

Going Green -

Why and How Thule Should Make Environmental Issues a Part of Their Business

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Abstract

Title: Going Green - Why and How Thule Should Make Environmental Issues a Part of Their Business

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Problem: When opening a newspaper today there is a good chance that the headlines have something to do with recent developments in the global climate debate. This development is forcing companies to take action. The problem for many companies, including Thule, is that they are unaware of the environmental work conducted throughout their value chain and also what they need to do to become green. Thule, a company with a strong focus on profitability and growth, will not make environmental issues a part of their core strategy unless it can be shown that economic incentives exist. With this thesis we will try to build a case that will help Thule, and also other companies, see the possibilities a green venture brings with it.

Purpose: Thule is one of many companies that is realizing that the environmental debate might have a real effect on business. The purpose of this thesis is therefore to show Thule, a company striving to become more environmentally sound, why they should make environmental issues a part of their business. Furthermore the aim is to review Thule's processes from an environmental perspective and also to give them guidelines on how to take their environmental work to the next level. By doing this we hope to show that environmental challenges can be treated as opportunities and not just risks.

Method: A qualitative method has mainly been used when writing this thesis. The theories and environmental tools have been collected through literature studies while the empirical data regarding Thule has been retrieved through extensive interviews with key personnel at Thule. A

quantitative method was used to provide examples of how Thule's processes and products affect the environment.

Conclusions: Even though it cannot for certain be said that the environmental debate will have a real effect on Thule in the near future, we believe that the incentives to go green are strong enough to motivate integrating environmental values into Thule's core strategy. The potential to reduce costs, increase market share and reduce financial and business risk are worth the peril investing in a greener business implies. By studying Thule it is evident that environmental issues have not been an area of focus as of yet. By increasing the level of competence, integrating environmental issues into Thule's core strategy and increasing focus on environmental ambitions we believe that Thule will be able to take their handling of environmental issues to the next level. Only then can they regard environmental challenges as opportunities and take full advantage of the possibilities going green presents.

Key Words: Environment, Green, Strategy, Thule, Environmental Management, Going Green

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Working with this thesis has been both challenging and educating. Year 2008 was the year when environmental issues really caught on. This has made the process of writing this thesis truly inspiring. The focus from media, politicians and society in general has resulted in that everyone we have talked with has had an opinion on the subject. The public attention has helped us find new angles and ideas that we hope have further enhanced the quality of our thesis.

We would like to acknowledge the efforts of our two university tutors, Lars J Nilsson and Göran Alsén, who have continuously challenged our findings and thereby helped us give this thesis a sharper edge.

Finally we would like to thank Thule and its employees who have been keen to answer our questions and contribute to our work. They have always greeted us with an open and welcoming attitude, not least around the lunch table at the office in Malmö. We would especially like to thank our tutor at Thule, Magnus Welander, who has challenged us and asked the right questions which we hope has increased the value of our thesis for both Thule and the academic world.

Lund, 2008-05-06

Christian Bernroth & Joachim Hansson

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1 Background

This chapter will give a brief description of the underlying problems and the challenges facing companies today. It will contribute to the understanding of the difficulties companies face when trying to handle environmental issues in an efficient and trustworthy way. The chapter will also describe the purpose of this thesis, which delimitations that exist, give a brief introduction to Thule and define what we mean by environmental issues. Finally an outline of the thesis will be provided in order to give the reader an overview of the contents of each chapter.

Melting glaciers, hurricanes, floods and droughts, today there are not many that still question the reality of global climate change. The seriousness of the matter is however hard to grasp. When the chairman of the Intergovernmental Panel on Climate Change (IPCC) made his speech, at the opening session of the UN high level event on climate change in New York 24th September 2007, the facts he presented were alarming. In 2005 the concentration of carbon dioxide in the earth's atmosphere exceeded the natural range that has existed for over 650.000 years. Eleven of the warmest years since instrumental records have been kept have occurred during the last twelve years which indicates that climate change is accelerating. In the 20th century the increase in average temperature was 0.74 degrees centigrade and sea level increased by 17 centimeters. This has led to that a large part of the northern hemispheres' snow cover has vanished. These figures are worrying by themselves but the consequences they will have even more so. Examples of the effects which are predicted to occur include water shortage and decreased food availability due to changes in temperature and precipitation. Some of these problems are predicted to happen as soon as by the year 2020, only a few years away.^{1 2} However all hope is not lost, the global society is opening its eyes and calculations show that investing 3 percent of GDP in the year 2030 will limit the increase of CO₂ to an equilibrium level. This is a promising projection but to make it a reality the time to take action is now.³

When opening a newspaper today there is a good chance that the headlines have something to do with recent developments in the global climate debate. Documentaries such as "The Inconvenient Truth" have made the facts and figures, which are hard to relate to, come alive. Industries are beginning to feel the pressure

¹ Solomon et al. , (2007)

² www.ipcc.ch, *Opening Session - 24 September 2007*

³ Ibid.

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and are starting to take action. One industry that has taken its fair share of time in the spotlight is the automotive industry with its large multinational corporations such as Ford, General Motors and Toyota. Few industries have products that can be so closely linked to the growing emission of green house gases as the automobile industry. To meet the growing demand for cleaner vehicles the car manufacturers have implemented programs to produce vehicles that will meet the tough emission regulations that are to be implemented in the United States and European Union. General Motors is pushing to “Unleash the power of corn” as a slogan for E85, corn-derived ethanol mixed with gasoline, and Toyota has been successful with its best selling hybrid powered Prius.⁴

There is however more to going green than just making a public statement declaring that one aims to fulfill environmental goals and make it a company mission to protect the environment. This is a lesson that Ford CEO Bill Ford learned the hard way. After declaring that Ford would make it its number one mission to protect the environment, critics were quick to point out that Fords corporate average fuel consumption was the highest of all U.S auto makers.⁵ Statements about how great the environmental concern is within an organization should not be made without first making sure that the organization is up for the challenge.

One company that is taking the environmental threat seriously is German car manufacturer BMW. BMW is spending large sums on research and development trying to gain an advantage by producing more efficient engines and finding points on the car where energy is lost and trying to reduce this loss. The challenge for BMW is while doing this they are trying to uphold the qualities that customers expect from their cars.⁶ The BMW approach raises the question if environmental thinking in the future will be a part of the premium brand concept. Quality is an important component of the premium brand concept, and is made up by many different elements where secondary performance is one. Authors Dobers and Wolff (1995) discuss whether environmental thinking and quality share common ground and come to the conclusion that environmental performance is indeed a part of the products secondary performance thus also a part of the products perceived quality. This conclusion gives companies aiming to build a premium brand reason to think twice when setting policies for environmental thinking, for many of them brand image is everything.⁷

⁴ Schweinsberg; Visnic, (2006)

⁵ Ibid.

⁶ Racanelli, (2007)

⁷ Dobers; Wolff, (1995)

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Many car manufacturers are today doing their best to measure all sources of increased fuel consumption; this includes sources such as air conditioning systems, roof racks, and extra lights. When visiting the Detroit auto show reporter Lasse Holmström talked with senior representatives from SAAB who told him that all equipment related to the car was now being measured and evaluated. Recent developments in the climate debate has led to that 99 out of 100 questions that Holmström gets are today related to environmental issues, only a few years ago 99 out of 100 questions concerned safety. This development has accelerated only during the last few months. All companies in some way linked to the car industry will be affected.⁸ Despite this, the car accessories industry has as of yet not felt any increased pressure regarding environmental issues.⁹

The Thule brand is strongly associated with high quality and a sense of style. More and more consumers today are gaining awareness regarding environmental issues; an example of this is the growing number of environmental cars sold in Sweden during the previous year. The number of newly registered environmental cars grew with 104 percent in January 2008 compared with the same period 2007.¹⁰ The growing environmental awareness acts as a motive for Thule to take environmental issues seriously. Current trends show that the concepts of high quality and environmentally sound products are tighter linked than ever, providing a strong incentive for Thule to take action in order to protect their brand image.¹¹ Robert Sarner, director of public affairs and communications at Wal-Mart, points out that being an outdoor brand places even higher demands on being environmentally sound. When building a company image that implies experiencing the outdoor, healthy living and an active lifestyle people hold the company up to a higher standard. But this increased pressure can also be used to give the company credibility when addressing the issues at hand. It all comes down to how the message is delivered.¹²

Despite the fact that few firms today have missed the growing evolution of business social contract many companies still treat social and environmental issues as a risk, and not as a means to gain competitive advantage on an evolving market. The challenges presented are great, as is the price of failure. Social and environmental responsiveness, and the public's view of how companies handle these issues, might

⁸ Holmström, Lasse, *Editor Bil & Trafik*, Sydsvenskan, 2008-02-05

⁹ Schylit, Roland, *Executive Vice President and Deputy CEO*, Thule, 2008-02-22

¹⁰ www.di.se, Bilregistreringarna ned i januari

¹¹ Tham, (2007)

¹² D'Innocenzo, (2006)

well be the differentiating factor deciding how large a market share a company can claim.¹³ Although people all around the world are feeling the effects of climate change, companies are still slow to make changes to their strategy. For real change to take place, company managements need to be convinced that going green will not only help the environment, it will also help them strengthen the bottom line.¹⁴

1.1 A Brief Introduction to Thule

Thule was founded by the Thulin family in 1942 and entered into the car accessories business in the 1960's. In 1979 Thule was sold to the publicly listed company Eldon and continued to grow both organically and through acquisitions. In 1999 the company was acquired by the private equity firm EQT who continued to develop the company with a strong focus on profitable growth. This development was continued until 2004 when EQT in their turn sold Thule to UK-based private equity firm Candover, together with 60 management representatives. In July 2007 Thule was acquired by Nordic Capital who still owns the company today.¹⁵ Throughout these changes in ownership Thule has maintained an impressive yearly sales growth of around 10 percent and has gone from a 2 billion SEK turnover 2001 to a turnover of approximately 6.5 billion SEK 2007.¹⁶ This impressive growth has been achieved by both organic growth and an aggressive acquisition strategy where they have bought companies that can be fitted under their four core business areas which are car accessories, towing systems, organizational solutions and trailers.¹⁷ Today Thule employs approximately 4500 people and is present in Europe, Asia, North and South America, Africa and Australia, 1250 of these people are employed within Car Accessories Europe Asia. Thule's vision is: "To be the brand of choice for consumers around the world who want to transport their equipment by vehicles safely, easily and in style." This puts a clear emphasis on being an outdoor brand with a strong focus on quality. To support this vision Thule Car Accessories Europe Asia, which is the primary focus of our study, annually spends four percent of their turnover on product development. This figure may not sound big but is above average when taking into account the type of products that Thule develops.¹⁸

¹³ The McKinsey Quarterly, p.9f

¹⁴ abcnews.go.com, Big Companies Go Green to Ensure Business

¹⁵ www.thule.com, History

¹⁶ Thule internal documents

¹⁷ Pettersson, Anders, *President and CEO*, Thule, 2007-08-29

¹⁸ Welander, Magnus, *Business Area President Car Accessories Europe Asia*, Thule, 2008-03-17

In Sweden Thule is mainly recognized for its line of roof boxes but the Thule Group incorporates much more. Thule provides products that allow people to, by vehicle, transport their equipment when they are practicing their favorite activities. The product range includes load carriers and accessories, car rails, trailers, snow chains and towing systems. These are the main groups of products. However under for example load carriers you will find smaller product groups like roof boxes, which is one of their more recognized products. Many of these products are also sold under other brands than Thule to further differentiate the product portfolio. In many of these areas Thule is the market leader and in for example roof boxes, roof racks, bike carriers, ski carriers etc Thule is number one in the world.¹⁹

The company is divided into different business areas where Car Accessories Europe Asia is the main focus of this thesis. Car Accessories Europe Asia develops, manufactures and markets load-carrying systems, i.e. roof racks, roof boxes and bike carriers. Included in the business are also accessories for recreational vehicles (RVs) and snow chains. The business area headquarters lies in Hillerstorp Sweden and has manufacturing facilities and market organizations in Sweden, Germany, UK, Belgium, China, Poland, Brazil and Malaysia, and sales offices in an additional three countries. The business area has approximately 1200 employees and sales are forecasted to 1744 MSEK 2007 which is around 25 percent of the Thule Groups total sales.²⁰

1.2 Will Environmental Issues Affect Thule's Environment

Thule has in many areas already begun to tackle the challenges that environmental issues place on the company, but is far from making it a part of the core strategy. Sustainability and environmental issues have, as of lately, become a question that has received more and more attention within many parts of the organization but without any real focus. Thule is slowly realizing that the environmental debate is likely to influence important factors such as consumer behavior, legislative demands, brand image, and competitor actions within their industry to. In what way these factors will be affected is uncertain but management at Thule are highly aware that the mentioned factors have an effect on a company's profitability. In order for environmental issues to grow in importance at Thule, the value of going green must be shown. Thule, a company with a strong focus on profitability and growth, will not make

¹⁹ Thule internal documents

²⁰ Ibid.

environmental issues a part of their core strategy unless it can be shown that economic incentives exist. With this thesis we will try to build a case that will help Thule see the possibilities a green venture brings with it. The challenges described above are in no way unique for Thule. Many companies are today facing the same challenges which makes this thesis applicable also in a wider setting.

Claiming that your company is more environmentally friendly than it really is; is a concept known as “greenwashing”. Greenwashing might initially attract eco aware consumers, but will eventually significantly harm a brand when the truth about the company’s environmental efforts comes to light. If you are to be considered an environmentally aware company you have to do much more than just make a public statement declaring the companies environmental visions. The path to becoming an environmentally conscious company must start from within. The problem for many companies, including Thule, is that they are unaware of the environmental work conducted throughout their value chain and also what they need to do to become green. When examining trade and industry today it is difficult to distinguish a standard as to what a company must do to fulfill its obligation towards the environment, since there are so many tools available. By studying Thule we aim to provide guidance regarding where they stand today, in terms of their environmental work, and help them see how they can move in the right direction. We feel confident that the methodology used to study and help Thule move in the right direction, could also be used on similar manufacturing companies.

1.3 Purpose

Thule is one of many companies that is realizing that the environmental debate might have a real effect on business. The purpose of this thesis is therefore to show Thule, a company striving to become more environmentally sound, why they should make environmental issues a part of their business. Furthermore the aim is to review Thule’s processes from an environmental perspective and also to give them guidelines on how to take their environmental work to the next level. By doing this we hope to show that environmental challenges can be treated as opportunities and not just risks.

1.4 Delimitations

Even though many of the findings we have made may apply to the whole of Thule, our research has been focused on the business area Car Accessories Europe Asia. We have also tried to understand the management processes that influence this business area. When discussing why Thule should go green a wide perspective will be used making the conclusions drawn applicable for the whole of Thule. In order to be able

to draw conclusions regarding the greening of a product we have studied the roof box. The findings made regarding roof boxes may be applicable to other products both at Thule and other companies but this has not been tested. Further the empiric data and interviews regarding roof boxes are based on interviews conducted with personnel at the Neumarkt site and not the production facilities in Brazil and the UK.

During this thesis we have also constricted us to looking at areas that are linked to the roof box as a product, we have consequently not included other areas of environmental importance such as corporate travel, office lighting and so on. For a clear specification of the areas we have investigated please see figure 1.

1.5 Defining Environmental

Environmental issues of today incorporate much more than just green house gases, although this is the issue that has received the most media attention during the new millennium. The use of the term environmental issues, without giving a more specific explanation of what the term implies, often leads to misunderstandings.²¹

If one takes a total perspective of the term environmental issues one can include factors regarding human health, ecosystem quality and resources. Human health includes environmental issues such as climate change, ozone layer depletion, carcinogenic effects, respiratory effects, and ionizing radiation. The term ecosystem quality widens the concept of environmental issues by also including the effects on species and diversity. This means taking into account acidification, ecotoxicity, eutrophication and land use.²²

In this thesis we will not make any delimitation to the term environment. The reason for this is that many of the theories presented, that aim to deal with environmental effects caused by man, are designed to deal with all the environmental effects named above. A delimitation of the concept of environmental effects will not lead to any differences in the conclusions which will be drawn later on in this thesis. Another reason for keeping the concept as wide as possible is the fact that although climate change is the issue that has received the most media coverage lately, all other environmental considerations are equally important. In order to align an organization to consumer expectations a total perspective must be taken, from the cradle to the grave.

²¹ www.pre.nl, Eco Indicator 99 – Manual for designers

²² Ibid.

1.6 Outline

In this chapter an introduction to the subject which this thesis aims to study has been given, and also an introduction to the problems that Thule face. The following chapter will describe the theoretical foundation on which this thesis rests and also present relevant environmental tools needed to build a green organization. Chapter 3 contains a description of the methodology used when writing this thesis. In order to show Thule which society trends that will influence their decision to go green, chapter 4 will presents facts on this subject.

In chapter 5 we take a closer look at Thule and more specifically at how they have handled environmental issues up until now throughout the life-cycle of a roof box. This is then followed by an analysis of why Thule would benefit from going green and also by an analysis of the current state of Thule's environmental work. The final two chapters in this study contain recommendations on how Thule should proceed and also our conclusions regarding why and how Thule should go green.

2 Theoretical Framework and Environmental Management

The following chapter will provide the reader with relevant knowledge needed to understand the available possibilities when it comes to handling environmental issues today. Within each area of the products life cycle both theoretical frameworks and environmental management tools will be presented. These will then be used during the analysis when it comes to determining the state of the environmental work at Thule. The theories and tools presented in this chapter are only briefly introduced. For readers wanting deeper understanding further information is available by following the references given.

2.1 Building a Green Organization

More and more companies are becoming interested in going green²³, but what does going green mean? Going green can be interpreted in many different ways but our view of going green implies integrating environmental thinking and actions into a company's core strategy, thus making it a part of one's business. The reason for doing this is ultimately to use these actions to strengthen one's organization and gain a competitive advantage. The question therefore arises: How can a company become a green organization that is trustworthy and not considered greenwashing by the general public? As earlier pointed out there is today no set standard as to how a company should build a green organization which then can convey a trustworthy green image. Simply using marketing to show that the products manufactured are green or sustainable is no longer acceptable if the whole organization behind the product does not live up to the same standards.²⁴ There is a term known as total marketing which incorporates a more holistic view on marketing. The term takes into account six different aspects which affect customer perception of a product and a company's environmental attributes.²⁵ These are;

- Products and their packaging. This includes all energy consumed directly or indirectly by products throughout their life cycle.
- The pollution and waste from the processes that produce them.
- The raw materials and energy involved.

²³ D'Innocenzo, (2006)

²⁴ www.sustainabilitydictionary.com, Greenwashing

²⁵ Peattie, (1992), p.175ff

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- The impact of company policies on the environment, the workforce and other countries.
- How a company manages its resources and investments.
- The environmental performance of its suppliers.

In the book *Green Marketing*, Peattie illustrates this further by saying that environmentally aware consumers view the company which produces a product as part of the product as well. This further strengthens the theory that a green organization and image cannot be created simply by offering green products or by making sure that production processes are clean. A green image as a whole includes both of these aspects and much more.²⁶

A company can be viewed from many different angles and thought of as many different things. To provide structure to this thesis work we have chosen to view Thule from the framework presented in figure 1. The framework describes a products life cycle and the activities involved from the cradle to the grave. In our case the product is a roof box but the framework can be applied to any manufacturing company.

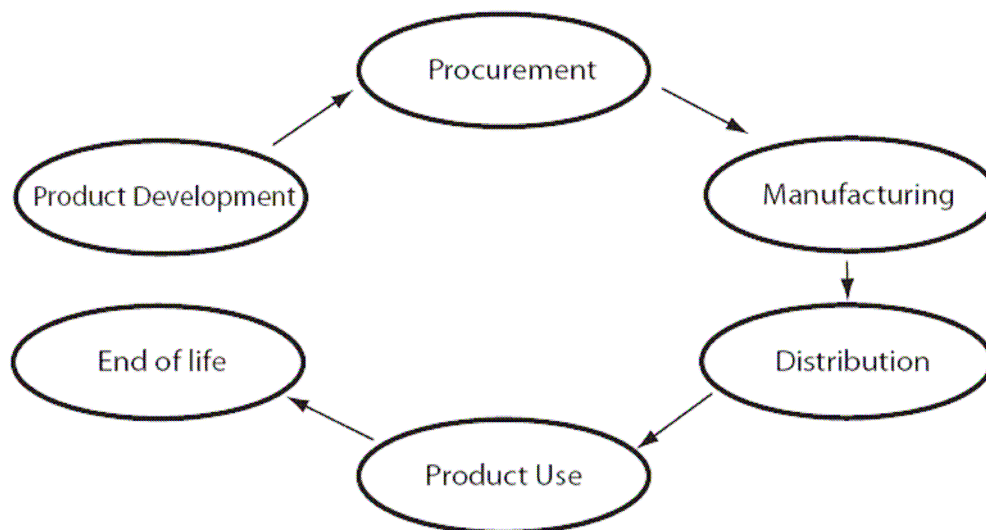


Figure 1 - Product process map

Within each stage of the products life there are several different methodologies and tools that describe how environmental issues can be dealt with; some methodologies even handle several of the stages presented in figure 1. After an extensive literature

²⁶ Peattie, (1992), p. 179

study on the subject of environmental tools we are able to present a select few tools that could aid a company in its quest of becoming green. One tool that is capable of handling several areas is an environmental management system. Our view is however that implementing an environmental management system will not create a green organization on its own. We share the view of Könnälä et al. (2006) who argue that it will be dangerous in the future to rely solely on environmental management systems since they only foster incremental environmental improvement and not radical innovations.²⁷ The theories we present in the following chapter are presented to aid us in our search for relevant information and also to compare the current status at Thule with what is desired.

The road towards becoming a green organization starts by understanding that the areas presented in figure 2 all interact with each other and affect a company's ability to become green. By taking into account and applying methods to improve the environmental performance throughout all stages of a products life a firm can become a green and sustainable organization.

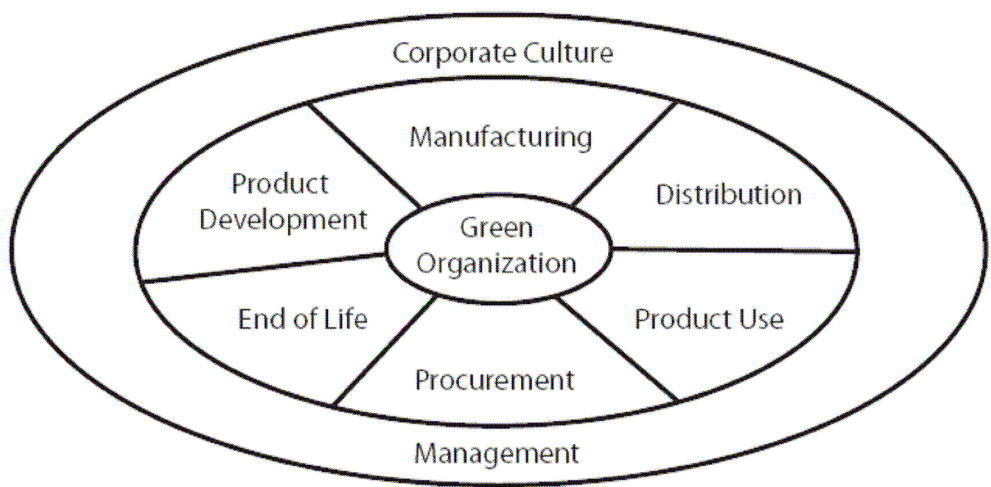


Figure 2 – Components of a green organization

By reviewing companies using the analytical framework presented in figure 1, together with the theories presented in the following chapter, an insight can be gotten as to how far they have come towards going green.

²⁷ Könnälä et al., (2006)

2.2 Analytical Framework

The framework presented above will be used to study Thule from an internal perspective. In order to study Thule's surroundings the following analytical framework is used.

2.2.1 The PESTEL Framework

The PESTEL framework is presented below since it later on in the thesis will be used to help us gather information to answer the question why Thule should go green.

The *PESTEL* framework categorizes macro-environmental perspectives into six main types: *political*, *economic*, *social*, *technological*, *environmental* and *legal*. Many of these factors are not independent but rather linked to one another. Utilizing the framework therefore calls for an understanding specific markets, organizations etc.²⁸ When taking the PESTEL perspective and then comparing it with the specific setting in which the studied firm operates it becomes possible to draw conclusions regarding which of these factors that will become opportunities and threats for the firm in the future. The key issue is how these more general trends affect the firm's business environment.²⁹

2.3 Management

Management systems influence all activities within a company. There are many definitions of management, all of which relate to organizing resources and directing activities in order to reach organizational objectives. Management control is a critical function in all organizations since it is a fact that employees cannot always be relied upon to act in accordance with the organization's best interest. For any management system to succeed, knowledge of objectives is necessary. The objectives do not have to be quantified or economical but they should exist in some form, so that employees can gain an understanding of what the organization is trying to accomplish.³⁰

The most common form of management control system is the results controls system, whereby employees are responsible for achieving a result rather than performing a task. Result control systems are consistent with and even necessary in decentralized organizations. Important aspects of a results controlled system are *defining performance dimensions*, *measuring performance*, *rewards* and *the ability to measure controllable results effectively*.³¹

²⁸ Johnsson et al.,(2005), p. 65ff

²⁹ Grant, (2005), p.68ff

³⁰ Merchant; Van Der Stede, (2003), p.3ff

³¹ Ibid.,p.26

Defining Performance Dimensions

This is a critical part of the system since goals that are set and measurements that are made shape employees views of what is important. If the dimensions are defined incorrectly, meaning that they are not congruent with the organization's objectives, result control may actually encourage personnel to do the wrong things.

Setting Targets and Measuring Performance

Measurement is a critical element of a results control system. The object of importance is the performance of an employee (or a group of employees) in a specific time period. Setting targets and measuring to which degree these targets are being met affects people in different ways. One is that it stimulates action and improves motivation since people much rather strive towards a concrete figure than a vague statement.

Rewards

Rewards and punishments are important elements of result controls since organizations can derive motivation by linking rewards to results that employees can influence. One example is granting successful employees more authority and perhaps increasing their status by publicizing their achievements.³²

Ability to Measure Controllable Results Effectively

For employees to embrace a control results system they need to understand how they can affect the results they are being held accountable for. Communication needs to take place from management regarding which issues, and which results, that are of importance. Training is sometimes also needed to further enhance employees' ability to influence the results upon which they are being measured. It is also important that results measures are precise, objective and timely.³³

There exist other forms of management control systems such as action controls, personnel controls and cultural controls³⁴. The cultural control in a corporation and how to shape a culture will be addressed further on in this chapter.

Management systems exist in every organization in order to make sure that planned strategies are implemented and carried out. Environmental management systems for example are designed to handle environmental issues within an organization and below the outline of such a system is presented.

³² Merchant; Van Der Stede, (2003), p.30ff

³³ Ibid., p.32ff

³⁴ Ibid., p.67

2.3.1 Environmental Management Systems – A Management Tool

The work of trying to manage environmental issues goes back to the early 1970's, when large corporations began to implement environmental management systems (EMSs) that resemble the EMS we see today.³⁵ Today two dominating EMSs exist; the Eco Management and Audit Scheme (EMAS), an effort by the EU, and ISO 14001.³⁶ The purpose of developing EMSs, from the business community's point of view, has been to enhance the credibility of firms as actors in the field of environment³⁷.

An EMS consists of a regulatory structure that arises from within an organization, not as with governmental regulations which impose requirements from outside the organization. EMSs are based on Deming's (1986) continuous improvement model with the four classical steps of planning, doing, checking and acting. An EMS, when used correctly, allows an organization to continuously reduce its impact on the natural environment. It consists of an environmental policy as well as a set of evaluation processes that requires organizations to assess their environmental impact, establish goals, implement environmental goals, monitor goal attainment and undergo management reviews.³⁸ This cycle of improvement can be viewed in figure 3.

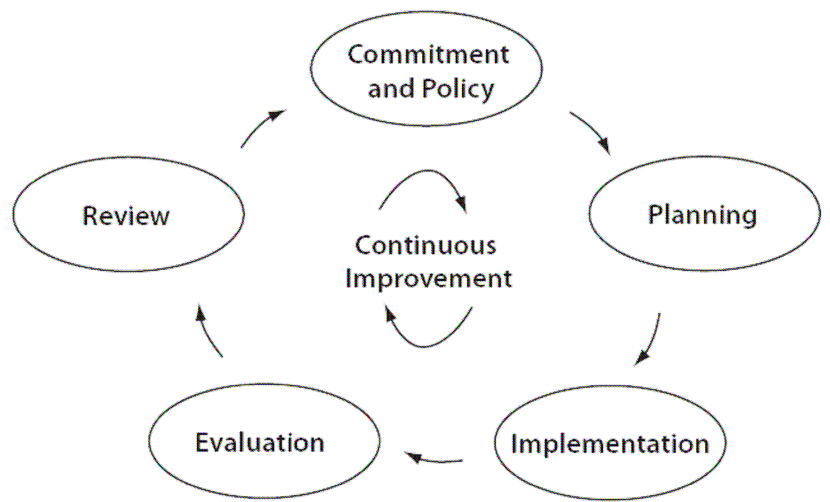


Figure 3 - Continuous improvement cycle of an environmental management system, Source: Derived from www.epa.gov, What is an EMS?

³⁵ www3.ivl.se, Effektivare miljöledningssystem

³⁶ www.ne.se, Miljöledningssystem

³⁷ www3.ivl.se, Effektivare miljöledningssystem

³⁸ Darnall; Edwards, (2006)

As with the implementation of any tool the implementation of an EMS into an organization brings with it effects. An obvious effect is the increased focus on environmental aspects within an organization.³⁹ Another effect is the increased documentation needed in an organization which implements an EMS. The risk exists that an EMS might contribute to more paperwork and less action in a firm; this is especially the case in organizations which are unfamiliar to bureaucracy. EMS systems also do not specify from what level the environmental improvements begin, and not at what rate the improvements are made.⁴⁰ To certify an EMS through the ISO 14001 standard is neither easy nor cheap. The cost can vary from figures as low as ten thousand dollars to several hundred thousands, depending on the size of the site being certified and the amount of preparation work needed. Then there is also an annual cost of maintaining the documentation that ISO 14001 requires. There are some economies of scale however since the cost of certification drops for every new site that is certified.⁴¹ Also some scholars argue that the cost cutting effects of an EMS implementation is greater than the cost of implementing the EMS, thus leading to a win-win situation for firms and the environment. In situations like this “*good ecology is good economy*”.⁴²

2.4 Culture

As the focus on environmental problems has increased in the business community throughout the 21st century, the question of whether organizations can be “greened” has been raised by several management scholars. In particular scholars have been interested in finding out if culture plays a role in a firm’s ability to embrace a greener way of doing business.⁴³ Purser (1994) for example argues that firms wishing to be ecologically sustainable have to institutionalize environmental beliefs and values into the very fabric of modern organizations, i.e. into the culture.⁴⁴ Indeed many more researchers suggest that organizations will have to engage in cultural change if they want to be able to handle the environmental challenges to come.⁴⁵

2.4.1 Components of a Culture

To pinpoint exactly which components that make up an organizational culture is difficult. There are nonetheless ideas of what important components in an

³⁹ Bansal; Bogner, (2002)

⁴⁰ www3.ivl.se, Effektivare miljöledningssystem

⁴¹ Bansal; Bogner, (2002)

⁴² Ibid.

⁴³ Harris; Crane, (2002)

⁴⁴ Purser, (1994)

⁴⁵ Harris; Crane, (2002)

organizational culture are. According to Bruzelius & Skärvad (2000) these include: *ideal goals, dominating ideas and values, significant actors and role models, standards and rules* and *informal communication channels*. These components are depicted in figure 4. The figure shows that all components influence the ideal goals of an organization and must therefore be taken into consideration.⁴⁶

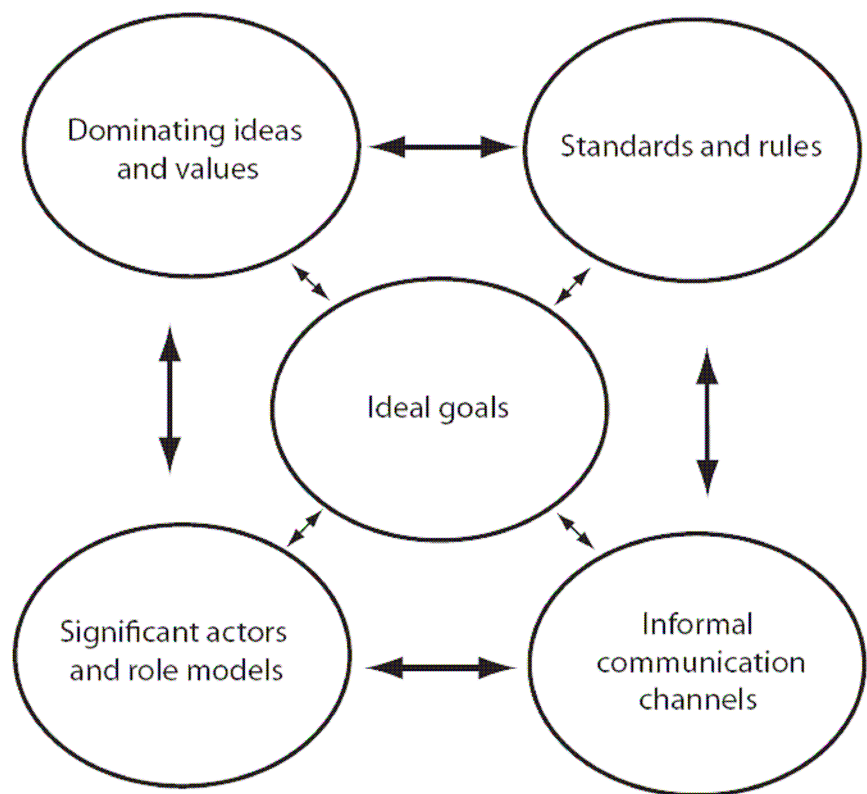


Figure 4 - Important components in an organizations culture, Source: Bruzelius; Skärvad, (2000), p.300ff

Ideal Goals

The typical example of a company's ideal goal is the company vision or mission. A firm's vision is an underlying value that is impregnated in all the employees throughout the organization.

Dominating Ideas and Values

Values that exist within an organization help employees to understand what is considered good and bad behaviour by the company. Bruzelius & Skärvad (2000)

⁴⁶ Bruzelius; Skärvad, (2000), p.310

argue that differences in values exist depending on the nature of the organization. A more mechanical organization is more likely to emphasize the importance of rules than an organic organization. One last point about values is that they are often derived from a firm's business concept and strategy.

Significant Actors and Role Models

Significant actors within an organization are people who have enough power and influence to affect the organization's values and ideas. These individuals often embody the company values through their actions and persona.

Standards and Rules

Standards and rules concern every aspect of an organization, from the way the employees communicate and conduct meetings to the formal work rules that exist. For a formal rule to have an effect incentives must exist e.g. there must be a possibility to give out rewards or punishment. This possibility is referred to as organizational control. Social control is another term used and it refers to the way a group handles informal rules and standards.

Informal Communication Channels

Informal communication channels play a big part in the web that is corporate culture. The informal communication channels are informal networks which put across values and standards in an organization and they are sometimes referred to as "gossip machines". According to some researchers up to 90 percent of the actions that take place in an organization are initiated through informal networks.⁴⁷

2.4.2 Developing and Shaping a Corporate Culture

According to Schein (1992), managers of an organization have a number of different mechanisms at their disposal when wanting to make changes in the corporate culture. These can be divided into primary and secondary mechanisms where the primary mechanisms can be summarized as "walking the talk". If the secondary mechanisms are to help shape and change the culture then they need to be aligned with the primary mechanisms. Some of the most relevant mechanisms for this thesis are presented below.⁴⁸

⁴⁷ Bruzelius; Skärvad, (2000), p.310

⁴⁸ Ibid., p.318

Primary Mechanisms

- Management interests and attention – The fact is that the issues which top management measures, controls, rewards and talks about are the issues which become important to the members of the organization.
- Resource allocation – Which issues that are most important to management becomes evident when resources are distributed within the organization. Important issues often receive the most resources.
- Rewards and status – The behaviour which employees see is rewarded the highest by top management will become the norm within an organization.⁴⁹

Secondary Mechanisms

- The organizational structure – The way in which responsibilities are defined and delegated within the organization affect the culture show which values management have.
- Systems and procedures – Reporting systems and routines also show what management values as important and unimportant.
- Formal statements – Clear statements of the company's vision, mission and culture can often be seen hanging on the walls of the offices. Even if the statements are slightly embellished they still give an indication of the culture and which values that are important.⁵⁰

2.4.3 Connection between Culture and Environmental Work

Since there are a large number of scholars currently studying the field of culture/environment there naturally exists a number of different views on what a green culture is and how the subject is best studied. There is however a consensus regarding certain ideal characteristics of green organizational culture. These ideal characteristics are summarised below;

- Companies should incorporate environmental considerations throughout the organization.
- These concerns should be considered throughout the value chain.
- Economic goals within the organization should be tempered.
- Organizations should display an intergenerational time frame in their planning.
- Spirituality, morality, smallness and futurity should be embraced.
- The environment should be afforded intrinsic valuation and respect.⁵¹

⁴⁹ Bruzelius; Skärvad, (2000), p.318

⁵⁰ Ibid., p.319

⁵¹ Harris; Crane, (2002)

2.5 Product Development

When aiming to develop a new product there are many different methodologies available. Regardless if one is aiming to develop an environmentally sound product or a conventionally designed product the methodologies are very similar. The product development process is a sequence of steps that a company uses to conceive, design and commercialize a product; it transforms a set of inputs to a set of outputs.⁵² A description of the product development process can be found in Appendix I. The product development process described is not specifically designed to take into account environmental impacts linked to different choices in the various stages of the development process.

2.5.1 Environmentally Sound Product Development

As the focus on environmental issues grows, companies are seeking better and more efficient ways of dealing with environmental issues within the organization. As a result more and more companies are implementing different kinds of “Design for Environment” methodologies. It is now accepted that products have an environmental impact during their entire life cycle. This includes all processes from extraction and procurement of raw materials through manufacturing, distribution usage and disposal.⁵³

The challenge for the environmentally sound product developer is to design a product which not only fulfils the customers’ needs in terms of performance but to do so in the most environmentally sound way possible. Research shows that the environmental aspects must be addressed during this stage; otherwise environmental demands will not be properly addressed. For most companies the primary concern is to design commercially successful products, this leads to the fact that environmental aspects must be thoroughly integrated into the design of the product so that the product can deliver both competitive functionality and low environmental impact.⁵⁴

2.5.2 Methods and Tools for Environmental Evaluation

With today’s knowledge regarding product life cycles it is known that a products environmental load often is incurred during the entire life cycle. Therefore products are now studied using a perspective which takes into account their entire life cycle, from the cradle to the grave; this is known as the life cycle perspective. There are a number of different methodologies which aim to integrate environmental thinking

⁵² Ullrich; Eppinger, (2003), p.11ff

⁵³ Santos-Reyes; Lawlor-Wright, (2001)

⁵⁴ Luttrupp; Lagerstedt, (2006)

into the design process and they all have their virtues. They vary in complexity ranging from easy to grasp checklists to full life cycle assessment.⁵⁵ Figure 5 shows four different methodologies available and also gives an indication of the amount of time required to complete them.

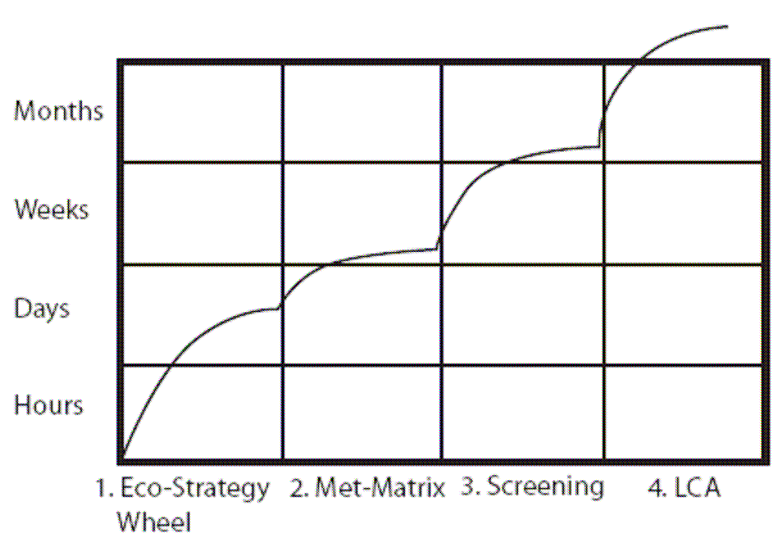


Figure 5 – Time required for environmental reviews Source: www.nutek.se, *Metoder för miljöanalys*

The decision regarding which methodology to use should be based on several different factors. A company that is just beginning to implement environmentally sound product development will find it extremely difficult to conduct a full life cycle assessment due to the vast amounts of data required, it is therefore a good idea for them to start using a simpler method and evolve this as more and more knowledge is gained about their products and production processes.

Eco Strategy Wheel

The ecodesign model developed in “Ecodesign: A promising approach to sustainable production and consumption” is intended to be used parallel with a companies existing product development process. It should continuously give directions and pointers as to how the developers can optimize a products environmental

⁵⁵ Ammenberg, (2004), p.269ff

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performance. The authors have developed a model they call the Ecodesign Strategy Wheel which is shown in figure 6.⁵⁶

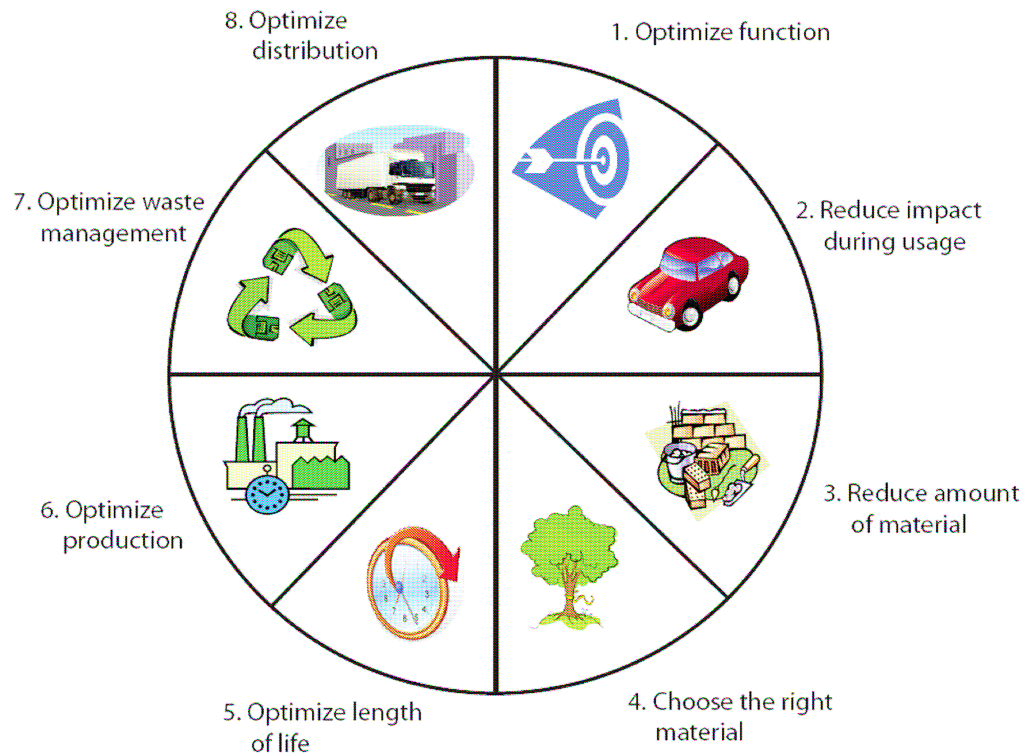


Figure 6 – The Eco-strategy wheel Source: Brezet; Van Hemel, (1997), p.80ff

The ecodesign wheel can be used in different ways. It can either be used as a worksheet where ideas and concepts are structured to give directions as to where more work needs to be done, or it can be used as an option generating tool. When using the ecodesign strategy wheel as an option generating tool it leads the design team towards areas that will lead to improvement of the environmental profile of the product, without describing the separate environmental effects. In this situation the environmental strategy wheel acts as a general framework provoking new ideas and solutions.⁵⁷ For a deeper description of how the eight steps in the eco strategy wheel can be used please read Appendix III.

⁵⁶ Brezet; Van Hemel, (1997), p.80ff

⁵⁷ Ibid.

Met Matrix

The MET matrix provides a structured outline describing a products Material, Energy and Toxic substance use. The MET matrix provides a simple description of the products life cycle with both a quantitative and qualitative perspective that can later be expanded into a more detailed environmental analysis.⁵⁸

Life Cycle Screening

Life cycle screening is a method developed to give designers an easy way to assess a products environmental impact during the product development process. The method is not as extensive as a full life cycle assessment and thus also far less time consuming. The method uses pre calculated environmental impact indexes which have been calculated for many of the most common materials, production processes and means of transportation. When designing a complex product a designer is often faced by a number of tough decisions regarding for example choice of materials and production techniques. The process of integrating environmental aspects into this process often proves to be an unbridgeable gap for designers; life cycle screening shortens this gap.^{59 60}

Eco-indicator 99 is one of many different tools available for these calculations. The Eco-Indicator 99 provides index values for over 200 commonly used materials and processes making it possible for designers to easily perform a life cycle screening of their product. The Eco-Indicator 99 method can however only be used in the early stages of the product development process. This is since decisions in for example the detail design phase of the product development process require more company specific information. In table 1 a life cycle screening done by Eco-Indicator 99 is shown for a production process of a product. The inputs needed by the Eco-Indicator are a specification of the products life cycle including production processes, transport and waste handling, and a specification of which materials and in which amounts that will be used. With this information the amount is multiplied with the indicator value and a result is obtained for each process.⁶¹

The Eco indicator takes into account three different types of “environmental impact”. These do not cover all possible impacts but do deal with the most pressing issues. The indicator divides the impact in three types of damage.

⁵⁸ www.nutek.se, Met-matris

⁵⁹ www.nutek.se, Livscykelnscreening

⁶⁰ www.pre.nl, *Eco Indicator 99 – Manual for designers*

⁶¹ Ibid.

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1. Human health - Under this category the number and duration of diseases are included and the number of years of premature death caused by environmental issues. Human health includes the effects caused by climate change, ozone layer depletion, carcinogenic effects, respiratory effects, ionizing radiation.
2. Ecosystem quality – Under this category the effects on species diversity is included, especially for vascular plants and lower organisms. The effects included are ecotoxicity, acidification, eutrophication, and land-use.
3. Resources – In this category the extraction and use of minerals and fossil fuels are considered, future needs to extract lower quality minerals are also included.

Table 1 – Example of Eco-indicator table for some materials Source: www.pre.nl, Eco Indicator 99 – Manual for designers

| Production | | | |
|----------------------------|---------------|------------------|---------------|
| Material or process | Amount | Indicator | Result |
| Polystyrene | 1 kg | 360 | 360 |
| Injection moulding | 1 kg | 21 | 21 |
| Aluminum | 0,1 kg | 780 | 78 |
| Extrusion Aluminum | 0,1 kg | 72 | 7 |
| Steel | 0,3 kg | 86 | 26 |
| Glass | 0,4 kg | 58 | 23 |
| Gas-fired (forming) | heat 4 MJ | 5,3 | 21 |
| Total [mPt] | | | 536 |

The result column gives an indication of what part of the production process that should be focused upon. By doing this evaluation of other processes in a products life the most crucial areas in regards to environmental impacts can be located and dealt with.⁶²

The life cycle screening methodology does however have limitations. The results of a life cycle screening should only be used to make products and services more environmentally sound and not as a mean of marketing, environmental labeling or proof that your product is better than competitors. This limitation is set by the Eco

⁶² www.pre.nl, *Eco Indicator 99 – Manual for designers*

Indicator 99 authors. For further specification of which factors that are included under the different indicators please see the Eco Indicator 99 – Manual for designers.⁶³

Life Cycle Assessment

Life cycle assessment is a tool that is used to, in an objective way, shed light upon the environmental impact of a product, process or activity. This is done by identifying and quantifying energy and material usage and other sources of environmental impact. Thereafter the type and seriousness of these impacts are assessed, and suggestions of ways to reduce them are provided. The analysis includes the entire product process which includes choice of raw material, extraction and procurement of energy and raw material, production processes, transport and distribution, product use, maintenance, product re-use, recycling, and waste disposal.⁶⁴

2.6 Procurement

Per definition, the term procurement includes all activities within a company that help to supply production units with goods and services which they need. These activities include identifying needs, choosing suppliers, negotiating prices, drawing up contracts and following up on the status of orders to ensure that contracts are obeyed. An important aspect to note here is that procurement does not only focus on the purchasing of components and material for manufacturing but it also includes the purchasing of such services as transportation and maintenance and is therefore closely linked to an area such as distribution.⁶⁵

The procurement functions single most important assignment historically has been to gather information regarding supplier prices and then to choose the supplier with the lowest price. Often the assignment has not only included finding the lowest price but also to lower this price a few percent. This is not the case today though since other factors such as lead time, quality, flexibility and service levels have become important to. Price is just one of many factors that play a part when a company chooses a supplier. This development has meant that the importance of the procurement function has increased. In business today a superior procurement function can create a competitive advantage for a firm.⁶⁶

Most other departments within a company are dependent on the procurement function in some way. The finance department is dependent on the prices at which the procurement department is purchasing supplies and the logistics department is

⁶³ www.pre.nl, *Eco Indicator 99 – Manual for designers*

⁶⁴ Ammenberg, Jonas,(2004), p.276ff

⁶⁵ Björnland et al., (2003), p.250

⁶⁶ *Ibid.*, p.251ff

dependent on procurement since they need to know when supplies are coming in and in which volumes. The fact is that today procurement plays a big part in the success of a business.⁶⁷

2.6.1 Ways of Greening Procurement

Environmental issues have become more and more important within many areas of business and procurement is no different. For a company today to be seen as a serious actor in the field of environmental care, environmental considerations need to be taken within all functions of the organization. Companies need to reduce the amount of raw materials and energy they use and here procurement can play a big role.⁶⁸ What is green procurement then? Green procurement is "*the selection of products and services that minimize environmental impacts. It requires a company or organization to carry out an assessment of the environmental consequences of a product at all the various stages of its lifecycle. This means considering the costs of securing raw materials, and manufacturing, transporting, storing, handling, using and disposing of the product.*"⁶⁹

If procurement is to play a role then the purchasers of tomorrow will have to take a greater responsibility for how material and components which enter the realms of the company leave it. They will have to assess whether current raw materials and components can be replaced by recyclable, recycled or less harmful inputs. Ways of greening procurement and purchasing include purchasing more material in bigger quantities and bulk to reduce the transport related pollution. This means that factors such as reduced warehousing costs and Just-In-Time deliveries will have to give way for environmental considerations. Another reason procurement is so important is that the level of environmental work done by ones suppliers often determines the level of one's own environmental work.

When choosing a supplier it is not always as easy as it looks to make accurate environmental choices. Tools which help to guide purchasers are constantly developed though and examples of such are ISO 14001, LCA assessment of a product and environmental product certifications. If a company wants to take environmental issues seriously it should make use of such tools in its procurement process. In cases when there are no environmental certifications to help guide the purchaser, he or she

⁶⁷ Björnland et al., (2003), p.254

⁶⁸ Ibid., p.156ff

⁶⁹ www.bsdglobal.com, Green Procurement

should conduct an analysis on his or her own by asking relevant questions and placing certain demands on the supplier.

The future of green procurement is also dependent on an even greater cooperation between purchasers, product developers and end users. Sustainable products will in the future be standardized to a higher extent, constructed so that they are easy to dismantle and made from recyclable material. The job of finding materials and suppliers fitting these descriptions will be placed on procurement.⁷⁰

2.7 Manufacturing

Manufacturing or production is a term which incorporates many different activities. Some people for example view all human activity as production. Most often though the term production refers to the manufacturing of goods and services which consumers are willing to pay for. This is also the view of manufacturing which this thesis takes. The manufacturing of goods or services can be viewed as a process of transformation where raw material or components are transformed into finished products. Besides these physical inputs and the finished products, a manufacturing process also contains a variety of information, feedback. The feedback may contain information such as product and process quality, quantities produced, costs and so on. An example of how a manufacturing process may look is depicted in figure 7. Figure 7 shows how feedback flows from a company's outputs, back into the inputs thus closing the circle and continuously improving the process.⁷¹

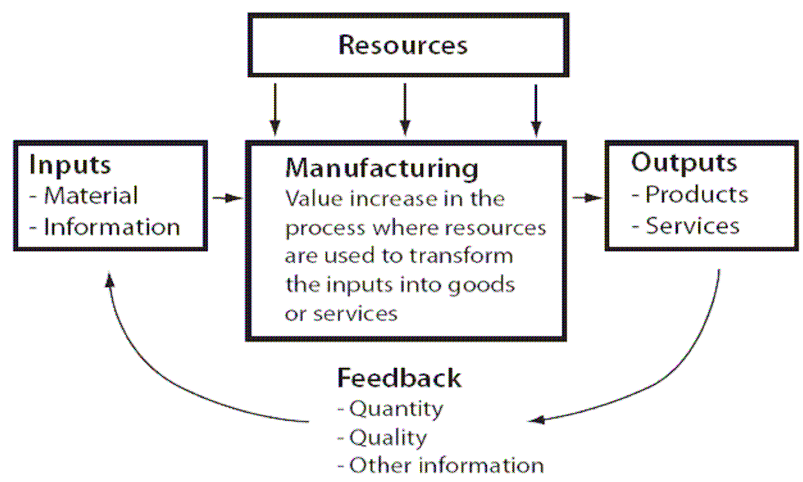


Figure 7 - Manufacturing process, Source: Björnland et al., (2003), p.217

⁷⁰ Björnland et al., (2003), p.166ff

⁷¹ Ibid., p.216

As mentioned before the inputs into the process may consist of raw material, components and information. The resources needed to carry out a manufacturing process can be divided into four categories, *capital, technology, energy and human resources*. The four different categories of resources are always present in a manufacturing process; however the importance of them differs from process to process.⁷²

2.7.1 ISO 14001 – An Environmental Tool

To handle environmental issues within the manufacturing process there are a number of different tools or methods available to companies today. The most common way is to implement an EMS such as ISO 14001 or EMAS.⁷³ ISO 14001 is an EMS designed by the International Organization for Standardization (ISO) and it is built upon the principles of an EMS. Even though ISO 14001 focuses on management processes its greatest positive effects occur within manufacturing. The reason for this is the fact that an EMS forces a company to list all the ways in which it has an impact on the environment. For most companies that manufacture goods, the list of environmental aspects will primarily concern the manufacturing process. The fact that an ISO 14001 certification can be applied to individual production sites and does not have to include the entire firm has probably also contributed to the application of ISO 14001 as a tool for handling operational environmental issues.⁷⁴

2.7.2 Other Tools for Handling Environmental Production Issues

For some companies the implementation of an EMS, like ISO 14001 or EMAS might seem like a daunting task. It might be that they find the initial costs too high or simply do not have the knowledge required to carry out the implementation. There are nonetheless other somewhat simpler tools which can assist with improving environmental performance within operations.⁷⁵ One such example is Key Performance Indicators (KPI). KPIs exist in other areas of business, particularly financial parts. The use of KPIs to measure environmental performance does not differ on principle from how they are used in other areas. The basic idea of KPIs is

⁷² Björnland et al., (2003), p.217

⁷³ Bansal; Bogner, (2002)

⁷⁴ Ibid.

⁷⁵ Institutet för Verkstadsteknisk Forskning, (2000), *Miljöverktyg*

that an objective that the firm wants to reach is set up and then KPI's are used to ensure that the objective is met.⁷⁶

2.8 Distribution

The need for fast and frequent deliveries of products from a manufacturer to various consumers is the foundation of all distribution systems. Consumer demands can however not always be met due to economical and physical restrictions. This has resulted in a number of different types of distribution systems, all with different advantages and disadvantages. The most common types of delivery systems are direct delivery, single-terminal and multi terminal systems. Simply put the direct delivery system contains the most transport relations out of the three systems and has the greatest flexibility while the single terminal system has the least number of transport relations and the least flexibility. The terminal in a single terminal system can be viewed upon as a central warehouse where all the goods manufactured are stored and that serves all customers within the network.⁷⁷

2.8.1 Environmental Effects

Today's distribution and transportation systems often meet or even exceed the demands posed by businesses and consumers. The level of cost, reliability and speed in today's distribution systems has facilitated the integration of production sites and changed the terms on which subcontractors operate. Since transports today are so cheap and reliable focus has shifted towards the environmental and safety aspects of distribution. One reason for this is the fact that life cycle assessments often highlight transportation as an area that has a great affect on the environment.⁷⁸

Distribution of goods affects the environment in many different ways. The most obvious way is through the release of CO₂, and other green house gases, into the atmosphere. Already in 1994 the emissions from traffic and transport amounted for up to 40 percent of the total emissions of CO₂ in Sweden. Other effects on the environment include other air pollution, noise pollution and water contamination from NO_x.⁷⁹

⁷⁶ Institutet för Verkstadsteknisk Forskning, (2000), *Miljöverktyg*

⁷⁷ Lumsden, (2004), p.551ff

⁷⁸ Ibid., p.631

⁷⁹ Ibid., p.634f

2.8.2 Ways of Improving Distribution

The environmental impact of the transport and distribution phase of a products life cycle can be divided into two parts, internal and external factors. Different ways of decreasing the environmental impacts can therefore also be divided into two parts, external and internal. Internal ways of decreasing the environmental impact focuses mainly on the improvement of roads, vehicles and fuel.⁸⁰

The external part involves the use of available resources. This is the most effective way, available today, to improve the environmental performance of distribution networks. Presented below are some of the ways in which a firm can improve its distribution, with regards to the environment.⁸¹

Service Levels

The demands regarding speed, flexibility and frequency in distribution networks have steadily increased over the past decade. This has had a negative impact on the environment since it has resulted in an increase of transport relations. If companies continue to increase the service levels, environmental improvement can only be gained through internal factors which will be costly and take time. One way of decreasing the environmental impact quickly and effectively is to lower service levels.⁸²

Joint Loading

Trucks operating today are on average loaded somewhere between 40-60 percent of their capacity. In theory this means that the environmental impact of road transport could be almost halved. If companies that have distribution networks which are located in the same area used joint loading studies show that it is possible to achieve a 20-25 percent reduction in transportation kilometres.⁸³ All changes which decrease the number of transports are beneficial for the environment.⁸⁴

“Green” Outbound Shipments

The concept of green outbound shipments basically means that a goods bound for a certain region is not shipped until it can be fitted on a truck bound for the same region which is full. This means that the firm makes sure that trucks use one hundred percent

⁸⁰ Lumsden, (2004), p.639

⁸¹ Ibid., p.639

⁸² Ibid., p.644

⁸³ Ibid., p.644

⁸⁴ Ibid., p.646f

of their capacity. A negative effect of green outbound shipments is on the other hand an unsure frequency of delivery since it is hard to predict when a truck which is going to the right region and with the right capacity will be available.⁸⁵ There is also the possibility of using green transports provided by shipping agents. DHL for example offers a service which they call “Go Green” which means that they offer carbon neutral transports.⁸⁶

2.9 Product Use

We have decided not to include any tools or theories regarding product use. The environmental impact incurred during this part of the life cycle is however largely dependent on the decisions made during the product development phase.

2.10 End of Life

Offering aftermarket services has become more and more important for manufacturing companies wanting to please their customers. These aftermarket services include handling claims, maintenance and repairs and disposal of the product. Particularly, the disposal of used products has come under increased focus as awareness of environmental issues has increased in society.

Manufacturing companies have however up until recently shown little interest in setting up systems that handle the end of life issue. The heightened environmental awareness and attention on recycling and re-usage of products has nevertheless spurred companies to take action within the area and to set up systems which aid consumers at the end of a products life.⁸⁷

2.10.1 Different Systems of Collecting Used Products

There exist a number of different systems which all aim to aid the collecting of used products. The systems differ in two major ways. Firstly the system can be an open or a shut system and secondly the system can use new or traditional logistical channels. The use of traditional logistical channels means that the used products are transported back to the manufacturer using the same intermediaries that are used when distributing the product in the first place. Consequently the use of new logistical channels implies that used products are handled by intermediaries other than the one who originally distributed the product. In a shut collection system the components of

⁸⁵ Lumsden, (2004), p.645

⁸⁶ www.dhl.se, DHL och miljön

⁸⁷ Björnland et al., (2003), p.169f

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a used product are utilized again in the same type of product, an example of this is aluminium cans. It is also common in this type of system that the manufacturer handles the recycling of the used product. In an open system on the other hand, the materials of a used product are utilized in many other types of products, an example being household waste.⁸⁸

The common denominator for all systems aiming to collect used products is cooperation. If a system is to be successful, cooperation is needed between suppliers, manufacturers, distributors and consumers. The most crucial link in the chain just mentioned are the consumers, since the success of the recycling system is dependent on them doing a good job at the end of the products life.⁸⁹

⁸⁸ Björnland et al., (2003), p.173

⁸⁹ Ibid., (2003), p.174

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3 Methodology

This chapter will describe the process of writing this thesis. The reliability and validity of the thesis will also be discussed along with the criticism that may be brought against the study.

3.1 The Process of Writing This Thesis

When the process of writing this thesis began, the purpose and aim of the thesis was not completely determined. A mutual vision existed among the stakeholders regarding what the thesis would result in but the purpose and aim were not specifically expressed. Naturally the aim and the purpose were altered slightly during the projects first few weeks until an outline that suited all the involved stakeholders could be found. Judith Bell states that small changes to the thesis' purpose during the work process are fine. The important thing is that a purpose exists so that there is something to alter⁹⁰. This has been guiding star for this project, to always have a purpose expressed, in order to ensure that the work has not gone astray. The purpose of this thesis can be viewed as having had two parts. The first part entailed investigating why Thule should go green, while the second part involved an investigation into the current situation at Thule and how a green venture might be undertaken.

The suitability of a method depends on the nature of the problem or issue being researched. In the case of this thesis the problem involved motivating why environmental profiling is worthwhile and also how an organization can achieve this profile. Since there was no hypotheses concerning the result and the collecting of empirical data called for an open attitude, the most suitable method for the thesis was deemed to be a qualitative.⁹¹ The qualitative method implies that the researcher tries to create an understanding of a unique problem and by analyzing it he or she can gain a deeper understanding of the specific problem area.⁹² However a small part of the thesis also called for a quantitative method, more specifically the Life Cycle Screening and the Product Use chapters. A quantitative method is characterized by the use of numerical observations such as experiments, tests, surveys and questionnaires.⁹³

⁹⁰ Bell, (2006), p.42

⁹¹ Bryman; Bell, (2005), p.297

⁹² Andersen, (1998), p.20ff

⁹³ Backman, (1998), p.31

3.1.1 Investigating Why Thule Should Go Green

Since part of the purpose was to investigate why Thule should go green information regarding the subjects of consumer trends, competitor actions, financial value of going green and successful examples of company's gone green were needed. This information was gathered both by using primary and secondary sources of information. A primary source is a source from which material can be gathered during the project and that helps to make up the empirical data in the study.⁹⁴ A secondary source interprets the primary sources, the raw empirical material.⁹⁵ Primary sources in this part of the project included interviews, both via telephone and e-mail, with experts and other relevant individuals within each field. To gain as deep an understanding as possible of the subject and to try and make sure that as many angles as possible were covered; we interviewed different experts within the same field. The face to face and over the phone interviews were conducted using a semi structured interview guide. This is deemed to be the best structure by many since it allows researchers to focus in on the problems that are relevant while at the same time allowing the interviewees to develop their thoughts on areas they find important.⁹⁶ Secondary sources in this part mainly consisted of articles, books and studies on the subject. After gaining substantial knowledge of the subject we analyzed how the different trends in society might affect Thule, in order to show Thule the specific value of going green for them.

3.1.2 Investigating How Thule Could Go Green

In order to investigate how Thule handled environmental issues and how they could improve within this area in the future, a theoretical framework which allowed us to examine this had to be established. To be able to fully understand how all functions within a company operate a literature study was conducted. During this literature study the environmental aspect was also regarded and it became apparent that a full life cycle perspective was the best way of highlighting both the different functions themselves but also the connection between them. This realization led to the creation of the analytical framework presented in figure 1. The framework then provided a structure in our empirical data gathering, pointing out from which different parts of the company we needed to collect data. During the analysis both the developed framework and presented tools were used to show Thule their strengths and weaknesses regarding environmental aspects. The primary sources of information in this part of the thesis included interviews with key individuals within each of the functions mentioned in the analytical framework. These interviews were performed

⁹⁴ Bell (2006), p.125

⁹⁵ Ibid., p.125

⁹⁶ Denscombe, (2000), p.10ff

with individuals both inside and outside the firm and they were conducted face to face, over the telephone and via e-mail. The interviews were as before, semi structured, and the questions were based on relevant theories. It was also in this part of the thesis that a more quantitative method was used in order to calculate the impact of a roof box on the environment. Other key sources of information included internal documentation and observations made by us, the authors of this thesis. Qualitative observational studies can be categorized as either observer-based or participatory-based⁹⁷. Our observations leaned more towards participatory-based observations since we observed, listened, questioned and acted. This method was for example used when studying Thule's culture. Secondary sources mainly consisted of books from Lund's University Library, articles from the ELIN database and other relevant publications suggested to us by our tutors, experts and fellow students. Their help ensured that we chose the most relevant material previously written on the subject.

3.2 Overall Validity of the Thesis

For this thesis to be considered trustworthy and valuable for Thule and the academic community, the overall validity of the study needed to be addressed. The overall validity of a study consists of three parts, reliability, internal validity and external validity.⁹⁸

3.2.1 Reliability

Reliability concerns how the layout of the study has affected the results. If the reliability of a study is high then one should be able to do two studies with the same objective and methods and get the same results, provided the population has not changed⁹⁹. A good pre-requisite for reliability is thoroughness by the author in the literature-study phase.¹⁰⁰ The fact that this thesis has been written by two authors has decreased the risks of missing out on or misinterpreting information. The reliability of the material which has been collected through interviews is harder to control though. This is because of the fact that such material to some extent relies on personal opinions and these opinions can change overtime due to external factors or because of the attitude of the interviewer. In this thesis this problem has been addressed by interviewing personnel from different parts of the organization on the same topic to try and cover the issue from as many angles as possible.

⁹⁷ Svenning, (1999), p.85f

⁹⁸ Jacobsen (2002), p.10ff

⁹⁹ Svenning, (1999), p.85f

¹⁰⁰ Ekengren; Hinnfors, (2006), p.81

3.2.2 Internal Validity

Internal validity handles the interaction between theory and empirics within the project. Good internal validity certifies that the method used actually measures and examines that which is supposed to be examined in the study. The inner validity concerns the design and the structuring of the project and the parts within it. If the project's minor parts are not valid then the entire project cannot be valid.¹⁰¹ To ensure a high degree of internal validity in this project the theoretical framework used has been constantly compared with the purpose of the thesis. In this way the validity has been controlled continuously both by the author's and by the tutor's. Also a large number of data sources have been used, all with different interests in the project and this, hopefully, has enhanced the internal validity of the project.

3.2.3 External Validity

The external validity handles the question of generalization of the findings from a specific study to a wider context. Qualitative data is often very context specific and hence researchers must be very careful about generalizing.¹⁰² How many of our findings that are applicable to a wider context is hard to determine, but we feel that the overall environmental debate and the issues it brings with it has relevance for many companies in this day and age.

3.2.4 Credibility and Criticism of the Thesis

Apart from the issue of overall validity there is the fact that when writing a thesis such as this, in close connection with a corporation and using participatory observations as a research method, there is always a risk of losing part of one's objectivity. The observer can become transformed into a true participator and lose perspective by way of friendship, feeling etc.¹⁰³ During the process we were aware of this risk and we tried to deal with it by distancing ourselves from other employees during work hours and keeping the interaction to breaks and interviews. We also kept a constant dialogue with our tutors at the university to ensure a certain level of objectivity. Still we cannot exclude the fact that we might have been influenced by people and ideas at the company but by the actions mentioned above we have tried to limit this risk.

¹⁰¹ Svenning, (1999), p.64

¹⁰² Ibid., (1999), p.65

¹⁰³ Ibid., (1999), p.86

4 Why Go Green

The aim of the following chapter is to examine how current trends in society and the industry in which Thule operates are affected by the climate debate. Consumer behavior, competitor behavior, as well as coming legislative and financial demands will be presented. The gathering of information in this chapter is partly based on the PESTEL framework but will also utilize examples of how companies have profited from making environmental issues a part of their core strategy.

4.1 Environmental Trends

The car accessories industry has not yet to felt any real pressure regarding environmental issues in relation to their product, this does however not mean that there is none. In order to gain insight into factors that may influence Thule in the future a number of areas of interest were investigated.

4.1.1 Consumer Behavior is Changing

Just a few years ago the relationship between business and society was simple, satisfy shareholders and don't break the law. Over the last few years this relationship has however become increasingly more complex as difficult environmental, social and governance challenges weave themselves in to day to day business decisions. Today more and more executives are realizing that the only way of dealing with social responsibility effectively is by integrating it into their core business strategy making it an ally in their quest to build a sustainable company and gain a competitive advantage.¹⁰⁴

The changes required due to the environmental debate might well be imposed by government regulations but the market might just as well be better equipped to handle the problem of growing green house gas emissions. The challenge is great, and the price of failure may be devastating. A company's way of handling social, environmental and governance issues might well be a determining factor of how large market share the company can claim. This trend is fuelled by a new breed of consumers that are environmentally and socially aware, and are taking action in accordance to their beliefs.¹⁰⁵

Consumers increasing concern regarding environmental issues is shown in figure 8. The figure shows both executives and consumers view of what issues that will be

¹⁰⁴ The McKinsey Quarterly, p.9f

¹⁰⁵ Ibid.

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most important to them during the next five years, environmental issues ranks highest among consumers and finished second among executives.

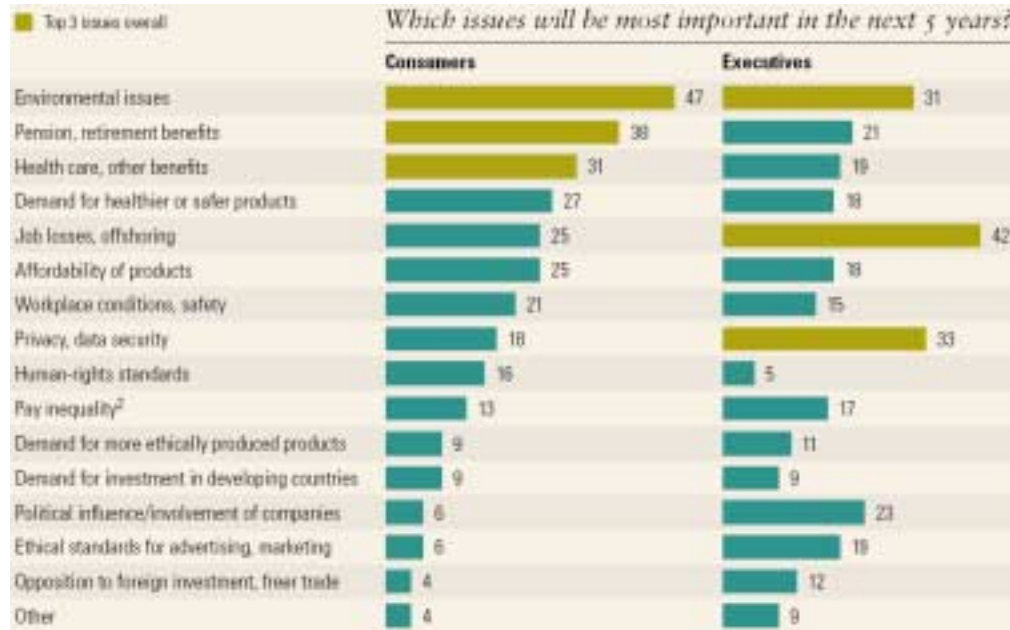


Figure 8 – Most important issues for consumers and executives during the next five years in China, France, Germany, India, Japan, United Kingdom, United States. Source: The McKinsey Quarterly, p.43

This figure says much in itself but it becomes a problem for companies only when consumers start acting in accordance with their beliefs. Recent surveys however show that consumers are ready to act against corporate behavior they think is not in the best interest of society. An example of this trend is that half of US consumers say they have refused to buy products or services for this reason, and four out of ten have recommended friends to take the same action.¹⁰⁶ Torbjörn Laike, associate professor at Lund University concerning Environmental Psychology, stresses that consumers are only in the beginning of acting in response to growing environmental trends. Companies cannot afford to be left behind when consumer behavior really starts favoring environmentally conscious products.¹⁰⁷

¹⁰⁶ The McKinsey Quarterly, p.44ff

¹⁰⁷ Laike, Torbjörn, *Associate Professor*, Environmental Psychology – Lund University, 2008-03-26

Consumers today are willing to make changes to their behavior; this should be considered as an opportunity rather than a risk. More than half of all consumers are willing to recycle, to buy energy efficient appliances, and to drive more fuel-efficient cars. This will inevitably lead to that the markets for these products are likely to grow as consumers start acting according to their beliefs. This gives companies an opportunity to differentiate themselves by acting on environmental and other social issues and to build consumer trust by displaying the work they are doing in the correct way. Creating awareness is critical since consumers buy products from companies they trust.¹⁰⁸ A common denominator for recycling, energy efficient appliances and fuel efficient cars is that the consumer directly can see the impact of their changed behavior. This is one of the most important factors when it comes to changing consumer behavior, the closer the link between cause and effect, the higher the probability is that a consumer may change his or her behavior in response. When drivers realize that their new fuel efficient car is saving them hundreds of dollars each month, the link could hardly be stronger. This shows yet another important aspect when it comes to changing consumer behavior, economic incentives. Torbjörn Laike points out that changes in consumer behavior can be accelerated by highlighting that good ecology and good economy goes hand in hand.¹⁰⁹ The importance of the combination of good ecology and good economy is further highlighted by Professor Anna-Lisa Lindén who is active at Lund University and has conducted extensive studies regarding the efficiency of policy instruments in influencing human behavior.¹¹⁰

4.1.2 Environmental Legislative Trends

Sustainable development, climate change and competitiveness are three terms which are currently at the centre of discussions within the EU. The member states have agreed on ambitious targets for the future in the reduction of greenhouse gas emissions and in order to reach these targets the EU believes that an industrial policy initiative is required. The policy should promote innovation and the deployment of European low carbon, energy efficient technologies, products and services.¹¹¹

The EU has however already moved down the path of legislation for sustainable development through a number of directives which have been passed during the 21st century. One example is directive 2002/96/EC on Waste Electrical and Electronic

¹⁰⁸ The McKinsey Quarterly, p.42ff

¹⁰⁹ Laike, Torbjörn, *Associate Professor*, Environmental Psychology – Lund University, 2008-03-26

¹¹⁰ Lindén, Anna-Lisa, *Professor*, Sociologiska Institutionen - Lund University, 2008-03-31

¹¹¹ <http://ec.europa.eu>, Towards a sustainable industrial policy

Equipment (WEEE) which enhances producer responsibility to electrical products.¹¹² Producer responsibility currently applies to the following categories of products; packaging, tires, recyclable paper, automotive vehicles and electrical products¹¹³. Another example of legislation for sustainable development is directive 2005/32/EC which lays out requirements on eco-design implementation in product development processes for certain products. The directive applies to all energy using products, except for means of transport.¹¹⁴

The examples mentioned above have in common the fact that they try to improve the sustainability of products in Europe and thereby create a better environment. The EU however wants to do more and according to a background document to a future directive, the EU is considering actions which go far beyond the directives passed so far. One of the proposed actions is a far reaching benchmarking system for all product categories, designed to reward frontrunners in environmental performance and to help consumers chose the most sustainable products.¹¹⁵ The background document also mentions instruments such as taxation policies for poorly performing products with regards to sustainability and subsidies for consumers buying products which perform better in terms of the environment.¹¹⁶

When asking the Director for Sustainable Development and Integration within the EU, Timo Mäkelä, about the suggestions in the document and the timeframe of implementation the answer is that a proposal for a new directive will be presented in May 2008. Furthermore Mäkelä states that the directive concerning eco-design requirements in product development processes will be expanded to cover all product groups and this suggestion will also be a part of the directive that will be laid forward in May 2008.¹¹⁷

4.1.3 Large Financial Institutions and Investors Demand Action

With the ongoing climate debate the importance of environmental issues has also reached the stock markets and financial investors there. In Sweden the demand for companies to publish annual Corporate Social Responsibility reports is increasing and from January 1st 2008 such a report is required from all companies in which the

¹¹² <http://ec.europa.eu>, European Commission

¹¹³ www.naturvardsverket.se, Producentansvar

¹¹⁴ <http://ec.europa.eu>, Directive 2005/32/EC

¹¹⁵ <http://ec.europa.eu>, Background document

¹¹⁶ Ibid.

¹¹⁷ Mäkelä, Timo, *Director for Sustainable Development and Integration*, European Union, 2008-03-13

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Swedish government is an owner. More and more publicly listed companies are also following the recommendations by the Global Reporting Initiative to produce a separate sustainability report. Although CSR and environmental work are not equivalent the issues are often handled in the same way, and the effects of poor performance in any one of these areas will lead to badwill for the company involved.¹¹⁸

Large investors on the OMX stock exchange are the four big banks Swedbank, Nordea, SEB and Handelsbanken who, through their different funds, invest and reinvest hundreds of billions SEK each year. For them the climate debate and the increased awareness among their customers of environmental issues, has brought with it increased focus on the environmental performance of the companies in which they invest. Swedbank Robur, which is the second largest investor on the OMX stock exchange behind the Swedish government, is one institution which offers ethical funds. Anna Nilsson, responsible for ethical and environmental analyses at Swedbank Robur, believes that it is important that big investors like Swedbank Robur take responsibility for the sustainability issue and that the share of owners taking this responsibility will increase over the next few years. Nilsson does not however see a near future in which owners drop corporations from their portfolios due to poor environmental performance. Instead she says the trend is that owners will exercise pressure in the board rooms to try and accomplish change from within.¹¹⁹

The reasoning is the same among other investors, especially within institutions such as the Swedish pension funds. The analysts at the Second AP Fund for example follow ten principles when investing in publicly listed companies, one of which is good ethics and environmental performance.¹²⁰ In order for the fund to invest in a firm, the firm needs to display awareness of its environmental affect and a willingness to improve.¹²¹ The Second AP Funds environmental demands have resulted in heightened awareness in companies such as Volvo, TeliaSonera and Assa Abloy¹²². The trend when it comes to environmental concerns among financial investors is according to Carl Rosén, chief of Ownership Control and Information at the Second

¹¹⁸ www.e24.se, Företag tjänar på ett rent samvete

¹¹⁹ Nilsson, Anna, *Responsible for Environmental and Ethical Fund Analysis*, Swedbank Robur, 2008-03-18

¹²⁰ www.ap2.se, Ägarrapport

¹²¹ Johannisson, Anci, *Information & Projects*, Andra AP Fonden, 2008-03-17

¹²² www.ap2.se, Ägarrapport

AP Fund that sustainability issues will be of even greater importance when choosing to invest ten years from now.¹²³

4.1.4 Retaining Talent

Today's companies rely, in a steadily growing extent, on individual's knowledge and professional competence in order for their company to be successful. Bearing this in mind it is not hard to motivate for companies that they should use all means possible to ensure that they are attracting the right people to take their company forward.¹²⁴ Today Companies do not only use their environmental image, if positive, to boost their brand and build a good image but also to attract and retain talented individuals essential to long-term growth of their company.¹²⁵

The Swedish market analysis firm Universum has conducted a study on how a company's corporate social responsibility work influences students and young professional's choice of future employer. Universum introduces the term Employer Branding which is about building a long term image for your company in order to attract the right employees. Having a trustworthy social commitment helps companies to build the right image. Although there are more factors included in the term corporate social responsibility; environmental issues is a large part of the term. 33 percent of the students responded that social responsibility will have great impact on their choice of future employer. This ranked as the third highest factor after the company having exciting products and services and the company having a good and trustworthy management. Among the young professionals social responsibility ranked in fifth place.¹²⁶

4.2 The Value of Going Green

4.2.1 Reduced Costs

Many corporate leaders today have a strong focus on profitability. In order to motivate such companies to actively embrace environmental issues it is often required that the investment can be motivated in terms of reduced costs, increased earnings and increased competitiveness which in turn will lead to increased market share. It is often difficult to directly link for example increased sales to a company's environmental work but some cost savings are easier to see.¹²⁷

¹²³ www.ap2.se, Ägarrapport

¹²⁴ Abbasi et al., (2008)

¹²⁵ The McKinsey Quarterly, p.9f

¹²⁶ Dyhre, Anna, Socialt ansvarstagande - Åsikter hos studenter och young professionals, Universum presentation

¹²⁷ Ammenberg, (2004), p.155ff

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Companies that work with an environmental management system often experience reduced costs due to less waste and better waste handling, reduced raw material usage, less accidents resulting in bad publicity, less use of office material, lower travel expenditures, and reduced energy usage.¹²⁸ It is however under debate whether or not an implemented environmental management system is required in order to benefit from the advantages of environmental work. Some argue that these cost savings will be realized in any case even if the company works with these issues in a way that doesn't conform to ISO 14001 or any other environmental management system.

Bansal and Bogner (2002) argue that different companies have different possibilities to reap cost savings adhering to environmental work. In their article "*Deciding on ISO 14001: Economics, Institutions, and Context*" they try to identify relevant contexts in which companies will benefit from ISO 14001 certification and present four factors namely coming clean, easing globalization, managing network relationships, and imitating competitors. Coming clean is about industries whose environmental impact is perceived as worse than other industries. Examples of such industries are chemical, mining and forestry but also as of lately the automotive industry. Since these industries don't want to be perceived as outsourcing their environmentally sensitive activities they often place demands on their sub suppliers to be certified as well. This was the case when Ford and General Motors announced that they favored ISO 14001 certified suppliers forcing sub suppliers to take action. The second criteria they set up in their article was easing globalization which implies that when trading over country borders ISO 14001 acts as a sales argument and also helps multinational companies to organize their environmental efforts. Managing network relationships is about companies that manage a large number of suppliers in which case ISO 14001 helps companies control their security of supply. The last identified criterion is imitating competitors. This factor deals with how a firm's competitive environment is set in regard to environmental management systems. If a number of competing firms have started working with ISO 14001 it is often beneficial to also start working with it in order to avoid negative inferences that could come from stakeholders for not being certified.¹²⁹

There are a number of examples of companies that can directly link the implementation of their environmental management systems to reduced costs. One example is the Jutras division of Meridian Magnesium Inc which manufactures magnesium automotive parts. They reported that after implementing ISO 14001 in

¹²⁸ Ammenberg, (2004), p.307ff

¹²⁹ Bansal; Bogner, (2002)

1998 they saved almost two million dollars after spending 45 thousand dollars on an ISO 14001 certified environmental management system. The company reduced its use of electricity, natural gas, and lubricants, while producing less solid waste and contaminated water. These cost savings were also expected to be perpetual. This was however not the only project they implemented. Out of ten projects 4 did not produce any saving, one had disappointing but positive results and the remaining five produced results over expectations.¹³⁰

There are of course costs linked to going green as well. Initial costs linked to implementing environmental management systems include salaries for own personnel, consultant fees, internal education, direct costs for certification, and educational material such as books and educational packages.¹³¹

4.2.2 Shareholder Value and Profitability

Companies often regard dealing with environmental issues as a balance act between taking care of the environment and fulfilling the company's responsibilities on the one hand, and pleasing profit-hungry investors on the other. There are however studies which show that this does not have to be the case. Studies show that companies which take significant steps towards dealing with their company's environmental issues often see an improvement in their company's financial condition as well. A company which has dealt with its environmental issues has less risk and therefore earns a lower cost of capital, which leads to an increase in company value.¹³² Öhrlings Pricewaterhouse Coopers (ÖPWC) recently conducted a study which highlights a positive connection between environmental work and profitability. In the study it is established empirically that companies which engage in sustainability work achieve greater profitability than companies that do not. In industries with low environmental risks the benefits on profitability of having a good environmental performance are even greater than in high risk businesses. This is the case since consumers do not have the same expectations on companies in low-risk industries as they do on high-risk businesses and therefore a firm with high environmental standards in a low-risk industry differentiates itself from the rest. ÖPWC also conclude that working with Corporate Social Responsibility (CSR) increases the shareholder value of a company irrespective of the type of business the company is in.¹³³ It should also be pointed out that the effects of improving environmental performance do not appear from out of the blue; a company must

¹³⁰ Bansal; Bogner, (2002)

¹³¹ Ammenberg, (2004), p.307ff

¹³² Gifford, (1997)

¹³³ Hassel et al., (2008), p.22ff

signal to the market that efforts are being made for the environmental work to have effect.¹³⁴

4.2.3 Strengthening Brand and Sales

Big business and industries are often blamed for causing large environmental impact through their operations. But it is also among these companies one can find leaders of change in investing in environmentally friendly technology. These investments are not only done because they are good for the environment, they are also good for the bottom line. Peter O'Toole, a spokesperson for General Electric, says that environmental initiatives helps them in two ways, it brings real profit through increased sales and also helps them strengthen the General Electric brand. By doubling the research and development budget into technology aimed at reducing energy consumption and waste, General Electric generated \$10 billion in revenues 2005 and is aiming at doubling that figure until 2010.¹³⁵

4.2.4 Environmental Strategies and Results

In a study by Nutek, a Swedish agency for business development, it is concluded that environmental work is profitable. The survey was conducted by interviewing 21 small and middle sized companies during 2002 and 2003 and drew conclusions from the data collected using statistical tools.¹³⁶

The report showed that process and sustainability oriented environmental strategies resulted in reduced costs. Product oriented environmental work did not show the same result. This could be explained by the fact that these companies had already done work and fixed obvious problems in their processes. It could also be the case that these companies had less environmental impact to begin with. The companies that focus on product oriented environmental work do however show increased sales. The survey also shows that companies that are willing to take a proactive approach to their environmental work will gain a higher return on their investment. In plain text this means that companies that chose to implement environmental initiatives due to a strategic choice rather than external demands will have a higher rate of growth.¹³⁷

¹³⁴ Gifford, (1997)

¹³⁵ www.cnn.com, Business sees green in going green,

¹³⁶ www.nutek.se, Det lönsamma miljöarbetet

¹³⁷ Ibid.

Formalizing Environmental Work is Beneficial

The report also shows that companies that have formalized their environmental work through systems such as ISO 14001 and EMAS have a higher growth rate than companies that work with environmental issues without using such systems.¹³⁸

Environmental Marketing and Profitability

The report does not show any links between using environmental aspects as a means of marketing and increased profitability or other financial measure. Means of marketing do however differ largely between different companies. This does not necessarily mean that there is no connection, only that the connection cannot be shown statistically.¹³⁹

Environmental Work Linked to Business Development is Most Profitable

The most important lesson the Nutek report gives is that environmental work gives the best results if it is integrated into a company's strategy. It often takes considerable time to implement environmental systems and tools making environmental work something that must be planned for well in advance. A company cannot take a decision to go green and make the changes required over night.¹⁴⁰

4.2.5 Companies Gone Green

The battle against climate change is not only being fought by governments, businesses are today taking a larger part in the fight to save the planet. This trend is being fuelled by the fact that consumers buy goods from companies they like and can trust.¹⁴¹

Companies are realizing that customers are beginning not only to think green but also buy green and are taking actions to be able to meet customer demands on environmental responsibility. One such company is Continental Airlines. Continental Airlines has over the past ten years spent over \$16 billion on new aircrafts that have lower emissions, installed winglets on most of their airplanes that reduce fuel consumption by up to 5 percent. They have also reduced nitrogen oxide emissions from their Houston hub with over 75 percent since 2000. This is just one example of a company that has taken action; other examples are Tesco, Honda and Hewlett-Packard.¹⁴²

¹³⁸ www.nutek.se, Det lönsamma miljöarbetet

¹³⁹ Ibid.

¹⁴⁰ Ibid.

¹⁴¹ www.seattlepi.com, Going green is good for bottom line

¹⁴² www.cnn.com, 10 green giants

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Another example of a company that has caught on to the environmental trend is Swedish auto maker Volvo, and today much of their advertising has environmental influences. Volvo argues that they there wasn't a clear starting point for their environmental work but rather that it came as a result of Volvos work with caring for humans, which goes hand in hand with Volvos work with safety. For them it is about maximizing the value of the car for its owner and the society, and environmental issues are clearly a part of this. Volvo works with environmental issues from a life cycle perspective aiming to reduce the cars environmental footprint over the cars whole life cycle. Volvo has always emphasized that environmental work done also should be economically sound. Volvo has gained a positive response from their environmental work and has experienced large sales increases in environmental friendly cars. This fact is especially true in Sweden where environmental cars amount to approximately 45 percent of their total car sales, Volvos "green package" where all aspects of a Volvo cars life cycle are taken into account has had a significant impact on this success. Volvo argues that this trend will only continue to grow and all companies will have to do their part regardless of how small their individual impact is.¹⁴³

These are only a few examples of companies that have seen the business opportunities presented from growing environmental trends and there are many others.

4.2.6 Thule's Competition

In order to gain insight into in what ways going green can benefit a company it is important to ascertain what the competitive environment looks like. To do this a number of Thule's competitors were contacted and interviewed regarding how their company addresses environmental issues and if they are striving to make it a larger part of their business.

The conducted competitor review did not show any signs of environmental issues becoming a part of Thule's competitor's strategies in the near future. The companies we came into contact with often referred to being ISO 14001 certified and were satisfied with that. It should however be noted that obtaining information regarding environmental work done by Thule's competitors was not easy which led to that contact was only made with three companies. The reluctance to inform about current environmental status can be interpreted as such that environmental issues lack

¹⁴³ Munck, Catarina, *Manager Sustainability Communications*, Volvo Car Corporation, 2008-03-19

importance and that it is far from being a competitive issue for them at present. The information from the competitor review can be found in Appendix IV.

4.3 Quality and the Environment

During the process of writing this thesis we have seen tendencies that the terms quality and environment are growing closer to one another.

One example of this tendency was found when contacting Thule retailers asking if they think environmental issues are important when buying roof boxes. The retailer replied that they take environmental considerations for granted when choosing to retail Thule's high quality products.¹⁴⁴ It can however not be concluded that quality and environmental considerations are intertwined today; this view is confirmed by Torbjörn Laike at the University of Lund. He does however believe that it is only a matter of time before these concepts grow closer. Regardless of how long it takes for quality and environmental considerations to merge, it can however be concluded that if the two concepts become linked, companies using quality as a strong sales point risk severe brand damage if consumer expectations are not met.¹⁴⁵

When discussing the matter of quality and environment with Thule roof box manager Michael Mitschke he points out that quality and environmental issues are not always compatible in the case of roof boxes. The example he took was the use of recycled ABS plastic in roof boxes. The problem arose when wanting to make a more environmentally friendly roof box by using 100 percent recycled plastic. This led to that there were serious quality and safety issues since the recycled plastic was not as good as a new ABS plastic.¹⁴⁶

¹⁴⁴ Fridenborg, Ola, *Purchase Manager*, Micro, 2008-03-04

¹⁴⁵ Laike, Torbjörn, *Associate Professor*, Environmental Psychology – Lund University, 2008-03-26

¹⁴⁶ Mitschke, Michael, *Product Manager roof boxes*, Thule, 2008-04-08

5 How Thule Handles Environmental Issues

In this chapter we examine how Thule handles environmental issues during different stages of a roof box life cycle. The information in this chapter has been retrieved through interviews and also by reviewing internal documentation. The information gathered for this chapter is primarily based on Thule's roof boxes albeit some of the points mentioned below should be applicable for the whole of Thule as well.

5.1 Management

The most common standard of environmental management today is ISO 14001 and we have therefore chosen to investigate Thule's environmental management using ISO 14001 as a guideline and to structure the following text according to the different areas within ISO 14001.

5.1.1 Environmental Policy

The Thule Group management team has composed an environmental manual with the overall aim of supporting the development of quality standards as well as the prevention of pollution and of health and safety impact on employees and users throughout the Thule Group. This manual is meant to improve the effectiveness of Thule's environmental status, set common policies and goals and demonstrate conformance to the market, authorities and other interested parties.¹⁴⁷ Work on the environmental policy began in 2002 when Roland Schylit, Executive Vice President and Deputy CEO, joined the company. Schylit had previously worked with environmental issues at Trelleborg and Akzo Nobel, two firms which handle large quantities of chemicals, and consequently Thule's environmental policy is influenced by the work of these two companies.¹⁴⁸

Below the main points of the Thule Group's environmental policy are laid out;

- Thule shall have safe and sound work places and train personnel in order to ensure that they are able to carry out their work in a safe way. No one works to get hurt.
- In the company's research and development operations Thule shall strive for environmentally sound technologies, products and packaging.

¹⁴⁷ Thule internal documents, Thule Environmental Policy

¹⁴⁸ Schylit, Roland, *Executive Vice President and Deputy CEO*, Thule, 2008-02-22

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- Thule shall maintain sound emergency preparedness by systematically evaluating the risk of accidents, fires and uncontrolled emissions.
- The firm shall provide open and objective information about environmental work to personnel, the general public and authorities.
- Thule shall comply with legislation and develop long-term plans relating to national and international legislation in the environmental, health and safety areas.
- Thule shall evaluate the company's environmental impact.¹⁴⁹

The environmental policy developed centrally at Thule applies, like the brand policy, to all areas within the Thule Group. The difference between brand management and environmental management at Thule is that the brand policy is lead from the head office while the responsibility for implementing the environmental policy lies with all local unit and site managers, not a centrally placed environmental manager.¹⁵⁰ This delegation of responsibility varies within different areas of the company. When visiting the factory in Hillerstorp, Sweden, another policy is presented for visitors and employees. The essences of the policies are the same, but the policy shown in Hillerstorp had more relevance to the situation at Hillerstorp and is more concrete in its choice of words.

5.1.2 Planning

Environmental Aspects

Providing environmental aspects is a part of the ISO 14001 framework. Since ISO 14001 has not been implemented on the entire organization there is no list of environmental aspects for the whole of Thule. The factory in Hillerstorp, which is the only site within Car Accessories Europe Asia that has ISO 14001 certification, has produced a list of environmental aspects which are updated on a yearly basis.¹⁵¹

Legislation and Other Requirements

Thule works actively to comply with all legislative demand and requirements. New demands made by the government and other stakeholders are monitored by the quality and environmental directors at the different sites, and taken into consideration as soon as possible.¹⁵²

¹⁴⁹ Thule internal documents, Thule Environmental Policy

¹⁵⁰ Welander, Magnus, Business Area President Car Accessories Europe Asia , Thule, 2008-03-17

¹⁵¹ Schylit, Roland, *Executive Vice President and Deputy CEO*, Thule, 2008-02-22

¹⁵² Adanko, George, *Quality Director Car Accessories Europe Asia*, Thule, 2008-03-05

Objectives and Targets

Thule as a whole has not set any measurable targets when it comes to environmental improvement. They do however strive to fulfill the objectives set in the environmental manual. The choice of working with environmental targets is left to the individual sites within the company.¹⁵³ Since Hillerstorp has implemented ISO 14001 they are forced to set targets for their environmental work.¹⁵⁴ The site at Neumarkt is currently in the process of implementing ISO 14001. The main reason for management there to implement the system is to be able to improve measured values such as energy consumption and waste and to thereby save money.¹⁵⁵

5.1.3 Implementation and Operation

Resources, Roles, Responsibilities, and Authority

Thule is a company where the existence of a business area structure is clear. Business responsibilities as well as responsibility for environmental issues are handed down from CEO Anders Pettersson to the business area managers. After the responsibility has been handed down to the business area managers, it is up to them to decide whether or not they will further delegate the responsibility downwards in the organization. The business area managers are however still held accountable for the performance of their business area, even if they have delegated responsibilities.¹⁵⁶

In reality the delegation process within Car Accessories Europe Asia has resulted in environmental responsibilities being given to the quality managers at the different manufacturing sites. This is due mainly to the similarities between the two standards ISO 14001 and ISO 9000.¹⁵⁷

The decentralization of responsibility when it comes to environmental aspects means that the effort put into the environmental work varies greatly within the Thule Group. Car Accessories Europe Asia, which is the focus of this thesis, is among the front runners regarding environmental issues according to Business Area President Magnus Welander.¹⁵⁸

¹⁵³ Schylit, Roland, *Executive Vice President and Deputy CEO*, Thule, 2008-02-22

¹⁵⁴ Adanko, George, *Quality Director Car Accessories Europe Asia*, Thule, 2008-03-05

¹⁵⁵ Plischke, Matthias, *Plant Manager Neumarkt*, Thule, 2008-04-08

¹⁵⁶ Schylit, Roland, *Executive Vice President and Deputy CEO*, Thule, 2008-02-22

¹⁵⁷ Adanko, George, *Quality Director Car Accessories Europe Asia*, Thule, 2008-03-05

¹⁵⁸ Welander, Magnus, *Business Area President Car Accessories Europe Asia*, Thule, 2008-01-14

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Although the business managers within the different business areas have great freedom when managing their businesses, there are some issues that are managed centrally by the Thule Group management team. The Thule brand is one such issue and it is led by a branding committee made up of the CEO, senior vice President (SVP) Communications and the Business Area Presidents. It is the SVP Communications job to make sure that the Thule brand signals the same values across all business areas. This means that no single business area manager can devise a strategy for the brand on their own.¹⁵⁹

Competence, Training and Awareness

Education on environmental issues is also left up to individual business area managers to attend to. It is up to them to make sure that the individuals responsible at each site have sufficient knowledge and training when it comes to environmental issues.¹⁶⁰ When starting at Thule there is no mandatory environmental training. New employees do however get to meet all section managers which give them an introduction regarding their areas of responsibility. The amount of training given also varies on different sites. For example at the Hillerstorp site all employees get an introduction course in waste management and recycling.¹⁶¹ At the Neumarkt plant, where most of the roof boxes are made, there is no obligatory introduction regarding environmental policy or any education concerning environmental issues. The environmental policy is however known among the Neumarkt management.¹⁶²

5.1.4 Checking

Monitoring and Measuring

Business performance of the different areas is regularly followed up but there exists no systematic follow up from top management on environmental performance; this is left to the business area managers. They do however also not use quantitative measures to follow up the environmental work. Top management does however visit the different sites within Thule regularly and discrepancies found during these visits are attended to.¹⁶³ The Neumarkt site which is yet to be certified does also measure waste, scrap, energy consumption and other relevant measurements that will be a part of the ISO 14001 standard and have done so for quite some time.¹⁶⁴

¹⁵⁹ Welander, Magnus, *Business Area President Car Accessories Europe Asia*, Thule, 2008-03-17

¹⁶⁰ Schylit, Roland, *Executive Vice President and Deputy CEO*, Thule, 2008-02-22

¹⁶¹ Adanko, George, *Quality Director Car Accessories Europe Asia*, Thule, 2008-03-05

¹⁶² Plischke, Matthias, *Plant Manager Neumarkt*, Thule, 2008-04-08

¹⁶³ Schylit, Roland, *Executive Vice President and Deputy CEO*, Thule, 2008-02-22

¹⁶⁴ Plischke, Matthias, *Plant Manager Neumarkt*, Thule, 2008-04-08

Internal Audits

The company as a whole does not conduct internal periodical environmental audits since Thule centrally does not follow any environmental management system. There have however been audits done in connection with mergers and acquisitions.¹⁶⁵ The Hillerstorp site does however perform environmental audits since this is required by ISO 14001.¹⁶⁶

5.1.5 Management Review

Although individual sites measure energy use and other such parameters there is no system in place centrally, which collects this kind of data. No goals regarding environmental performance are stipulated centrally either and as a result the only follow up of environmental performance is through visits in the form of business review meetings held with factory management at least once every quarter.^{167 168}

5.1.6 Internal Communication Activities

The environmental policy manual has been communicated to employees but in an informal and unstructured way. The informal way includes distribution of the manual in cafeterias, on the intranet and on notice boards. Since the communication of the environmental policy has been quite unstructured it has not been communicated to new employees as a part of the introduction to the company either. A reason for not communicating the manual in a more structured way is that there is enough information passing through the organization as it is.¹⁶⁹

5.1.7 External Communication Activities

Up until today Thule has not communicated any information, regarding their environmental work externally. Management at Thule does not feel ready to use environmental issues as a means of marketing since they have yet to feel that it would help them gain more customers. Roland Schylit argues that if Thule begins communicating an image which signals care for the environment, people will also begin looking harder for possible flaws which may exist in this image. However in time Thule will publish their environmental work, but not until they have their house in order and stakeholders demand it.¹⁷⁰

¹⁶⁵ Adanko, George, *Quality Director Car Accessories Europe Asia*, Thule, 2008-03-05

¹⁶⁶ Ibid.

¹⁶⁷ Welander, Magnus, *Business Area President Car Accessories Europe Asia*, Thule, 2008-03-17

¹⁶⁸ Schylit, Roland, *Executive Vice President and Deputy CEO*, Thule, 2008-02-22

¹⁶⁹ Ibid.

¹⁷⁰ Ibid.

When speaking with Frank Feiland, Vice president Sales Car Accessories Europe Asia, he confirms that no environmental information has been communicated to customers regarding roof boxes. Feiland argues that market communication as a whole is not one of Thule's stronger points. Even though many benefits of roof box usage are known they have not been emphasized enough in any marketing material. One example of Thule's unsatisfactory market communication is their web site which is not up to the standards that can be expected by today's consumers.¹⁷¹ Peter Kjellberg, Thule Car Accessories Europe Asia's recently hired Vice President Product Management and Marketing, acknowledges the possibilities of working with environmental issues in the communication towards customers. He however also emphasizes that Thule must have a grip on the environmental performance of their whole business in order to start using it in their external communication.¹⁷²

5.2 Culture

5.2.1 Ideal Goals

During our time at Thule the terms quality, functionality and safety keep reoccurring. These are also keywords in Thule's vision which states "To be the brand of choice for consumers around the world who want to transport their equipment by vehicles *safely, easily and in style.*"

5.2.2 Dominating Ideas and Values

The type of organization Thule utilizes encourages employees to take responsibility and make decisions individually. When meeting employees, in different parts within Thule Car Accessories Europe Asia, we have however gotten the feeling that in order for things to really happen; approval or pressure must come from high up in the organization. When talking to top management on the subject of environmental responsibility it is clear that these issues are not priority issues. Thule's management has yet to see any real benefits available from implementing a higher standard in their environmental work and these beliefs definitely influence the company's will to become green. Values which Thule clearly emphasizes are quality and functionality; during March 2008 they launched a quality and functionality test centre at their site in Hillerstorp. The test centre represents an investment of around 20 MSEK and sends a clear signal that Thule, quality and functionality go hand in hand.

¹⁷¹ Feiland, Frank, *Vice President Sales Car Accessories Europe Asia*, Thule, 2008-04-09

¹⁷² Kjellberg, Peter, *Vice President Product Management and Marketing Car Accessories Europe Asia*, Thule, 2008-04-18

Although it is not one of the dominating values with top management the environmental issue has gained foothold among Thule employees. When discussing the matter of greening Thule's products and brand we have been met by enthusiasm and curiosity. Managers throughout the organization acknowledge the importance of sustainability and we feel that they are willing to make real changes. An example of this is how we were greeted at the concept development office in Hillerstorp where the personnel exclaimed "finally" when we told them what our thesis was about. The same attitude has been evident when discussing the matters around coffee tables at the Thule head quarters in Malmö. Employees feel that these issues are important and that Thule should take action in order to meet the challenges.

When discussing market issues, product development issues and so on it becomes evident that Thule staff sees themselves as clear market leaders. They know that they in many ways have the best products and a brand that consumers are willing to pay more money for. Thule is a premium brand which is slightly more exclusive than the rest and this mentality is mirrored in the Thule culture.

5.2.3 Standards and Rules

We have not observed any clear standards or rules at Thule but we have observed a clear focus on profitability. Profitability influences everything from production methods and choice of material to goals set by management. Many employees within Car Accessories Europe Asia also have a shared passion for the products they are working with. Employees working with roof box development for example often go skiing, thereby using their products and learning more about them.

5.2.4 Informal Communication Channels

During our time at Thule we have not gained any deeper insight into Thule's informal communication channels. There do however exist the normal lunch and break room conversations. We have also observed a conference where management met and exercised various sporting activities and where we assume informal communication took place.

5.3 Life Cycle Screening of Roof Box

The following life cycle screening will be conducted according to the Eco-Indicator 99 methodology which has been presented in chapter 2.5.2.

5.3.1 Purpose of Eco-Indicator Calculation

The purpose of this screening is to give Thule an idea of which part of a roof box life cycle that has the largest impact on the environment. By identifying this step it will help them see where future focus on improvement should be directed in order to make the largest possible difference in regard to environmental performance. The product which will be examined is the Thule Atlantis 780 since it is Thule's most sold roof box¹⁷³. The aim of the calculation is not to include every single gram of metal used in the roof box; the parts deemed to have the biggest effect on the final result will however be included. The parts of the roof box that are included in the calculations have been chosen together with personnel at the production site at Neumarkt.

5.3.2 The Roof Box Life Cycle

The diagram presented in figure 9 is a description of a complete roof box life cycle. The Eco Indicator 99 tool takes into account all processes up to the production of semi manufactured products shown in the box diagram below, including the transport to the sub suppliers factories. We have not been able to retrieve figures regarding the energy usage of the different sub suppliers and this impact has therefore not been included. The transport from the sub suppliers to Neumarkt, energy usage at Neumarkt, impact from the main operations at the plant in Neumarkt and also the transport from Neumarkt to the end consumer has been included. The recycling of material spill in the production process has not been included.

¹⁷³ Petré, Anna, *Business Controller Car Accessories Europe Asia*, Thule, 2008-03-06

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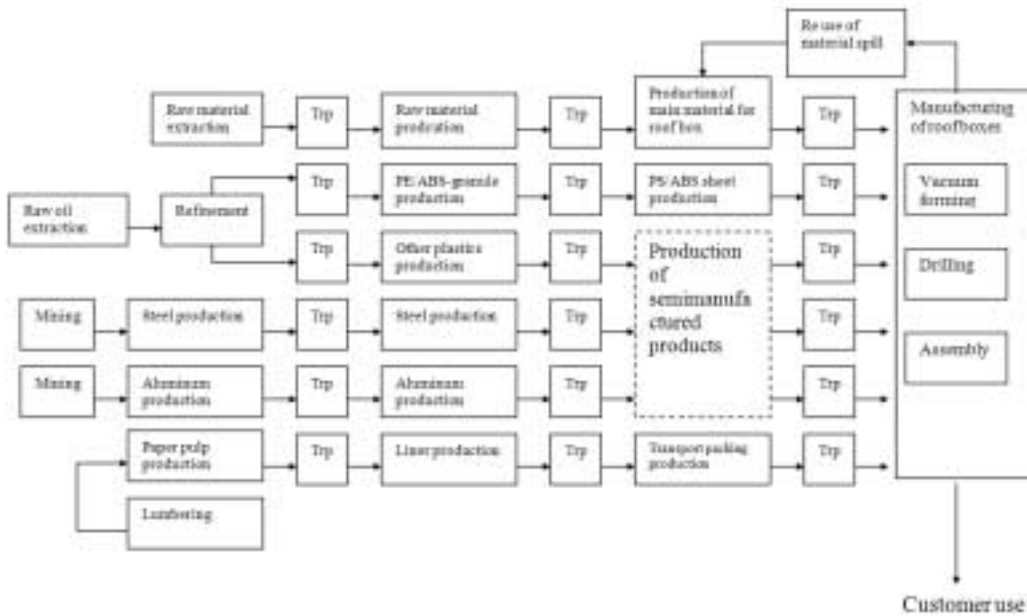


Figure 9 – Roof box life cycle Source: EPD, Produktspecifika regler för takboxar, Autoform internal document

5.3.3 Quantify Materials and Processes

Calculation Unit

To set a limit as to which processes to include in the different parts of the calculation a functional unit has to be specified. A functional unit is description of a product, life cycle and function. For a roof box this is the ability to transport extra luggage on the roof of your car. To illustrate ways in which the roof box can be used two different calculations will be made to provide a frame of reference depending on usage. The different usage behaviors are continuous usage, which amounts to 15 000 kilometers per year and occasional usage which is estimated to be 3000 kilometers per year. The functional unit of this screening will be one Thule Atlantis 780 roof box.

Life Span

The life span of a roof box is also very varying; some customers use their box on a regular basis and might not ever take it off. This will inevitably cause the life of the roof box to shorten, some customer only use their roof box a few times per year which leads to roof boxes having a life span of more than 10 ten years. Customer research however shows that 65 percent of customers own a roof box that is less than

5 years old.¹⁷⁴ In the calculations shown in table 2 in Appendix V the life span of a roof box is set to 10 years.

Production Processes

The production process has been defined by interviews with people at Thule. Further understanding of the process has been gained by a visit to the production site in Neumarkt. The data regarding included material and amounts in a roof box have been retrieved from an internal Thule report which specifies every component and material included in a roof box. Only the main components which were deemed to have impact on the total result have been included in the life cycle screening. We have decided together with personnel at Thule to divide the roof box into four main components namely ABS plastic, aluminum, steel and POM plastic. These parts make up the main components of the roof box and should provide a good estimation of the environmental impact. The energy consumed when producing a roof box at the Neumarkt plant has been retrieved from internal documents available at the production site. When the roof box is finished it is packed in a cardboard box, this box has also been included in the screening.

Suppliers

The Neumarkt site has around 70 different suppliers which of many are local. Information regarding where the main materials for a Thule Atlantis 780 are acquired from was supplied from Thule, and the distance from the supplier's site to Neumarkt was measured.¹⁷⁵ We have not taken into account the energy usage needed for the sub suppliers since this would require large amounts of time and is not a main focus of the thesis.

Distribution

Neumarkt produces some 200 000 roof boxes every year and roughly 80 percent of them are delivered within a 1000 km radius from Neumarkt. The other 20 percent of them are delivered to harbors and are shipped overseas. This means that a rough estimate would be that 100 percent of all roof boxes delivered from Neumarkt are shipped around 700 kilometers. In the life cycle screening we will estimate the delivery distance to be 800 kilometers. This should be on the high side and thus make sure that the distribution is not under valued in the life cycle screening. The trucks used are large semi trailer trucks that carry around 100 roof boxes per truck. The number of roof boxes transported is determined by volume and not weight i.e. the trucks could carry more boxes but are limited by the size of the boxes.¹⁷⁶

¹⁷⁴ Thule internal documents

¹⁷⁵ Hackner, Josef, *Test and Security*, Thule, 2008-04-07

¹⁷⁶ Mitschke, Michael, *Product Manager roof boxes*, Thule, 2008-04-08

End of Life

The information we have gotten indicated that most of the roof boxes are incinerated when the customers are finished with them, we will therefore use this value when calculating the impact of the end of life perspective a roof box.

5.3.4 Indicator Calculation

The following diagram gives a graphic presentation of how large environmental impact the different processes of a roof box's life cycle incurs. The calculations and also the values they are based on can be seen in Appendix V.

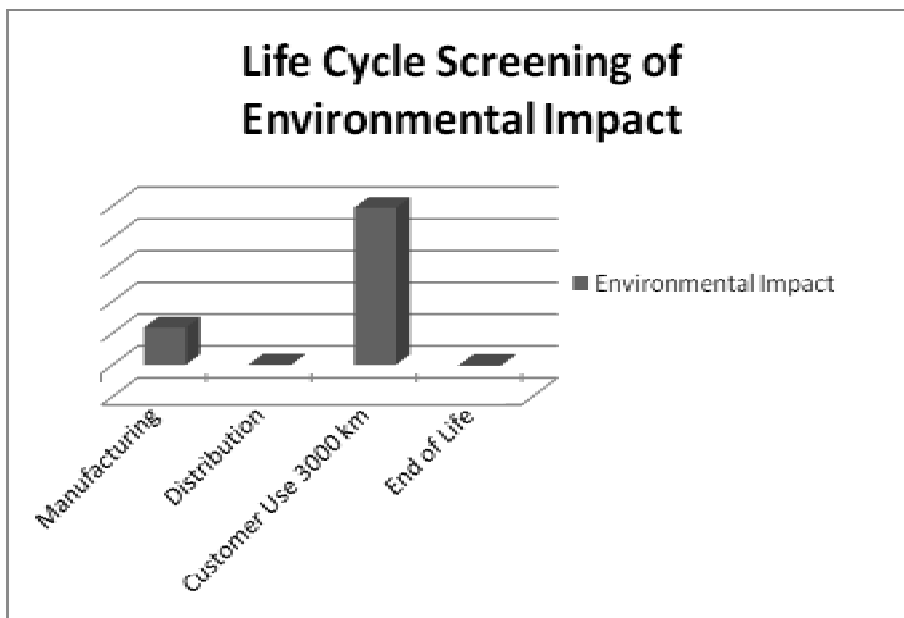


Figure 10 – Life Cycle Screening of a Thule Atlantis 780 roof box

5.3.5 Interpretation of Results

Figure 10 clearly shows that even when only having the roof box mounted during 3000 kilometers, each year during the roof boxes ten year life, the usage phase still has the largest environmental impact. Since the end of life process actually decreases the environmental impact of the roof box life cycle this value is negative.

5.4 Product Development

Thule's roof boxes are developed in Neumarkt, Germany, and the product development is headed up by Alex Emmerling. The team working with roof box development began working with Thule's new product development methodology, which is called the Thule Projects System (TPS), in 2007. They are currently developing their first roof box according to the latest revision of TPS.¹⁷⁷ The TPS gate model has been developed over several years and was originally influenced by Volvo and Husqvarna. The first environmental aspects were included in the manual around the year 1997 and the environmental aspect has since then grown in importance.¹⁷⁸

5.4.1 The TPS Gate Model

TPS is the gate model which Thule uses for open market development of new products. TPS has been developed to aid design teams in developing products to the right specifications, at the right cost and at the right time. The TPS system is developed so that the design team can choose which parts of the methodology they wish to use for the project at hand. This is to ensure that only the parts of the methodology which will aid them in their work will be used. The backbone of the TPS is the TPS Checklist which acts as a master document for the project. All activities are listed here and are reviewed prior to checkpoint approval.¹⁷⁹

Projects are carried out in five phases A to E with checkpoint or gates after the completion of every phase. Within each phase there are several activities. In the TPS manual the phases are briefly described as follows:¹⁸⁰

Phase A – Commercial Requirement

In this phase the commercial need of a new product is identified. The ideas originate either from Thule's three year product plan or from ideas within the organization.¹⁸¹

Phase B – Pre Study

In this phase the market requirements and opportunities are investigated in more detail and the concept is defined. This phase focuses on gaining an insight into the market, on which the product will be released, through studies of competitor's

¹⁷⁷ Emmerling, Alex, *Chief Product Development roof boxes*, Thule, 2008-04-07

¹⁷⁸ Lundgren Anders, *Technical Group Manager Concept Development Car Accessories Europe Asia*, Thule, 2008-03-05

¹⁷⁹ Thule internal documents, TPS manual

¹⁸⁰ Ibid.

¹⁸¹ Ibid.

products and previous experience. A conceptual design of the product is produced and studies are carried out regarding production, design, logistics, basic strength, patents and outsourcing. Risk and profitability analysis are also done during this phase. Finally documentation is produced which describes the findings made and these are used in the checkpoint approval.¹⁸²

Phase C – Engineering Design

In this phase the developed concept is transformed into working production documentation. For example all calculations are from here on based on actual offers and more detailed calculations regarding strength and durability of the product are conducted. Phase C also includes a design for manufacture and design for assembly step. These steps are intended to take into consideration demands placed on the product from the assembly and manufacturing part of the organization and to make sure this is done meetings are held with representatives from the named departments. During this phase the Design Review is done. This is an approval meeting where a complete review of the new product is done.¹⁸³ During this phase the product developers do have a large influence on the choice of production techniques and use of materials. It is however required for them to clarify why they wish to use new techniques and materials. Anders Lundgren, Head of the Concept Development Department at Hillerstorp, believes that environmental considerations today could be used as motivation for a technology or material shift.¹⁸⁴

Phase D – Production Engineering

Phase D is the phase where all production tools and equipment are ordered and made for the designed product. All documentation regarding fitting, instructions, product packaging, and marketing documents are also completed. During this phase the tools required for production are ordered and the product is phased into Thule's ERP system Movex. The first batch of products is also manufactured using serial production equipment and there after tested. The phase leads to the project approval document which forms the basis of product release in checkpoint D.¹⁸⁵

¹⁸² Thule internal documents, TPS manual

¹⁸³ Ibid.

¹⁸⁴ Lundgren Anders, *Technical Group Manager Concept Development Car Accessories Europe Asia*, Thule, 2008-03-05

¹⁸⁵ Thule internal documents, TPS manual

Phase E - Production

During this phase the product is put into to serial production and customer deliveries begin.¹⁸⁶

5.4.2 Environmental Considerations in TPS

TPS has an environmental policy which is presented in the beginning of the TPS manual. The responsibility for implementing environmental considerations into the product development process lies with the project and product manager. The following text is extracted directly from the TPS manual:

*TPS environmental policy – ‘for brand support and cost reduction’
Thule has an active working environmental policy, which also applies to the TPS project work. Thule considers this work extremely important for our brand recognition, supporting an active lifestyle in a good environment, which will bring us pleasure and happiness in return. Thule also actively applies a combined financial and environmental approach in trying to reduce costs associated with e.g. product weight, packaging material etc.*

TPS projects primarily take into consideration the following environmental issues:

- *Ensuring that substances that are classified as harmful are not used.*
- *Material marking on details or components for the material recycling process.*
- *An optimization approach to logistics that minimizes transport needs.*
- *The weight reduction approach.*
- *A ‘lean thinking’ approach to all steps of the process and the production set-up.*

Any project issues regarding the environmental policy are reviewed and ticked off as ‘OK’ on the design review in phase C of the TPS project.¹⁸⁷

This environmental policy covers many of the most significant aspect which a company should keep in mind during product development in order to produce a product with as low an environmental impact as possible. When reviewing the different parts of the TPS methodology there is however, no specific mentioning of environmental considerations that should be taken during the development process. Only when reaching the design review in phase C is the environmental policy once

¹⁸⁶ Thule internal documents, TPS manual

¹⁸⁷ Ibid.

again mentioned.¹⁸⁸ Environmental considerations were included into the TPS manual partly because of ISO 14001 but also because there is a growing concern among the people working at Hillerstorp, where TPS was developed, regarding environmental issues. This has led to environmental issues being included in the manual, but the issues are seldom dealt with in the actual product development processes, largely due to lack of training regarding how the issues should be handled. For example the design review activity in phase C is intended to check that the environmental issues are taken care of in phase A and B, there are however no specific actions regarding environmental issues required during these phases. This is a typical example of how environmental issues are handled during product development, the developers want to take environmental issues into consideration, but lack the relevant training and knowledge to do so.¹⁸⁹ This view is confirmed when reviewing internal documents regarding environmental targets included in ISO 14001, which has LCA training for the product developers on the to do list.¹⁹⁰ One interviewee however argues that not setting specific points for when environmental considerations should be made allows environmental thinking to permeate the entire development process. Environmental issues should not be handled as a routine but rather be handled from case to case.¹⁹¹

When discussing environmental considerations during the roof box development process with Alex Emmerling many of the views presented above are confirmed. The roof box development process does not use any specific tools to facilitate a more environmentally conscious design. They have however reviewed the whole roof box production process in order to make sure that the best possible materials and production processes are used. Alex Emmerling points out that although they have not used any specific tools to aid the development process, Thule have used wind tunnel testing on a few of their boxes. The lessons learned from these tests have been used to enhance the aerodynamic performance of all of Thule's roof boxes. A clear result of these tests is a spoiler on the underside of the roof box to control air flow around the roof rack upon which the roof box is mounted. The main reason that not all newly developed roof boxes are aerodynamically tested is that it too costly and time consuming. Emmerling does however not think that it would be possible to make large improvements in roof box aerodynamic performance since external factors such as type of car, and how the roof box is mounted has too large an impact on aerodynamic performance. The roof box development team does however still feel

¹⁸⁸ Thule internal documents, TPS manual

¹⁸⁹ Lundgren Anders, *Technical Group Manager Concept Development Car Accessories Europe Asia*, Thule, 2008-03-05

¹⁹⁰ Thule internal documents

¹⁹¹ Ferman, Magnus, *Product development Car Accessories Europe Asia*, Thule, 2008-03-19

that it would be good to further develop the environmental considerations taken in the development process but also point out that there are a number of hurdles to overcome. One is that they do not have sufficient knowledge regarding design for environment methodologies and the other is that Thule's investment horizon, which controls the pay-back time criteria, is too short. Investments to increase environmental performance of a roof box will take significantly longer than the current pay-back time requires.¹⁹²

The main things that influence the design of Thule's products today are functionality, style and safety. The two first points in Thule's TPS environmental policy shown above are adequately taken care of in the product development process. The weight reduction approach is an aim to reduce the amount of material used, there is however no consideration taken to total life cycle impact of the material used. The only considerations taken are cost and functionality. As for the lean thinking approach this is yet to be implemented in a development project. The point referring to minimizing transport impact of the product is also not given continuous attention during the product development process. There have however been some projects which have used sub-assembly methods for shipments of roof boxes to Asia in order to minimize cargo volume.¹⁹³ The reason that this has not been further developed is that this method of shipping incurred too many damages during the shipping process since the roof boxes are not made to be stacked in this fashion.¹⁹⁴

5.5 Procurement

5.5.1 Purchasing Organization

Despite Thule's size they do not have a central purchasing function. The business area has a total of six factories of which three have an appointed purchasing manager. Purchasing at Thule is divided into different sub groups; this means that for example all purchases of aluminum are coordinated. Thule recently started working with a system where they use lead buyers. There are currently eleven different lead buyers which are located at factories around the Thule organization. The lead buyer system was imposed on the business areas from the Thule group management and is therefore implemented throughout all of Thule's business areas. Lead buyers are essentially people with a specific area of purchasing expertise. In Hillerstorp there is for example a lead buyer responsible for fastening devices. The main reason for implementing a system with lead buyers was to give the Thule group more purchasing power and

¹⁹² Emmerling, Alex, *Chief Product Development roof boxes*, Thule, 2008-04-07

¹⁹³ Lundgren Anders, *Technical Group Manager Concept Development Car Accessories Europe Asia*, Thule, 2008-03-05

¹⁹⁴ Hackner, Josef, *Test and security*, Thule, 2008-04-07

thereby give them an opportunity to reduce costs and increase demands on their suppliers. The purchase of fastening devices was previously conducted by the different factories which led to higher prices and more inconsistent quality. Through the use of the lead buying system the number of suppliers has decreased significantly.¹⁹⁵

5.5.2 Roof Box Suppliers

The Neumarkt plant has around 70 suppliers, the main parts of a roof box are however concentrated to around 10 suppliers. The main part of a roof box is made up of ABS and PS plastic, steel components, aluminum components and POM plastic components. The roof box suppliers are all situated relatively close to Neumarkt and the distances range from around 700 kilometers to across the street in Neumarkt.¹⁹⁶ Despite the implementation of the lead buyer system the Neumarkt plant still makes most of its purchasing decisions on its own and chooses suppliers that they deem reliable and cost competitive.¹⁹⁷

5.5.3 Environmental Considerations

The number of articles that are purchased from sub suppliers and to what degree they are refined when they reach Thule varies greatly depending on the product. Thule does not place any demands regarding environmental performance on their suppliers other than that they must not use any substances which are present on the car industries black list. This has for example led to the abolishment of Chromium six in the surface treatments of Thule's products. Thule prefers that their suppliers use ISO 9001 and ISO 14001 but it is not a requirement. Today Thule focuses on quality, service levels, and price when choosing suppliers; environmental considerations are some way down the list of priorities.¹⁹⁸ Neumarkt plant manager Matthias Plischke emphasizes that he rather sees that a supplier fulfills Thule's demands in real life, than on paper. This means that he does not want Thule to rely solely on certifications when examining a supplier's environmental performance. Thule has recently launched a new line of soft roof boxes which they see a growing demand for. The fabric for these roof boxes is imported from suppliers in China and Plischke admits that the control of these suppliers is less rigorous than that of their European suppliers.¹⁹⁹

¹⁹⁵ Bergstedt, Tomas, *Purchasing Director Car Accessories Europe Asia*, Thule, 2008-03-27

¹⁹⁶ Hackner, Josef, *Test and security*, Thule, 2008-04-07

¹⁹⁷ Plischke, Matthias, *Plant Manager Neumarkt*, Thule, 2008-04-08

¹⁹⁸ Bergstedt, Tomas, *Purchasing Director Car Accessories Europe Asia*, Thule, 2008-03-27

¹⁹⁹ Plischke, Matthias, *Plant Manager Neumarkt*, Thule, 2008-04-08

5.6 Manufacturing

Thule is a diversified and global company, producing and selling its products in many countries around the world. Car Accessories Europe Asia has presence in Europe, South America, and Asia and the locations of the different sites can be seen in figure 11. The roof boxes are manufactured or assembled in three different factories, namely Neumarkt in Germany, Haverhill in the United Kingdom, and Sao Paulo in Brazil.²⁰⁰



Figure 11 - Map of Thule Car Accessories Europe Asia Sites – Source: Thule internal documents

The main manufacturing of roof boxes takes place in Neumarkt, and it is upon the process there that the production process described below is based.

²⁰⁰ Thule internal documents

5.6.1 The Roof Box Production Process

The production process of a Thule roof box is relatively simple and can be divided into five different activities, from raw material to finished product.

1. The first activity in the production process at Thule Neumarkt is the receiving and storing of materials and components.
2. Activity number two is the shaping of the roof boxes' top and bottom. The roof boxes are made of Polystyrene (PS) and/or Acrylonitrile Butadiene styrene (ABS) plastic. To form this plastic into a roof box, a thermoforming process is used. The thermoforming process used by Thule is vacuum forming which, as the name implies, draws the heated sheet against a tool with the assistance of vacuum. The formed shells are thereafter trimmed before being ready for the next stage. The scrap plastic derived from this process is ground into new granulates in a separate process and then sold, either back to Thule's suppliers or to other suppliers of ABS or PS plastics.
3. The next step is to pre-assemble the roof boxes. During this stage holes or slots are pre-drilled into the shell, automatically. The holes drilled accommodate mounting systems and other components that are a part of the finished box.
4. The fourth activity in the process is the assembly process. This stage brings the base and lid together with the appropriate components to create a finished roof box. Components added in this process will be for example locking mechanisms, lid lifters, hinges, latches etc. On the assembly line, the roof boxes are also wrapped in protective plastic and packed in cardboard boxes. At the Neumarkt facility there currently exist three production lines but a fourth line is in the planning stages.
5. The last activity performed inside the manufacturing plant is the storage of the finished products. Thule has a capacity of 1000 boxes per day and a storage capacity of three days worth of production, i.e. 3000 boxes at the factory in Neumarkt.²⁰¹

²⁰¹ Hackner, Josef, *Test and security*, Thule, 2008-04-07

These steps are preferably completed in one continuous in-line process but storage of components between different stages is necessary due to production capacity constraints.²⁰²

5.6.2 Environmental Considerations during Manufacturing

The production of a roof box is not chemically intensive processes and does not give off any major emissions to neither air nor water. As far as being certified for environmental work, through EMAS or ISO 14001, only one of the manufacturing facilities within Car Accessories Europe Asia meets this criteria and it is the Hillerstorp site.²⁰³ Consequently none of the three factories that produce roof boxes currently have ISO 14001 certification. The plan is however to certify all production sites before the end of 2008. The decision to set this goal was taken by George Adanko and Richard Jamsek after discussions with the business area management.²⁰⁴ The factory in Neumarkt is a fairly clean operation and the oldest manufacturing equipment is no older than 20 years. There are no big emissions to talk about, other than transport emissions from trucks coming to and from the site and the emissions generated by the factory's energy consumption. As far as controlling and measuring environmental impacts of the manufacturing, the personnel in charge of these issues measure Thule's yearly energy, water, gas and oil consumption as well as the amount of waste which they generate. The challenge which the near future brings is to certify the site in accordance with ISO 14001 during this year and according to Josef Hackner, Test and Security, Thule Neumarkt lives up to the standards of the EMS.²⁰⁵ The only real challenge that remains before becoming fully ISO 14001 certified is producing the necessary documentation.²⁰⁶ The willingness to improve environmental performance exists at Neumarkt, one example of this are the plans to use the heat given off from the production process to heat up the buildings at the site. Such an investment costs money however and so far top management at Thule has been reluctant to approve the investment due to a long payback time.²⁰⁷

²⁰² Gray, Martin, *Quality Manager Haverhill Car Accessories Europe Asia*, Thule, 2008-02-11

²⁰³ Adanko, George, *Quality Director Car Accessories Europe Asia*, Thule, 2008-03-05

²⁰⁴ Ibid.

²⁰⁵ Hackner, Josef, *Test and security*, Thule, 2008-04-07

²⁰⁶ Plischke, Matthias, *Plant Manager Neumarkt*, Thule, 2008-04-08

²⁰⁷ Emmerling, Alex, *Chief Product Development roof boxes*, Thule, 2008-04-07

5.7 Distribution

Thule's large presence in Europe places great demands on the distribution network and it also means that the cost for distributing goods is one of Thule's main expenditures.²⁰⁸

5.7.1 Distribution Network

The factory in Neumarkt, Germany, is by far the largest in terms of volume and it serves the whole of the European continent. Hence the distribution network that Neumarkt is connected to is the network of greatest interest to this thesis.²⁰⁹

The distribution of roof boxes is split up into two different types of systems. The two systems are linked together and neither works independently from the other. Both systems are characterized by the importance of cost and lead time. Lead time is especially important to Thule since one of Thule's greatest competitive means in big markets such as Germany, Belgium and the Czech Republic, is next day delivery according to Lotta Castell, Supply Chain Director. Next day delivery means that customers who place an order before twelve o'clock should receive their goods the following day.²¹⁰ The main modes of transport for roof boxes are by truck on pallets and by sea in containers.²¹¹

5.7.2 Direct Delivery

As mentioned before, Thule distributes roof boxes from the factory in Germany in two different ways. One way for a customer to receive Thule's products is by direct delivery, as shown in figure 12. Thule opts for direct deliveries to customers if the customer orders enough roof boxes to fill at least half a truck load. The choice whether to deliver directly from the factory in Neumarkt to the customer or from Duisburg is taken by Thule's customer service centre.²¹² Thule does not own any trucks of their own and consequently the actual transports are carried out by five or six of the main European shipping agents.²¹³

²⁰⁸ Schylit, Roland, *Executive Vice President and Deputy CEO*, Thule, 2008-02-22

²⁰⁹ Castell, Lotta, *Supply Chain Director Car Accessories Europe Asia*, Thule, 2008-03-07

²¹⁰ Ibid.

²¹¹ Faulhaber, Werner, *Logistics Manager Neumarkt Car Accessories Europe Asia*, Thule, 2008-04-08

²¹² Castell, Lotta, *Supply Chain Director Car Accessories Europe Asia*, Thule, 2008-03-07

²¹³ Faulhaber, Werner, *Logistics Manager Neumarkt Car Accessories Europe Asia*, Thule, 2008-04-08

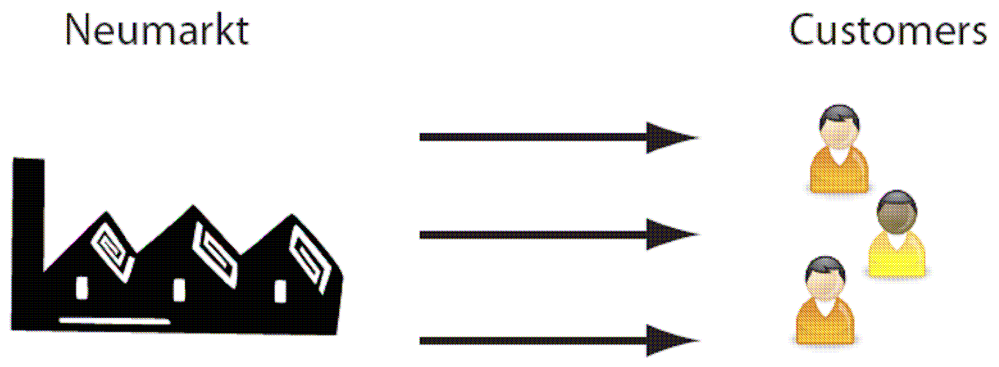


Figure 12 - Direct delivery of roof boxes

5.7.3 Central Warehousing

The other way in which Thule distributes their products is through a centrally placed warehouse in Duisburg, Germany. As is shown in figure 13 products from all of Thule's different European manufacturing sites are shipped to Duisburg, including roof boxes from Neumarkt.²¹⁴

When a customer lays an order which, in volume, does not fill at least half a truck load then the order is shipped from Duisburg and not Neumarkt. As mentioned before it is the customer service centre that determines where the breakpoint between the two options lies. The warehouse in Duisburg is serviced two to three times a week with roof boxes from Neumarkt, depending on the season. On the route between Neumarkt and Duisburg Thule tries to maximize the utilisation of truck capacity, meaning that trucks bound for Duisburg are only released if they are full.²¹⁵ On the route Thule employs a handful of different logistics partners. The criteria these partners are mainly chosen on are network, reliability and price.²¹⁶ Thule is most of the time responsible for transporting the goods out to customers, but there are occasions when customers prefer to utilise their own shipping agents. In these cases the customer's trucks can pick up the order at the warehouse in Duisburg.²¹⁷

²¹⁴ Castell, Lotta, *Supply Chain Director Car Accessories Europe Asia*, Thule, 2008-03-07

²¹⁵ Ibid.

²¹⁶ Faulhaber, Werner, *Logistics Manager Neumarkt Car Accessories Europe Asia*, Thule, 2008-04-08

²¹⁷ Castell, Lotta, *Supply Chain Director Car Accessories Europe Asia*, Thule, 2008-03-07

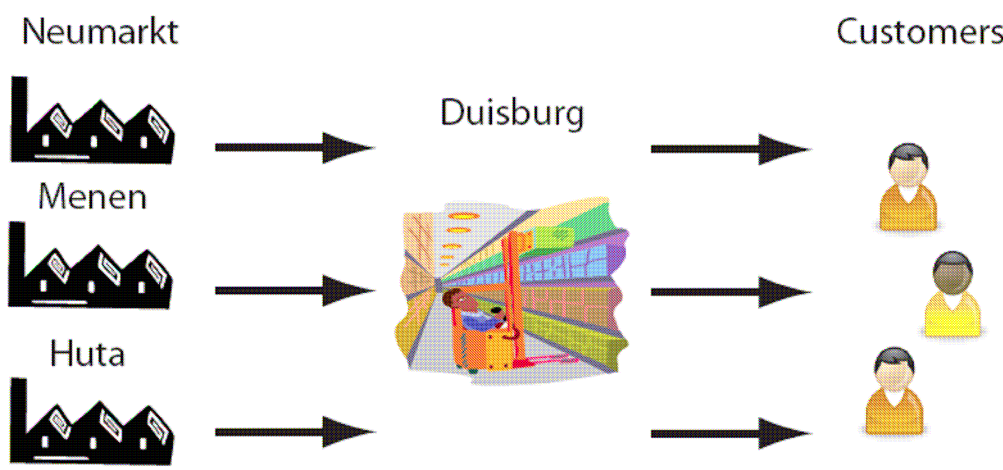


Figure 13 - Central Warehousing

5.7.4 Environmental Considerations in the Distribution Network

In the Thule environmental manual, distribution is mentioned as one of the areas within which Thule should strive to improve its environmental performance²¹⁸. Furthermore distribution is also mentioned in the environmental policy which is specific to Car Accessories Europe Asia. Here it is stated that Thule strives to reduce transport relations and to only use shipping agents which have an environmental certification.²¹⁹ In reality the last statement of the policy is not implemented, at least not to the knowledge of Lotta Castell. She says that Thule does not perform any checkups on whether the shipping agents are certified or not and there has been no pressure from top management to do so either.²²⁰ Werner Faulhaber, Logistics Manager at the production site at Neumarkt, confirms this picture but believes that most of the logistics partners Thule uses are environmentally certified. He is however not sure of this since Thule does not actively screen them.²²¹

Thule Car Accessories Europe Asia tries to constantly reduce its number of transport relations. The main reason perhaps is not to improve environmental performance

²¹⁸ Thule internal documents, Thule Environmental policy

²¹⁹ Thule internal documents, Intranet

²²⁰ Castell, Lotta, *Supply Chain Director Car Accessories Europe Asia*, Thule, 2008-03-07

²²¹ Faulhaber, Werner, *Logistics Manager Neumarkt Car Accessories Europe Asia*, Thule, 2008-04-08

though, the main reason is rather to lower costs but the effect is the same according to Castell. Thule does not, at the moment, purchase green miles or use any equivalent way of compensating for the emissions which their distribution causes. They do not either continuously evaluate their distribution network from an environmental perspective.²²²

5.8 Product Use

When reviewing the environmental aspects of Thule's roof boxes it becomes clear that the area where the least information is available regards environmental aspects of customer usage. Thule does have information regarding how the roof boxes are used but it has never been structured and presented either externally or internally in a clear and structured way.²²³ To gain a greater understanding of what drives roof box sales Thule ordered a market survey to be done during 2007, the survey was completed and presented to Thule on December 7th 2007. The survey was conducted in five different countries namely Thule's key markets Sweden, Germany, France, Italy, and the UK. The interviewees were not only roof box users but also buyers, importers, shop owners, and non-users.²²⁴

5.8.1 Roof Box Usage Areas

The survey revealed the following patterns regarding roof box usage.

Private or Professional

The survey shows that the boxes are used by both professional and private users. Private usage is however much larger than professional which is partly due to that boxes are currently not designed to meet professional user demands.

When

The roof box is primarily used during winter and summer holidays when extra storage space is required. There are however customers that use their box on a daily basis and also for shorter trips. There is a trend for customers to begin using their boxes on other occasions than winter holidays which previously has been the main area of use.

Who

The survey showed that the main customer segments buying roof boxes were families. Winter sportsmen and dog owners were also target groups albeit smaller.

²²² Castell, Lotta, *Supply Chain Director Car Accessories Europe Asia*, Thule, 2008-03-07

²²³ Welander, Magnus, *Business Area President Car Accessories Europe Asia*, Thule, 2008-03-17

²²⁴ Thule internal documents

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Families that own a mid-size car often need the extra storage space during vacations. Dog owners require the extra storage space since their dogs occupy the trunk of the car.

What

On the question of what customers transport in their boxes the answers were mainly luggage and winter sport equipment. Other usage areas were transportation of water sport equipment, tools and building material, children's push chairs and daily consumer need purchases.

Life Cycle

The survey shows that the life of roof box is quite long, some customers even stick with their roof box for up to ten years. This behavior is driven by the fact that users often only use their roof boxes once or twice every year and thereby incur very little wear to them. This is especially true for quality products such as Thule boxes.

Handling

84 percent of the interviewees say that they only use their roof box occasionally and both sellers and owners complain about trouble with installing the roof box as one reason that the roof box is only used on rare occasions.

Borrowing and Renting

Due to the size of the roof box customers express concerns about storing roof boxes. Many potential customers simply can't find the room for it in their home. This is especially true for people living in large cities, where apartments often don't have storage. The storage issue together with the fact that most users only use their box on a few occasions each year renting is increasingly becoming an option.

Buying

The survey showed a great impact of test performance on customer purchase decisions. There are a number of independent organizations that regularly perform tests and rate the different roof boxes and the survey gives indications that customers are very aware of these results when choosing which brand of box to buy.²²⁵ Included in these tests are factors such as price, load capacity, design, handling and safety during driving and crashes. The boxes have however not yet been rated according to environmental aspects.²²⁶

²²⁵ Thule internal documents

²²⁶ www.adac.de, ADAC-Test: Dachboxen 2006

5.8.2 Environmental Impact of Roof Box Use

The Swedish National Road Administration states in their guide to eco driving that a roof box increases the fuel consumption of your car with around one tenth of a liter for every ten kilometers driven. In the same guide they state that the roof box should be removed when not in use.²²⁷ The fact that a roof box increases fuel consumption is without debate, it does however have some meaning to further describe how and when the roof box increases fuel consumption.

A car's fuel consumption is largely dependent upon two factors, air resistance and roll resistance. A rule of thumb when calculating the increased fuel consumption caused by a roof box is that the air resistance of a vehicle is increased with around 20-25 percent when a roof box is mounted. The car has a roll resistance already at 0 kilometers per hour but at the same speed the air resistance is zero, given there is no wind. When accelerating, the roll resistance will grow along a linear curve up to relatively high speeds. The air resistance however increases with the velocity squared. This gives that the dominant factor deciding a cars fuel consumption at lower speed is the roll resistance and at higher speeds, the air resistance. The point where these two curves meet is for most cars around 70 kilometers per hour. The air resistance is consequently higher than the rolling resistance at speed above 70 kilometers per hour. This reasoning gives that a roof box's influence on the fuel consumption of a car is higher when the cars speed is higher. For example; when driving at 90 kilometers per hour a decrease in air resistance with approximately 10 percent will render a fuel consumption decrease with 3 percent. Since the rule of thumb stated that the air resistance was increased with around 20-25 percent when having a roof box mounted, a good estimate of a roof box's impact on fuel consumption is around 6 percent when driving at 90 kilometers per hour. However, if the car would travel faster the fuel increase would be larger, and if the car would travel slower the fuel increase would be less. It is however important to point out that the increase in air resistance, and thus also in fuel consumption, caused by a roof box is dependent on the type of roof box, mounting and car.²²⁸

Relevant figures concerning increased fuel consumption related to roof box usage are hard to come by. Most magazines, agencies, and institutions are content with stating that roof boxes have a negative impact on automobile fuel consumption and that it should be removed when not in use. As previously stated the Swedish Road Administration, states on their home page that fuel consumption will increase by approximately one deciliter per ten kilometers, and that a roof box should be removed

²²⁷ Sveriges Trafikskolors Riksförbund, (2006)

²²⁸ Danielsson, Håkan, *Aerodynamics and Calculations*, Saab Automobiles, 2008-02-12

as when it is not used²²⁹. To find out which sources the Swedish Road Administration had used to make this statement contact was made with Per Gustafsson, Environmental Manager at the Swedish Road Administration; unfortunately even he did not know where the figures originated from²³⁰. Further research on the subject has however shown that it is impossible to give a general figure of how much the fuel consumption will increase when driving with a roof box mounted. The reason for this is that it varies heavily depending on type of box, type of car, how the box is mounted and the speed at which the car is driven. Even if the same box and car is used a small shift of the boxes position on the roof could cause either an increase or a decrease in air resistance and thereby affect the fuel consumption.²³¹

In order to provide a frame of reference as to how fuel consumption can be affected by the use of a roof box, we have found two sources that have conducted testing on air resistance influence on fuel consumption of a roof box mounted car.

Saab Automobile

In the year 2000, Saab conducted a wind tunnel test with a Saab 9-5 fitted with a Thule roof box. This test resulted in an increase of the air resistance of around 22,5 percent. The car was first tested without the roof box mounted to give an initial value of the cars air resistance. The increase in air resistance was thereafter measured with the roof box mounted both according to specifications and thereafter turned 180 degrees. This is standard procedure when testing roof boxes at Saab since many roof boxes on the market have lower air resistance when turned around. This is due to the fact that they have been designed aerodynamically incorrect! The test also showed that the roof box decreases the rear lifting forces of the car with more than 20 percent which is good. The wind tunnel test confirms the previous estimate of an increase of fuel consumption of around 6 percent.²³²

VTI

In 1998 Magnus Lenner, then employed at the Swedish Road and Traffic Research Institute, conducted a study on fuel consumption, NO_x and, NO emissions when driving a car with different types of peripheral equipment mounted. The study used a 1992 Volvo 940 Sedan with a 2.3-l B230FB engine which had been fitted with measuring equipment enabling precise readings of the influence of outer circumstances. The tests were conducted in a systematic manner and a straight, even,

²²⁹ www.vv.se, Ta bort takbox m.m.

²³⁰ Gustafsson, Pär, *Environmental Manager*, Swedish Road Administration, 2008-02-06

²³¹ Emmerling, Alex, *Chief Product Development roof boxes*, Thule, 2008-04-07

²³² Danielsson, Håkan, *Aerodynamics and Calculations*, Saab Automobiles, 2008-02-12

and horizontal stretch of highway was used as a test track. A single experiment consisted of six successive test runs, three each way, at constant speed. For each run data was collected during at least 1 km of the test run. The tests were conducted during low-traffic periods to minimize the influence of other traffic. All experiments were run at three different speeds; 70, 80, and 90 kilometers per hour. The experiments tested the influence on fuel consumption and emissions when using studded tires, trailer, roof-rack and ski-box. The result of the test was that all mounted extra equipment caused an increase in fuel consumption; this increase also became larger when driving at higher speeds. The increase of fuel consumption when using a roof box was measured to be around 10 percent.²³³

5.8.3 Examples of Roof Box Use

To provide a frame of reference, as to how an increase in fuel consumption may affect end users of a roof box, a number of examples will be presented. By providing these calculations we wish to highlight how the use of a roof box can affect both costs related to owning a car and fuel consumption. The figures which concern fuel consumption, luggage compartment volume and the influence of a roof box on fuel consumption are based upon second hand data retrieved from car manufacturer SAAB. To validate this data, the figures have been compared to data from Nybilsguiden²³⁴ and VTI²³⁵. Since the later source provided different figures regarding the influence of the roof box on fuel consumption, we have chosen to incorporate figures from both Saab and VTI.

The driving distance used in the calculations, 15 000 kilometers per year, is based on figures from Statistics Sweden.²³⁶ The fuel price was retrieved from Statoil the 26th of February 2008 and was at the time 12.59 SEK/ liter. The cars used in the comparison are the Saab 9-3 Sport Wagon and the Saab 9-5 Sport Wagon. They were chosen since they represent Saab's two biggest selling models in 2007²³⁷. Both cars have engine alternatives which can run on both E85 and gasoline. For the calculation of these examples, figures based on gasoline as primary fuel were chosen. The engine alternatives, the 2,0t and 1,8t, were chosen since they have similar performance; for example they give the cars the same acceleration from 0-100 km/h.^{238 239} The roof box

²³³ Lenner, (1998)

²³⁴ Nybilsguiden is a booklet distributed by Konsumentverket, Swedish Road Administration and Naturvårdsverket.

²³⁵ Väg och trafik institutet

²³⁶ www.scb.se, Körsträcka mil per bil

²³⁷ Mattson, Mats, *Responsible for statistics*, Bil Sweden, 2008-02-13

²³⁸ www.saabsverige.com, SAAB 9-5 Pris- och produktfakta

²³⁹ www.saabsverige.com, SAAB 9-3 Pris- och produktfakta

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model used in the calculations is the Thule Atlantis 780, with a load capacity of 480 liters and a weight of 18 kilograms; Thule's most sold roof box in 2007.²⁴⁰ In calculating the carbon dioxide emissions generated from one liter of fuel we have retrieved figures from ALD environmental index which gives a value of 2.41 kilograms of carbon dioxide for every liter of gasoline.²⁴¹

Two examples of how a roof box influences fuel consumption and cost are shown below. The first compares the use of a Saab 9-5 without a roof box to the use of a Saab 9-3 with a roof box constantly mounted. The second example compares the use of a Saab 9-5 without a roof box with the use of a Saab 9-3 but with the roof box only mounted for a few activities per year. To put a number on the distance a roof box might be mounted if used on weekends only we made certain assumptions. We assumed that during these activities the roof box owner will drive 3000 kilometers; the remainder of the yearly distance of 15000 kilometers is driven without a roof box mounted. We also assume that the 3000 kilometers driven is the only time when the roof box owner needs the extra luggage space the roof box provides.

Due to the fact that the influence of a roof box on fuel consumption may vary slightly, depending on the type of car, roof box, mounting, and driving speeds one should bear in mind that the actual increase in fuel consumption may vary depending on the assumptions used. They do however give an indication of how the roof box and other alternatives affect fuel consumption.

The performed calculations can be viewed in table 4 and 5 in Appendix VI, and are summarized in figure 14 and figure 15 below. The figures show that the roof box SAAB 9-3 combination excels in all categories.

²⁴⁰ Thule internal documents

²⁴¹ www.aldautomotive.dk, Environmental Index

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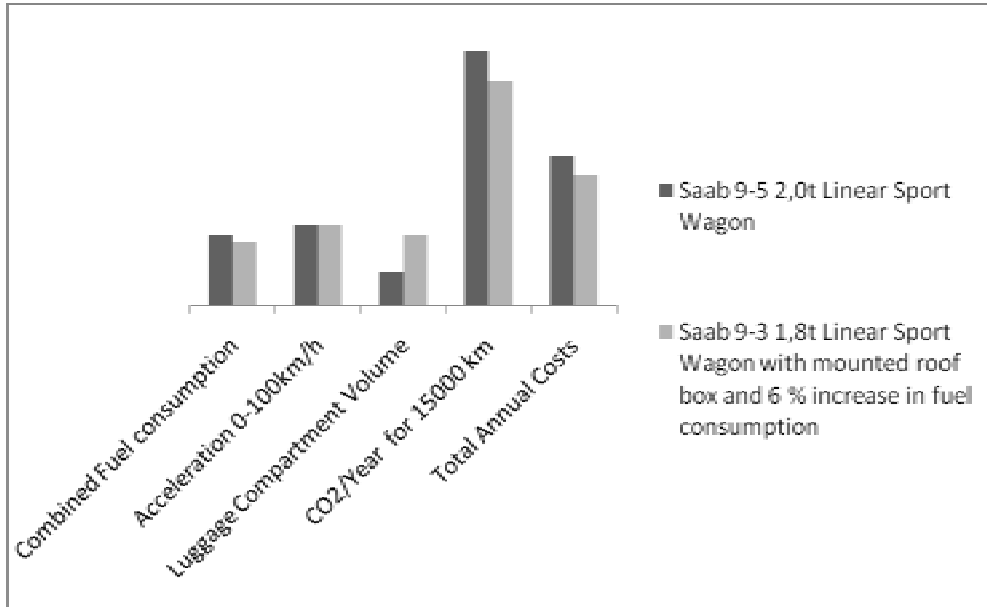


Figure 14 - Roof box usage example

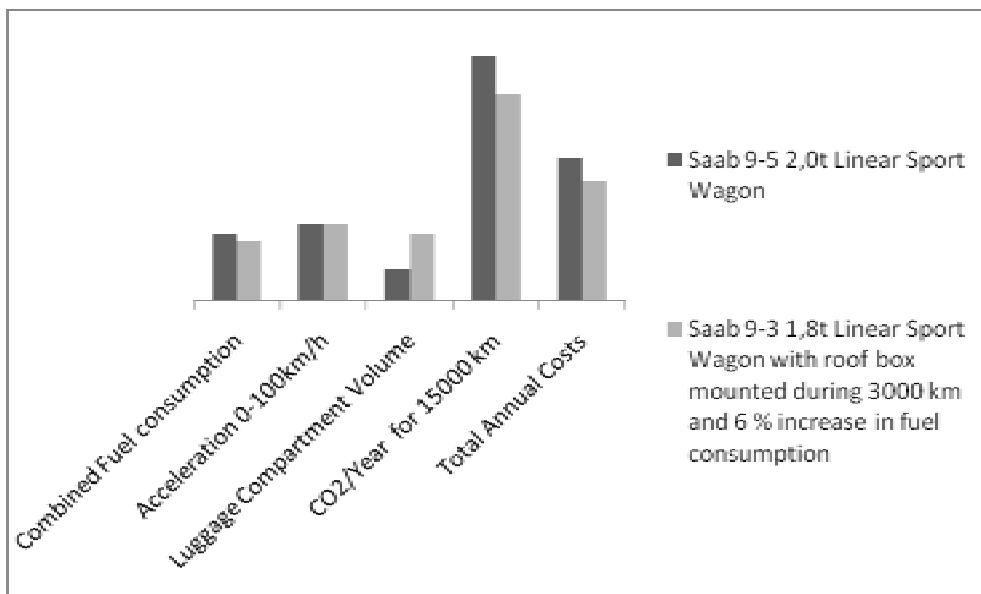


Figure 15 - Roof box usage example

5.9 End of Life

As stated before the life expectancy of a roof box is over ten years. Since Thule is a premium brand with a strong focus on quality they design their roof boxes with a life expectancy of 20 years. The end of life process is aided by the fact that all roof box parts are marked with material information making efficient recycling possible. The roof box is however not designed to aid de-assembly.²⁴²

Despite that all parts are recyclable and also marked with material information not many roof boxes are recycled. When speaking to Swedish recycling plants regarding roof box recycling they state that on the few occasions they have received roof boxes to their facilities, they are incinerated to generate energy and heat rather than recycled for material.²⁴³ At the Neumarkt plant in Germany it is possible to drop off your roof box for it to be recycled. This however rarely happens since it costs too much to send the box to Neumarkt. On a few occasions Thule has also initiated a campaign to increase the amount of recycled roof boxes. This campaign allowed customers to return their used roof box and receive a 15 percent discount on the purchase of a new model. This recycling campaign was however not successful due to misuse from the roof box retailers. Instead of sending the returned boxes back to Neumarkt, they gave the customers a 15 percent discount and then sold the returned boxes to friends. Only a few boxes made it back to Neumarkt.²⁴⁴

²⁴² Emmerling, Alex, *Chief Product Development roof boxes*, Thule, 2008-04-07

²⁴³ *Customer Service Department*, SYSAV, 2008-03-03

²⁴⁴ Emmerling, Alex, *Chief Product Development roof boxes*, Thule, 2008-04-07

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Their Business

6 How Green is Thule

In this chapter the arguments for why a company should go green, presented in chapter 4, are applied to Thule. This is done to show Thule how the incentives to go green affect them. By combining the facts regarding Thule presented in chapter 5 with the theories and tools presented in chapter 2 an analysis of Thule's current environmental performance can be made. The results of this analysis will be presented using the structure familiar from chapter 2.

6.1 Why Should Thule Go Green

The different trends affected by the environmental debate we have observed; customer behavior, investor demands and profitability have all been described in quite general terms. But how might they affect Thule more specifically?

6.1.1 Low Risk Could Mean High Profit

One observation is that companies in low risk industries who incorporate environmental values into their core business gain greater economic benefits from this than companies in high risk industries do. The reason for this is that consumers expect companies in industries such as the chemical industry or the energy industry to engage in environmental work. In low risk industries on the other hand consumers do not have the same expectations regarding environmental work. This is an opportunity that Thule can take advantage of. The roof box manufacturing process cannot be categorized as environmentally unfriendly in comparison to for example the chemical industry. Many of Thule's products can therefore be categorized as environmentally low risk. The implication this has for Thule is that going green, and actively communicating the environmental work, gives them a good chance of enhancing both shareholder value and profitability. It is however important to point out that in order for many of the benefits of internal environmental work to flow to a company, the company must signal the market.

6.1.2 Consumer Behavior Will Affect Thule

For a company such as Thule, which is linked both to the automotive industry and an active outdoor lifestyle, there are even more incentives to go green. Consumers today are becoming more and more aware and are starting to take action in accordance with their beliefs. If reports such as the one presented in the McKinsey quarterly show what is really happening in the ranks of consumers and executives alike, we believe that it would be devastating not to take action. Research also shows that consumers of outdoor goods have a higher awareness of environmental issues making it an even

more pressing issue for Thule. There are however also facts that indicate that since Thule's products do not consume energy directly and are not associated to large environmental risks, consumer behavior will not change at the same pace as it has in the car industry for example. The fact does however remain that when consumer behavior really starts to shift no company can afford to be left behind.

6.1.3 Taking the Lead

A review of Thule's main competitors on key European markets show that none of them have taken significant action in regards to environmental issues. The competitors we have had a chance to talk to tell us that no such plans are in the making either. The reasons why competitors are not acting on the environmental debate are unknown but a probable cause is the uncertainty of the gains it would give. The lack of action however gives Thule a chance to further enhance their brand as responsible and trustworthy by being the first car accessory brand that takes environmental issues as seriously as many auto manufacturers are doing today. If Thule is proactive regarding environmental issues it will make them a more attractive partner for car manufacturers. There is always a risk though with being the first to implement changes to product strategies in an industry. Our view is however that the downside of taking a larger environmental responsibility is small.

6.1.4 Reducing Costs and Retaining Talent

Even if the venture does not help to increase roof box sales we believe that it will benefit Thule in many other areas such as decreased costs. This is our belief since Thule is a company with a constantly growing and expanding network of suppliers and international business partners. Both these factors favor the implementation of environmental work, and increase possibilities that unified environmental work across all of Thule's areas, will lead to reduced costs. Another area where Thule might benefit from being more environmentally responsible is when hiring new employees. This is increasingly becoming a factor when students and young professionals choose their future employers. Thule already today has employees that are environmentally aware and see it as an important issue. Strengthening Thule's environmental work will therefore also retain the talent already present.

6.1.5 Staying Ahead of Legislation

So far we have stated positive incentives which can be seen as opportunities for Thule, there are however threats looming in the background as well. Investors, legislative bodies and other stakeholders might in the near future place demands on the entire industry, forcing Thule to take action. A few years back the European Union implemented an Eco-Design directive forcing all manufacturers of energy consuming products to implement Eco-Design methodologies into their product

development process. As stated earlier in the report it is highly likely that this directive will be extended to all products sold within the European Union. The indications we have gotten say that suggestions for changes in the directives regulating product development and eco design will be put forward within a year. We believe that there is no reason for Thule to wait for a new directive forcing them to take action. Successfully implementing Eco-Design into a product development process takes several years and a proactive approach to environmental work pays off in the long run.

6.1.6 Meeting Future Demands on Transparency

It is no secret that the goal of many private equity firms is to capitalize on their investments earning the highest possible profit when selling them off; in Thule's case this might very well mean going public. If Thule were to be publically owned there would be new demands placed on Thule and their environmental performance. Institutions like the Swedish pension funds place demands on environmental reports and a high level of transparency. Thule's top management may well be correct when stating that Thule is ready to face most of the demands that going public places on a firm, but when it comes to the environmental issue it is doubtful if this is the case. Thule currently has few if any measurements in place that give a total perspective of their operations, measurements that are required by for example the Global Reporting Initiative.

6.1.7 The Environment a part of Thule's Premium Brand?

Even though we have not found any conclusive evidence that the term quality and environmental awareness have been intertwined we still believe that Thule should seriously consider what implications it would have if the terms were to be closer linked in the future. Thule has the highest brand recognition in their industry and cannot afford to lose credibility, which would be the case if Thule would fail to deliver something that customers expect.

6.2 Management

6.2.1 Environmental Issues are Handled in Different Ways

Top management at the Thule Group has chosen not to implement a structured management system with focus on the environment, an EMS, at a central level. The choice not to do so is connected to the fact that Thule is quite a decentralized company with a results control system, where most of the issues are dealt with at a lower level than top management. Environmental issues are no different, as stated in chapter 5.1.3, and consequently it has been up to the different business area managers

and their subordinates to handle these issues within their particular area. The implication this has had for Thule is that the level of environmental performance within the different business areas may vary greatly. During this thesis we have only studied one business area in detail and we can therefore not be certain that this is the case. The indications we have gotten though, when speaking to employees, is that a difference does exist. The creation of an additional more specific environmental policy within Car Accessories Europe Asia is one example of how environmental work might differ within Thule.

Since brand issues are handled centrally at Thule the environmental performance of a product or a company may affect the brand. The existence of a difference in environmental performance between different product areas could potentially harm the Thule brand if one business area alone decided to emphasize the positive environmental aspects of their product. The paying customer sees the Thule brand as one entity and might not be aware of the decentralization of the organization. If poor environmental performance within one area of Thule becomes public knowledge then this badwill will certainly spill over to other products bearing the name Thule, no matter how environmentally sound they are.

6.2.2 Lack of Focus Leads to Lack of Attention

Even though Thule has no structured environmental management system at a central level they do not lack the ambition to address the issue, and they actually do address the issue in their environmental manual. The language in the policy is very general, probably since Thule is such a diversified company and top management wants the policy to be applicable to all parts of the company. The values conveyed in the policy are supposed to apply to all Thule employees and permeate the activities conducted within Thule. This is however not our view of the situation. Knowledge about the existence of an environmental policy is there, but to say that the policy is representative for the way in which Thule works with environmental issues today would be misleading. The reasons for why the environmental policy has had so little impact on the daily activities at Thule vary. One of the biggest reasons is the fact that environmental performance is not measured at management level. Such figures do exist at lower levels of the organization but the figures, and the activities which they measure, are not deemed important by employees since top management does not demand to see the figures. The fact is that issues and activities that are measured receive attention from members of an organization whilst non measured activities do not come into focus. This is the case at Thule to, where financial performance is measured in every way and subsequently awareness of costs and sales is high among the employees.

6.2.3 Low Level of Environmental Education

Another reason we believe has hindered the implementation of the environmental policy in daily work is the lack of education among employees on the subject. There is sufficient knowledge to be able to live up to regulatory and government demands but perhaps not to go the extra mile. Without a certain level of competence from all employees it is difficult for environmental work within an organization to reach a high standard. If employees do not actively take into consideration what effects their actions have on the environment, then it cannot be said that the company is as environmentally sound as it could be. The issue of environmental education, as so many other things, has been left up to the individual business area managers. Why business area managers have not made education a higher priority we do not know. It may however be linked to the measurement issue as well. Education comes at a price and if business area managers are evaluated purely upon financial performance, and environmental performance is overlooked, then it is not difficult to understand why environmental training is such a low priority.

Communication goes hand in hand with education and the lack of communication, regarding Thule's environmental policy, has played a part in the fact that Thule does not completely live up to its policy. Communication is a foundation needed to achieve goals and targets and by not communicating the environmental policy clearly and often enough it becomes difficult for Thule employees to live up to the policy.

6.3 Culture

6.3.1 Thule's Culture does not Include Green

On the whole there are no explicit concerns for the environment in Thule's culture today. Environmental concern is not a core value expressed in the company's mission or vision and it does not permeate the daily activities within the company. The factors that matter in the Thule culture are making functional and high quality products with a good profit. The main reason for profitability and functionality running as a thread throughout the organization is top management's focus on these issues and the inclusion of them in the strategic process. The culture at Thule is one where the primary mechanism of top management's values has great affect on the actions of employees, perhaps more so then in the average organization. Even though the organization is decentralized, employees still seek approval and guidance from above. The knowledge of what is approved of is gained for example from key performance figures. Quality and safety are measured through independent tests and the measuring provides a signal of the importance of these parameters. Environmental performance

on the other hand is not measured and consequently it has not become important within the culture either.

Another factor which helps to shape a culture is resource allocation; within Thule environmental issues have not received enough resources to signal their importance. Since top management's values have large influence on the Thule culture it has resulted in the culture being very adaptable. Employees are very conscious of management views and adapt easily to changes in values.

As individuals many Thule employees have understood the importance of environmental issues and have expressed their wishes to do something about them. They have however not been encouraged by Thule to act upon their feelings since reward systems and other organizational structures have encouraged other ways of thinking and acting. The implication of the environmental awareness we have seen among staff is that any environmental venture undertaken by Thule will most likely be well accepted by employees and also incorporated into the culture.

6.3.2 Focus on Profitability has both an Upside and a Downside

Thule is a private equity owned company and as stated before profitability is a very large part of the Thule way of thinking, as it should be. Without profit there are no financial resources to improve environmental performance with. The consequence of this is however that any environmental venture or attempt to go green must be accompanied by profitability. Any actions that are taken which do not improve, or at least sustain, current levels of profitability will most likely not lead anywhere. Often the focus on profitability is mentioned as something negative, but it can just as well be viewed as something positive. For example, the focus on profitability within Thule will most certainly lead to a successful implementation of ISO 14001. The mindset of the employees means that any instrument or tool which is brought into the organization will be made useful as so to not waste any money. This means that ISO 14001 in Neumarkt, Menen and so on will not become just paper products.

A downside to being owned by a private equity firm, from an environmental perspective, is the timeframe that the culture adapts. Planning at Thule often does not extend beyond three years when it comes to pay back times and investments. As mentioned earlier a culture that wants to embrace environmental issues needs to move away from three year plans and display a more intergenerational timeframe in their planning.

6.3.3 Being an Outdoor Brand Influences the Culture

In Thule's vision and in advertisements there is no specific mention of the environment. Still there is an underlying sense of nature embedded in the advertising pictures and slogans that are communicated to employees. Personnel, within Thule Car Accessories Europe Asia, have a shared passion for outdoor life and nature. It is therefore our view that people at Thule would have little or no difficulty identifying with a culture that embraced environmental issues to a greater extent in the future.

The study of Thule's culture is based upon observations made when interviewing Thule's top management and also employees within one business area; namely Car Accessories Europe Asia. If the observations made are applicable to the whole of Thule is hard to say and should be investigated further before drawing conclusions regarding Thule as a whole.

6.4 Product Development

6.4.1 The Product Development Process Influences the Entire Life Cycle

When developing roof boxes, and other articles within Car Accessories Europe Asia, Thule does not use a life cycle perspective in their approach. Not using a life cycle perspective leaves Thule unknowing of what improvements that could be made in a products life cycle. The lack of knowledge does not mean that Thule products are environmentally unsound; it does however mean that Thule cannot claim them to be environmentally sound either. The important thing when beginning to address environmental issues is not to achieve radical breakthroughs at once; the important thing is to keep improving and to keep striving for a better environmental performance. We believe that the product development process is the only stage which gives Thule the chance to influence the entire life cycle, and thus changing the mindset during this activity has the biggest potential to improve a roof box's environmental performance. One reason why Thule has yet to integrate a life cycle perspective in their product development process is that they lack the relevant knowledge regarding how this should be done and also lack the incentives to take such an approach.

6.4.2 The Product Development Process Shows Promise

When reviewing the current product development methodology it becomes apparent that even though there are some environmental considerations present in the methodology little work is, or has been, done. There are few concrete actions linked to environmental issues and those that are present are seldom executed. We believe

that it will be difficult for developers to truly take into account environmental issues without the proper training and knowledge required regarding available tools and methodologies. Thule does however show that it is capable of change if incentives are high enough. One such incentive came from the car industry and the EU when it recommended the abolishment of chromium six from products. Thule quickly responded and has today totally discontinued the use of the dangerous substance throughout the organization.

Today's roof box and car accessory design is highly characterized by functionality, safety and style. When comparing what attributes the product developers are prioritizing in the design process one can clearly see the link between what is getting done and the values being pushed by management. Safely, easily and in style are three words which are used in the Thule vision to describe the Thule Brand, they have obviously made their way into the minds of the product developers as well. The wholehearted commitment to Thule's vision in the design of Thule products gives us hope. If Thule were to integrate an environmental aspect into the Thule vision, and management would raise incentives to develop more environmentally conscious products, we feel that the product developers would be willing to accept the changes made. Today all decisions made are based on economic models that do not reward a more environmentally friendly choice of material, unless it is cheaper. If this model were to be changed, so would the products produced by Thule.

Although Thule isn't currently dealing with environmental issues in a serious way in the product development process, they have begun making changes to their methodologies and made attempts to do better. Many of these changes such as design for assembly and design for manufacture have only just been included in the TPS system and have not yet been fully utilized. If Thule were to really start working with the tools and guidelines present in TPS, a big step towards a greener product development would be taken.

6.5 Procurement

6.5.1 No Green Demands on Suppliers

The procurement of semi manufactured products and materials at Thule today lacks an environmental perspective due to the fact that costs, quality and service levels have been prioritized factors. The implication this has for Thule is that they cannot be certain that their products are environmentally sound throughout the life cycle. Since no demands are made on suppliers regarding environmental performance, Thule knows little of how these issues are handled further down the product chain. When speaking to purchasers at Thule it is however apparent that they are aware of the

problem, and they do see the implementation of ISO 14001 as an advantage when choosing between two similar suppliers. Research shows that pursuing ISO 14001 certified suppliers, especially for an international company such as Thule, helps organizations gain benefits from their environmental work.

We believe that placing demands, on some level of environmental work, among suppliers will help Thule reach a higher level of security when it comes to the environmental performance of their products. This will become increasingly important when suppliers from countries that are difficult to effectively monitor such as China are used.

6.5.2 Thule is no Greener than its Suppliers

If Thule chooses to go down the green path, then the use of environmentally sound suppliers will be of the up most importance since the level of environmental work conducted by one's suppliers often determines one's own level.

6.6 Manufacturing

6.6.1 Thule Knows their Manufacturing Process

When visiting the Thule roof box manufacturing site in Neumarkt it becomes apparent that it is not a manufacturing process with high environmental impact. Thule has since a couple of years back continuously measured parameters such as energy consumption and scrap which shows that they see these issues as important. A contributing reason that these measurements are important for Thule is the economic incentive it gives to be resource efficient. These measurements started three years before we have seen any mentioning of ISO 14001 in internal documents which further strengthens our belief that the Neumarkt plant takes this matter seriously.

The roof box uses components that are fairly kind from an environmental perspective. The ABS, PS and POM plastics used for the roof box are recyclable and thus as good an environmental choice there is today without putting quality second, which is not an option for Thule. A few years ago there was a review conducted to investigate if Thule was using the best materials and the best machines available to them at that time. This review gave them guidance and we think that it clearly shows that Thule is serious about combining good economy with good ecology. This perspective does however become a problem when investments that would decrease environmental impact have a payback time in excess of what is accepted at Thule. In these cases the clear focus on profitability, which otherwise is positive, backfires and hinders investments that would without doubt help both Thule and the environment.

6.6.2 ISO 14001 will Bring Further Focus on Environmental Issues

ISO 14001 helps companies structure their environmental work and thereby make improvements that otherwise had been neglected. We believe that this aspect is the most significant benefit of working with ISO 14001, helping the company increase focus on environmental issues. When discussing with plant manager Matthias Plischke about the reasons for implementing ISO 14001 he does not deny that the economic benefits of using the system was the main priority. We believe that this is not a bad way to view the decision of implementing ISO14001. If the work with ISO 14001 is to become more than just a certificate on a wall; the benefits of working with it has to be clear. In Neumarkt's case measurements regarding for example savings in energy consumption will motivate management to keep working with ISO 14001 actively. With the decision to implement ISO 14001 throughout Car Accessories Europe Asia, management has clearly shown that this is an important issue.

The manufacturing process of roof boxes is one of the areas within the roof box value chain that we deem the most environmentally sound. They have a clean operation and are aware of their main environmental impact. One could argue that this situation can be attributed to the soon to be implemented ISO 14001 system but we argue that this has little to with that. The Neumarkt site has since long had a strong focus on productivity which in turn has given them a resource efficient manufacturing process. In this case good economy and good ecology clearly goes hand in hand.

6.7 Distribution

6.7.1 Environmental Impact not a Priority

Within Car Accessories Europe Asia's distribution network, environmental issues are not high up on the agenda. The network is constantly evaluated from many different aspects; however the environment is not one of these aspects. They do not measure any environmentally related aspects such as ton kilometres or carbon dioxide emissions. The biggest reason for this is the fact that environmental issues have not been considered important at Thule until now; the focus has been on cutting costs and improving customer service. Distribution costs are the number one focus but luckily costs and improved environmental performance often go hand in hand.

6.7.2 Cost Efficiency is Often Good for the Environment

The consequence for Thule, when choosing not to evaluate the environmental impact of their distribution network through measurable or other goals, is that it becomes difficult to make any improvements. Since they do not know the current impact of

their distribution system it is difficult to say if any changes that they make are going to have a positive or negative effect. One action that almost always leads to a reduced environmental impact is the reduction of transport relations. Even though Thule does not actively work with environmental issues within distribution, certain decisions which they have made have contributed to reducing the company's environmental impact. One such example is the opening of a central warehouse in Duisburg. The use of a central warehouse automatically decreases the number of transport relations in a distribution network and thus it is good for the environment. Another example of how Thule has reduced its transports is the choice to only send shipments from Neumarkt to Duisburg if they are able to fill an entire truck. These two examples both illustrate how Thule's cost cutting work inadvertently has improved their environmental performance.

The second type of delivery system which Thule operates, direct delivery, is not optimal from an environmental perspective. It requires many transport relations and often the trucks are only half full. Direct delivery is however a way of competing on certain markets and therefore difficult to move away from.

6.7.3 Policies are made to be Followed

In theory, Car Accessories Europe Asia is only supposed to use environmentally certified transport companies to cater their transport needs. In practice this is both true and untrue. Today most of the big shipping agents in Europe are environmentally certified and since Thule often utilizes the big shipping agents they do use environmentally certified transports. The untrue part of the statement is the fact that Thule does not actively check if a shipping agent is certified and so when they do choose certified transports it is purely by coincidence. That fact that Thule has set a target signals that they want to make the environment a bigger part of their distribution in the future.

6.8 Product Use

6.8.1 Changing Consumer Mentality Regarding Roof Boxes

When discussing the environmental impact of roof boxes the first statement one is confronted with is that roof boxes increase fuel consumption when used, and are therefore bad for the environment. This fact is further enhanced by for example the Swedish Road Administration's guide to eco driving which highlights the increase in fuel consumption the roof box causes. Yes, you should remove your roof box when you are not using it and a roof box does increase fuel consumption of your car. It is

however worthwhile to challenge these common truths regarding roof boxes with the aim of trying to change the consumer's view of roof box use.

The fact of the matter is that a roof box not only increases the fuel consumption of your car, it also increases your luggage space. If you own one of Sweden's most common family cars, the Saab 9-5, you more than double the available luggage space by having a roof box mounted. We believe that the reason many people buy larger cars is to be able to use it when going on weekend getaways or longer holidays and have room for all the luggage these trips demand. The roof box provides this extra luggage space without the need of owning a larger car. Most people drive this larger car to work every day as well, and most of those trips are done with both passenger seats and luggage compartments empty. Using this line of argument it becomes evident that the roof box provides far more flexibility than a large car does, there is however the problem with convenience. Not many customers are willing to mount and dismount their roof box on a regular basis and the ownership of a roof box requires sufficient storage space in your home which also presents a problem. Thule has during recent years had a strong focus on functionality when developing their line of roof boxes. If customers start taking environmental issues seriously this strategy could prove successful since it allows customers to easily mount and dismount their boxes. This makes Thule's roof boxes a better alternative for consumers who wish to use the roof box in order to make their car more flexible. Thule's new line of foldable roof boxes also fit nicely into this trend since they do not increase fuel consumption as much when they are empty.

6.8.2 Reducing Total Fuel Consumption

In the example provided in chapter 5.8.3 it is however shown that dismounting a roof box is not necessary in order to use the roof box in a way that benefits the environment. The figures presented in the comparison between a Saab 9-3 with a continuously mounted roof box and a ordinary Saab 9-5 clearly show that the Saab 9-3 with the roof box has more than double the storage space and one tenth of a liter lower fuel consumption for every ten kilometers driven. Not to mention that the Saab 9-3 is both cheaper to buy and has a lower vehicle tax. The Saab 9-3 with a roof box also provides the possibility to dismount the roof box leading to an even lower fuel consumption, this is however not needed in order for it to beat the Saab 9-5 on that point. This example could of course have been made more extreme by comparing the Saab 9-5 with an even smaller car; we however feel that the presented combination gives a realistic ground for comparison. It is more likely for car buyers to make the switch from a 9-5 to a 9-3 than to a Volkswagen Golf, the step isn't that large. The Saab 9-3 would also be a viable alternative for example families with children, the roof box could for example store trolleys and groceries, leaving the luggage

compartment free for additional items and equipment. An additional component of this is that many cars in need of extra luggage space are driven in urban areas where speed seldom exceeds 70 km/h. Since roof boxes influence on fuel consumption is tightly linked to air resistance these lower speed results in an even smaller influence on fuel consumption.

Many outdoor activities demand large quantities of equipment which has to be transported from you and your friends home out into the wilderness or wherever the site for your favorite activity is. The roof box makes it possible to fit both passengers and equipment into a small car and it can even make it possible to use one car instead of two.

6.8.3 Communicating the Message

In order for Thule to be able to benefit from the arguments presented above they have to change consumer mentality regarding the environmental effects of a roof box, this is however not an easy task. One reason for the difficulties in using environmental arguments when selling a roof box is that the roof box itself does not consume any energy. Products such as environmental cars have been successful much do to the clear link between customer and environmental benefits. The cars are not only good for the environment but they cost less to own, consume less fuel and enjoy benefits such as free parking and are relieved from paying congestion tax in Stockholm. For the greening of roof boxes to become successful, the link between customer savings, environmental savings and roof boxes must be made clear in similar ways.

By working with the aerodynamic aspects of the roof box design it is possible to reduce the increase in fuel consumption that a roof box causes. The different conditions that occur when the roof box is mounted does however make it extremely difficult to claim that a Thule roof box increases the fuel consumption less than a competitors box. Thule could however highlight the aerodynamic design adjustments made to show that they take aerodynamic issues seriously and thereby enhance the image of the Thule brand as a premium product.

6.8.4 Roof Box Drawbacks

Despite the obvious strengths of the examples presented above it does not show the whole truth. There are other aspects that influence the decision to buy a larger car than just luggage space, and not all people are keen to drive around with a roof box continuously mounted on their brand new good looking car. A smaller car with a roof box might provide more luggage space but the fact of the matter is that it is still easier to own a larger car despite the fact that it consumes more fuel. Regardless of this we

still believe that the arguments have some clout and although we have not tested them on consumers they might at least help shift roof box mentality in the right direction.

The greening of Thule's roof boxes shows potential, but much work still remains in order for Thule to be able to take advantage of its strengths. It is also difficult to assess how an effort to change consumer perception of roof boxes will be received by consumers, roof box weaknesses such as storage problems and the difficulties in mounting and dismounting the box might prove to be large obstacles to handle.

6.9 End of Life

6.9.1 Why Buy a New Roof Box?

Consumer behavior regarding roof box use has led to that recycling of roof boxes has received very little attention from Thule. People buy new cars on a regular basis but they keep mounting their old roof box on their new car year after year. This behavior can be viewed from two perspectives. The long product life is of course beneficial from an environmental perspective since the environmental impact from the manufacturing process is distributed over a larger number of years. However, when viewing the life cycle screening in chapter 5.3 it can be seen that the customer usage phase incurs by far the largest environmental impact. If new boxes were proven to have significantly better aerodynamic properties than old boxes an economic incentive would be given to owners of old boxes to buy new ones, thus saving money for the customer and reducing total environmental impact. It is however very difficult to prove that a new box is aerodynamically superior to an old one due to differences in mounting, car etc. which has been discussed above.

6.9.2 Recycling the Roof Box

The current recycling behavior does not call for design for de-assembly to be implemented into the product development process. The roof box is also such an easy product to de-assemble that no major changes can be made. The attempts to increase roof box recycling at the plant in Neumarkt did not work mainly because of the logistics problem of getting the product from the customer, back to Neumarkt. Since Thule is unwilling to pay for the shipping it will be difficult to motivate customers to pay for their roof box to be recycled. This is also the reason that the roof boxes that are scrapped are incinerated and not recycled for material. Logistics was also one of the main reasons that Thule's campaign to give discounts for recycled roof boxes was unsuccessful. The customers did in fact recycle their roof boxes, by leaving them at their local dealers, but the boxes never made it to Neumarkt due to the long distance and the possibility to sell the box on the second hand market. We however believe that a campaign to increase the amount of recycled roof boxes could be successful

since it is positive for both the environment and gives the consumers an incentive to buy a new box. The theory regarding end of life systems also points out that the consumer's willingness to bring their roof boxes to the dealer for recycling is the most crucial link in the end of life chain. We therefore believe that Thule's campaign to give discounts when recycling old boxes is the right way to go since it gives consumers an incentive to take this first crucial step.

6.10 Environmental Evaluation of Thule

The following chapter will summarize Thule's current status in comparison with the environmental tools and theories presented in chapter 2. Below we will discuss how well Thule utilizes the tools we have previously presented. The different headlines are retrieved from chapter 2 and represent actions which companies wishing to become green could take. To give an overview of Thule's performance regarding the actions presented below each action will be rated according to the list below.

- **Good** - The action more than well meets the demands.
- **Sufficient** - The action is taken but leaves room for improvement.
- **Needs improvement** - The action is not implemented.

6.10.1 Management

The headlines specified in the management chapter below are based on figure 3 which is the continuous improvement cycle. This reference is used to give Thule an idea of how their environmental management at a central level functions.

Commitment and Policy - Sufficient

Thule's current environmental policy is good, but not fully implemented. For this tool to have the desired effect Thule should work harder to fulfill the statements made and make sure they are applicable to different circumstances throughout the organization.

Planning – Needs improvement

Thule currently does not have any significant environmental performance dimensions on a corporate level. Examples of relevant dimensions on a corporate level could for example be meeting the requirements of the Global Reporting Initiative. This would ensure that the planning step of the environmental management system is dealt with in a more efficient way.

Implementation – Needs improvement

Since Thule has not specified any numeric performance dimensions regarding environmental performance there also does not exist anything to follow up on and measure.

Evaluation – Needs improvement

For an environmental management system to be successful it is important that the environmental policy is continuously evaluated and updated to fit the company's needs. This is not satisfactorily taken care of at Thule today.

Management Review – Needs improvement

For the measurements to have the desired effect they should be continuously reviewed and checked. This is one of the most important aspects of utilizing an environmental management system.

6.10.2 Culture

Management Interest – Needs improvement

Environmental issues have not been an area of focus at Thule as of today. Since management values are important when shaping the culture at a company; Thule's culture cannot currently support going green. Management mentality at Car Accessories Europe Asia is however shifting and some improvements are being made. These improvements have been implemented during the end of this thesis and have therefore only to a limited extent been taken into considerations when evaluating Thule's environmental work.

Resource Allocation – Sufficient

Since environmental issues as of yet have received limited focus from management they have also not received the necessary resources to make a difference. The resources needed are for example time for education and the hiring of employees with competence regarding sustainability issues. Some resources have however been given to the implementation of ISO 14001 but not enough to influence the culture.

Intergenerational Time Frame – Needs improvement

Thule's current strategic perspective spans over 3 years. This cannot be considered to be an intergenerational time frame which is required when building a culture that supports a sustainable perspective.

6.10.3 Product Development

Using a Life Cycle Perspective – Needs improvement

As mentioned earlier Thule does not employ a life cycle perspective when developing new products. The common denominator of all methodologies aiming to improve environmental performance during the product development process is using a life cycle perspective. Even though the product developers at Thule have extensive knowledge regarding their products, viewing products from a life cycle perspective is necessary in order to take Thule's products forward.

6.10.4 Procurement

Place Demands – Needs improvement

Since a company is no greener than their suppliers, placing demands on one's suppliers is necessary. Thule does currently not place any demands regarding environmental performance other than saying that it is preferable if they implement ISO 14001. Consequently they cannot guarantee the environmental performance of their products.

Use Available Tools when Evaluating Suppliers – Needs improvement

In order for a large company such as Thule to green their procurement a specified set of demands must be placed on all their suppliers. This is something that Thule does not do today. By for example demanding that suppliers implement ISO 14001 a good common level would be obtained.

6.10.5 Manufacturing

ISO 14001 - Good

Thule Car Accessories Europe Asia is currently in the process of implementing ISO 14001 throughout their manufacturing sites. This will guarantee a sufficient minimum level regarding environmental work.

Key Performance Indicators - Good

On many of the sites which have not yet implemented ISO 14001 key performance indicators are used. This will make implementing ISO 14001 easier when the time comes.

6.10.6 Distribution

Joint Loading – Needs improvement

Thule does, to our knowledge, not utilize joint loading on any distribution routes.

Green Outbound Shipments - Good

Thule is very good when it comes to shipping goods in fully loaded trucks. When it comes to using green shipping agents the same cannot be said to be true. Even though Thule has a written policy stating that they should use green shipping agents, this is not always the case. When green shipping agents are used it is often merely by chance since this policy statement is not controlled.

6.10.7 End of Life

Actively Support the Recycling of Products - Sufficient

Thule has on some occasions actively supported the recycling of roof boxes but there is currently no incentive for customers to do so. Thule does however provide the possibility of recycling their products if the customer is willing to deliver the roof box to Neumarkt.

6.10.8 Thule Shows Potential for Improvement

Even though many of the actions that the theory regarding successful environmental work recommends is not implemented, we feel that there are factors that indicate that an attempt at going green will be successful.

Thule's management system has a strong track record of getting things done and focusing on what matters most to them. If this focus was to be redirected to environmental issues we believe that the transition could be made in a swift and efficient way. Combining this with Thule's previous experience of ISO and also their strong focus on profitability, we believe will help them make a change that will last. If the change does take place it will be on incentives that are sustainable both from an environmental and economic perspective.

Another aspect that would support Thule going green is that they have products that, if exposed in the right way, are environmentally sound. The roof box offers ways to reduce the total environmental impact when using your car, a product attribute that we believe would be difficult to market if the production process was anything but clean. Thule's production process is clean, and they have good knowledge regarding product development and materials used which are important factors from a life cycle perspective. Knowledge and know how regarding internal factors are essential for Thule in order to reduce the risk of being accused of greenwashing.

We also believe that the culture at Thule could aid going green if the right mechanisms are used. Adaptability combined with the will to make an effort in order to help the environment, are factors that are important if an environmental effort is to become more than just pretty words on a paper.

Going Green - Why and How Thule Should Make Environmental Issues a Part of Their Business

Thule's organization does however display some obstacles that might hinder a serious green venture. Thule does currently not have any focus regarding environmental issues and their current focus on profitability could also have negative impact on their decision to go green. If management is unconvinced of the economic benefits and strategic needs to go green, the risk is great that nothing will be done. Examples of the deficient focus are the lack of measurements and follow up of basic environmental parameters needed in order to be able to improve.

There is also a lack of basic environmental knowledge in the organization which has to be dealt with in order for any green venture to be successful. Going green implies more than just implementing ISO 14001; one must also understand the impact of one's products from a life cycle perspective, an awareness that is missing at Thule today. Thule's current growth strategy makes this even more difficult when new products, manufacturers and suppliers are added every year. For the Thule brand to go green, all products must be environmentally sound throughout their life cycle.

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7 Taking Thule Forward

The following chapter aims to present ideas of actions that Thule can take in order to start working with environmental issues in a concrete way. The recommendations presented below do not follow the structure that previously has been used throughout this thesis. The reason for this is to focus on the areas that are most critical for Thule in order to take their environmental work to the next level.

7.1 Recommendations

7.1.1 Integrate Environmental into Thule's Strategic Plan

Today Thule has a strong focus on quality, functionality and style when designing and developing their product portfolio. This focus is not something that just happened but is a result of strategic thinking and planning aimed at producing products that target a specific segment of customers and market trends. Thule's current strategic plan has no mention of environmental goals or values and it has therefore not become important either. We feel that it is important that environmental issues are integrated into Thule's strategic plan. It is the only way of clearly saying: this is important! If this decision is taken we feel confident that Thule will be up for the challenge.

7.1.2 Increase Competence through Education

To be able to become a green organization, the employees working at Thule need to understand the impact their actions have on the environment from many perspectives. This understanding, the life cycle perspective, is lacking in today's organization and in order for Thule to become a truly green company they need to bring new knowledge into the organization. Most of this new knowledge can be obtained by educating the personnel already working at Thule; some new knowledge will however have to be brought in by new people with significantly more experience within the field of sustainability.

As all products also Thule's roof boxes have an environmental impact throughout their life cycle. The life cycle screening performed in chapter 5.3 clearly shows that a roof box's primary environmental impact is incurred during the usage and manufacturing stage. The only part of the roof box value chain where both these phases can be influenced is the product development process. We therefore believe that this should be the starting point when educating employees. The product developers are crucial since it is in the design stage that much of a product's environmental impact can be reduced. The product managers on the other hand are responsible for the entire

life cycle of a product and should therefore be aware of the different options and tools available to reduce the environmental impact. By starting with these key employees, most stages of the product life cycle are covered.

7.1.3 Communicate the Ambition to Go Green

Many of the benefits of going green that have been presented in previous chapters require that the environmental work done is communicated. If Thule starts taking environmental issues seriously we therefore believe that they also should start communicating their ambitions. This communication should first be internal and strive to be as transparent as possible. When a good grip of the environmental situation at Thule is acquired steps should be taken to make this message external as well. By being honest and transparent the risk of being accused of greenwashing is minimized. Initially Thule should not claim that this is their main focus but rather that they are making an effort and started working with an issue that will take years to handle effectively. Experience from companies' show that this process takes time, one such example is presented in Appendix II and the case of ABB.

7.1.4 Increase Focus through Measurements

Many of the recommendations we have made are measures we feel need be taken now, for example the incorporation of environmental issues into the strategic plan. One recommendation we also have is one which perhaps not should carried be out right away but one that is necessary if Thule wants to be successful in an environmental venture. To increase focus on environmental issues we argue that Thule needs to start measuring its environmental performance. In decentralized organizations the old saying what gets measured gets done is really true. Examples of this within Thule include financial and quality performance; which is measured and has consequently become important for employees. Which measurements Thule should incorporate into the organization, and use as guidelines to evaluate their environmental performance, we have not studied further. One suggestion could however be to follow the Global Reporting Initiative's structure.

7.2 Forming an Environmental Strategy

The recommendations we have made above mainly focus on improving internal environmental performance. In order for a company to clearly focus their environmental work an environmental strategy is however needed.

R.J Orsato (2006) presents a framework inspired by the BCG matrix. In the matrix Orsato presents the relationship between competitive advantage and competitive focus in environmental strategy. Figure 16 separates four possible environmental

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strategies that can be implemented to gain competitive advantage in a firm's business environment.

The first business strategy is labeled the Eco-Efficiency Strategy. Companies that employ this strategy seek to both lower their environmental impact while at the same time lowering the costs of their organizational processes and operations.

The second competitive strategy is termed the Beyond Compliance Leadership Strategy. Here a firm differentiates itself by excelling in the environmental performance of its internal processes. This strategy is often employed by companies who are under public and/or regulatory pressure to improve their environmental performance. One action that firms striving to move towards strategy two often take is to comply with reporting standards required by for example the Global Reporting Initiative.

The third competitive strategy is labeled the Eco-Branding Strategy. This strategy is distinguished by a company offering products and services with a green appeal that is difficult for its competitors to follow or imitate.

The final competitive strategy is termed the Environmental Cost-Leadership Strategy. The companies following this strategy not only offer products with good environmental performance but also with a lower price than its competitors.

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Figure 16 - Generic Competitive Environmental Strategies, Source: Orsato, (2006)

Firms seldom implement only one of the strategies presented in figure 16 but tend to straddle the boxes. After studying Thule we have concluded that Thule is currently implementing Strategy 1: Eco-Efficiency. By following our recommendations that focus on internal organizational processes we believe that Thule would move in the direction of Strategy 2: Beyond Compliance Leadership. In the future we believe that Thule has the potential to move towards Strategy 3: Eco-Branding, but first moving through Strategy 2 is the right way to go. By taking this route through the environmental strategy map Thule will ensure that its organization is ready to use environmental arguments in the marketing of their products.

8 Conclusions

The purpose of this thesis was to show Thule why and how they should go green. In this chapter we return to the purpose of this thesis to discuss how it has been fulfilled.

Even though it cannot for certain be said that the environmental debate will have a real effect on Thule in the near future, we believe that the incentives to go green are strong enough to motivate integrating environmental values into Thule's core strategy. The potential to reduce costs, increase market share and reduce financial and business risk are worth the peril investing in a greener business implies.

When using the developed framework to study Thule it is evident that environmental issues have not been an area of focus. The level of environmental work carried out within the different parts of Car Accessories Europe Asia varies greatly making the lack of understanding of the life cycle impact of the roof box evident. During the course of writing this thesis things have however started to happen. Steps are taken in the right direction and in line with the recommendations we have presented.

By implementing the suggested changes presented in chapter 7 we believe that Thule will take their environmental work to the next level. By covering all aspects of the roof box life cycle Thule greatly reduces the risk of greenwashing and gains an understanding of the complete value chain. We believe that covering all aspects of a product life cycle is the only way for a company to truly go green.

In order for Thule to be truly successful in meeting future challenges regarding environmental issues they must be seen as an opportunity and not a risk. This view must be shared by all business areas since the Thule brand is shared by the entire organization. Only then can they take full advantage of the possibilities going green presents.

The methodology we have used to study Thule in order to gain insight into how they should go green could easily be used on other companies as well. The general question regarding the value of making environmental issues a part of one's strategy is a question other companies are dealing with today. This has the consequence that the whole thesis should make for interesting reading for any company considering going green. Even though we have limited our approach to one of Thule's products we feel that many of the conclusions drawn can be applied to other products as well. Hopefully Thule will use this thesis as a source of inspiration if and when they make the decision to make environmental issues a part of their brand.

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9 Reflections and Future Work

In this last and final chapter we will discuss possibilities for future studies regarding the greening of organizations.

During the process of writing this thesis we have covered a wide area of interesting subjects and have therefore not had time to examine every area in greater depth. There are however some areas in which we feel that further studies would be beneficial for Thule and the academic world.

Thule does not today have a functioning end of life system. We have presented some ideas regarding this subject but feel that a more thorough investigation of the problems and possibilities that exist within the end of life area would be useful. Roof boxes are not the only products that have difficulties with end of life issues and this study could therefore be useful for other companies as well.

Most of Thule's products are today shipped by truck inside continental Europe. During our interviews we have not focused on the subject of using railroads for transporting Thule's goods and we feel that it would be interesting to weigh it against truck transports from both an environmental and economic perspective.

As we have pointed out in the thesis it is difficult to prove that for example Thule's roof boxes are more aerodynamic than a competitor's box. We however feel that this area has not been fully dealt with. Thule could for example test one of their boxes using a car that is popular among their current customers and optimize it aerodynamically to that car. The cost of this optimization could thereafter be weighed against if it can be used as a sales argument towards customers, and if it leads to increased sales. Thule currently works together with a number of car manufacturers; one of them might even be interested in paying for the wind tunnel tests required to optimize a box for one of their cars.

For the greening of the roof box to be truly successful customers must value environmental aspects when purchasing roof boxes. Even though we feel that customer mentality is shifting and are starting to act green the arguments regarding the roof box should be tested. This would give a better picture of how they could be expected to work in real life.

Part of the purpose of this thesis was to show the value of going green. In our study this has mostly been done through the use of rational and qualitative arguments

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regarding increased sales and reduced costs. When reviewing existing literature on the subject we have hardly found any studies which actually put a figure on the value of going green for a company. Further studies which would aim to quantify the value of going green for Thule would therefore be interesting; not only for Thule, but for the academic world as well since the method used at Thule would most likely be applicable on either firms as well.

We would also like to present is the possibility to use the life cycle screening tool as a strategic aid to show a company where future focus regarding environmental work should be directed. Many companies are facing the same challenge as Thule and it is often difficult to know where one should begin in order to gain the highest possible effect. By using the framework we presented in figure 1 together with the life cycle screening methodology companies get an instant overview of the impacts of their operations, an overview which is useful in the initial stages of their work to become environmentally sound.

Our last suggestion for future work regards the possibility to develop a tool that ranks a company's environmental performance. Using our factors presented in chapter 6.10 one could easily construct a matrix that gives a company points depending on how well the studied aspects are met. Thule for example has good environmental performance when it comes to their manufacturing process; this would then give them three points. By adding up points an overall grade of a company's environmental performance would be obtained. This tool would be useful for companies that quickly would like to get an overview of how their current environmental performance is without conducting a deeper and more time consuming analysis.

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Appendix I The Product Development Process

Phases in the product development process

Phase 0: Planning

This phase precedes the actual project approval and the launch of the product development process. This phase takes into account the corporate strategy and includes a market assessment. The output from this phase should be the project mission statement which specifies the target market for the product, business goals, key assumptions, and constraints.²⁴⁵

Phase 1: Concept Development

In this phase the needs of the target market are specified and one or more concepts are generated. These concepts will then carry on and be tested and evaluated. A concept is a description of the form and function of the product and will often be accompanied by an economic calculation regarding the profitability expectations of the product, a set of specifications of the product and benchmarking against competing products within the same segment.²⁴⁶

Phase 2: System Level Design

This phase includes the definition of the product and splitting the product into different sub systems and components. In most cases a final assembly scheme will also be defined during this stage of the process.²⁴⁷

Phase 3: Detail Design

The detail design phase includes complete specification of all included components geometry, materials, and tolerances. The team will also decide which of these components that will require purchasing and which that will be manufactured in house by the company. During this phase computer drawings are generated for all included components and required tools are designed to fit these needs. The process plan for the assembly and manufacturing of the product is developed, this will give the team a good idea of the cost associated with producing the planned product and documentation of these costs will be created.²⁴⁸

²⁴⁵ Ullrich; Eppinger, (2003)

²⁴⁶ Ibid.

²⁴⁷ Ibid.

²⁴⁸ Ibid.

Phase 4: Testing and Refinement

This phase includes the construction and refinement of multiple pre-production versions of the product. The first prototypes will often be produced with the same material and geometry as the final product but seldom with the same production techniques that will be used for the actual production. The first prototypes will be used to test the functionality of the concept and later prototypes will often be tested by potential users in their own use environment. The input of these tests is as far as possible integrated into the final design of the actual product.²⁴⁹

Phase 5: Production Ramp-Up

This phase intends to make the product ready for the widespread distribution. During this phase the product is produced using the actual methods that will later be used when producing the product for the mass market. At some point during this process the product is finally deemed ready for launch and the company initiates sales of the developed product.²⁵⁰

²⁴⁹ Ullrich; Eppinger, (2003)

²⁵⁰ Ibid.

Appendix II Design for Environment at ABB

One example of a company that has successfully integrated design for environment into their current product development process is ABB. ABB uses a product development process derived from the process described in Appendix I. The fact that ABB has integrated this method into their existing gate model shows that this is a commercially sound methodology. One key factor of the integration of sustainability thinking in their gate model was the support given from the project management. However, integrating design for environment into ABB's gate model was not something done overnight; ABB first launched their formal environmental management program in 1991. Today ABB's sustainability organization comprises a network of 600 employees, all do not however work full time with sustainability questions. ABB took their first step towards design for environment in 1995 when they introduced a LCA tool and a handbook for environmentally conscious design in ABB's product development departments on an international level. By doing this they were taking a proactive approach and addressing the problems head on. A year later ABB supported Chalmers University of Technology in Gothenburg Sweden in the establishment of a competence center for environmental assessment of product and material systems (CPM). The formal decision to integrate sustainability objectives into ABB's gate model was taken first in 2000 when management gave the go ahead.²⁵¹

ABB's product development methodology is constructed in such a way that the responsibility of integrating sustainability into a product during its development lies with the gate owner. The gate owner is the person responsible for the product specification and identifies the project leader which is best suited for the project at hand. The project leader is then responsible of taking documented, conscious decisions regarding sustainability aspects, requirements and goals. In the beginning of their work with sustainability in the product development process ABB hired environmental experts but they soon realized that this was not a feasible way to deal with the issue, they have now made sustainability issues everyone's responsibility.²⁵²

Sustainability actions were integrated into ABB's GATE model according to the following steps:

1. Identify sustainability requirements. Various types of requirements should be considered, like laws and regulations, customer demands, risks, hazardous materials, etc.
2. Conduct a "quick but adequate" environmental assessment for the current type of product to identify the significant sustainability aspects to address in

²⁵¹ Tingström et al., (2006)

²⁵² Ibid.

- the project. This can be done through a screening LCA or some type of qualitative environmental assessment.
3. Set sustainability goals based on the significant sustainability aspects and establish a sustainability action plan about how to achieve these goals. The sustainability plan then serves as the 'main thread' throughout the project. Also, consider if it is relevant to prepare sustainability marketing material within the project.
 4. Communicate the sustainability plan to the project members and other relevant stakeholders.
 5. Implement the actions in the sustainability plan.
 6. Follow up to determine whether the sustainability plan fulfilled the objectives and document the results.

By integrating sustainability into the GATE model it can however not be guaranteed that the developed product will be sustainable.²⁵³ But by giving employees the necessary tools and training, and also making sustainability a mandatory part of the product development process, a first step is taken.²⁵⁴

²⁵³ Poole et al. (1999)

²⁵⁴ Tingström et al., (2006)

Appendix III The Eco Strategy Wheel

Product Design Review

When designing a product it is important to focus on what demand the product aims to fulfill. Rather than viewing a car as a motorized vehicle it could be perceived as a means of transportation.²⁵⁵ The same line of argument can be applied to the use of roof boxes. Roof boxes are basically a means of transportation needed when transporting large and bulky goods. So instead of selling roof boxes Thule could sell the service of supplying customers with roof boxes when their need arises. This could be done by delivering and mounting roof boxes for customers that are about to go on a ski trip, thus filling that customers demand for transportation of his/her ski equipment. This would also give Thule an incentive to produce even more durable roof boxes and therefore also be of benefit for the environment.²⁵⁶

Low Impact Materials

When trying to minimize a products environmental impact due to material usage there are many different aspects one can weigh against each other. While the use of aluminum may incur large energy consumption during the extraction this might be compensated during the usage phase due to aluminums superior specific weight. This might make it possible to reduce the total weight of the product significantly and make usage of the developed product less costly for the environment. The large amount of chemicals and materials available however make it difficult to properly review these relations. There is today still not an adequate tool to aid in decisions regarding this topic.²⁵⁷

Material Use

Since product environmental load often is intimately linked with material usage it is often advantageous to reduce the amount of material used in a product. One technique for doing this is to reduce material used during the products life cycle. Reductions in material usage can be comprised of material directly associated with the product as well as material used during transport.²⁵⁸

²⁵⁵ Ammenberg, (2004), p.270ff

²⁵⁶ Ibid.

²⁵⁷ Ibid.

²⁵⁸ Brezet; Van Hemel, (1997)

Production Techniques

Increased production efficiency is an area that most companies have done significant work in and it is also the area most often linked to an increased environmental awareness. The extension of products environmental impact to a life cycle perspective has not lessened the importance of this area, in fact for some products their only environmental impact derive from this phase. It is important that a product developer is aware of the consequences different designs have during the production process so that the product is not only cheap to manufacture but is manufactured in a way that puts the least possible strain on the environment.²⁵⁹

Distribution System

Transportation of goods from the factory to the end customers generally has large environmental impact and is therefore an area of interest. Naturally weight and size have significant impact on methods and impact of transportation but also possibilities to optimize the number of units that fit on one pallet is of great importance.²⁶⁰ Problems that have to do issues of distribution are largely incorporated into the area of logistics.

Impact During Use

Many studies show that the largest environmental impact of products comes about during product usage. This is true for products such as washing machines, refrigerators and cars but also for other products that indirectly use environmentally hazardous materials. Regardless of this, it is often this part of a products life cycle that companies have the least knowledge about. To be able to optimize a products life cycle in respect of environmental impact it is imperative to gain more knowledge about this area.²⁶¹

Initial Lifetime

The lifespan of a product is naturally also important to consider when developing a new product. Using a plastic that creates a larger environmental load can sometimes be motivated if it causes the product lifespan to increase significantly.²⁶²

End of Life System

Sooner or later all products reach the end of their life cycle. The possibility for a product to be efficiently taken care of when this time comes is defined during the

²⁵⁹ Ammenberg, (2004), p.270ff

²⁶⁰ Ibid.

²⁶¹ Ibid.

²⁶² Ibid.

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product development stage. In connection with the environmental debate the term ecocycle society is often used. This refers to the way that the materials included in the products continue their cycles after usage in the first project. Ways of dealing with final handling of product materials is described in the list below.

1. Maintenance and repair
2. Partial recycling
3. Material re use
4. Material recycling
5. Energy extraction: Incineration
6. Land fill

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Appendix IV Competitors Environmental Status

To provide a perspective as to how far Thule has come in regard to facing environmental problems, some of Thule's competitors have been reviewed. The competitors have been chosen on basis of sales volume on Thule's main markets Sweden, Germany, Italy, France and the UK. The information regarding the reviewed company's environmental work has been obtained from their websites and also through telephone interviews and e-mail questionnaires.

Packline

Packline produces roof boxes made of both glass fiber and acryl based ABS plastic. Packline does not mention any environmental work on their home page but they do however point out that the material used in their boxes made of ABS plastic is environment friendly.²⁶³ Some of Packline's ABS plastic roof boxes are manufactured by Autoform.²⁶⁴ Despite repeated attempts to contact Packline we have not been able to contact them to further discuss the subject.

Autoform

Autoform is a Swedish company which manufactures, among other things, roof boxes and pick-up truck canopies. The canopies are delivered to leading brands in the car industry such as Ford, Mazda, and Nissan.²⁶⁵ These canopies have traditionally been made out of glass fiber or steel. Autoform's canopies are however made of ABS plastic which has a number of environmental advantages over glass fiber. ABS plastic is recyclable and does not require spray painting. The production process is also very efficient since it does not produce any spill; all trimmed plastic can be re used. These advantages were presented by Autoform managing director Sven Isaksson. The same environmental advantages presented for the canopies are not used in the same way in relation to roof boxes. Sven argued that the tighter the link was to the car industry, the larger demands there were on environmental aspects of products. Autoform implements ISO 14001 but Sven Isaksson admits that they do not work with it on a day to day basis. ISO 14001 was first implemented during 2003 and now serves more as a certificate on the wall than efficient management system. ISO is however still regarded as the main part of their environmental work and little other work regarding environmental issues is done. Sven Isaksson does not see environmental issues becoming an important factor for the roof box market in the near future. He argues

²⁶³ www.packline.se, ABS 80

²⁶⁴ Isaksson, Sven, *Managing Director*, Autoform AB, 2008-03-14

²⁶⁵ www.autoform.se, Flakkåpor

that the roof box market is steady and has been that way for a number of years, the main factors that customers focus upon when buying a roof box are price and design. Sven does however acknowledge that environmental issues may grow in importance in the future but Autoform will not use environmental issues as a means of marketing for many years to come.²⁶⁶

Hapro

Hapro makes no mention what so ever of environmental considerations on their web site. When viewing marketing material for their roof boxes they do however show that they use wind tunnel testing for their roof boxes. When in contact with sales representatives from Hapro some simple questions were asked regarding their environmental work. They did however refuse to answer these questions referring to company policy forbidding them to comment on environmental issues externally.²⁶⁷

Montblanc

Montblanc industries is a car accessories manufacturer with product in many of the same product segments as Thule. MontBlanc is since the beginning of 2008 owned by Swedish investment firm Accent Equity partners. Montblanch industries has had ISO 14001 since the year 2000.²⁶⁸ On their web page there is little mention of the specific products environmental impacts, there is however a section on the website referring to Montblanc's environmental policy.²⁶⁹ Montblanc works with aerodynamic experts in order to design their roof boxes in a way that reduces environmental impact to as large extent as possible. They believe that this information could be used as a sales argument and that customers would be interested in buying the roof box with the lowest impact on fuel consumption. Attached in the sales information for Montblanc's roof boxes the user will find information stating that the roof box should always be removed when not in use for safety and environmental reasons.^{270 271}

²⁶⁶ Isaksson, Sven, *Managing Director*, Autoform AB, 2008-03-14

²⁶⁷ www.hapro.com, Hapro Zenith

²⁶⁸ www.montblanc.se, Accent Equity förvärvar Mont Blanc

²⁶⁹ www.montblanc.se, Miljöpolicy

²⁷⁰ Melin, Christina, Mont Blanc Industries, 2008-03-17

Appendix V – Life Cycle Screening

Below you will find the complete life cycle screening calculation. The indicator value for POM plastics have been estimated by using the indicator value for ABS plastic since they are both thermoplastics which are recyclable. All other indicator values were extracted from the Eco Indicator 99 – Manual for designers. The material amounts were extracted from Thule internal documents.

Table 2 – Life Cycle Screening of Thule Atlantis 780 Roof Box

| Manufacturing | | | | |
|--|----------------------------|--------------------------------|--------|-------|
| <i>Material or process</i> | Amount [kg/km/kwh/kgkm] | Indicator [milli points] | Result | |
| ABS Plastic | | | | |
| Transport | 7710 | 0,022 | 170 | |
| PS or ABS Plastic for shell | 12,85 | 400 | 5140 | |
| Vacuum forming | 12,85 | 9,1 | 117 | |
| POM Plastic | | | | |
| Transport | 0,94 | 0,022 | 0 | |
| Plastic for hinges and other components | 0,94 | 600 | 564 | |
| Production process for the plastic components used | 0,94 | 21 | 20 | |
| Steel | | | | |
| Transport | 1595 | 0,022 | 35 | |
| Steel | 3,19 | 910 | 2903 | |
| Production process for the steel used | 3,19 | 500 | 1595 | |
| Aluminium | | | | |
| Transport | 320,6 | 0,022 | 7 | |
| Aluminium | 0,7 | 780 | 546 | |
| Extrusion of aluminium | 0,7 | 72 | 50 | |
| Energy | | | | |
| Energy used for the production of one roof box | 5 | 23 | 115 | |
| Packaging material | | | | |
| Transport | 679 | 0,022 | 15 | |
| Packaging carton | 7 | 69 | 483 | |
| | | | Total | 11760 |

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| Distribution | | | |
|--|-------|-------|-----|
| Process | | | |
| Average kilometers transport and what type for the finished roof boxes by Thule? | 20000 | 0,008 | 160 |
| | | Total | 160 |

| Usage | Amount[<i>l</i>] | | |
|--|--------------------|-----|--------|
| Process | | | |
| Increased fuel consumption of car 3000 km and 6 % increase | 135 | 366 | 49410 |
| Increased fuel consumption of car 3000 km and 10 % increase | 225 | 366 | 82350 |
| Increased fuel consumption of car 15000 km and 6 % increase | 675 | 366 | 247050 |
| Increased fuel consumption of car 15000 km and 10 % increase | 1125 | 366 | 411750 |

| End of life | | | |
|--------------------|---------------------|------|--------|
| Plastic | | | |
| | Amount[<i>kg</i>] | | |
| Recycling | 13,79 | -240 | 3309,6 |
| Incineration | 13,79 | -5,3 | 73,087 |
| Land-fill | 13,79 | 4,1 | 56,539 |
| Steel | | | |
| Recycling | 3,19 | -70 | -223,3 |
| Landfill | 3,19 | 1,4 | 4,466 |
| Incineration | 3,19 | -32 | 102,08 |
| Municipal waste | 3,19 | -5,9 | 18,821 |
| Aluminium | | | |
| Recycling | 0,7 | -720 | -504 |
| Landfill | 0,7 | 1,4 | 0,98 |
| Municipal waste | 0,7 | -23 | -16,1 |
| Incineration | 0,7 | -110 | -77 |

Energy Consumption when producing one Roof Box

The data displayed in figure 17 shows the energy consumption of the whole Neumarkt plant distributed on the roof boxes produced.

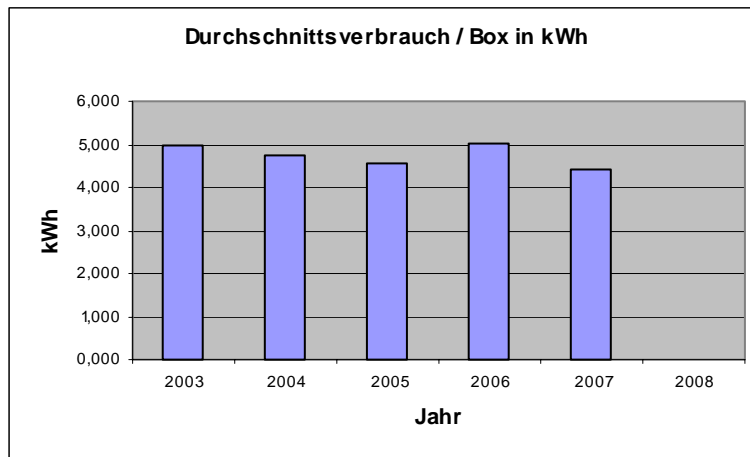


Figure 17 – Energy Consumption per box, Source: Thule internal documents, Neumarkt

Distances to Sub Suppliers

The names of the sub suppliers have been provided by Thule during a visit to their Neumarkt site. The distances have thereafter been calculated using a routeplanner. In the case when there is more than one supplier an average distance has been estimated depending on from where the main part of the material is delivered. The distances entered have been rounded up in order to on the safe side when calculating environmental impact.

Table 3 – Distances Sub Suppliers, Source: Thule internal documents, Neumarkt

| Material | Distance from Neumarkt [km] |
|-----------------------|-----------------------------|
| Packaging Material | 97 |
| ABS Plastics Supplier | 600 |
| Aluminum Supplier | 458 |
| Steel Supplier | 500 |
| POM Plastics Supplier | 1 |

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Appendix VI

Table 4 – Roof box usage example

| | Fuel price SEK 12,59 | |
|---|---|---|
| Comparison continuous use of roof box | Saab 9-5 2,0t Linear Sport Wagon | Saab 9-3 1,8t Linear Sport Wagon |
| Combined Fuel consumption liters/100 km | 9,0 | 7,5 |
| Combined Fuel consumption liters/100 km with roof box 6% increase | 9,5 | 8,0 |
| Combined Fuel consumption liters/100 km with roof box 10% increase | 9,9 | 8,3 |
| Acceleration 0-100km/h[Seconds] | 10,2 | 10,2 |
| Luggage Compartment Volume[liters] | 416 | 419 |
| Luggage Compartment Volume with Thule Atlantis 780, 480[liters] | 896 | 899 |
| Cost/Year for fuel consumption for 15000 km and 12,59 SEK/liter | 16997 | 14164 |
| kg CO2/Year for 15000 km | 32535 | 27113 |
| Cost/Year for fuel consumption for 15000 km and 12,59 SEK/liter and roof box with 6% increase SEK | 18016 | 15014 |
| kg CO2/Year for 15000 km and roof box with 6% increase | 34487 | 28739 |
| Cost/Year for fuel consumption for 15000 km and 12,59 SEK/liter and roof box with 10% increase SEK | 18696 | 15580 |
| kg CO2/Year for 15000 km and roof box with 10% increase | 35789 | 29824 |
| Vehicle tax SEK | 2070 | 1620 |
| Total Annual Costs 9-5 SEK | 19067 | |
| Total Annual Costs 9-3 with roof box 6% increase SEK | 16634 | |
| Total Annual Costs 9-3 with roof box 10% increase SEK | 17200 | |
| Annual savings when driving a SAAB 9-3 with a roof box continuously mounted with a 6 % fuel consumption increase compared to a SAAB 9-5 without a roof box mounted SEK | 2433 | |

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| | |
|--|------|
| Annual savings when driving a SAAB 9-3 with a roof box continuously mounted with a 10 % fuel consumption increase compared to a SAAB 9-5 without a roof box mounted SEK | 1866 |
| Annual savings kg CO2 when driving a SAAB 9-3 with a roof box continuously mounted with a 6 % fuel consumption increase compared to a SAAB 9-5 without a roof box mounted SEK | 3796 |
| Annual savings kg CO2 when driving a SAAB 9-3 with a roof box continuously mounted with a 10 % fuel consumption increase compared to a SAAB 9-5 without a roof box mounted SEK | 2711 |

Table 5 - Roof box usage example

| Comparison occasional use of roof box | Saab 9-5 2,0t Linear Sport Wagon | Saab 9-3 1,8t Linear Sport Wagon |
|---|---|---|
| Combined Fuel consumption liters/100 km | 9,0 | 7,5 |
| Combined Fuel consumption liters/100 km with roof box 6% increase | 9,5 | 8,0 |
| Combined Fuel consumption liters/100 km with roof box 10% increase | 9,9 | 8,3 |
| Acceleration 0-100km/h[Seconds] | 10,2 | 10,2 |
| Luggage Compartment Volume[liters] | 416 | 419 |
| Luggage Compartment Volume with Thule Atlantis 780, 480[liters] | 896 | 899 |
| Cost/Year for fuel consumption for 15000 km and 12,59 SEK/liter | 16997 | 14164 |
| kg CO2/Year for 15000 km | 32535 | 27113 |
| Cost/Year for fuel consumption for 12000 km and 12,59 SEK/liter | 13597 | 11331 |
| kg CO2/Year for 12000 km | 26028 | 21690 |
| Cost/Year for fuel consumption for 3000 km and 12,59 SEK/liter and roof box with 6% increase | 3603 | 3003 |
| kg CO2/Year for 3000 km and roof box with 6% increase | 6897 | 5748 |
| Cost/Year for fuel consumption for 3000 km and 12,59 SEK/liter and roof box with 10% increase | 3739 | 3116 |
| kg CO2/Year for 3000 km and roof box with 10% increase | 7158 | 5965 |

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| | | |
|-----------------|------|------|
| Vehicle tax SEK | 2070 | 1620 |
|-----------------|------|------|

| | |
|--|-------|
| Total Annual Costs 9-5 SEK | 19067 |
| Total Annual Costs 9-3 with occasional use of roof box 6 % increase SEK | 15954 |
| Total Annual Costs 9-3 with occasional use of roof box 10 % increase SEK | 16067 |
| Annual savings when driving a SAAB 9-3 with a roof box mounted during 3000 km with a 6 % fuel consumption increase compared to a SAAB 9-5 without a roof box mounted SEK | 3113 |
| Annual savings when driving a SAAB 9-3 with a roof box mounted during 3000 km with a 10 % fuel consumption increase compared to a SAAB 9-5 without a roof box mounted SEK | 2999 |
| Annual savings kg CO2 when driving a SAAB 9-3 with a roof box mounted during 3000 km with a 6 % fuel consumption increase compared to a SAAB 9-5 without a roof box mounted | 5097 |
| Annual savings kg CO2 when driving a SAAB 9-3 with a roof box mounted during 3000 km with a 10 % fuel consumption increase compared to a SAAB 9-5 without a roof box mounted | 4880 |