Best available techniques (BAT) for auto repair shops

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Preface

The environmental impact from the care and repair of cars seen over the complete life cycle is not insignificant. Auto repair shops generate noise, waste and waste water and can in addition generate air pollution, primarily from the use of volatile organic compounds (VOC) from the treatment of undercarriages and painting, and products such as degreasing agents, fillers and glue.

Waste water from auto repair shops can contain large amounts of oil, heavy metals and other environmentally dangerous substances.

Auto repair shops generate large amounts of waste and many types of hazardous waste. There is also a significant risk for soil pollution involving oil and heavy metals in particular.

Cars and a long series of car care products, spare parts and materials that are used in auto repair shops, contain substances that are of particular concern with respect to environment and health. These substances are of concern for the working environment and can be released to the environment not only by direct emissions from the auto repair shop, but also from the car during the whole of the operation phase, and when the car is disposed of.

The objective of this publication is to present an overview of the processes and products that are used in auto repair shops, and to describe existing opportunities for implementing cleaner technology, or best available techniques in order to avoid or reduce emissions and environmental impacts as a whole.

The report is written for auto repair shops and inspection authorities in the Nordic countries.

The technologies that have been described are selected on the basis of the authors' best knowledge, which is based on accessible information relating to current techniques. The work was carried out in the autumn of 2005 and the spring of 2006. The report, which is published in Danish and English, was prepared by:

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- Järd Gidlund, Swedish Environmental Protection Agency, Sweden
- Olaug Bjertnæs, The Norwegian Pollution Control Authority, Norway
- Susanne Särs, The Government of Åland, The Åland Islands.

The BAT-group works on a Nordic plan by consulting and disseminating information on the opportunities for environmentally friendly production within significant sectors. The group works toward promoting the use of best available techniques (BAT), with focus on cleaner technology within selected sectors. The objective is effective use of natural resources and prevention or reduction of negative environmental impacts of production and consumption.

The BAT-group works under the Working Group for Products and Waste, which has the mandate of overseeing implementation of the Nordic Council of Ministers' action plan for cleaner technology, waste and recycling. This report should be considered to be a contribution to this action plan, where BAT by itself is a means to fulfil the overall objective – cleaner technology.

Summary

This report describes the opportunities, which today are available to introduce cleaner technology at auto repair shops.

The concept “Best Available Techniques” (BAT) covers the selection of raw materials, processes, etc. which together result in the least possible environmental impacts with regard to economy. It is not immediately possible to identify a specific “auto repair shop BAT”, since conditions at individual firms can vary considerably, just like very different climatic conditions can be a determining factor for the selection of BAT.

The report gives a series of recommendations which are in line with BAT and according to best actual knowledge account for the best way to restrict environmental impacts without compromising on quality and economy. Situations where climatic conditions must be incorporated into the assessment of the best solution, are also indicated.

The report describes the technologies within the following areas:

- Waste water and water consumption
- Energy
- Chemicals and oil products
- Waste treatment
- Noise
- Air
- Soil

Waste water

In areas with sewage systems, together with areas where wastewater is discharged into water courses, lakes or the sea, it is recommended that silt collectors, oil separators and inspection manholes are established according to the guidelines and principles described in this publication. It is recommended that a maximum of 5 mg/l oil is in the waste water measured in the inspection manhole, which is why there should always be established a coalescence filter in the separator, if waste water is discharged with a content of both oil and soap, such as from car wash and motor parts.

There can be special conditions in arctic areas, where the effect of the separator is reduced at low temperatures.

In areas without sewerage system, the waste water must be collected in containers, which are emptied into the treatment plant according to need or handed over to an authorized receiver.

Water consumption

Water consumption is primarily related to car wash and washing of motor parts. Recirculation is recommended in general. It is noted that there are special challenges related to the recycling of the cleaning water at wash halls due to the accumulation of hazardous substances in the cleaning water. The wash halls are treated separately in the report “BAT - Car washing facilities” from Swedish IVL (2006).

Energy

The largest proportion of the energy consumption in auto repair shops is from heating, pressurized air compressors, ventilation and other equipment. The most significant energy source is electricity together with for heating also gas and oil.

An effective climate shield, in particular in the colder areas, is considered to be the most significant measure for energy savings. A series of initiatives for energy savings are shown in connection with the use of el-powered tools.

Chemical substances

In the automotive sector a series of products are used which are part of different service and repair work. The methods to select the products within the different technical areas are described. Furthermore, a series of mainly net based tools are presented which can help the user find the best alternatives.

The opportunities to restrict the use of the environmentally damaging substances are defined and special initiatives to minimize the environmental impact are described.

Waste

Auto repair shops generate their fair share of waste in the form of disposed car parts, waste oil and other disposed liquids together with remains of auxiliary materials. A large proportion of this is hazardous waste, which requires special treatment.

The waste groups are described, and methods are given for sorting, storage and disposal.

Noise

The majority of auto repair shop activities lead to noise. Noise represents a problem for the working environment and for the surroundings, in particular when the auto repair shop is placed close to residential areas or other areas that are noise sensitive.

A series of initiatives are explained which can limit noise from the testing of motors, tools, compressors, etc.

Air

At auto repair shops many different liquid chemicals are used, which lead to the emission of vapours to the air. This applies in particular to organic solvents, which can be in paint, degreasers, glue, fillers, rust protection substances and fuel. In addition, different types of dust, welding fumes and exhaust gases are generated.

A series of measures are described in order to minimise dust emissions, welding fumes, exhaust gases, paint mists and vapours.

Soil

Soil pollution occurs often as a result of activities in auto repair shops, such as from overfilling or defect oil separators, unsealed oil tanks and leaks from the storage of oil products, chemicals and waste.

A series of methods are presented for avoiding soil pollution and appropriate surfacing types under the storage are described.

In chapter 5, a series of useful web sites are listed, where additional information and support in the Nordic languages can be found.

1. Introduction

1.1 Environmental effects

A car has many different environmental aspects through its life cycle, in other words during the manufacture of the materials, during production, in the operation phase, during car service and repair and when it is disposed of. The environmental effects from car servicing and repair seen over the cars complete life cycle are not insignificant.

The auto repair shops can, if they are placed close to housing, be a nuisance due to noise. They can contribute with air emissions, primarily from the use of volatile organic solvents (VOC) during the treatment of the undercarriage and painting but also from for example degreasers, fillers and glue. Waste water from auto repair shops can have a high content of oil, heavy metals and other environmentally damaging substances.

The amount of waste generated from auto repair shops is large and contains many types of hazardous waste, just like there is a significant risk for soil pollution in particular with oil and heavy metals.

Substances contained in the cars themselves and in a long series of car care products, spare parts and materials that are used at car auto repair shops, are, based on an environmental and health assessment, particularly dangerous. These substances are significant for the working environment and are spread to the environment not just through the pollution directly from the auto repair shop, but also from the car in the whole operation phase, and when the car is disposed of.

1.2. BAT

The concept Best Available Techniques (BAT) is defined in EU's IPPC (Integrated Pollution Prevention and Control) Directive from 1996 as:

"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".

This is understood as:

- "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.

Considerations to be taken into account generally or in specific cases when determining best available techniques, as defined in Article 2 (11), bearing in mind the likely costs and benefits of a measure and the principles of precaution and prevention:

- the use of technology that has the lowest possible energy and material consumption, and generates the lowest amount of emissions and waste,
- the use of less hazardous substances (substitution),
- the furthering of recovery and recycling of substances generated and used in the process and of waste, where appropriate,
- the consumption and nature of raw materials (including water) used in the process and their energy efficiency.

In order to select BAT one needs to be able to compare different techniques. This can be done for example with the use of key figures for emissions and consumption for a certain product. In auto repair shops the product is a repaired or serviced vehicle. There are however many types and models of vehicle, just like there are many forms of repair and service, which are difficult to sort as standard products to make them comparable. The selection of BAT in this report is therefore made on a more qualitative basis and based primarily on known techniques and approaches, which are the authors’ assessment as what is considered to be BAT. In most cases either information about the economy is missing or the economic situation is very complicated.

To be able to operate a auto repair shop in the most environmentally best way is however not just a question of BAT, but also on how the operation is controlled and organized. Environmental management is about systematizing work with environmental improvements, and this is carried out at many auto repair shops. In addition to environmental improvements, such methods can lead to significant economic savings in the form of savings on el, heating, water, chemicals, waste disposal, green taxes, etc. Environmental management is not addressed in more detail in this report.

2. The car sector in the Nordic countries

2.1. General conditions

The auto repair shop sector covers many different kinds of auto repair shops with a large variation in the service they provide. The sector consists of different types of firm, such as auto repair shops for mechanical repairs, plate workshops, car painting and undercarriage treatment plants, wash places, wash halls, workshops connected to auto repair shops, tyre centres, car care centres and motorcycle auto repair shops. Often there is a combination of the aforementioned activities at one company and in addition activities such as sales of new or used cars.

A very large part of the car fleet is maintained at auto repair shops which cooperate via contractual relationships with one or a few suppliers of cars. These auto repair shops are, as a rule, larger units. A smaller part of the car fleet, in particular most probably the older part of this, is serviced by small auto repair shops without any connection to the car factories. Finally, certain services are increasingly being offered together with the car owner him/herself, such as repair or changing of windscreens and smaller repair work which is carried out from service vehicles.

Fig. 2.1 Interior in a typical modern service auto repair shop

The development is moving clearly in the direction of fewer and still larger auto repair shops, since modern cars contain electronics that require more and more special equipment to control and adjust together with continual re-qualification of employees in the use of this equipment.

Fig. 2.2 Typical car auto repair shop outside city areas

In principle the individual car owner can choose freely which auto repair shop will carry out the service that is part of the purchase agreement, no matter what the car make. In practice, this free choice almost means nothing since most people prefer a service to be carried out by the auto repair shop that specializes in the respective car make. As a result there continues to be close relationships between the factory and the service/ repair auto repair shops, and these are also important for the structuring of the environmental work in the individual auto repair shop.

2.2. Denmark

2.2.1. Number of auto repair shops

According to the Branch Organisation's estimate, there are approximately 5,700 auto repair shops in Denmark. The number of employees varies from the owner him/herself to several hundred. The auto repair shops are located both in the centre of the towns, in residential areas, in industrial areas and in country areas.

2.2.2. Regulation

Auto repair shops must be designed and operate in compliance with the Law on Environmental Protection just like all other types of polluting firms, so they pollute as little as possible.

Auto repair shops are covered by the general sector conditions stipulated in the Statutory Order for auto repair shops (no. 922 of 5th December, 1997). Only very large car painting and undercarriage treatment plants together with body work auto repair shops over a certain size and car scrap dealers are required to obtain an environmental permit according to Chapter 5 of the Environmental Protection Law.

The Statutory Order for auto repair shops stipulates specific requirements for establishment, design and operation with regard to prevention and restriction of pollution from auto repair shops. According to § 17, art. 1 of the Statutory Order for auto repair shops, the authority can require the firm to reduce its pollution if a auto repair shop generates significantly more pollution including more waste, than if the least polluting technology or best possible cleaning was used. This means that auto repair shops must also live up to the BAT principle.

In addition, the discharge of waste water also requires a permit.

2.2.3. Branch Associations

The auto repair shop sector in Denmark is organised in several branch organisations: The Central Association of Auto Mechanics (Centralforeningen af Autoreparatører i Danmark (C.A.D.)), Denmark's Auto Dealers' Association (Danmarks Automobilforhandler Forening (D.A.F.)), Union for Body work builders and automotive mechanics in Denmark (Samenslutningen af Karrosseribyggere og Autooprettere i Danmark (S.K.A.D.)) together with the Association for Automotive and Industrial painters (Foreningen af Auto- og Industrilakerere (FAI)).

2.3 Finland

2.3.1. Number of auto repair shops

According to Finnish statistics approximately 5,300 auto repair shops are found in

Finland (2004). This includes auto repair shops in the whole country, in towns and the country.

2.3.2. Regulation

Finland received in 2000 a new environmental protection law (86/2000), which transposes the EU's IPPC-directive and contains general condi-

tions for environmental protection and pollution prevention. The law covers all activities, which cause or can cause impacts on the environment and thereby also auto repair shops.

The Law on Environmental Protection is enforced through permits, which cover all environmental issues in compliance with the IPPC Directive. The application for a permit is made to one and the same authority. The city councils grant the majority of the environmental permits for auto repair shops. If there is talk of auto repair shops where large amounts of chemicals are stored or where large amounts of volatile organic solvents are used, the authority responsible for inspection is one of the 13 regional environmental centres. The storage of large amounts of chemicals that are health and environmentally damaging is monitored by the Safety Technology Authority (Turvatekniikan keskus -TUKES). The storage of small amounts of chemicals is monitored by the council's chemical inspectorate and Fire Manager. Auto repair shops must also seek permission to discharge waste water. This permission can contain conditions regarding material and content that is discharged.

Together with the Law on Environmental Protection, there is a Statutory Order (169/2000), which details the activities that require permission. Auto repair shops are not directly mentioned on this list, but are assessed to fall under the general conditions of the Law on Environmental Protection due to the VOC Statutory Order (435/2001).

2.3.3. Branch conditions

“Autoalan Keskusliitto” (Automotive Branch Federation) and “Autoalan ja korjaamoiden liitto” (Automotive Branch and Auto repair shop Federation) are the Finnish central organisations for car dealers and repairers with over 1,000 members.

2.4. The Faroe Islands

2.4.1. Number of auto repair shops

A complete overview of the total number of auto repair shops on the Faroe Islands is not known, but it is estimated to be around 30.

2.4.2. Regulation

On the Faroe Islands, it is the Environmental Protection Law from 29th October 1988 together with the Statutory Order for Environmental Rules from the 3rd May, 1994 which regulates auto repair shops in general. The councils are responsible for inspection, and they can in this role make requirements to the auto repair shops. The council must approve the

cleaning system before the waste water is discharged to the sewage system.

2.4.3. Branch organisation

The car branch on the Faroe Islands is organised in a Automotive Dealers Association. There has been an Automotive Auto repair shop Association but this has not been so active recently.

2.5. Greenland

2.5.1. Number of auto repair shops

It is estimated that approximately 20 auto repair shops carry out car repair in Greenland. The largest are in Nuuk and Sisimiut and have 10 to 20 employees. These carry out all kinds of service, including painting, plate work, repair, tyre changes and undercarriage treatment. Individual (1–2) firms carry out car wash.

In addition, several firms are found that carry out car repair along with other activities.

2.5.2. Regulation

Environmental protection is covered by the Parliament's order no. 12 from the 22nd December 1988 on the protection of the environment. Auto repair shops are covered by the rules for environmental permits, in accordance with the statutory order no. 11 from the 20th August 2004 on Environmental Permits. A statutory order that particularly targets the auto repair shops is being prepared.

Only a few auto repair shops are currently approved.

2.5.3. Branch organisation

Branch associations are not found in Greenland.

2.6. Iceland

2.6.1. Number of auto repair shops

According to the branch's estimate, approximately 160–170 auto repair shops are found in Iceland, which includes both service auto repair shops, paint auto repair shops and plate auto repair shops. The number of employees varies from the owner him/herself to up to 20 employees in the

largest auto repair shops. The largest auto repair shops are found in the Reykjavik area, but many small auto repair shops are located in the country districts.

2.6.2. Regulation

Auto repair shops are subject to Icelandic laws and regulations, which are largely harmonized with EU regulations and directives. Two main laws concerning auto repair shops are the Act on Working Environment, Health and Safety in Workplaces, No. 46/1980, and the Act on Hygiene and Pollution Prevention No. 7/1998. Local health and environment inspectorates (Heilbrigðiseftirlitið) carry out inspections with respect to Act No. 7/1998 and the Administration of Occupational Safety and Health (Vinnueftirlitið) is responsible for inspections based on Act No. 46/1980.

Permission must be sought for the establishment of new auto repair shops partly from the council's Planning and Building Department (building permits) and partly from the Labour Inspectorate (Vinnueftirlit ríkisins) and Fire authority (Eldvarnareftirlitið). These authorities have the authority to make requirements in the permits which ensures that the law is complied with. Environmental operating licences are required by local health and environment inspectorates.

2.6.3. Branch Associations

The car branch is only organised in Iceland as a branch organisation "Bilgreinasambandið" which is an organisation for service auto repair shops, paint auto repair shops and plate workshops, but only a few tyre workshops.

2.7. Norway

2.7.1. Number of auto repair shops

There is no complete overview of the total number of auto repair shops in Norway. There are approximately 5,000 authorized auto repair shops. The size varies from one man firms to firms with up to several hundred employees. The large auto repair shops are located typically in the towns and densely populated areas, whilst the small ones are typically located outside the towns.

2.7.2. Regulation

In Norway there are requirements that all auto repair shops are approved by the authorities, in accordance with the Road Traffic Law. Not all auto

repair shop services require however permits. Services which do not affect traffic safety such as car painting and replacement of exhaust pipes do not require permits.

In addition, all firms are covered by the Pollution Law and associated regulations. All firms must have an operation permit from the council. The permit itself does not stipulate specific requirements relating to environmental conditions, but requires that the firm fulfils the general environmental requirements according to the Pollution Law.

From the 1st of July 2005 there are requirements that a quality control system is established for auto repair shops approved to carry out periodic control of vehicles ("periodisk kontroll av kjøretøy" (PKK)).

2.7.3. Branch organisation

Norway's Car Branch Federation (Bilbransjeforbund (NBF)) is the largest branch organisation for the auto repair shops in Norway and accounts for the largest actors in the sector as members. NBF has approximately 1,200 member firms, which together employ approximately 17,000 employees, and which as a whole account for over 70% of new car sales and auto repair shop turnover.

The Danish Automotive Suppliers' Association (Autobranchens leverandørforening (ABL)) represents suppliers of spare parts, care products, etc. Furthermore a series of auto repair shop chains and unions with non-independent members are found such as the Snap-drive chain, Automaster, Mekonomen and Borsch. These unions and chains build on common purchasing, guarantee agreements and other common services with the advantages of large economies of scale.

Furthermore, there is the Car Paint Association, the Norwegian Powder Paint Technical Association, the Nordic Paint Federation, the Norwegian Automotive Federation (Norges Automobilforbund (NAF)) and damage repairers together with Car Importers Country Association ((Bilimportørenes Landsforening) (B.I.L)) and Car Dealers Development Centre (Bilforhandlerne's Utviklings Senter (BUS AS)).

2.8. Sweden

2.8.1. Number of auto repair shops

There are approximately 8,000 auto repair shops in Sweden, of which approximately 5,000 are estimated to have one to two employed. The auto repair shops are located both in the centre of towns, in residential areas, in industrial areas and in the country.

It is expected that the number of small workshops in the future will be reduced as a result of the large investments that are needed to service the

ever more complicated cars. At the same time the need for service is expected to be reduced with the development of even better cars.

2.8.2. Regulation

The auto repair shops must just like all other types of polluting firms be designed and operated in compliance with the Environmental Law from 1st January 1999. The goal with this Environmental Law is to promote sustainable development and a good and healthy environment.

In accordance with the Environmental Law the auto repair shops must live up to a series of guidelines related to the external environment and the working environment. Particular focus is given here to the substitution of hazardous substances where it is possible, and good housekeeping with energy, raw materials and restriction of waste.

According to the Statutory Order for Environmentally hazardous industries (1998:889) auto repair shops are classified as C firms, which mean that they have a notification responsibility. A notification must be given to the local inspection authority upon establishment of a new plant and when changes are made to the operation of an existing plant, with a submission of drawings, technical descriptions and other information so that the authority can assess possible environmental effects.

"Kontrollerad Bilverkstad" with the logo a green dot, is a partnership for quality control between the national automobile association (MRF), the car industry union (BIL Sweden), the national gasoline union (PRF), the consumer association (KOV), drivers' union (M), car testing and car insurances.

Approximately half of Sweden's auto repair shops are affiliated to "Kontrollerad Bilverkstad". The green dot means that the auto repair shop fulfils these conditions that are laid down for approval by "Kontrollerad Bilverkstad".

2.8.3. Branch organisation

In Sweden, the national automobile association (Motorbransch Riksförbund) is the joint enterprise for car dealers and auto repair shops. Approximately 1,900 auto repair shops in Sweden are members of MRF. Sweden's Åkeriföretag organises the country's car transport companies.

2.9. Åland

2.9.1. Number of auto repair shops

It is estimated that there are approximately 25 auto repair shops in Åland. Approximately half are located in the countryside and half in the towns.

If repairs carried out by other firms such as lorry drivers and contractors are taken into account, it is estimated that there are approximately 40 workshops, of which 25 are located outside the towns.

2.9.2. Regulation

There is no notification requirement for the establishment of auto repair shops, but auto repair shops are obliged to be inspected because of the general rules of environmental protection regulated according to rural law on protection of the environment (2001:30) and regulation regarding protection of the environment (2001:35). The handling of waste is regulated according to the Law on landscapes (1981:3) relating to nature protection.

2.9.3. Branch organisation

There are no branch organisations for auto repair shops in Åland.

3. Activities in auto repair shops

A auto repair shop can be more or less specialized within one or more of the activities which relate to the maintenance of cars. Such activities cover:

- Mechanical reparations
- Service
- Bodywork
- Undercarriage treatment
- Car wash and cleaning
- Automative painting.

In the following section working methods and processes together with the significant sources of environmental effects are described for the above mentioned activities together with the operation of auto repair shops in general.

3.1. Mechanical repairs

Different activities are carried out at the auto repair shop such as repair of motors, brakes, gear boxes, steering wheel, etc.

With motor repairs a thorough cleaning of the motor is carried out after disassembly. For this, hot water and cleaning liquid based either on organic solvents or alkali (water based) solutions are used. Cleaning is carried out with cloths or in a cleaning basin, where hot water or cleaning liquid is applied with a brush or pistol.

Diverse motor spare parts, seals, etc. are used in motor repair. During assembly of the motor, motor oil and cooling liquid is refilled.

During brake repairs a thorough cleaning is given after disassembly. For the cleaning/ degreasing of the brakes, both hot water and organic and water based solvents are used. Brake wash is carried out usually with a brake washer, which is a container assembled with a shower and with the possibility for heating of the water/ degreaser. The brake service covers the changing of hoses, shoe brakes and brake blocks, sand blasting and grinding and brake lining, turning of brake drums and disks and filling with brake fluid.

Examples of other repairs at the auto repair shop include the changing of accumulators and diverse repairs of the steering wheel, gear boxes, clutches, etc. where as with motor repair spare parts, greases, oils and cleaning fluids are used. Furthermore, repair, assembly and balancing of

tyres, cutting of truck tyres together with repair and changing of electrical parts, exhaust and catalysators are carried out.

3.2. Service

Service check-ups cover primarily the changing of motor oil, fuels and air filters, control and filling of cooling liquid and changing of diverse worn parts (V-belt, ignition plugs and windscreen wipers). In addition, brakes are controlled and cleaned, and worn brake parts (brake blocks, shoe brakes, etc.) are checked and changed according to need. Emissions (such as CO, CO₂, NO_x particles) are controlled and the fuel and air mixture is adjusted. For trucks, particle filters are also cleaned. Finally, a check-up can include a motor wash.

3.3. Body work

At auto repair shops different activities can be carried out regarding the body. This includes plate work together with repair and changing of windscreens and rubber seals.

Plate work consists of the disassembling of all defect parts. The damaged area is corrected in order that it fits the new parts and rust and sealants are cleaned. The new parts are bolted, glued or welded securely and a sealant may be applied. Afterwards the area is polished with for example an angle grinder, sand paper or equivalent.

Smaller scale body work can be carried out by first correcting the damage (possibly by heating with acetylene/ oxygen burner) followed by filling out with a filler, which after drying can be modified through grinding and polishing.

During the replacement of windscreens, the frame is cleaned after the old windscreen is taken out with the use of tools and solvents. The new windscreen is similarly cleaned and subsequently positioned with the use of glue or a rubber seal.

3.4. Undercarriage treatment

Rust protection of new and older cars is carried out in order to increase the lifetime of the undercarriage. After a possible disassembly of the inner screen and wheel the undercarriage is cleaned with a high pressure cleaner, steam cleaner or alternative. After drying a rust protection agent is applied with the help of spray equipment on the undercarriage and possibly in cavities, amongst others doors and side members. Application takes place with a minimum of 15°C. Application and evaporation must

take place in a special spraying/ drying place, separated from other work areas. After assembly and plugging the car is placed for dripping and drying. The car is finally cleaned with the use of a degreaser or water and soap.

3.5. Car wash and cleaning

At the washing place, different washing and cleaning tasks are carried out. It can be a car wash or an interior cleaning of the car. The cleaning is carried out with the use of cleaning and care agents together with hot water. Washing and cleaning of cars can take place both in an automatic washing machine or in a manual wash (high pressure cleaner, steam cleaner or water hose).

The theme is not addressed in more detail here. Reference is made to the report “BAT - Car washing facilities” from Swedish IVL (2006).

3.6. Car painting

Car painting covers complete or partial painting both inside and outside of motor vehicles or individual new or damaged body parts. The damaged parts which must be painted are prepared by the plate smith and the car painter only carries out fine spartling. Areas that must be painted are cleaned and grinded. Remaining areas are covered and with the help of a spray pistol primer, grounder and filler are applied. Middle grinding and cleaning is carried out according to need. Afterwards base/ prime colour and clear paint is applied. Drying then takes place with at least 60° C. Infrared (IR) drying can be used here.

3.7. Operation of auto repair shop rooms

The most significant consumption of resources with the operation of auto repair shop rooms is energy and water. Furthermore, cleaning agents are used.

4. Processes and technology

4.1. Water consumption and waste water

Auto repair shops use water for a series of different reasons closely connected to the auto repair shop's other activities and can cover:

- Motor clean/ motor wash with high pressure cleaner,
- Dewaxing together with wash in connection with car finishing,
- Undercarriage wash in connection with corrosion protection,
- Auto repair shop activities/ greasing halls,
- Degreasing in the washing machines or basin,
- Washing places with high pressure wash or ordinary water hoses,
- Wash halls,
- Cleaning of auto repair shop,
- Sanitary reasons.

Waste water is generated mainly from the car wash, but other significant sources include motor wash, cleaning of the rooms and cleaning after spills.

Water from the washing of car parts (brakes, motor parts, gear boxes, rear axle assembly, etc.) in the washing machine is recirculated to a large extent and disposed of, either completely or partially, as hazardous waste.

In addition, polluted rainwater with a content of dirt and possibly spills from surfaced areas are treated as waste water.

The use of the high pressure cleaner, hot water cleaner or car wash plant, results in the oil being broken up into very small droplets. In other words, the oil emulsifies and subsequently is more difficult to separate from the water. Emulsification of the oil also takes place when degreaser and washing agents are used..

The washing water containing road dirt, dust and oil/chemicals is discharged normally to the sewage via a silt trap and oil separator. Degreasing and washing agents in the waste water can reduce the oil separator's ability to hold back the oil.

The waste water from the car wash can amongst others contain heavy metals and PAH's from oil and tar products, phthalates (DEHP) from rust protection agents and nonylphenolethoxylates (NPE) which can originate from plastic components, paint, oil spills and brake fluid. DEHP and NPE are two of the substances/ substance groups that have been in focus in the recent debate on the use of waste water sludge in agriculture because of its poor biodegradability, biological effect and ability to accumulate in biological systems.

4.1.1. Reduced water consumption

There are a series of measures that reduce the water consumption and reduce the discharge of environmentally hazardous substances with the waste water.

Reuse

The water consumption in the auto repair shop can be reduced significantly by reusing the washing water in the washing halls and other washing facilities.

The recirculation of the washing water leads to the accumulation of chemical substances in the water which can give health problems. These health risks can be minimized or eliminated technically by ensuring ventilation and preventing release, contact and inhalation.

Fig. 4.1 Wash hall

Car wash

The car wash has the largest consumption of water at a auto repair shop. Examples of car washes includes automatic wash plants and washing places for manual washing. The washing of cars takes place normally with the use of high pressure cleaners or a hot water cleaning plant. When investing in a washing plant, the water and energy consumption of the different plants should be compared.

There has been a considerable development of car wash plants, where the recycling of washing water has become standard. The car wash plant can be operated with a very low water consumption per car wash. A recirculation plant can also be established for manual washing places, where the water is collected, filtered and reused. Reference is made to the report “BAT - Car washing facilities” from Swedish IVL (2006).

Wash of motor and other car parts and tools

It is also an advantage that the cleaning of motor parts, tools and items that must be repaired is carried out in a “washing machine” with water and soap agents. In other words, a closed system with hot water recirculation.

The washing water that has been used and which contains soap agents, oil and other dirt and which is collected in a container, must be disposed of as hazardous waste and not discharged to the sewer. Used washing water can in certain cases be discharged with caution to the sewer, if an oil separator, etc. is installed with sufficient capacity to be able to separate oil.

Cleaning of auto repair shop

It can be recommended that special larger auto repair shops acquire a floor washing machine. A floor washing machine cleans the floor effectively with a minimum of water consumption.

4.1.2. Pollution restricting measures

The discharge of polluting substances in the waste water can be restricted by changing the work routines or by installing cleaning measures in the form of a silt trap, oil separator together with a filter or plant that removes and degrades substances that are unwanted in the waste water. Finally, the waste water can be collected and discharged as chemical waste.

If there are drains in the auto repair shop halls, the direct discharge of waste water with a content of chemicals and oil must be prevented. Waste water must therefore be cleaned in a way that the cleaned waste water conforms to the valid emission limits. One possibility is also to remove the drains from the auto repair shop halls.

Oil separators and filters

Regulations for the design and establishment of oil separators follow the principle of the European standard defined by CEN (Comité Européen de Normalisation) EN 858-1 in all Nordic countries. The standard was adopted by the EU in 2001. The requirement of this standard for “class 1 separators” is that 99.88% oil remains in the separator. A minimum size for the drops has not been set, which is why in principle oil drops down to a diameter of 20 micrometre must be caught, if an emission requirement of

maximum 5mg/l is to be complied with. It must be noted that it has not been possible in practice to comply with the requirement of drop size, but that it has been possible to achieve an effect which meets a requirement of a maximum of 5mg/l oil in waste water which leaves the oil separator, if the retention period fulfills the need.

"Class 2 separators" are designed to retain oil, in a way that the concentration measured in the inspection manhole is maximum 100mg/l. It is noted that both standards are based on "standard test conditions". In other words, the goal normally only can be expected to be achieved by ensuring a long retention period as mentioned above.

In most Nordic countries the objective for waste water is a content of 5 mg/l. In Iceland the emission value for discharge into the sea is 15 mg/l.

Fig. 4.2 Principle for discharge of waste water through an oil separator

Oil separator An oil separator has a submerged inlet and a deep water lock at the outlet. Since oil is lighter than water, the oil will rise up in the separator and lie on the surface of the water. First, when the boundary between the oil and water gets as far as the drain, will the oil be able to run out. The retention period must be so long that the oil manages to rise up and lie as a layer on the surface of the water, before the water leaves the separator.

By using a high pressure cleaner, hot water cleaner or car wash plant, the oil is broken up into small drops (mechanical emulsion), which takes a long time to rise up to the water surface in the oil separator. The larger the pressure that is used, the smaller the oil particles become, and the longer the time it takes for the oil and water to separate.

The use of degreasers and washing agents makes the oil mixable with water. In other words, the oil emulsifies with the water (chemical emulsion). Chemical emulsified oil can normally not be separated in a conventional oil separator. This requires a long retention period or additional cleaning.

Improved oil separation can be achieved by choosing a separator with a larger volume and thereby a larger retention period for the waste water in the separator. Another possibility is to choose a lamel separator or a coalescence separator.

Lamel separator

Water is led away in a lamel separator through a section of moulded metal lamel, where the oil drops accumulate as larger drops and thereafter rise to the surface, and the oil is then separated far more effectively.

Coalescence separator

The principle in a coalescence separator is the same as in a lamel separator, though the oil collector has a finer media. The coalescence separator is supplied with mats of “insulation wool” or “sponge” similar materials with a large surface, which collects oil drops, before they rise to the surface (coalescence filter). The mats can be placed as a dividing room or as a chimney around the float stop. It is possible in the old separators to assemble coalescence mats. Some coalescence separators have, instead for mats, long thin oblique plastic pipes, which the water flow is lead through.

The coalescence filters are particularly suited, where high pressure cleaning is used, and where there is only talk of mechanical emulsification of mineral oil in the water phase (not chemical emulsification). With chemical emulsification of the oil, the same effectiveness can not be achieved. Coalescence filters are supplied with a treatment capacity of between 1.5 and 2,000 l/sec and can be an integrated part of an oil separator. The coalescence filter will after time be soaked with oil and must therefore be changed occasionally. Used filters are disposed of as hazardous waste - typically to incineration, if the filter material is suitable for incineration.

Fig. 4.3 Principle for assembly of coalescence filter in oil separator

Absorption filters

A variation of a coalescence filter is the type of filter, where the filter material's function alone is to adsorb the oil. When the filter is soaked

with oil, it must be replaced and the used filter disposed of to incineration. It can often be a problem that the filter gets soaked very quickly with oil and therefore must be replaced often in order to be able to keep a low oil concentration in the discharge to the public sewage system.

Filter material for the absorption of oil has often been used in connection with the fight against oil spills in harbours, at sea and in the lakes, but the filter material is also used in wells. Products can be found that are shaped as granulate, hoses, mats, rolls, pillows, etc. The supplier of the filter material informs that it can soak up oil equivalent to 6–25 times its own weight.

Absorption filters can be a good solution for cleaning of small amounts of waste water containing oil ($<1 \text{ m}^3/\text{t}$), but the suppliers of these filters can often not document the filter's effectiveness in relation to the actual waste water. It will in these situations be sensible to agree a trial period, which includes measurements, which can document the filter's effectiveness in relation to the burden and drain quality together with the time interval between replacements of the filter.

Batch treatment

An effective method for the treatment of small amounts of wastewater containing oil ($<1 \text{ m}^3/\text{d}$), can be batch treatment of the waste water in a container designed for the purpose. After the waste water containing the oil (mechanical emulsification) has been standing still for one to several days, drops down to a size of $18 \mu\text{m}$ will be separated. The water phase can then be led to the sewage system, whilst the oil phase is tapped and disposed of as hazardous waste for further treatment. Two containers can also be installed in a way that the one is being filled up, whilst the other is left so that the oil/water mixture can be separated.

Dimensioning of oils separators

The oil separator and silt trap must be designed so that it is also able to treat rainwater from outside spaces and in such a way that the waste water can comply with the discharge requirements, which are set by the authorities.

The amount of rainwater that is added can be reduced by establishing correct sloping around the outside wash places or by covering.

It is necessary to make demands to the supplier for documentation on sealing and ability to separate.

Altered routines, substitution of wash and degreasing agents and in some cases additional cleaning of the waste water can lead to a reduction in the emulsified oil in the waste water. Certain washing and degreasing agents are found on the market, which have the effect that the oil separator can separate the oil/ fuel without a longer retention period. It is necessary to make demands to the supplier of these agents. One demand can be inter alia that "splitting time" is stated on the declaration of the products.

The shorter the splitting time, the quicker water and oil is separated. The product's splitting time must be lower than the retention time in the separator system. Hot water should be used as much as possible instead of washing and degreasing agents.

Maintenance of oil separators

When broken down oil separators are cleaned up, it is often discovered that the oil separators and piping have been leaking. It would be a good idea if the auto repair shop regularly, for example every two years, carried out sealant tests of the oil separators and the components of the drain system which carry the waste water with that contains oil.

In order to avoid waste water leakage resulting in soil pollution, the oil separator must be cast solid and all drain parts sealed.

When using an oil/ fuel separator, the auto repair shop must be aware that the oil separator:

- must live up to the authority's requirements,
- cannot separate cleaning fluids, solvents and paint products, etc. from the water,
- must be checked, gauged and emptied regularly,
- can be assembled with an alarm and float stop (this equipment must be cleaned and maintained). An alarm can be assembled for both maximum fluid level and maximum thickness of the oil layer.

By carrying out regular gauging of the oil separator, the auto repair shop can experience which operational situations give larger amounts of oil waste than necessary. It can also show that the use of emulsified agents or the cleaning method result in the part of the oil that is already separated, dissolving and running with the drain water out of the oil separator, so that the thickness of the oil layer is reduced.

If the maximum fluid level falls, after the oil separator has filled up with water after emptying, there can be an indication that the oil separator is leaking.

If so much oil enters the separator that it is close to collection capacity, the oil separator must be emptied more often, unless the auto repair shop has a well functioning alarm and automatic float stop.

A silt trap must be established in front of an oil separator. A large amount of the oil binds to the silt/ soil, and there can therefore be significant amounts of oil in the silt trap.

Inspection manhole

An inspection manhole must be located after the separator. If the separator works, oil must not be found in the inspection manhole.

On the basis of experience gathered in Denmark on the technologies for cleaning of waste water that contains oil,, the following recommendations can be given:¹

- If the treatment of the waste water that contains oil with a silt trap and an oil separator are not sufficient to comply with the emission level, the cheapest and easiest solution can be the collection of the water stream with the highest content of oil in a container, where the retention time and thereby the separation of the oil can be increased substantially compared to the retention time in an oil separator.
- The cheapest additional cleaning technologies compared to the oil separators are the coalescence separators and adsorption filters. Coalescence filters, inclusive an oil separator and with a capacity of between 5 and 35 m³/t can be acquired for between 30,000 and 70,000 DKK (2005). The acquisition costs for an adsorption filter with an equivalent capacity will be between 40,000 – 100,000 DKK (2005).

Collection

For very small amounts of waste water at auto repair shops outside the ordinary sewage system, collection is recommended and disposal as chemical waste.

4.1.3. Summary of BAT for waste water

It is not possible to select a best technique for the discharge of waste water from auto repair shops. The right solution depends on a series of factors. However, since an overall objective of as little environmental burden as possible must be fulfilled, the following is valid:

- In areas with sewage systems, where the waste water is discharged to water courses, lakes and the sea, it is recommended to establish a silt trap, oil separator and control drain as described above.
- Coalescence filters must always be established in the separator, if waste water is discharged with a content of both oil and soap, in other words from the washing of cars and motor parts, and if the objective is to ensure a content of maximum 5 mg oil per litre water (measured in the inspection manhole). In principle, a coalescence filter should always be established for such plants, also even though the objective is higher, as for example in Iceland (15 mg/l).

There can be special conditions in the arctic areas, where the effect of the separator is reduced with low temperatures.

¹ Environmental Protection Agency (DK): Environmental Project No. 609, 2001: Reduction of mineral oil in waste water

In areas where there is not a sewage system, waste water must be collected in containers, which are emptied according to need. Emptying must happen at the waste water treatment plant, or the container must be delivered to an authorised receiver.

4.2. Energy

The majority of the energy consumption in auto repair shops is due to heating, pressurised air compressors, ventilation and other equipment. The most significant energy source is electricity together with heating with gas or oil.

4.2.1. Reduced energy consumption

The most significant energy savings to heating are achieved through the establishment of climate screens (insulation, port and windows) together with sensible heating installations and domestic hot water plant.

With regard to electricity consumption, the most significant savings opportunities are with lighting and compressor/ pressurised air plants together with cleaning/ maintenance of filters and channels.

A mapping of the auto repair shop's energy consuming installations and processes gives an overview of the energy activities with a high consumption. It is a good starting point to find energy saving initiatives together with opportunities for energy optimisation of the auto repair shop's energy consuming installations and tools, e.g. replacement of electricity powered tools supplied with pressurised air. Such measures can result in large energy savings.

Saving opportunities

The Danish Branch Orientation for auto repair shops recommends:

- After-cavity wall insulation, and insulation of walls and roof construction,
- Sealing of joints at, for example, windows and doors,
- Windows with thermo and energy glass. Possibly also continuous windows on glass panes with a layer of glass,
- Insulation of ports,
- Automatic closure of ports (possible assembly of automation at ports, which ensure that the port can close halfway, if there is not need for more),
- Replacement of sliding gate with automatic sliding door,
- Replacement of electric panels with radiators connected with central heating/district heating,
- Correct adjustment of burners,

- Investigation of whether older oil burners are supplied with closely sealed draught control, heating and too high flue gas temperature in order to assess whether the replacement can pay,
- Control of whether radiators and calorifier are supplied with thermostat valves. Replacement of defect thermostat valves,
- Heat recycling,
- Control of ventilation and lighting according to need,
- Control of whether cooling and pressure conditions with district heating is acceptable, and whether the piping is to be after-insulated,
- With new installations it is worth considering installing automation on the heating plant (automatic control of supply pipe temperature compared to outside temperature), or apply time control on the central heating pump.

Domestic hot water plant

- Control the circulation pump's speed and assess whether the need can be met with a lower pump speed during part of the year,
- Assess whether the insulation of the hot water tank and piping is sufficient, or whether after-insulation is economically viable,
- With new installations it is worth considering choosing pumps that can be regulated with several speeds, installing time control and adopting heat saving automation (reduction of heating loss from piping and boiler),
- Timing control on pumps.

Lighting

- Voltage regulation of light (alternative to electronic coupling),
- Automatic light control,
- Time switches, switch timers, movement and heating sensors.

Compressor plant

- Investigate whether the pressure can be reduced,
- Install a storage container after compression to balance the air consumption, so frequent start/stop functions of the compressor can be avoided,
- Control whether there are leaks in the pressurised air system,
- Turn off the pressurised air plant outside working hours, possibly via automatic turn on/off timers,
- Investigate the pressurised air need prior to new acquisition of pressurised air plants, so over-dimensioning is avoided,
- Use el motors and compressors with a high effectiveness,
- Utilise waste heat from the compressor.

Car painting

New heated air ovens for spraying cabins can reduce the energy consumption. Infra-red drying can reduce the energy consumption during drying by up to 20–30 times compared with traditional drying in the oven or combined cabin. Separate spraying and drying cabins instead of combination cabins can give big savings at larger auto repair shops.

See also BAT for car painting plants².

Heat recycling

Heat recycling can in certain cases be profitable. With relative high heating consumption it can be considered to combine room ventilation with a cross heat exchanger, which recycles approximately 50% of the heat.

4.3. Consumption of chemicals and oil products

In connection with car repair and maintenance both a large amount of auxiliary materials and products in car parts are handled, which are replaced and repaired.

Fig. 4.5 Chemicals with hazard labels

It is characteristic of the car branch, that a large amount of auxiliary substances are used. Auxiliary substances can present an immediate health problem and can be hazardous to the external environment.

In table 4.1, there are products shown that have environmental and health effects that require special attention.

² Nordic Council of Ministers: BAT for car painting plants (TemaNord 1995:607)

Table 4.1 Products with problematic substances and their environmental and health effects

PRODUCTS	PROBLEMATIC SUBSTANCES	ENVIRONMENTAL/ HEALTH EFFECTS
Cleaning and care agents	LAS (Linear Alkyl-benzen Sulfonates) NPE (Nonyl Phenol Ethoxylates)	In a waste water treatment plant most of LAS is degraded, but a proportion ends up in the sludge which is used in the manure for agricultural soil. NPE is degraded to NP (Nonylphenol) which is difficult to degrade. NP can accumulate in the water environment and is poisonous for water living organisms.
Oil products (motor oil, gear oil, grease)	PAH (Poly Aromatic Hydrocarbons)	PAH accumulates in the environment both in water and on land. It is poisonous for organisms, which live in the water, as for mammals. Inhalation can lead to lung cancer.
Solvents (amongst others in degreasers, paints, glue and filler)	Benzen, ethylbenzen, toluen, xylene, white spirit, acetone, trichlorethylene, styrene-terpentine, halogenated hydrocarbons, mixed thinners, etc.	Solvents are inflammable and have a high danger of explosion. Can lead to eczema with skin contact. Many solvents with inhalation, even at low concentrations, lead to chronic brain damage. With longer term effects, certain solvents can lead to cancer. Some solvents are poisonous for organisms in water and can cause long-term effects in the water environment. Halogenated solvents (trichlorethylene) can during welding form extremely poisonous gases (e.g. fosgene). Degreasers that contain acids can develop a mixture of oxygen and hydrogen gas which can be explosive.
Rust protection agents	Bitumen, asphalt, solvents	Bitumen is considered to be carcinogenic
Benzin	Benzen, toluen etc. MTBE (Methyl Tertier Butyl Ether)	Several carcinogenic substances. Risk of percolation to the groundwater. Possibly carcinogenic.
Hardeners for paint, glue and filler	Isocyanate, amines, epoxy, dibenzoylperoxide	Can irritate skin, eyes and breathing organs and give over sensitivity and allergic eczema. Can be dangerous or poisonous with inhalation. Possibly carcinogenic. Some can be poisonous towards water living organisms.
Pigments in paint and primer	E.g. Yellow 13 and Yellow 83 and possibly other PBT/vPvB-substances	Persistent, bioaccumulation and poisonous and very bio accumulating substances (vPvB) covering amongst others substances which are classified as carcinogenic, mutating and damaging for reproduction
Cooling agents, propellants	Fluorocarbons, (HCFC, HFC, PFC, CFC)	Hydrofluorcarbons (HFC) og perfluorocarbons (PFC) are groups of synthetic chemical compounds, which have in the later years been used as replacements for chlorfluorocarbons (CFC), hydrofluorocarbons (HCFC) and halogens. Both HFC and PFC are moderate to strong climate gases. Emissions of these gases contribute to global heating with an effect between 140 and 9,200 times stronger than equivalent amounts of carbon dioxide (CO ₂).

Furthermore, TIG welding (Tungsten Inert Gas), for example on rust-free and acid-resisting steel, can generate radioactive dust under special conditions.

4.3.1. Environmental friendly alternatives

Many products are found that are used for the same purpose, but which are very different seen from a health and environmental angle. As a user of environmental damaging products it is important to assess the used products. It can often be an advantage to replace a chemical with a less damaging one or completely avoid using it. Even though the product is not a

problem in its own production, it can have damaging effects in other phases of the life cycle. Therefore, the use of products that are required to have labels in accordance with the respective country's legislation, based on EU's list of dangerous substances, is to be restricted as much as possible.

An overview is shown below of substitution possibilities. The overview is followed by a mapping of tools, which are relevant with an assessment and selection of chemical products.

- *Motor- and gear oil.* It is recommended to use synthetic oils and highly refined motor and gear oils with a very low content of tar substances, the so-called PAH compounds. Tar substances can through long term skin contact generate allergies and be carcinogenic.
- *Degreaser.* Avoid degreasers where it is possible. Where it is not possible, the process must be made as short as possible. Use if possible products with solvents first and followed by water dissolvable agents, for example, during the removal of silicone. Alternatively, alkali degreasers can be used. Hot water can, combined with a brush, be used for easier cleaning tasks, where it is technically not necessary that the object's surface becomes completely clean. Degreasing should not be carried out with pressurised air, since there can be a risk of inhalation of health damaging aerosols. Use preferably water based products for degreasing, such as for brake fluid and for car care. For brake rinsing and possibly motor rinsing, hot water alone can be used.
- *Painting and rust protection.* Use water thinning materials as much as possible with painting, degreasing and cleaning. Where this is not possible, use products with a particularly high dry content (in other words High Solid or Very High Solid - HS/VHS products) and the lowest possible content of solvents. Use spraying pistols, which ensure a large degree of transfer as possible. Avoid lead, strontium and zink chrome containing products. Use if possible water thinnable primers, basis paint and fillers.
- *Glue.* Use screen glue and sealants which do not contain isocyanates. If this cannot be achieved, it is normally better to use 1 component products than 2 component products. Use screen glue which does not have to be heated up before use, and screen glue which does not require the use of primer. Glued screens in cars can be a part of the bearing chassis. There can therefore be restrictions in the use of alternative glue types. With the removal of old car screens, avoid methods using heat/ heating (energy savings and improved working environment).
- *Rinsing agents and car care products.* Use water based rinsing agents and car care products instead of products with organic solvents. Be aware of any content of environmentally damaging substances in the water based products and investigate whether they reduce the oil separator's ability to separate oil. Substitute products in spray cans with products which can be applied with a cloth, sponge or equivalent.

In this way spray mists are avoided. Do not use products with silicone since this with potential subsequent paint repairs, requires the use of large amounts of silicone remover with organic solvents in.

- *Cooling liquid.* Cooling liquids with ethyleneglycol should be substituted with cooling liquid which contains propyleneglycol, which is less damaging to the health.
- *Cooling agents.* Hydrofluorcarbons (HFC) and perfluorcarbons (PFC) are groups of synthetic chemical compounds, which in recent years have been used as a substitution for chlorfluorcarbons (CFC), hydrochlorfluorcarbons (HCFC) and halogens as cooling agents in an air conditioning plant. At the moment there are no alternatives to these substances.
- *Skin rinsing agents.* Use for example grapeseed oil instead of skin rinsing agents with abrasive. It is just as effective for dirt containing oil and it doesn't give dry skin and eczema. Never use thinner or other organic solvents for the cleaning of the skin.
- *Brake grease.* Use brake grease where there is no notification requirement. Use copper and aluminium products with as low a content of copper and aluminium as possible.

4.3.2. Tools to assess chemicals

Different tools have been developed to assess chemical products. Many are targeted towards professional chemists, but many new tools can be used without particular knowledge of chemicals. Furthermore, labelling is continuously developed in order to ensure the best possible communication with the user.

Labelling

The first impression of a product is made from the product's etiquette. One can get information on the product's hazardous properties on the hazard etiquette. Etiquettes contain a hazard symbol - black symbol on an orange background - which shows whether the product is toxic, corrosive, damaging to health or locally irritating.

Label	Symbol	Hazard term
Tx	Very toxic
	T	Toxic
Xn	Damaging to health
	Xi	Locally irritating
C	Corrosive
E	Explosive
Fx	Extremely inflammable
	F	Very inflammable
O	Oxidizing
N	Environmentally dangerous

Fig. 4.6 Hazard labelling

In addition, risk sentences (R-sentences) will be displayed which tell about the risk of working with the product. It can be for example “R 49 - Can lead to cancer with inhalation” or “R 11 – Very inflammable”.

Finally, there must be safety sentences (S-sentences) which inform about the general safety conditions for working with the products. It can be for example “S 24 - Avoid contact with skin”.

Environmental labelling

The car sector uses many products which are environmentally labelled, for example, car care agents. There are two environmental labels, which are relevant for the car sector:

- The Nordic environmental label “The swan”
- EUs environmental label “The flower”.

Fig. 4.7 The flower and swan

The flower and the swan make it easier to act environmentally correct. When one buys an environmentally labelled product, one has a guarantee that it is among the least damaging products for the environment, without a negative effect on the quality and function.

The flower is targeted primarily towards the European market, whilst the swan is targeted towards the Scandinavian market. When it relates to requirements to the environment, quality and health, the labels however are largely the same. There are likely to be more swans than flowers on the products that are used by the car sector.

Supplier's user instructions and Safety Data Sheets (SDS)

Hazardous chemical products must be supplied in all the Nordic countries with a user instruction in the respective language. In the user instruction, information can be found on the product's content of chemical substances, health hazards and how it is handled safely.

Guidelines

Public institutions and authorities within environment, safety and health in the Nordic countries publish guidelines on the selection of chemicals. For example, the State's Pollution Inspectorate in Norway has prepared substance lists and guidelines for the use of firms that use chemicals. Here it is possible to search for substances which are damaging to health

and environment or inflammable and explosion hazardous, and get information on this. Furthermore, Grip - Association for sustainable production and consumption (Stiftelsen for bærekraftig produksjon og forbruk) has prepared a guideline for firms in the organisation on the use of chemical information (EHS data sheet, and such like).

The addresses are shown in chapter 8.

The internet

Several tools have been developed in recent years which target the user of products, and which are also relevant for auto repair shops.

Chemical inspection in Sweden has launched a web-based tool which is a risk prioritisation guide for chemicals to support firms. The tool is called PRIO and will be an aid when there is a need to determine which substances require particular attention in relation to the risk for environment and health. PRIO also provides information about which substances will be regulated by EU's chemical legislation (REACH).

KEMIguiden (The Chem Guide) is a Danish web-based tool, which can help firms control the consumption of chemicals, together with keeping them orientated about the development within the chemical field. KEMI-guiden targets in particular small and medium-sized firms without special competence within the chemical area.

Keminøglen (The Chemi Key). The Confederation of Danish Industries, Danish Metal Workers Union and Danish Motor Car Industries Employers' Association have published Keminøglen, which contains a list of chemical products used in the car sector. The objective with the list is that the users of the chemical products from the car sector have the opportunity to choose products from a health and environmental perspective. It is voluntary to submit products to Keminøglen. Submitted products are assessed with regard to the working environment, the external environment and the impact on oil separation in connection with the discharge of waste water.

Volvo, as part of the overall environmental management system, make requirements, to all substances that are used within the Volvo Group. These requirements manifest themselves in the form of three lists:

- Black list: Substances that may not be used,
- Grey list: Substances that may be used,
- White list: Environmental friendly alternatives.

The lists can be used as a good guide for making the correct choice and can be found on Volvo's homepage.

In chapter 8, there are references to the aforementioned tools and in addition to the Nordic homepages with relevant information relating to auto repair shops.

4.3.4. *Reduced chemical consumption*

The most effective way to reduce chemical consumption is to use so few products as possible. As a start to the work of controlling chemical consumption, one should therefore carry out a thorough clean-up of the auto repair shop's products. It often is the case that there is a need for a lot fewer products.

As a rule of thumb, it is about:

- Always using a box, tube or cartridge up before opening a new one,
- Using up any remains,
- Using as few products as possible,
- Keeping the packaging closely sealed after use,
- Disposing of possible solvents to distillation and recycling. Paint remains can be mixed with solvents before disposal.

Spray pistols reduce material consumption and result in less discharge to the surroundings in the form of spill.

Spray pistols with disposable cartridges lead to more waste, but less solvent consumption to cleaning.

4.3.5. *Pollution reducing measures*

Tapping and filling of fluids

Service and repair covers tapping and filling of cooling liquids, brake fluid together with motor and gear oil. Furthermore, there is a tapping of cooling agents from the air-conditioning system.

Container trolley

For the tapping of used fluids, such as motor oil, a container trolley with an assembled funnel can be used. It is necessary with a container for every type of fluid that must be tapped. The container trolley is rolled in under the car to the actual place of tapping. When the container trolley must be emptied, the fluid can be sucked from here to a big tank or barrel, which is emptied according to need. A funnel assembled with a swing arm can also be used, which can be adjusted.

Suction probe

With the above mentioned methods there is a risk of coming in contact with waste oil when the bottom screw in the motor block or gearbox/ rear axle assembly is loosened. This can be solved by using a suction probe, which sticks down through the hole to the measuring pin in the motor block. A disadvantage with this method is that one is not able to remove oil sludge and metal pieces from the motor block's bottom.

Spill trays

If it is not possible to use the above arrangements, one should use spill trays when pouring and tapping fluids. In all cases, spill trays must be used to collect fluids which drip from cars, together with the storage of spare parts during repair. This will lead to a reduced need for the use of absorbing materials together with the use of fewer cloths and thereby less waste. In the same way, the need for floor washing will be reduced. Good tools such as trays with a spout and good funnels to containers must be made available.

Cooling agents

Cooling liquids (HFC-134) for air-conditioning systems in most of the Nordic countries are covered by high duties and can be reused. There are different systems to ensure the largest possible recycling.

Discharges cannot however be avoided. If aircondition systems are not used in the car in a period (e.g. in the course of the winter), the system loses its filling, in other words the seals dry out and are thereby no longer tight.

With any kind of repair to an air-condition system, the cooling liquid must be tapped with a suction probe before faults and defects are corrected. One must also ensure that hoses are emptied completely.

Replacement and rinsing of particle filter

Particle filters are used in buses, lorries and heavier vehicles such as those used in construction.

Particle filters are placed in a house/ container. In each end of the filter there are many small channels of ceramic. The exhaust gas is forced from the inlet through these channels to the exhaust channel. Here the soot and ash from the vehicle's combustion of fuel is captured.

There are different types of filter. For some, the whole filter unit must be disassembled from the exhaust system before the filter itself can be disassembled from the filter house/container. For others, the filter can be disassembled from the filter house/container, which remains fixed to the vehicle.

The filter is taken out and rinsed normally every 6 months.

The spreading of particles is restricted as much as possible through the rinsing of the filter rinser. The filter rinser is a closed container with negative pressure and an internal pressurised air pistol which is operated with the use of fixed assembled gloves.

Particle filters are expected in Euro 4 generation lorries to be cancelled in favour of SCR catalysators, which is why the problem relating to particle filters is expected to be eliminated in a number of years.

4.4. Waste

Cars consist of steel and metal and a series of materials, which contain substances, which comprise of a health problem with direct contact, and which present a special problem at disposal.

In addition, a series of products are used during repair and service, which lead to different forms of waste, which can lead to special problems.

4.4.1. Waste types

Hazardous waste

A series of products must be treated as hazardous waste due to their content of health damaging substances.

In table 4.2, significant product types are shown, which contain damaging substances, and which therefore as a rule must be treated as hazardous waste.

Table 4.1 Problem substances in car materials and their environmental effects/health impacts

PROBLEM SUBSTANCES	MATERIALS IN CARS	ENVIRONMENTAL EFFECTS/ HEALTH IMPACTS
Softeners (phtalates, DEHP)	Undercarriage coating PVC	Washing out of phtalates happens during the washing of cars, wear and tear and in rain. Phtalates can have long term effects on water living organisms. Some substances can damage reproductive ability and some are carcinogenic in animals.
Heavy metals (mercury, copper, chrome, tin, zink, lead, cadmium)	Electronic parts Paint Accumulators, etc. Balancing blocks Contacts (mercury and in old cars)	Heavy metals e.g. lead are toxic for both organisms which live in water and for mammals. Heavy metals also accumulate in different organisms.

In addition, hazardous waste from auto repair shops comprises typically of:

- Used degreasers, grease, rust protection and diverse fluids,
- Paint remains (not hardened),
- Grinding dust,
- Particle waste from particle filters (lorries),
- Disposed solvents,
- Oil,
- Used cloths,
- Accumulators and electronic parts,
- Glue remains and filler/sealants,
- Aerosol sprays.

Other waste

Other waste includes used spare parts, scrap, tyres, empty packaging from auxiliary materials (on occasions hazardous waste) together with ordinary household waste.

Released airbags and belt tighteners are not considered to be hazardous waste. Airbags with sodiumazide based propellant in the gas generator has however a related health risk with contact.

4.4.2. Waste handling

It is important that waste is handled correctly until it is collected in compliance with the authorities' waste regulations.

Hazardous waste

The majority of the auto repair shop's fluid hazardous waste is oil, cooling liquid, thinner and paint remains. By tapping these fluids, it is important to use methods, where the contact with the waste and the risk for spills is minimized as much as possible. Container trolleys, suction probes and spill trays are all examples of such methods.

Solid hazardous waste is a mixed group for the car sector, which consists of inter alia, brake coating, oil filters, cloths contaminated with oil or solvents and equivalent, together with used batteries and accumulators.

Storage

It is BAT to store waste from the auto repair shop appropriately. With regard to vandalism it can be appropriate to lock up the auto repair shop. If waste consisting of toxic substances is stored, the waste must be stored in a locked place inaccessible to children. Also waste consisting of substances that are corrosive, damaging to health or locally irritating should be stored appropriately and inaccessible to children.

With regard to the working environment, stores of hazardous waste must be located outside, under a roof or in a separate shed. It is appropriate to protect the place from driving rain. With regard to the risk of spills from transport of waste which is not pumped, there should be easy access to the auto repair shop.

Be aware of the fire authorities' requirements for storage of airbags, belt tighteners and inflammable waste.

It is BAT to establish storage with a sealed floor with rim and without possibility for discharge to the drains. The storage must be designed so that the waste can be collected, if the container that contains the largest volume is emptied. The storage can be split up into 2 compartments for solid and fluid waste and can be placed and designed, so that a gully emptier can suck the fluid waste directly from the containers.

The storage should be supplied with clearly marked containers for each waste type, which the auto repair shop must segregate and deliver in sepa-

rate fractions. Oil and fuel filters are to be placed over a collection tray for dripping before storing. Oil filters are not to be mixed with other waste, since they require separate treatment. At several receiving installations, the filters are compressed in a press in order to remove the oil completely.

It is an advantage that containers for fluid waste are placed on a grate over a collection area. In this way, one avoids the containers taking up any of the collection volume. This solution also means that it is easy to discover any leaks in the container, and that the spill tray is easy to keep clean. Spills from the handling of waste are to be collected and stored in closed containers. If the grate is sunk, transportation of the containers over a kerb in connection with the collection of the waste is avoided.

Storage can also be carried out in closed containers. Special containers are found with a rim and collection reservoirs, where the spill from the handling of waste can be collected.

Delivery

Delivery must take place at appropriate intervals, so the auto repair shop can still handle the waste correctly. Regular collection intervals can be agreed with the waste transport company, no matter whether the waste is collected via public collection schemes or via private schemes. This applies to both waste collected in containers, receptacles, tanks, and the like, but also waste from the emptying of silt traps and oil separators.

Other waste

Other waste types from auto repair shops, for example, household waste, waste to recycling (paper/ cardboard and scrap) and industrial waste, must be handled, sorted and stored correctly in containers or other closed receptacles.

4.4.3. Measures for minimizing waste amounts

The amount of waste that is generated from the use of auxiliary materials can in general be restricted by using so few products as possible.

A proportion of the waste can be recycled. Today, the majority of the waste oil is refined which can then be used as fuel. Metal waste from, for example, oil filters can be used as diverse steel products. Some organic solvents can be distilled to new cleaning agents or thinners. Tyres are recycled to a certain extent through the incorporation of granulate in road surfacing. In addition, there is the possibility for the reuse of alkali cleaning fluids, brake fluids, accumulators (lead), brake and clutch parts, cloths, empty paint cans and other scrap.

4.5. Noise

4.5.1. Noise sources

Most of the auto repair shop's activities generate noise. Noise presents partly a problem for the working environment and partly for the surroundings, in particular when the auto repair shop is located close to housing or areas with other noise sensitive uses.

Significant sources of noise include:

- Pressurized air tools (angle grinder, eccentric grinder, sanders, air keys, drills, chisels, etc.),
- El-powered tools (angle grinder, eccentric grinder, drills, cutter, polishing machine, etc.),
- Testing of motors,
- Rolling area,
- Hammer drill,
- Ventilators,
- Compressors,
- Sand blasting,
- High pressured cleaners,
- Washing machines (wash halls).

4.5.2. Measures for minimizing noise burden

Outdoor noise sources

If there are outdoor noise sources, such as compressors, the noise can be abated by encapsulating the noise source. Shielding can be made around the perimeter, or the noise source can be moved to another place on the site, where there is natural shielding or by establishing a noise embankment. Noise disturbance to neighbours can in some cases be reduced by placing noisy, outdoor activities at places, where the buildings can shield.

Noise from within the buildings

Noise from within the buildings can be reduced significantly if ports, doors and windows are kept closed. Free openings in buildings can possibly be abated with a sound sluice. Noise abatement measures can be made to the stacks from the exhaust ventilation plant. The plant can possibly be controlled automatically, so it turns off when there is a need for it. This removes both the noise and saves energy.

Noise in the building

Noise abatement at source:

- Buy machines with comparatively low noise levels. The machines' noise level must be shown on the supplier's user instructions,
- Carry out noise encapsulation of machines with a relatively high noise level,
- Maintain all machines thoroughly, e.g. by greasing the bearings.

The reduction of noise in the auto repair shop rooms reduces also the noise that affects the surroundings.

- Set noise shields up around the machines and processes with a relatively high noise level,
- Assemble sound muffling materials on the ceilings and possibly walls,
- Abate the noise from large surfaces, which is set in a swing by the machine, e.g. with swing abating magnetic plates,
- Clip, grind or drill instead of using an air chisel with plate work,
- Use vibrations and a slugging wrench with a comparatively low noise level, e.g. air hydraulics at the tyre centre.

Avoid as much as possible sand blasting. Use a centrifugal cleaner for smaller objects such as rims, brake shoe and motor parts. Use silencing mouth pieces when sand blasting cannot be avoided.

4.6. Air

4.6.1. Emissions to the air

Many different fluid chemicals are used in the sector, which can release hazardous vapours to the air. These chemicals are also environmentally problematic during their manufacture and disposal.

Due to the volatile nature at normal room temperature of a series of substances that are used during car repairs, there is a particular risk of air emissions. This applies in particular to organic solvents which can be in paint, degreasers, glue, fillers, rust protection agents and fuel.

In addition, different types of dust are generated (metal dust and dust from paint) during grinding and other mechanical cleaning.

Air emissions comprise mainly of:

- Exhaust gas,
- Fuel vapours,
- Vapours from degreasers,
- Vapours from rust protection and solvents,

- Vapours from glue, fillers, sealants and paint,
- Welding fumes,
- Dust from grinding of brakes and other mechanical cleaning,
- Dust from the polishing of surfaces,
- Metal dust from angle grinding.

At smaller auto repair shops without painting and undercarriage treatment, pollution to the external environment is minimal whilst the activities in general will affect the working environment.

4.6.2. Measures for minimising emissions

Dust, welding fumes, exhaust gas, spray mists and vapours must be removed from the working environment with effective ventilation. It is important that process ventilation is established with window glueing, spartling, rinsing of particle filters, use of degreaser in deposits together with mixing and weighing tables to vehicle painting.

All spray applications in connection with vehicle painting and rust protection must take place in specially designed cabins, which comply with the authorities' requirements to, for example, ventilation.

The Nordic Council of Ministers has published "BAT for car painting plants"³. The report describes the available options that existed to implement cleaner technology in vehicle painting plants at the beginning of the 1990's with regard to protect the external environment. A series of measures have been described to reduce small, non continual emissions of volatile organic substances (VOC) from vehicle painting plants.

There is focus on two main alternatives:

- Substitution: transition to paint products with a reduced content of solvents,
- emission reduction.

For paint products with a reduced content of solvents, the restrictions will mainly be a result of a reduced content of solvents, whilst to a lesser extent a lower consumption.

Different types of paint and spray equipment together with methods for cleaning and washing are assessed. The same applies to assessments of the drying method and time. Cleaning methods are assessed with regard to use, effect and economy.

In Norway a programme "Environmental measures for painting" (Miljøtiltak Maling og Lakk) has been established within The Association for sustainable production and consumption (GRIP Stiftelsen for bærekraftig produksjon og forbruk). In 2001, a project was implemented in this forum

³ Nordic Council of Ministers: BAT for car painting plants (TemaNord 1995:607)

regarding car painting which resulted in the preparation of a guideline which can be found on <http://www.grip.no/>.

Plan for the cleaning of air

During painting, colour particles are removed from the exhaust air in dry and wet filters. A wet filter functions with an air flow with particles being led through water where the moist particles are then separated from the water flow. The dry filter can be a filter termed “paint-stop”, which is manufactured in glass fibre and specially manufactured in order to detain paint dust, or a so-called Andrafilter, which is manufactured specially for paint cabins in a two layer cardboard, and which detains paint vapours.

During the treatment of the undercarriage the oil mists from the exhaust air are filtered off. The filters must be maintained, so the concentration of the remains does not exceed the emission limit values set by the authorities. In relation to this, a steel filter is often used, which detains the oil drops and possibly a paint-stop filter. Metal filters can be reused after cleaning.

Plan for the cleaning of air from dusty activities

For the cleaning of the air from dusty activities, cassette-, envelope, bag or cartridge filters can be used. In addition, cyclones for pre-cleaning of the rougher particles are often used. Some filters are self-cleaning. The filters do not have an indefinite lifetime and must be maintained and replaced according to the supplier’s instructions.

Assessment of filters

One must assess whether the existing filters are suitable for the actual activity and can meet the requirements for the cleaning of the exhaust air. The supplier of the installed filter types at the workshop should be contacted in order to collect information about the installed filters and compare with the regulative requirements.

Maintenance of filters

A correct maintenance of the installed filters is necessary. Maintenance procedures for the periodic control, cleaning and replacement should be prepared according to the advice and guidance of the supplier. Here information on the filter’s replacement frequency and possibility for recycling can also be acquired. Note that used filters and filter dust can be hazardous waste.

4.7. Soil

Soil contamination often occurs as a result of overfilled or defect oil separators, leaking oil tanks and waste.

Prevention

By establishing the measures which are described in the paragraphs on waste and wastewater, i.e. diligent storage and handling of chemicals, routine control of oil tanks and oil separators together with the establishment of surfaced areas, the workshop will have gone a long way in relation to the prevention of soil contamination.

The surfacing of areas, where spills of fuel or other oil products can take place, must be sealed and be able to withstand oil/ fuel products together with other products such as washing and greasing agents, without a risk for percolation to the soil.

Oil products dissolve asphalt. Therefore, the surface must not be covered with asphalt where oil products are handled.

Gravel surfacing and concrete tiles/ stones laid in gravel are not impervious. It can also be difficult to assess whether a surface of concrete tiles/stones laid in cement gravel is sealed. It is significantly easier to keep an eye on whether the surfacing is sealed and can continue to be sealed, if the surfacing is a concrete that is cast in one piece, oil resistant, and can be driven on.

Storage space should be examined in connection with inspection in order to identify possible damage in the form of cracks and holes.

Percolations in connection with installation stops

If there is a suspicion that a percolation of polluting substances has taken place from the installations, the tightness of these installations must be checked as quickly as possible.

If one becomes aware that a soil contamination has taken place, for example from the percolation of polluting substances from installations, the pollution must be stopped immediately, for example, by emptying the leaking installation. In addition, the local environmental authority must be contacted or, if outside normal working hours, the control centre.

With an acute spill, the spill must be collected as quickly as possible, and a spreading of the pollution contained as much as possible. The local environmental authority must be contacted, or, if outside normal working hours, the control centre.

A quick intervention can minimise the spreading and extent of the pollution and reduce the risk for further pollution.

5. Further information

5.1. Nordic Council of Ministers

Nordic Council of Ministers: <http://www.norden.org/start/start.asp>

Nordic Council of Ministers: BAT for car painting plants (TemaNord 1995:607) <http://www.norden.org/pub/sk/showpub.asp?pubnr=-1995:607>

5.2. Danish

Danish Environmental Protection Agency (DEPA):
www.mst.dk

Orientation from the Danish Environmental Protection Agency No. 13 2000: Branch Orientation for car auto repair shops, DEPA, <http://www.mst.dk>

Industry Sector Occupational Health Counsel (Brancharbejdsmiljøråd): *Keminøglen* - List of chemical products in the car industry - anvendelse, sundhed og miljø, 4. udgave 2003. Also found on www.keminoglen.dk/.

KEMIGuiden is developed to ease the work of establishing an overview of the situation in each firm. Kemiguide is found on <http://nge-stam.key2green.dk>

Environmental Project No. 609, 2001: Reduction of mineral oil in wastewater, Danish Environmental Protection Agency, www.mst.dk.

Environmental Project No. 876 2004: Car wash. Reduction of wastewater loading through cleaner technology, Danish Environmental Protection Agency, www.mst.dk.

In Denmark there is a Knowledge Centre for Waste, which regularly informs about waste within several branches, including the car industry. On the Knowledge centre's homepage one can be orientated about good waste handling and related rules. <http://www.affaldsinfo.dk/>.

Miljøvis is an environmental cooperation between Swedish and Danish councils in the Øresund Region. The objective is to help smaller companies to achieve environmental improvements in an economically advantageous way. Relevant reports are published. <http://www.miljovis.org/> Miljøvis. Fact sheet 2a1: Waste from auto repair shops, 2005.

Miljøvis. Fact sheet 2a2: Hazardous waste from auto repair shops, 2005.

Centralforeningen af Autoreparatører i Danmark (C.A.D.) (Central Association for Automotive Mechanics in Denmark). www.cad.dk/.

5.3. Finnish

Ympäristöministeriö, The Finnish Environmental Ministry. www.ymparisto.fi or: www.miljo.fi

Autoalan Keskusliitto (The Finnish Central Organisation for car dealers and repairers). <http://www.akl.fi/>

Autoalan ja korjaamoiden liitto: www.aakl.fi

Sikkerhedsteknikcentralen: www.tukes.fi

Councils: www.kommunerna.net .

5.4. Icelandic

Umhverfisstofnun (Environment and Food Agency of Iceland) www.ust.is

Bílgreinasambandið (Branch organisation for Iceland's car industry) <http://www.bgs.is/index.asp> .

5.5. Norwegian

Statens Forurensningstilsyn (SFT). <http://www.sft.no/>

SFT-informasjon: “Vaske- og pleiemidler til kjøretøy” (Wash and care agents for motor vehicles) <http://www.sft.no/publikasjoner/kjemikalier/2047/ta2047.pdf>

Miljøstatus (Environmental Status) i Norge is an information service developed by the Environmental Protection Directorates on the request of the Environmental Protection Department. The State's Pollution Inspectorate is the responsible editor.

Miljøstatus i Norge has published a guideline on the assessment of chemicals and a database with 3,500 substances on its homepage. <http://www.miljostatus.no/datasok/stoffliste/stoffliste.asp?topmenuindex=2&leftmenuindex=1&pagename=Stofflisten> .

The Environmental Protection Department and Agriculture Department established in 1999 *ORIO* - “Organiske restprodukter - ressurser i omløp” (Organic residues - resources in circulation). The objective is to inform about and strengthen the interdisciplinary initiatives towards organic wastewater, waste and sludge. The “Kolon” project, which carries out tests of the treatment methods for wastewater, was initiated under Orio. www.orio.no .

Kolon-projektet: Kolon-projektet: “Lokale, naturbaserte løsninger for avløpsvann og våtorganisk avfall, årsrapport 2002” (Local natural based solutions for wastewater and wet organic waste, annual report 2002) can be found on <http://www.orio.no/norsas/oriomain.nsf/ec91c1926eeab620c-125680f0048ed2c/dafc1d1d9c17d0a0c1256bdb004d4b02!-OpenDocument> .

Norwegian Petroleum Institute (NP) is the branch organisation for oil companies. NP publishes reports of relevance in this connection. www.np.no

Norwegian Petroleum Institute: “Uttesting av oljeutskillere for bilvaskeanlegg. Resultater og konklusjoner, 2002” (Testing of oil separators for car wash plants. Results and conclusions, 2002) www.np.no/ktml2/-files/uploads/Rapporter/uttest%20oljeutskillere%20ekstern%20versjon.pdf

The Norwegian programme “Miljøtiltak Maling og Lakk” within “GRIP - Stiftelsen for bærekraftig produksjon og forbruk” (Association for sustainable production and consumption) carried out in 2001 a project regarding car painting, which resulted in the preparation of a guideline, which can be found on: <http://www.grip.no/MalingogLakk/Billakkundersokelse.htm>.

GRIP Stoffkartotek (substance list) with guidelines in chemical assessments are found on: <http://www.grip.no/Kjemikalier/Produkter/Stoffkartotek/Stoffkartotekveileder/stoffkartotek.htm>

Norges Bilbransjeforbund (NBF) (Norwegian Car Branch Federation) <http://www.nbf.no/>.

5.6. Swedish

Swedish Environmental Protection Agency. <http://www.naturvardsverket.se/>

The Swedish Environmental Protection Agency publishes fact sheets with guidance to certain sectors. The fact sheets are prepared to support authorities in connection with inspection. A fact sheet for car wash halls has been prepared in 2005. This can be ordered from <http://www.naturvardsverket.se/bokhandeln/dse/620-8207-8>.

The Chemical Inspection KemI is the authority for the Swedish environmental quality objectives “toxic free- environment” and has the objective of promoting Sweden’s objective of a “toxic-free environment” and coordinate the work. The chemical inspection can be found on på: <http://www.kemi.se/>.

KemI runs from its homepage a prioritisation guide *PRIO*, which is a tool for assessing substances and is targeted towards all purchasers of chemicals that do not have special professional competencies. <http://www.kemi.se/templates/PRIOframes.aspx?id=1067>.

On VOLVO’s homepage, three lists of chemical substances are published, which respectively must be avoided “black list” substances, can be used “grey list” and environmental friendly alternatives “white list”.

The lists are found on: <http://www.volvo.com/group/global/engb/Volvo+Group/ourvalues/environmentalcare/products/>.

Swedish Petroleum Institute (SPI) is the branch organisation for oil companies. SPI publishes reports of relevance in connection to this. www.spi.se.

SPI: "Biltvättningsanläggningar, 2005". <http://www.spi.se/fprw/files/-Biltv%C3%A4ttningsanl%C3%A4ggningsanlag.pdf>

SPI: "Utvärdering av 10 bilvårdsanläggningar tvättsäsongen 2002/2003" www.spi.se/fprw/Slutrapport%2003-08-22%20rev.pdf

Miljøvis is an environmental cooperation between Swedish and Danish councils in the Øresund Region. The objective is to help smaller companies to achieve environmental improvements in an economically advantageous way. Relevant reports are published. <http://www.miljovis.org/>

Miljøvis. Fact sheet 2a1: Waste from auto repair shops, 2005.

Miljøvis. Fact sheet 2a2: Hazardous waste from auto repair shops, 2005.

Motorbranschens Riksförbund (MRF). <http://www.mrf.se/>.

IVL: BAT- Car washing facilities, 2006.

Sammenfatning

Denne rapport beskriver de muligheder, der i dag er til rådighed for at indføre renere teknologi på autoværksteder.

Konceptet „Best Available Techniques“ (bedste tilgængelig teknik, BAT) omfatter valg af råvarer, processer mv., som samlet giver den mindst mulige miljøbelastning under hensyntagen til økonomien. Det er ikke muligt umiddelbart at udpege en specifik „autoværksted-BAT“, da forholdene på den enkelte virksomhed kan variere meget, ligesom meget forskellige klimatiske forhold kan være afgørende for valget af BAT.

Rapporten giver en række anbefalinger, som er på linie med BAT, og som efter bedste aktuelle viden udgør den bedste måde at begrænse miljøbelastningerne på uden at forringe kvalitet og økonomi. Det er heri også anført, hvor klimaforhold skal inddrages i vurderingen af den bedste løsning.

Rapporten beskriver teknologier inden for følgende områder:

- Spildevand og vandforbrug
- Energi
- Kemikalier og olieprodukter
- Affaldshåndtering
- Støj
- Luft
- Jord

Spildevand

I kloakerede områder samt i områder, hvor spildevand udledes til vandløb, søer eller havet, anbefales det at etablere sandfang, olieudskiller og kontrolbrønd efter nærmere beskrevne retningslinier og principper. Det anbefales, at der maksimalt er et indhold på 5 mg/l olie i spildevandet målt i kontrolbrønden, hvorfor der altid bør etableres koalescensfilter i udskilleren, hvis der afledes spildevand med indhold af både olie og sæbe, dvs. fra vask af biler og motordele.

Der kan være særlige forhold i de arktiske egne, hvor effekten af udskilleren nedsættes ved lave temperaturer.

I områder, hvor der ikke er kloakeret, skal spildevand opsamles i beholder, der tømmes til rensningsanlæg efter behov eller afleveres til godkendt modtager.

Vandforbrug

Vandforbrug er primært forbundet med bilvask og vask af motordele. Generelt anbefales recirkulation. Det bemærkes, at der ersærlige udfordringer forbundet med genbrug af vaskevand ved vaskehaller på grund af akkumulering af sundhedsskadelige stoffer i vaskevandet. Vaskehaller behandles særskilt i „BAT – fordonstvätt“, fra svenske IVL (2006).

Energi

Størstedelen af energiforbruget i autoværksteder skyldes opvarmning, trykluftskompressorer, ventilation og andet udstyr. Den væsentligste energikilde er elektricitet samt til opvarmning også gas eller olie.

En effektiv klimaskærm, specielt i koldere egne, anses at udgøre den væsentligste foranstaltning til energibesparelse. Der anvises en række tiltag for energibesparelser i forbindelse med brugen af el-drevet værktøj.

Kemiske stoffer

I autobranchen anvendes en række produkter, som indgår i forskellige service- og reparationsarbejder. Metoder til valg af produkter inden for de forskellige tekniske områder beskrives. Endvidere præsenteres en række fortrinsvis net-baserede værktøjer, der kan hjælpe brugeren i at finde de bedste alternativer.

Muligheder for at begrænse anvendelsen af miljøskadelige stoffer anvises, og særlige tiltag for at minimere miljøpåvirkningen beskrives.

Affald

Autoværksteder producerer en del affald i form af kasserede bildele, spildolie og andre kasserede væsker samt rester af hjælpestoffer. En stor del heraf er farligt affald, der kræver særlig behandling.

Affaldsgrupperne beskrives, og der anvises metoder til sortering, opbevaring og bortskaffelse.

Støj

De fleste af værkstedsaktiviteterne giver anledning til støj. Støj udgør dels et problem for arbejdsmiljøet og dels for omgivelserne, især når værkstedet er placeret nær boliger eller arealer med anden støjfølsom anvendelse.

Der redegøres for en række tiltag, der kan begrænse støj fra afprøvning af motorer, værktøj, kompressorer mv.

Luft

På autoværksteder anvendes mange forskellige flydende kemikalier, der medfører afgivelse af dampe til luften. Dette gælder i særlig grad de organiske opløsningsmidler, der kan være i maling/lak, affedtningsmidler, lim, spartelmasse, rustbeskyttelsesmidler og benzin. Desuden frembringes forskellige typer støv, svejserøg og udstødningsgas.

Der beskrives en række tiltag for at minimere emissioner af støv, svejserøg, udstødningsgas, sprøjtetåger og dampe.

Jord

Jordforurening opstår tit som følge af aktiviteter på autoværksteder, f.eks. fra overfyldte eller defekte olieudskillere, utætte olietanke og spild fra oplag af olieprodukter, kemikalier og affald.

Der anvises en række metoder til at undgå jordforurening, og egnede belægningstyper under oplag anvises.

Information på nettet

I kapitel 8 er der anført en række nyttige web-steder, hvor yderligere information og hjælpemidler på de nordiske sprog kan findes.