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# Establishing an Environmental Management System in Accordance with ISO 14001:2015

Case Study: Chiller Oy

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<p>The purpose of this thesis was to establish an environmental management system for Chiller Oy, a Finnish manufacturer of air-conditioning equipment and heat pumps. In order to achieve ISO 14001 certification, it was important to establish the environmental management system in accordance with the ISO 14001 standard. Energy efficiency, lifecycle thinking, and material recyclability are key elements in Chiller's products. Furthermore, environmental consciousness is emphasized in every business decision. An ISO 14001 certified environmental management system will demonstrate Chiller's commitment to social responsibility to the stakeholders.</p> <p>To ensure that all the requirements of the ISO 14001 standard would be fulfilled, the environmental management system was established by utilizing standards ISO14001 – requirements with guidance for use, and ISO 14004 – general guidelines on implementation. The standard's requirements and how they were executed in practice in Chiller's environmental management system have been covered in this thesis. However, the main focus is on issues related to environmental performance such as determination of risks and opportunities, environmental aspects, and environmental objectives.</p> <p>As a result of this thesis a straightforward environmental management system was established, which can be implemented in its entirety or in stages, if necessary. The management system can be expanded and further developed in the future to meet the needs of that time. During the process of this thesis some major weaknesses and disadvantages of ISO 14001 were observed, such as lack of transparency and symbolic implementation. Chiller can avoid these pitfalls by implementing and maintaining its environmental management system at a high level.</p>	
Keywords	ISO 14001, environmental management system, environmental performance

Tekijä Otsikko  Sivumäärä Päivämäärä	Sarlena Hänninen ISO 14001:2015 mukaisen ympäristöjärjestelmän luominen  35 sivua + 6 liitettä 18.9.2017
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<p>Tämän opinnäytetyön tarkoituksena oli luoda ympäristöjärjestelmä suomalaiselle lämpöpumppu- ja jäähdytyslaitevalmistajalle, Chiller Oy:lle. Jotta ISO 14001 -sertifiointi voitaisiin saavuttaa, oli tärkeää, että ympäristöjärjestelmä toteutettaisiin ISO14001 standardin mukaisesti. Energiatehokkuus, elinkaariajattelu ja materiaalien kierrätettävyyys ovat olennainen osa Chillerin tuotteita. Lisäksi jokainen liiketoimintaa koskeva päätös tehdään ympäristöasiat huomioon ottaen. ISO 14001 -serfioitu ympäristöjärjestelmä osoittaa sidosryhmille Chillerin sitoutumisen vastuulliseen yritystoimintaan.</p> <p>Jotta voitiin varmistua siitä, että kaikki ISO 14001 -standardin vaatimukset täyttyvät, ympäristöjärjestelmä toteutettiin hyödyntämällä standardeja ISO14001 – yleiset vaatimukset ja niiden soveltamisohjeita, sekä ISO 14004 – yleisiä toteuttamisohjeita. Työssä käsiteltiin standardin vaatimuksia, sekä miten ne toteutettiin käytännössä Chillerin ympäristöjärjestelmässä. Pääpaino tässä opinnäytetyössä on kuitenkin ollut ympäristönsuojelun tasoa koskevissa aihealueissa, kuten riskien ja mahdollisuuksien tunnistamisessa, sekä ympäristönäkökohtien ja ympäristötavoitteiden määrittämisessä.</p> <p>Työn lopputuloksena luotiin selkeä ja yksinkertainen ympäristöjärjestelmä, joka voidaan ottaa käyttöön kokonaisuudessaan tai tarvittaessa myös vaiheittain. Tulevaisuudessa järjestelmää voidaan helposti laajentaa sekä kehittää vastaamaan Chillerin sen hetkisiä tarpeita. Tämän opinnäytetyöprosessin aikana esiin nousi ISO 14001 -standardin merkittäviä heikkouksia ja haittapuolia, kuten sen symbolinen toteuttaminen ja läpinäkyvyyden puuttuminen. Chiller voi välttää nämä sudenkuopat toteuttamalla ja ylläpitämällä ympäristöjärjestelmäänsä korkealla tasolla.</p>	
Avainsanat	ISO 14001, ympäristöjärjestelmä, ympäristönsuojelun taso

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## Terms and Definitions

**Audit** – systematic and documented process where evidence is gathered and evaluated to determine the extent to which the *audit criteria* are fulfilled. Whether internal or external, an audit must be objective, impartial and independent.

**Audit criteria** – policies, procedures, and requirements against which the audit evidence is compared to.

**Compliance obligations** – legal and other requirements the organization has to or chooses to comply with.

**Conformity** – fulfilment of a requirement set by the standard or the organization itself.

**Continual improvement** – recurring activities used to enhance organization's *environmental performance*.

**Corrective action** – action that eliminates the cause of a *nonconformity*.

**Documented information** – information and its supporting medium that has to be controlled and maintained by the organization.

**Environmental aspect** – element of the organization's activity, product or service which interacts, or can interact, with the environment.

**Environmental impact** – either a beneficial or adverse change to the environment, which results entirely or partially, from the organization's *environmental aspect(s)*.

**Environmental objective** – an objective that is set by the organization itself, and is coherent with its *environment policy*.

**Environmental performance** – performance related to the management of the organization's *environmental aspects*.

**Environmental policy** – organization’s intentions, commitments and direction related to its *environmental performance*, which are formally expressed by the *top management*.

**Indicator** – indicates or measures the condition or status of the organization’s operations or activities. Can be used to evaluate and determine the organization’s *environmental performance*.

**Interested party** – person or organization that can affect, be affected by, or perceive itself to be affected by, a decision or activity related to the *environmental performance* of the organization of interest.

**Nonconformity** – non-fulfilment of a requirement related to the environmental management system set by the standard or the organization itself.

**Preventive action** – action that prevents the recurrence of a *nonconformity*.

**Top management** – people who direct and control the organization at the highest level with respect to the scope of the environmental management system.

## 1 Introduction

As environmental awareness within the public grows, numerous organizations are faced with increasing internal and external pressure to pay more attention to their environmental performance. An environmental management system provides a method for organizations to address these socio-economic demands.

The purpose of this thesis was to develop an environmental management system for Chiller Oy in accordance with the ISO 14001 standard. Chiller's main objective is to establish an environmental management system in compliance with the EU Eco-Management and Audit Scheme (EMAS) and apply for EMAS registration. ISO 14001 certified environmental management system is the natural course of action before pursuing EMAS registration since ISO 14001 is an integral part of EMAS.

To achieve a more straightforward transition to EMAS in the future, some of the requirements of ISO 14001 were surpassed. However, the aim was to keep the environmental management system straightforward and practical to ensure successful implementation.

This thesis will cover all the requirements of ISO 14001:2015 standard and demonstrate how the main features of the standard were fulfilled in practice in Chiller's environmental management system. While establishing the management system each requirement was addressed by considering what has already been done, what can be done to improve existing procedures, and what still needs to be done to achieve compliance. However, the main focus in this thesis is on processes that were established as a part of the environmental management system. While the environmental management system was established, some disadvantages and weaknesses of ISO 14001 were observed. A few of those views are also presented in this thesis.



## 2 Environmental Management Systems

### 2.1 ISO 14001:2015

An environmental management system is a structured framework for managing organizations' significant environmental impacts and improving their environmental performance. ISO 14001, developed by the International Organization for Standardization (ISO), is one of the world's widely used environmental management systems. ISO 14001 is a part of a larger ISO 14000 family of complementary standards, one of which is the ISO 14004 that provides general guidelines for the implementation of ISO 14001. In addition, there are standards that focus on specific approaches related to the requirements or features of ISO 14001 such as life cycle assessment, performance evaluation and auditing. These standards are also referred to for further guidance in the 14001 standard. [1]

ISO 14001 specifies the requirements for establishing, implementing, and maintaining an environmental management system. It is not designed for any specific activity or sector so it is applicable to all organizations regardless of their size, type, and nature. Certification of the management system is not necessary but can provide an independent verification of proper implementation of the standard to the stakeholders. [1]

An effective environmental management system that provides continual improvement can be achieved by implementing and maintaining it through an iterative process, which is consistent with the Plan-Do-Check-Act (PDCA) model illustrated in Figure 1. The PDCA model is applicable to the environmental management system and to all of its elements. [2]

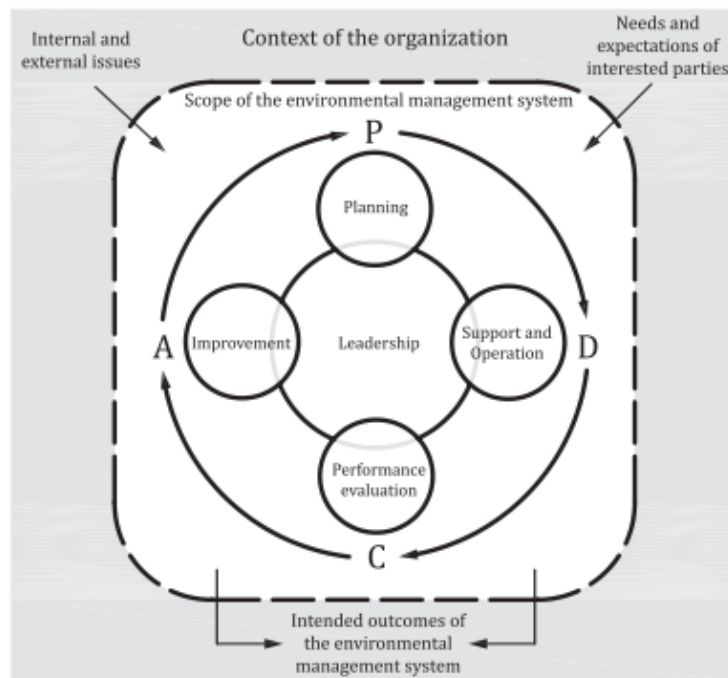


Figure 1. Iterative Plan-Do-Check-Act model. [2]

The four phases of the Plan-Do-Check-Act cycle can be described shortly as follows. In the first phase, the organization establishes objectives and develops plans and processes necessary to achieve the set objectives. The actions determined in the first phase are then implemented as planned. The planned actions need to be monitored and measured to evaluate their effectiveness. To check if the intended outcomes of the environmental management system have been achieved, actual results from the implemented processes are compared against the planned objectives. To meet and exceed the objectives in subsequent cycles, the organization needs to take actions to correct and improve its plans and processes. [2]

## 2.2 EU Eco-Management and Audit Scheme

The EU Eco-Management and Audit Scheme (EMAS), is an environmental management system developed by the European Commission. EMAS and ISO 14001 are complementary and the requirements of ISO 14001 are an integral part of EMAS. However, EMAS can be considered more rigorous, and implementing it requires some additional steps and modifications to an existing ISO 14001 system. Additional steps include an initial environmental review and an annual environmental statement, which must be externally validated and accessible to the public. The initial environmental review is not compulsory if an ISO 14001 certified organization has already considered

all the aspects required by EMAS Annex I in its environmental management system. The required modifications include demonstration of legal compliance, commitment to continuous improvement of environmental performance, compulsory communication with the public, and employee participation. [3, 4]

### 2.3 Benefits of Environmental Management Systems

Implementing and maintaining an environmental management system can have various benefits for an organization. The primary purpose of an environmental management system is of course, to improve environmental performance and management of environmental impacts. By systematically examining opportunities for improvement and acting on them, the organization can gain financial advantage through improved efficiencies and reduced costs. Robust risk management and compliance of both current and future statutory and regulatory requirements can produce significant savings through reductions in permit violations and fines. Further financial benefits of implementing and maintaining an environmental management system can arise from enhanced competitiveness and marketing opportunities that can provide an increase in sales. [5, 6]

External communication with customers, regulators, nongovernmental organizations, and other interested parties can improve the organization's reputation and increase trust and understanding between the organization and its stakeholders. The standard also requires internal communication and involvement from all levels of the organization. This can enhance employee motivation and improve the working environment. [5, 6]

## 3 Context of the Organization

Before establishing an environmental management system, the organization should understand the context within which it operates, including the needs and expectations of relevant interested parties [2]. The organization might already be familiar with the internal and external issues that affect its operations, but it is important also to understand how those issues affect the environmental management system and the intended outcomes of it. Some of the internal and external issues to consider can

involve organizational structure, preceding standards or management systems, cultural, financial, and legislative issues. Relevant interested parties and their needs and expectations should be determined at a level that provides the organization with information, that is beneficial in determining which of those needs and expectations become its compliance obligations [7]. Relevant interested parties can include regulatory or statutory agencies, employees, customers, and/or non-governmental organizations.

### 3.1 Chiller Oy

Chiller was founded in 1990 and it has developed into one of the leading manufacturers of environmental technology systems in Europe. Chiller manufactures high quality, tailor-made, energy efficient air-conditioning equipment and heat pumps. Chiller provides customer-focused services covering everything from product development, installation, service systems, maintenance and repair, technical support to end-of-life recycling. Innovative cooling, heating, and energy solutions are provided for demanding sites in Finland and abroad. Typical sites include office buildings, hospitals, industrial processes and telecommunication rooms. [8]

Chiller's product development and manufacturing is focused on the optimization of energy consumption, life cycle thinking and material recyclability [8]. In addition to its products, environmental consciousness has always been a key element in Chiller's overall business operations. A certified environmental management system will provide external verification of Chiller's environmental performance to the stakeholders. Furthermore, Chiller recognizes the potential to improve its environmental performance with a structured management system.

The extent to which Chiller can affect its environmental management and the environmental impact of its products are, to a certain degree, restricted by the national building code of Finland and preceding standards. For example, the fire classification of materials that are used in air conditioning systems are strictly defined and cannot be substituted with just any material that is more environmentally friendly even if it would be technically possible.

### 3.2 Scope of the Environmental Management System

When an organization determines the scope of its environmental management system, it can choose whether or not it is implemented throughout the entire organization or only in some parts of it, for example, at a regional office. The scope should include aspects that the organization can control and, to a reasonable extent, affect. When the scope has been determined, all activities, products, and services within that scope should be included in the environmental management system. [2]

Chiller's environmental management system was established for the company's head office and production site located in Tuusula, Finland. The scope covers maintenance and repair, production processes, warehousing, product development, and the overall office operations conducted at the premises. While developing the environmental management system the scope has been considered through a lifecycle perspective and is limited to activities the organization can either control or influence.

## 4 Leadership

### 4.1 Leadership and Commitment

The top management has an important role in creating and maintaining a successful environmental management system, whether it is through a hands-on approach or by delegating authority and providing resources. Leadership and commitment from the top management is demonstrated by taking accountability for the effectiveness of the environmental management system and for ensuring that it continually improves and achieves its intended outcomes. The top management should ensure that the requirements of the environmental management system are integrated into the organization's business processes and considered whenever strategic business decisions are made. Furthermore, the top management's should ensure that the environmental policy and environmental objectives are established and compatible with the organization's business objectives. [2]

### 4.2 Environmental Policy

An environmental policy should entail the organization's commitment to fulfil its compliance obligations, protect the environment, and continually improve its

environmental management system. When the policy is sufficient, appropriate to the organization's operations, and within the scope of the environmental management system, it provides a framework for setting the environmental objectives. The environmental policy should be documented, communicated within the organization, and available to any interested parties. [2]

Chiller has established and implemented an environmental, occupational health and safety policy in 2010. In the policy Chiller commits to continuously improve its environmental, occupational health and safety performance, protect the environment and treat its legal and other requirements as a minimum standard. Subcontractors, suppliers and consultants are encouraged to comply with the same standards as Chiller does. Furthermore, Chiller commits to monitor and measure its environmental, occupational health and safety performance and openly communicate in relation to it [9]. The latest revision of the policy from 2017 can be found in its entirety in the Appendix 1. As a sign of its operation's transparency Chiller has chosen to make its policy fully accessible to the public by posting it on the company's web page.

#### 4.3 Organizational Roles, Responsibilities and Authorities

It is the top management's responsibility that authorities for relevant roles are defined and communicated within the organization. This means that people involved with the environmental management system should have a clear understanding of their roles, responsibilities, and authorities. Responsibilities and authorities are assigned to ensure that the environmental management system complies with ISO 14001 and that the overall performance of the environmental management system is reported appropriately. Although the top management can delegate responsibility for different actions regarding the environmental management system, the accountability for those actions to be performed retains with the top management. [2]

## 5 Planning

### 5.1 Risks and Opportunities

By determining possible risks and opportunities associated with the environmental aspects, compliance obligations, and other issues and requirements, the organization

can obtain valuable information to accomplish the desired outcomes of the environmental management system, prevent or reduce undesired effects, and achieve continual improvement. The organization should also consider possible emergency situations that might have an impact on the environment when risks and opportunities that need to be addressed are determined. [2]

Possible risks and opportunities associated with the environmental management system were identified after the environmental aspects and compliance obligations were determined. Hence, different sources of risk and opportunities could be viewed simultaneously instead of determining them for each element individually.

Majority of the risks were associated with handling and storing hazardous chemicals. The risk of spillages and leaks is always present whether it is through human error or equipment malfunction. This risk was recognized prior to establishing the environmental management system. Hence, a storage plan for hazardous chemicals was created in accordance with the appropriate statute, and with the help of Finnish Safety and Chemical Agency's guidebooks. Fire and occupational safety, and available space were also taken into account while establishing and implementing the storage plan. Considering the hazard and precautionary statements of the chemicals, as well as the aforementioned factors, each chemical was given a specific storage location. All hazardous surplus chemicals were removed from the production area and to improve occupational safety, applicable material safety datasheets were placed in the immediate proximity of the chemicals. Areas, where chemicals are stocked were clearly indicated with signs and by demarcating them. Old hazard signs on the entrance doors of the warehouse and production area were replaced with new ones. Flammable chemicals were placed to a separate outdoor chemical storage to minimize their potential hazardous effects in emergency situations and a prohibitory sign, smoking and naked flames forbidden, was added.

Refrigerants are a key element in Chiller's operations and they are regulated in the European Union by regulation (EU) No 517/2014 of the European parliament and of the Council on fluorinated greenhouse gases (F-gas regulation). The renewed F-gas regulation entered into force on January 2015 where the main features include a phase down of the quantities of hydrofluorocarbons that can be placed on the EU market and a number of bans on the use of fluorinated gases in some new equipment and for the servicing of existing equipment [10]. These restrictions create possible risks mainly to

business operations and legislative compliance rather than environmental performance. Overall, there is a considerable amount of enactments regarding hazardous chemicals which can increase the risk of regulatory violations.

While the F-gas regulation creates risks, it also creates a possibility to substitute the currently used powerful greenhouse gases, hydrofluorocarbons, with more sustainable alternatives in the future. Furthermore, an opportunity to regenerate used refrigerants was recognized. Regenerated refrigerants are equivalent to new ones and could be used in Chiller's maintenance and repair.

Recycling in the production area was considered to be effective but the waste segregation in the office space provided an opportunity for improvement. All risks and opportunities that were identified are compiled in Appendix 2. Risks and opportunities that were recognized in this process were also considered in the determination of environmental objectives.

## 5.2 Environmental Aspects

The organization should understand the environmental aspects and their associated environmental impacts related to its activities, products, and services that are within the scope of the environmental management system. To ensure a comprehensive review on the organization's environmental aspects it is important to apply life cycle thinking and to consider both normal and abnormal operating conditions, as well as reasonably predictable emergency situations. Also past, present and planned activities, products, and services should be examined. Referring to the life cycle perspective, the organization should not only consider aspects that it can control but also those that it can influence [7]. For example, a waste management company can only control its own operations but it can influence its customers' behavior and attitude towards recycling.

Environmental impacts are a direct result from environmental aspects. Depending on the source, environmental impacts can be actual or potential, and have either positive or negative effects on the environment [7]. Since practically all activities, products, and services have, at some point during their life cycle, an effect on the environment the organization may end up with a considerable amount of environmental aspects. Thus, it is important to establish criteria and a method for determining which of those aspects can be considered as significant.



The determination of Chiller's environmental aspects begun by considering different activities, products, and services that are related to the organization's office, maintenance and repair, production, and warehouse processes. Environmental impacts for each activity, product, and service was determined by considering actual and potential emissions to air, land and water, use of raw materials, natural resources and energy, generation of waste and by-products, and emitted energy. Also other possible impacts were considered, such as the utilization of by-products. The complete list of Chiller's environmental aspects and their associated environmental impacts can be found in Appendix 2. Abbreviated operational controls, together with monitoring and measurement requirements for risks and opportunities that need to be addressed, are combined in the same table.

The significance of the environmental aspects that resulted from this review, were determined based on the scope, severity, likelihood, and duration of the impact. The organization's possibility to influence the aspect, impact or both was also one of the criteria in determining significance. Each criterion gave an environmental aspect a score between zero and three as shown in Table 1.

Table 1. Criteria for determining significance

Criteria	0	1	2	3
Scope of the impact	Negligible	Local	Regional	Global
Severity of the impact	Insignificant	Minor	Moderate	Significant
Likelihood of the impact	Highly unlikely	Unlikely	Likely	Highly likely
Duration of the impact	Negligible	Short-term	Medium-term	Long-term
Organization's possibilities to influence	Negligible	Minor	Moderate	High

On the basis of the total score, each aspect was given a level of significance out of four possible alternatives; insignificant, minor, moderate or significant. The determination resulted in five significant environmental aspects that are listed in Table 2. For the determination of significance for each environmental aspect see Appendix 3.

Table 2. Significant environmental aspects and their associated environmental impacts

<b>Object, activity, service</b>	<b>Environmental aspect</b>	<b>Environmental impact</b>
Maintenance and repair	Company cars	Use of natural resources and energy, emissions to air, land and water, noise emissions
Partners	Road freights	Use of natural resources and energy, emissions to air, land and water, noise emissions
Premises	Electricity consumption	Use of energy and natural resources, emissions to air
Premises	Generation of waste	Emissions to air, noise and dust nuisances from waste collection
Maintenance and repair	Refrigerant waste, disposal through incineration	Emissions to air
Premises	District heating	By-product utilization, indirect emissions to air and water, indirect consumption of natural resources.

The environmental impacts of road traffic are vast, greenhouse gases and air pollution being paramount. Thus, it was inevitable, that the company cars and road freight transport were high on the significance level. Although the road freights of partner organizations cannot be fully controlled, they can be influenced through operational planning and control. The environmental impacts of district heating were considered to be more positive than negative. Although district heating is a by-product of a process with negative environmental impacts such as emissions to air, it is considered to be environmentally friendly and an energy efficient heating method. District heating enables the utilization of waste heat that would otherwise be discharged to water bodies.

Environmental aspects and their significance will be reviewed each year simultaneously with internal audits. Revisions and redetermination of significance will be performed also between internal audits if any significant changes in Chiller's operations occur with respect to the environmental aspects.

### 5.3 Compliance Obligations

Compliance obligations are requirements that the company has to or chooses to abide by. They can be binding legal requirements or for instance, voluntary principles of practice. A voluntary commitment becomes a compliance obligation once the organization decides to adopt it. These obligations should be determined in such detail that it allows the organization to adapt to any changes from interested parties without having to compromise its conformity [7]. Rather than determining all the compliance obligations related to the organization's business the organization should focus on those that are related to its environmental aspects. The organization should also define how the compliance obligations apply to the organization and take them into consideration throughout the iterative environmental management process. [2]

The Finnish Ministry of the Environment provides a list of acts, decrees, and guidelines of its administrative sector. Both national and EU legislation are included in the list. The compliance obligations related to environmental legislation were largely determined based on said list. Supplementary compliance obligations were provided by Chiller's existing documentation on legal obligations. Instead of determining acts and decrees that are only related to the environmental aspects, a more comprehensive approach was taken by determining all the statutes and obligations related to the environmental management system. This allows Chiller to improve its management of legal compliance and to surpass the requirements of the standard. This will also be beneficial in the transition to EMAS where the organization has to determine all of its requirements related to environmental legislation.

The legal obligations are monitored by appropriate personnel for possible changes. Theoretically, the monitoring of some statutes is outsourced. Chiller is a member of the SELT Association, which is a producer organization that takes care of the statutory producer responsibilities such as organizing the recycling and waste management of electronic and electrical equipment placed on the market by Chiller. The producer organization also informs its members of any developments or changes in the legislation regarding producer responsibility. Chiller is also a member of the Finnish Refrigeration Enterprises Association (FREA), which informs its members of any changes related to the refrigeration branch, especially legislation regarding F-gases. Other legislation related to chemicals is monitored by production and maintenance managers. Production managers are also responsible for monitoring waste legislation

excluding the aforementioned statutory producer responsibilities. The technical director is responsible for the Pressure Equipment Directive (2014/68/EU), product development manager for the National Building Code of Finland, and the environmental manager for the Environmental Protection Act (527/2014).

#### 5.4 Planning Action

The organization should consider and plan how to manage its compliance obligations, significant environmental aspects, and risks and opportunities that need to be addressed. Actions that address these issues can be, for example, environmental objectives, operational controls or a combination of these. The effectiveness of the chosen actions should be evaluated [7]. Different operational controls are discussed in more detail in section 7.1 *Operational planning and control*.

#### 5.5 Environmental Objectives

The environmental objectives are set based on the organization's environmental policy, risks and opportunities, significant environmental aspects, and compliance obligations. Even though the emphasis should be on the significant environmental aspects when determining environmental objectives, it is not necessary to determine an objective for each significant aspect. The environmental objectives should be measurable, and if they are not, the organization should have another reliable approach to determine if it has reached the objective. [2, 7]

After the environmental objectives have been set, they need to be communicated to the appropriate personnel and monitored. The environmental objectives should be revised if there are any significant changes in the organization's operations regarding the objectives. By establishing performance indicators for objectives that can be measured, the organization can monitor the progress of achieving them. An indicator can be, for instance, quantity of emitted emissions, total consumption of water or percentage of waste recycled. In order to reach its environmental objectives, the organization should determine what actions need to be taken, what resources are required, what is the timeline for completion, who is responsible, and how the results are evaluated. [7]

Each significant environmental aspect was addressed by setting objectives for them as shown in Table 3. Setting both straightforward short-term objectives and more demanding long-term objectives provides an accessible approach for the implementation of the environmental management system, as well as an effective and purposeful environmental program.

Table 3. Abbreviated environmental program

Aspect	Objective	Indicator	Monitoring and measurement
Company cars (maintenance and repair)	Minimization of carbon dioxide emissions	Fuel consumption per vehicle, l/ 100 km	Fuel consumption and customer visit monitoring biannually
Road freights (partners)	Minimization of traffic emissions	Full cargo, Yes/No	Continuous monitoring of freight deliveries
Electricity consumption	Reducing electricity consumption by 3 % by 2020	Total electricity consumption with respect to turnout	Progression evaluation annually
Refrigerant waste	Reducing hazardous waste	Regenerated refrigerant, %	Monitoring regenerated refrigerant amounts
Generation of waste	Improving waste segregation	Estimation of sorted waste portion	Personnel interviews after 6 months

Each environmental objective was assigned with a supervisor whose job description was most appropriate for the monitoring of that specific objective. The supervisor is also responsible for ensuring that necessary actions are performed as planned. The objectives are described in more detail in the following sections.

#### 5.5.1 Minimizing carbon dioxide emissions

Carbon dioxide is a significant greenhouse gas that is emitted from vehicles as a result of fuel combustion. Thus, a vehicle's carbon dioxide emissions are proportional to the fuel consumption. Hence, the main measure for minimizing carbon dioxide emissions is to decrease fuel consumption; this will be achieved through various actions that are described below.

Chiller's aim has been that the maintenance or repair of an apparatus is accomplished during one on-site visit. This aim will be further developed to achieve minimization of carbon dioxide emissions. In principle, if a mechanic visits the site once instead of two times, carbon dioxide emissions are reduced by 50% per service request. After the environmental management system has been implemented, mechanics will have to report the reason for any additional on-site visits unless the repair or maintenance is so extensive that it will take more than one working day. Hence, the possible determination of necessary actions to decrease on-site visits will be more straightforward.

The condition of the vehicles also has an impact in generating emissions and therefore regular maintenance of the vehicles will be maintained and more closely monitored. By utilizing navigation technology, routes on-site can be optimized and for example traffic congestions avoided. This can decrease the total fuel consumption since slow speeds and accelerations significantly increase fuel consumption momentarily. Overall, economical driving is a method with the least variables and can be controlled the most which is why its importance has been emphasized to the mechanics.

The fuel consumption of each vehicle will be recorded when the environmental management system commences and thereafter monitored biannually together with on-site visit reports.

### 5.5.2 Minimizing traffic emissions

The possibility to influence road freights and their traffic emissions are quite small but existent. The aim is to have a full cargo whenever possible and to keep the amount of weekly inbound road freight transports at bare minimum. At the moment, semi-finished products that are used in the production are delivered twice a week. One or both deliveries are cancelled if the inbound products will not constitute a full cargo provided that, it does not affect the production schedule significantly. In addition, Chiller will henceforth require environmental awareness from all of its transportation partners.

Considering the operational controls the objective of minimizing traffic emissions in practice is set for each individual road freight transport. Thus, the indicator is simply whether the cargo is full or not. Continuous monitoring is essential to ensure that unnecessary deliveries can be cancelled in time.

### 5.5.3 Reducing electricity consumption

The third long-term objective is to reduce electricity consumption by 3 % by the end of 2019. The results will be compared to the electricity consumption of 2016. Electricity consumption in the production area has been optimized so the potential to make reductions lies mostly in the office activities. Instructions on how to save energy were made in order to decrease the energy consumption in the office. Fluorescent lamps in the building will be replaced in stages with LED lamps and energy efficiency will be factored in when new devices are purchased.

Total electricity consumption could not be considered as a suitable indicator for the objective since Chiller's turnout increases annually and higher the production rate, higher the electricity consumption. As the production and office space are in the same building, it is not possible to determine what fraction out of the total electricity consumption is consumed by office activities. To achieve comparability with current and past energy consumption values, the electricity consumption was made proportional with the turnout. Since the production of different products requires different amounts of electricity, this indicator can also be problematic and possibly cause erroneous results. Thus far the turnout of different products relative to each other has remained nearly constant. If these ratios change intensely within annual levels, electricity consumption with respect to turnout cannot be considered as a reliable indicator. Progression of the objective will be evaluated annually.

### 5.5.4 Reducing hazardous waste

Thus far, the disposal of used refrigerants has been through incineration. By redirecting used refrigerants to regeneration instead of incineration, unnecessary emissions to air can be avoided, and the regenerated refrigerants reused in repair and maintenance. The regeneration will be commenced in stages and the aim is, that when the process is in full operating mode all of the used refrigerant will be regenerated.

### 5.5.5 Improving waste segregation

During the determination of risks and opportunities, a possibility to improve waste segregation in the office was recognized. Biowaste had not been separated from mixed

waste, and office paper was recycled only by some of the employees. Beginning from fall 2017, these waste fractions will be recycled. The sorted waste portion will be approximated and personnel will be interviewed after six months to determine, whether the segregation has been successful or if additional operational controls are needed.

## 6 Support

### 6.1 Resources, competence, awareness and communication

The organization should determine and provide necessary financial, physical, and human resources for establishing, implementing, and maintaining the environmental management system. Knowledge is an important resource and people working under the organization, who can affect the organization's environmental performance, should be provided with this resource in the form of competence and awareness. Sufficient awareness can be ensured through training and/or appropriate internal communication. Necessary competence can be achieved through training, education, experience or any combination of these. The organization should determine the level of competence it will require from its personnel and the need for training related to the environmental aspects and the environmental management system. [7]

The organization should establish processes for internal and external communication of relevant information related to its environmental management system. The processes should include what information is communicated and when, to whom the information is communicated, and how. [7]

A training event will be arranged to the personnel where an overview of the environmental management system and its general requirements will be covered. The main focus of the training is, that employees will be aware of the significant environmental aspects, potential and actual environmental impacts, and risks and opportunities that are associated with their work. Chiller's environmental objectives and the necessary operational controls to achieve them will also be explained along with the consequences of noncompliance. A record of participants will be kept as evidence of achieving necessary competence. Future employees will be familiarized with Chiller's environmental management system at the beginning of their employment.



The training need related to the environmental management system will be incorporated into Chiller's personnel and training plan. The purpose of the plan is to maintain and improve personnel's occupational skills. The plan includes information on the personnel's structure, an assessment of personnel's occupational skills, and possible upcoming changes in the requirements of occupational skills, as well as causes for those changes. How the plan will be implemented and monitored is also included in the personnel and training plan. If there are any new developments or significant changes in the environmental management system that requires personnel training, the training plan will be revised and implemented. If the changes are minor and no training needs appear, internal communication can be considered as a sufficient method for informing the personnel.

Internal communication regarding the environmental management system will be managed primarily through an information management system or by email. Informal discussions and meetings are a form of communication that can be used when the information is not extensive and does not require further familiarization. External communication will be focused at Chiller's internet site. If the nature of the information requires more efficient and prompt communication, interested parties are contacted via email. Chiller's marketing communications manager will be responsible for the external communication. Statutory and regulatory external communication is carried out by the environmental manager in accordance with the appropriate statute.

## 6.2 Documented information

Documented information ensures effective implementation of the environmental management system and provides evidence of its compliance with the standard. The ISO 14001 requires the following elements of the environmental management system to be maintained as documented information:

- Scope of the environmental management system
- Environmental policy
- Risks and opportunities that need to be addressed
- Environmental aspects and their associated environmental impacts
- Significant environmental aspects
- Criteria used for determining significant environmental aspects

- Compliance obligations related to environmental aspects
- Environmental objectives
- Operational controls. [7]

The extent of the documented operational controls should be sufficient enough to ensure that the processes needed to meet the requirements of the environmental management system have been carried out as planned. Documented information as evidence of achieved results or performed activities should be retained of the following:

- Competence and communication, as appropriate
- Monitoring, measurement, analysis and evaluation of results
- Results of compliance evaluations
- Implementation of internal audit program
- Results of internal audits and management reviews
- Nonconformities and their nature, corrective actions, and results of the corrective actions. [7]

In addition, the organization can choose whatever information it considers necessary with respect to the environmental management system. Additional documented information can include, for instance, other standards, reports, site emergency plans or any other information to help with aspects such as transparency, conformity, training, and auditing. [7]

When documented information is created or revised, the content should be purposeful and easily understood. The chosen format and medium should be useful and accessible for those who need the information the document contains. The document can be in either in paper or electronic form, it can be a poster or a picture, or it can be in any other medium that is appropriate to the information the document contains. Also, the identification and description such as title, date, and revision history of documents should be appropriate. Before the documented information is published, the suitability and adequacy should be reviewed and approved by an individual with sufficient competence and authority. [7]

Documented information should be maintained in a way that is appropriate to the organization. Controlling documented information should ensure that the information is directed at the right people, distributed effectively, reviewed regularly, revised appropriately, and approved by a suitable person. Thus, the information is kept

available and up to date and unnecessary, obsolete information is removed promptly. [7]

Main features of the environmental management system were summarized into one document to provide a clear overview of it. In addition, it provides quick access to the essential information which will be especially useful during the implementation of the environmental management system. The aim was to keep the overall amount of documents minimal and the content of each document as simple as possible. The documented information will be reviewed during internal audits. Revisions will be made as soon as changes in the documented information occur. New and revised documents will be reviewed and approved, prior to issue, by a supervisor that is appropriate based on the content of the document.

Documented information will be retained for three years with few exceptions. Statutory documents will always be retained in compliance with the appropriate statute. Procedures and work instructions are removed only if the information they contain becomes unnecessary with respect to operational control. Documented information will be controlled through a data management system that will also manage the important metadata such as title, date, and revision history.

## **7 Operation**

### **7.1 Operational planning and control**

Through operational planning and control the organization can ensure that it is able to fulfill the commitments of its environmental policy and achieve its environmental objectives. Furthermore, operational planning and control ensures that the significant environmental aspects, compliance obligations, and risks and opportunities that need to be addressed are well managed. The organization determines processes and operations that need to be controlled and the extent of control it chooses to exercise. Special attention should be paid to risks and opportunities that need to be addressed, and to any possible consequences. Effectiveness of the planned controls should be maintained and evaluated periodically. [7]

Operational controls can be procedures, work instructions, physical controls, use of competent personnel, or any combination of these. A suitable control method depends

on the environmental significance and complexity of the process or operation being controlled, as well as the competence of the personnel performing it. If aforementioned administrative controls are believed to be insufficient, the organization can also consider more extreme measures such as elimination, substitution or engineering controls. For example, the use of a hazardous chemical can be completely eliminated, substituted for a less harmful substance or engineering controls can be applied where the negative impacts of the chemical are technically controlled or minimized. [7]

## 7.2 Emergency preparedness and response

The organization should prepare for emergency situations it has identified in the planning stage as well as their consequent and possible subsequent environmental impacts. In addition to serious emergency situations, the organizations should also consider small scale situations with less significant impacts. Necessary preparedness is achieved by establishing responsive actions that prevent or mitigate negative impacts to the environment [7]. If practical, the response actions should be tested periodically to ensure their effectiveness. Preparedness and the planned responsive actions should be reviewed and revised periodically, especially after tests or emergency situations. [2]

According to the Rescue Act (379/2011, 15 §), buildings or other sites where the evacuation safety or rescue operations are exceptionally demanding or where the risk to the environment, cultural property, safety of persons, fire safety or the damage caused by any accident, may be considered serious needs to have an emergency plan [11]. Due to the chemicals that are used in the production processes, Chiller has a legal obligation to establish and maintain a site emergency plan, where possible hazards and emergency situations and their impacts are identified and assessed. The site emergency plan includes preventive and responsive actions that are annually tested to the extent possible. The plan is periodically reviewed and if any changes with possible hazards, emergency situations or other relevant information appear the plan is also revised. Changes in the site emergency plan are always communicated to the personnel to ensure that preventive and responsive actions will be performed as planned.

The latest revision in the site emergency plan was made after the storage plan for hazardous chemicals was established since chemicals, their quantities, and positions in the building, are also specified in the site emergency plan. As a part of emergency preparedness and risk management, a report on the fulfilment of safety requirements was made. The report is based on the actions that were performed in accordance with the storage plan for hazardous chemicals and can be found in Appendix 4.

## **8 Performance evaluation**

### **8.1 Monitoring, measurement, analysis and evaluation**

Through monitoring, measurements, analysis, and evaluation the organization can assess its environmental performance and the effectiveness of its environmental management system. Considering its environmental objectives, significant environmental aspects, compliance obligations, and operational controls, the organization should determine what needs to be monitored and measured. Furthermore, what are the methods that will provide reliable and valid results; when the monitoring and measurement should be performed; and when the results should be analyzed and evaluated [7]. When appropriate, the measurements should be conducted with verified or calibrated monitoring and measurement equipment. Depending on what the organization has specified in its communication process, it should internally and externally communicate about its environmental performance. External communication regarding monitoring and measurements should fulfill the organization's compliance obligations. [2]

### **8.2 Evaluation of compliance**

An organization should evaluate its performance against all its compliance obligations periodically to ensure that the obligations are fulfilled and no regulatory violations or nonconformities have occurred. Frequency and timing of compliance evaluations should reflect the nature of the organization's legal and other requirements, past performance, and changes in the compliance obligations. The methods for performing a compliance evaluation are determined by the organization and may include interviews, facility tours or project reviews. In addition to the aforementioned methods, the organization may apply also other auditing techniques in its compliance

evaluations. However, internal audits as such cannot be used to determine whether or not the obligations are fulfilled [7]. If the results of a compliance evaluation indicate noncompliance, the organization needs to determine and implement necessary actions to regain its compliance. Even if a regulatory violation would not occur, all nonconformities regarding compliance obligations need to be resolved. [2]

Chiller's compliance evaluations will be performed simultaneously with internal audits. The compliance obligations which will be evaluated depend on the department that is being audited. For example, if the production processes are being audited, the compliance evaluation will only cover legal and other requirements that are related to those processes specifically.

### 8.3 Internal audit

In order to establish that the environmental management system complies with the requirements set both by the organization and the ISO 14001 standard, and that it has been properly implemented and maintained, the organization should conduct internal audits at planned intervals. When creating an internal audit program, the organization can choose to audit the environmental management system in its entirety in one audit or in sections over one or several years. Audit intervals between different processes can deviate depending on their nature, scale, and complexity. Thus, complex activities with more significant environmental impacts should be audited more frequently. The standard requires that the entire system is audited periodically but does not define a time frame for it. [7]

For each audit, the organization should select a competent, objective, and impartial auditor or audit team, and define the audit criteria and scope. Audit criteria are the procedures and requirements to which the discoveries from the audit are compared to. Results of the audits should be reported to relevant personnel. Both the audit program and the audit results should be documented. [2]

One employee from maintenance and repair, production, and the office will participate in an internal audit training to achieve the necessary competence to perform audits. One from each sector was chosen so that objectivity and impartiality can be ensured in each audit process. As complementary information, instructions for creating the internal audit program and plan were made together with an internal audit checklist. The

checklist covers all the requirements of the standard and can be used to determine if the environmental management system has been appropriately implemented and maintained. The internal audit checklist is represented in Appendix 4.

Before each audit, a preparatory meeting is held where the chosen audit team creates an audit plan. The audit team consists of a head auditor and one or more assistant auditors all of whom are objective and impartial with respect to the department being audited. The head auditor is always a person who has participated in the audit training. He or she will instruct first-time assistant auditors and is accountable for planning, executing, and reporting the audit. A manager from the department that will be audited will also participate in the preparatory meeting. The audit plan includes a schedule and details of the audit team and their individual responsibilities, operations that will be audited, audit criteria, and auditing techniques.

After the preparatory meeting, the manager from the department that will be audited is responsible for compiling and delivering the audit material, which has been agreed upon in the preparatory meeting, to the audit team. If interviews have been chosen as an auditing technique, the manager chooses who will be interviewed in the audit and provides a list of those people together with the audit material. The audit will be executed according to the audit plan and schedule. After the audit, the department will have a meeting where the manager informs the audit results to the personnel, especially any good practices, improvement suggestions or deficiencies that have been observed by the audit team.

The environmental management system will be internally audited in its entirety during 2018. The internal audits will be performed in two parts. The first audit will cover maintenance and repair, production, and warehousing. Office operations, including emergency preparedness, will be audited in the second audit. The conformity of Chiller's environmental management system with ISO 14001 will be audited together with the office operations.

After the audit process, possible corrective actions, and the management review have been completed, the accredited certification process will commence. The aim is to certify Chiller's environmental management system to ISO 14001 within two years. After the certification has been achieved a three-year audit plan will be implemented (Table 4). As mentioned before, the standard does not specify a time period within

which the environmental management system should be internally audited, however, the certificate is valid for three years which is why a three year audit period is logical. Furthermore, one of EMAS' requirements is, that the entire environmental management system is audited within a three year period and that internal audits are performed annually.

Table 4. Preliminary three year audit plan.

Department, activity, service	2019	2020	2021
Maintenance and repair	x	x	x
Production	x	x	x
Warehousing	x	x	x
Office	x		
Environmental management system			x

The preliminary audit plan has been set for 2019 to 2021. According to the plan, maintenance and repair, production, and warehousing will be audited annually being that majority of the risks with respect to Chiller's environmental performance result from those operations. Office operations and conformity of the environmental management system with the standard will be audited once every three years.

#### 8.4 Management Review

The top management should evaluate the suitability, adequacy and effectiveness of the environmental management system periodically [2]. The organization has the freedom to determine the frequency of its management reviews. During the review top management should address information and any changes related to the environmental management system, previous reviews, environmental performance, environmental objectives, resources, and interested parties. The output of the management review should include conclusions on the continuing suitability, adequacy and effectiveness of the environmental management system, and opportunities for continual improvement. If a demand for changes in the environmental policy,



environmental objectives, resources or other parts of the environmental management system are considered necessary, decisions of those changes should be included. In the case that an environmental objective has not been achieved, the organization should determine if actions need to be taken and incorporate those actions into the results of the management review. [7]

To comply with the EMAS standard, Chiller will arrange management reviews annually. For the review to be purposeful, it will take place after the latest internal audit has been conducted and the results reported. If nonconformities have been identified during the audit, corrective measures should be put into effect before the management review. Instructions for the management review were made to ensure that the requirements set by the standard are complied with. The instructions included the aspects that need to be addressed in the review, as well as aspects that need to be incorporated into the results.

## **9 Improvement**

### **9.1 Nonconformity and Corrective Action**

When a requirement related to the environmental management system or the environmental performance is not fulfilled, it is considered as a nonconformity. An environmental management system nonconformity can be a situation where the organization has not performed management reviews periodically. A situation where an environmental objective is not achieved is then an environmental performance nonconformity. The organization can utilize internal audits as a process for identifying possible nonconformities. When a nonconformity is discovered, the organization should implement appropriate actions to manage and mitigate possible negative consequences. It is important to determine the fundamental source of the nonconformity so that the corrective actions are appropriate considering the nature of the nonconformity. After the corrective actions have been implemented, the organization should review their effectiveness to ensure that the nonconformity, and the underlying issue have been resolved. [7]

When nonconformities are observed, a nonconformity form must be filled out. The form will provide evidence of performed activities and achieved results, and help with the monitoring of nonconformities. The person who has observed the nonconformity will

write a description of it and together with an applicable supervisor, determine its root cause and necessary preventive and corrective actions. Each nonconformity, considering its nature, is assigned to an appropriate person who is responsible for supervising that the preventive and corrective actions are performed as planned. The appointed person is also responsible for evaluating the effectiveness of the performed actions and reporting the results of said evaluation into the nonconformity form.

While determining the compliance obligations, a nonconformity was discovered. According to the Finnish Waste Act an organization that produces hazardous waste should keep a record of waste for six years. The record should include information, for example, about the quality, quantity, and origin of the waste. In addition, the Waste Act enjoins that a shipping document should be composed and retained for three years when hazardous waste is handed to a waste management company. The shipping document is very similar to the record of waste, only more extensive. These documents were found to be either insufficient or missing. As a corrective action a prefilled shipping document for hazardous waste was produced and the appropriate personnel were informed how to correctly use and retain it. The shipping document for hazardous waste can be found from Appendix 6. A production supervisor was assigned to monitor and evaluate the effectiveness of the corrective actions.

To avoid unnecessary work and retaining of documents, the shipping documents will be retained as record of waste. As mentioned before, the shipping document entails all the information that is required in the record of waste. Thus, compliance with legislation can be ensured. It was taken into consideration that by law a record of waste for all the produced waste fractions must be kept if the company's annual waste amount exceeds 100 tons. Consequently, shipping documents for hazardous waste would not be sufficient anymore. Chiller's waste amounts will be more closely monitored from annual waste reports that are provided by the waste management company, although the likelihood of annual waste amounts exceeding 100 tons is almost negligible.

## 9.2 Continual improvement

On the basis of the results of environmental performance and compliance assessments, internal audits, and management reviews, the organization should define its possibilities for improvement [2]. Improvement can be achieved for example by taking preventive and corrective actions to address risks, nonconformities, and other

possible issues. Other approaches for improvement include taking action to address the identified opportunities and continual improvement. [7]

Continual improvement can be achieved by reaching environmental objectives and enhancing one or more element of the environmental management system. Identified improvement opportunities do not need to be performed all at once, and it is up to the organization to determine the rate, extent, and timescale of actions it takes to achieve continual improvement. As the performance of the environmental management system improves, achieving continual improvement can become more difficult. [2, 7]

## **10 Disadvantages and Weaknesses of ISO 14001**

Although it is reasonable that the ISO 14001 standard cannot be explicit for it to be applicable to all organizations, it can be seen as unnecessarily ambiguous. The standard emphasizes throughout, that the organization should establish processes for different features of the environmental management system but does not provide further information of the meaning or content of those processes. Nor does it provide clear examples on implementing its other requirements. Instead, other standards are systematically referred to for additional information. The effectiveness of the organization's environmental management system can suffer greatly when essential information is not provided and the organization has to proceed through trial and error.

Beyond the ambiguousness, the disadvantages of ISO 14001 are very much intertwined. ISO 14001 suffers from an obvious lack of transparency. Unless the organization chooses otherwise, it is not obligated to make any other information public than the environmental policy, which as such, is nothing more than a statement. This is a major disadvantage of ISO 14001 and weakens its credibility. Since there are no requirements to make information about the overall environmental performance public, a consumer might unknowingly purchase products or services from a less legitimate, yet certified company. If a consumer cannot be convinced that buying products or services from a certified company will have a real advantage for the environment, it does not only affect consumers but certified organizations as well. Organizations cannot fully benefit from enhanced competitiveness and marketing opportunities if consumers find ISO 14001 certification mostly symbolic.

In addition, ISO 14001 can be critiqued about being too generic as it only sets a frame for the environmental management system and the rest can be freely determined by the organization itself. Although the standard states that an environmental management system cannot be effective or credible if the organization for example, disregards key elements from the scope or does not exercise its control to the full extent, it has no significant meaning. When the organization has the freedom to choose these matters themselves, the absence of effectiveness or credibility becomes inconsequential. If the environmental management system is established within the framework of the standard, it can be certified despite these issues. Also, the public image and the stakeholders' impressions of the organization are preserved, again, due to the lack of transparency.

ISO 14001 emphasizes the importance of processes and focuses on those, rather than their actual outcomes. One feature that confirms this claim is the fact that the level of the organization's environmental performance is irrelevant from certification point view. The intent of decreasing environmental impacts and improving environmental performance is enough. Equivalently, any organization despite the severity of their environmental impacts can theoretically achieve ISO 14001 certification, whether it is a coal burning power plant or a nickel mining company. Considering that all organizations, at least in some level, have to comply with statutory and regulatory requirements, complete negligence towards the environment is unlikely. However, the level of how stringent the environmental laws are, varies. Hence, organizations that conduct their businesses in countries with stricter legislation benefit less, and consequently can be tempted to operate in countries where regulatory compliance is more easily achieved.

Studies on the environmental benefits and financial advantages of ISO 14001 have been contradictory and inconclusive [12, 13]. There are studies both for and against whether ISO 14001 certified organizations truly are greener than noncertified organizations. For instance, while some organizations have been shown to significantly increase their material reuse and reduce wastage, some organizations have been shown to be equally polluting as noncertified ones [14, 15]. The financial benefits of ISO 14001 depend on several factors. One noticeable factor is the organization's existing environmental performance. If an organization is already operating on a high level, or even surpassing the requirements of ISO 14001, the probability of achieving financial advantage is significantly less than with an organization that has not

considered environmental issues in its operations. The cost of implementing an environmental management system can be immense, and maintaining a certified system requires both human and financial recourses. Thus, organizations whose environmental performance is initially high, benefit less from ISO 14001 certification.

One of the key features of ISO 14001 is continual improvement. Although it provides more leeway than continuous improvement, it can still become extremely difficult to achieve when the performance of the environmental management improves. This easily leads to a situation where an organization establishing an environmental management system does not improve its environmental performance as much as it could. Instead, it establishes its environmental management system at a low level so that finding opportunities for continual improvement is more effortless. This is again one reason why ISO 14001 would benefit greatly from increased awareness and transparency. If organizations would be required to report about their environmental performance and make more information about the environmental management system public, these issues would occur at a much smaller scale.

## 11 Conclusions

The aim of this thesis was to develop an environmental management system for Chiller in accordance with the ISO 14001:2015 standard. The environmental management system was established on schedule but the implementation did not take place until after this thesis was completed. The environmental management system was established to comply with the ISO 14001 standard but if necessary, it can still be easily modified. Including supplementary aspects to the environmental management system and developing it further should be effortless.

The process of developing an environmental management system to Chiller began with an overview of the standards requirements after which the standard was systematically followed to establish the environmental management system. Determining risks and opportunities, environmental aspects, compliance obligations, and environmental objectives was the most time consuming process. Documented information was created simultaneously and the compliance with relevant legislation was evaluated when the compliance obligations were determined. Information was documented also for operational control, internal audits, and management reviews.

Establishing the environmental management system was an interesting and educational process. Considering a wide range of aspects that affect the environmental management system and its intended outcomes was necessary throughout the process. Although some disadvantages and weaknesses were observed, there can be significant benefits for the organization and to the environment from implementing an environmental management system in accordance with ISO 14001. The positive outcomes of an environmental management system are highly dependent on the organization's input. If the organization commits to establish, implement, and maintain an effective and credible environmental management system, it can certainly improve its environmental performance and achieve additional benefits.

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## Appendix 1. Chiller's Environmental Policy

Suomen johtavana lämpöpumppu- ja jäähdytyslaittevalmistajana meidän tulee kaikessa tuotanto- ja huoltotoiminnassamme:

- Parantaa jatkuvasti suoriutumistamme ympäristö-, terveys- ja työturvallisuusasioissa.
- Säästää luonnonvaroja.
- Ehkäistä vaarallisia päästöjä sekä tarjota turvallisia työpaikkoja ja tuotteita.
- Varmistaa, että kaikki toimitilamme ja tuotteemme noudattavat voimassaolevia lakeja ja säädöksiä sekä Chillerin ja Kylmäyhdistyksen standardeja, tai ylittävät näiden vaatimukset.
- Käyttää elinkaarianalyysiä pyrkiessämme minimoimaan ympäristö-, terveys- ja työturvallisuushaitat tuotteissamme ja palveluissamme, aina raaka-aineiden käytöstä tuotteen elinkaaren loppuun asti.
- Ottaa käytöstä poistettavista laitteista kylmäaine ja öljy talteen ja hävittää ne lain mukaan sekä kierrättää elektroniikka- ja metallikomponentit.
- Hyödyntää nykyaikaisinta tekniikkaa energian säästämiseksi.
- Kouluttaa, motivoi ja kannustaa työntekijöitämme osallistumaan ympäristösitoumuksiimme sekä noudattamaan tätä politiikkaa.
- Kannustaa alihankkijoitamme, toimittajamme ja konsulttejamme noudattamaan samoja standardeja kuin me käytämme.
- Tiedottaa avoimesti suoriutumisestamme ympäristö-, terveys- ja työturvallisuusasioissa sekä osallistua ulkopuolisiin ympäristöaloitteisiin, joiden avulla voimme parantaa osaamistamme ja suoriutumistamme.
- Varmistaa, että poikkeamista tiedotetaan ripeästi ja että suoriutumistamme ympäristö-, terveys- ja työturvallisuusasioissa valvotaan ja mitataan asianmukaisesti, sekä säännöllisesti varmentaa, että prosessimme ja johtamisjärjestelmämme täyttävät tehtävänsä.

## Appendix 2. Environmental Impacts and their Associated Aspects, Risks and Opportunities

NÄKÖKOHTA	VAIKUTUS	MERKIT- TÄVYYS	RISKIT JA MAHDOLLISUUDET	TOIMENPITEET	SEURANTA JA MITTAUS
KIINTEISTÖ					
Sähkönkulutus	Energian kulutus, luonnonvarojen kulutus, päästöt ilmaan	14		Liikkeen tunteilla varustetut valaisimet ja huonekohtainen kirkkauden säätö, toimintaohjeet (energiansäästö)	Kts. Ympäristöohjelma
Lämmitys (kaukolämpö)	Sivutuotteen hyötykäyttö, epäsuorat päästöt vesiin ja ilmaan	11			
Lämmitys (maalämpö)	Energian kulutus, luonnonvarojen kulutus, uusiutuva	9			
Jäte	Päästöt ilmaan, keräyksen aiheuttamat melu- ja pölyhaitat	11	Lajittelun kehittäminen toimiston tiloissa	Tuotteille kehitetyt uudelleenkäytettävät pakkaukset. Toimintaohjeet (lajittelu, pakkaus)	Jättemäärien seuranta, Kts. myös ympäristöohjelma
Vedenkulutus	Luonnonvarojen kulutus, epäsuorat päästöt vesiin (jätevedet)	10			
TUOTANTO JA HUOLTO					
Laitteiden valmistus	Energian käyttö, melupäästöt	7			
Hitsaus- ja juotostyöt	Päästöt ilmaan	5			
Kylmäaineiden käyttö	Päästöt ilmaan	10	F-kaasujen tiukentuvat säännökset. Siirtyminen vaarattomampiin aineisiin tulevaisuudessa.	Henkilöstön pätevyysvaatimukset, luonnonmukaisten kylmäaineiden kehityksen seuraaminen.	Lainsäädännön seuraaminen

Jäteöljy, hävittäminen polttamalla	Päästöt ilmaan, mahdolliset päästöt maaperään ja vesistöön	10	Puhdistuskustannukset, sakot, negatiivinen julkisuus	Valuma-altaat	Säiliöiden tarkkailu mahdollisten vuotojen varalta.
Käytetty kylmäaine, hävittäminen polttamalla	Päästöt ilmaan	11	F-kaasujen tiukentuvat säännökset. Kylmäaineiden regenerointi	Asianmukainen hävitys. Kts. ympäristötavoitteet (regenerointi).	Lainsäädännön seuraaminen, tuottajankirjanpito, siirtoasiakirjat ja hävitystodistukset. Kts. myös ympäristöohjelma (regenerointi).
Kuljetukset	Luonnonvarojen kulutus, energian kulutus, päästöt ilmaan, vesiin ja maaperään, melupäästöt	11			
<b>HÄTÄTILANTEET</b>					
Vaarallisten aineiden kuljetukset, onnettomuustilanteet	Päästöt ilmaan, maaperään ja vesistöön	9	Vapaarajan ylittäminen	Vapaarajojen noudattaminen ja kommunikointi henkilöstölle, toimintaohjeet (VAK)	Vapaarajojen tarkistaminen aina suurempia kemikaalimääriä kuljetettaessa
Vaarallisten kemikaalien käyttö ja varastointi, onnettomuustilanteet	Päästöt ilmaan, vesiin ja maaperään	9		Pienet varastomäärät, toimintaohjeet (kemikaalien varastointi)	Inventaariot, varastomäärien kiertonopeudet. Toteutumisen seuranta näiden yhteydessä.
Tulipalo	Päästöt ilmaan, maaperään ja vesistöön	9	Kiinteistön vahingoittuminen, henkilövahingot, hallitsemattomat päästöt	Toimintaohjeet (pelastussuunnitelma, kemikaalien varastointi)	Pelastusharjoitukset
<b>TOIMITTAJAT JA KUMPPANIT</b>					
Puolivalmisteet	Energian kulutus, luonnonvarojen ja raaka-aineiden kulutus	10			
Kuljetukset	Energian kulutus, luonnonvarojen kulutus, päästöt ilmaan, vesiin ja maaperään, melupäästöt	11			

## Appendix 3. Determination of Significance

ARVIOINTIPERUSTEET	0	1	2	3
Vaikutuksen laajuus	Ei vaikutusta	Paikallinen	Alueellinen	Globaali
Vaikutuksen vakavuus	Merkityksetön	Vähäinen	Kohtalainen	Suuri
Vaikutuksen todennäköisyys	Erittäin epätodennäköinen	Epätodennäköinen	Todennäköinen	Erittäin todennäköinen
Vaikutuksen kesto	Erittäin lyhyt	Lyhyt	Kohtalainen	Pitkä
Organisaation vaikutusmahdollisuus	Erittäin vähäinen	Vähäinen	Kohtalainen	Suuri

MERKITTÄVYYS	EI VAIKUTUSTA	VÄHÄINEN	KOHTALAINEN	MERKITTÄVÄ
Kokonaispistemäärä	0	1-5	6-10	11-15

NÄKÖKOHTA	VAIKUTUS	LAAJUUS	VAKAVUUS	TODENNÄKÖISYYS	KESTO	VAIKUTUS-MAHDOLLISUUDET	YHT
Sähkönkulutus	Luonnonvarojen käyttö	3	3	3	3	2	14
Lämmitys (kaukolämpö)	Sivutuotteen hyötykäyttö, epäsuorat päästöt vesiin, epäsuorat päästöt ilmaan	2	2	2	3	2	11
Lämmitys (maalämpö)	Luonnonvarojen käyttö, uusiutuva	3	0	3	3	0	9
Jäte	Päästöt ilmaan, keräyksen aiheuttamat melu- ja pölyhaitat	2	2	3	2	2	11
Vedenkulutus	Luonnonvarojen käyttö, jätevedet	2	3	2	3	0	10
Laitteiden valmistus	Melupäästöt	1	1	3	2	0	7

Hitsaus- ja juotostyöt	Päästöt ilmaan	1	0	3	0	1	5
Kylmäaineiden käyttö	Päästöt ilmaan	3	3	1	3	0	10
Jäteöljy, hävittäminen polttamalla	Päästöt ilmaan, mahdolliset päästöt maaperään ja vesistöön	2	2	1	3	2	10
Kylmäainejäte, hävittäminen polttamalla	Päästöt ilmaan	3	0	3	3	2	11
Kuljetukset (huolto)	Luonnonvarojen käyttö, päästöt ilmaan, vesiin ja maaperään, melupäästöt	3	3	2	3	0	11
Vaarallisten aineiden kuljetukset, onnettomuustilanteet	Päästöt ilmaan, maaperään ja vesistöön	2	3	1	3	0	9
Vaarallisten kemikaalien käyttö ja varastointi, onnettomuustilanteet	Päästöt ilmaan, vesiin ja maaperään	2	3	0	2	2	9
Tulipalo	Päästöt ilmaan, maaperään ja vesistöön	2	3	1	2	1	9
Puolivalmisteet	Luonnonvarojen ja raaka-aineiden käyttö	3	2	2	2	1	10
Kuljetukset (kumppanit)	Luonnonvarojen käyttö, päästöt ilmaan, vesiin ja maaperään, melupäästöt	3	3	2	3	0	11

## Appendix 4. Fulfillment of Safety Requirements

Chiller Oy:n omistuksessa olevan kiinteistön 858-401-4-184 tiloissa toimintaa harjoittaa logistiikka palveluita tarjoava Warasto Finland Oy. Kiinteistössä varastoidaan Chiller Oy:n, sekä kolmansien osapuolien tuotteita, joihin sisältyy muun muassa vaaralliseksi luokiteltavia kemikaaleja.

Kiinteistön omistajana Chiller Oy on osaltaan velvollinen vastaamaan kiinteistöstä, sekä sen turvallisuudesta. Näin ollen Chiller Oy edellyttää, että vaarallisia kemikaaleja käsitellään ja varastoidaan kiinteistössä niin, että vaarallisten kemikaalien ja räjähteiden käsittelyn turvallisuudesta annetun lain (390/2005) ja sen nojalla säädetyn valtioneuvoston asetuksen vaarallisten kemikaalien teollisen käsittelyn ja varastoinnin turvallisuusvaatimuksista (856/2012) kolmannessa luvussa säädetty vaarallisten kemikaalien sijoitusta koskevat periaatteet täyttyvät. Toiminnan tulee täyttää myös maankäyttö- ja rakennuslaissa (132/1999), kemikaaliturvallisuuslain 15 §:ssä, pelastuslaissa (379/2011), sekä edellä mainitun valtioneuvoston asetuksen (856/2012) neljännessä luvussa ja muissa rakentamista koskevissa säännöksissä säädetty vaatimukset.

Chiller Oy on suorittanut selvityksen vaaralliseksi luokiteltavien kemikaaliensa turvallisesta säilytyksestä ja varastoinnista. Selvityksen perusteella on luotu varastointisuunnitelma soveltuvia lakeja ja asetuksia noudattaen. Vaarallisten kemikaalien varastointisuunnitelmaa sovelletaan sekä kiinteistössä 858-401-4-184 että Chiller Oy:n tuotantotiloissa, kiinteistössä 858-401-4-183.

Kemikaalit on sijoitettu varasto- ja tuotantotiloissa niiden vaarallisten ominaisuuksien perusteella. Erityisvaarat ovat huomioitu sijoittamalla erittäin helposti syttyvät ja helposti syttyvät palavat nesteet ja kaasut, sekä hapettavat aineet muista toiminnoista erilliseen astiavarastoon. Yhteensopimattomien kemikaalien riittävä etäisyys toisistaan on varmistettu astiavarastossa sijoittamalla inerttejä kaasuja niiden väliin. Tuotantotiloissa säilytettävät kemikaalit on sijoitettu sellaisille paikoille, joissa niiden mahdolliset onnettomuustilanteissa aiheuttamat henkilö-, omaisuus- ja ympäristövahingot voidaan ennaltaehkäistä taikka minimoida. Työturvallisuuden lisäämiseksi kemikaalien säilytyspisteet tuotantotiloissa varustetaan niille sijoitettujen kemikaalien käyttöturvallisuustiedoilla.

Paloturvallisuuden ylläpitämiseksi ylimääräinen palokuorma varasto- ja tuotantotiloissa on poistettu tai siirretty kemikaalien välittömästä läheisyydestä, sekä rakennusten ulkoseinustoilta. Alueet joille kemikaaleja on sijoitettu, on merkitty selkeästi lattiaan. Varastorakennuksista ilmoitetaan soveltuvin varoitusmerkein ja erillinen astiavarasto merkitään myös kieltotauluilla tupakointi kielletty, sekä avotulenteko kielletty.

Aiemmin mainittuihin turvallisuusvaatimuksiin vedoten Warasto Finland Oy:tä on 21 päivänä kesäkuuta 2017 pyydetty selvittämään varastoimensa kolmansien osapuolien kemikaalien vaaraominaisuudet. Kiinteistön turvallisuuden ylläpitämiseksi ko. yritystä on lisäksi pyydetty poistamaan mahdolliset räjähtävät kemikaalit sekä erittäin helposti syttyvät tai helposti syttyvät palavat nesteet ja kaasut kiinteistön tiloista.

Warasto Finland Oy on annettuun määräaikaan mennessä suorittanut siltä pyydetty toimenpiteet. 23 päivänä elokuuta 2017 Chiller Oy on suoritettujen selvitysten perusteella voinut varmistua siitä, että molemmissa kiinteistöissä harjoitettava toiminta täyttää vaarallisten kemikaalien käsittelyä ja varastointia koskevat turvallisuusvaatimukset niiltä osin kuin soveltuviin rakennuksiin ja rakenteisiin, sekä vaarallisten kemikaalien sijoitusta koskevissa säännöksissä on säädetty.

## Appendix 5. Internal Audit Checklist

ISO 14001 VAATIMUS	AUDITOINTIKYSYMYS	TIEDON TARKISTAMINEN	TOTEUTUMINEN KYLLÄ/EI	KOMMENTIT (johtopäätös, hyvät käytänteet, kehitysidea, poikkeama, korjaavat toimenpiteet)
YLEISET VAATIMUKSET	Onko soveltamisala dokumentoitu ja tarkoituksen mukainen?	<i>ISO 14001 -ympäristöjärjestelmä.</i> Tarkista, että soveltamisala käsittelee selkeästi yrityksen toiminnot, tuotteet ja palvelut.		
YMPÄRISTÖPOLIITIIKKA	Onko ylin johto määritellyt yrityksen ympäristöpolitiikan?	<i>Ympäristöpolitiikka.</i>		
	Onko ympäristöpolitiikka soveltuva, ottaen huomioon yrityksen toiminnot, tuotteet ja palvelut?	<i>Ympäristöpolitiikka.</i> Poliitiikan tulisi sisältää kuvaus asianmukaisista toiminnoista, tuotteista ja palveluista.		
	Sisältyykö ympäristöpolitiikkaan sitoutuminen ympäristön suojeluun, jatkuvaan parantamiseen, sitovien velvoitteiden täyttämiseen?	Tarkista <i>ympäristöpolitiikka.</i>		
	Muodostaako ympäristöpolitiikka perustan ympäristötavoitteiden asettamiselle?	<i>Ympäristöpolitiikka.</i> Varmista, että päämäärät on tunnistettu (esim. jätteen vähentäminen, energian säästäminen).		
	Onko ympäristöpolitiikka dokumentoitu, otettu käyttöön, ylläpidetty, koko organisaation tiedossa ja sidosryhmien saatavilla?	<i>Ympäristöpolitiikka ja nettisivut.</i> Haastattele henkilökuntaa.		
YMPÄRISTÖNÄKÖKOHDAT	Onko ympäristönäkökohtia varten luotu tarvittavat prosessit? Huomioidaanko prosesseissa myös poikkeavat tilanteet?	Tarkista, että prosessit ympäristönäkökohtien tunnistamiseen ovat olemassa.		
	Onko ympäristönäkökohdat määritetty, merkittävät ympäristönäkökohdat ja niiden arviointi perusteet dokumentoitu?	<i>Ympäristönäkökohdat ja ympäristövaikutukset.</i> Tarkista ympäristönäkökohdat ja arviointikriteerit.		



	Onko merkittävät ympäristönäkökohdat työntekijöiden tiedossa?	Tarkastele kuinka näkökohdat on viestitty työntekijöille, suorita henkilöstöhaastatteluja.		
	Onko ympäristönäkökohtia päivitetty?	<i>Ympäristönäkökohdat ja ympäristövaikutukset.</i> Tarkista näkökohtien päivitykset ja muutokset/uudistukset toiminnoissa, jotka vaativat näkökohtien katselmusta.		
SITOVAT VELVOITTEET	Onko sitovien velvoitteiden tunnistamiseen luotu tarvittavat prosessit?	Tarkista, että prosessit ovat olemassa. Huom. Standardin vähimmäisvaatimus on ylläpitää vain ympäristönäkökohtia koskevia sitovia velvoitteita.		
	Ovatko ympäristöjärjestelmää koskevat sitovat velvoitteet ajantasaiset?	<i>Sitovat velvoitteet.</i> Varmista, että velvoitteet katselmoidaan säännöllisesti ja muutokset dokumentoidaan.		
	Suoritetaanko vaatimustenmukaisuus arviointeja säännöllisesti ja raportoidaanko niiden tulokset?	Tarkista <i>auditointiohjelma ja auditointitulokset.</i>		
RISKIT JA MAHDOLLISUUDET	Onko ympäristönäkökohtia, sitovia velvoitteita sekä sidosryhmän tarpeita ja odotuksia koskevat riskit ja mahdollisuudet tunnistettu?	Tarkista <i>ympäristönäkökohdat ja ympäristövaikutukset.</i>		
	Onko käsittelyä vaativia riskejä ja mahdollisuuksia varten määritelty tarvittavat toimenpiteet?	<i>Ympäristönäkökohdat ja ympäristövaikutukset.</i> Tarkista, että jokaiselle kohdalle on määritelty toimenpiteet ja että ne ovat riittäviä.		
	Onko toimenpiteille määritelty seuranta ja arviointi menetelmät? Entä milloin seuranta toteutetaan ja tuloksia arvioidaan?	Tarkista <i>ympäristönäkökohdat ja ympäristövaikutukset.</i> Arvioi menetelmien tarkoituksenmukaisuutta.		

YMPÄRISTÖTAVOITTEET	Onko merkittävät ympäristönäkökohdat huomioitu ympäristötavoitteissa?	<i>Ympäristönäkökohdat ja ympäristövaikutukset ja ympäristöohjelma.</i> Varmista, että ympäristönäkökohdat ja tavoitteet ovat yhteydessä toisiinsa.		
	Ovatko ympäristötavoitteet yhdenmukaiset yrityksen ympäristöpolitiikan kanssa?	Tarkastele <i>ympäristöpolitiikkaa ja ympäristöohjelmaa.</i>		
	Ovatko tavoitteet yksityiskohtaisia ja mitattavissa?	<i>Ympäristöohjelma.</i> Huom. mittaus voi olla joko kvalitatiivinen tai kvantitatiivinen. Mikäli tavoitetta ei voida mitata, pitää kuitenkin pystyä määrittämään onko se saavutettu vai ei.		
	Onko tavoitteille asetettu vastuuhenkilöt?	Tarkista <i>ympäristöohjelma</i> ja suorita henkilöstöhaastatteluja.		
	Seurataanko tavoitteiden edistymistä?	Tarkista <i>tulosten mittaus, analysointi ja arviointi</i> ja/tai varmista vastuuhenkilöiltä.		
RESURSSIT, TIETOISUUS, PÄTEVYYS JA VIESTINTÄ	Onko roolit, vastuut ja valtuudet määritelty?	Tarkastele onko ympäristöjärjestelmän eri osaluueille määritelty vastuuhenkilöt.		
	Onko ympäristöjärjestelmän toteuttamiseen varattu riittävät resurssit?	Varmista, että järjestelmää toteutetaan ja ylläpidetään aktiivisesti.		
	Onko pätevyysvaatimukset määritetty henkilöille, jotka voivat vaikuttaa yrityksen ympäristönsuojelun tasoon?	Tarkista <i>ISO 14001 Ympäristöjärjestelmä.</i>		
	Onko koulutustarpeet tunnistettu?	Varmista työntekijöiden pätevyys haastatteleamalla henkilöitä joiden työtehtävät liittyvät merkittäviin ympäristönäkökohtiin.		
	Ovatko työntekijät tietoisia ympäristöjärjestelmästä ja miten he voivat osaltaan vaikuttaa siihen?	Haastattele henkilökuntaa.		

	Onko sisäiselle ja ulkoiselle viestinnälle luotu tarvittavat prosessit?	<i>ISO 14001 Ympäristöjärjestelmä.</i> Varmista viestinnän riittävyys ja dokumentoidun viestinnän tarkoituksenmukaisuus.		
DOKUMENTOITU TIETO	Onko dokumenttien ja tallenteiden hallintaa varten luotu prosessit?	<i>Ympäristöjärjestelmän tiedostoluettelo.</i> Käy läpi tiedostonhallinta prosesseja.		
	Voidaanko dokumentit ja tallenteet löytää helposti?	<i>Ympäristöjärjestelmän tiedostoluettelo.</i> Tarkista, että kaikki asiakirjat ovat saatavilla.		
	Ovatko ajantasaiset versiot saatavilla?	<i>Ympäristöjärjestelmän tiedostoluettelo.</i> Varmista asiakirjojen saatavuus.		
	Poistetaanko epäoleelliset ja vanhentuneet dokumentit ja tallenteet hetimiten?	Käy läpi ympäristöjärjestelmän asiakirjat epäoleellisten ja vanhentuneiden dokumenttien varalta.		
	Ovatko vanhentuneet dokumentit ja tallenteet, joita voidaan tarvita laillisista syistä tai näyttönä saavutetuista tuloksista tunnistettu ja merkitty?	Käy läpi ympäristöjärjestelmän asiakirjat epäoleellisten ja vanhentuneiden dokumenttien varalta.		
	Onko dokumenteissa ja tallenteissa asianmukaiset yksilöinti ja tunnistus sekä tallennusmuoto?	Käy läpi ympäristöjärjestelmän asiakirjat.		
	Onko dokumenteille ja tallenteille luotu prosessit niiden soveltuvuuden ja tarkistuksenmukaisuuden sisäiseen tarkistukseen ja hyväksymiseen?	Varmista, että tiedostot on tarkastettu ja hyväksytty asianmukaisesti.		
	Löytyykö dokumenteille ja tallenteille säilytysajat?	Varmista, että säilytysaikoja noudatetaan.		
	Onko dokumentoitu tieto riittävän kattava ja standardin vaatimusten mukainen?	<i>Ympäristöjärjestelmän tiedostoluettelo.</i> Tarkista, että tiedostoluettelon mukaiset asiakirjat löytyvät.		

TOIMINNANOHJAUS	Onko toiminnanohjaus riittävää, jotta voidaan saavuttaa ympäristöjärjestelmältä halutut tulokset?	Arvioi toiminnanohjauksen vaikuttavuutta tarkastelemalla mm. ohjeita ja henkilöstön pätevyyttä.		
	Onko kohtuudella ennakoitavat hätätilanteet tunnistettu ja niille luotu vastesuunnitelmat?	Tarkista sisäisten pelastussuunnitelmien ajantasaisuus ja arvioi onko muita hätätilanteita jätetty tunnistamatta.		
	Toteutetaanko hätätilanneharjoituksia säännöllisesti?	Varmista kiinteistövastaavalta.		
SEURANTA, MITTAUS, ANALYSOINTI JA ARVIOINTI	Onko organisaatio määrittänyt mitä sen pitää seurata ja mitata ottaen huomioon ympäristötavoitteet, merkittävät ympäristönäkökohdat, sitovat velvoitteet ja toiminnanohjaukset?	<i>Ympäristönäkökohdat ja ympäristövaikutukset.</i> Varmista, että seuranta ja mittaus ovat riittäviä.		
POIKKEAMAT JA KORJAAVAT TOIMENPITEET	Onko korjaavia toimenpiteitä suunniteltaessa arvioitu toimenpiteitä, joilla varmistetaan että poikkeama ei toistu tai esiinny muualla?	Tarkista <i>poikkeamat ja korjaavat toimenpiteet.</i>		
	Onko korjaavat toimenpiteet toteutettu ja niiden vaikuttavuutta arvioitu?	Tarkista <i>poikkeamat ja korjaavat toimenpiteet.</i>		
SISÄINEN AUDITOINTI	Auditoidaanko koko ympäristöjärjestelmä säännöllisesti ja suunnitelmallisesti?	Tarkista <i>auditointiohjelma.</i>		
	Raportoidaanko auditointien tulokset asiaankuuluville henkilöille?	Varmista, että auditointien tulokset on jaettu ja käsitelty asiaankuuluvien henkilöiden toimesta (esim. johdon katselmuksessa)		
	Määritelläänkö auditointiohjelmassa auditointien taajuus, menetelmät, vastuut, suunnitelmavaatimukset ja raportointi?	Tarkista <i>auditointiohjelma.</i>		

JOHDON KATSELMUS	Tarkistaako ylin johto säännöllisesti ympäristöjärjestelmän soveltuvuuden, tarkoituksenmukaisuuden ja vaikuttavuuden?	Tarkista <i>johdon katselmus</i> ja <i>johdon katselmusten tulokset</i> . Varmista dokumentointi.		
	Sisältyykö johdon katselmukseen seuraavat: näkökohtien ja tavoitteiden tilanne, korjaavat ja ehkäisevät toimenpiteet, auditointien tulokset, sidosryhmien vaatimukset ja sitovien velvoitteiden täytyminen?	Tarkista <i>johdon katselmus</i> ja mahdolliset kokousmuistiot.		
	Tarkastellaanko johdon katselmuksessa mahdollisia tulevia muutoksia yrityksen tuotteisiin, palveluihin ja toimintoihin?	Tarkastele <i>johdon katselmusten tulokset</i> ja mahdolliset kokousmuistot.		
	Tarkastellaanko johdon katselmuksessa mahdollisia muutoksia ympäristöpolitiikkaan, tavoitteeseen ja muihin järjestelmän osioihin?	<i>Johdon katselmusten tulokset</i> . Tarkastele onko tulosten perusteella tehty muutoksia.		
	Raportoidaanko johdon katselmuksen päätökset?	Tarkista <i>johdon katselmusten tulokset</i> ja dokumentointia vaativat päätökset asiakirjasta <i>johdon katselmus</i> .		

## Appendix 6. Shipping Document for Hazardous Waste

JÄTTEEN TUOTTAJA/ HALTIJA TÄYTTÄÄ	JÄTTEEN TUOTTAJA / HALTIJA Chiller Oy	YHTEYSHENKILÖ											
	SÄHKÖPOSTI	PUHELIN											
	POSTIOSOITE Louhostie 2	POSTINUMERO JA -TOIMIPAikka 04300 Tuusula											
	JÄTTEENSIIRRON ALKAMISPAIKKA Louhostie 2 / Louhoskuja 4, 04300 Tuusula	JÄTTEENSIIRRON PÄÄTTYMISPAIKKA											
	JÄTTEENSIIRRON AJANKOHTA												
	JÄTEKUORMAN SISÄLTÖ												
<table border="0"> <thead> <tr> <th>Vaaralliset jätteet</th> <th>Jätenumero / EWC</th> </tr> </thead> <tbody> <tr> <td><input type="checkbox"/> Synteettiset moottori-, vaihteisto ja voiteluöljyt</td> <td>13 02 06</td> </tr> <tr> <td><input type="checkbox"/> Kloorifluorihilivedyt, HCFC –yhdisteet, HFC –yhdisteet</td> <td>14 06 01</td> </tr> <tr> <td><input type="checkbox"/> Jäätymisenestoaineet, jotka sisältävät vaarallisia aineita</td> <td>16 01 14</td> </tr> <tr> <td><input type="checkbox"/> Loisteputket ja muut elohopeaa sisältävät jätteet</td> <td>20 01 21</td> </tr> <tr> <td><input type="checkbox"/> Muu vaarallinen jäte, mikä? _____</td> <td>_____</td> </tr> </tbody> </table>		Vaaralliset jätteet	Jätenumero / EWC	<input type="checkbox"/> Synteettiset moottori-, vaihteisto ja voiteluöljyt	13 02 06	<input type="checkbox"/> Kloorifluorihilivedyt, HCFC –yhdisteet, HFC –yhdisteet	14 06 01	<input type="checkbox"/> Jäätymisenestoaineet, jotka sisältävät vaarallisia aineita	16 01 14	<input type="checkbox"/> Loisteputket ja muut elohopeaa sisältävät jätteet	20 01 21	<input type="checkbox"/> Muu vaarallinen jäte, mikä? _____	_____
Vaaralliset jätteet	Jätenumero / EWC												
<input type="checkbox"/> Synteettiset moottori-, vaihteisto ja voiteluöljyt	13 02 06												
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<input type="checkbox"/> Loisteputket ja muut elohopeaa sisältävät jätteet	20 01 21												
<input type="checkbox"/> Muu vaarallinen jäte, mikä? _____	_____												
TARKEMPI KUVAUS JÄTTEESTÄ													
Olomuoto:													
Koostumus:													
Pääasialliset vaaraominaisuudet:													
Jätteen määrä:													
JÄTTEEN PAKKAUS- JA KULJETUSTAPA	JÄTTEEN KÄSITTELYTAPA												
JÄTTEEN TUOTTAJAN / HALTIJAN ALLEKIRJOITUS Vakuutan yllä antamani tiedot oikeiksi. Allekirjoitus ja nimenselvennys Pvm													
JÄTTEEN KULJETTAJA TÄYTTÄÄ	KULJETUSLIKE / KULJETTAJA	AUTON REKISTERINRO											
	OSOITE	PUHELIN											
	<input type="checkbox"/> Kuorma on tarkastettu silmämääräisesti noudettaessa Kuljettajan allekirjoitus ja nimenselvennys	<input type="checkbox"/> Kuormaa ei ole tarkastettu Pvm											
JÄTTEEN VASTAAN- OTTAJA TÄYTTÄÄ	JÄTTEEN VASTAANOTTAJA	OSOITE											
	PUHELIN	<input type="checkbox"/> Jäte vastaanotettu <input type="checkbox"/> Jätettä ei vastaanoteta											
	VASTAANOTETUN JÄTTEEN MÄÄRÄ	PUNNITUSTOSITTEEN NRO											
	Vastaanottajan allekirjoitus ja nimenselvennys	Pvm											