Evaluation and development of environmental aspects and objectives at Saab Training Systems, Huskvarna

Mimmi Fagrell
Subject: Environmental Science
Level: First cycle
Nr: 2011:M6
Abstract

The purpose of this project work is to evaluate and update Saab Training Systems’ environmental objectives and to propose recommendations for its continuing environmental work. Since the company is ISO 14001 certified the work is based on that standard. To be able to update the objectives and propose new ones; the environmental aspects where first updated.

The results of the work are; an evaluation of the company’s current environmental objectives, new environmental aspects, new environmental objectives and some suggestions for its continual environmental work.

The results follow the current aspects and objectives when it comes to disposition but the content is updated. The company does not have industrial manufacturing or other activities that is usually associated with environmental impact but it still affects the environment in many ways. The many differences and additions the results show compared to the company’s own aspects and objectives show that it can be a good thing to look at things from a new perspective.

Sammanfattning


Resultatet av arbetet är; en utvärdering av företagets nuvarande miljömål, nya miljöaspekter, nya miljömål samt vissa förslag för det fortsatta miljöarbetet.

Resultaten följer de befintliga aspekterna och målen när det gäller disposition men innehållet är uppdaterad. Företaget bedriver ingen industriell tillverkning eller har någon annan verksamhet som vanligtvis förknippas med miljöpåverkan men det påverkar ändå miljön på många sätt. De många olikheter och tillägg resultatet visar jämfört med företagets egna aspekter och mål visar att det kan vara bra att se på säker från ett nytt perspektiv.
1. Introduction

Saab Training Systems (STS) is a company that offers products, solutions and services for military education and training as well as for civilian defense. These products range from high-tech vests to complete combat systems including command centers, where exercises can be followed and evaluated. High quality standards for their products and services are important to STS while remaining true to the principles of sustainable development. Regarding the latter, STS is committed to a body of active environmental work that now needs to be evaluated and updated. STS is ISO 14001 certified.

2. Purpose

The purpose of the work is to:

1. Evaluate current environmental objectives to see in which ways they contribute to positive environmental impact.
2. Update the environmental objectives and produce new ones if needed.
3. Propose recommendations for the company’s continuing environmental work.
3. Method

The work is based on the company’s products, activities and services, and its current environmental work. First, the current environmental work was studied and evaluated, and then new material was produced. When producing the new material, relevant and up-to-date research was consulted to ascertain that the results are as relevant and usable as possible. When the company’s current environmental aspects were produced the work was based on an environmental evaluation. The idea was to use the same environmental evaluation as a foundation for this work and complete it with more recent information and data. This was not possible since the evaluation turned out to be done in 2001 and therefore lacking ten years of information. These circumstances provided a challenge since it is not possible to establish a company’s environmental aspects without having a certain level of knowledge about the company. Since that knowledge was not sufficiently provided through the environmental evaluation a lot of data was collected through the company intranet and human contacts. When updating the environmental objectives the aspects were however assumed to cover all major environmental impact generated by the Company.

A method used by all companies in the company group was used to determine which environmental aspects had proven most significant. See Method table 1. The method has three aspect criteria for consideration: Size/Grievousness, Duration and Distribution.

Method table 1

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size/Grievousness</td>
<td>1 3 5</td>
</tr>
<tr>
<td>Duration</td>
<td>2 4</td>
</tr>
<tr>
<td>Distribution</td>
<td>2 4</td>
</tr>
</tbody>
</table>

In this Method, an aspect's Size/Grievousness is judged in relation to the other aspects and by how serious it is from an environmental perspective; possible ratings are 1 for small/low, 3 for medium/middle and 5 for big/high. Duration is judged by how long the effects of the environmental impact caused by the aspect can be traced in nature; possible ratings are 2 for days and 4 for years. Distribution is judged by how large an area is affected by the aspect; possible ratings are 2 for local and 4 for global. All aspects that have a combined value of 9 or higher, and in cases where the rating for Size/Grievousness is 3 or 5, are deemed to be significant.

If the company is pleased with the results, the new aspects will be integrated in their environmental management system. Therefore the format they have on their intranet has been used as model when the aspects where written for this work.

4. Theory/Background

4.1 ISO 14001

ISO 14001 is an international standard providing the generic requirements for an Environmental Management System (EMS). Any company or organization that so wishes can implement the standard and then be certified by a third party. ISO 14001 certification signifies
that any interested party knows that the certified company has a well functioning environmental work. The aim of the standard is that it shall play a supportive role in the work of producing a successful environmental work that encompasses both environmental protection and the prevention of pollution.

When implementing ISO 14001 there are some requirements that must be met. An environmental policy statement must be made, including commitments of continual improvement of the EMS and prevention of pollution. It must also include a commitment to abide all laws and other regulations that are relevant to the company/organization. Thereafter, all environmental aspects must be identified and those that are significant be determined. Environmental objectives shall be established, and the EMS shall be implemented to meet those objectives. The work shall be periodically reviewed both internally and externally by a third party. All work shall be done by a systematic approach and documented.  

4.1.1 Environmental aspects

According to ISO 14001 “Environmental aspects are parts of a company’s/organization’s products, activities or services that can affect the environment.” Environmental aspects shall be identified and environmentally evaluated to determine which are significant. The evaluation can be done in many different ways; it is preferred to use a method that is documented and used by others. That makes the environmental work that is done easier to compare to other companies' environmental work and easier to evaluate for certification.

Identification

When the environmental aspects are being identified, it is important not to take into consideration how much it is possible to influence or control them later. As long as something affects the environment, it shall be noted and identified as an environmental aspect. Both direct aspects (such as emissions) and indirect aspects (such as product use) shall be considered. A good way of delimitation is to look at the environmental aspects that occur within the lifecycle of the company’s products and services. The aspects shall have a defined responsible owner and it is preferred if they are easily measurable.

Evaluation

When evaluating which aspects are significant consideration should be taken to the size and grievousness of the environmental effect, for how long the impact has an effect, and the size of the area that is affected. Environmental impact is usually defined to be local, regional or global. Global impact is considered to be the most troublesome, partly because it is very difficult to trace the source of global environmental effects and therefore difficult to control it politically. It is important that the person doing the evaluation has some knowledge about the environment and how it can be affected, and an ability to find the knowledge that is lacking. In his book Zackrisson(2002) writes that a method for evaluation of environmental aspects should be documented and well known to make the results comparable to the results of other companies/organisations. He also states that it is preferred that all methods used are detailed; not having a sufficient number of rating criteria’s can result in widely different aspects getting the same grading. It could also result in personal opinions having to much influence.

Environmental impact

Environmental impact is any positive or negative alterations in the environment that is caused by an environmental aspect, the aspect can be the direct cause of the impact or contribute to it partially. Environmental impact is usually defined as resource use or emissions. Because it is the source to emissions, resource use is considered to be the origin of all environmental impact. Emissions are both physical substances such as gases and non-physical “substances” such as noise and electromagnetic radiation.
Aspect-related risks
When environmental aspects are determined consideration shall be taken both to normal and abnormal situations. Abnormal situations can be anything from a vehicle functioning badly and therefore causing more emissions than normal, to accidents such as fires. The risks can have an aspect of their own or be integrated in the other aspects. 3, 4

4.1.2 Environmental objectives
According to the ISO 14001 requirements a certified company shall have documented, specific and achievable objectives and targets. Objectives are goals and the targets are the more detailed workplans to how the goals shall be achieved. The objectives shall encompass when it is possible be measurable and compatible with the environmental policy at the same time as laws and other regulations are being regarded. Consideration shall also be given to technological options and interested parties as well as to financial, operational and business requirements. The targets shall include timetables and instructions to how the objectives are to be reached. 5

5. Results

5.1 The company’s current environmental objectives
The environmental objectives currently used by the company are presented in tables; then an evaluation to see in which ways they contribute to positive environmental impact or help to reduce negative environmental impact follows.
(For information about the human toxicity and ecotoxicity of the substances see: Table 1 Substances)

5.1.1 Environmental friendly transports

<table>
<thead>
<tr>
<th>Measurement:</th>
<th>Environmental friendly transports</th>
</tr>
</thead>
</table>
| Description:  | - Flight transport to the sites to be coordinated so that deliveries will be made on fixed days of the week.  
- Increase the purchase amount of "Green Ton" annually by 30%.  
- Upon purchase of garage cars should be offered only green cars.  
- Upon purchase of company cars should be offered only green cars. |
| Objectives:   | - Number of Site transports on time / Total number of site transports X 100 ≥95%.  
- Buying goods transports as "Green Ton" in 2011 for 104 000 SEK.  
- Number of purchased green garage cars / Total number of purchased garage cars = 1.  
- Number of purchased green company cars / Total number of purchased company cars = 1.  
Monitoring objectives:  
- Percentage of air travel compared to car and boat transportation, both within the EU and in other parts of the world.  
- Measure the amount of carbon emissions from business travel ordered through the company’s core travel booking.  
- Measure the amount of carbon emissions from freight Transport Company. |

Transports cause environmental impact in form of noise, emissions, resource use and land use. Therefore, striving to make the company’s transports as efficient and well planned as possible is very beneficial to the environment. Using cars that are graded as environmentally friendly for person transports also makes a difference; it decreases the emissions per kilometer
compared to if less environmentally friendly cars had been used. The same is true for buying goods transports as “Green ton”. “Green ton” is bought from the freight company DHL, which uses trucks fueled by renewable fuels, mostly biogas and Rape Methyl Ester (RME).  

Emissions from transports are carbon dioxide, sulphur dioxide, nitrogen oxides and particulate matter PM10 and PM2.5. Transport related land use comes both from the areas exploited for the resources used to produce fuel and from the land used to build roads. Although some of the resources used to produce fuel are renewable most of the fuel used is produced using oil which is a non-renewable resource. It is estimated that 80% of the world’s fuel is produced using oil. RME consists of a mix of rapeseed oil and methane. Using RME as fuel produces 60 – 80% less emissions of carbon dioxide than using diesel. Emissions of nitrogen oxides are however equal or higher, and arable land is used to produce the fuel. Biogas (methane) is produced by anaerobic digestion of different types of organic waste. The carbon dioxide that is emitted from use of the biogas is considered to be neutral; since the fuel is produced by renewable organic waste, the carbon dioxide is not considered to contribute to climate change. Methane can, however, leak to the atmosphere from the production.

### 5.1.2 Environmental friendly design

<table>
<thead>
<tr>
<th>Measurement:</th>
<th>Environmental friendly design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>We will reduce use of hazardous substances in the new design.</td>
</tr>
</tbody>
</table>

**Objectives:**

**Improvement objectives:**
- 100% of new construction should have updated the environmental module in the spring.
- 100% of new design shall be coated with a six-host chromium-free coating.
- 100% of new components for PCB assembly included in the standard should be RoHS Compliant.
- No new connector included in standard shall be coated with cadmium.
- Monitoring objectives: Monitoring of the outside world on cadmium replacement.

By making sure that the company products and components follow the RoHS directive the environmental impact of the company products is reduced when the use of the substances regulated in the directive is reduced. Substances that are regulated by the RoHS directive are mercury, hexavalent chromium, cadmium, lead and the flame retardants PBB and PBDE.

### 5.1.3 Recycling

<table>
<thead>
<tr>
<th>Measurement:</th>
<th>Recycling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>We will act in such a way that our waste is minimized. The waste generated shall be sorted on that way that the minimum amount needs to be burned.</td>
</tr>
</tbody>
</table>

**Objectives:**
- Monitoring Objectives: Monitor the relationship between waste for recycling and waste for burning.

Minimizing the amount of waste produced is very good for the environment. The waste produced has originally been a product of some sort and in order to make to make that product resources and energy was used. The waste has to be processed in such a way that includes transportation, disassembly, burning or being put in a landfill – all of which create negative impact to the environment. It is beneficial to nature that the remaining products are recycled instead of being treated as waste. Producing products from recycled materials rather than from
new resources saves energy and future resources, and reduces emissions of carbon dioxide. For example, the energy saved is 95% for aluminum, 75% for steel and 20% for glass. The reduction in carbon dioxide emissions per ton of recycled material is 20 tons for copper, 10 tons for aluminum and 0.6 tons for glass.  

5.1.4 Energy consumption and water consumption

<table>
<thead>
<tr>
<th>Measurement:</th>
<th>Optimization of energy consumption and water consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>We will adjust our operations and our behaviour regarding the usage of energy in the form of lighting, ventilation, facility warming and water consumption so as to avoid unnecessary consumption.</td>
</tr>
<tr>
<td>Objectives:</td>
<td>Monitoring Objectives: Monitor electrical energy, thermal energy and water consumption.</td>
</tr>
</tbody>
</table>

**Electricity consumption**

Avoiding unnecessary electricity consumption saves energy and resources. How much effect that has on the environment depends on how the electricity is produced. In Sweden about 90% of the country’s electricity is produced by hydroelectric power and nuclear power, with the remaining mainly produced by combined heat and power, wind power and condensing power. The amount of energy produced by Swedish power plants depends on various factors such as the amount of precipitation or stoppage in nuclear power plants due to repair. When the amount of electricity produced is not enough to meet the demand, electricity is imported from other countries. Imported electricity is often based on fossil fuels.  

**Nuclear power**

The major environmental impact from nuclear power comes from the uranium used as fuel, at the mining stage, and continues through the usage and storage of waste. Uranium mining has a major impact on the environment because uranium production is production intensive for small levels of product. That means large amounts of ore needs to be mined resulting in very large open cast mines. Uranium mining also generates large amounts of radioactive waste and slurry. The slurry usually also contains other heavy metals. Two other environmental impacts from nuclear power are that the plants use large quantities of water and produce radioactive waste.  

**Hydroelectric power**

The main environmental impact from hydroelectric power is the effect it has on natural river systems. Dams and reservoirs are built in order to control the flow of water and electricity produced so that it meets the energy needs of the population served. The regulation of the water flow leads to erosion of the river banks and disturbance of both plant and animal life. Under such conditions, up to 50% of plant species may disappear while the production of the remaining species decreases. Bottom dwelling animals also decrease in production and number of species, which affects the fish species that feed on them. The fish are also affected by the alterations made when the dams and reservoirs are built and as passages get blocked and suitable places for breeding are destroyed.  

**Combined heat and power and condensing power**

Combined heat and power plants produce electricity when producing district heating, during periods when the need for heating is low some plants don’t produce district heating and therefore don’t produce electricity either. Most combined heat and power plants in Sweden use biomass as fuel; biomass is a renewable energy source. Burning biomass produces
nitrogen oxides, sulphur dioxide and carbon dioxide emissions. Condensing power plants are similar to combined heat and power plants but with the difference that they only produce electricity. In Sweden the condensing power plants are fuelled by oil and only used when there is an electricity shortage.\textsuperscript{17,18}

\textit{Wind power}
In Sweden there is strong enough wind to produce electricity by wind power about 80\% of the time. Sea-based wind power is, on average, 50\% more efficient than land based. When in use the turbines do not produce any emissions. However, emissions are produced during construction and transport of the turbines. The environmental effects from turbines in use are localized and usually in the form of noise along with some disturbance of plant and animal life.\textsuperscript{19}

\textit{Fossil fuel-based electricity production: oil, coal, natural gas}
The environmental impacts from using oil as an energy source are many. Oil is collected from nature by drilling of deep wells and then pumping the oil to the surface; this procedure uses large quantities of water and produces methane emissions. It can also contaminate underground water supplies and surface water. Oil refineries also use large amounts of water and produce wastewater, sludge and solid waste that require treatment before disposal due to contamination of metals and other toxic compounds. When the oil is burned for electricity production large amounts of water are used, and wastewater and solid waste are produced. The burning also produces emissions of nitrogen oxides, sulphur dioxide, carbon dioxide, methane and mercury compounds.\textsuperscript{20}

Coal mining requires large quantities of water, produces methane emissions, and produces solid waste and wastewater that is often contaminated. Coal mines also have a big impact on nature because of the large amounts of land that are required to mine the coal, especially for surface mining. Large amounts of water are also used in the power plants and the burning of the coal produces emissions of carbon dioxide, sulphur dioxide, nitrogen oxides and mercury compounds. Waste water and ash are other unwanted products from the burning; the ash contains metal oxides and alkali which are substances that when dissolved in water produces a base with a pH greater than 7.\textsuperscript{21,22}

Natural gas is retrieved from nature by the drilling of wells which impacts the land in the area of the wells. Before the gas is transported to the power plants it is treated to remove impurities that are hydrogen sulphide, helium, carbon dioxide, hydrocarbons and moisture. Transportation is done by the use of pipelines with risk of methane leaching. Burning of natural gas is done with several different methods; some of the methods require quite large quantities of water and produces contaminated waste water. The burning of the gas produces nitrogen oxides and carbon dioxide emissions; if the gas is not completely burned methane gas can be emitted to the air.\textsuperscript{23}

\textit{Water consumption}
Avoiding unnecessary water consumption is good because it saves water, reduces the amounts of chemicals used for treatment and saves energy needed for distribution. The positive effects from the energy saving depends on how the electricity is produced, for more information about the environmental impacts; see this report’s section about electricity consumption. Treatment of the waste water produced also cause environmental impact; different sewage-treatment plants use different methods. The company’s waste water is piped to Huskvarna sewage-treatment plant where the treatment method activated sludge is used. Iron Chloride is used for removal of phosphorus.\textsuperscript{24}
Thermal energy consumption
Avoiding unnecessary energy consumption for heating saves oil which is good for the environment since oil is a non-renewable energy source. Using oil as an energy source impacts the environment in many different ways, for example, by emissions of carbon dioxide, nitrogen oxides and sulphur dioxide. For more information about the environmental impacts, see this report’s section about fossil fuel-based electricity production.

5.1.5 Use of chemicals

<table>
<thead>
<tr>
<th>Measurement:</th>
<th>Use of chemicals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>We shall in the selection, acquisition and management of chemicals act in a manner that ensures minimizing risk and environmental impact during manufacture, use and disposal.</td>
</tr>
<tr>
<td>Objectives:</td>
<td>Monitoring objectives: Monitoring of number and amount of used chemicals.</td>
</tr>
</tbody>
</table>

Monitoring the number and amount of chemicals used and thereby avoiding unnecessary use or reducing the risk of emitting chemicals to the environment is good. It reduces the risk of environmental impact from the chemicals, both by effects that are known and by effects that are as yet unknown. That is beneficial to nature, animals and humans now, as well as to future generations since many such chemical effects are environmentally long lasting.

5.1.6 Environmental supplier evaluation

<table>
<thead>
<tr>
<th>Measurement:</th>
<th>Environmental supplier evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>Strategic- and Non-Strategic-rated supplier proportion of quality &amp; environmental approval.</td>
</tr>
<tr>
<td>Objectives:</td>
<td>Strategic- and Non-Strategic-rated suppliers shall, in the following proportion, be quality and environmentally approved: Quality Approved: 80%, Environmental Approved: 50%.</td>
</tr>
</tbody>
</table>

Environmental approved suppliers must among other requirements have a functioning environmental management system that fulfils the requirements of ISO 14001 or some other similar standard. This reduces the company’s indirect environmental impact when products and components are bought from environmental approved companies. If the company had not cared about the suppliers environmental status and only chose suppliers depending on the price and quality offered there would have been a great risk that the company had been indirectly contributing to more negative environmental impact. By making demands on the suppliers the company makes sure that the products bought keep a high enough environmental standard. It also benefits the environment by encouraging companies that could be possible suppliers to have a good environmental work.  

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5.2 Proposed new environmental aspects, presented according to the company model

In this section of the results, the new aspects proposed by the author are presented. They are categorized and divided in to three areas depending on the source of the environmental impact: Facility-related environmental impact, Process-related environmental impact and Product-related environmental impact. Note that Environmental Aspects (EA) are designated by EA-1, EA-2, EA-3 and so on below. The Aspects have also been evaluated and graded, as well as rated as significant or not significant. The ratings are suggestions by the author; the final decisions as to which Aspects are to be considered significant is to be done by the company.

5.2.1 Facility-related environmental impact

EA-1 Land use and buildings

How do our facilities and activities affect land and nature?

1. Reference to environmental assessment
   KM_770921, kap. 7.1 Mark/Fastighet Miljöteknisk markundersökning 2009
   Environmental Aspects Evaluation, § 1.1 Land use and buildings, 2011

2. Product, activity, service
   Work in, alterations and demolition of existing buildings and changes of land use. New construction. Leaching of substances from the soil. Generation of storm water. Effects on the area by previous companies that have occupied the land and buildings.

   It is very likely that there is asbestos in the boiler room and there is a possibility it occurs elsewhere in the buildings. Asbestos probably occurs in the thermal insulation around heating pipes. PCB most likely does not occur in the buildings since no alterations were made during the period PCB was in use.

3. Environmental impact
   The substances present in the soil can affect nature and humans in many different ways, including through the disrupting of photosynthesis in plants, poisoning aquatic organisms or poisoning people. Storm water runs via wells in the yard to the municipal storm water system, in one case it runs directly to Huskvarnaån.

   In the event of a discharge of asbestos, it would mainly be people in the vicinity of the property that would be affected and risk developing asbestos-related diseases.

   (For information about the human toxicity and ecotoxicity of the substances see: Table 1 Substances)
**Harmful substances:**
Aliphatic hydrocarbons  Copper
Arsenic  Lead
Asbestos  Nickel
Chromium  PAHs
Cobalt  Zink

**Scope:**
There are elevated concentrations of some of the substances in the soil, sediment of Huskvarnaån and the groundwater.

### 4. Aspect significance

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Rating</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size/Grievousness</td>
<td>5</td>
<td>Harmful substances with concentrations above the generic guideline values for contaminated soil, sensitive land use set by the Swedish Society for Nature Conservation.</td>
</tr>
<tr>
<td>Duration</td>
<td>4</td>
<td>The substances will stay in the soil and sediment for a long time affecting the environment.</td>
</tr>
<tr>
<td>Distribution</td>
<td>2</td>
<td>Only the local area is affected.</td>
</tr>
</tbody>
</table>

Sum: 11
Significant

### 5. Aspect-related risks

#### 5.1 Risks
When changing the land use, precautions must be taken to prevent effects on nature and/or human health. Consideration must also be taken to the cultural-historical remains in the area. In the occurrence of a fire or a spill there is a risk of an increase of the soil contamination and contamination of the storm water.

When altering buildings, precautions must be taken to prevent effects on human health by asbestos.

#### 5.2 Risk probability
The most probable spill is from vehicles, but that is not likely to occur. Most work on the property is office work and therefore the risk of a fire is considered low. Change in land use and alterations of buildings rarely happens and when it does, the risk for contamination is small.

For risks concerning spillage from customer owned goods and oil refilling see aspects *Customer owned goods* and *Thermal energy consumption*.

#### 5.3 Risk minimizing
In the event of a spill in the yard there is a cover available to put over the storm water drain. There are fire safety representatives that go through regular training and the fire department sometimes practice on the facility. There are existing procedures for what to do in case of a fire. There are existing procedures for how to proper conduct building alterations. Before conducting new construction the area will be examined for cultural-historical remains.
EA-2 Water consumption

How does our water consumption affect the environment?

1. Reference to environmental assessment
KM_770921, kap. 7.2 Vattenförsörjning/förbrukning
Environmental Aspects Evaluation, M Fagrell, 2011

2. Product, activity, service
Process-related water consumption and water consumption for lavatories, kitchen facilities, cleaning and so on.

3. Environmental impact
Use of the resource water and the environmental impact that is related to the withdrawal, distribution and treatment of the water. The main environmental impact from the withdrawal and distribution is the energy consumption and thereby the energy production.

(For information about the human toxicity and ecotoxicity of the substances see: Table 1 Substances)

Harmful substances:
CO2, SO2, NOx and other energy production-related substances.
Iron Chloride for water treatment.

Scope:
Water consumption 2008 was 7746 m3
Water consumption 2009 was 6937 m3
Water consumption 2010 was 5298 m3

4. Aspect significance

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Rating</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size/Grievousness</td>
<td>3</td>
<td>There is not a lack of water in Sweden but the environmental impact related to the withdrawal and treatment together with the fact that water is a commodity in short supply in many places in the world sums up to it being a medium sized aspect.</td>
</tr>
<tr>
<td>Duration</td>
<td>4</td>
<td>As long as the use continues so does the environmental impact. Impact from withdrawal can take time for nature to heal.</td>
</tr>
<tr>
<td>Distribution</td>
<td>2</td>
<td>The immediate environmental impact from the water use at the company is local.</td>
</tr>
</tbody>
</table>

Sum: 9
Significant

5. Aspect-related risks

5.1 Risks
Abnormally high water consumption could occur if a closed cooling system malfunctioned and started to use running water for cooling. It could also occur if a water valve broke or malfunctioned.
5.2 Risk probability
The risk is low, it has only happened once the last ten years.

5.3 Risk minimizing
All units that use water for cooling are regularly inspected. The water consumption is regularly monitored so that if something would occur it will be quickly noticed.

EA-3 Thermal energy consumption

How does our need of thermal energy affect the environment?

1. Reference to environmental assessment
KM_770921, kap. 7.3 Energi
Environmental Aspects Evaluation, M Fagrell, 2011

2. Product, activity, service
Burning of oil for heating of buildings. The heating system, including the burner and oil tank, is located on the facilities but the heat is bought from Jönköpings Energi.

3. Environmental impact
The substances released to nature from the combustion contribute to eutrophication, acidification, climate change, tropospheric ozone and smog. Oil is a non-renewable energy source. In humans, it is mostly the respiratory system that is affected.

(For information about the human toxicity and ecotoxicity of the substances see: Table 1 Substances)

Harmful substances:
- Carbon dioxide
- Nitrogen oxides
- Sulfur dioxide

Scope:
- 1619 MWh 2008
- 1701 MWh 2009
- 2060 MWh 2010

4. Aspect significance

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Rating</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size/Grievousness</td>
<td>5</td>
<td>Burning of oil produces many emissions and oil is a non renewable energy source. There are also many more environmentally friendly alternatives to oil.</td>
</tr>
<tr>
<td>Duration</td>
<td>4</td>
<td>The environmental effects such as acidification and climate change take long time to heal. It also takes an enormously long time for nature to produce new oil.</td>
</tr>
<tr>
<td>Distribution</td>
<td>4</td>
<td>The emissions spread globally; the oil is collected on many different places in the world.</td>
</tr>
</tbody>
</table>

Sum: 13
Significant
5. Aspect-related risks

5.1 Risks
When the oil is delivered there is a risk of spillage. Another risk is that the oil cistern can break which could result in oil leaking out.

5.2 Risk probability
The probability for a spill or for the tank breaking is very small; so far, it has never occurred.

5.3 Risk minimizing
In the event of a spill in the yard there is a cover available to put over the storm water drain. There are absorbents available to collect fluids in case of a spill. The oil cistern is embanked.

EA-4 Electricity consumption

How does our need of electrical energy affect the environment?

1. Reference to environmental assessment
KM_770921, kap. 7.3 Energi
Environmental Aspects Evaluation, M Fagrell, 2011

2. Product, activity, service
Process-related electricity consumption and electricity consumption for lighting, ventilation, climate control and office appliances.

3. Environmental impact
Energy production leads to environmental impacts such as emissions of green house gases, acidification, eutrophication, tropospheric ozone and different effects such as symptoms on the respiratory system on wildlife and humans.

(For information about the human toxicity and ecotoxicity of the substances see: Table 1 Substances)

Harmful substances:
Energy production related substances:
Ash Nitrogen oxides
Carbon dioxide Sulphur dioxide
Mercury compounds Uranium
Methane

Scope:
3520 MWh 2008
3457 MWh 2009
3458 MWh 2010
4. Aspect significance

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Rating</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size/Grievousness</td>
<td>5</td>
<td>Electricity production creates a lot of emissions and other environmental impacts such as land use and creation of radioactive waste.</td>
</tr>
<tr>
<td>Duration</td>
<td>4</td>
<td>The environmental effects such as acidification and climate change take long time to heal. The radioactive waste has to be stored for a very long time.</td>
</tr>
<tr>
<td>Distribution</td>
<td>4</td>
<td>The emissions spread globally.</td>
</tr>
</tbody>
</table>

Sum: 13
Significant

5. Aspect-related risks

5.1 Risks
The only risk related to our electricity consumption is if some sort of electrical error would occur resulting in a fire.

5.2 Risk probability
The risk is minimal.

5.3 Risk minimizing
All electrical wiring and installation is done correctly which drastically minimizes the risk.

EA-5 Coolants – facilities

How does our use of coolants affect the environment?

1. Reference to environmental assessment
KM_770921, kap. 7.6 Utsläpp till luft
Environmental Aspects Evaluation, M Fagrell, 2011

2. Product, activity, service
Cooling of the facilities. Three cooling units in the facilities contain RA 22 but they are not in use. Cooling units leak small amounts of coolants.

3. Environmental impact
HCFCs are ozone depleting, contributes to tropospheric ozone and climate change. Exposure can cause symptoms for the respiratory system, nervous system, heart, skin and more. HFCs are greenhouse gases with high global warming potentials.

(For information about the human toxicity and ecotoxicity of the substances see: Table 1 Substances)

Harmful substances:
The hydrochlorofluorocarbon (HCFC) Difluorochloromethane also known as R 22 or HCFC-22.
HFC
Scope:
12 kg of the HCFC R 22
402.5 kg of HFC

4. Aspect significance

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Rating</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size/Grievousness</td>
<td>1</td>
<td>The substances are harmful to the environment but only if they are leaked.</td>
</tr>
<tr>
<td>Duration</td>
<td>4</td>
<td>Effects on the ozone layer and climate change take long time to heal.</td>
</tr>
<tr>
<td>Distribution</td>
<td>4</td>
<td>The substances effect the environment globally.</td>
</tr>
</tbody>
</table>

Sum: 9
Significant

5. Aspect-related risks

5.1 Risks
If a coolant unit would break the substance inside could leak to the atmosphere.

5.2 Risk probability
The risk is very low, it has never happened.

5.3 Risk minimizing
All units are regularly inspected by an accredited firm that also takes care of refilling the units when necessary.

EA-6 Noise and vibrations - facilities

How does the noise and vibrations we produce affect our surroundings?

1. Reference to environmental assessment
KM_770921, kap. 7.8 Buller och vibrationer
Environmental Aspects Evaluation, M Fagrell, 2011

2. Product, activity, service
Running of roof fans.

3. Environmental impact
High levels of noise can cause symptoms such as stress and increased heart rate; it can also damage the hearing. Animals that rely on sounds for many things such as communication, navigation and finding food are more sensitive to noise pollution than humans.

(For information about the human toxicity and ecotoxicity of the substances see: Table 1 Substances)

Harmful substances:
Noise

Scope:
Low, no noise measurements have been done.
4. Aspect significance

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Rating</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size/Grievousness</td>
<td>1</td>
<td>The noise level is very low.</td>
</tr>
<tr>
<td>Duration</td>
<td>2</td>
<td>The noise stops as soon as the activities making it stop.</td>
</tr>
<tr>
<td>Distribution</td>
<td>2</td>
<td>The noise is only audible for a short distance.</td>
</tr>
</tbody>
</table>

Sum: 5
Not significant

5. Aspect-related risks

5.1 Risks
Placing of new fans in wrong directions so the noise is directed towards populated areas or the wetland area adjacent to the property. Loud noise could occur if a fan malfunctions.

5.2 Risk probability
Since we are aware of what could happen if a fan is placed wrongly the risk for that is very low. The risk for loud noise in case of a malfunction is also low since it is more probable that a malfunctioning fan would stop and become quiet.

5.3 Risk minimizing
New fans are placed in the most optimal way.

5.2.2 Process-related environmental impact

EA-7 Air emissions

How do our air emissions affect the environment?

1. Reference to environmental assessment
   KM_770921, kap. 7.6 Utsläpp till luft
   Environmental Aspects Evaluation, M Fagrell, 2011

2. Product, activity, service
   The production processes generates emissions of organic solvents from gluing and cleaning. The emissions are very low and therefore no treatment of the emissions is considered necessary.

3. Environmental impact
   Emissions of organic solvents can contribute to the formation of tropospheric ozone.

For air emissions related to transport, cooling and energy see respective aspects.
(For information about the human toxicity and ecotoxicity of the substances see: Table 1 Substances)
Harmful substances:
Organic solvents

**Scope:**
2008 – 263 litres used
2009 – 90 litres used
2010 – 67.5 litres used
(Varies with production volume)

4. Aspect significance

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Rating</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size/Grievousness</td>
<td>3</td>
<td>Only small amounts are used but since many organic solvents can bio accumulate the environmental impact adds up.</td>
</tr>
<tr>
<td>Duration</td>
<td>2</td>
<td>As long as the exposure is not prolonged the effects are either.</td>
</tr>
<tr>
<td>Distribution</td>
<td>4</td>
<td>Organic solvents are volatile and spreads easily.</td>
</tr>
</tbody>
</table>

Sum: 9
Significant

5. Aspect-related risks

5.1 Risks
The only risk related to the aspect is if a fire would occur which would cause emissions.

5.2 Risk probability
The risk of a fire is minimal; it has only occurred once in the last ten years. That fire was caused by short circuited batteries, now there are procedures controlling the handling of batteries to prevent it from happening again.

5.3 Risk minimizing
There are fire safety representatives that go through regular training and the fire department sometimes practise on the facility. There are existing procedures for what to do in case of a fire.

**EA-8 Emissions to water**

How do our emissions to water affect the environment?

1. Reference to environmental assessment
KM_770921, kap. 7.2 Vattenförsörjning/förbrukning
Environmental Aspects Evaluation, M Fagrell, 2011

2. Product, activity, service
Water is piped from the facilities to the municipal water treatment plant; kitchen water is piped through a fat separator. In the production area there are closed water systems for surface finishing containing Cr3+, diethanolamine and 2-(2-butoxietoxy)ethanol. Storm water is conducted through underground stone basins to other areas in the natural environment; one of the storm water drains is directly connected to the adjacent stream.
3. Environmental impact
Phosphates, nitrogen and organic matter added to nature by wastewater can contribute to eutrophication and oxygen depletion. The chemicals for surface finishing can damage eyes, are harmful if swallowed and are irritating to the skin.

(For information about the human toxicity and ecotoxicity of the substances see: Table 1 Substances)

Substances:
Chemicals for surface finishing
Nitrogen
Organic matter
Phosphates

Scope:
N/A Since no process water is generated no measurements are made.

4. Aspect significance

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Rating</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size/Grievousness</td>
<td>3</td>
<td>Eutrophication and oxygen depletion is serious but the amount of substances coming from the company is relatively small.</td>
</tr>
<tr>
<td>Duration</td>
<td>4</td>
<td>Eutrophication and oxygen depletion takes time for nature to heal.</td>
</tr>
<tr>
<td>Distribution</td>
<td>2</td>
<td>Affected areas are local and regional.</td>
</tr>
</tbody>
</table>

Sum: 9
Significant

5. Aspect-related risks

5.1 Risks
Spillage inside buildings on site does not constitute a risk to the environment because there are no wells; spills are collected using absorbents. Spillage outside the buildings (e.g. from a truck) could affect the environment if the substance spilled is harmful and leaks into a well.

5.2 Risk probability
The risk of a spill is low – so far, it has never occurred.

5.3 Risk minimizing
One of the storm water wells in the yard has a cover that can be applied if necessary. There are absorbents available to collect fluids in case of a spill.
EA-9 Electromagnetic fields

How do the electromagnetic fields we generate affect the environment?

1. Reference to environmental assessment
KM_770921, kap. 7.11 Transporter, 7.12 Produkter och marknad, och 7.14 Kontor Environmental Aspects Evaluation, M Fagrell, 2011

2. Product, activity, service
The company personal uses DECT phones and mobile phones for communication. Communication systems are used at the facilities for testing of products. There is a transformer station on the property where electromagnetic fields are generated, the radiation is however very low.

3. Environmental impact
Although electromagnetic radiation in high enough doses can have some effects on biological processes in the body no studies have indicated that it can cause health problems.

(For information about the human toxicity and ecotoxicity of the substances see: Table 1 Substances)

Harmful substances:
Electromagnetic fields

Scope:
Almost all employees are provided with DECT and/or mobile phones. All radiation generated from products or processes is low.

4. Aspect significance

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Rating</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size/Grievousness</td>
<td>1</td>
<td>Low radiation and no known serious health or environmental effects.</td>
</tr>
<tr>
<td>Duration</td>
<td>2</td>
<td>Only when the source is being used.</td>
</tr>
<tr>
<td>Distribution</td>
<td>2</td>
<td>Only in the vicinity of the source.</td>
</tr>
</tbody>
</table>

Sum: 5
Not significant

5. Aspect-related risks

5.1 Risks
The only risk is if the effects of electromagnetic radiation have been miscalculated.

5.2 Risk probability
The probability is very low since many studies have been made.

5.3 Risk minimizing
Since electromagnetic radiation is something affecting the entire society studies are done often and if any effects were discovered we would know it quickly.
EA-10 Noise and vibrations – process related

How does the noise and vibrations we produce affect our surroundings?

1. Reference to environmental assessment
   KM_770921, kap. 7.8 Buller och vibrationer
   Environmental Aspects Evaluation, M Fagrell, 2011

2. Product, activity, service
   Transports to and from the facility, test shootings and demonstrations.

3. Environmental impact
   High levels of noise can cause symptoms such as stress and increased heart rate. They can also damage hearing. Animals that rely on sounds for many things such as communication, navigation and finding food are more sensitive to noise pollution than humans.

   (For information about the human toxicity and ecotoxicity of the substances see: Table 1 Substances)

Harmful substances:
Noise

Scope:
Low, varies with production volume

4. Aspect significance

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Rating</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size/Grievousness</td>
<td>1</td>
<td>The noise is low, slightly higher noise is produced in areas where it is not disturbing.</td>
</tr>
<tr>
<td>Duration</td>
<td>2</td>
<td>The noise stops as soon as the activities making it stop</td>
</tr>
<tr>
<td>Distribution</td>
<td>2</td>
<td>The noise is only audible for a short distance.</td>
</tr>
</tbody>
</table>

Sum: 5
Not significant

5. Aspect-related risks

5.1 Risks
   Unplanned and unnecessary noise, from shooting or careless driving.

5.2 Risk probability
   Low

5.3 Risk minimizing
   Some of the test shooting is done indoors which minimizes the noise outside; other shooting is done on shooting ranges which are located far from homes. Some shooting demonstrations and testing are done on or adjacent to the property which means bursts of loud noise, they are planned to be as little disturbing as possible.
EA-11 Coolants – process related

How does our use of coolants affect the environment?

1. Reference to environmental assessment

   KM_770921, kap. 7.6 Utsläpp till luft
   Environmental Aspects Evaluation, M Fagrell, 2011

2. Product, activity, service

   Cooling of production processes. Cooling units can leak small amounts of coolants.

3. Environmental impact

   HCFCs are ozone depleting, contributes to tropospheric ozone and climate change. Exposure can cause symptoms on the respiratory system, nervous system, heart, skin and more. HFCs are greenhouse gases with high global warming potentials.

   (For information about the human toxicity and ecotoxicity of the substances see: Table 1 Substances)

   **Harmful substances:**
   Hydrofluorocarbons, HFC R404A and R23
   Hydrochlorofluorocarbon, HCFC R22

   **Scope:**
   HCFC 21.6 kg
   HFC 132.4 kg

4. Aspect significance

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Rating</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size/Grievousness</td>
<td>1</td>
<td>The substances are harmful to the environment but only if they are leaked.</td>
</tr>
<tr>
<td>Duration</td>
<td>4</td>
<td>Effects on the ozone layer and climate change take long time to heal.</td>
</tr>
<tr>
<td>Distribution</td>
<td>4</td>
<td>The substances effect the environment globally.</td>
</tr>
</tbody>
</table>

   Sum: 9
   Not significant

5. Aspect-related risks

5.1 Risks

   If a coolant unit would break, the substance inside could leak to the atmosphere.

5.2 Risk probability

   The risk is very low – it has never happened.

5.3 Risk minimizing

   All units are regularly inspected by an accredited firm that also takes care of refilling and emptying the units when necessary.
EA-12 Chemicals

How does our use of chemicals affect the environment?

1. Reference to environmental assessment
KM_770921, kap. 7.5 Kemikalier
Environmental Aspects Evaluation, M Fagrell, 2011

2. Product, activity, service
Chemicals are used in the manufacturing processes for things as gluing, casting, maintenance and cleaning.

3. Environmental impact
Many different kinds of chemicals with different kinds of environmental impacts are used. The chemicals can among other things cause cancer, be irritating to skin and eyes, be toxic if inhaled and many of them are very toxic to aquatic organisms and can cause long-term adverse effects in the aquatic environment.

(For information about the human toxicity and ecotoxicity of chemicals see: Table 1 Substances)

Harmful substances:
Glue Paints
Lubricants Sealants
Oil
Organic solvents And more

Scope:
Number of chemicals used: Solvents used:
2009: 1662009: 90 litres
2010: 1822010: 97,5 litres

4. Aspect significance

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Rating</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size/Grievousness</td>
<td>5</td>
<td>Some of the chemicals used are toxic to humans and nature, there are some that are very toxic which gives the aspect a high rating although relatively small amounts are being used.</td>
</tr>
<tr>
<td>Duration</td>
<td>2</td>
<td>In the way the chemicals are being used they do not cause any environmental impact that takes long time for nature to heal.</td>
</tr>
<tr>
<td>Distribution</td>
<td>4</td>
<td>Many chemicals are volatile and spread easily.</td>
</tr>
</tbody>
</table>

Sum: 11
Significant
5. Aspect-related risks

5.1 Risks
Spills could harm nature and/or humans.

5.2 Risk probability
The risk is low.

5.3 Risk minimizing
In the case of a spill there are absorbents available to use to stop the chemicals from leaking into nature and to collect them.

EA-13 Package materials

How does our use of package materials affect the environment?

1. Reference to environmental assessment
KM_770921, kap. 7.13 Förpackningar
Environmental Aspects Evaluation, M Fagrell, 2011

2. Product, activity, service
Use of package materials for incoming goods and our own products. Both plastic-based and wood-based materials are used.

3. Environmental impact
Use of the non-renewable resource oil and the resource wood; refining of the resources to package materials leads to environmental impact. A lot of the materials are recycled but not all.

For environmental impact related to waste see environmental aspect Waste.
(For information about the human toxicity and ecotoxicity of the substances see: Table 1 Substances)

Harmful substances:
Plastics in case of littering

Scope:
n/a

4. Aspectsignificance

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Rating</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size/Grievousness</td>
<td>1</td>
<td>Use of a non renewable resource but in relatively small amounts and otherwise use of a renewable resource.</td>
</tr>
<tr>
<td>Duration</td>
<td>4</td>
<td>Using plastic as package material means using the non renewable resource oil.</td>
</tr>
<tr>
<td>Distribution</td>
<td>2</td>
<td>No emissions that can spread globally. Most environmental impact is local to the area where the resources are collected.</td>
</tr>
</tbody>
</table>

Sum: 7
Not significant
5. Aspect-related risks

5.1 Risks
Risks related to this aspect are littering and fire.

5.2 Risk probability
The risk of littering is low. The risk of a fire is minimal, having occurred only once in the last ten years. That fire was caused by short-circuited batteries. Now there are procedures controlling the handling of batteries to prevent it from happening again.

5.3 Risk minimizing
The handling of package materials is done indoors which minimizes the risk of littering. There are fire safety representatives that go through regular training and the fire department sometimes practices on site. There are existing procedures for what to do in case of a fire.

EA-14 People transports

How do our people transports affect the environment?

1. Reference to environmental assessment
KM_770921, kap. 7.11 Transporter
Environmental Aspects Evaluation, M Fagrell, 2011

2. Product, activity, service
Transports to and from work by car, public transportation or bicycle. Business trips by car, train or air. Because of the nature of the company many business trips are needed but as many contacts as possible are done via phone or the Internet to keep trips to a minimum. All company cars are environmentally friendly according to the environmental grade from 2005.

3. Environmental impact
Transports cause environmental impact in form of noise, emissions, resource use and land use. The emissions contribute to eutrophication, acidification, climate change, tropospheric ozone and smog. They also cause health problems, mainly in the respiratory system. To produce the fuel large amounts of resources are needed which means an environmental impact from land use and refining. Some of the resources are non-renewable.

(For information about the human toxicity and ecotoxicity of the substances see: Table 1 Substances)

Harmful substances:
Carbon dioxide  Sulphur dioxide
Noise
Nitrogen oxides
Particulate matter PM$_{10}$, PM$_{2.5}$
Scope:
Business trips by car, both private cars and company cars. Tons CO$_2$ calculated by an average factor of 200 grams/km.

2008: 177320 km by car equaling 35.5 tons of carbon dioxide
2009: 172190 km by car equaling 34.4 tons of carbon dioxide
2010: 310130 km by car equaling 62 tons of carbon dioxide

Train, public transportations, bicycle and airplane N/A.

4. Aspect significance

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Rating</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size/Grievousness</td>
<td>5</td>
<td>Emissions, land use and resource use for producing the fuel.</td>
</tr>
<tr>
<td>Duration</td>
<td>4</td>
<td>Non renewable resources are used, the effect of the emissions takes very long time for nature to heal.</td>
</tr>
<tr>
<td>Distribution</td>
<td>4</td>
<td>The emission spread globally, resources for fuel are extracted globally.</td>
</tr>
</tbody>
</table>

Sum: 13
Significant

5. Aspect-related risks

5.1 Risks
Malfunctioning cars produce unnecessary large amounts of emissions.

5.2 Risk probability
Low.

5.3 Risk minimizing
The company cars receive regular maintenance.

EA-15 Goods transports

How do our goods transports affect the environment?

1. Reference to environmental assessment
KM_770921, kap. 7.11 Transporter
Environmental Aspects Evaluation, M Fagrell, 2011

2. Product, activity, service
Goods transport to and from the company by truck, ship or air. Some products are transported both to and from the facility since they are manufactured elsewhere but inspected at the company before being sold to a customer. Transports by air are mainly done when there is a lack of time. Since the company has customers all over the world many of the goods transports are long.

3. Environmental impact
Transports cause environmental impact in form of noise, emissions, recourse use and land use. The emissions contribute to eutrophication, acidification, climate change, tropospheric ozone and smog. They also cause health problems, mainly in the respiratory system. To produce the
fuel large amounts of resources are needed which means an environmental impact from land use and refining. Some of the resources are non-renewable.

(For information about the human toxicity and ecotoxicity of the substances see: Table 1 Substances)

**Harmful substances:**
- Carbon dioxide
- Sulphur dioxide
- Noise
- Nitrogen oxides
- Particulate matter PM10, PM2,5

**Scope:**
Tons CO2 calculated by ton/km for each way of transportation
2008: 3092 tons of carbon dioxide
2009: 2766 tons of carbon dioxide
2010: 736 tons of carbon dioxide

(Varies with production volume)

### 4. Aspect significance

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Rating</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Size/Grievousness</em></td>
<td>5</td>
<td>Emissions, land use and resource use for producing the fuel.</td>
</tr>
<tr>
<td><em>Duration</em></td>
<td>4</td>
<td>Non renewable resources are used; the effect of the emissions takes very long time for nature to heal.</td>
</tr>
<tr>
<td><em>Distribution</em></td>
<td>4</td>
<td>The emission spread globally, resources for fuel are extracted globally.</td>
</tr>
</tbody>
</table>

Sum: 13

Significant

### 5. Aspect-related risks

#### 5.1 Risks
Malfunctioning cars and trucks produce unnecessary large amounts of emissions. Accidents can cause environmental impacts in form of emissions and spillage; if an accident involves harmful goods the impact can be severe.

#### 5.2 Risk probability
Low, the amounts of harmful goods are low.

#### 5.3 Risk minimizing
As much as possible, the company hires environmentally certified transporters which mean they should be aware of the risks and work to avoid them. Everyone handling harmful goods has proper training and if a problem should arise there is a security adviser to consult.
EA-16 Offices and kitchen facilities

How do our offices and kitchen facilities affect the environment?

1. Reference to environmental assessment
   KM_770921, kap. 7.14 Kontor
   Environmental Aspects Evaluation, M Fagrell, 2011

2. Product, activity, service
   Office work and use of food and beverages. Most office work is done with computers but papers, pens etc is also used. Meals are eaten in the personal restaurant and there are also coffee rooms and coffee machines spread out in the buildings.

3. Environmental impact
   Use of office supplies and the consumption of food and beverages necessarily indicate resource usage and environmental impacts related to their production and manufacturing. Flame retardant can cause different health effects such as nausea and liver damage.

For environmental impact related to energy and waste see respective aspects.
(For information about the human toxicity and ecotoxicity of the substances see: Table 1 Substances)

Harmful substances:
Electronic equipment can contain flame retardants and heavy metals such as copper

Scope:
n/a

4. Aspect significance

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Rating</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size/Grievousness</td>
<td>3</td>
<td>Flame retardant can cause health effects if they leak out from the equipment, the single use cups are made of plastic which is oil based.</td>
</tr>
<tr>
<td>Duration</td>
<td>2</td>
<td>Tree materials and food are renewable resources.</td>
</tr>
<tr>
<td>Distribution</td>
<td>2</td>
<td>No emissions that can spread globally. Most environmental impact is local to the area where the resources are collected.</td>
</tr>
</tbody>
</table>

Sum: 7
Not significant

5. Aspect-related risks

5.1 Risks
The only risk related to the aspect is if a fire would occur in an office or the kitchen facilities which would cause emissions.

5.2 Risk probability
The risk of a fire is minimal; it has only occurred once in the last ten years. That fire was caused by short circuited batteries, now there are procedures controlling the handling of batteries to prevent it from happening again.
5.3 Risk minimizing
There are fire safety representatives that go through regular training and the fire department sometimes practice on the facility. There are existing procedures for what to do in case of a fire.

EA-17 Waste

How does our waste affect the environment?

1. Reference to environmental assessment
KM_770921, kap. 7.9 Avfall
Environmental Aspects Evaluation, M Fagrell, 2011

2. Product, activity, service
Generation of recyclable, combustible, organic and hazardous waste. The waste is sorted into fractions and then taken care of by a hired contractor.

3. Environmental impact
Generating waste means bad use of resources and the energy it takes to produce and refine them. Hazardous waste can harm both the nature and humans in many different ways, for example by disrupting fetus development or causing cancer. Organic waste can contribute to eutrophication.

(For information about the human toxicity and ecotoxicity of the substances see: Table I Substances)

Harmful substances:
Hazardous waste such as waste oil, paint-, glue-, and solvent residues and batteries.

Scope:
2009: 4.5 ton electronics, 1 ton aluminium, 5.5 ton corrugated cardboard, 20.5 ton combustible, 2 ton fats from kitchen facilities
2010: 1.5 ton aluminium, 14 ton corrugated cardboard, 29 ton combustible, 2.5 ton fats from kitchen facilities

4. Aspect significance

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Rating</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size/Grievousness</td>
<td>5</td>
<td>Hazardous waste can harm the environment. All waste is the result of use of resources and energy, non hazardous waste also affects the environment.</td>
</tr>
<tr>
<td>Duration</td>
<td>4</td>
<td>Eutrophication takes time for nature to heal; all waste has to be treated in some way which takes time.</td>
</tr>
<tr>
<td>Distribution</td>
<td>2</td>
<td>The waste does not spread globally; it stays local or regional depending on where it is treated.</td>
</tr>
</tbody>
</table>

Sum: 11
Significant
5. Aspect-related risks

5.1 Risks
Wrongly sorted waste can lead to unnecessary energy use. Wrongly sorted hazardous waste can lead to harmful substances being released to nature. A fire in a waste container can lead to harmful emissions.

5.2 Risk probability
The risk is low.

5.3 Risk minimizing
There are routines controlling the sorting of the waste. The hazardous waste is sorted and stored in two sheds, one of them is locked. The waste containers are placed at a distance from buildings to minimize the risk of fire.

EA-18 Customer owned goods

How do customer-owned goods affect the environment?

1. Reference to environmental assessment
KM_770921, kap. 7.1 Mark/Fastighet
Environmental Aspects Evaluation, M Fagrell, 2011

2. Product, activity, service
Vehicles, weapons and parts of vehicles and weapons are sometimes borrowed from customers to use as references when products are developed. Customer-owned goods are stored in “Röda Ladan” among with 25-liter containers of diesel for the vehicles. The vehicles are driven very little; the weapons are sometimes tested using blanks or live ammunition. To make training as realistic as possible pyrotechnics are used to simulate the noise and smoke that comes from firing a weapon with live ammunition, this is also tested. The pyrotechnics used are magnesium based.

3. Environmental impact
When the vehicles are driven they emit emissions, produce noise and use fuel. The emissions contribute to eutrophication, acidification, climate change, tropospheric ozone and smog. They also cause health problems, mainly in the respiratory system. To produce the fuel large amounts of resources are needed which means an environmental impact from land use and refining. Some of the resources are non-renewable.

Both the live ammunition and the blanks contain lead, lead can among other things in high doses affect the nervous system and cause infertility in both humans and animals. Plants are affected in several ways including disruption of the growth of the fine roots. Shooting also generates noise. Magnesium is not very harmful to nature or humans and is used in such a small amount that it poses no threat.

(For information about the human toxicity and ecotoxicity of the substances see: Table 1 Substances)
**Harmful substances:**
Carbon dioxide  Sulphur dioxide  
Lead  
Nitrogen oxides  
Particulate matter PM10, PM2.5  

**Scope:**
Small, customer owned vehicles are only periodically stored on the facilities. About 100 blanks, 500 of live ammunition and 10 pyrotechnics are used each month.

4. Aspect significance

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Rating</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size/Grievousness</td>
<td>3</td>
<td>Very small amounts of resources are being used and very little emissions are created. The lead in the blanks and the ammunition is a problem.</td>
</tr>
<tr>
<td>Duration</td>
<td>4</td>
<td>The emission cause environmental impact that lasts for years. Ammunition and blanks in nature also cause environmental impact for a very long time.</td>
</tr>
<tr>
<td>Distribution</td>
<td>2</td>
<td>The impact from the lead is local, the emissions are global but so small in amount that the rating stays at 2.</td>
</tr>
</tbody>
</table>

Sum: 9  
Significant

5. Aspect-related risks

5.1 Risks  
Spillage of fuel, oil or other substances from vehicles.

5.2 Risk probability
The risk is low; the vehicles are relatively new and have assumingly been receiving frequent maintenance.

5.3 Risk minimizing
There are existing instructions for how the customer owned goods should be handled. There are no wells in “Röda Ladan”, spills are collected with absorbents.

5.2.3 Product related environmental impact

**EA-19 Purchased products**
How do the products we buy for integration into our own products affect the environment?

1. Reference to environmental assessment  
KM_770921, kap. 7.11 Transporter och 7.12 Produkter och marknad  
Environmental Aspects Evaluation, M Fagrell, 2011
2. Product, activity, service
Our products contain standardized components that are bought finished or nearly finished; it can be anything from computers to condensers and batteries. The components contain different harmful substances in small amounts.

3. Environmental impact
The substances in the components have different environmental impacts such as being harmful to aquatic organisms and disrupting photosynthesis. They can also cause different health problems, including kidney damage and cancer.

(For information about the human toxicity and ecotoxicity of the substances see: Table 1 Substances)

Harmful substances:
Cadmium
Chromium
Flame retardants
Lead

Scope:
N/A

4. Aspect significance

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Rating</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size/Grievousness</td>
<td>5</td>
<td>The substances in the products can cause quite serious environmental- and health problems. Use of metal resources. Insecurity about what the products can contain increases the grievousness.</td>
</tr>
<tr>
<td>Duration</td>
<td>2</td>
<td>The way the products are being used the substances do not cause damage that take long time to heal.</td>
</tr>
<tr>
<td>Distribution</td>
<td>4</td>
<td>The substances do not spread very far on their own but the products are sold on a global scale.</td>
</tr>
</tbody>
</table>

Sum: 11
Significant

5. Aspect-related risks

5.1 Risks
There is a risk that there is unknown substances in purchased products that are in use now or in future purchased products.

5.2 Risk probability
There is unfortunately a possibility that unknown substances occur in the purchased products.

5.3 Risk minimizing
There are directives that the company follow for supplier evaluation. They control the restriction and reporting of hazardous substances in the products and environmental requirements for the suppliers.
EA-20 Company-designed products

How do the company-designed products affect the environment?

1. Reference to environmental assessment
   KM_770921, kap. 7.11 Transporter och 7.12 Produkter och marknad
   Environmental Aspects Evaluation, M Fagrell, 2011

2. Product, activity, service
   The company designs and sells simulators for combat practice. Some products are fitted to the customer's own products using components designed by the company.

3. Environmental impact
   The substances in the components have different environmental impacts such as being harmful to fish and other aquatic organisms and disrupting photosynthesis. They can also cause different health problems, including kidney damage, nerve disorders and cancer.

   (For information about the human toxicity and ecotoxicity of the substances see: *Table 1 Substances*)

**Harmful substances:**
- Chromium
- Flame retardants
- Lead

**Scope:**
Varies with production volume

4. Aspect significance

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Rating</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size/Grievousness</td>
<td>3</td>
<td>The substances in the products can cause quite serious environmental- and health problems. Use of metal resources.</td>
</tr>
<tr>
<td>Duration</td>
<td>2</td>
<td>The way the products are being used the substances do not cause damage that take long time to heal.</td>
</tr>
<tr>
<td>Distribution</td>
<td>4</td>
<td>The substances do not spread very far on their own but the products are sold on a global scale.</td>
</tr>
</tbody>
</table>

Sum: 9
Significant

5. Aspect-related risks

5.1 Risks
There is a risk that some of the products contain unknown substances that are harmful.

5.2 Risk probability
The risk is lowering as old products are replaced.

5.3 Risk minimizing
All new company-designed products are environmentally classified. The classification includes identifying all substances in the product.
EA-21 Product use

How does the use of our products affect the environment?

1. Reference to environmental assessment
   KM_770921, kap. 7.11 Transporter och 7.12 Produkter och marknad
   Environmental Aspects Evaluation, M Fagrell, 2011

2. Product, activity, service
   The company sells simulators for combat practice, with the simplest products being targets for live ammunition. The most common products are different types of simulators where laser technique and blanks is used instead of live ammunition. The company sells both targets and the shooting mechanisms and systems that can be part of anything from a single soldier’s field equipment to a helicopter. Entire combat systems including command centers where exercises can be followed and evaluated are also sold. Information is stored which makes it possible to evaluate the exercise after it is done and use the material for training.
   To make the training as realistic as possible pyrotechnics are used to simulate the noise and smoke that comes from firing a weapon with live ammunition. The pyrotechnics used are magnesium based.

3. Environmental impact
   The use of our products contributes to positive environmental impact since it leads to use of less live ammunition by our customers.

   The use of our products produces electromagnetic radiation equivalent to the amount cellular phones produce, noise and use of live ammunition containing lead against our targets. Although electromagnetic radiation in high enough doses can have some effects on biological processes in the body no studies have indicated that it can cause health problems; exposure to noise can cause stress, annoyance, fatigue, tightening of muscles, increased heart rate and blood pressure, and damage to hearing. Animals are affected by noise in similar ways but also by disturbance of their reproduction, survival and habitat use. Since animals rely on sounds for many things such as communication, navigation and finding food they are more sensitive to noise pollution than humans. Lead can cause health problems such as kidney damage and infertility; in plants it can disrupt photosynthesis. Magnesium is not very harmful to nature or humans and is uses in such a small amount that it poses no threat.

   (For information about the human toxicity and ecotoxicity of the substances see: Table 1 Substances)

   **Harmful substances:**
   Beryllium  Noise
   Cadmium
   Electromagnetic radiation
   Lead

   **Scope:**
   n/a
4. Aspect significance

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Rating</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size/Grievousness</td>
<td>3</td>
<td>The substances in the products can cause quite serious environmental- and health problems. Use of metal resources.</td>
</tr>
<tr>
<td>Duration</td>
<td>2</td>
<td>The way the products are being used the substances do not cause damage that take long time to heal.</td>
</tr>
<tr>
<td>Distribution</td>
<td>4</td>
<td>The products are used on a global scale.</td>
</tr>
</tbody>
</table>

Sum: 9
Significant

5. Aspect-related risks

5.1 Risks
Batteries could be misplaced or explode. There is a component that if short-circuited, could explode and distribute a powder containing beryllium and copper.

5.2 Risk probability
The risks are low.

5.3 Risk minimizing
There is continuous work done to improve the handling of batteries. The component containing beryllium and copper is inside a sealed box: the box has warning label on it to stop the box from being opened in case of a malfunctioning.

5.4 Possibilities
Since the use of the company’s product leads to the use of less live ammunition by their customers they have a possibility to contribute to the lessening of negative environmental impact.

EA-22 Product repairs

How do the repairs of our products affect the environment?

1. Reference to environmental assessment
KM_770921, kap. 7.11 Transporter och 7.12 Produkter och marknad
Environmental Aspects Evaluation, M Fagrell, 2011

2. Product, activity, service
Repair and maintenance of our products, transport of products and spare parts to and from workshops. Some of the maintenance is done at the company facilities in Huskvarna but most is done at workshops located closer to the customers. A lot of different types of repairs are done, when the repairs involves small and sensitive parts like components on circuit cards they are usually done in Huskvarna.

3. Environmental impact
Environmental impact from repair and maintenance of the products occurs if there is a spill or emission of some sort. The substances that can be emitted can be harmful to aquatic
organisms and disrupt photosynthesis. They can also cause different health problems including kidney damage and damage to the respiratory system as well as cancer.

For environmental impact regarding the transportation of the products and components to and from workshop, see environmental aspect *Goods transports*.

(For information about the human toxicity and ecotoxicity of the substances see: *Table 1 Substances*)

**Harmful substances:**
Beryllium  Copper
Cadmium  Lead
Carbon dioxide
Chromium

**Scope:**
10 workshops in 6 different countries.

4. **Aspect significance**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Rating</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size/Grievousness</td>
<td>3</td>
<td>Repairing the products containing the harmful substances increases the risk of them being leaked to nature.</td>
</tr>
<tr>
<td>Duration</td>
<td>2</td>
<td>The way the products are being used the substances do not cause damage that take long time to heal.</td>
</tr>
<tr>
<td>Distribution</td>
<td>4</td>
<td>Repairs are done in many different countries.</td>
</tr>
</tbody>
</table>

Sum: 9
Significant

5. **Aspect-related risks**

5.1 Risks
If the need for repair is miscalculated there is a risk of unnecessary transports for repairs in Huskvarna that could be done at location. Repairs not done properly could result in extra otherwise unnecessary repairs. There is a component that if short-circuited, could explode and distribute a powder containing beryllium and copper.

5.2 Risk probability
The risk is small.

5.3 Risk minimizing
The products have been pre-tested before sale and are of high quality which minimizes the need for repairs. The future need of repairs is also estimated and spare parts and qualified personal are available at the workshops. The component containing beryllium and copper is inside a sealed box: the box has warning label on it to stop the box from being opened in case of a malfunctioning.

5.4 Possibilities
High-quality products, good maintenance and good repairs give the products a long life span which benefits the environment since it reduces the need to produce new products.
EA-23 Product destruction

How does the destruction of our products affect the environment?

1. Reference to environmental assessment
KM_770921, kap. 7.9 Avfall
Environmental Aspects Evaluation, M Fagrell, 2011

2. Product, activity, service
Used up or broken products are sent to the proper companies for destruction, either by the customers themselves or by the company after the products have been sent to the company facilities.

3. Environmental impact
If the products are disposed of wrongly, harmful substances can leak to nature. The substances that can be emitted can be harmful to aquatic organisms and disrupt photosynthesis. They can also cause different health problems including kidney damage, damage to the respiratory system and cancer.

For environmental impact regarding the transportation of the products, see environmental aspect *Goods transports*.

(For information about the human toxicity and ecotoxicity of the substances see: *Table 1 Substances*)

**Harmful substances:**
- Beryllium
- Copper
- Cadmium
- Lead
- Carbon dioxide
- Chromium

**Scope:**
10 workshops in 6 different countries.

4. Aspect significance

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Rating</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size/Grievousness</td>
<td>5</td>
<td>Destruction of the products containing the harmful substances increases the risk of them being leaked to nature. Destruction processes use energy.</td>
</tr>
<tr>
<td>Duration</td>
<td>2</td>
<td>A normal destruction of the product should not cause any environmental damage that takes long time for nature to heal.</td>
</tr>
<tr>
<td>Distribution</td>
<td>4</td>
<td>Destruction of the products is done in many different places and therefore affecting the environment in many different places.</td>
</tr>
</tbody>
</table>

Sum: 11
Significant
5. Aspect-related risks

5.1 Risks
There is a risk that some of the products contain unknown substances that are harmful.

5.2 Risk probability
The risk is lowering as old products are replaced.

5.3 Risk minimizing
All new company designed products are environmentally classified. The classification includes identifying all substances in the product.

5.3 Proposed new objectives
Here the result of the update of the environmental objectives is presented.

5.3.1 Environmental friendly transports
The company shall strive to as much as possible use environmentally friendly vehicles and as few transports as possible, both goods transports and people transports. To minimize the amount of transports, all transports shall, as much as possible, be coordinated and made on fixed days of the week.

Measurements:
100% of all new purchased cars shall be “environmentally friendly”.
The amount of “Green Ton” purchased shall be increased by 30% annually.
At least 95% of transports from the company to other sites shall be on time.
Monitoring the percentage of people transports and goods transports done by train, car, truck, plane and ship.
Measure the amount of carbon dioxide emissions from goods transports, total and per transported ton and kilometre.
Measure the amount of carbon dioxide emissions from people transports, total and per kilometre.

5.3.2 Environmentally friendly design
When new products and components are designed, the company shall strive to give as much consideration as possible to the environment. This includes following active legislation such as the RoHS-directive but also taking own initiatives to use as much environmentally friendly materials possible.

Measurements:
100% of all new design shall be RoHS compliant.
5.3.3 Recycling and minimizing waste
The company shall strive to reduce the amount of waste being produced. All waste that is produced shall be sorted and as much as possible be sent to recycling. Production of waste that can not be recycled or burnt but is put on landfills shall be minimized as much as possible.

Measurements:
Monitoring the percentage of waste recycled.
Monitoring the percentage of waste to landfills.
Volume or mass of waste produced, possibly per volume or mass products produced.

5.3.4 Energy consumption and water consumption
The company shall strive to use as little electrical energy, thermal energy and water as possible. Unnecessary consumption shall be avoided and if it is possible the overall use shall be reduced.

Measurements:
Monitor the amount of electrical energy, thermal energy and water used. It is important that the use of electrical energy and the water consumption only increases when the production volume does. The use of thermal energy shall not increase more than the weather demands.

5.3.5 Chemicals
The company shall strive to whenever it is possible reduce the use of chemicals. There shall be a continuous work to always use the most environmentally friendly chemicals available at the market, including looking for replacements to chemicals that are environmentally approved by law.

Measurements:
Monitoring the amount and number of chemicals used.

5.3.6 Environmental friendly suppliers
The company shall strive to reduce the indirect environmental impact that comes from the use of suppliers. This shall be done by using environmental approved suppliers.

Measurements:
At least 80% of the existing suppliers shall be environmental approved.
All new suppliers shall be environmental approved.


5.4 Recommendations for the company’s continuing environmental work

- The responsibility for the environmental work should be more clearly divided. It would probably make the environmental work more effective if only one person made the majority of the decisions and the work. This person should have environment as the main work task.
- Connect the company environmental objectives to the national environmental objectives. This would show the company in which ways they contribute to the national objectives. That could be used as a part of their public relations. Being ISO 14001 certified becomes more and more common so more has to be done if a company wants to stand out amongst competition.
- Encourage employees to choose the most environmentally friendly way of transportation available to them when traveling to and from work. This can be done by information campaigns about the environmental impact of transports, by encouraging car-pooling and by giving all employees who choose public transportation economic fare allowances. To monitor the progress in this area, a questionnaire asking which way of transportation they use can be sent to the employees before and at some point after the plan is put into effect.
- Educate employees in Eco-Drivering. Eco-driving is good for the environment since it reduces fuel use and the ware of the vehicles. That reduces emissions and to some extent the need for repairs which of course benefits the environment. That would also be economically beneficial to the company.
- Ask Jönköping Energi to repair the pipe between the oil cistern and the burner. There is a possibility that the insulation contains asbestos, which could be taken care of during a repair.
- Investigate the possibilities for alternative energy sources and stop using oil. Oil is not good from an environmental point of view and it is also becoming more and more expensive.
- Investigate if it is environmentally and economically advantageously to improve the old buildings insulation.
- Improve the sorting of waste, for example by placing containers for organic waste and plastic in every department.
- Investigate if there is a more environmentally friendly alternative to the blanks that are being used, an alternative not containing lead.
- The cooling units in the facilities that contain R 22 should be emptied and disassembled.
- Investigate if there is a possibility to exchange the HCFC used to HFC.
- Start keeping records of exactly which substances the purchased products contain and making those records easily accessible in the event that there is a need to ascertain what the products sold by the company contain.
- Continue measuring the usage of solvents; in addition, also measure how much solvent is used per produced unit.
- Keep records of how much paper is used in the offices and try to reduce the use.
- Investigate how much packaging materials are made of plastic to see if it is possible to use wood- or paper-based materials instead. Are there better ways of packing which would require less package materials?
- Minimizing transports of products and components for repairs and destruction. As many of the repairs as possible should be done at site. Avoiding transporting products to the company before destruction,
- Investigate how efficient the system for repairs is. Do products that could have been repaired at site get sent to the company?
- A new environmental evaluation as the one done in 2001 would probably be useful for the continues environmental work.
- Improve the methods used to document people transports.
6. Discussion

A probable consequence of the environmental evaluation being from 2001 was that more time was needed for data collecting than planned and less time was available for producing new material. If more time had been available for getting to know the company and its products it would possibly have given other results. Greater familiarity with the company's products and environmental practices and more time for comprehensive investigation could conceivably have led to more accuracy in pinpointing environmental challenges and in well founded methods for their improvement.

That the company’s work with their current environmental objectives contribute to positive environmental impact is obvious. Among other things they reduce their emissions of greenhouse gases, save energy and reduce their resource use. This shows that a functioning environmental work as the company’s really is beneficial to nature; the effort put in to creating and following the environmental objectives pays off.

The aspects produced for this work show that even though the company is not industrial or has large scale manufacturing it affects the environment in many ways. It also shows that it is important not to be too focused on the obvious and “big” aspects such as goods transports and chemicals but to remember that it is possible to make a difference in many ways. People transports, the use of office supplies and the environmental impact that comes from the activities in the kitchen facilities are all areas that can seem to be not important. It is however areas where it is relatively easy to make a difference since the size/amount of the environmental impact can be affected quite easily by small changes in habits. Environmental impact that occurs outside the of the company facilities is also important to remember, the products generates environmental impact in many ways when they are used, repaired and sent for destruction. The suppliers also affect the environment and thereby cause environmental impact that the company is indirect responsible for, the objective Environmental supplier evaluation show that it is an important area where the company can make a difference without much own effort.

The first aspect EA-1 Land use and buildings shows that it is also important not only to evaluate the environmental impact caused direct or indirect by the company’s activities but to also take into consideration previous activities in the area. The many substances in the soil and the environmental effects they bring are not the results of the company’s activities but it is still something that must be considered whenever the company wants to make any alterations of the land use.

Since a method that is common for the entire concern was used to evaluate which environmental aspects are significant, it should be easy for the company to compare its environmental impact to other companies in the concern. The method is, however, not very detailed and therefore, there is a risk that personal opinion has too much impact on the results. It is quite possible that an aspect that was determined to be significant when this paper was written would not have been so if another person had performed the evaluation. Another problem that comes from the method being so unspecific is the lack of a sufficient number of rating categories, which limits the use of certain criteria and results in widely disparate aspects being sometimes given similar ratings of significance. Five of the aspects in question were rated as significant because they had a score of 9 or higher and a 3-5 for the Size/Grievousness category. In this author's opinion, such aspects would not normally be rated as “significant” given the application of a broader range of suitable criteria. Nevertheless, for the purposes of this report, the criteria were deemed sufficient to meet existing standards of
reporting and the author stands by the results. The aspects in question are EA-2 Water consumption, EA-7 Air emissions, EA-8 Emissions to water, EA-18 Customer owned goods and EA-22 Product repairs. Another drawback that comes from using this particular method is that it is not documented and used by others outside the concern. As Zackrisson says in his book, a documented and well known method would have made the company’s environmental work easier to compare to other companies environmental work as well as easier to evaluate for certification.

The update of the environmental objectives resulted in almost the same names on the objectives but with alterations to the contents. Although I think that the objectives the company has now are quite good I felt that they were not enough. The Energy consumption and water consumption objective is almost the same as before with the small addition of a more ambitious approach to reduce use. The others have all been given additions as well, either to the way of measurements or to the content itself. How much of a change the new objectives can make on the company’s environmental work if they are approved depends on the level of ambition set to the targets (workplans).

The list of recommendations for the company’s continuing environmental work could be endless; there is always something that can be improved. I have however tried to suggest things that I believe are practical to do at the moment and/or could show good results relatively fast.

I believe that the results of this work have shown how important it can be to look at things from a new perspective or with a fresh set of eyes. The company’s environmental work was approved since the company is ISO 14001 certified but I have found several areas which I believe can be improved.

7. Acknowledgments

Thanks to Nina Widtfelt at the company who has both answered many questions and sent me in the right direction to find the necessary facts.

Thanks also to Eva Pohl who has been my supervisor and given me useful feedback and suggestions.

8. Table 1 Substances

This table produced by the author describes the ecotoxic and human toxic effects of all substances mentioned in the aspects and objectives.

<table>
<thead>
<tr>
<th>Substance</th>
<th>Effects</th>
<th>Related to aspects</th>
<th>Related to objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic, As</td>
<td>Depending on the type of arsenic one is exposed to and for how long, arsenic can cause various symptoms and/or death. The substance works by blocking the enzymes needed for cell metabolism. One type of arsenic affects plants by replacing the phosphate in the plant's metabolism,</td>
<td>EA-1 Land use and buildings</td>
<td></td>
</tr>
<tr>
<td>Substance</td>
<td>Description</td>
<td>Environmental Aspects</td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
<td>-----------------------</td>
<td></td>
</tr>
<tr>
<td>Asbestos</td>
<td>Asbestos is mainly relevant from a human toxicological perspective. The mineral can cause several different diseases such as asbestosis, pleural plaques, mesothelioma, lung cancer and pleurisy. The diseases are caused by inhalation of asbestos fibers; it takes between 8 and 45 years from exposure to the manifestation of symptoms. Asbestos has a local environmental impact.</td>
<td>EA-1 Land use and buildings</td>
<td></td>
</tr>
<tr>
<td>Beryllium, Be</td>
<td>Beryllium is highly toxic; exposure can damage the respiratory system and cause symptoms such as asthma and a reduction in lung capacity. Exposure to high doses or exposure over time can cause cancer.</td>
<td>EA-21 Product use, EA-22 Product repairs, EA-23 Product destruction</td>
<td></td>
</tr>
<tr>
<td>Cadmium, Cd</td>
<td>Cadmium is toxic for both humans and animals in high doses; when it enters the body it attaches to a protein which makes it harmless. If the dose is high enough or the exposure continues for a long time, the substance will attach to other proteins, a process that can cause kidney damage. Cadmium is also believed to cause cancer.</td>
<td>Environmental friendly design</td>
<td></td>
</tr>
<tr>
<td>Carbon dioxide, CO2</td>
<td>Carbon dioxide is a greenhouse gas that contributes to global warming by absorbing thermal radiation from the earth. It also affects the oceans by lowering the pH and making them more acidic. How a more acidic ocean affects the aquatic species is not certain but studies show that organisms with shells or skeletons containing calcium carbonate are likely to be affected. Carbon dioxide has a global environmental impact.</td>
<td>EA-2 Water consumption, EA-3 Thermal energy consumption, EA-4 Electricity consumption, EA-14 People transports, EA-15 Goods transports, EA-18 Customer-owned goods, EA-22 Product repairs, EA-23 Product destruction</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Energy consumption, Environmental friendly transports, Recycling</td>
<td></td>
</tr>
<tr>
<td>Chemicals</td>
<td>Many different kinds of chemicals with different kinds of environmental impacts are used. The chemicals can among other things cause cancer, be irritating to skin and eyes, be toxic if inhaled and many of them are very toxic to aquatic organisms and can cause long-term adverse effects in the aquatic environment.</td>
<td>EA-12 Chemicals</td>
<td>Use of chemicals</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Chemicals for surface finishing</td>
<td>The chemicals for surface finishing contains Cr$^{3+}$, diethanolamine and 2-(2-butoxietoxi)ethanol. They can damage the eyes, be harmful if swallowed and are irritating to the skin.</td>
<td>EA-8 Emissions to water</td>
<td></td>
</tr>
<tr>
<td>Chromium, Cr</td>
<td>In nature, chromium primarily affects aquatic creatures where some species bio accumulate the substance, fish do not bio accumulate it but may show symptoms such as damage to gill epithelium, internal organs and disorder of the ion balance. In humans, exposure to chromium can cause cancer and genetic damage. Exposure to high concentrations can lead to damage to the digestive system, kidneys, liver and lungs, in some cases it can also cause asthma.</td>
<td>EA-1 Land use and buildings, EA-19 Purchased products, EA-20 Company designed products, EA-22 Product repairs, EA-23 Product destruction</td>
<td>Environmental friendly design</td>
</tr>
<tr>
<td>Cobalt, Co</td>
<td>High doses of cobalt can cause reproductive damage and death to aquatic organisms. Animal testing has shown that high doses of cobalt can affect fetal development, lung, heart, liver, kidneys and skin of mammals.</td>
<td>EA-1 Land use and buildings</td>
<td></td>
</tr>
<tr>
<td>Copper, Cu</td>
<td>Copper is toxic to humans in high doses, poisoning can cause vomiting and diarrhea. High levels of copper in plants can lead to chlorophyll deficiency, several fungi and bacteria are sensitive to copper which at elevated levels in nature can lead to the decomposition of dead organic matter slowing down or almost completely coming to a stop. Elevated copper levels in nature can</td>
<td>EA-1 Land use and buildings, EA-16 Offices and kitchen facilities, EA-22 Product repairs, EA-23 Product destruction</td>
<td></td>
</tr>
</tbody>
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also lead to behavioral problems and impaired reproduction in fish as well as lead to poisoning of mammals. Affected mammals exhibit symptoms such as seizures, liver damage, blood cell disintegration and death.  

| Electromagnetic fields | Laboratory studies on animals and cell structures show that magnetic fields can affect biological processes in the body. The effects are not significant and do not appear to cause any health problems, it is not known if long term exposure can cause cancer but so far, no studies show a definite connection.  
|---|---|
| Flame retardants | There are several hundred different flame retardants with different properties, most of them are stable and many of them are bio accumulative. Because they are stable they often get transported long ways and affect nature globally and many of them bio accumulate in the body. Studies have shown that flame retardants can cause health effects such as nausea, acne and liver damage.  

| Hazardous waste | Hazardous waste is an umbrella term for different types of wastes that can affect nature or humans negative. Hazardous waste can be explosive, irritating, toxic, carcinogenic, harmful to fetuses, cause genetic damage etc. Effects can be cancer, skin irritations, respiratory damage, deformed fetuses, disrupted growth in plants etc.  
|---|---|
| Hydrochlorofluorocarbons, HCFC | Hydrochlorofluorocarbons, including Difluorochloromethane, are a group of ozone depleting compounds that generally are stable and unreactive. They have a small local environmental impact since they can be part of the formation of tropospheric ozone; but their main environmental impact is on a global scale since they are ozone depleting and also a greenhouse gas. HCFC
| **Hydrofluorocarbons, HFC** | Hydrofluorocarbons are used as coolants in replacement of ozone depleting substances. They contribute to the global warming and have very high global warming potentials. | EA-5 Coolants facilities, EA-11 Coolants process related |
| **Iron chloride** | Contact with iron chloride can cause redness and pain on the skin and in the eyes. Ingesting the substance can cause vomiting, diarrhea, shock, collapse or abdominal pain. If released in nature, it can harm aquatic organisms. Iron chloride primarily has a local environmental impact. | EA-2 Water consumption |
| **Lead, Pb** | Lead is a toxic substance that, among other things can cause nervous system disorders, kidney damage, infertility and disrupt brain development in fetuses and young children. Poisoning occurs when lead ions binds to enzymes and disrupt their function. In plants several functions like photosynthesis and the formation of ATP are disrupted, the biggest impact occurs on the growth of the fine roots. Mammals and birds ingest lead through food, which can lead to several symptoms such as nerve disorders, depressed immune system and growth disorders. | EA-1 Land use and buildings, EA-18 Customer-owned goods, EA-19 Purchased products, EA-20 Company designed products, EA-21 Product use, EA-22 Product repairs, EA-23 Product destruction |
| **Mercury, Hg** | Mercury occurs in three different forms in nature: as elemental mercury, inorganic mercury compounds and organic mercury compounds. Microbial activity in nature can transfer mercury from one form to another. The most toxic form is the organic compound methyl | EA-4 Electricity consumption, Environmental friendly design |

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<tr>
<th>Compound</th>
<th>Description</th>
<th>Energy Consumption</th>
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| Mercury        | Mercury which also bio accumulates. Exposure to mercury can effect many parts of the body such as the immune system, the nervous system and the enzyme systems as well as cause genetic damage.  
[50,51]       | Energy consumption                                                                                                                                                                                        |
| Methane, CH4   | Like carbon dioxide, methane is a greenhouse gas that contributes to global warming by absorbing thermal radiation from the earth. Methane is about 21 times stronger than carbon dioxide as a green house gas by weight. Methane also contributes to the production of tropospheric ozone which contributes to photochemical smog, affects the respiratory system and is itself a green house gas. Emissions of methane have local, regional and global effects.  
[52,53,54]       | EA-3 Thermal energy consumption, EA-4 Electricity consumption                                                                                                                                            |
| Nickel, Ni     | Vascular plants are affected by nickel when cell stretch and root development are inhibited. In humans nickel can inhibit enzyme processes and compete with essential metal ions and trace elements in the body which may cause deficiency disorders. Nickel poisoning can cause damage to lungs, nose, reproduction, skin, blood and fetuses; it can also cause cancer and genetic damage. Nickel primarily has a local effect since it accumulates in soils and sediments and can spread to adjacent water.  
[55,56]       | EA-1 Land use and buildings                                                                                                                                                                               |
| Nitrogen oxides, NOx | Nitrogen oxides is an umbrella term for gases composed of nitrogen and oxygen; the different nitrogen oxides vary in toxicity but nitric oxide and nitrogen dioxide is commonly seen as the two most important ones. When nitrogen oxides are released into nature they react with other substances producing more toxic substances. Among others they form nitric acid which contributes to the acidification of land and water. Nitrogen dioxide reacts with sunlight producing tropospheric ozone and smog, downfall of nitrogen oxides. | EA-2 Water consumption, EA-3 Thermal energy consumption, EA-4 Electricity consumption, EA-18 Customer-owned goods |
Humans breathing in nitrogen oxide can show symptoms to the respiratory system, long term exposure or exposure to high levels can cause chronic conditions. Emissions of nitrogen oxides have local, regional and global effects.  

| Noise | The effects of exposure to noise varies depending on how high and frequent the noise is, if it comes as a sudden boom and on personal hearing sensitivity. Exposure to noise can cause stress, annoyance, fatigue, tightening of muscles, increase heart rate and blood pressure and damage the hearing. Animals are affected by noise in similar ways but also by disturbance of their reproduction, survival and habitat use. Since animals rely on sounds for many things such as communication, navigation and finding food they are more sensitive to noise pollution than humans.  

| Organic solvents | Different organic solvents have different properties but most of them are easy solvable in fat with means that they can bioaccumulate in humans and animals. Because they are volatile they can easily be absorbed in the body via the respiratory system. Health effects caused by prolonged exposure to organic solvents can be different types of brain damage such as problems with the memory, problems to concentrate, dizziness, loss of smell and loss of balance. Some of the solvents can contribute to cancer. Along with Volatile Organic Solvents (VOCs), organic solvents in general contribute to tropospheric ozone and smog.  

| Particulate matter, PM10, PM2.5 | Both PM10 and PM2.5 have health and environmental effects. The latter ones are worse from a health point of view since they are small enough to
| **Plastics (littering)** | Plastics contain many different types of substances that can affect both humans and animals. One is phthalates that are used as softeners in the plastics. Phthalates are emitted from the plastics constantly in small amounts; they can be absorbed in the body both via the skin and the respiratory system. Tests have shown that they can affect the testicles and other genitalia and cause reproductive damage, both in mammals and aquatic organisms. Another harmful substance in plastics is bisphenol A which disrupts the endocrine system and can cause multiple health problems such as cancer, diabetes, obesity and birth defects. Plastic is also harmful to animals since they get trapped in plastic litter in nature and mistake plastics for food. 63,64,65 | EA-13 Package materials |
| **Polycyclic aromatic hydrocarbons, PAH** | Exposure to polycyclic aromatic hydrocarbons can cause cancer, genetic damage and birth defects in newborns in mammals. In humans exposure to high doses have also shown to cause symptoms in the eyes, immune system, liver, reproduction, skin and fetuses. PAHs in soil have a local effect, whereas PAHs in soot and fumes can spread globally. 66 | EA-1 Land use and buildings |
| **Sulphur dioxide, SO2** | Sulphur dioxide affects the respiratory system in animals and humans, asthmatics are extra sensitive. In the air sulphur dioxide can be transformed to sulphuric acid | EA-2 Water consumption, EA-3 Thermal energy, EA-4 Electricity |

| **EA-18 Customer-owned goods** | | |
and in water to sulphurous acid which both are substances than contributes to acidification. Emissions of sulphur dioxide have local, regional and global effects.\textsuperscript{67}

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<tr>
<th>Uranium, U</th>
<th>Uranium is a radioactive metal that in high or long term doses can cause DNA damage; it is usually the kidneys that are affected. Since uranium is a heavy metal it can bind to DNA and change the genetic codes affecting the cell growth. That can cause different mutations and in some cases cancer. Plants and animals are also affected by radiation but their radiosensitivity varies much. Very high doses of radioactivity can cause radiation sickness with symptoms such as nausea, diminished organ function or even death. Another problem with uranium is that it decays into other radioactive substances; one of them is radium that after long term exposure can cause cancer.\textsuperscript{68,69,70,71}</th>
</tr>
</thead>
</table>

| Zinc, Zn | Zinc in high doses is toxic to humans and fish; it can affect the blood, digestive system, eyes, kidneys, lungs, pancreas, reproductive organs, skin and fetuses. Because the substance accumulates in aquatic organisms it has the greatest impact on those who eat them. Zinc has local environmental impact.\textsuperscript{72} |
9. References

Where no reference is noted the information has been collected from the company intranet or by investigations done by the author.

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