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**Customer approach in the relocation of spare part  
warehouse**

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## Thesis Abstract

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This study focuses on a decision made by a global company to centralize its logistics and, following that decision, on the planning of the physical transfer of the spare part warehouse, and on how the customer approach is taken into account during and after the transfer.

The study is based on an analysis of the existing transfer plan, and the method is empiric by nature. The target is to describe the different parts of the order-delivery process, the planned operations during the transfer and the foreseen effects on customers' service experiences. The report is divided into two parts. Observation of how to prevent disturbances caused by the transfer is an essential part of the study. Secondly, an evaluation of the operations after the transfer and possible new services created form a separate section of this document.

The financial impact of the project described in this study is very remarkable. The business risks caused by the transfer are high. Most probably, there will be disturbances in operation during the transfer. The new operational environment and the new organization will create big challenges but logistic efficiency will also offer the company the opportunity to differ from its competitors. Achieving a non-stop spare part service and reaching the level of service existing before the transfer is a challenge where the customer finally decides on its outcome. Measuring logistic performance provides a tool to evaluate the operation and pinpoints the focal areas of development.

Keywords: centralization, customer approach, distribution, logistics

SEINÄJOEN AMMATTIKORKEAKOULU

## Opinnäytetyön tiivistelmä

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Tässä opinnäytetyössä keskitytään kansainvälisillä markkinoilla toimivan yksikön logistisen keskittämispäätöksen ja sen seurauksena aiheutuvan tuotteiden varaosavaran fyysisen siirron suunnitteluun ja asiakasnäkökulman huomioimiseen siirron aikana ja sen jälkeen.

Tutkimus perustuu olemassa olevan muuttosuunnitelman analysointiin ja on luonteeltaan empiirinen. Tavoitteena on kuvata yksikön eri tilaus-toimitusprosessin osa-alueet, suunniteltu toiminta muuton aikana ja muuton ennakoitavat vaikutukset asiakkaan palvelukokemuksiin. Työ jakaantuu kahteen osaan. Muuton aiheuttamien toimitushäiriöiden estämisen huomiointi muuttosuunnitelmassa on olennainen osa työn sisältöä. Toisaalta muuton jälkeisen tulevan toiminnan tehokkuuden arviointi ja mahdolliset uudet palvelusisällöt muodostavat oman kokonaisuutensa.

Työssä kuvattu muuttohanke on taloudellisesti erittäin merkittävä. Muuton aiheuttamat liiketoiminnalliset riskit ovat suuret. Häiriötön toiminta muuton aikana ei todennäköisesti ole mahdollista. Uusi toimintaympäristö ja uusi organisaatio asettavat suuria haasteita, mutta logistinen tehokkuus tarjoaa myös yritykselle mahdollisuuden erottautua kilpailijoista. Varaosapalvelun järjestäminen tauottomana muuton aikana ja saattaminen nopeasti vähintään muuttoa edeltävälle tasolle muuton jälkeen on haaste, jossa asiakas lopulta päättää onnistumisesta. Logistisen suorituksen mittaaminen antaa työkalun toiminnan arvioinnille ja osoittaa palvelun kehittämiskohteet.

Avainsanat: asiakaslähtöisyys, jakelu, keskitys, logistiikka

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## Abbreviations

<b>CDC</b>	Central Distribution Centre
<b>ERP</b>	Enterprise Resource Planning
<b>GLS</b>	Global Logistic Service – centralized distribution and logistics organization
<b>KPI</b>	Key Performance Index
<b>NC</b>	Network Company (~ sales office)
<b>PC</b>	Production Company
<b>PO</b>	Purchase Order
<b>POC</b>	Parts Order Coordination in sales
<b>SAP</b>	ERP system
<b>SKU</b>	Stock Keeping Unit
<b>SPC</b>	Spare Part Centre located in the U.S.A and in Singapore

# 1 INTRODUCTION

## 1.1 Background

The significance of having goods physically transferred between the place where they are produced and the place where they are consumed has strongly increased during the last decades. This exchange process is a cornerstone of economic activity and choosing the distribution channel an essential factor of competition among the companies. The scope and role of logistics has become more prominent and is recognized as a critical factor of competitive advantage instead of supportive role as it used to be. The importance of logistics arises from the globalization when the whole world has become a common market place. The logistics performance is a vital element when competing globally and the customer is not in the neighbourhood anymore.

A major concern for companies is how efficient the channel of distribution from the customer's point of view really is. The manufacturer's objective is to obtain optimum performance in warehousing, transportation and physical handling of consumables. Due to the dynamic business environment the companies have to monitor the performance of selected distribution channels. If the performance is not as expected other possible channels must be evaluated and implemented. (Stock & Lambert 1999, 55.)

In today's business environment, the importance of after sales service is high. Lost revenues due to disservice can be enormous. When customers buy a product they expect a certain quality, that the product will function as promised both in terms of efficiency and life-time and that, in case of break-down or failure, the responsible company will take care of the problem and make the product functional again in a fast and timely manner. Service therefore becomes an inevitable part of a company's value creation activities if it is going to compete with other companies and the goal is to triumph. As an example: a customer is buying an expensive durable, an engine, which needs 24/7 support. The customer will try to estimate the total cost of the investment by estimating the purchase price, running costs, the reliability of the engine and the availability and cost of the after sales support.



To ensure running of the business there are far more details to take into account including faster delivery times and availability of the spare parts from the supplier.

## **1.2 Problem definition**

In 2006 the Board of the company in scope made a decision that all existing spare part warehouses in Europe will be centralized creating one big delivery centre to be built in the Netherlands. This decision aimed to one responsible spare part organization and one controlled, standardized way of working instead of local differing versions in every country. The centralized delivery centre (CDC) was built and started in December 2010 and some of the first stock transfers in the Netherlands were done when writing this in March and April 2011.

There are different ways to reach the centralization and control the transfer period if you have existing stocks geographically spread in a wide area. You can decide just to transfer the items by wall-to-wall method meaning that every stored part is picked and packed and transported to the new centralized location in an order they happen to be located in an old stock. This seldom gives a good result from the customer's point of view. Normally the spare part order consists of more than one order line and the parts needed do not locate in the same storage area of the warehouse. This means that during the transfer period some of the ordered parts may be available in the stock to be shipped, some may be in transit and some already shipped to the new central stock. From the customer point of view this means either long lead time before each order line can be delivered from one shipping point or many deliveries taking place from different sites at a different point of time.

The other alternative is to purchase all or most of the spare parts existing in the old stocks into the centralized stock and deliver them from centralized stock from day one when the transfer starts. The problem is that if the total transfer time is relatively long the cost for ensuring the availability is very high and the turnover of the stock will be decreasing dramatically for a longer period.

The third alternative is to transfer parts segmented according to customer or product segments based on order history trying to avoid long-lasting breaks in availability keeping also the transfer period as short as possible. This means perhaps more work during the picking phase in a stock to be shipped but creates a more accurate result meeting better the customer need during the transfer phase.

The third alternative i.e. to transfer parts segmented was used in this case. The segments were created from the different engine reference types. An engine reference type describes the engine model into which is a single spare part belongs to. Majority of the incoming customer orders include spare part order lines just for one engine type.

The main target of the transfer planning was to make a detailed plan on how to organise and transfer the stock while maintaining acceptable parts availability and minimising the disturbance in the service level and deliveries to the customers.

### **1.3 Objective and scope**

The objective of this study is to describe and understand the drivers behind the decision to centralize distribution and logistics of a global company. The other objective is through a case study define the critical factors in maintaining and measuring the level of customer satisfaction level during and after the implementation of centralized distribution and logistics.

The purpose of this thesis is to conduct a case study on the main reasons for centralization of warehousing in a global company and how the customer approach is built into the actual change plan. Also ways of measuring the customer satisfaction before and after the transfer is in the scope. This study concentrates on relocating the spare part warehouse in Finland to a centralized distribution centre.

The legal setup of companies and entities within the concerned group, ERP transactions and daily business transactions between the different companies have been excluded from the scope.

## **1.4 Method**

There are two basic ways with several differences of research approach, quantitative and qualitative. The approach should be defined by the nature and purpose of the study. In a qualitative approach the data is collected, analyzed and interpreted. It can't be presented in terms of numbers and figures. The outcome can be plain text presented in a certain order to explain the studied problem. The quantitative approach expresses the problem and the result in numbers and figures with mathematical or statistical analysis and explanations. In most of the cases the qualitative approach is used.

Due to the scope of this study and the fact that the success of the plan can be measured just when the transfer is taking place, a qualitative approach is used in this study. Quantitative elements are presented in the context of the evaluation of present customer relationship and the characteristics of the stock to give an idea of the situation before the transfer and working environment of the stock. Because the transfer of the different stocks is still continuing, and the Finnish stock transfer has not been started, no numeric data for comparison of operation concepts before and after the transfer is not yet available.

## 2 LOGISTICS CREATING COMPETITIVENESS

### 2.1 Logistic thinking

The development of logistic thinking has been very fast during the last four decades. This has been affected by vast development of methods and means during the whole 20<sup>th</sup> century and especially after the Second World War. The method logistics itself was formulated in present form in 1980's. The management of logistics has been reflected both the role of logistics in an enterprise but also the general development of the market. The different schools of management affecting to the logistics are activity base management, lean management, time base management, quality base management, process management and customer oriented operation. Continuous problems of the logistics are changing business environment, history of own organisation, delayed and distorted information, delays in in operation, financing, different time frames and conflicting targets. (Karrus 2001, 19-21.)

The most essential objects of logistic control are material flow, information flow and capital flow. The targets are often conflicting as described in figure 1 (Karrus 2001, 24-25):

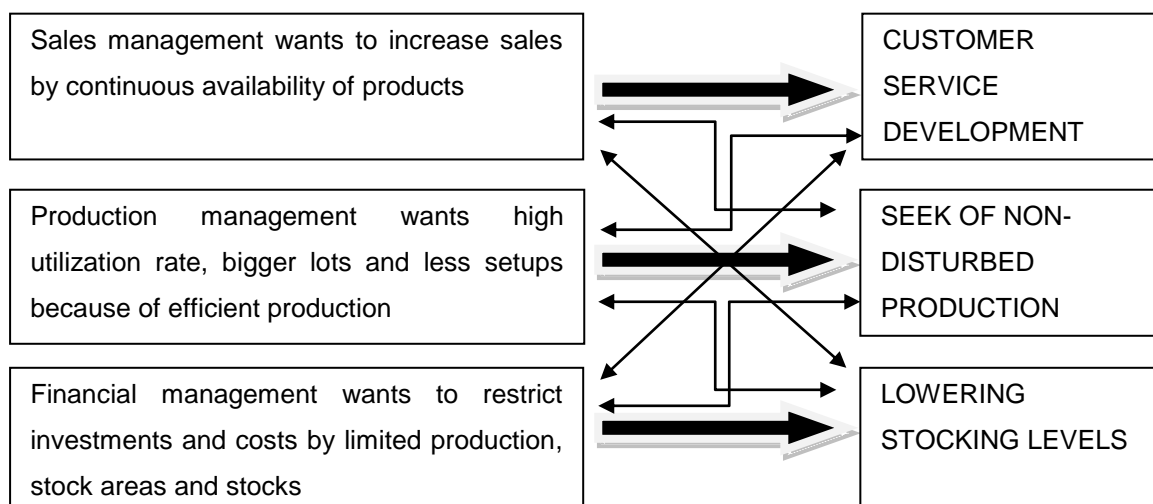


Figure 1. Conflicting objects of logistic control

The characteristics of modern logistic thinking are

- it considers the processes of an enterprise and tries to develop them as a whole taking the basic processes as procurement, production, delivering, marketing, order and service functions as well as financial and organisation into account
- logistics takes the whole value addition chain from the vendors to the customers into account and tries to develop the competitive edge of the whole chain
- logistics is responsible of adding value to the customers and usage of the capital and operative costs of the enterprise. (Karrus 2001, 26.)

## **2.2 Customer orientation in logistics**

According to a dictionary a customer is somebody who is in relation with an enterprise by purchasing or having produced something.

A long term relationship between a customer and a vendor is considered to be valuable for a vendor because it creates prerequisites for a vertical cooperation, creates possibilities of savings, it may have a high reference value and it can prevent the competitor penetrating the market . It has also been estimated that to get a new customer is seven times more expensive than selling to an old, satisfied customer. (Karrus 2001, 292-293.)

The basic thought in customer oriented marketing is to reach a competitive edge and to foster the customer's loyalty. The customer starts the relationship with a vendor in order to get the service or product produced easier, faster or cheaper than producing it by himself. By doing so a customer can use knowledge or expertise which he or she doesn't have. Shortly a customer is a customer to succeed better. (Karrus 2001, 293.)

The successful enterprises are understanding the short and long term needs and expectations of the customers and the operational relationship between the own product development, production and deliveries. They are committed to the customers in a way that creates trust in organisation, products and services and

they are ready to support customers in many ways. They are also measuring the satisfaction of the customers, comparing the results with their earlier results and also with the results of their competitors and use the feedback for developing the operation. (Karrus 2001, 294.)

There is not so much new in customer orientation but focusing in customer orientation in logistics is a relatively new phenomenon. For instance in delivery function according to Haapanen & Vepsäläinen (1999, 51) the progress has been very slow.

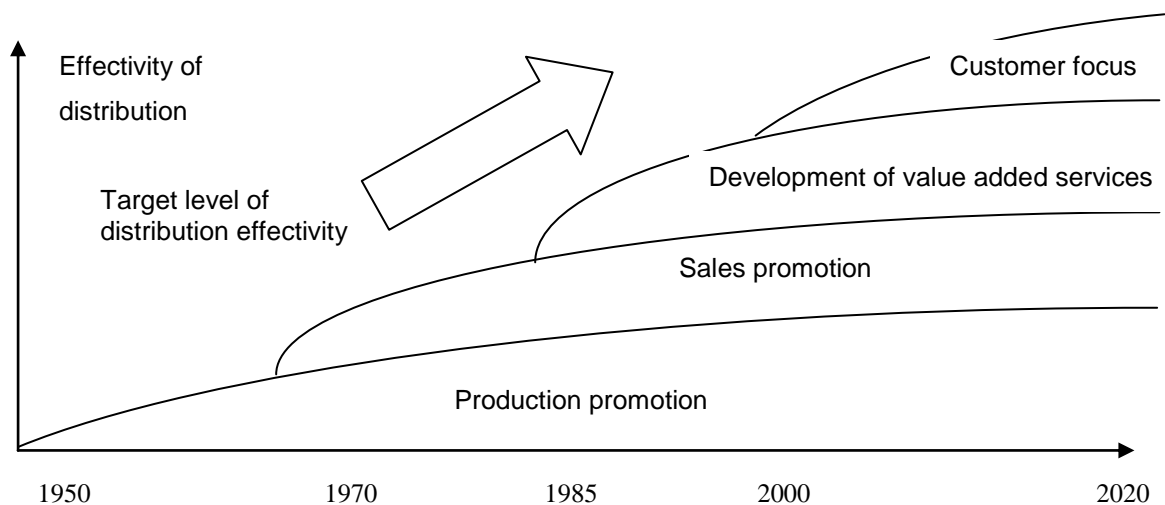


Figure 2. Development of distribution towards better customer service

We can assume that in the future the logistics is one of the most important areas in creating the total competitiveness of an enterprise. According to customer oriented thinking we have to consider who is the customer and what the customer really wants. Typically it is precise deliveries and ability to continuously deliver small quantities fast. Also the pressure for lowering the total costs is remarkable. Additional to this customers want to have easy and simple order-delivery processes and better access to information.

### 2.3 Customer service

Customer service is the output of logistic system. Customer service is not only determining whether the existing customer is remaining as a customer but also how many potential customers the company attracts. It has a direct impact to company's market share and its total costs as seen in figure 3 (Stock & Lambert 2001, 8).

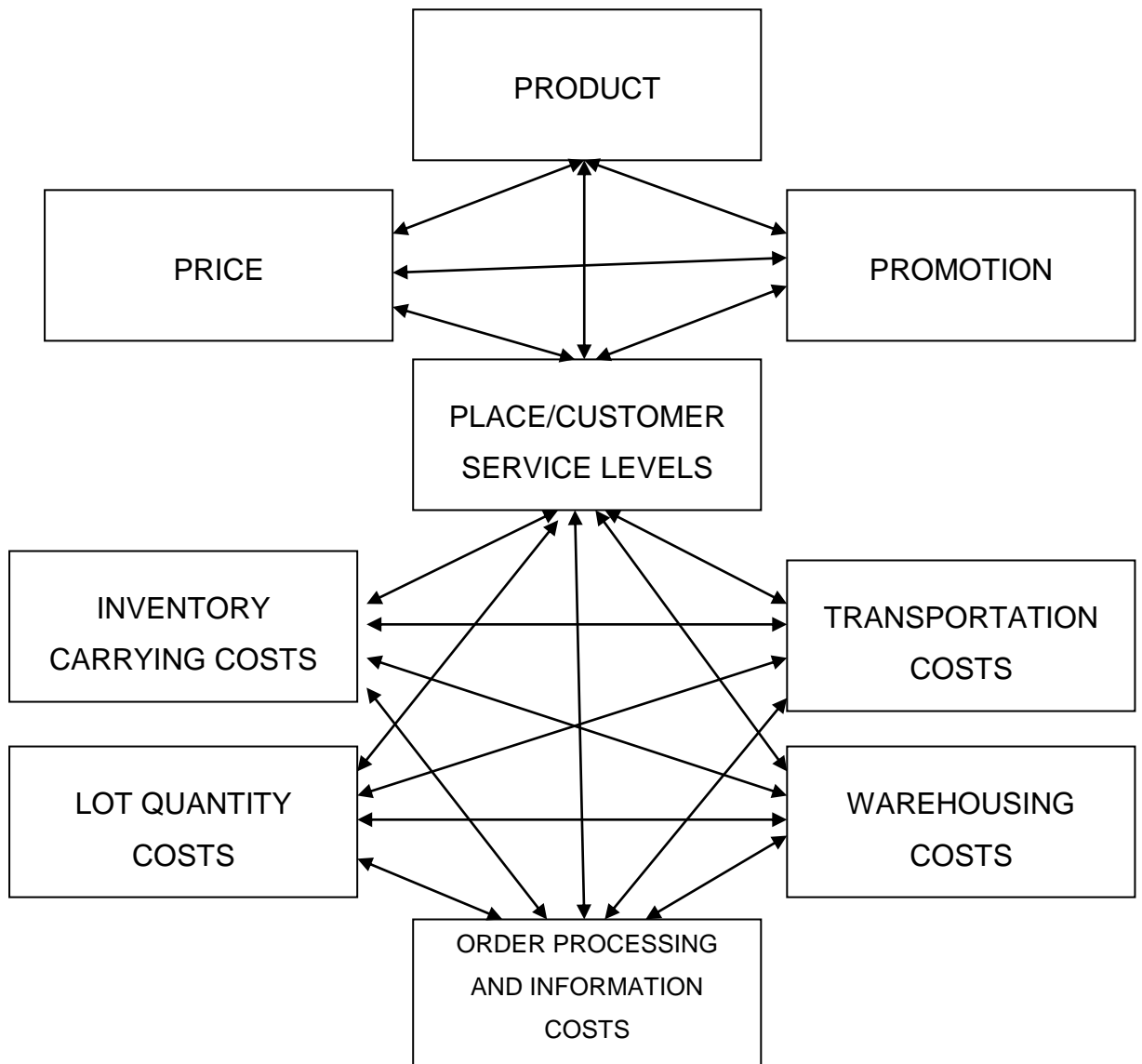


Figure 3. Total cost model

The customer service is commonly defined as a performance measurement, for instance what percentage of orders can be delivered in 48 hours after received. Service can be used for differentiation of the actual product and influence the market price. According to Stock & Lambert (2001, 98-102) the elements of customer service can be divided into pretransaction, transaction and posttransaction elements.

Pretransaction elements are 1) a written statement of customer service policy which is based on customer needs, defines the service standards, determines the reporting responsibilities and reporting frequency is possible to be implemented 2) the service policy informed to a customer 3) organisation structure suitable for managing and providing the customer service 4) system flexibility for unplanned events and 5) management services designed to help customers for instance manuals, training and seminars.

Transaction elements are preferred as normal service elements. They are 1) stockout level as a measure of product availability 2) order information as a feedback to customer in form of inventory status, order status, expected shipping and delivery date 3) order cycle, total time which is elapsed from order initiation to a delivery to customer 4) special handling of shipments for qualified customers 5) transshipments between different locations to avoid stockouts 6) accurate operation; correct products and amounts and correct invoicing 7) order convenience experienced by a customer and 8) product substitution during the stockouts.

Posttransaction elements include 1) after sales services like installation, warranty, modifications, repairs and spare parts 2) product tracing meaning ability to recall potentially dangerous products if the problems are identified 3) quality process including claim handling and returns and 4) temporary placement of product to cover the delivery time of a new product or repair time of previously purchased product.



A decentralized distribution model can lead to increased cost and less efficiency in performance. One way to cut the costs and increase the performance is to have a regional distribution centre. A centralized distribution model can improve the delivery performance and customer service and decrease the inventory and transportation costs. (Stock et al. 2001, 188).

## **2.4 Critical elements and customer expectations in spare part business**

The following elements are mentioned in context of customer satisfaction (Oskarsson, B., Aronsson, H., Ekdahl, B. (2006), 40-41):

*Lead time:* The lead time is the time from placed order to actual delivery. This includes also the logistic time needed for inventory management. There are urgent spare part deliveries, such as in power off of a power plant or engine loss of a ship out of the sea. Not so urgent deliveries can be for instance the replenishments of customer owned stock. In general the expectation of lead time has been decreasing during the last years and even if the delivery is not urgent it is not allowed to have unreasonable lead times for a standard spare parts.

*Delivery reliability:* It measures the precision of delivery against the confirmed delivery time. Delivery reliability can be high even if the lead time is long if the delivery date just meets the confirmed delivery date. The indicator can be measured by correct deliveries against all deliveries or correct order lines against all delivered order lines.

*Information:* Information change in delivery chain is important. A distributor wants to have information from a customer to be able to allocate resources according to the need. To a customer it is important to know what kind of service can be expected, are there some exceptions in the service etc. It is very hard to indicate when the level of information is sufficient.

*Delivery dependability:* A customer wants to have a correct material, a correct quantity and a correct quality of the delivery. This is usually measured with the ratio of defect deliveries against all deliveries. In export business there are usually

third parties, authorities like customs etc. who are also interested of correct materials and right quantities.

*Adaption and flexibility:* A global customer can have local variations in processes which may reflect to the different needs of packing, transportation etc. A good supplier can adapt and be flexible in case of different needs.

## **2.5 Benefits of centralization**

Reachable scale benefits have lead to centralization of distribution and warehouses during the recent years. Having fewer points of centralized operation the volume increase gives greater prerequisite to develop efficiency. Also less capital is bound to achieve higher service level than in decentralized model. The following benefits with centralized model have been listed:

- The material flow will get larger in centralized model because of fewer stocks. Large material flow creates a need to handle bigger volumes effectively and investments in efficient automatic processes pay off faster. Also savings in personnel cost can be achieved.
- Few stocking points decrease the need of high stocking levels in order to reach sufficient service levels and availability.
- Less personnel – more people in the same place – better learning curve
- Reduced bullwhip effect when the demand fluctuates
- Lower risk of material shortages and obsolete materials, the different market needs are balanced

Abrahamsson (1992) mentions two different kinds of advantages in centralisation, cost advantages and logistic benefits to a customer. Cost advantages include lower cost for personnel, inventory and administration. Lower inventory decreases the warehousing cost, central control and management improves the physical flow. Logistically lead times shorten and are more predictable, the delivery reliability increases, it is easier to differentiate and customer information is more reliable and faster.

## 3 OPERATIONAL ENVIRONMENT

### 3.1 The company

The company is an enterprise with three main business areas: Power division is producing power solutions based on diesel engines, Marine division is delivering engines and propulsion systems to marine customers and Services division offering a wide range of after sales services for own brand but also for engines of other brands globally.

In 2009 the total net sales of the company was 5,26 billion€. The volume was divided between three business areas so that Services made 35%, Marine 34% and Power 31% of the total turnover. The personnel at the end of the year 2009 was roughly 18.500 people of which 61% worked in Services, 6% in Ship Power, 5% in Power s and the rest 28% in production units and administration. Most of the personnel, 59%, was working in Europe. (Compass 2011. Fast Facts: Key figures 2010.)

The company has a long history. It is developed into the present form as a result of several acquisitions and joint ventures. Several companies all over the world were acquired during the years 2001-2008: Sulzer from Switzerland and Stork from the Netherlands to name some examples.

The biggest competitors vary depending of the business area. In Marine business the market is divided in medium-speed, low-speed and auxiliary engines. In medium-speed engines the company is the market leader by its 36% share. The biggest rivals are a German company, MAN Diesel with 27% and an American company, Caterpillar (MAK) with 9% of the total installed power . In low-speed engines MAN Diesel is clear number one with 82%, the company is the challenger by 12% and Mitsubishi the third by 6%. In auxiliary engines the market is very fragmented, The company share is about 2%. All these figures are based on year 2009 market figures. (Compass 2011. Marine, Ship Power Shape 2010.)

In Power division business diesel engines are competing against gas turbine installations. The biggest players in gas turbine markets are General Electric,

Siemens and Alstom but the market is more fragmented, there are also several smaller competitors acting of the same markets. (Compass 2011. Power Strategy Background 2010.)

### **3.2 ERP System of the company**

SAP is currently the leading ERP (Enterprise Resource Planning) system in the organization. It is the system that is implemented at the production facilities and the one that is used by the spare part centres globally as well. All the spare part and engine production planning activities carried out are done within SAP. The same goes for all the order handling, warehousing and shipping activities of spare parts.

### **3.3 The Services business**

The Service business consists of several different offerings to customers: There are engine services, propulsion services, electrical & automation services, boiler services, operations & management services, training services and based on tightened laws and legislation continuously growing environmental services. Most important of the businesses is, however, the traditional spare part sales in engine services section. (Compass 2011. Services External presentation 2010.) This study is focused on the spare part sales.

### 3.3.1 Offerings and strategy of Services

In 2010 Annual report Services defines its offering: “Our goal is to offer services based on customer needs. We focus, therefore, on developing close relationships with our customers, thus enabling us to gain an in-depth understanding of their business and extending our offering accordingly. We aim at continuously developing our existing competences as well as building new competencies in strategic growth areas. Expanding our offering by developing our portfolio through strategic acquisitions and innovations will continue to be our strategic focus in the future.”

In Service’s volume business, Engine Services, the offering message is: “We provide complete engine services for own and other engine brands. These services cover everything from basic services to management support and performance optimiser packages”. The actual Services strategy continues with statements:

“Our customers recognize Services as their service partner: competitive, trusted and easy to deal with.

- We will maximize our market share with our present customer base and present portfolio
- We will extend our offering with new products in existing customer segments
- We will grow by providing service agreements with new Marine and Power divisions’ deliveries
- We will become the market leader in our industry in environmental upgrade and retrofit solutions.

Services strengths are defined as

- Long-term relationships with customers and deep understanding of their needs
- Broadest services offering in the industry

- Integrated offering with Marine and Power.  
(Compass 2011. Services Strategy 2010.)

### 3.3.2 Future trends in Services business

General market trends of this branch are

- strong public focus on global warming
- emission control and efficiency measures
- volatility in different markets: fuel, security of supply, raw materials etc.

The key words in Services strategy are (Compass 2011. Services Strategy 2010)

- customer need
- cooperation with other business areas of the company
- new technology
- having and acquiring competences
- profitable growth.

To identify customer need is crucial in service business. To have a long-term relationship with outstanding customers helps to understand their needs. However, to reach one of the key factors in strategy, growth, a service company can't focus just on few customers but it has to listen very carefully the trends of the whole industry and lately also the community in form of environmental issues and legislation to meet the market needs when they occur.

Cooperation with the other two company's business areas, Power and Marine, is somehow self-evident. Because the service business is mainly based on existing engine base it is not significantly growing if the engine base doesn't grow. On the other hand, Services also serves the other business areas: when you are "in" having an agreement and doing service business with an existing customer, you continuously communicate with the customer and also get the early information of the next steps the customer is going to take. Thus you can be prepared when the customer plans get real and make your offerings precise and in time.

Cooperation with other units of the company is vital. However the company has different business cultures in the three main units originating from the history and present markets. It is understandable that customers, business habits and needs among Power business are different of those in marine business. This creates a strong need to communicate over the organizational borders. How to deal with this communication so that necessary information is effectively communicated between the colleagues in different unit is an essential challenge.

Originally Services business was created to support the engine sales. It was not possible to sell valuable diesel engines without proper after sales function. During the years Services business has increased and grown as one of the three main business units of the whole company resulting constantly increasing volume and stable profit in spite of the fluctuations of global economy. It goes also vice versa: in the long run Services business is very dependant of the other two main businesses: Power s and Ship Power.

In the industry Services is working in, the technology is very important. In diesel engines the major costs are running costs and cutting the costs, both customers' and your own, can be done by new inventions and new technology. Also the environmental issues have become more and more important and to reach the lowering emission levels and other targets you have to be able to implement the state-of-the-art technology in your products.

In 2004-2006 the company implemented a common ERP (Enterprise Resource Planning) globally. Just after that it has been possible to develop operation, collect the feedback and create common guidelines via one platform. Anyway, according to personnel inquiries, the communication strategy needs to be revised so that the message goes loud and clear from one unit to another

A large mix of offerings brings a large variety of customers with different needs and expectations. It puts a special pressure for focusing the business. Who decides which customers to listen and which of the new technologies to develop? The resources are restricted: if you make a wrong choice you can lose a significant business. So, a large mix is an advantage: it makes the company less

vulnerable against economic fluctuations, but on the other hand it is a risk with limited resources and the need of spread focus.

Because services business is a people business the company's value is tied into people's skills and this creates a need for keeping the skills in the company. Some of the services are already subcontracted but to keep the common target and quality standards is difficult.

Additional to global spare part and retrofit business Services business is strongly based on the expertise and knowledge of the personnel. A long engine manufacturing history with various engines and engine versions and several different brands requires a wide variety of skills in the company. The skills can be maintained by continuous training of own personnel or outsourcing some part of the operation to external companies. Training the own personnel needs a lot of resources and continuous identification of knowledge needed and evaluation of own skills now and in the future. Successful outsourcing means giving a part of the business to external company. The operation of this external company effects also to the image of your company because a customer makes no difference whether it is you or your subcontractor performing well or not.

Growth is important for every company. Profitable growth is an enabler, it makes possible to be present globally. It gives you possibilities to invest new technologies and be more competitive, growth is fuel for success. However growth can be reached in many ways. Without profitability the growth itself is not valuable in the long run.



## **4 CUSTOMER APPROACH IN PLANNING AND IMPLEMENTATION OF THE TRANSFER**

### **4.1 Arguments of centralization**

Objectives behind the decision to centralize the logistics and distribution in this case study were

- to improve overall spare parts service responding to more demanding customer requirements
- increase flexibility
- realize efficiency improvements

The target to improve the overall service and to become a world-class provider of the industry included an idea of enabling 24/7 service to serve customers globally in different time zones, to cut the lead times both in supplier and customer processes and to offer additional services.

The centralization will increase flexibility by supporting acquisition strategy, absorbing new growth and helping to manage the changing customer demands. The efficiency improvements are realized by less personnel and training, more efficient investments and less working capital.

In payback calculations the biggest benefits were found from transportation, warehousing, inventory management and purchasing areas. This is according to what Abrahamsson (1992) states. Additional to cost advantages and logistic benefits also non-material issues were notified. The customer friendly one-stop-shopping i.e. customer ordering from one point instead of many, and the environmental issues in form of shorter transportation distances and fewer shipments both in inbound and outbound deliveries were seen as clear advantages of centralized model.

In 2006 it was decided by the company Board to build a new centralized warehouse in the Netherlands to replace all the eight European spare part warehouses situated in Finland, Sweden, Norway, France, Italy and the Netherlands. The special project group was established and the whole project was named as “24/7 project” describing the target to be reachable for the customer 24 hours per day, 7 days a week.

The idea was not a new one, it was planned several times during the earlier years but it was earlier prevented by the lack of common IT system. In 2004-2006 the company implemented globally a new IT system in every remarkable sales office and production unit and the decision for centralizing could be made.

The arguments were clear: to centralize the deliveries and streamline the spare part operation into one specialized organisation in order to reach better availability of spare parts, shorter delivery times both from vendors and to customers and thus better customer loyalty and satisfaction. The building project and the new warehouse premises with surface area of 39000 m<sup>2</sup> were ready in December 2010. The transfers of individual stocks started immediately and were going on at the moment when writing this study.

Before the centralized spare part centre was established Services had eight different spare part warehouses in Europe. They were located in: Finland, France (2 warehouses), Italy, the Netherlands (3 warehouses), Norway and Sweden. The three biggest in volumes was Vaasa in Finland, Zwolle in the Netherlands and Trieste in Italy. In this study the scope is on the transfer of Finnish warehouse.

As mentioned before the company has been grown by acquisitions and joint ventures, This has brought a wide variety of different brands into the after sales scope: Sulzer, Deutz, Nohab, GMT, Wichmann, SACM, Stork, Duvant Crepelle, Nordberg, Poyaud and Bolnes engines additional to the engines manufactured by the company have also to be served. (Compass 2011. Services External presentation 2010.)

The spare parts stored in present warehouses are partly overlapping i.e. the warehouses in different countries include a small portion of the identical materials. In some cases if a customer needs to have spare parts for more than one type of

an engine especially if the engines are manufactured in different countries, he may be obliged to make more than one purchase order to be delivered from different warehouses to get all the necessary spare parts.

## 4.2 Logistic organisation

The logistic organisation includes several different functions which are described in figure 4. :

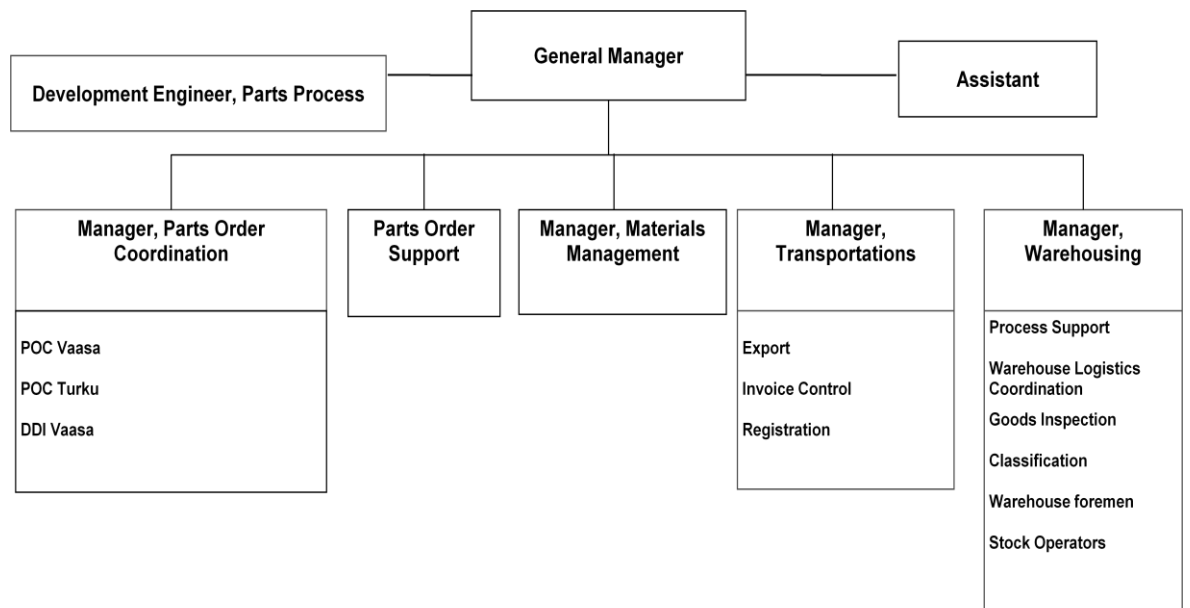


Figure 4. Organisation chart of Global Logistic Service, Finland,

The warehousing function in the logistic organisation is described in figure 5.:

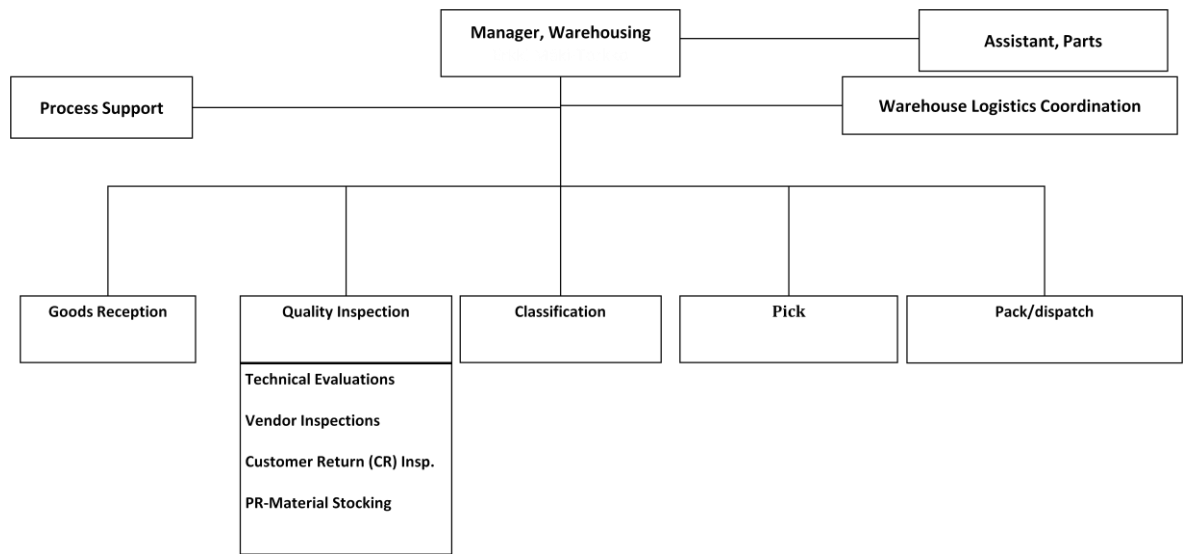


Figure 5. Warehouse organisation

### 4.3 Warehouse operations in Finland

The stock of spare parts is located in four different geographic places, three of them in Vaasa City area and one in Vähäkylä, about 25 km east from Vaasa. The surface of the stock in four different places is totalling up to 11500 m<sup>2</sup>. Additional to Runsor main warehouse there are three satellite warehouses to store big, heavy and slow moving goods. The three satellite warehouses are:

	<b>surface area</b>	<b>distance from main warehouse</b>	<b>type of stored materials</b>
Strömberg Park	2000 m <sup>2</sup>	< 5 km	big and heavy items
Suvilahti	1400 m <sup>2</sup>	< 3 km	cylinder liners, bellows
Kotanen (Vähäkylä)	2000 m <sup>2</sup>	< 30 km	non-movers

Table 1. External satellite warehouses in Finland

The materials are transported from and to satellite warehouses by scheduled truck shipments. The warehouse personnel, about 80 persons, are working in two shifts.



supporting the end-customers locally. Most of the external customers, i.e. end-customers and network companies are located abroad. *Project organisations* of the company in Power, Marine and Services business itself are the biggest internal customers. They need spare parts as packages for the new engine deliveries and separate project related spare parts for overhauls and renewals. Two main *spare part centres* (SPC) in the U.S.A. and in Singapore are ordering the replenishments for their stocks and internal *reconditioning workshop and engine assembly lines* are using the spare parts delivered by the warehouse.

The amount of incoming sales orders and order lines varies a lot but in average 200 orders and approximately 1500 order lines are received daily. This means that the average sales order includes six order lines to be delivered. The orders can be different in nature: some of them are just replenishments for used spare parts in a customer stock and can be delivered in many batches if necessary (some of the ordered materials may be missing from the stock or they are not stored materials at all). Most of the orders are however urgent and critical to be delivered as a whole and they are marked to be delivered complete also in ERP system. In practice this means that if there is a sales order with 50 lines marked as a complete delivery it can't be delivered unless all the 50 materials with correct amounts are available. Total lead time for an external sales order from recording the sales order into ERP system to delivery from the stock is quite short, only 3,5 working days in average.

At the time the transfer plan was made the total net value of the stock was approx. 80 MEUR and the number of stored articles was approx. 26600 items. Total weight of the materials to be transferred was roughly 3500 tons.

#### **4.4 Material scope**

In general all spare parts shall be transferred to CDC. However there are groups of materials that for certain reasons should be excluded from the stock transfers. The reasons for excluding the materials are usually such as the material needs to have certain additional installation work or tailoring to meet the customer and order

specific needs and the knowhow will remain in Finland. Also the reconditioning and cylinder head manufacturing workshop will remain in Finland and the parts needed have to be in place. These exclusions have been listed and assessed locally by the planning team.

The material groups listed as exclusions are:

- Parts in Network Stock (agreement with customers)
- Parts which need tuning or programming
- Cylinder head production
- Sub assembly
- Crankshafts
- Crankshaft parts
- Governor service parts
- Governor service parts, other
- Governors, complete units
- Dangerous goods
- Tools and toolsets for projects
- Castings
- Forgings
- Engine blocks
- Manuals
- Software products
- Reconditioned parts

The usual reason for exclusion is that the materials are not ready for delivery in the form they are stored but need some kind of additional work before they are usable for a specified customer installation.

#### 4.5 Product reference types

Product reference type describes a material group which includes spare parts for a certain engine model. Majority of the customer orders are including spare part order lines just for one engine model. One of the biggest engine reference type, “Common parts”, includes general spare parts which can be used in many different engines; bolts, nuts and gaskets as an example.

The following 13 different product reference types were identified:

1. W50
2. W46
3. W46 GD&F
4. W Vasa 14/24
5. W Vasa 32
6. W Vasa 32 GD&LN
7. W64
8. Others
9. W32
10. W32 DF&GD&SG
11. W Vasa 20
12. Equipments / parts
13. Common parts

The number in the context of an engine reference type means the bore of the cylinder expressed in centimetres.



#### 4.6 Approach to transfer the stock from Finland

Planning of the Finnish stock transfer was officially started in April 2010. The main objective of the planning was to make a detailed plan on how to organise and transfer the stock while maintaining acceptable parts availability and minimising the disturbance on the Services level and deliveries to the customers. The thought was also to create a template to be used in the transfers of other warehouses in Europe.

In the initial stage, one product reference type (W32) was selected as an example. This was done in order to create a picture of the activities, workload and inventory related to W32 in different stocks. At this stage, one target was to create a report containing information about materials in different stocks sorted by picking areas. The report included product reference type, storage type, stock quantity, available quantity (quantity to be transferred = stock – materials for open order book), XYZ indicator and gross weight. Based on the reports and experience the planning team estimated the resources and time needed in different storage types.

The detailed plan includes the description of the processes, resource requirements; takes into account the required safety measures and the quality aspects. Furthermore, the required actions and preparations needed before the actual transfer are documented and assigned to responsible persons. The plan also includes a day-to-day time-schedule and budget. Finally, risks related with the stock transfers are documented.

The plan was created by a project team containing:

- Warehouse Manager
- Supervisors (receiving, picking, packing and transportation)
- Process Support Engineer as coordinator and facilitator for planning of warehouse operations during the stock transfers
- Safety and quality supervisor

#### 4.7 Customer approach in the plan

Because one of the main targets was to minimize the disturbance to daily operations as much as possible and keep the service level and customer satisfaction as high as possible some principles and assumptions to be followed in the transfer were defined already at the early stage in cooperation with operational organization and 24/7 project team. The following principles and the approach for moving the stock from Finland were listed:

- Spare part sales orders are generally created per product reference type i.e. one order includes spare parts just for one specific engine model. Therefore the transfer shall also be done per product reference type. The transfer time for the specific product reference type must be as short as possible.

The shorter the transfer time is the less the customer is suffering of the delays in deliveries. By doing the transfer by product reference type it is possible to stop the transfer after a certain product reference type if something goes wrong, perform corrective actions and continue the transfer without delivery disturbances.

- One shipping point shall be applied meaning that there shall be clear cut-offs when the delivery responsibility for a certain product reference type is shifted from Finland to Central Delivery Centre (CDC). During the transfer parts are located either in CDC or in Finland or parts are in transit. During transit parts are not available until the goods reception in CDC.

An effort to clarify the situation during the transfer when spare parts are partly located in dispatching warehouse, partly in receiving central warehouse and partly in transit created the rule to have just one shipping point. It is very difficult to handle the deliveries and confirm delivery times in case of two shipping points and some parts in transit. It is also difficult to handle the situation where customer wants to use a transportation of his own in this case. However there is a conflict between customer expectations and one shipping point principle: a customer wants to have the parts as quickly as possible and if there is a big product

reference type under the transfer in the worst case it can take the transfer time added by the transit time before the delivery can happen from the central warehouse.

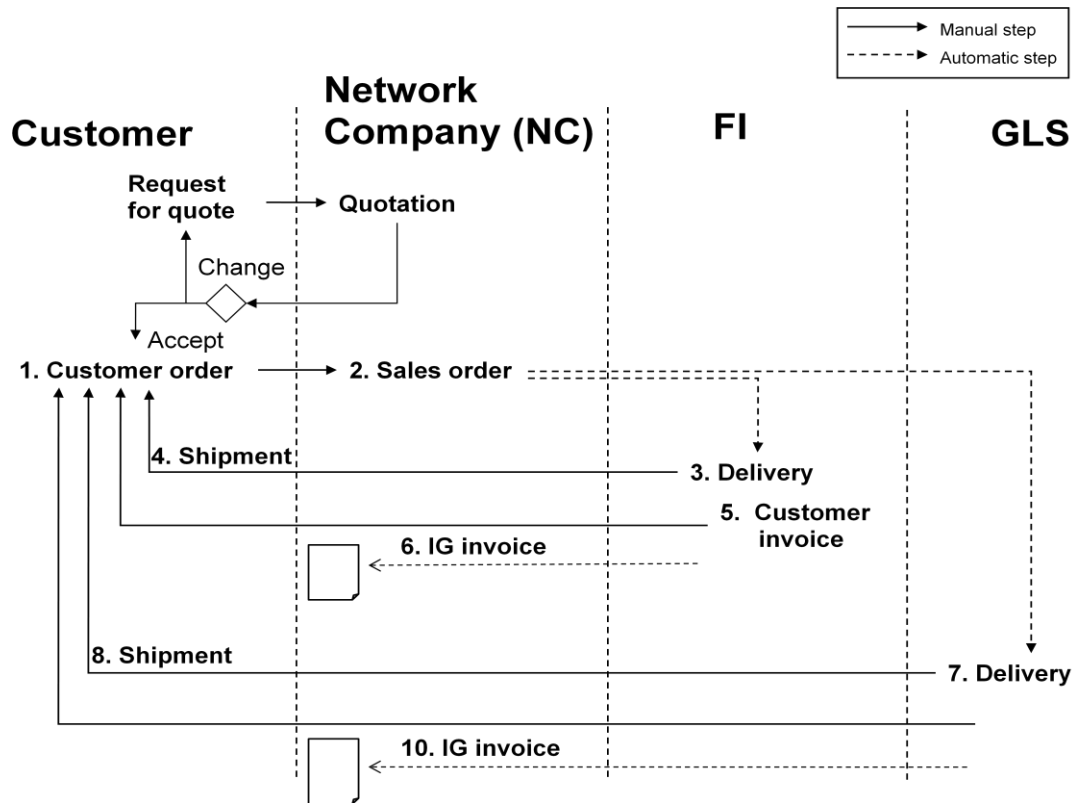


Figure 7. Order-delivery process in the situation of two shipping points

- The transfer per product reference type shall begin with XY parts (fast and medium movers) followed by the Z parts. Each product reference type has to be completely finished before the transfer of the next engine reference type is started.

Spare parts are classified in XYZ class depending on what is the demand of a certain individual part. XYZ class is calculated based on the rule of how many months of consumption has occurred during the last 12 months:

- X  $\geq$  10 months with consumption
- Y  $\geq$  4 months with consumption
- Z  $\geq$  1 months with consumption

By sending the XY parts first it is more probable to meet the customer demands in earlier phase of the transfer of a certain reference type. To complete each product reference type before starting the next one helps to control the shipping point and enables the possibility to stop the transfer after a product reference type if problems occur.

- Existing excess stock shall be transferred in advance to CDC during Q1 or Q2 in 2011. Scrapping shall be done in advance to secure that no obsolete parts are transferred to CDC.

By moving excess stock beforehand to central warehouse it is ensured that as many materials as possible exist and can be sold from the central stock as soon as possible. Also the space urgently needed in shipping stock can be released and the workload during the actual transfer reduced. During the preliminary excess stock transfer all the systems and procedures for the actual transfer also be tested.

- The actual transfer from Finland to CDC shall start at the end of July 2011.

This is due to several reasons: In August the sales volume and the warehouse workload is in the lowest level during the whole calendar year. It is also possible to have extra resources i.e. summer workers to make the transfer effective working in three shifts and during the weekends.

- The transfer starts with W50, a relatively small product reference type in volume for testing and training purposes (the transfer of W50 takes approx. 2 working days). After the test transfer, the next product reference type to be transferred is W46 with all its variations.

Engine reference type W46 represents about 20% of the daily delivery lines. Moving W46 in the beginning has a considerable impact on normal daily packing and transportation need and thus releases resources and space for further operation. Because the normal daily warehouse operation with spare part deliveries to customers is continuing at the beginning of the transfer and then

gradually moving to CDC as the transfer proceeds the idea to start with engine reference types with big volumes is aimed to decrease the daily workload as quickly as possible and to help the one shipping point strategy.

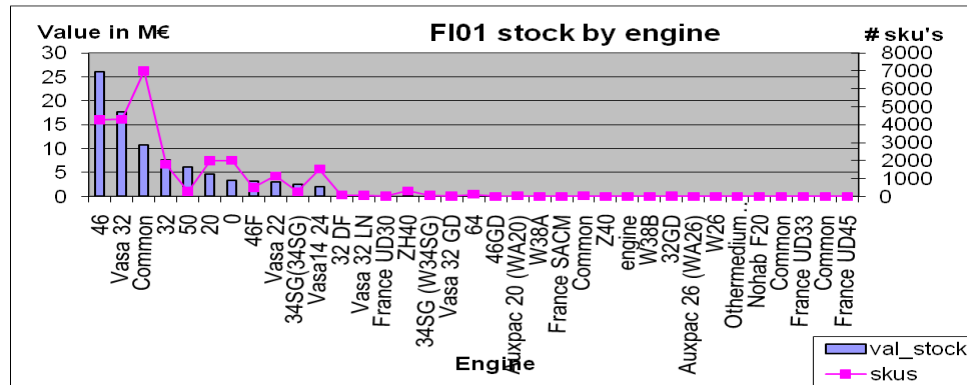


Figure 8. Sales and SKU's per product reference type in Finland in year 2009

- The transfer of all significant product reference types (big impact in sales and long transfer time) shall start on Fridays.

The argument to start transfer on Friday and continue during the weekend is to reach maximum throughput in the warehouse and keep the transfer time as short as possible. The cut-off delivering from Finland and starting deliveries from CDC happens at the same moment. This means that all new sales orders opened after the transfer has started will be delivered from CDC. At this cut-off point all existing already opened sales orders shall however be delivered from Finland.

- The inventory for common XY parts shall be built up in CDC in advance before the actual transfer starts

The argument to build up this double inventory is the fact that 30% of the delivery line items belong to common parts. By moving the common parts last it is possible to continue delivering from Finland during the transfer. Building up the stock in advance of XY Common parts in CDC ensures that more of the customer orders can be dispatched from CDC as complete at the early stage of the transfer.

#### **4.8 Challenges in sales and purchasing before and during the transfer**

Within sales the main challenges during the stock transfer are order-delivery monitoring and managing the customer expectations. Delivery monitoring includes defining the right shipping point and keeping track of the availability of parts on daily basis. Having the overview on the availability is challenging since parts are during the transfer partly stored in Finnish stock, partly being transported to Central Distribution Centre (CDC) and partly already stored in CDC. The customers expect that reliable delivery dates are confirmed also during the transfer project.

In material management the coordination of purchases is challenging since the stock transfer project is being implemented by product reference type. Existing order book will be delivered from Finnish warehouse meanwhile order intake in CDC is commencing by the transfer based on product reference types from Finland. The fact that cut-off points for sales is based on product reference type but for purchasing there is a defined date when all purchase orders are directed from suppliers to CDC is also challenging. This means that in practice the goods reception flow will decrease in Finland but material requirements for open sales orders needs to be arranged for.

To clarify the process and to avoid disturbances the following principles were determined for sales and purchase processes during the transfer:

1. The cut-off and shift for sales from Finland to CDC happens when the transfer for a particular product reference type starts. This means that all new sales orders will be opened to be delivered from CDC. At this cut-off time all existing opened sales orders (order book) in Finland shall remain to be delivered from Finland.
2. The open (= not delivered) purchase orders generated in Finland shall be re-directed in the beginning of the transfer to CDC. The remaining safety stock levels are covering a certain consumption during the transfer.
3. There shall be an emergency process enabling the fast track deliveries for customers having off-power situations in their installations or for sales orders

with significant penalties in case of delay. However, there shall be a strict policy of using this process to avoid mistakes and missing deliveries.

#### **4.9 Sales order handling process during the transfer**

Transit time of individual material has to be estimated to be able to give a delivery time for each individual sales order. In Finland case the estimated transit time from Runsor to CDC was defined as four calendar days.

If product reference type is big i.e. the transfer takes more than one week this may create some problems with sales order lead times. According to Finland transfer plan for instance W46 takes 12 calendar days to be transferred totally. This means that the first truck is in CDC after 4 days from the starting date but in the worst case it can take 12 days + 4 days for transit = 16 days to have the material available in CDC. To minimize the delay in delivery the transfer plan is based on the idea that the transfer of the big product reference types start on Fridays to have the weekend as a buffer to increase availability of the next week's working days.

To improve the customer satisfaction and to avoid long lead times it could be considered that the materials included in the sales orders opened during the transfer for product reference type under the transfer, should be prioritized in everyday creation of transfer deliveries and thus be shipped first in line during the next day.

##### **4.9.1 Delivering in different situations**

If sales order is for materials which are not under the transfer or not yet transferred the delivery happens from Finland.

In case a sales order includes lines from several product reference types (excluding Common parts) and some of them have already been transferred, the sales order has to be divided into separate orders to be delivered from Finland and

from CDC according to where parts exist. If the customer doesn't accept splitting, parts order coordinator confirms a delivery date based on the date when the transfer of concerned product reference types are ready.

The forecasting of stock transfer status shall be done on weekly basis. The forecast is updated daily according to progress.

One week before the transfer starts all open purchase orders are re-directed to CDC. This is based on the assumption that the safety stock levels in Finland are covering the expected consumption (approx. 2 months) during the transfer. By doing so, part of the deliveries originally ordered for Finland existing sales orders are shipped to CDC. These items have to be shipped to Finland from CDC during the transfer. There has to be a close follow-up of each delivery and each item to be able to define the availability for a certain sales order and sales order line.

To be able to coordinate the material traffic between Finland and CDC, a *command centre* concept is to be established. Command centre is a cooperative team including experts from parts order coordination, materials management and warehouse. During the transfer it has a daily meeting in which the open issues are handled and detailed status of the transfer is updated. The team has predefined responsibility of informing the stakeholders of the decisions and situation of the transfer.

#### **4.10 Emergency process**

Emergency process has to be in place from the beginning of the transfer. However the criterion of emergency (i.e. black-out, power-off, cases with high risk of injuries or high penalties) has to be considered very carefully to avoid mix-ups and overloading of moving resources. The 24/7 service for urgent cases can be misused if criteria are not tight enough. There are different situations from emergency delivery point of view while the transfer proceeds: the needed parts can be in Finland, in CDC, partly in Finland and partly in CDC, in transit or even at the vendor.



#### **4.10.1 Parts in Finland**

If parts are available in a shipping stock the normal emergency process can be followed. If parts are in Finland but reserved for open sales orders, emergency delivery creates a lack of material for one or more open sales orders. If emergency delivery happens there has to be a mechanism to give an impulse to both parts order coordination and materials management. If replacing material can be purchased and delivered in time to meet the promised delivery time of the sales order, there are no problems. If it is not possible to meet the promised delivery date parts order coordinator has to inform customers concerned and ask extra instructions. Also the possibility to deliver from SPCs has to be checked.

#### **4.10.2 Parts in CDC**

If parts are available in CDC the normal emergency process can be followed. 24/7 service orders the needed materials and delivery takes place from CDC.

#### **4.10.3 Parts partly in Finland and partly in CDC**

If emergency need contains materials located in both in Finland and in CDC the preferred process is to open two separate sales orders. Customer gets two separate invoices.

#### **4.10.4 Parts in transit to CDC**

If parts are in transit no emergency delivery is possible. The delivery can take place only when materials have arrived to CDC. The availability and delivery time from SPCs should be checked.

#### **4.10.5 Parts to be delivered to CDC from vendor**

If parts needed are to be delivered from vendor and already shipped, the delivery can take place only when materials have arrived to CDC. If the delivery is not yet shipped from the vendor the direct delivery from vendor to customer has to be considered. However at least the availability in SPCs should be checked

#### **4.11 CROL® - Customer satisfaction measures**

In order to maintain and develop the customer relationships the company has developed a systematic process to handle the individual customer relationships as well as customer satisfaction. The process is called CROL, Customer Relationship On-Line and it is developed in cooperation with PBI Research Institute. The customer relationship should be seen as continuous and operative, on-line. The purpose of the process is to support the company in managing the customer relationship and customer trust as well as monitor the company's performance with the customer. The process has been ongoing since year 2003. It focuses the whole supply chain from sales, project and service phases. In this context we concentrate on the service phase.

The CROL process requires the company to make a self assessment with the same questions as given to customers. This gives an opportunity to compare the customer feedback and own perception of the relationship. The evaluation process takes place in every quarter of the year, four times a year.

The Services business monitors the customer perceptions of the service performance covering all different service activities from spare part deliveries and maintenance support to individual projects and training services. In this context we are focusing on the spare part services. Annually over 1000 customer relationships from over 50 countries are monitored with CROL.

The scale used in questions varies from 1 to 10. If the question is not applicable, then an empty answer can be used. The scale is 1-2 = poor, 3-4 = fair, 5-6 = average, 7-8 = good and 9-10 = excellent. The questionnaire is shown in appendix 1.

## 5 CREATING CUSTOMER VALUE AFTER THE RELOCATION

When the decision to centralise the distribution and logistics took place there were two different targets: cost advantages and logistic benefits to a customer. Logistical benefits mentioned were shortened and more predictable lead times, increased delivery reliability, easier differentiation and more reliable and faster customer information. The benefits can and should be continuously measured after the centralization phase is over.

The present customer relationship measures, CROL, does not fulfil all the needs occurring in the new situation. There are qualitative but also quantitative values to be measured to control the service level and customer satisfaction. There are three different areas in CROL concentrating on the customer awareness, performance and quality. The overall index for organisation Parts in Q4/2010 was evaluated by 158 customers and the result was 7,9. In Q1/2011 the overall result including global spare part operations was 8,1. For Finnish Parts organisation the index was 8,2 evaluated by 103 customers. Within the index the customers were the most satisfied with performance of order processors (index 8,4) and the least satisfied with meeting agreed delivery times (index 8,0). In 2010 the corresponding figures for Finnish Parts organisation were as an overall index 7,7 as an opinion of 566 customers. In 2010 the least satisfying issue was availability of spare parts with index 7,5. The situation was the same in year 2009.

If we look at the situation Q1/2011 from the geographical point of view the most satisfied customers were in Middle East and Asia and the least satisfied in North and Central Europe. This is somehow conflicting with the fact that all of the big warehouses including the widest assortments of spare parts are situated in Europe.

Roughly one third of the customers were giving high ratings on delivery times but 13% of the feedback was evaluated by value 6 or less meaning average or below average performance. Verbal comments were concerning not fast enough

deliveries of critical spares splitting the deliveries because of stockouts and missing tracking possibility of the deliveries.

The low rates in delivery time of spare parts should be noticed. The CROL questionnaire handles the delivery time as a whole and doesn't give any exact answer to question of which specific part of the order-delivery process takes too long from customer's perspective. There are many details in the process which affect to total delivery time. Some of the customers may include the time required for normal correspondence of spare part availability to a delivery time. If the order includes parts which are not kept in stock the delivery time is usually longer. If the order is to be delivered as complete the delivery date has to be set according to the part that has the latest delivery date. If the customer wants to have a spare part which has to be equipped before the delivery the process time has to be reserved.

The management of the company should establish the new standards of performance, measure each service element, analyze the variance between the standard and actual service performance and take corrective actions to reach the standard level in service. The standard service should reflect what the customers need rather than reflecting what the management thinks customers need. (Stock et al., 2001, 124-126.)

The targets for standard service should be divided into segments such as type of customer, geographic area, channel of distribution and product line. The ideal standard includes the pretransaction, transaction and posttransaction elements presented in chapter 2. Some possible measures of customer service performance are presented in figure 9 (Stock et al., 2001, 127.)

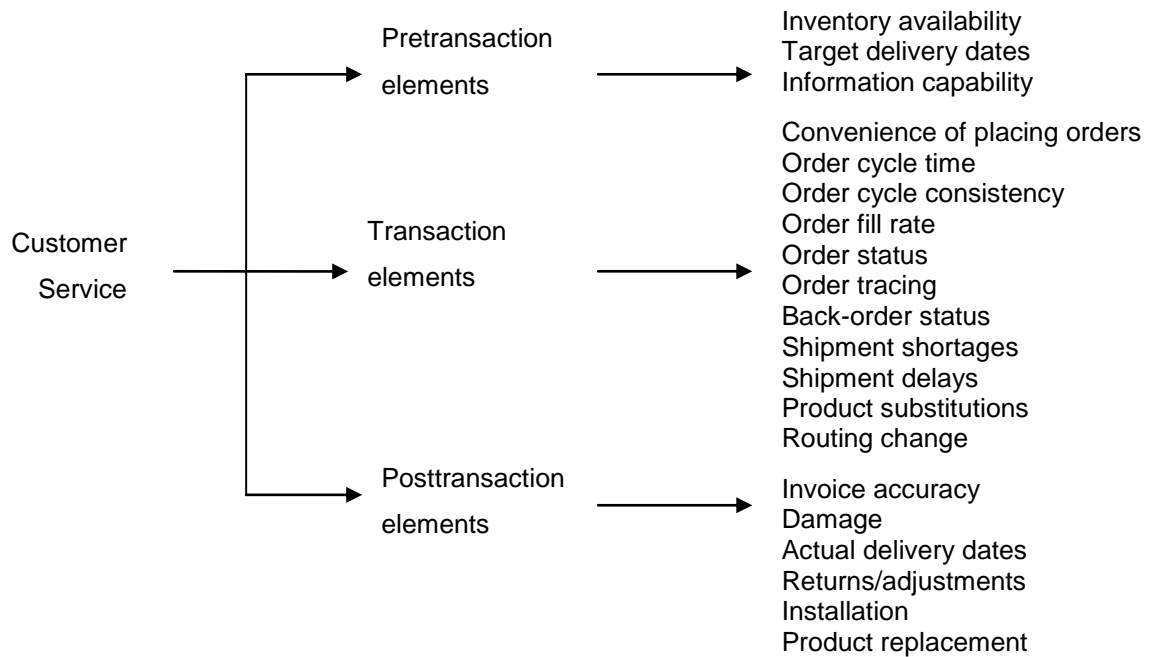


Figure 9. Possible measures of customer service performance.

## 5.1 Standard service segments

The targets for standard service should be divided into segments such as type of customer, geographic area, channel of distribution and product line

### 5.1.1 Customer segments

The customers of a spare part business can be divided in many different ways according to the delivery process they need. First the customers can be divided in *internal and external customers*. The external customers i.e. the end-customers and the network companies are usually ordering materials for an instant need. Most of the external customers are located abroad. Internal customers like project organisations in power generation, marine and services engine renewals or service businesses mainly need spare parts as packages for the new engine deliveries or spare parts for project overhauls and renewals. Two internal customers, spare part centres (SPC) in the U.S.A. and in Singapore are ordering the replenishments for their stocks on the regular basis and internal reconditioning workshop and engine assembly lines are using the spare parts ad hoc delivered

by the warehouse. The difference between external and internal customers and their orders is the size and urgency of an order, the external orders are usually remarkably smaller, the delivery time shorter and the customer is located abroad.

The customers could also be divided in *marine and non-marine customers*. The difference in delivery process is the need of classification. Marine customers usually need a classification process for critical spare parts before the delivery. Classification means that the critical parts are individually identified, inspected and approved before the use by an external classification society. The classification society used is defined by the insurance company of the marine customer. The classification process can be part of the delivery process or the critical spare parts can be bought classified for a certain classification society. With marine customers the punctuality of the delivery is essential because the vessels are visiting ports just in a certain time window and if the delivery is delayed the next possibility to deliver can be in another port after several weeks.

The third way of dividing customers is based on *urgency of the need*. For instance in stock replenishments and project deliveries the order cycle can usually be longer because the need is seen earlier. The ordering process starts earlier to ensure the longer logistics time before the delivery. In urgent needs the customer needs the spares as soon as possible to minimize the downtime losses. To handle these cases the standard service has to include separate processes and standard cycle times for both normal and urgent deliveries and they should be measured separately.

### **5.1.2 Geographic location of customer**

The geographical distance between the customer and delivering stock partly obtains the delivery time. The service can also include different elements depending on where the customer is located. For instance domestic or EU deliveries need remarkably less time and documentation than deliveries to the U.S. customer. The idea of spare part centres (SPC) is to eliminate the delay caused by the location and support and fulfil the local need of customers in North

America and Far East. Before the centralization of the European warehouses the role of the SPCs has been relatively small. Now the focus has to be changed. The customer sitting in the North America or in Far East has the same expectations of delivery time than the European one. The stocking levels and the availability have to be built up according to installed engine base and the level of service has to be measured with the same standards as in CDC.

### **5.1.3 Channel of distribution**

There are no big differences in channel of distribution in before and after situation: All internal and the biggest customers can place orders directly to CDC. The rest are ordering via network companies as they used to do in an old model. The way of working in network companies has to be unified in a new environment. In decentralized model the network company ordered the items from different warehouses when necessary and did the consolidation as a service for a customer. This may not be necessary any more in the new

### **5.1.4 Product line**

There are two main groups, portfolio and non-portfolio products based on the technology and manufacturing period of a certain engine type. The standard service level between these two groups can be differentiated so that the portfolio products which belong to present manufacturing agenda do have a higher standard service level than non-portfolio products which originate from different era of production. The stocking levels and availability has to be set accordingly.

## **5.2 KPI measures in new environment**

A spare part customer has some basic expectations when ordering a spare part: the part has to be available and in most of the cases it has to be available as soon as possible all over the world. A customer feedback tells that the least satisfying issue in company operation during the last two years has been the availability of spare parts. The customers also feel that meeting the agreed delivery times has not been very successful. In a sense the lacking availability i.e. that the spare parts ordered are not deliverable from the stock and delayed deliveries result the same: the spare part is not usable at the customer when expected and needed.

Trying to keep up the availability as high as possible may lead to excess stocks and increased costs. Meeting the agreed delivery times is difficult without exact knowledge and up-to-date information of the whole delivery chain. In chapter 2 some critical elements and customer expectations were listed.

### **5.2.1 Total lead time**

In most of the cases lead time of the delivery is essential. Often it is difficult to measure the total lead time if there are several operators within the delivery chain or external operators involved. For instance in cases where the customer uses external operator for delivery transportation it is difficult to get reliable figures of how many or what percentage of the deliveries were delivered in time.

The total lead time is divided in several phases:

- order preparation and transmittal
- order entry and processing
- order picking, classification and packing
- transportation
- customer receiving



To get reliable figures of lead time only the process controlled by the own organisation should be measured. The measurement should be enabled by necessary amount of time stamps during the process. It should be possible to measure lead times in each and every essential phase of the process. There should be clear tracking for every major transaction of a single order. Also rework i.e. changes along the process should be recorded. The control of agreed delivery times should be possible and the feedback given in numeric form. There should also be at least two levels of urgency in deliveries in place: a fast lane for urgent deliveries with a guarantee of delivery happening within certain hours from receiving the order or a delivery taking place on the same day if the order is placed before the certain time of the day. Ordering should be possible 24 hours per day. To reach a world class operation the internal measures should be made *on hourly basis*. The focus should be put on how to define the delivery time as precisely as possible.

Some restrictions have to be in place: amount of order lines may affect to delivery time, some spare parts have to go through special processes before they can be sent and parts of non-portfolio engine types may also have a different delivery schedule. To increase customer satisfaction a list of stored materials available when needed directly from the central warehouse should be published and updated online as a promise to keep up the service level.

### **5.2.2 Delivery reliability**

In customer feedback the delivery reliability goes hand in hand with the lead time. It is tempting and common for salespeople to promise shorter lead times than can be in practise met to avoid long discussions with the customer. Unfortunately some of the delivery times are also set advisedly short to create safety margin to the end of the delivery chain or to motivate the following phases of the process to try their best. This causes distortion in measures of delivery reliability. From customers point of view a confirmed delivery date is a promise. The delivery reliability can be increased by clear service level guidelines giving instructions and templates of standardized cycle times for different types of deliveries noticing for instance the customer group, size of the delivery, geographical distance and type

of transportation. The measures should be similar for both internal and external customers.

In today's operation the warehouse is measuring its performance by delivery lines packed in time. Every working day all the delivery lines printed out on picking lists before 6 p.m. should be packed before 10 p.m. The target has been set to 85% and it is usually reached in a normal season. However there are exceptions in the present rules and the results are not always unambiguous.

In a new centralized way of working there should be clear guide lines and commitments to delivery times in every phase. The order delivery time could be based on following parameters:

- spare parts ordered are portfolio or non-portfolio products
- spare parts ordered are stocked or non-stocked material
- amount of order lines exceed x lines
- spare parts ordered need some special treatment (tuning, classification etc.) before they can be delivered
- the order has to be delivered as complete

A reasonable time for logistic operation in warehouse i.e. time for picking, packing and dispatching should also be counted in. In cases where the delivery is on vendor's responsibility also the transportation time should be included.

### **5.2.3 Delivery dependability**

The target of the spare part service is to have a correct material with a correct quantity delivered in promised time. In export business there are usually third parties, authorities like customs etc. who are also interested of correct materials and right quantities. The quality of the operation can be measured by counting the ratio between incorrect and correct deliveries. Today the quality of the operation is measured via the number of customer claims both against all deliveries and also all delivery lines. Even if it is sometimes difficult to define what is the real reason

for a single customer claim, the claims should be analyzed and claim handling process continued.

One indicator of the service quality could be the ratio between the amount of deliveries and sales orders. In theory the ratio should be one delivery against each sales order in a centralized model. If the ratio increases it means that more deliveries than incoming orders take place. This can in some cases be according to customer wishes but at least it creates additional costs and lowering margins. In general it describes the service level of the company: several deliveries against one single sales order indicate the problems in delivery process. Extra deliveries are usually generated by backorders (delayed purchase orders) and backlog (delayed delivery lines).

#### **5.2.4 Adaption and flexibility**

A global spare part service has global customers which are operating in many locations of the world. The operation can have local variations and the local authorities affect to delivery processes which may reflect to the different needs of packing, transportation etc. In a centralized model it is difficult to adapt different needs and flexibility. If several different ways of working are implemented usually the operation will become less efficient. Flexibility also means the ability to react unplanned events. This will be the real challenge, also the measures of adaptation and flexibility are difficult to obtain. Some kind of local adaptation can be reached in the spare part centres (SPC) in Singapore and the U.S.A. having more homogenous customer and engine base.

#### **5.2.5 KPIs in new environment**

The customer satisfaction measures in form of CROL should be continued to give a perspective how customers feel and react in a transfer phase when the operation is changing from old decentralized model to a centralized one.

Additional to qualitative CROL measures also the following quantitative KPIs should be used to control the daily and monthly performance of the new centralized model:

- Inventory value of materials in stock

Both gross and net value should be calculated on monthly basis (net value = gross value – devaluation). Actual and proportional value against monthly turnover indicates possible over/understocking.

- Inventory turnover

Indicates how many times the inventory is sold and replaced within 12 months period. The bigger the value the better procurement and stocking policy with lower invested capital in the warehouse.

- Complete sales order availability in %

Describes how many complete sales orders can be delivered on the same day when they are created .i.e. all materials for the order are available in stock

- Same day ready for shipping in %

The value indicates the warehouse performance. Should be measured against pre-defined deadline i.e. sales orders registered before certain time of the day should be shipped on the same day. The deadline is dependant of the working hours and resources of the warehouse.

- Number of justified claims addressed to the warehouse against delivery lines

Describes the operational quality of the warehouse, typical value is one claim against 1000 delivery lines.

- Put-off promptness in %

Put-off promptness describes how quickly the warehouse receiving process manages to clarify and handle the incoming deliveries to get the materials into the storage bins for sale. A typical target of put-off promptness could be 85% of delivery lines put-off into the bins on the same day received or 95 % on the following day of receive.

### **5.3 Improvements to be implemented**

#### **5.3.1 Information**

The role of information change in a global delivery chain has become more and more important. The new technologies enable a view to each delivery if wanted. For instance external transport operators and couriers are offering tracking systems by which a customer can follow his own orders. A supplier would also like to have the information of incoming order in the earliest possible phase to be prepared with correct resources and materials when the delivery takes place. Unfortunately the information is often based on forecasts and estimates and the commitment of neither the customer nor the vendor are very strong.

In a new centralized model new services could be taken in use: The customer or at least certain key customers should have an opportunity to check the availability of a certain material in stock and follow their orders after they have placed them. The service should also cover the internal processes of CDC. By giving information of what is the actual status of a certain order also a customer can be prepared if disturbances happen. There could be predefined statuses of the order of which the customer could conclude what is the situation of a certain order. Some examples of statuses could be like "order registered", "order confirmed", "picking started", "packing started", "waiting to be delivered" and "delivery made". The service could be built as an Internet service to be available globally. It could be integrated to transportation operator services and it would give a clear advantage and differentiation from rivals. The service could even be a product to be sold to most of the customers.

### 5.3.2 Balancing the daily workload

The fluctuation of the workload creates problems in resourcing of the daily operation. For instance in Runsor warehouse in April 2011 the amount of incoming daily order lines varied between 995 and 2238 lines. According to long time measures the daily capacity is approx. 1550 lines. This means that the workload varied from 64% to 144%. This can also be the case in CDC even if the bigger volume usually decreases the fluctuation. With multi-skilled personnel this can be partly handled by placing the resources in different operations according to the need but the available equipment creates restrictions for the balancing efforts.

One method of balancing the workload could be the control of incoming order lines within certain time frame and dividing the daily delivery capacity available according to predefined rules which are set up into ERP system. If the daily delivery capacity is known it can be defined that within certain tolerance no more order lines can be neither delivered nor confirmed to the customer. If there is no delivery capacity for a certain day then the delivery has to be placed later. If the order can't be delivered in a reasonable time it is a sign of lacking resources which needs corrective actions.

As a theoretical example (see table 2. below) we could have a situation in which the daily capacity has been measured during a longer period and defined as 1300 lines. On day 1 we have 1430 incoming lines to be delivered. However, because there is not capacity enough the overload is cut and defined to be delivered on the next day. On day 2 the amount of incoming lines is 1085, the rest from previous day to be delivered is 130 lines and the capacity 1300 lines. The cumulated capacity of these two days is 85 lines which could be used for deliveries after day 2. The calculation period of cumulated capacity has to be long enough to get the benefit of the system. Some advisory values for a period can be quarter of the year or half of the year depending on the length of the order base. The calculation has also to be executed backwards from the end of the period meaning that if the delivery is bigger than one day's capacity it has to be balanced to previous days if possible. In the example the cumulated capacity of day 5 is positive meaning that

if nothing is done there will be an overload of 206 lines. However there's capacity on day 4 and the overload can be located there and part of the work has to be done on the previous day. If there is no capacity on the previous days and the delivery can't be postponed, it means that there is a need of corrective actions like doing overtime or getting some temporary or permanent resources.

Table 2. An example of balancing the daily workload

<b>Day</b>	<b>Incoming</b>	<b>Capacity</b>	<b>Over/underload</b>	<b>Cumulated</b>
1	1430	1300	130	130
2	1085	1300	-215	-85
3	1229	1300	-71	-156
4	1230	1300	-70	-226
5	1901	1300	601	375

## 6 CONCLUSIONS

During the transfer planning phase of one year it has become evident that moving a huge spare part stock with roughly 26.000 different materials to another country is not going to happen without any disturbances in customer services. Also the operation after the transfer in a new centralized environment with new personnel and new ways of working will create differences compared to the expected service levels and create misunderstandings and problems to customer relationship. It is a high financial risk in case the customers are feeling not getting the service they are used to.

The transfer plan has been made very carefully to minimize the problems during the transfer phase. The centralized stock is also a chance to promote new technologies, new ways of interaction with the customers and new standards of services in the new environment. The benefits of the centralized model i.e. shortened and predictable lead times increased delivery reliability, easier differentiation and more reliable and faster customer information are there to be realized. It needs exact measures and instant reactions to performance failures in different areas of services.

The big challenges during the transfer phase exist in sales department. They have to be on the top of the process all the time to be able to confirm reliable delivery times. The purchasing function will have a difficult task to control the incoming delivery process in the phase when deliveries are redirected from Finland to CDC.

The project of centralizing the spare part stocks into one logistic centre is combining eight different ways of working into one common concept. It has not been planned according to local characteristics due to different engine types. This is a big change for most of the customers and the new standards of service should be informed to every service user.

Because of the new situation it is very important to concentrate the transaction elements of service during and after the transfer period. A qualitative measure like convenience of placing order or supplier's ability to provide enough order information should be with in customer questionnaires regularly done once in a



quarter of the year. The quantitative measures effecting to customer satisfaction should be measured monthly. Total cycle time of an order is one of the most important factors in the customer feedback. The cycle time measure should be divided in different phases to find out the possible bottlenecks in the process. Number of delayed deliveries, number of backorders, delivery promptness, number of partial deliveries, faulty deliveries with incorrect materials or amounts give a comparable picture of the service quality and explain the customer satisfaction.

CDC has already started the daily operation and some of the warehouses have already transferred to CDC. The whole year 2011 will be a transfer time towards centralized logistics and distribution. The service level will suffer from the change but the key issue is how quickly the new centralized service level is reached and stabilized on a sufficient level. If the transition period is too long the customers will search other sources for their needs.

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## APPENDICES

## APPENDIX 1. CROL Questionnaire

<b>CROL®- MEASURING CUSTOMER PERCEPTIONS OF PRODUCTS AND SERVICES</b>		
ACCOUNT NAME (CUSTOMER COMPANY)		CUSTOMER CONTACT PERSON
ACCOUNT NUMBER (CUSTOMER ID)		ACCOUNT MANAGER
<b>ENGINE SERVICES</b>	Please assess the statements below on a scale from <b>1 to 10</b> . Leave empty if the question is not applicable. <b>The scale is 1-2 = poor, 3-4 = fair, 5-6 = average, 7-8 = good, 9-10 = excellent.</b>	
S01	understands your business.	
S02	takes responsibility for its promises and actions.	
S03	is open and sincere in its communication.	
S04	is reasonable when handling complaints and claims.	
S05	actively suggests ways to improve the performance of the installation.	
S06	The local representatives are available when needed.	
S07	The scope of offers is clear and suits your needs.	
S08	The response time for offers/inquiries is prompt.	
S09	The Account Manager contacts you often enough.	
S10	The Account Manager informs you enough about different products and services.	
S11	The Account Manager listens to your opinions and pays attention to your needs.	
S12	The Account Manager ensures that your problems and inquiries are taken care of.	
T01	The availability of the installation is high.	
P01	The quality and reliability of mechanical components is good.	
P02	The quality and reliability of electrical components is good.	
S13	The operating costs of the installation are in accordance with your expectations.	
S14	Spare parts are easy to order.	
P03	Engine spare parts are available when needed.	
P04	Auxiliary equipment spare parts are available when needed.	
P05	is able to meet the agreed delivery times for spare parts.	
S15	keeps you updated with the status of your orders.	
T02	The Service Bulletins are understandable and useful	
T06	The technical information provided by meets your needs	
T04	Technical problem solving is efficient.	
T05	The response to technical inquiries is thorough and prompt.	
F01	The service engineers are competent.	
F02	Service engineers are available when needed.	
F03	The behaviour and attitude of engineers is good.	
F04	The quality of maintenance work is good.	
F05	gives you satisfactory status reports of ongoing maintenance work.	
F06	The maintenance reports are correct and useful.	
<b>Please specify what in particular</b>		<b>Services handles well</b>
<b>Please specify what</b>		<b>Services needs to improve the most</b>
When completed, e-mail the file to <a href="mailto:crol@pbi-institute.com">crol@pbi-institute.com</a> or fax it to +358 2 233 0494		

