreviation of Integrated Pollution Prevention and Control. The IPPC Directive gives the definition of BAT which is used throughout Europe today.

BAT means:

“the most effective and advanced stage in the development of activities and their methods of operation which indicate the practical suitability of particular techniques for providing in principle the basis for emission limit values designed to prevent and, where that is not

practicable, generally to reduce emissions and the impact on the environment as a whole:

- *“techniques” shall include both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned,*
- *“available” techniques shall mean those developed on a scale which allows implementation in the relevant industrial sector, under economically and technically viable conditions, taking into consideration the costs and advantages, whether or not the techniques are used or produced inside the Member State in question, as long as they are reasonably accessible to the operator,*
- *“best” shall mean most effective in achieving a high general level of protection of the environment as a whole.”*

(The IPPC Directive article 2, 11)

As part of the implementation of the Directive it was decided that the EU should develop so called BREF documents (BAT reference documents), which describe the best available techniques in each industrial sector as well as techniques that can be applied in several sectors. A total of 33 BREF documents are to be produced, of which 32 are ready and in use. For more information see <http://eippcb.jrc.es/pages/FActivities.htm>.

The work of the Nordic Council of Ministers BAT group

BAT is a concept that has gained international acceptance and been integrated in national, EU and international environmental regulation. The Nordic countries have been active in promoting the use of BAT in various industrial activities in the Nordic countries, within the EU and in international negotiations.

The Nordic cooperation on BAT has had two main aims:

- 1) To prepare information about BAT and cleaner technologies in sectors with many Nordic and particularly small and medium sized companies.
- 2) To contribute to the work of the EU on BREF documents with up-to-date information from the Nordic countries.

The reports on cleaner technologies and BAT have also aimed at giving companies and authorities an overview and easy access to information, with the hope that the techniques would be implemented and the environmental impact reduced.

The reports have had a significant effect on the international BAT work. The fact that in several cases the Nordic countries had already published a report when international negotiations began meant that the Nordic countries were in a position to provide valuable information. This has resulted in a better representation of Nordic values and interests than would otherwise have been the case. For instance in relation to BAT in the food industry, the Nordic reports are some of the most referenced documents in the EU BREF documents.

The Nordic Council of Ministers has made 16 BAT publications in different industrial sectors over the last 12 years, and the publications have maintained their relevance.

The use of the BAT reports

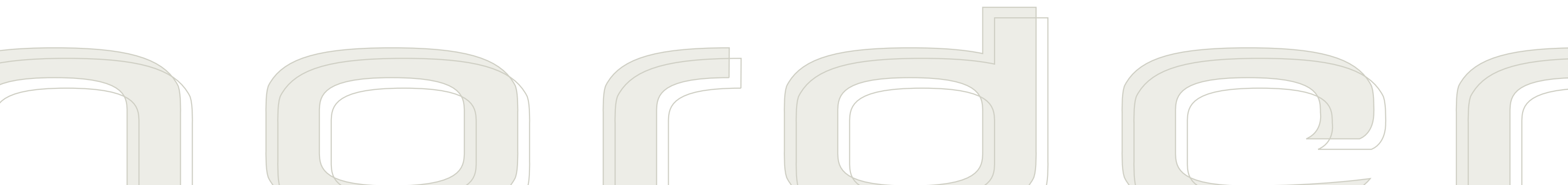
The fundamental requirements in all Nordic environmental regulation and the EU IPPC Directive are that companies must minimise pollution as much as possible by using BAT.

Traditionally in the Nordic countries, authorities and companies work together, as far as possible, to solve environmental problems that may arise.

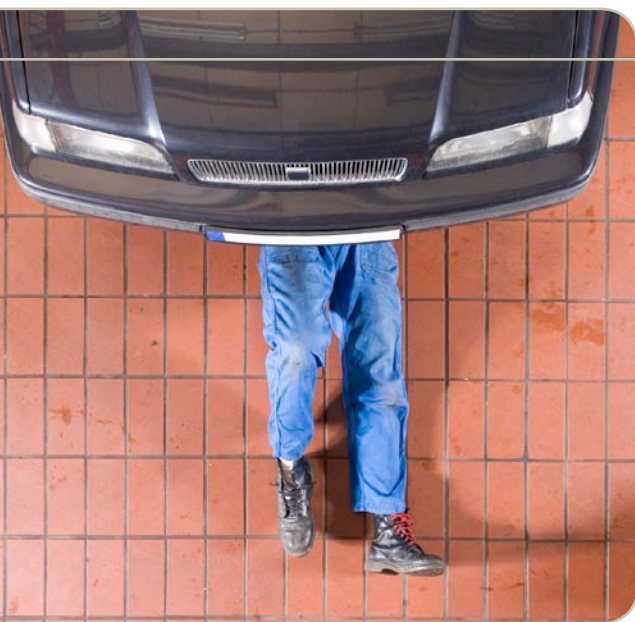
In this cooperation between authorities and companies the Nordic BAT reports are good tools and sources of inspiration for giving a common overview of the available possibilities. Experience has shown that using the BAT reports and BREF documents means:

- a more qualified dialogue between the authorities and the company,
- that more environmental activities are initiated than earlier,
- that some issues are included on the agenda earlier than before.

On the following pages you will find short summaries of the reports and examples of the recommended BAT. An overview of all publications and where to obtain these are found at page 22.



Best available techniques (BAT) in auto repair shops



In 2007 the Nordic Council of Ministers published the report "Best available techniques (BAT) in Auto Repair Shops" (TemaNord 2007:544), (in Danish "Bedste tilgængelige teknikker (BAT) i autoværksteder", TemaNord 2007:545). The report presents an overview of processes and products which are used in auto repair shops, and describes the existing possibilities of implementing cleaner technologies or best available techniques for avoiding or reducing emissions and environmental impacts.

Auto repair shops produce noise, waste and wastewater and contribute to air pollution primarily from the use of volatile organic solvents (VOC) through under sealing of cars and painting of cars, but VOCs are also emitted from degreasing agents, filling agents and glue.

Wastewater from auto repair shops may have a high content of oil, heavy metals and other hazardous substances. The amount of waste from auto repair shops may be large and could consist of many types of hazardous waste. Also, there is a significant risk of soil pollution from oil and heavy metals.

Cars themselves and many car maintenance products, spare parts and other materials used in auto repair shops contain substances which from an environmental and health point of view are particularly concerning. These substances are of significance to health and safety and are emitted to the environment not only from the auto repair shops, but also from cars being used and when they are scrapped.

Examples of BAT

The report describes potential BAT techniques in the following areas:

- Wastewater, especially from sand and grit traps, oil separators and catching and control wells.
- Water usage, primarily in case of recirculation in connection with car washing and washing of spare parts and engine parts.
- Energy, where energy saving can be achieved from an efficient weather screen and optimization of the use of electrical tools.
- Chemicals and oil products, where especially methods for choosing more environmentally sound products are described.
- Waste management, where the report shows ways of sorting, storing and disposing.
- Noise, which mainly refers to the possibilities of reducing noise while testing engines, tools and compressors etc.
- Air emissions, where possibilities of minimising emissions of dust, welding smoke, exhaust fumes and paint vapour are described.
- Soil pollution, where suitable surface types under storage facilities and impervious materials are described.

BAT - Car Washing Facilities

The Nordic Council of Ministers published in 2007 the report "BAT - Car Washing Facilities" (TemaNord 2007:547), (in Swedish: "BAT – fordonstvätt", TemaNord 2007:546). The aim of the report has been to identify BAT for reducing the environmental impacts from car washing sites in the Nordic countries.

More than half of all car washings in the Nordic countries occur outside car washing sites and with no treatment of the waste water, which carries a risk of polluting groundwater or other recipients of pollution. Pollution from car washing arises from washing chemicals, road surfaces, oil products from cars etc. and consist for instance of oil, detergents (tensides), complex binders and metals. Plasticizers such as diethylhexylphthalat (DEHP), for instance from caulking compound, and polyaromatic hydrocarbons (PAH) which are found in tires, have been found in wastewater from car washing.

Examples of BAT

One of the report's conclusions is that if many more carwashes were done at car washing sites rather than in private homes, pollution could be reduced considerably. Furthermore the report describes

potential BAT techniques at car washing sites, for instance:

- Use of more environmentally sound chemicals, for instance avoiding the use of solvent based degreasing agents and nonylphenol.
- Installation of closed systems including collection of all residuals and waste.
- Installation of further treatment techniques including rinsing and recirculation of washing water and chemicals etc.
- Training of personnel in self monitoring, recordkeeping and environmentally sound behaviour.
- Sorting of waste and disposal at approved treatment site.



Waste management on fishing vessels and other smaller vessels



In 2006 the Nordic Council of Ministers published the booklet "Håndtering av avfall ombord på fiske fartøyer og mindre fartøyer" (2007:567) together with a background report (TemaNord 2006:502). The booklet is published in several Nordic languages, but neither the booklet nor the report is available in English. The main purpose of the booklet and the report has been to give an insight into the regulation in the area and an overview of the techniques which can contribute to efficient management of waste from fishing vessels and other smaller vessels.

In particular, the booklet discusses the production and disposal of waste from vessels which are regulated by the international MARPOL

73/78 Convention, which sets minimum requirements on pollution from vessels in the marine environment. The booklet covers oil waste, sewer waste and wastes similar to household waste. It describes both best available techniques (BAT) and Best Environmental Practice (BEP) and the special regulations that are in force in Northern European waters.

The booklet identifies guidelines for waste handling on board vessels, including technologies and systems as well as routines and reporting. The booklet concludes that responsible and sound handling of waste often starts with establishing and implementing good and efficient routines. Routines should be described in a

simple and easily accessible waste handling plan which shows where the waste is generated. Good waste handling on fishing vessels and other smaller vessels requires the following simple elements:

- Consciousness and training – motivation
- A system for implementing routines and processes
- Monitoring – surveillance and verification.

Examples of BAT

In choosing BAT on board a vessel a starting point should be that the crew establishes an environmentally sound practice and implements it on board, followed by defining solutions which ensure compliance with these practices. This could for instance be waste handling and sorting, which ensure that waste is collected and disposed of at an approved waste handling site on land, and that the crew have ensured that waste may be stored safely on board in advance.

BAT examples from the Nordic iron and steel industry

In 2006 the Nordic Council of Ministers published the report "BAT examples from the Nordic iron and steel industry" (TemaNord 2006:509). The main purpose of this study is to support the up-coming updating work on the EU BREF documents in the related industries, and also to promote the possibilities of including Nordic examples in these BREF documents.

The reference documents for this study are two present BREF documents:

- 1) BREF document on the production of iron and steel, 2001.
- 2) BREF document on the ferrous metals processing industry, 2001.

The report presents good examples of BATs in the Nordic countries including:

- present data concerning especially the environmental impact and the energy efficiency and
- examples of both "Established techniques" and "Emerging techniques", which are to be established in the near future.

Examples of BAT

The report shows that there are a lot of BAT processes, sub-processes and measuring technologies in both the production of iron and steel and in the ferrous metals processing industry.

The report presents 35 Nordic examples equally divided between the iron and steel production and the ferrous metals processing areas, with the bulk of examples on established techniques, but eight emerging techniques are also described.

The report also comments on the present BREF documents.





Boating – a pure pleasure!

In 2006 the Nordic Council of Ministers published the booklet "Boating – a pure pleasure!" (ANP 2005:750). The brochure has been published in most Nordic languages and English and German. The booklet is aimed at boat users, members of boat clubs and responsible for marinas. The booklet provides information about their duties to reduce pollution in and around marinas. Examples of ways to reduce pollution are also provided.

In the Nordic countries at least one million litres of antifouling paint and boat maintenance products are used every year. Some of these contain biocides, which have harmful effects on organisms living in water. Many boat owners each year remove a big amount of flakes of antifouling paint and residues, which could be a source of pollution if not collected. Also huge amounts of other wastes are generated in and around marinas.

At the end of the boating season the boats are often cleaned with water at high pressure. Here copper and other active compounds in the paint, which are mainly attached to the solid particles on the boat, are washed off.

To reduce these potential environmental impacts the booklet recommends several solutions.

Examples of BAT

The booklet recommends:

- All marinas and boat clubs should appoint someone responsible for the environmental work.
- All marinas should have an easily accessible waste facility with the possibility of sorting the waste into categories.
- Antifouling paint and dust from sanding and scraping should be collected and disposed of as hazardous waste.
- Boat owners should be aware of the hazardousness of the products they use and consider more environmentally sound alternatives.
- All marinas should establish washing down areas, where water runs off into collection and sedimentation tanks.
- Oil and fuel should be stored on an impervious base with a raised edge.
- Absorbent materials should be available in case of accidental spills.

Best available techniques in fish breeding

In 2005 the Nordic Council of Ministers published the report "Beste tilgjengelige teknikker for fiskeoppdrett i Norden" (TemaNord 2005:528), and in 2006 a short version was published in most Nordic languages. The report is not available in English. The report gives an overview of processes which are available for the industry and describes the environmental aspects and techniques, which may be seen as BAT to reduce the use of resources and environmental impacts from both land-based and ocean-based fish breeding.

Fish breeding in the Nordic region includes many different marine and freshwater species and represents a considerable annual production in Europe. The report distinguishes between land-based fish-breeding plants that release effluents to lakes and rivers, and ocean-based fish-breeding plants.

The BAT report was developed as a tool for Nordic companies to identify cleaner technologies. The processes used in the Nordic companies are somewhat comparable, which



makes a shared collection of experiences helpful.

The main environmental impacts related to fish breeding are:

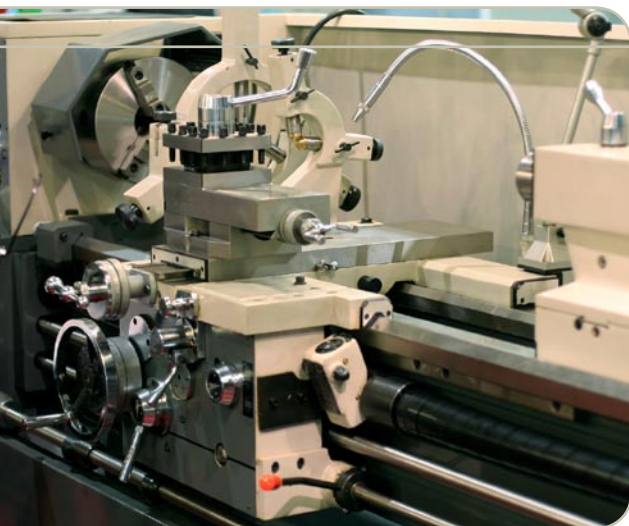
- Use of energy for heating and pumping of water, lightning, oxidizing and UV treatment of water (land-based plants).
- Medicine (antibiotics) and disinfection agents.
- Emissions of organic matter (nutrients) in the form of sedimentation of waste from fish feed and excrement.
- Waste in the form of dead fish and packaging.
- Smell from fish feed storage and tanks for conservation of dead fish.
- Clearing of fish breeding.

Examples of BAT

The report describes potential BAT techniques. A selection of these is:

- Recirculation of water including micro filtration, bio filters and oxidizing of water (land-based plants).
- Denitrification filters in recirculation plant to minimise the emission of nitrates.
- Phosphor sedimentation in the recirculation plant to minimise the emission of phosphor.
- Use of smooth surfaces and high-pressure washing down with water to reduce the use of disinfection agents and detergents.
- Techniques for detection and collection of fish-feed waste.
- Techniques to reduce the need for copper-proofing of fish feed bags.

Environmentally acceptable metalworking processes



In 2002 the Nordic Council of Ministers published the report "Environmentally acceptable metalworking processes" (TemaNord 2002:528) (In Swedish: "Miljövänligare mekaniska metallbearbetningsprocesser" (TemaNord 2002:527)). The report describes the possibilities of reducing the environmental impacts from metalworking processes. The report primarily goes through the metal-working processes in which metalworking fluids are used, such as cooling oils and lubricants. The opportunities for substituting chemicals and procedures for minimising fluid losses are described in the report.

Metalworking fluids are used in metalworking processes to reduce friction, wearing, process stops and increased use of energy. The fluids are needed to ensure well functioning cooling, lubrication and removal of turnings and chips.

The fluids often consist of a base of mineral oil including some additives related to the function of the fluid. Most of the losses of fluids (75%) are collected and treated (burned) at licensed incineration plants, but the rest are carried over on the machined products, turnings and chips, which are degreased at a later stage.

Mineral oil is classified as non-degradable and among the additives there are a number of hazardous substances, for instance the so called EP (extreme pressure) additives, which could be chlorinated paraffins, chlorinated fatty acids or sulphur compounds. There are phenolic compounds used in emulsifying agents and ditiocarbonates, lead and boron compounds used in anti-wearing compounds.

The environments in which the fluids shall be active are very easily infected by microorganisms, which increase the need for using biocides, which could cause health problems and later environmental impacts.

Examples of BAT

To minimise the losses of fluids and the impact on the environment the report recommends:

- Substitution of poorly refined fluids including polycyclic aromatic hydrocarbons (PAHs), chlorinated paraffins, phenolic compounds.
- Use of products with additives which are well documented and well declared.
- Improved design of tanks and piping to storage of the fluids to increase lifetime of the fluids and reduce waste.
- Treatment of used fluids by ultrafiltration supplemented by reverse osmosis, so they can be recycled.
- Closed degreasing systems, minimising the amount of oil and additives in the waste water.
- Use of alternative metalworking processes with no need of fluids through development of advanced materials for machine tools.

Best available techniques (BAT) in the surface treatment industry

In 2002 the Nordic Council of Ministers published the report "DEA – an aid for identification of BAT in the inorganic surface treatment industry" (TemaNord 2002:525). The report is an update of an earlier report on the same issue: "Possibilities for reducing environmental impacts from the surface treatment industry" (TemaNord 1993:560). The report describes the latest technical developments and presents the results of a new benchmarking method to identify BAT and the possibilities of reducing environmental impacts from surface treatment.

The report uses a new benchmarking method known as the Data Envelopment Analysis (DEA). The advantage of the method is that it can identify BAT from existing material without having first to apply a

priori weighting of a large number of variables such as emissions, use of energy and raw materials in order to make them mutually comparable. A survey among metalplating companies shows that high productivity and a good environmental performance are easily combined.

Examples of BAT

In the surface treatment industry the best environmental results are achieved by low water consumption combined with low energy consumption, because it gives best efficiency and the lowest spillage of metals. Some of the BAT techniques presented are:

- Separate material flows give the best possibilities for recycling.
- Zero-effluent processes, which minimises water consumption and loss of metals.

- Post-processing and rinsing technologies, which reduce the content of metals in the wastewater.
- Alternative energy sources, for instance oil and gas replacing the use of electricity for heating of processing baths.

The report shows that the most environmentally sound and efficient surface-treatment industries often are specialised and have quality and environmental management systems and an efficient network with suppliers and authorities.

Best available techniques (BAT) for the Nordic dairy industry



In 2001 the Nordic Council of Ministers published the report "Best available techniques (BAT) for the Nordic dairy industry" (TemaNord 2001:586), and in 2003 a short version (ANP 2003:719) was published in Danish, Swedish, Norwegian and Finnish. The report gives an overview of the dairy industry in the Nordic countries, the production processes and techniques used and the current emission and consumption levels. The potential candidates for best available techniques are described.

The dairy industry processes milk into different types of dairy products and in the Nordic countries the industry is characterised by both small

farm dairies and large cooperatives and multinational companies.

The BAT report was prepared at the same time as the EU started its work on developing the BREF document for food, drinks and milk industries. The Nordic report was a much referenced report during the work of the EU and the final EU BREF document has more than 40 references to the Nordic Council of Ministers.

The main environmental aspects related to the milk-processing industry are:

- a high consumption of energy for heating, cleaning, evaporation, drying, cooling, ventilation and lighting,
- a high consumption of water for cleaning of production equipment and cooling,
- a consumption of chemicals for cleaning and disinfection,
- discharge of effluent with a high organic load and solutions of cleaning agents,
- waste such as discarded packaging material,
- refrigeration systems based on chlorofluorocarbons (CFC) which are being phased out,
- noise from traffic, spray dryers and cooling compressors.

Examples of BAT

The report describes potential BAT techniques to reduce the environmental impacts of the industry and mentions environmental management systems, regular monitoring of impacts, identification of inappropriate routines and motivating employees as important measures to consider as part of a successful environmental management. Some of the BAT techniques presented are:

- frequency converter on electric motors,
- precooling of circulating ice water,
- heat recovery,
- minimising of water consumption for cleaning, for instance recycling of the cleanest water from the last stage of rinsing,
- automatising of dosing of cleaning agents,
- recycling of transportation packaging.

Best available techniques in slaughterhouses

In 2001 the Nordic Council of Ministers published the report "BAT report – best available techniques in slaughterhouses" (TemaNord 2001:553), (in Danish: "BAT rapport – bedste tilgængelige teknik (BAT) i slagterier", TemaNord 2001:552). The implementation of cleaner technology solutions was carried out in the meat industry during the 90s. This report attempts to give an overview of the possibilities for the use of cleaner technology in slaughtering and related areas. Pollution data, figures for resource use and key figures are reported at plant level and for specific processes.

The BAT report was prepared at the same time as the EU started its work on developing the BREF document for slaughterhouses. The Nordic report was a much referenced report during the work of the EU and the final EU BREF document has more than 20 references to the Nordic Council of Ministers.

The Nordic slaughtering industry is characterised by having relatively few yet big facilities. Some countries do however have several facilities which are small in an international perspective, for geographical reasons. The industry has a large consumption of energy and water



and emissions of wastewater with a high content of organic materials.

Examples of BAT

The report describes BAT solutions in slaughtering of pigs, cattle, lamb/sheep and chicken, production of sausages and cattle feed. For instance, cleaner technology at a slaughterhouse means:

- Minimising water consumption by equipping taps and hoses with saving nozzles and auto-

matic stop system when production stops.

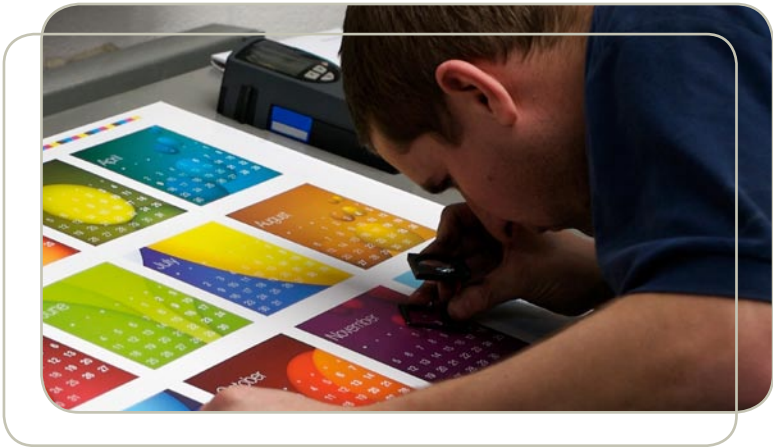
- Minimising energy consumption through maintenance of compressed-air installations and ventilation system.
- Minimising wastewater by removing waste as close to the source as possible to avoid blood, bits of meat and manure in the wastewater.

Best available techniques (BAT) for the printing industry

In 1998 the Nordic Council of Ministers published the report "Best available techniques (BAT) for the printing industry" (TemaNord 1998:593), (in Danish: "Bedste tilgængelige teknikker (BAT) i den grafiske industri", TemaNord 1998:592). In 2002 a short version of the report was published in Danish, Swedish, Norwegian, Icelandic and Finnish. The report includes a detailed review of the printing industry in the Nordic countries, the production processes and printing methods used, significant environmental aspects and recommendations on cleaner technologies and BAT.

The printing industry produces many different printed products: newspapers, magazines, catalogues, books, brochures, packaging etc. and in the Nordic countries the industry is characterised by huge variation, but most companies are SMEs.

The BAT report was drafted to help companies identify cleaner technologies at a time when a growing number of purchasers, users and producers of printed matter were becoming aware of the environmental impacts of the printing industry, and at a time when printing companies were implementing environmental management systems and received



licenses for the Nordic Swan environment label.

The main environmental impacts of the industry are not related to the printing processes, but to the production of paper, cardboard, plastic or other materials, which the industry prints on. The report recommends preventing over-consumption and waste of materials, and considering all possibilities for reuse of materials.

Examples of BAT

The report recommends using printing materials produced with a minimum impact on the environment which means paper made from recycled fibre or virgin fibre from sustainable forestry and bleached without the use of chlorine gas (TCF

paper). Other recommendations are for instance:

- Use printing ink, lacquers and adhesives without hazardous components to reduce the use of heavy metals such as cadmium, mercury, lead and chromium (6+).
- Use mineral-oil-free offset inks based on vegetable oils.
- Choose the lowest possible paper basis weight that still fulfills the purpose of the product.
- Ensure that size and format is chosen to correspond to the standard sizes of sheets, and thereby ensuring that as little as possible is wasted while trimming.
- Use vegetable cleaning agents.
- Reduce the percentage of alcohol in fountain solution.

BAT Best Available Technology in the Fishing industry

In 1997 the Nordic Council of Ministers published the report "BAT Best Available Technology in the Fishing Industry" (TemaNord 1997:579), (in Danish: BAT – Best Available Technology i Fiskeindustrien", TemaNord 1997:580). The report describes the possibilities for reducing water consumption and pollution in wastewater in the herring-filleting industry, mackerel, white-fish and the shrimp processing industry and the fish-meal and oil industry through implementation of cleaner technology.

The Nordic fishing fleet lands a huge amount of fish and seafood every year, and the aim of the report was to describe the methods and equipment to reduce the use of resources in processing the fish and to reduce emissions. The report described cleaner technologies at a time when the industry was in the limelight for having a high water consumption and large emission of organic matter. Processes used in the Nordic fishing industry are often alike and therefore collection of Nordic experiences has been valuable.

From an environmental perspective the industry has high water consumption (fresh water) and large emissions of waste water with a high

content of organic matter. Therefore the location of the industry is important in relation to the recipient environment's ability to degrade and cope with the effluents.

The report has been used as a reference document in the EU's work on developing the BREF document for the food, drinks and milk industries.

Examples of BAT

The industry is very dependent of the quality of its fish and seafood. The cleaner technologies presented in the report will not influence the quality of the products negatively. The report describes BAT based on quick separation of waste and process water and:

- elimination of unnecessary usage of water,
- minimising the necessary use of water by known technologies, and
- development of new technologies.





Reduction of Emissions from Ship Yards

In 1995 the Nordic Council of Ministers published the report "Reduction of Emissions from Ship Yards" (TemaNord 1996:556), (in Norwegian: "Reduksjon av utslipp fra skipsverft", TemaNord 1995:609). The report gives a review of the shipbuilding and ship-maintenance industry in the Nordic countries, Germany and the Netherlands. The report describes the environmental aspects, the operational units used and possible candidates for best available techniques.

Shipbuilding has long traditions in the Nordic countries, and in the shipyards all sorts of ships are built, for instance fishing cutters, passenger ships, icebreakers and cargo ships. From an environmental perspective the type of ship build does not make any difference. On the other hand there are significantly different environmental impacts from yards building new ships and yards rebuilding, repairing and maintaining ships.

The main environmental aspects for the industry are:

- wastewater including sand-blasting medias, rust, oil, heavy metals and paint residues,
- noise from removal of rust, grinding, sand blasting and compressors,

- air emission of particles, solvents, aerosols and smell,
- wastes like iron and metal waste, sand-blasting media, oil-containing waste, paint and varnish containing waste and solvent-containing waste.

Examples of BAT

The report describes potential BAT techniques and some of the techniques presented are:

- All activities should be carried out indoors to minimise external noise, but this requires good extraction ventilation and collection of waste.
- Collection and reuse of sand-blasting media.
- Cleaning of steel with high-pressure water and collection and rinsing of the effluent.
- Indoor closed painting spray booths / shielded boxes with good air extraction and collection of waste.
- Closed washing systems with reuse of solvents.

BAT for Vehicle Refinishing Shops

The Nordic Council of Ministers published in 1995 the report "BAT for Vehicle Refinishing Shops" (TemaNord 1995:608). (In Norwegian: "BAT for billakkeringsanlegg", TemaNord 1995:607). The report describes the processes, approaches and equipment, which are applicable for reducing small, non-continuous emissions of volatile organic compounds (VOC).

The industry which paints cars is a sector which typically consists of small and medium-sized enterprises – on average with two employees per company. The main environmen-

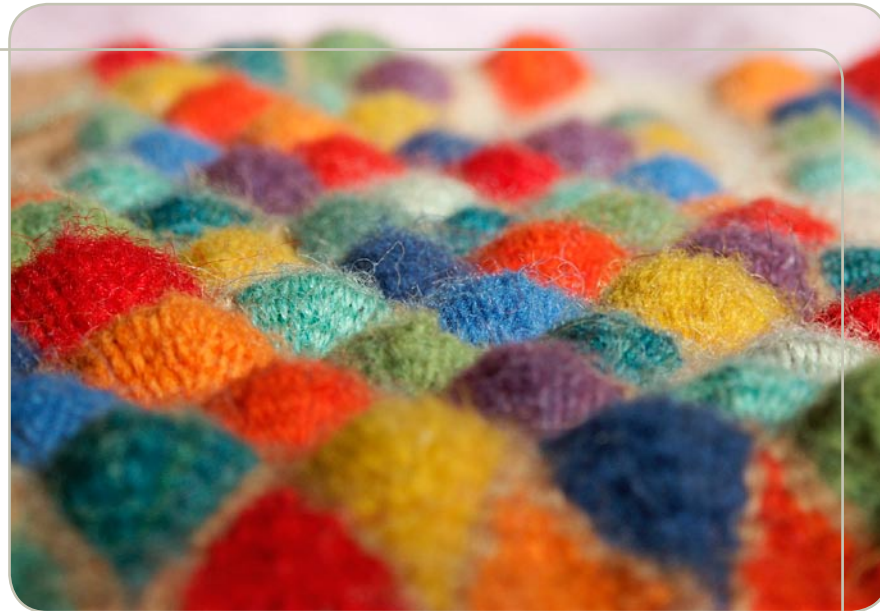
tal impacts from these companies come from the painting process, which is the largest source of VOC emissions – especially the finishing coat and top paint have a large content of solvents. The emissions occur both in connection with the painting process when surplus paint that does not hit the product is carried out through ventilation, and in connection with the drying of the product.

Examples of BAT

From surveys of the trends in the area the report describes commercially applicable and available

cleaning approaches and new paint products and their demands on equipment. The report also describes the environmental opportunities offered by the new products. The report outlines a step by step approach to the reorganizing of the more than 20,000 combinations of colours which are available for cars, where solvent-based and water-diluting products are used in parallel. The new paint types will reduce the VOC emission by up to 85-90% using a complete waterbased system, where the equipment is also washed in waterbased cleaning agents.

BAT for Textile Industry



In 2002 the Nordic Council of Ministers published the report "BAT for Textile Industry" (TemaNord 1995:558), (in Danish: "BAT Tekstil vådbehandling", TemaNord 1995:568). The report describes the available possibilities of implementing cleaner technologies and in doing so reducing pollution from textile wet treatment.

Textile wet treatment includes pre-treatment, dyeing, printing and/or finishing of textile products. The textile industry in Nordic countries has

generally experienced very strong competition from the world textile market, but still consists of many small and medium sized companies.

From an environmental perspective the industry has a significant consumption of water and energy, emissions of waste water and use of chemicals.

Examples of BAT

The report describes potential BAT techniques and some of the techniques presented are:

- Process optimizations by reducing the liquor ratio – litres of water pr kg of textile.
- Process optimization of rinsing processes by reusing water from the last and cleanest rinsing bath.
- Process automatization of dosing of chemicals.
- Substitution of natriumhypochlorit (NaOCl) with hydrogen peroxide (H₂O₂) in bleaching or bleaching with enzymes.
- Substitution of APEO-based (alkylphenolethoxylater) solvent-based detergents.
- Substitution of azo-dyes, metal-complex dyestuff and dispersing agent based on chlorinated solvents.

Possibilities for a Reduction of the Pollution Load from Tanneries

In 1993 the Nordic Council of Ministers published the report "Possibilities for a Reduction of the Pollution Load from Tanneries" (NSA 1993:516), (in Swedish: "Möjligheter att minska miljöbelastningen från garverier", NSA 1993:517). The report describes the applicable practices for reducing the environmental impacts from tanneries.

Tanneries produce leather, which in principle is a transformation of biological degradable material – hides – to biologically stable material – leather – which consists of three main processes: removal of dirt, hair etc., and chemical treatment of the hides to give the leather the right properties and qualities and a post-process operation, for instance dyeing.

The tanneries in the Nordic countries have experienced tough competition on the world market and both the total production and the number of companies have been steadily decreasing.

The main environmental aspects of the industry are:

- Large amounts of wastewater polluted with sulphide, organic nitrogen and ammonium, chromium and organic matters.
- Large consumption of water, energy and chemicals.
- Waste such as tanned and untanned hides.

Examples of BAT

The report describes potential BAT techniques and some of the techniques presented are:

- Tanning of fresh hides to avoid salt conservation and the wash-out of salt.
- Careful depilation and dehairing processes to reduce the content of organic matter in wastewater.
- High-fixing chromium tanning at high temperatures and less use of water.
- Chromium recirculation.
- Waterbased post-process operations as an alternative to solvent-based processes.



Overview of the Nordic BAT publications in English

- Best Available Techniques for Auto Repair Shops, TemaNord 2007:544
- BAT - Car Washing Facilities, TemaNord 2007:547
- BAT examples from the Nordic iron and steel industry, TemaNord 2006:509
- Boating – a pure pleasure!, ANP 2005:750
- Environmentally acceptable metalworking processes, TemaNord 2002:528
- DEA – an aid for identification of BAT in the inorganic surface treatment industry, TemaNord 2002:525
- Best available techniques (BAT) for the Nordic dairy industry, TemaNord 2001:586
- BAT report – best available techniques in slaughterhouses, TemaNord 2001:553.
- Best available techniques for the printing industry, TemaNord 1998:593
- BAT - Best Available Technology in the Fishing Industry, TemaNord 1997:579
- Reduction of Emissions from Shipyards, TemaNord 1996:556
- BAT for Vehicle Refinishing Shops, TemaNord 1995:608
- BAT for Textile Industry, TemaNord 1995:558
- Possibilities for a Reduction of the Pollution Load from Tanneries, NSA 1993:516.

All the mentioned reports and booklets are available from the Nordic Council of Ministers. or can be downloaded at http://www.norden.org/miljoe/pa/sk/PA_BAT_rapporter.asp

Nordic Environmental Co-operation

The Nordic Environmental Action Plan 2005-2008 forms the framework for the Nordic countries' environmental co-operation both within the Nordic region and in relation to the adjacent areas, the Arctic, the EU and other international forums. The programme aims for results that will consolidate the position of the Nordic region as the leader in the environmental field. One of the overall goals is to create a healthier living environment for the Nordic people.

Nordic co-operation

Nordic co-operation, one of the oldest and most wide-ranging regional partnerships in the world, involves Denmark, Finland, Iceland, Norway, Sweden, the Faroe Islands, Greenland and Åland. Cooperation reinforces the sense of Nordic community while respecting national differences and similarities, makes it possible to uphold Nordic interests in the world at large and promotes positive relations between neighbouring peoples.

Co-operation was formalised in 1952 when the Nordic Council was set up as a forum for parliamentarians and governments. The Helsinki Treaty of 1962 has formed the framework for Nordic partnership ever since. The Nordic Council of Ministers was set up in 1971 as the formal forum for co-operation between the governments of the Nordic countries and the political leadership of the autonomous areas, i.e. the Faroe Islands, Greenland and Åland.



norden

Nordic Council of Ministers

Nordisk Ministerråd
Store Strandstræde 18
DK-1255 København K
Telefon (+45) 3396 0200
Telefax (+45) 3396 0202

Nordisk Råd
Store Strandstræde 18
DK-1255 København K
Telefon (+45) 3396 0400
Telefax (+45) 3311 1870

www.norden.org

ANP 2007:xxx

