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Rework of defect products with maintained traceability

Bachelor of Science thesis at Coca-Cola Enterprises Sweden

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Examensarbete TMT 2015:02
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Omarbete av defekta produkter med bibehållen spårbarhet

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Sammanfattning

Det huvudsakliga syftet med detta examensarbete har varit att identifiera, analysera och förbättra procedurerna vid omarbete hos Coca-Cola Enterprises Sverige samtidigt som man belyser betydelsen av att ha en bibehållen spårbarhet. Procedurerna vid omarbete behandlade omarbete i produktion; före och efter EPN samt det omarbete som utförs på lagret. Vid EPN får varje pall en EPN etikett som ger pallen en unik identitet. En ny generell procedur för omarbete i produktion efterfrågades även.

Varje företag som tillverkar och hanterar livsmedel har strikta riktlinjer som måste följas. CCES måste följa riktlinjer från EU lagstiftning, svensk lagstiftning och The Coca-Cola management system (KORE). En viktig riktlinje är att ha fullständig spårbarhet på alla producerade produkter.

Vid omarbete av defekta produkter finns det alltid en risk att spårbarheten kan förloras om allt inte görs på rätt sätt. Detta innebär att procedurerna vid omarbete måste göras på ett korrekt sätt för att ha en bibehållen spårbarhet. Spårbarheten är essentiell för varje tillverkningsföretag för att veta vad för råmaterial som har använts och var produkterna är. Detta är viktigt för att alltid ha möjligheten att kalla tillbaka produkter om det visar sig att de inte har den önskvärda kvalitén.

Hur det nuvarande omarbetet sker har dokumenterats via tre flow-charts som omfattar omarbete innan EPN, efter EPN och på lagret. En flow-chart som omfattar proceduren för återkallande och en som omfattar hur spårbarheten fungerar framställdes även.

Genom att analysera hur procedurerna för omarbete utfördes så identifierades ett antal problem vilket ledde till att vi tog fram nya dokument med information om procedurerna vid omarbete, proceduren för återkallande och den nyutvecklade samt standardiserade proceduren för hur omarbete görs i produktion.

Vår slutsats är att komplexiteten med problemen gällande omarbete av defekta produkter har varit svår att hantera. Våra rekommendationer tror vi är steg i rätt riktning för att lyckas lösa problemen och förbättra procedurerna vid omarbete samt hjälpa till med att ha en bibehållen spårbarhet.

Nyckelord

Omarbete, Defekta produkter, Spårbarhet, Bibehållen spårbarhet

Bachelor of Science Thesis TMT 2015:02

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Abstract

The main purpose of this thesis was to identify, analyse and improve the rework procedures at Coca-Cola Enterprises Sweden while considering the importance of maintaining the traceability. The rework procedures covered rework in the production; before and after EPN, and the rework performed in the warehouse. At EPN, individual pallets are assigned EPN labels, which gives them a unique identity. A new general procedure for rework in the production was also desired.

Every manufacturing company that handles food production has strict guidelines that need to be followed. CCES has to follow guidelines from EU legislation, Swedish legislation, and The Coca-Cola management system (KORE). One important guideline is to have a full traceability on all produced products.

When reworking defect products there is always a risk that the traceability could be lost if it is not done correctly. This means the rework procedures have to be done in a correct way in order to have a maintained traceability. The traceability is crucial for every manufacturing company to know what raw material has been used and where the products are. It is important to have the ability to call products back if it turns out that they do not meet the acceptable required quality.

The way existing rework is done was documented through three flow-charts showing rework before EPN, after EPN, and in the warehouse. One flow-chart that concerns the recall procedure and one that concerns how the traceability works were also developed.

By analysing how the rework procedures were done, some problems were identified which lead to that we developed new documents with information about the procedures during rework, the procedure for a recall and the newly developed and standardized procedure of how rework is done in production.

Our conclusion is that the complexity of the problems concerning rework of defect products has been hard to handle. The future recommendations are presumably great steps in the right direction to succeed with tackling the problems and to improve the procedures with rework and to have a maintained traceability.

Key-words

Rework, Defect products, Traceability, Maintained traceability

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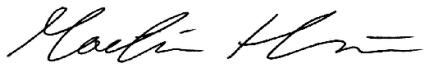
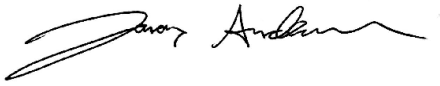
We hope that this thesis will be beneficial for your future work!

Stockholm, January 2015





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Key words and abbreviations

CCE	Coca-Cola Enterprises
CCES	Coca-Cola Enterprises Sweden
QMS	Documentation management system, with Lotus Notes as platform.
IMS	Inventory Management System, keeps track of the balance of products in the production.
WMS	Warehouse Manage System, keeps track of the balance and location of products in the warehouse. Each pallet is given a unique identity.
BOM	Bill of Material. Containing all the raw material used.
Rework	When a product has some type of defect and has to go through some steps of production again.
Production Sin Bin	A systemically and physical location to place pallets with defect products that shall be reworked.
Lotus Notes	A software for handling of documents, communication etc.
Ghost pallet	An EPN label gets printed out to a non-existing pallet e.g. prints out two times.
Case	Sales unit. E.g. 24-pack or 6-pack.
ERP	Enterprise resource planning, a business management system.
SAP	The business management system used by CCES. It involves systems, applications and products. This is the main system at CCES which is connected to all the other systems.
EPN	A bar code which is placed on the pallets with finished products. The EPN label has all the important information about the products on the pallet, such as when they were produced, which batch it was, the best before date etc. Gives the pallets a unique identification.

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1. Introduction

This bachelor thesis was performed at Coca-Cola Enterprises Sweden during ten weeks in the fall and winter of 2014. It constitutes the final requirement for the Bachelor Engineer program 'Mechanical Engineering with Industrial Business Administration and Manufacturing' at the Royal Institute of Technology in Stockholm, Sweden.

The introductory section consists of a short company description, the background for the Bachelor thesis, a problem definition, and the purpose of the thesis. Fundamental goals are then determined followed by the scope. Limitations are specified and finally the report outline is described.

1.1 Company description

The history of the product Coca-Cola™ started in 1886. A pharmacist from Atlanta, Dr. John S. Pemberton, developed flavoured syrup, which he mixed with carbonated water to create the beverage Coca-Cola. Prior to his death in 1888, Dr. John S. Pemberton sold his business to several parties and in 1892 "The Coca-Cola Company" was founded (The Coca-Cola Company, 2014).

Today, The Coca-Cola Company is one of the biggest, most valuable and trusted corporations in the world and its headquarters are located in Atlanta, Georgia. The company stands out as the biggest beverage company in the world, selling approximately 1.8 billion bottles of beverages every day in roughly 200 countries. The company is using a franchised distribution system, where the company in Atlanta produces the concentrate that all the products are based upon. This concentrate is then sold to nearly 275 licensed Coca-Cola bottlers around the world who are responsible for producing, packaging, and distributing the finished products. The company in Atlanta also develops new products and is responsible for marketing and advertisements for the products (The Coca-Cola Company, 2014).

The third largest bottler in the world, by volume, is Coca-Cola Enterprises (CCE). The company expanded from USA in 1993 when they purchased bottling rights in the Netherlands. Thereafter a significant expansion in Europe followed in 1996 and 1997 when CCE acquired bottling rights in Great Britain, Belgium and France. The bottling factory in Jordbro, Sweden, was founded in 1997 but was acquired by CCE in 2010. Today CCE has bottling-plants in several European countries, including Sweden, Norway, the Netherlands, Monaco, Luxembourg, Great Britain, France and Belgium (Coca-Cola Enterprises, 2014).

Coca-Cola Enterprises Sweden (CCES) produces nearly 97% of all the products from Coca-Cola which are consumed in Sweden. Some of the produced products are also exported to Norway and Finland. The plant in Jordbro produces just over one million litres of beverage per day and approximately 380 million litres per year. There are roughly 750 employees at the facility (Coca-Cola Enterprises Sweden, 2011) (Olsson, 2014).

The factory has seven individual production lines:

- A bag-in-box line
- A canning line
- A Tetra brick line
- A glass bottling line
- Three PET lines

1.2 Background

The goal for manufacturing companies, such as CCES, is to get paid for all the products they produce to cover for the costs for e.g. raw material, salaries etc. To receive continuous orders and payments from customers, it is important to offer high quality products. All customers and consumers have an expectation of product quality. For CCES to live up to the Coca-Cola Company' standard this has to be correct and high. They cannot ignore production related problems, that could lead to a bad reputation, a negative corporate image, and furthermore to a decrease in demand. All these problems would furthermore result in financial losses (Olsson, 2014) (Lindberg, 2014).

To guarantee high quality products, traceability is required. With a system that allows the company to trace the refining process from the beginning to the end, it is possible to receive continuous information about a product. It is important to have the ability to know exactly how much and what raw material that is used to create each product. This information could be used to determine when a product was produced and what raw material that was used to create the product. EU legislation and Swedish legislation determines that there needs to be full traceability on all produced products and The Coca-Cola Company cannot accept CCES to be handling traceability poorly.

A defect product has to be traced and sometimes called back to CCES. To have the ability of tracing a product through the manufacturing process is crucial in order to find out what the cause of the problem was. The traceability backwards is possible because of the documentation during the production with for example the production-code, date-code and barcodes on the products and pallets. The traceability backwards at CCES usually works very well without any noticeable problems.

Tracing a delivery could be required either because of a customer finding a defect or that CCES finds a reason to make a recall. If a defect product for some reason would be dangerous to consume, it is very important to prevent the product to enter the market. If a defect product has reached the market it could lead to a recall being necessary. The recall procedure is a long and extensive process, which CCES certainly wants to avoid.

Manufacturing industries occasionally have to rework some products because they do not fulfil the quality requirements. This is not something desirable because it is a very unnecessary expense for the industry to rework products. For the most part this is quite uncommon, but when it does happen it is a disturbing problem. It also takes time from the current ongoing production, which could have been used to produce new products.

When defect products return back into production for rework it is important that they can still be traced after the rework is done. The rework procedure has to be done correctly in order to allow CCES to maintain the traceability forwards. With clear and comprehensive instructions for employees to follow, the effects of rework would be reduced and the level of traceability would increase (Olsson, 2014).

1.3 Problem definition

When introducing finished products back to production for rework it is crucial that the rework procedures are followed correctly in order to maintain the traceability. If they are not followed it may lead to a loss of production specific and batch information. This means that there is a risk that the traceability gets lost, which is unacceptable for a manufacturing company like CCES.

1.4 Purpose

The main purpose of this bachelor thesis was to identify, analyse and improve the rework procedures at CCES while considering the importance of maintaining the traceability.

1.5 Goals

- Define current state:
  1. Define and document the current state for reworking products that passed through the EPN mark.
  2. Define and document the current procedure for rework of products on the line that has not yet passed the EPN mark.
  3. Define and document the current procedure for rework of products in the warehouse.
  4. Document all these areas with related flow-charts

- Define a common procedure for rework of products with an EPN label and that needs to be brought back into production for rework. This procedure must fulfil CCES's demands for traceability, both backwards and forwards. And it must also be a procedure that the current information systems (EPN, SAP, WMS etc.) can support.
- Document this as a flow-chart
- Arrange a presentation to inform/train relevant CCE staff on the new procedure.

1.6 Scope

The thesis mainly covers these questions:

- Why do products become defect?
- What defect products can be reworked?
- How do the rework procedures work?
- What are the most common errors during rework?
- Why is it important to maintain traceability?
- How does the recall procedure work?
- Which improvements can be made?

1.7 limitations

This bachelor thesis does not focus on specific problems on individual production lines. Instead a common factor for several lines is established. Procurement of new equipment are out of scope.

1.8 Report outline

In this section, the different areas and chapters of the report are explained.

1.8.1 Methodology

The Methodology section describes the methods used in the thesis in order to acquire the information needed to successfully execute the project. This includes research used for collecting and processing data of the existing situation and information for creating project results.

1.8.2 Theory

The theory section covers the literature studies that were used in the thesis that had an impact on the bachelor thesis.

1.8.3 Empirics

In this section the major findings from CCES are presented. It contains a current situation analysis regarding the rework procedures before EPN, after EPN and in the warehouse. Also included are the recall procedure and a summary of the conducted interviews with employees.

1.8.4 Analysis and Results

This section summarizes the most important findings from the thesis. The findings are then analysed and possible measures are presented. The new rework procedure is also presented.

1.8.5 Discussion

In this section the results and findings are discussed. A critical review is made by the authors where the reliability and validity is revised. The problem definition, purpose, and goals are taken into account as well as a reflection regarding how the thesis could have been made differently.

1.8.6 Conclusions

This section includes the conclusion of the entire thesis. It contains an overview of the existing problem, identified causes and furthermore the root cause is described. Finally the improvements with the new procedure is clarified.

1.8.7 Future recommendations

In this section the most suitable and effective solutions for the future are recommended by the authors.

2. Methodology

This section involves the methods used to complete the Bachelor thesis. It includes the working process, research methods, a current situation analysis, interviews, and a literature study.

2.1 Working process

At first there was a problem that needed to be examined and therefore a problem definition was created. The next step was to analyse appropriate theory. Thereafter the empirical section started with a current situation analysis to understand how the different procedures work in the company. This was made by observations, interviews and lastly documented as flow-charts. Possible solutions are presented in the final section of this thesis together with the new procedure. The solutions are related to the problem and problem definition. Finally, future recommendations based on the findings in the thesis are presented.

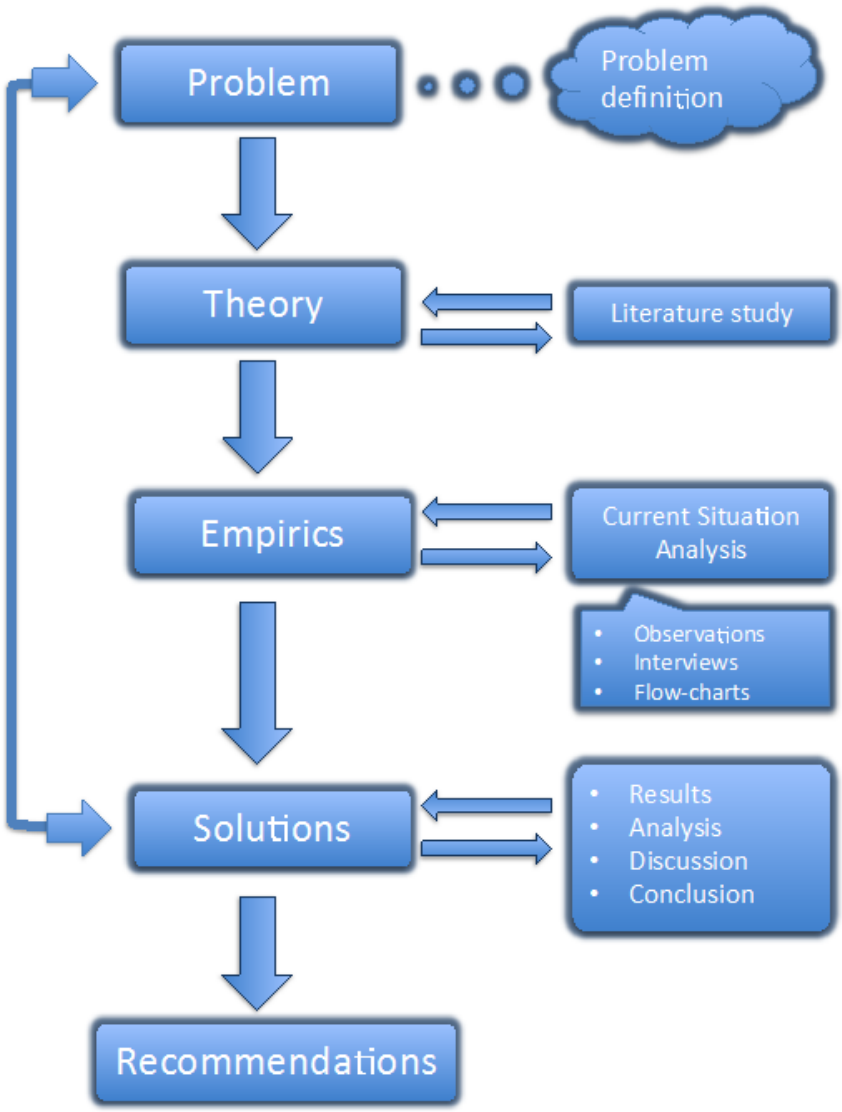

Figure 1 - Schematic overview of the working process

2.2 Research methods

There are two types of research methods used in this thesis: qualitative and quantitative

- Qualitative methods use information gathered through interviews, workshops, observations, literature studies, documents etc. The information is used to characterize and describe.
- Quantitative methods use information gathered through surveys, forms, statistics etc. The information is used to gather size, amount, and quantity (Olsson & Sörensen, 2007).

By using both qualitative and quantitative research methods this thesis has acquired information from both sources, which made the information more reliable. This thesis has used qualitative methods regarding interviews, observations, literature studies and documents. The quantitative methods were used via the fault data.

2.3 Literature studies

Literature from different sources that is connected to the project was used, such as: books, internal information, The Internet, and empirical sources. This made the theory very reliable because it was compared and analysed which resulted in more correct results. The literature concerned lean production, management and understanding, how to change, traceability etc. Quality certifications such as ISO 9001 and FSSC 22000 were all needed for the quality aspect in the project.

2.4 Current situation analysis

The information about the existing situation was gathered through:

- Interviews with employees with field expertise
- Inspections at scene on production lines
- Inspections at scene in the warehouse
- Check database for fault data (statistics and more)

Microsoft Visio was used to create flow-charts of the current situation with included processes.

2.5 Interviews

The planning of the interviews started with the development of questions suitable to reconnect with the main purpose. The questionnaires have been executed together with additional questions to get an overview of the current situation and what improvements can be done.

The interviews were open-ended with a couple of pre-determined questions. The interviews were held in a certain amount of time and in a closed environment with an unstressed approach in order to acquire the best possible answers. They were made with several employees on different levels in the corporation.

The most important tool when executing the interviews was a recording device. This allowed the authors to go back and re-listen to segments, which might had been missed.

3. Theory

In this section the theory that was covered in this thesis report is presented. It begins with a section regarding Codex Alimentarius, and several quality standards from ISO and FSSC. Following is a section with information about ERP, maintenance and EPN. After that the traceability is covered. Furthermore Lean production is described and finally Management, change and improvement tools are defined.

3.1 Codex Alimentarius

In Latin "Codex Alimentarius" stands for "book of food". All different types of foods are covered in The Codex Alimentarius: processed, semi-processed, and raw. All international food standards, codes of practice and guidelines that have been collected in The Codex Alimentarius have to be followed. This is vital in order to guarantee quality, safety, and fair food trade. For the consumers this means it assures them that the products they purchase are safe to consume, has a good quality and has the specifications they expect from their products (Codex Alimentarius Commission - International Food Standards, 2014).

Behind The Codex Alimentarius stands the United Nations and the World Health Organization. Their goal is to protect the health of consumers and also to ensure that fair practices are used during international food trade. The World Trade Organization is using the Codex Alimentarius as an international reference for resolving any disagreements concerning consumer protection and food safety.

The Codex Alimentarius covers standards for specific foods, standards covering e.g. food labelling, food additives, food hygiene, and pesticide residues. Furthermore it contains different procedures for measuring the level of safety of food from modern biotechnology (Codex Alimentarius Commission, 2006).

3.2 Quality

The word quality originates from the Latin word "qua litas" which means "off what" and essentially translates to "properties" or "characteristics" (Bergman & Klefsjö, 2012).

Many opinions exist concerning how to define the word quality, but a common definition is that it describes the ability to satisfy customer needs and expectations of a product or service. This is why all quality improvement work has to begin with the customers and their needs.

It is the company's responsibility to produce products or services that meet the customers' demands, needs, requirements and expectations. These are then gathered by the company in product specifications, which very important for a company's ability to do the "right things". The "right things" are the things that the customers want and are willing to pay for.

Trends, increased competition, and technical innovations continuously change the customers' needs. For a company to stay competitive it is consequently essential both to have an ability to pinpoint the customer needs and to adjust the quality of their products into line with them.

3.2.1 The International Organization for Standardization - ISO

"*A standard is a document that provides requirements, specifications, guidelines or characteristics that can be used consistently to ensure that materials, products, processes and services are fit for their purpose.*" (The International Organization for Standardization, 2014)

ISO is the International Organization for Standardization and they both develop and publish international standards. The ISO standards ensure that products have a good quality and that they are safe and reliable. For companies the ISO standards are strategic instruments which can be used in order to decrease costs by reducing errors and waste and also to increase productivity.

3.2.2 ISO 9001:2008

ISO 9001 can be used by both large and small corporations regardless of the field of activity. The standard sets out principles for a quality management system and over one million companies in over 170 countries are, to some extent, currently using ISO 9001 (The International Organization for Standardization, 2014).

The standard uses several quality management criteria such as continuous improvement, process approach, strong customer focus and the motivation and implication of top management.

By using ISO 9001 companies can rely on the fact that they produce products or services with a good and consistent quality, which will satisfy the customers' needs and expectations.

Controlling and doing follow-ups is an important part of ensuring that the companies sustain the principles and requirements of ISO 9001. To perform internal audits in order to verify how the quality management team is working is a good way to do this. The company may perform these internal audits themselves or invite an external independent certification body in order to verify that the company is in conformity to the standard.

3.2.3 ISO 14001:2004

The ISO 14001 contains principles for an environmental management system mainly directed to be used to its full extent by large companies. Even though small and medium size companies may benefit from the ISO 14001 it might be difficult to implement the standard to its fullest in these companies (The International Organization for Standardization, 2014).

The ISO 14001 does not express that any specific environmental performances is required by a company to implement. Instead ISO 14001 describes a framework that companies may follow in order to set up an efficient environmental management system.

By using ISO 14001 the company states that they are working with sustainable development and that their environmental impact is being evaluated and improved. This will most certainly send positive signals to customers and might also improve the corporate image.

3.2.4 ISO 22000

The ISO 22000 family consists of multiple standards concerning food safety management. Many food products pass through several countries and borders before finally arriving at their final destination. In order to ensure that nothing happens which can affect the quality of the food in the global food supply chain the need for an international standard is clear. ISO's food safety management standards help companies and organizations to pinpoint and control food safety hazards (The International Organization for Standardization, 2014).

3.2.5 ISO 22000:2005
The ISO 22000:2005 grasps the overall principles for food safety management and maps out what a company needs to do in order to prove its ability to control food safety risks and to ensure that the food they produce, handle, buy etc. is safe. The standard may be used by any company no matter what size or position in the food chain they have (The International Organization for Standardization, 2014).

3.2.6 ISO 22005:2007
The ISO 22005:2007 concerns the traceability in the food and feed chain. The standard contains basic requirements and general principles for the system design and application of a food and feed traceability system. This standard may be implemented by any corporation in any part of the feed and food chain (The International Organization for Standardization, 2014).

The standard is intended to allow feed and food organizations to reach identified objectives. The ISO 2205:2207 traceability system is a technical tool to help with assisting a corporation to follow their defined objectives, and it is applicable whenever necessary in order to determine the location or history of a product or any significant components.

3.2.7 FSSC 22000
FSSC stands for The Foundation for Food Safety Certification and was founded in 2004. They developed FSSC 22000 which is a food safety management system that provides a structure to effectively manage corporations' food safety responsibilities. The base for FSSC 22000 is constructed by using existing ISO standards with several appropriate additions. FSSC 22000 is supported by the confederation of the FoodDrinkEurope and recognized by GFSI – the Global Food Safety Initiative (The Foundation for Food Safety Certification, 2014).

The main reason for a corporation to implement FSSC 22000 is to show that they use a robust food safety management system that fulfils the requirements and needs of the customers and consumers. This may also improve the customers and consumers trust for the corporation.

3.3 Business management system - ERP
ERP stands for Enterprise Resource Planning and is a corporate management software, which is used to gather, store, manage, and process information. The ERP system makes it possible for the companies to keep track on several different business areas such as product planning, inventory management, manufacturing, transportation and marketing and sales (Rouse, 2014).

The ERP system is divided into several modules. What makes the ERP systems especially good is that all the different modules are interconnected. This makes it possible for each module to receive exactly the right information. The idea of using the same system in the entire company reduces the risk of misunderstandings due to e.g. different user layouts.

Figure 2 – ERP

The main purpose is to make it possible for companies to store, overlook, and control their business areas in a unanimous system where everything is possible to locate. Many companies are already using different ERP systems such as the SAP system.

3.4 Maintenance

Maintenance is very important in order for machines to consistently work well and to reduce the risk for errors to occur. If an error occurs with one machine this will subsequently affect the entire production system (Kumar & Suresh, 2007).

Maintenance can either be planned or unplanned. Planned maintenance is called "preventive maintenance" and is something, which is done successively in order to prevent errors from happening. Unplanned maintenance is called "corrective maintenance" and is something, which is done in order to restore equipment to a good condition after an error has occurred.

3.5 Traceability

"*'Traceability' means the ability to trace and follow a food, feed, food-producing animal or substance intended to be, or expected to be incorporated into a food or feed, through all stages of production, processing and distribution*" (European Union Directive, 2002)

This definition of traceability comes from the EU directive and is something that every food producing company is required to follow by law.

Every company needs to have the ability to trace their products in order to assure that the products they have produced are safe. In case of products having any defects or being dangerous to consume it is very important to always have the ability to trace them. This is important in order to call them back from the customers and to trace them back to see what went wrong in the production process. It is necessary to know where the products are, where they are going, what raw material has been used, what time and date the products were produced and what supplements were used (Olsson, 2014).

If a consumer would for some reason for example turn ill because of a product, it is of major importance to claim it back and to trace all of the products that were produced at the same time. Companies have an obligation to have the ability of tracing defect products and to do a recall when it is needed.

The identities of the products are given from unique information; such as the date/time they were produced and the serialized sequence number written on the barcodes. Due to the fact that products have identities via unique information they can be traced through the entire supply chain, connecting all different sections of the business from suppliers to customers. Also pallets can be traced through their pallet number e.g. via the EPN-label. The products identities are stored in computerized systems and can always be accessed (Fagerlund, 2009).

Two distinctive types of traceability exist; internal traceability and external traceability. Internal traceability is the knowledge of how food flows within in the company. External traceability on the other hand is the ability to trace backwards to the supplier and forwards to the customers. Internal and external traceability together represents the entire traceability (Nambiar, 2010).

3.6 Lean production

Lean is a way to look at, operate and manage businesses based on resource efficient, flexible and fast processes, which are based on the customers' existing needs. The foundation of Lean is to put the customers and their needs at center and to focus on quality instead of short-term economic results. Lean is neither an activity nor a method which is possible to implement and finish at once. It is rather an approach or strategy for how the business should be operated. Lean is a superordinate concept covering among other things; corporate culture, values, basic principles, practices, leadership, and cooperation (Petersson, et al., 2009).

3.6.2 The method of 5S

The method 5S contains five different parts which all starts with the letter s. The main goal with 5S is to put an end to waste by creating a well-organized and functional workplace while helping to eliminate anything that causes mistakes and errors. Everybody should know where the different objects are placed and what they are used for (Petersson, et al., 2009).

1. Seiri – Sort

In order to accomplish a transparent and clean working environment the first step is to sort different objects such as tools and materials. The goal is to separate objects which are used often from tools that are used more rarely.

2. Seiton – Set in order

Every tool that is used shall have its specific location and documents shall be placed in a way which makes the operators not having to look for them. This requires a well-organized file structure and standardization in order to counteract so that mistakes do not occur.

3. Seiso – Shine

Everything should be in order and work as it is supposed to. Good preparation results in that the cleaning process will take less time and that more time is spent on making sure that everything is in a good condition. It is also important to stop the source of contamination.

4. Seiketsu – Standardize

After the three first steps are completed, a standardization of the work process is required. The standardization is an agreement that the way of working is commonly accepted and should be followed without any exception. This standard could for example contain which tools and materials should be available at the different work positions, how different routines regarding e.g. cleaning or rework should be finished, how new tools are ordered, what to do when finding a defect product etc.

It is of utterly importance to create as simple standards as possible which are easy to understand and follow. Instructions and routines which require lots of administration and are hard to update will be hard to follow in the long run.

5. Shitsuke – Sustain

To make all the employees to follow the new standards is often the hardest phase, but also the most important one. It is the hardest phase because it is often a problem to change attitudes and behaviours. In some cases it might take several years before the new system of working starts functioning really well. This is because the responsibility lies on the operators to enforce the new standards and to keep on pushing to find even more improvements. To get the employees to think that "right from me" is something important to strive for is a key element in this phase.

It is of extreme importance that the management understands that it takes time to change people's attitudes and behaviours. If the management would fail to do so, their motivation regarding this will successively decrease and the entire purpose of the change will be deprived. If

the management stops to follow-up results and ask for a way of working, no matter what it may be, the workers will soon abandon it because they will see no meaning in doing it if the management does not even care.

Figure 3 - 5S

3.6.3 Factors of success with 5S

To succeed with 5S it is required to have a clear and understandable problem definition in order to know what is required to do and why this is required. It is also required that the management is motivated and is able to involve the workers in this process of change. To only use 5S in order to create order and make the workplace "neat and tidy" is often a bad idea because this will most likely make 5S end up to be some sort of cleaning project without any deeper purpose. This will end up with 5S not being sustainable in the long run (Petersson, et al., 2009)

It is also not enough if the management starts a work by picking a responsible person and educates the operators. To sustainably improve the operation it is absolutely crucial of the management to continuously ask for results in the right way and allow the employees, at scene, to tell about their latest changes and what will be their next step for improvement.

Besides creating a well-organized and functional workplace, the workers need to learn how it is to run an effective work with improvements. In the beginning of the work with 5S it is often about creating relatively simple counter measures. For that reason it may be appropriate to already then train the staff in problem solving so that they can then gradually take on increasingly advanced deviations.

The work with implementing a structured way of working takes time because understanding takes time. If the way of implementing changes is made in small and comprehensive steps everyone will understand what is happening and why this is happening. The co-workers could then make sure that everything works correctly before the next step is performed. If the changes happen too fast, there is a risk that the standardization with all the required ways of working are not thoroughly understood by the employees. Thus there is a risk that the changes are never firmly established in the organization if the management makes few comprehensive implementations instead of several minor implementations.

3.6.4 Lean disorders
The three basic lean disorders that may occur in production are Mura, Muri and Muda (Bicheno, et al., 2006).

Mura - Unevenness
Unevenness and fluctuations during the implementation phase and the operations phase of production. The waste occurs as a cause due to fluctuations in either volume or quality (Bicheno, et al., 2006). Unevenness also results in reduced predictability, which is a big problem because predictability is such an important key component in an effective corporation (Apreutesei, et al., 2010).

Muri - Overburden
Overburden means that resources, e.g. humans and machines, are given more work than the capacity allows for. In order to tackle this problem the management needs to create a better balance to evenly level out the burden. The planning and design of the production is vital (Bicheno, et al., 2006).

Muda – Waste
"*…muda means "waste," specifically any human activity which absorbs resources but creates no value*" (Womach & Jones, 2003).

Waste can be defined as any unnecessary activities which do not add value to the products. Value may be added actively or passively to a product through different operations from e.g. operators and machines. The activities which do not actively or passively add value to the products in process are unnecessary and needs to be eliminated (Bicheno, et al., 2006).

Waste elimination is a key Lean concept and it is this kind of waste which is the focus of the work with daily improvement at the employee level. The management analyses Muda and then eliminates problems in Muri and Mura (Apreutesei, et al., 2010).

By continuously eliminating waste, the overall quality increases at the same time as production time and costs are reduced. The process of eliminating waste needs be carried out continuously.

3.6.5 The 7+1 types of waste
The seven plus one types of waste are used in order to make the waste become visible. The responsibility lies at the management to set an appropriate level of how much waste should be made visible. The level of which the waste should be visible is set individually by each company after considering of how much the management decides they can handle at a point in time. Thereafter all the visible waste should be eliminated to make sure it never occurs again (Bicheno, et al., 2006).

1. Overproduction
This is considered to be the worst kind of waste because it contributes to all other forms of waste. To overproduce means manufacturing more than the customer demand, manufacturing faster or earlier than what is needed for the next process and to produce to big batches.

2. Waiting
This type of waste implies unused time while waiting for necessary prerequisites to e.g. continue with an on-going production. This could for example be that the required material has not arrived or lacking of communication regarding what should be produced.

3. Transportation
Transportation does not add any value. The only logical transportation a customer is prepared to pay for is the one when the products are sent to the customer. Thereby all the internal transportations are considered as waste. An important question is thus why we need all the internal transportations. The need for transportations could have emerged as a result of an incomplete layout and that is why revising this is also important.

4. Over processing
Overwork is about conducting work which the customers are not willing to pay for. This could for example be to produce a product with higher quality than the customer wants and is willing to pay for or to do unnecessary work steps.

5. Inventory
Large warehouses, buffers and storage rooms are often required due to the fact that delivery processes (internal or external) cannot always deliver what they promise in time. Another cause of storage need could for example be that the purchasing department got a good price when ordering an annual volume at one point. But this alleged saving could cost more than it tastes because the material ties up capital, takes up space, hides other problems, etc. The tied up capital could be used for other useful investments.

Another drawback with warehouses is that it extends the lead time which reduces the ability to quickly adapt to changes in customer demand. If quality problems are detected or customers go bankrupt the big warehouses might not be such a good idea after all. Another risk is that the produced products could get obsolete.

6. Unnecessary motion
Motion which does not add any value is clearly a waste. It could for example be that operators have to walk a short distance to get a necessary tool in order to complete the next step in the production process. This small distance in total would make up for a whole lot of time if you look at the production during e.g. an entire year. Another example could be that the operators have to bend or stretch to reach tools because they are positioned at hard to reach locations.

The economic consequences for an organization where employees suffer from work-related injuries due to poor ergonomic principles are obviously unwanted. There is furthermore a great potential in improving the productivity by designing the workplace in a way which eliminates, or at least reduces, unnecessary movements and improves the ergonomics.

7. Producing defect products
To produce defect products generates waste in the form of rework with fixing what were not correctly manufactured from the beginning. Common examples of defect products are incorrectly executed tasks e.g. improperly filled out forms or if an operator forgets to perform an essential stage in the ongoing production.

Rework takes valuable time which for example could have been used to create new products or perform maintenance. Resources should in the first place be used to solve the basic problems. The management should analyse where in the production processes problems emerge, why they emerge and what can be done in order to counteract this in the future.

8. Waste of intellect
Unused competence or waste of intellect is often referred to as the “+1” waste or eight waste. This waste is actually an addition to the other seven types of waste. By not fully taking advantage of the competence and expertise that the employees possess, the corporation risks

losing both employees and missing out on improvements that would otherwise be an opportunity for the organization to implement.

A good way to make greater advantage of the employees' competence is the integration of the work content in depth rather than breadth. That an employee e.g. tightens a variety of screws at several different stations hardly means that he or she gets more use of their skills.

Instead, it is often better to expand the content of work in depth. By working at a station and having the opportunity to become really good and experienced at it, it is natural that the employee may also be responsible for improving the situation by driving out waste. This is a good way to let individuals grow in the corporation while at the same time the corporation gets access to a larger portion of the individual's competence.

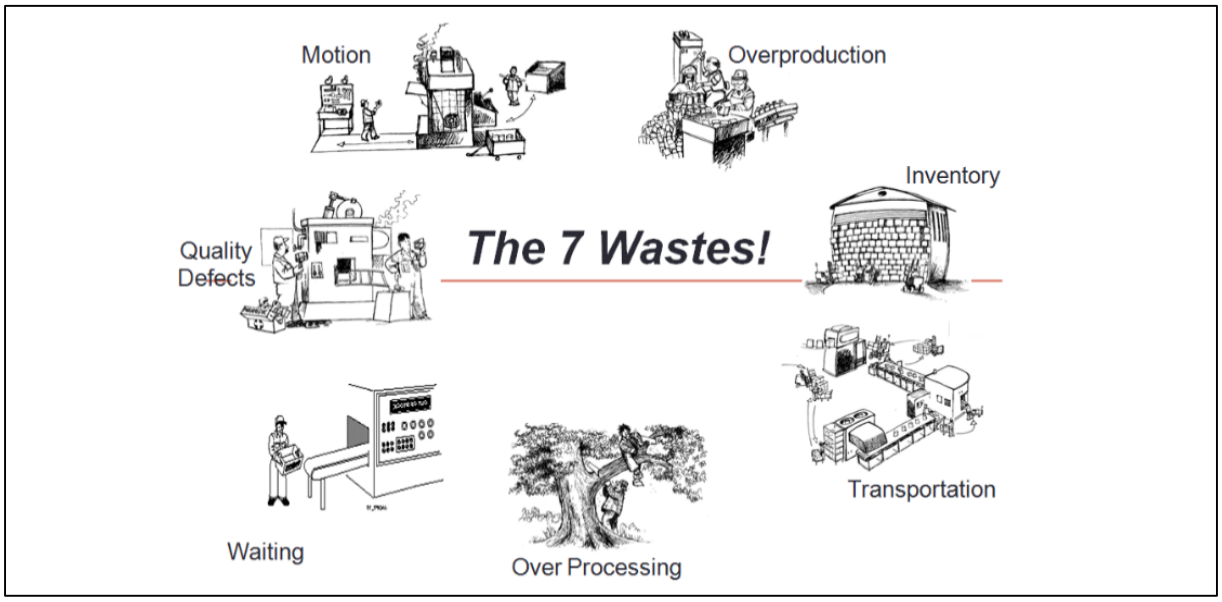

Figure 4 - The 7 wastes

3.6.6 Continuous improvements with Lean

In order for an investment by Lean to become a long-term success it is required to have a well-established work with improvements that involves the employees in the organization. Otherwise the risk is that the good effects achieved in the short term will disappear and then the organization will soon back at square one (Petersson, et al., 2013).

3.6.7 Leadership and management concerning Lean

Working with continuous improvements concerning Lean requires a management and leadership with a great deal of motivation and endurance. It is not enough to only command and tell the workers what to do without giving them any information. It is important to make the workers understand why they should do certain things and what this generally will lead to. The leadership should work adapted to each individual situation while also giving support and showing presence. The workers need to feel that they are allowed, and actually are expected, to affect their own situation by eliminating waste and figure out improvements (Petersson, et al., 2009).

At the beginning the manager should support and encourage the workers in order to lead the group forward. But in a more mature improvement group the manager works more with telling other parts of the corporation which improvements should be made and why. Later the manager also presents the groups voice upward in the organization considering for example necessary investments and to negotiate with issues concerning these.

A successful manager shows interests for the small things in the corporation because he or she understands that the small things build up the big picture. By working with the details and continuously improving them, the entire corporation can be transformed. (Womach & Jones, 2003)

The leader needs to show his authority through the knowledge in Lean and by passing on the understanding of Lean to the workers by real life examples in the corporation. This will increase the employees understanding of Lean and the authority of the manager will rise.

Once the organization realizes that the discovery of deviations is something positive which may be handled in a good way, the work with Lean has come a long way. When workers no longer feel the need to hide problems and instead get recognition if they find deviations the corporation has come a long way. The situation with continuous improvements should now be working exceptionally and if any new deviations should occur they will be handled with accordingly, without giving anyone the blame. This is the sought corporate culture (Liker, 2003).

3.7 Management and Understanding

Leading a company with many employees involved includes a necessary task of affecting other people's actions. This is demanding for the top management to do because they need to affect how people are generally acting within a large group of people. To be aware of how to do it, they need to understand why people are doing something in a specific way and what they need to do to change people's ways of thinking (Sandberg & Targama, 2013).

The top management needs to realize what their employees understanding is of doing a specific task and what their role is in the entire supply chain. To be successful, it is important that there is a specific culture in the company where everyone understands each other and knows their own part in the entire supply chain. Everyone is working within the same standards and routines. It is like in a football team where there is a goalkeeper, defenders, midfielders and forwards where everyone is working as a team. They know their role and work towards the same goal.

The top management needs to get their employees to think in the same way and to work with the same standards. Different people might understand how to do a specific task differently. People will perform a task in the way they have learnt how to do it. Some people might misunderstand instructions or routines and thus it is the management's responsibility to make everyone have the same understanding of how to perform a specific task.

The solution is to study and understand how people are learning and what they do to understand something. When it is understood, the top management can choose what type of methods and techniques to use for leading the employees to work within the same standards.

Peoples understanding are formed after previous experiences and when people are learning something new they relate it with something they are already familiar with. Depending on how well someone understands what they are doing, the better competence they will get.

The top management's role is to create good conditions for employees to learn and improve their knowledge at a personal and professional level. To constantly have group meetings and let employees and leaders discuss together and find improvements, the result will be a bigger collective understanding of how to work. The top management's part could be to give the employees the time they need in order to have their group meetings.

3.8 Management vs. Leadership

There is a need to differentiate management and leadership (Kotter, 2012). According to Kotter the differences between them are:

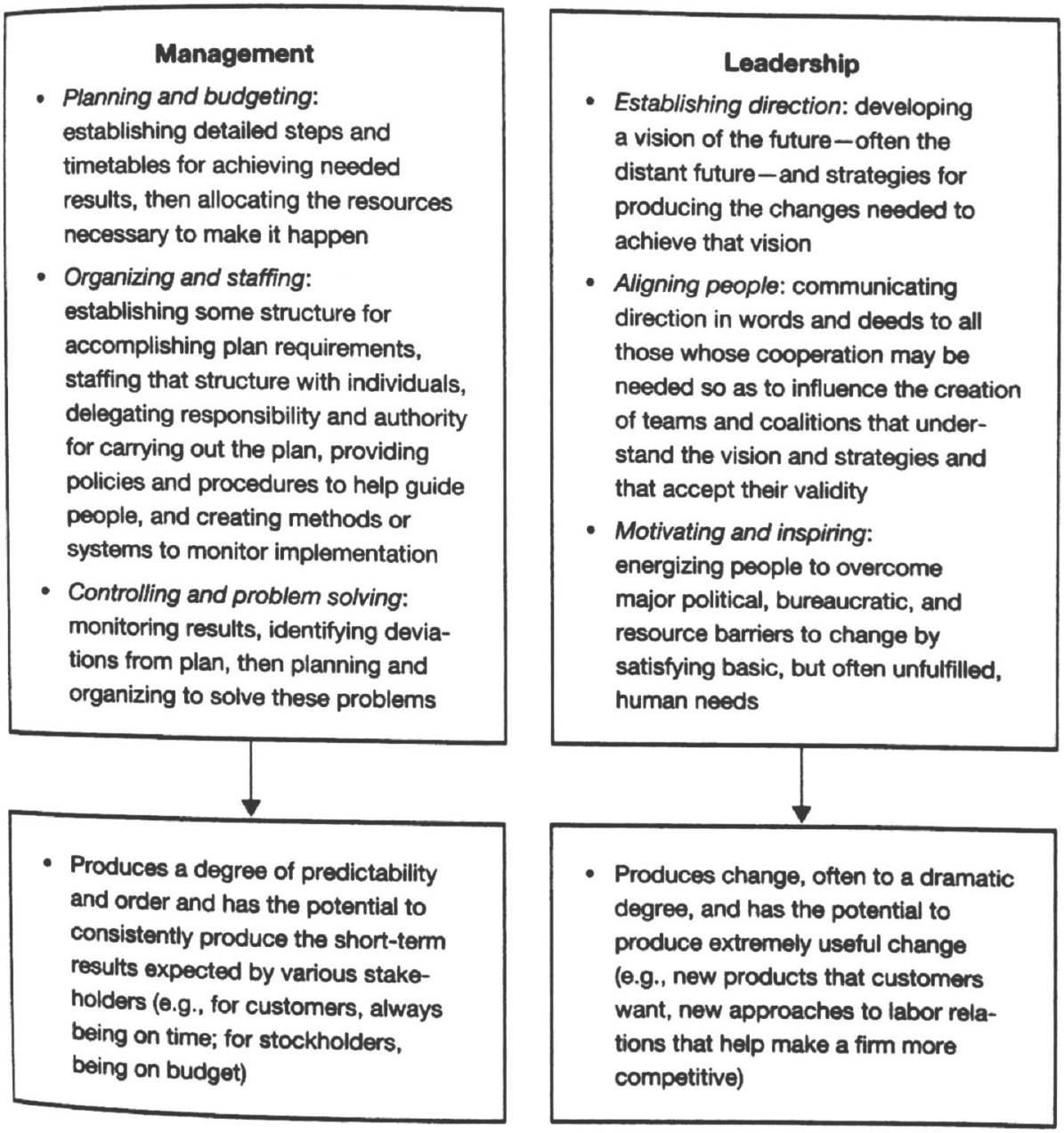

Figure 5 - Differences between management and leadership (Kotter, 2012)

Companies have encouraged people for a long time to learn management but very little about leadership. Management has been easier to teach than leadership, which have resulted into less training and understanding about the importance of leadership. A successful change in an organization is to have more of leadership and less of management. John P. Kotter suggests that the focus in the organization should be divided in 10-30% of management and 70-90% of leadership.

3.9 Thinking differently for change to happen

In order to really make a change there is a need to think and do something different to get different results. (Smith, 2007)

"The MindShift model" is a model that helps thinking about how to do things differently

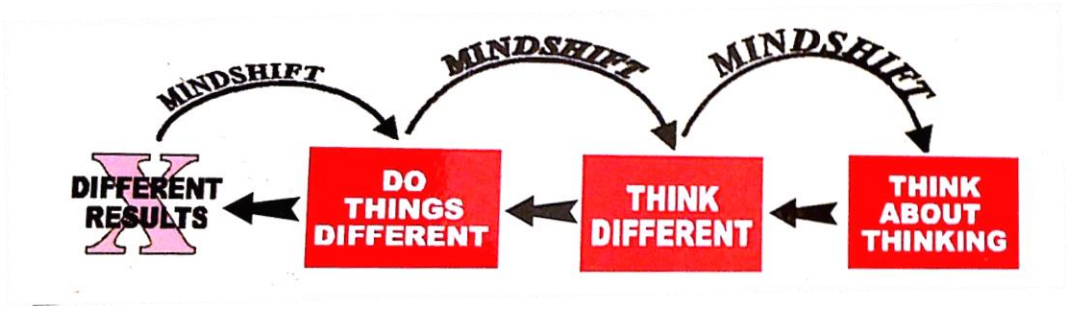

Figure 6 - The MindShift Model (Smith, 2007)

The 7 Levels of Change

Rolf Smith has come up with a model, which he calls "The 7 Levels of Change". It has seven phases of thinking to tackle each level of change. The 7 levels of change are increasing in difficulty on each level, from easy in the beginning to almost impossible at the end. The purpose of this model is to start thinking differently.

Level 1: Effectiveness – Doing the right things

Do the right things and do them effectively. Be aware of the right things and focus on doing them. Learn the basics for how things are done at present.

Level 2: Efficiency – Doing things right

Doing things correct by doing the procedures exactly how they should be made in order to complete the tasks and increase the efficiency.

Level 3: Improving – Doing things better

Finding new ideas for improvement to do things better. Thinking about how to do things better, what improvements can be done, and how to make them more efficient.

Level 4: Cutting – Doing away with things

Cutting away things that does not count. Approximately 20% of any process controls 80% of the results the process produces, which means that it is better to focus on the 20% and doing away with the other things.

Level 5: Copying – Doing things other people are doing

Doing things other people are doing by looking how a person, a team or a company are doing something and try to adapt it in an own unique style. Learn how others are doing and by copying it, find improvements to use it in an own way.

Level 6: Different – Doing things no one else is doing

Doing things no one else is doing by thinking differently and to be innovative. Thinking "outside the box" to finding new ways of doing something very differently.

Level 7: Impossible – Doing things that can't be done

Doing things that are considered at first to be impossible, but when it is done, are not considered to be impossible anymore. There has to be an imaginative thinking to make things, which at first seem impossible come true.

3.10 Improvements

The perception of what is good and what is not can differ. When making an improvement, it is not always clear if it really is an improvement or if something is just made differently. What to achieve in order to improve something may sometimes be hard to realise. When starting to improve something, there is a need to identify the existing problems to come up with ideas that could be considered as improvements to reduce or eliminate them. An improvement means that there is a breakthrough in the organization where something is done on a better level than before. It is something positive and something that should be established in the core of the organization. (Söderqvist, 2004)

An improvement process is based on the four phases: Identify, solve, implement, and maintain.

- Identify what improvements that can be done.
- Solve the actual problem by determine an effective solution.
- Implement the chosen solution for improvement.
- Maintain the implemented improvements.

The top managements' role is decisive for the improvement process. They need to have a good involvement in the process. By having a strong connection to it, the top management can contribute to successful improvements.

3.9.1 Improvement tools

There are many different improvement tools that can be used in improvement projects. They are good to use for understanding and solving problems effectively.

To be able to use the improvement tools, there needs to be some sort of collection of data. It has an important purpose for the improvement project, because the decisions are made from analysing the data. (Söderqvist, 2004)

These are some of the used improvement tools:

Flow-chart

A flow-chart describes how a certain operation is done or should be done. It contains a number of symbols that represents different working operations and activities, which are related through connectors. A usual application is that it describes a solution for a specific problem and the working process for it.

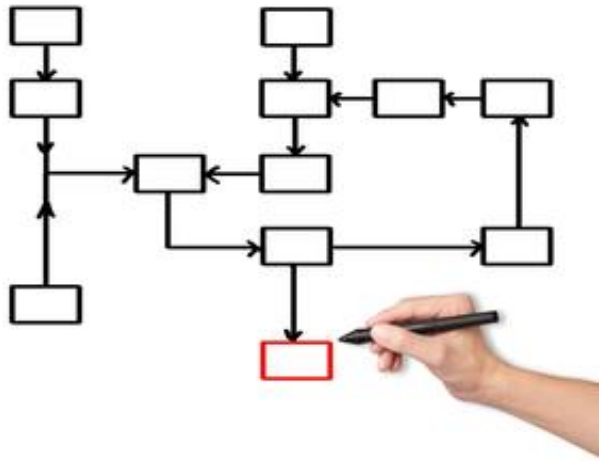

Figure 7 - Flow-chart

SIPOC
SIPOC stands for: Supplier-Input-Process-Output-Customer. It summarizes the inputs and outputs of a process to get a simple overview. It is good to use when defining a problem and to attain consistency and understanding within a project group.

Developing a SIPOC contains the following steps:

1. **Choose process**
   Determine the purpose and the assignment of the process in the organization.

2. **Decide starting- and ending points**
   Decide the limitations of the process and how long it will be in progress.

3. **Draw the main steps of the process**
   Draw an overview of the main steps in the process.

4. **Identify the customers of the process**
   Identify the customers that use the process and its results.

5. **Identify the output of the process**
   Identify what will come out of the process, like for example products.

6. **Identify the input of the process**
   Identify what the process needs to function, for example material.

7. **Identify the suppliers of the process**
   Identify all the suppliers that supply the process with inputs.

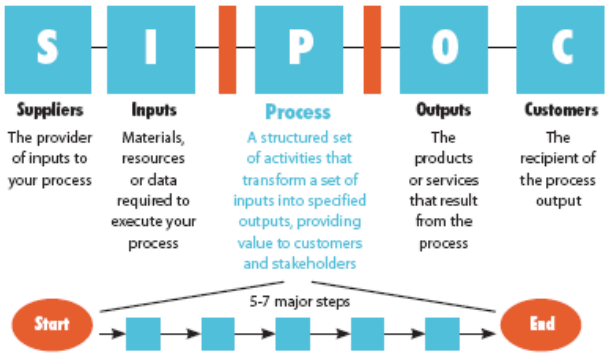

Figure 8 – SIPOC

Cause-Effect diagrams
There are different types of diagrams that illustrate and describe the factors concerning the connection between cause and effects. Some of the most used are the Ishikawa diagram, Tree diagram and relation diagram.

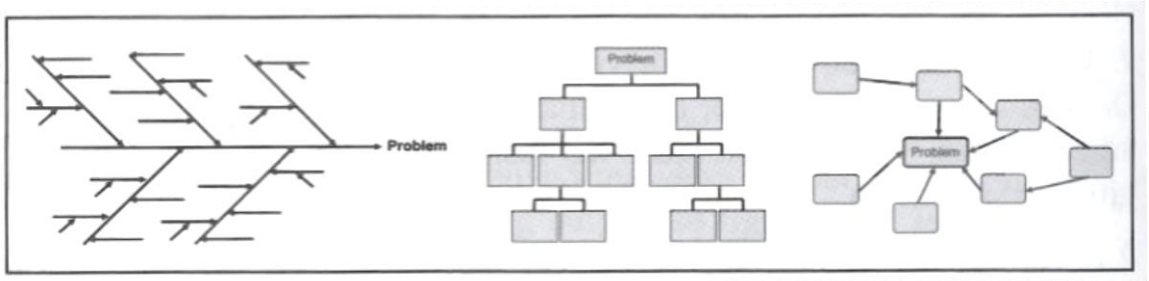

Figure 9 - Cause-Effect diagrams (Söderqvist, 2004)

They are useful to identify theories about the causes of the problems and are arranged with a good structure. The diagrams contribute understanding and clearness. The basis for the improvement tools is to use the "5 WHY" to get to the core of the problem. Repeatedly asking why some things are happening to get a full understanding of the problem.

Checklists

A checklist is a list of activities, which is successively checked off as the activities are completed. Checklists are used to control that the correct procedures are done. According to Gawande checklists can inform about changes in standards of care, protect against memory lapse, encourage attention to thoroughness, and build an organized team that together can outdo what a single individual is able to perform (Gawande, 2010).

Figure 10 – Checklist

Root cause analysis

When something goes wrong in the production there is a need to make a root cause analysis in order to evaluate what went wrong and why it went wrong. Two common types of methods can be used to determine the root cause. These are C/C and CAR. C/C stands for Cause and Corrective action and CAR stands for Correction Action Report or Corrective Action Record. The results from the analyses are documented in the reports in order to counteract the problems from reoccurring (Wanner, 2014).

Below is an example of how a CAR can be outlined:

CORRECTIVE ACTION RECORD

Company Name:_____ **Address:**_____

Product Identity:_____ **Production Code:**_____ **Date:**_____ **Time:**____

Operation or processing step:

_____

_____

_____

Description of problem or deviation:

_____

_____

_____

Corrective action taken (including disposition of product):

_____

_____

_____

_____

Cross-referenced forms, results of the evaluation, or other documents:

_____

_____

_____

Signature and date of person responsible taking the corrective action: _____

Reviewer:_____ **Date** _____

Figure 11 – CAR

Tool for personal improvement
Giving feedback is a good way for the employees to improve. Without any feedback, a change gets more difficult to accomplish. It is a good way for individual and organizational knowledge and helps to verify if a progress is in fact occurring. A 360-degree feedback can be used, which is anonymous feedback that comes directly from people that are working around them. It can give a broad and in-depth view of an individual's competence and skills. The results can then lead to an individual development plan (Napier & McDaniel, 2006).

Visual control & information
The purpose for using visual control methods is to make visually instructions and phases in a process easier to understand. It makes it easier to have consistency between the employees. Visual production control contributes to making enhanced decision-making systems and to broader employee involvement in managing production units. The traditional view of work areas where information flows from the top to the bottom needs to be replaced by a flow of information in several directions. Management and employees needs to have the ability to freely communicate in order for every employee to take action for improvements (Greif, 1997).

One example of how to create visual instructions is to construct a special board with information, instructions, and routines regarding for example rework. It is good as reminders for the employees and a good way for showing what steps has to be done resolve a problem.

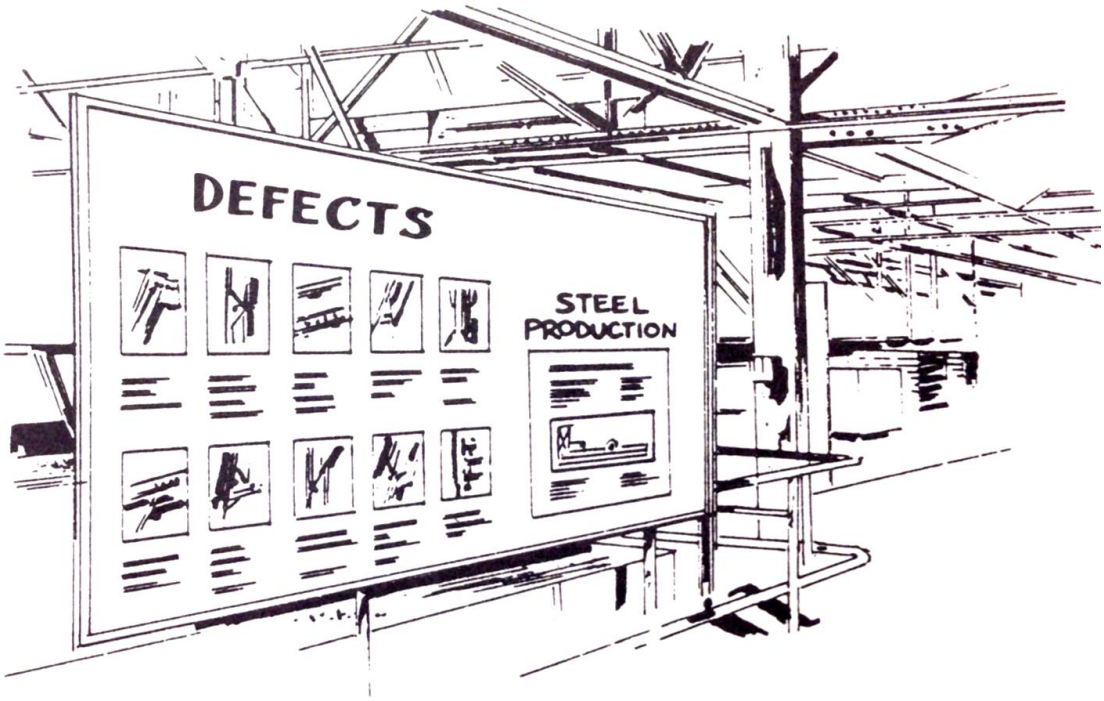

Figure 12 - Visual instructions (Greif, 1997)

3.11 The Eight-Stage Change Process

To make an improvement, people need to change their values and behaviours. John P. Kotter has come up with a model concerning how to make dedication together with the employees and how to reduce their scepticism of change. It is a changing process that according to Kotter produces a successful change in every part in an organization. It is called "The Eight-Stage Change Process" and by following these eight stages the organization will accomplish a successful change (Kotter, 2012).

The eight stages are:

1. **Establishing a sense of urgency**

Develop a sense of urgency in the organization that there is a need for change. Start to talk about how the existing situation is by examining the market and competitive realities to get other people thinking. It is important that many have understood the need for change before moving to the next step.

2. **Creating the guiding coalition**

Create a group of people with enough power to lead the change. They need to convince other people that a change is necessary. Strong leadership is required. Good management is not enough, there needs to be good leading as well. The group has to work as a team.

3. **Developing a vision and strategy**

Link all the great ideas and solutions to form a vision to help routing the change effort and develop a strategy for it. People need to easily grasp that vision.

4. **Communicating the change vision**

Continuously communicate about the new vision and strategy so everyone remembers it and can respond to it. It will keep the vision and strategy fresh on everyone's minds. Demonstrate the behavior that is wanted of the employees.

5. **Empowering broad-based action**

Get rid of obstacles that are in the way of the changing process. It helps the change move forward and empowers the people to execute the vision. It is good to encourage risk taking and non-traditional actions and ideas.

6. **Generating short-term wins**

Success is motivating and by creating visible short-term improvements or "wins" can make everyone see that it is going somewhere. Otherwise it could lead to negative thinkers and critics that can hurt the changing process. It is good to reward and visibly recognize people that have made the wins possible.

7. **Consolidating gains and producing more change**

The short-term improvements or "wins" are only the beginning of what needs to be done. Many of the changing projects fail because they are considering to be completed too early. There are more things to do to achieve the long-term change. But with every success, there is a chance to analyse what went well and what can be improved.

8. **Anchoring new approaches in the culture**

To make the change remain, it needs to be established in the core of the organization, in the culture. The result from changes needs to be seen in every part of the organization. The top management needs to continue support the change.

3.12 Why some changes fail

It is interesting to know about what changes have been successful, but it is also important to learn which ones have failed (Alvesson & Sveningsson, 2008). Common mistakes are:

- There is a belief that the top management has the total authority and that only their actions will decide the final results.
- There is a belief that everyone in the organization reacts predictably and consistently.
- There is a belief that there is a quick solution for it. That with limited instructions and resources assumes leading to big improvements.
- There is an underestimation of the need for expressivity and to get the people involved.

Kotter lists eight common mistakes, which he calls errors, regarding why organizational change might fail and the following consequences. The errors that Kotter mentions are not inevitable. But with skill and awareness, they can be avoided or at least significantly mitigated (Kotter, 2012).

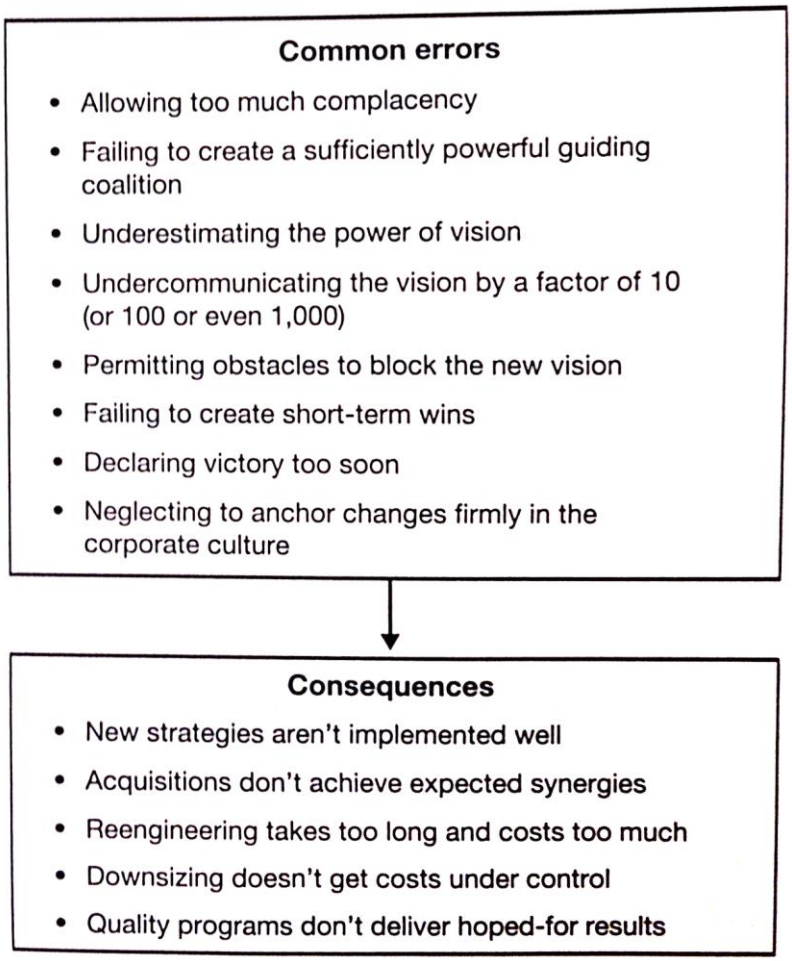

Figure 13 - Common errors (Kotter, 2012)

4. Empirics

In this section a description of the current situation regarding rework of defect products is presented. It starts with an overview of the supply chain at CCES with related flow-charts. Following are three more detailed descriptions with related flow-charts that describes the processes regarding rework before EPN, after EPN and in the warehouse. Thereafter a description regarding the recall procedure is presented with a corresponding flow-chart. Finally a summary of the conducted interviews is presented.

4.1 Current Situation Overview

This is an overview description where details are only covered for understanding purposes. Only the most fundamental steps of the supply chain are included in order to give the reader an introduction to the current situation and how the rework processes works.

4.1.1 Raw material

Raw material is everything that is used to create the products, for example: sugar, water, the Coca-Cola concentrate, labels, preforms etc.

4.1.2 Production

Several different operations within the production lines creates the products. Each individual operation adds value to the products. The production processes differs from line to line but some common elements are the same. Either a can, a bottle or a tetra-brick is made in the production and is also filled with beverage ready for consumption or a bag-in-box for mixing with water and carbon dioxide at e.g. a restaurant. The containers for instance get a production code and best-before-date code. There are seven different production lines: a bag-in-box line, a canning line, a Tetra brick line, a glass bottling line, and three PET lines. Included in the production is also a laboratory that controls the quality of the beverages. Several continuous quality controls are made automatically in order to ensure that the desired product quality is met.

4.1.3 Defect product identified before EPN (Rework 1)

If defect products are identified before EPN (before it is on the stage considered to be a finished product) and if it is possible to perform rework, the EPN will be shut off. The defect products will then be taken back into production from the warehouse for rework. If defect products are detected and there is no way to rework them, they are sent to the destruction to be destroyed.

4.1.4 EPN

This is where the finished products are placed on pallets and receive two barcodes on two different sides and gets their unique identification number. The products are thereafter considered as finished and are visible in the IM-system (Inventory Manage). This is the point where the pallets leaves manufacturing and enters the warehouse. When the pallets are moved into the warehouse the bar-codes on the pallets are scanned and they are moved from the IM-system to the WM-system (Warehouse Management).

4.1.5 Defect product identified after EPN (Rework 2)

Defect products, which are still in the CCES building, can be detected either by the production or the warehouse. If a defect product is detected after the EPN-mark it is necessary to block the pallets with products and contact the MIX for further processing. The MIX is a section in the warehouse, which have a responsibility to control that the pallets have been blocked.

4.1.6 Warehouse

The pallets with finished products gets registered in the IMS-system that they have arrived at the warehouse when the forklift trucks have scanned the barcodes on the pallets. The IMS-system

(Inventory Manage System) used in production, only counts the balance. What happens next is that the balance of counted products gets transferred from the IMS-system to the WMS-system (Warehouse Manage System). The WMS-system counts the balance and determines the location of a pallet. The next step is that a BOM (Bill of Material) is made in the SAP system. The SAP system is a business management system. It is at this point that the system is able to count how much material that was used to create the products.

4.1.7 Destruction
This is where products end up if they can be reworked in the warehouse or if they have to be destroyed. Different materials are processed separately: plastic, metal etc. The beverage is collected in a tank and the material of the container is collected and sent for recycling.

4.1.8 Defect product identified after the warehouse (Rework 3)
If a customer, consumer or CCES notices any irregularities with the products the need for rework might appear. When defect products enter the warehouse, through production or via recall, they might be reworked in the warehouse or sent back for rework in the production.

4.1.9 Distribution
Trucks deliver the products to different clients that have ordered the products. There are sixteen different cross-docks in Sweden to which some of the products are transported for re-load and further transport. When a pallet leaves CCES the products on the pallet gets removed from the WMS in the SAP-system. But the information about the pallet can always be looked up.

4.1.10 Customer
Customers receive the products and sell them to consumers. If something is wrong with the products, the costumers contact the support at Coca-Cola Enterprises Sweden. CCES will then compensate the customer and offer the customer to make a new order.

4.1.11 Consumer
Consumers are the people who buy the products from the customer. If something is wrong with the products they buy they have the option to either contact the customer they bought the products from or the customer service at CCES.

4.1.12 Customer service
This is where the customers and consumers turn to if they detect any defects with their products.

4.1.13 Recall/return procedure
The recall procedure from customers starts with CCES contacting the customer or the other way around, to make a retrieval of a sample of defect products to be investigated more closely at CCES. Based on the outcome of the investigation, a decision is then made whether or not to make a recall. The entire batch from a specific date and time could be called back or to not make a recall at all. Also safety margins of products could be included in order to make sure that all of the defect products are called back.

Returns from individual consumers may differ from the extensive recall process from customers. If a consumer finds a single defect CCES will take it back straightaway. Depending on what kind of defect there is, CCES may need to contact the customer who received the pallets with the products in the first place to make a wider recall.

4.1.14 Rework 1, 2, 3
Rework can either be done on the production lines or, if possible, in the warehouse. Everything that has to be reworked goes through some of the steps in the regarded production line again. It is

important that the rework process is done correctly to maintain the traceability on all the products that are reworked. When reworking products it is necessary to make a new BOM manually that includes all the new raw material that was used to create the product. This is in order to prevent material discrepancies and to know what material have been used.

4.1.15 Traceability

The existing traceability spans from the production at CCES all the way to the customers, consumers and back to CCES. It is of major importance that CCES always has the ability to trace their produced and shipped products.

An overview of the existing traceability is presented on page 29.

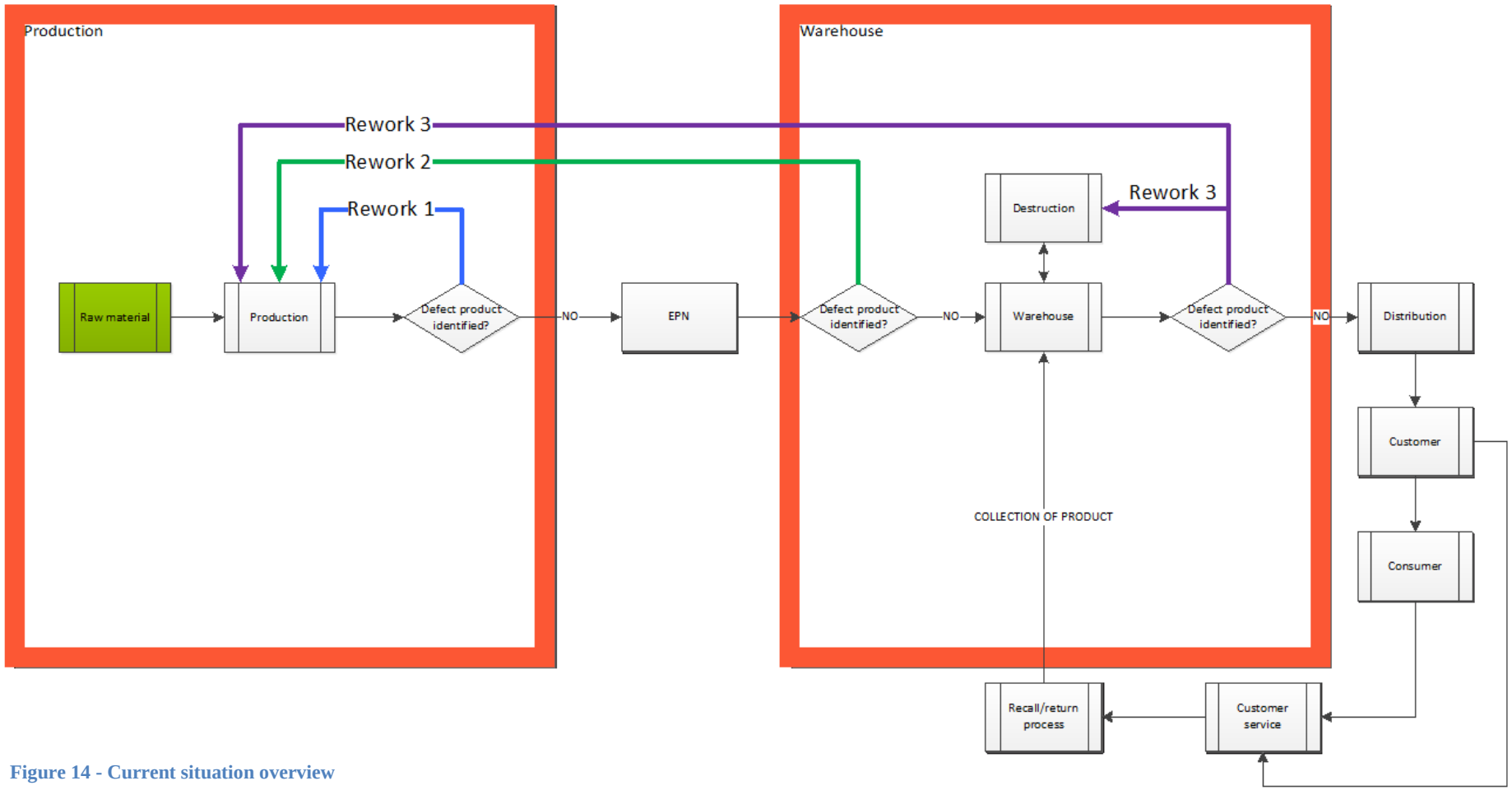

Figure 14 - Current situation overview

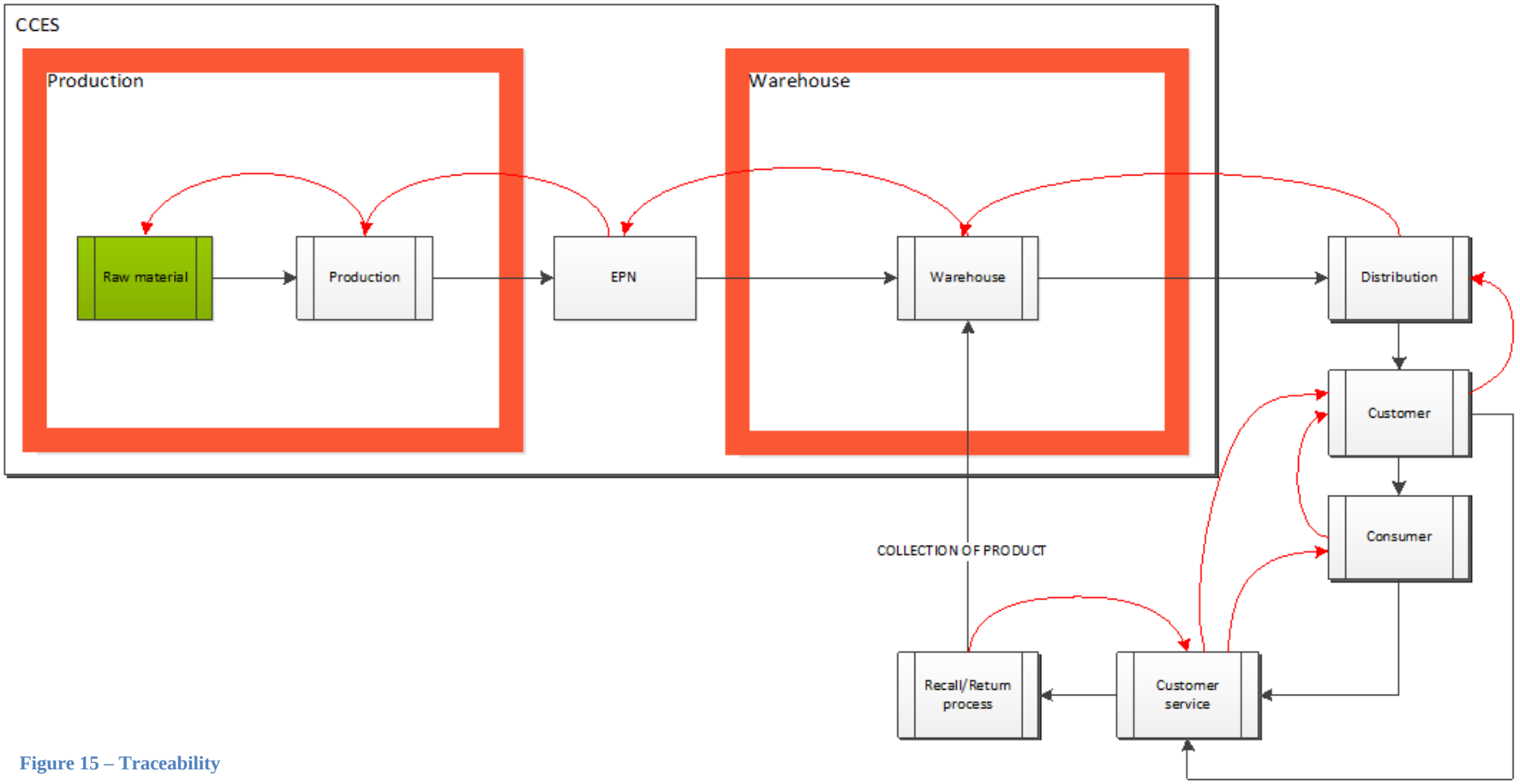

Figure 15 – Traceability

4.2 Rework before EPN

This section covers the rework procedure in the production before the EPN-mark. It also describes how the procedure works when defect products get back into the production. The flow-chart only consists of three production steps to demonstrate how the rework procedure generally works. In reality there might be several more production steps. This differs from line to line and what type of rework that needs to be done.

4.2.1 Raw material

See section 4.1.1

4.2.2 Syrup room

All beverages are produced here. CCES purchases concentrate (beverage bases) from an approved distributor. This is decided centrally by CCE, who has close contact with The Coca-Cola Company. This concentrate is then mixed with purified water, sugar (only for non-light products) and carbon dioxide.

4.2.3 Water treatment

The water used in the production of soft drinks is regular water from the municipal water system, which is purified in several stages to ensure consistent quality and to meet internal specifications. This creates a flavourless base for future products. Spring water products are an exception due to the fact that they are based on spring water instead of the public water system.

4.2.4 QC - 0

After the beverage for a batch is created the quality is controlled in order to ensure that the beverage is not harmful or in any other way deviates from the desired quality.
OK QC = Send the beverage on to enter production.
NOT OK QC = Stop the beverage to enter production. The laboratory controls this.

4.2.5 Production step 1

The refining process in production step one is the first step on the production line where the creation of the product starts. It could for example be that the beverage is filled in a container.

4.2.6 QC - 1

After production step 1, there is a quality control to ensure that the quality standards are fulfilled. This could for example be a control to ensure that fill level is acceptable.
OK QC = The quality standards are met. Send to production step 2.
NOT OK QC = The quality standards are not met. Ask the question “Rework possible?”

4.2.7 Production step 2

In the next production step, the product in process undergoes some more handling to get closer to become a finished product. This could for example be the process of putting on bottle caps.

4.2.8 QC - 2

This quality control checks that the product in process has the acceptable quality from the previous step. This could for example be that there is a bottle cap on every bottle and that they are sealed correctly. It is also important that it is the right type of bottle caps on the bottles.
OK QC = The quality standards are met. Send to production step 3.
NOT OK QC = The quality standards are not met. Ask the question “Rework possible?”

4.2.9 Production step 3
In this final production step the products in process undergoes the final handling before becoming finished products. This could for example be when the bottles are labeled.

4.2.10 QC - 3
The final quality control verifies that the products in process have the acceptable quality from the previous step. This could for example be that the labels are checked for any errors. If the products have come this far they are physically considered as finished products. But they do not get registered as finished products in the system until they get an EPN-mark.
OK QC = The quality standards are met. Send to EPN.
NOT OK QC = The quality standards are not met. Ask the question "Rework possible?"

4.2.11 Rework possible?
If a product was not approved after QC 1, QC 2 or QC 3 there are two options:
If yes = send to rework
If no = send to destruction

4.2.12 Rework in quality controls 1, 2, 3
If a defect product is detected in the quality controls after any of the production steps the products might have to go through some quality control checkpoints again. This is to see if it was the machines themselves that caused the problems. E.g. when the glass bottles are controlled temporary glares may cause the machine to be tricked into thinking that there is a crack in the bottle when really the bottle is fine. During this type of rework the operators examine the products and if they look okay they put them back just before the quality control. If they do not look okay they will be thrown away and destroyed.

4.2.13 EPN
During a current production where the flow occasionally is high and there is no possible way to stop the current production without causing interferences to take care of defect products, the employees or the ones responsible on the specific line might decide to turn off the EPN. When they do this, the products never get considered as finished products. The operators on the production line then contacts the employees on the warehouse to announce that e.g. the two first pallets have defects and need to be brought back into production for rework.

4.2.14 Warehouse
The warehouse operators get contacted by operators from the production and then transport the defect products back into the production line to a special area called Sin Bin. The Production Sin Bin, Psin or Sin Bin is a special physical area, which is marked on each production line and is created specifically for defect products that need to be reworked.

4.2.15 Rework
Employees from the production initially examine the defect products to make sure that they know how to rework them. If the defect products needs to be prepared before entering the production this is what happens next, e.g. to rip off wrong labels from bottles. Then they move the defect products to a certain part of the production line for doing the specific operations needed to rework the defected products. This could for example be to insert the bottles right before the production step that puts on the labels.

4.2.16 Destruction
Products, which cannot be saved, are sent to the destruction in the warehouse to be destroyed.

4.2.17 Laboratory
The laboratory frequently takes samples to guarantee that the desired quality standards are fulfilled. The responsibility lies at the laboratory to make sure that the quality of the beverages is acceptable. If there is any irregularities with the beverage the laboratory are able to take samples of the concerned batch and control the level of quality. If they find irregularities they contact QESH with information about the concerned batch.

4.2.18 QESH
QESH has the final verdict to decide whether to destroy or rework defect products. They are contacted when there are higher volumes or problems with defect products or if there are lots of defect products

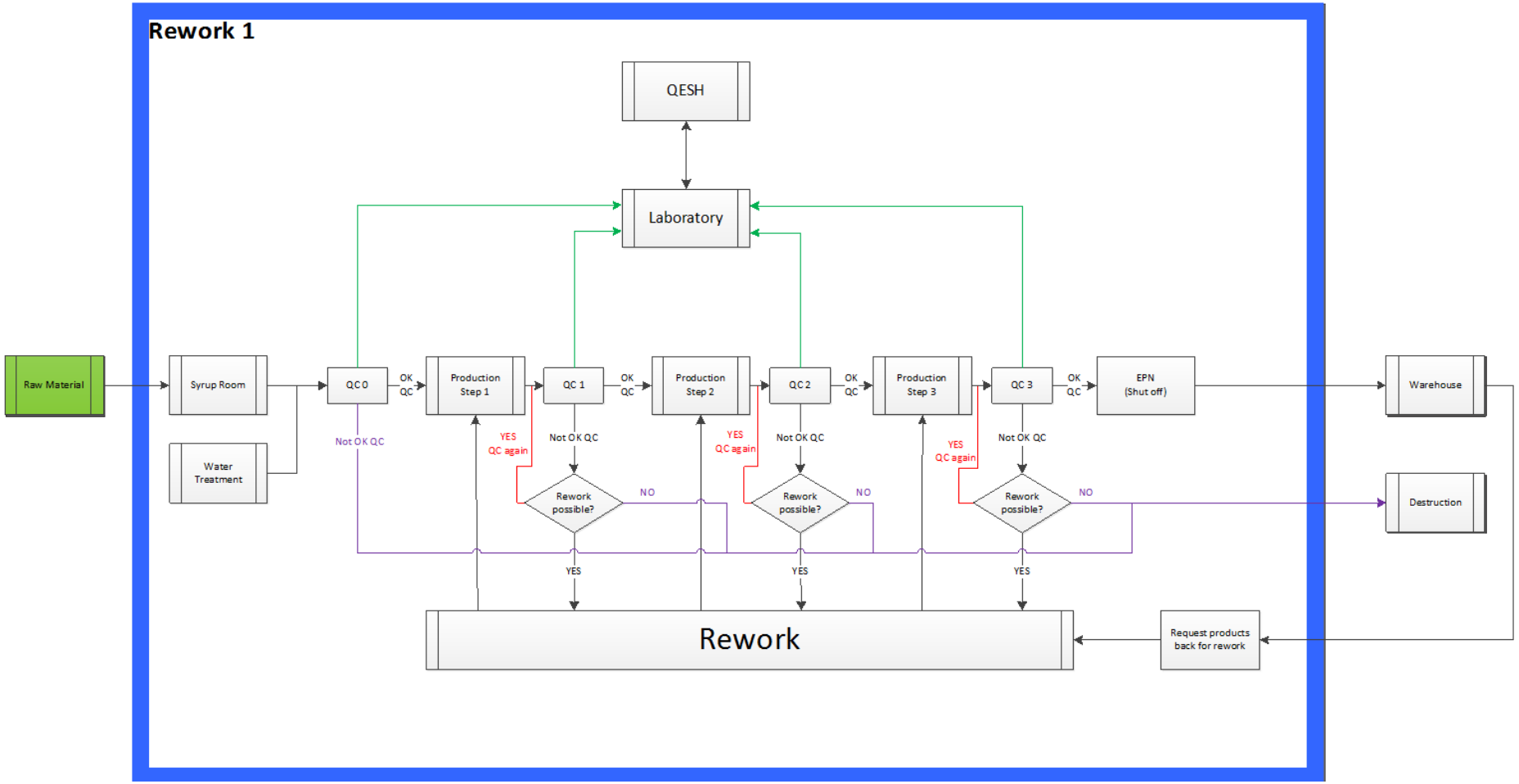

Figure 16 - Rework before EPN

4.3 Rework after EPN

This section covers the rework procedure in the production after the EPN-mark.

4.3.1 Production

See section 4.1.2
The production plans how and when the rework shall be made. They also decide which pallets should be reworked at a specific time. This is registered in the blocking database. During the planning of the rework procedure a new BOM has to be made at least one day in advance.

4.3.2 EPN

See section 4.1.4

4.3.3 Warehouse

See section 4.1.6. This is where the blocked products are.

4.3.4 Laboratory

See section 4.2.17
A follow-up of blocked products is made every day by the lab analysts and the laboratory. This is made to get a good overview of all the blocks.

4.3.5 QESH

See section 4.2.18

4.3.6 Defect product identified

Defect products can be detected both in the production and in the warehouse.

4.3.7 Block products (contact MIX)

When defect products have been detected they need to be blocked by those who detected the defect products. To be sure that the products are truly blocked there is also a need to contact the operators at the division called MIX to make sure it is done. The MIX is a division in the warehouse where blocked products are handled. There are different ways of blocking pallets. For example an entire bin can be blocked with several pallets or individual pallets can be blocked.

4.3.8 Shall the product be reworked in production?

If yes = send it to production for rework.
If no = send it to destruction where the products are reworked or destroyed.

4.3.9 The rework procedure in production

The production contacts the MIX, which delivers the pallets with defect products. The MIX moves the pallets systemically and physically to PSIN. Production then executes the rework. After the rework is done the blocking database needs to be updated with necessary information e.g. the amount of reworked pallets, the date when rework was done and a signature by the one responsible for the rework. The reworked products are then released from the blocking database and are approved for staging.

After this is done a new EPN-label is required for the new pallet that gets a new pallet number. The new EPN-label replaces the old one is updated in the blocking database. The production manager has the responsibility to make sure that the blocking database is updated after rework.

4.3.10 Destruction

See section 4.1.7

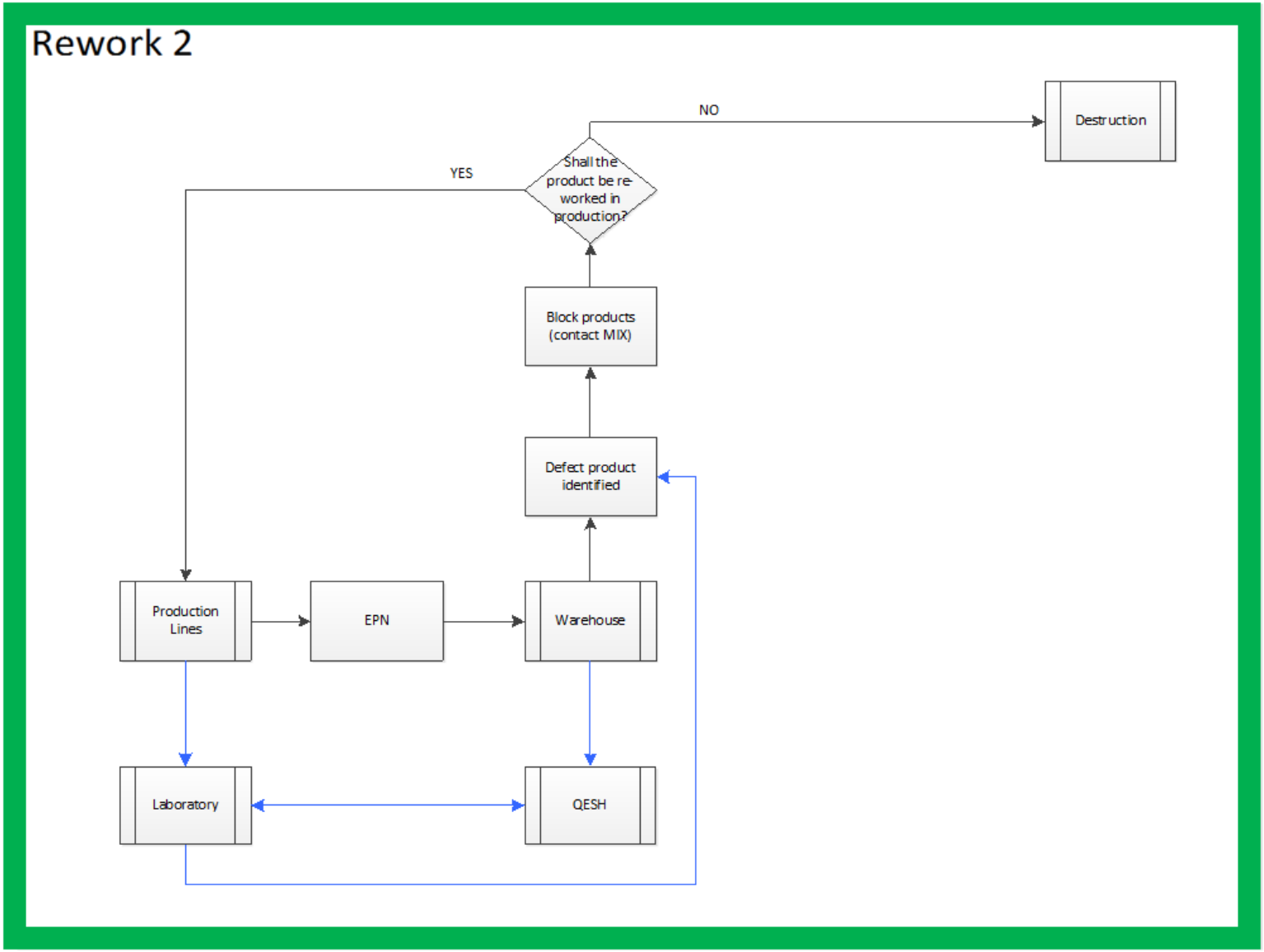

Figure 17 - Rework after EPN

4.4 Rework in the warehouse

In this section the procedure for reworking defect products in the warehouse is described. Defect products can arrive to the warehouse from the production or from a customer via a recall or a return.

4.4.1 Production

See section 4.1.1
Finished products from the production enters the warehouse.

4.4.2 Recall/return

Products can also enter the warehouse through a recall/return from a customer.

4.4.3 Warehouse

The products from production and recall/return enter the warehouse.

4.4.5 Defect product identified

Products from the production are stored in the warehouse for at least ten days before they are transported to customers. The reason for this is to ensure the product quality. During this period of time defects can be identified e.g. is labels falling of bottles after a few days.
Also if an accident happens in the warehouse it could lead to defect products.

4.4.6 Possible to rework the products?

Depending on what type of defect the products have it may or may not be able to do a rework.
If yes = ask the question “possible to rework in the warehouse?”
If no = send to destruction where the products are destroyed.

4.4.7 Destruction

See section 4.1.7

4.4.8 Possible to rework in the warehouse?

If yes = send to the rework area in the warehouse
If no = send back to production for rework

4.4.9 Send back to production for rework

If it is not possible to rework in the warehouse the defect products are sent back to be reworked in the production.

4.4.10 Rework area

The rework area in the warehouse is placed in the same room as the destruction. At the rework area in the warehouse it is possible to perform simpler types of rework such as wrapping new plastic around bottles, changing packaging and printing new EPN-labels.

4.4.11 Rework procedure

The rework procedure starts with the products getting removed from the WMS-system and are then sorted. The products, which cannot be saved, are then sent to the destruction machine. The products that can be saved are considered as finished products and are then re-entered in the system again. Products, which after rework in the warehouse, are considered as finished products are also re-entered in the system again. It is important to not mix products with different production dates on the same pallet because this leads to the possibility of losing the significant traceability.

4.4.12 QC
This is a quality control, which the operator makes to ensure that everything proceeded well in the rework procedure and that the required quality standards are fulfilled.

4.4.13 Storage
The products with satisfactory quality are sent back to the storage in the warehouse.

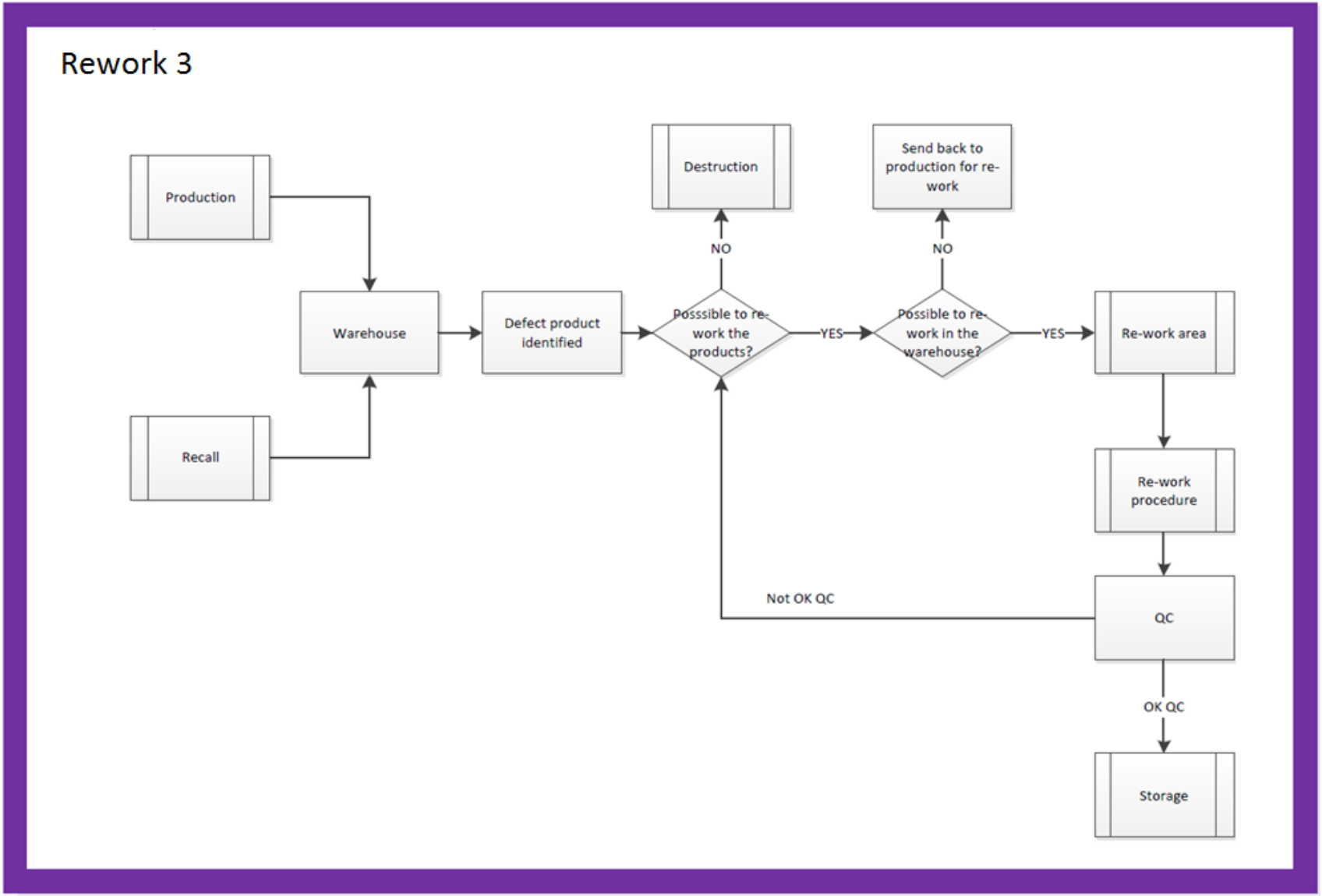

Figure 18 - Rework in the warehouse

4.5 Recall procedure

This section covers the existing recall procedure at CCES.

4.5.1 Warehouse

See section 4.1.6

4.5.2 DSD?

This can be defined as a delivery straight to the costumer without any 3rd party or retail warehousing involved. DSD = Direct Store Delivery.
If yes = Transportation from CCES to the customer without any 3rd party involved.
If no = It goes to an external distribution party.

4.5.3 Transportation

The products are transported of finished products directly to customers, via cross-docks where necessary.

4.5.4 Distribution

The products gets distributed and delivered by trucks to customers that have ordered the products. They can also get picked up by the customers at CCES premises.

4.5.5 Customer

See section 4.1.10

4.5.6 Consumer

See section 4.1.11

4.5.7 Defect product identified

If a customer, consumer or CCES notices any irregularities with the products the need for rework might appear. This will start the recall procedure. The dashed blue arrow describes that CCES can find discrepancies after they have shipped products that they thought were okay.

4.5.8 Investigation & Retrieval of defect products

Trace the production process and/or warehouse management. Search for noteworthy errors in either of these areas. Check what raw materials, labels etc. that have been used to notice any remarkable differences. Depending on the type of defect the investigation could either be in the laboratory, warehouse or a combination of these two.

If a customer or a consumer identifies or suspects that something is wrong with certain products, CCES retrieves individual samples to be sent to the investigation for a closer look. An individual sample could for example be a single bottle of Coca-Cola.

4.5.9 Is a recall required?

The investigation finally has to ask the question if a recall is required or not.
If no = Reimburse customer of client
If yes = then trace the customers

4.5.10 Reimburse Customer or Consumer

Give the customer or consumer their money back.

4.5.11 Trace customers
If the defects are detected by CCES then it is essential to trace the customers.

4.5.12 Collection of defect products
If the investigation shows that something is wrong with the products, sometimes CCES needs to collect the entire batch. Depending on the grade of danger, CCES may also need to include a safety margin in the collection of defect products.

4.5.13 Transportation
Transport the defect products back to CCES. All the collected defect products are gathered and placed in the warehouse.

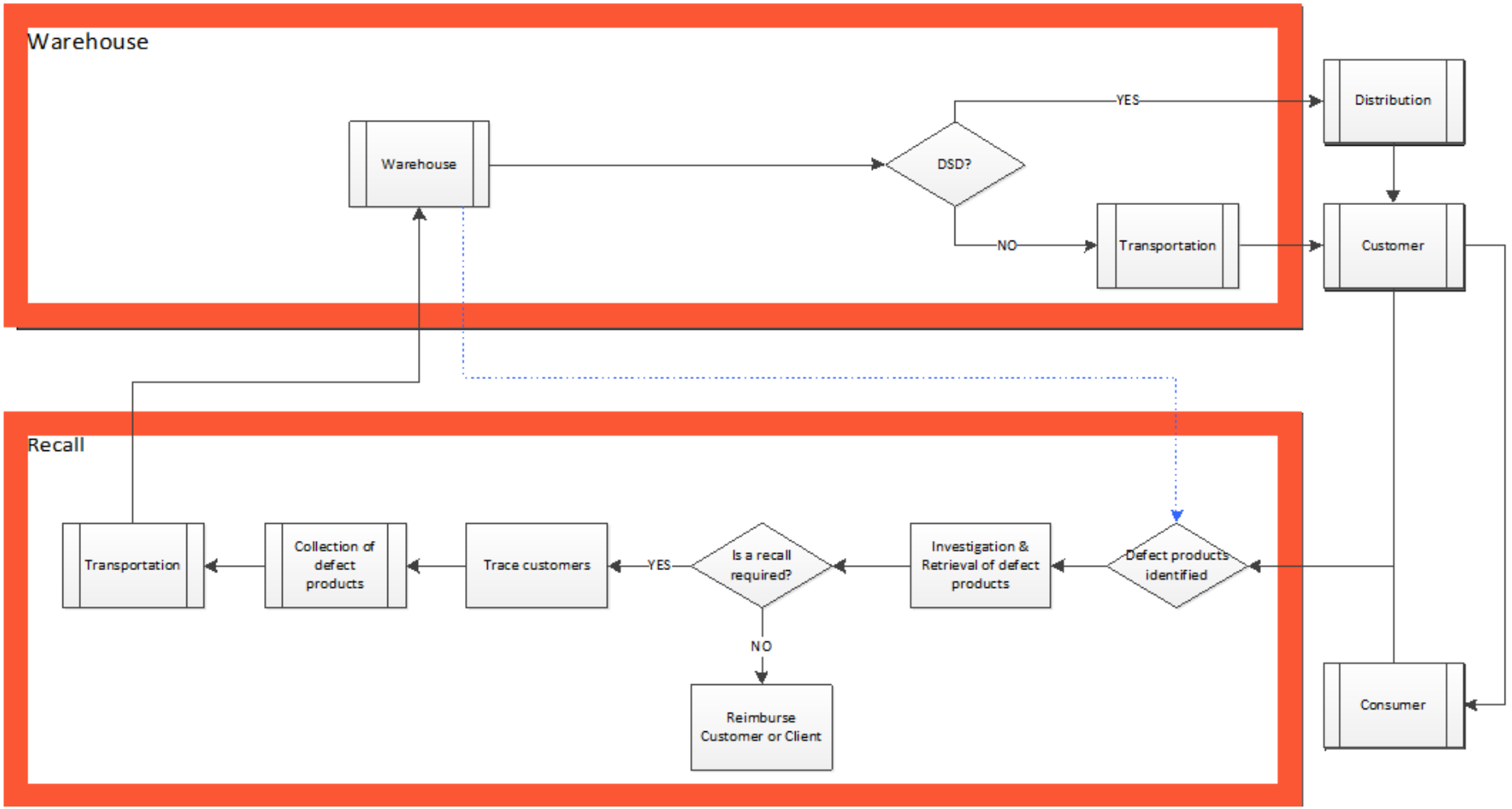

Figure 19 - Recall Procedure

4.6 Interviews

Ten different interviews were conducted in order to understand what the current problems with rework and lost traceability is. Employees from three main areas in the company were interviewed: production, warehouse and QESH (Quality Environment Safety and Health). The summary is a compiled result of several interviews with selected key issues.

4.6.1 Defect products

During production and handling of products, defects may occur. Defects could for example concern the beverage, the container that holds the beverage, the packaging of the products with plastic or the pallets with products generally.

Known defects concerning the beverage are: mixing problems - wrong doses of substances, bad brix (sugar amount), microbiological differences, old syrup, caffeine levels, CO_2 levels or if the beverage gets an unwanted colour.

Known defects concerning the containers of beverages are: incorrect best-before date, wrong net content, no labels, wrong capsules, wrong labels, labels that fall of the bottles due to little or no glue (glass & plastic bottles), the laser printed date-code is not readable (plastic bottles), wrong type of bottle caps, leakage or ink-stains on the cans from the supplier.

Known defects concerning the packaging and handling of finished products are: incorrect plastic wrapping, wrong EPN-labels, damaged products in the warehouse etc.

4.6.2 Why products become defect

Products might become defect due to machine-based issues or as a result of human factors. The human factor is always a risk e.g. when the machines are not handled correctly. It could for example be that no one has manually changed the settings for the date-code laser printer, which could result in a wrong date-code being printed on bottles. Another example is if no one has refilled the machine that puts glue on the labels, which could result in labels falling off.

Why these problems occur in the first place could be because of many reasons. It could for example be because of insufficient training for the operator, laziness, stress, mistakes, inexperienced operators who might be new on the job and so on. The problems could also occur due to bad raw material from suppliers.

The machines themselves usually work fine if they only get the necessary maintenance. But in some cases defect products can occur because of problems with the machines. It could for example be problems with printing out labels, that a “ghost pallet” is created etc.

4.6.3 What to do when finding defect products

What a person is supposed to do when identifying a defect product depends on where in the supply chain that individual works and what position and assignments that individual has. Anyone that identifies defect products shall block them. The employees have an obligation towards CCES to block identified defect products.

If a small amount of defect products are identified in the production, the EPN is shut off and the defect products are taken back into the production for instant rework (if it is possible). If a pallet with defect products does not have an EPN-label, it is important that it is brought back in to production again, so the pallet is not forgotten.

If it is possible, a product that can be reworked is taken off the production line and placed before the step that failed to perform a specific task. This could for example be a single bottle that has failed to get its label. This furthermore has to be done during the same batch.

Defect products that cannot be reworked are taken off the production line right away and are sent to the destruction area, if possible without interfering with on-going production.

If bigger amounts with defects are identified, the production employees need to block the products in the blocking database. The decision whether or not to rework the defect products are made at a later point in time by QESH. Thereafter a date for rework needs to be planned.

If defect products are identified in the warehouse they need to be blocked in the blocking database. The warehouse operators thereafter need to contact the MIX to make sure that they are blocked and cannot leave the building. When it is done, the QESH is contacted. QESH are the ones who make the final decision whether to rework or destroy the defect products.

If the laboratory detects a deviant result from a test on products they immediately block the affected products and contact QESH. In some cases it is necessary to block entire batches and even include safety margins to make sure that all the affected products are called back to CCES.

4.6.4 How the rework procedure works

The rework procedure for defect products are different considering if it is done before the product passed through the EPN or after. Some rework is also possible in the warehouse. If a defect product is found before it goes through the EPN, the employees' turns off the EPN and the products are transported back into the production to a specific location - the SinBin.

The Production Sin Bin, PSin or SinBin is essentially a specific area on each production line where defect products are placed for upcoming rework. These defect products will be reworked at a suitable point in time depending on how fast the products are needed, the amount that needs to be reworked and the production plan.

The rework procedure varies depending on what type of defect that needs to be reworked. Some defects can be reworked solely in the warehouse compared to other defects, which may need to be put back into production for some or several production steps. If there is something simple to rework like for example re-wrap plastic over a pallet, it is done in the warehouse. But if there is something more complicated which needs to be reworked it has to be sent back into production as for example putting on new labels on bottles. It is a common responsibility for production, warehouse and QESH to make sure that the rework processes works as smoothly as possible and that all instructions and routines are followed.

If defect products have already gone through the EPN, the employees from the production need to block the products that were made during that specific time. The employees in the production need to call the MIX in the warehouse so they can assure that the products are blocked and are not leaving the CCES warehouse. Depending on what the defect is, some part of QESH is also contacted. When a decision is made to rework, the products go back into the production to be handled. If there are many products that need to be reworked they might be assigned to be reworked during a whole shift or divided to be reworked at several occasions. The production also needs to inform the warehouse that they need a specific amount of pallets with defect products to be sent back into production for rework. For example they could notify the warehouse that they want 25 of 100 pallets with defected products to be sent into production.

Before rework it is also important by the production to remember to create a new BOM (bill of material) for all the concerned defect products. The new BOM is made for all the new raw material that was used for reworking the products. It is important that the old EPN-label on the pallet is deleted from the system and is replaced with a new label after the rework.

Depending on what type of defects that was reworked, someone has to approve that the products are acceptable to be shipped. In some cases it is QESH that makes this decision and in some cases it might be the people in production or the warehouse.

4.6.5 How the recall procedure works

Depending on what type of defect that has been detected by CCES, a customer or a consumer, QESH has to determine whether or not to recall the products. The decision whether or not to recall the defect products depend on the severity of the defects. It starts with retrieving a sample, which will be examined by QESH at CCES. Based on the outcome of the investigation a decision to make a recall or not is made. CCES could also reimburse the customer or client.

CCES has the ability to trace pallets via the WMS (Warehouse Management system) to know exactly what products a client has received and who has received the products.

4.6.6 Why traceability gets lost

When reworking products it is significant that the process and the instructions are followed correctly. This is important in order to make sure that the traceability of a specific product and pallet is maintained. What might happen is that instructions and guidelines are not followed which leads to the possibility of losing the traceability. Known incidents are: mixing dates of products by inserting products for rework during a current production, forgetting to update the EPN, forgetting to create a new BOM, forgetting to enter information in systems when performing rework etc.

If a product has been reworked on the same day as it was made, the specific production time could be different compared to when it was actually produced. This leads to a traceability that is not precise. But CCES can trace and ensure which day it was produced due to the production date. If there would be a severe problem with a detected defect product, CCES also uses safety margins in order to make sure that they get back all the defect products.

4.6.7 Which time of the year most defects occur and why?

The most common answer was that defects occur during the entire year, but the problem tends to peak during the summer. Reasons for this could be because when it is summer there is a high demand for beverages, which leads to a higher production rate at CCES. This, combined with ordinary employees being on vacation, leads to a high demand for temporary summer workers. Considering that the summer workers are usually more inexperienced than regular operators the risk of them doing mistakes is often higher. It is common that mistakes happen due to summer workers not knowing how do handle specific situations according to some of the interviewees.

4.6.8 Destruction of products

Products are sent to destruction if a defect cannot be reworked. Examples that could lead to destruction are: products getting damaged in the warehouse, products are about to expire and could not be sold, wrong bottle caps, wrong net content and so on.

The main reason that leads to destruction is that the acceptable quality standards are not met and that there is no way to perform rework or in some other way restore the products.

All the products that are being moved physically from one place in the warehouse to the destruction zone also need to be moved systemically in the WMS-system.
The products go into the destruction machine where they are punctured to release the liquid. The liquid is then separated from the containers and is collected in a big tank. The liquid is then used for another purpose at the wastewater treatment plant at CCES. The containers are crushed and end up in a bin. The crushed containers are then sent to be recycled.

Everything that is damaged is moved to Break KL, which is an area in the destruction zone. All the products that end up here are scrapped in the system and those that can be saved or restored by doing simpler rework are then created again in the system. The ones that are defected are sent to the destruction machine to get destroyed.

4.6.9 Communication

Mistakes can occur because lack in communication, e.g. if employees misunderstand each other. It could be that they believe that the other person they are working with should do something, which they do not do, which could result in irregularities. Another example is if it is loud in the production and the operators have problems hearing each other. It is important to have a good communication in order to ensure that these kinds of problems do not occur in the first place.

4.6.10 Education and training

New employees receive an education when they start working at CCES. Some key-points when training new employees involves how to complete specific tasks, hygiene, quality etc. The summer workers receive the same introduction as regular employees, but due to the fact that they are at the facility during a limited time they usually do not have the time to get a deep experience.

The employees continuously get information about how well their work is and what they have to do in order to improve it. Every year all of the employees also have to go through an education concerning GMP – Good Manufacturing Practice, which covers safety, quality and other important aspects.

5. Results & Analysis

This part of the bachelor thesis consists of the empirics and theory being analysed and compared to each other in order to get dependable results. The most important identified problem areas are brought up, which are: rework, traceability, instructions and routines, education and training, and finally management & leadership. Each of these areas is evaluated regarding findings, analysis and possible measures. Finally the new procedure regarding rework of defect products in the production is presented.

5.1 Defect products

5.1.1 Findings

During the thesis two different areas of defects, which may lead to rework, were identified. Areas concerning the beverage, the containers and the packaging and handling of finished products could all possibly lead to defect products occurring. Defects concerning the beverage are not reworked.

Defects concerning the containers of beverage:

- Incorrect dates (best before date, production date etc.)
- No labels
- Wrong labels
- Wrong capsules (only glass bottles)
- Labels that fall of the bottles due to little or no glue (glass & plastic bottles)

Defects concerning the packaging and handling of finished products:

- Incorrect plastic wrapping
- Wrong EPN-labels
- Damaged products in the warehouse

5.1.2. Analysis

Defect products may occur because of machine based problems or the human factor.

Machine based problems are machine malfunctions due to for example software issues. The reason why software issues occur could be that programs occasionally lag. It could be that the EPN-labeller prints out two of the same EPN labels, which results in a "ghost pallet" being created in the system. Machines usually work fine if they are correctly handled and regularly maintained.

Human factors could be that the operators are doing something wrong by e.g. not following the instructions. It might be because of laziness, stress, mistakes, inexperience, or insufficient training and education. Another problem could be that operators misunderstand each other which results in defects, e.g. Misunderstandings about who will refill the glue in a machine.

In the Lean Production philosophy it is considered to be a waste to produce defect products. It should be avoided as much as possible because it is very costly to rework what were not correctly manufactured from the beginning. The fifth waste "inventory" is apparent if the defect products also take up storage place. It is important to continuously control products in order to make sure that they are fulfilling the quality standards. According to the ISO 22000 standards family it is important for companies to have the ability of pinpointing and controlling food safety hazards. This means it is also important to have control over the machines and that they are functioning correctly.

5.1.3. Possible measures

There has to be some sort of preventive maintenance on the machines to avoid machine based problems. Maintenance is always important and is a huge factor for machines to work correctly. When performing maintenance and basic procedures in the production, it is important that there are no misunderstandings in the communication.

By visually inserting some types of checklists would result in avoiding misunderstandings. It would include all the important procedures, who conducted them, when it happened etc. It would also be mandatory that the operators who conducted certain activities signed the checklist.

More extensive and comprising education and training could be implemented in order to counteract the problem with operators not knowing what to do. Clear standards and routines are furthermore needed in order to successively avoid defect products from occurring.

5.2 Rework

5.2.1. Findings

Rework can be made in the production or in the warehouse. In the production the rework procedures that can be done concerns basically every defect that may occur. In the warehouse the rework is more restricted. It is important to differentiate rework procedures for defect products found before EPN, after EPN and in the warehouse. Defects found before EPN are always reworked in the production. Defects found after EPN can be reworked in the production and sometimes in the warehouse.

Defects that causes rework in the production:

- Incorrect dates (best before date, production date etc.)
- No labels
- Wrong labels
- Wrong capsules (only glass bottles)
- Labels that fall of the bottles due to little or no glue (glass & plastic bottles)
- Incorrect plastic wrapping
- Wrong EPN-labels

Defects to be reworked in the warehouse:

- Incorrect plastic wrapping
- Wrong EPN-labels
- Damaged products in the warehouse

Rework procedures

The rework procedures before EPN, after EPN and in the warehouse can be seen in the empirics' parts 4.2, 4.3 and 4.4. The rework procedures are sometimes done incorrect which can lead to problems such as losing the traceability and inventory discrepancies for raw materials and finished products.

Some things that are usually done wrong during rework are:

Mixing products and dates

Employees are mixing products with different dates while reworking. It happens by putting defect products produced from an earlier date into a current production instead of waiting until after the current batch is completed. Mixing products with different dates on a pallet and deliver this pallet to a customer could also lead to problems. This is not supposed to be done but it might happen anyway.

New BOM
Employees do not know how to make a new BOM when reworking or they forget to make one. If the work with the new BOM is not done correctly, the reworked products could be using an old BOM again. The system will then register all the material used in the production again instead of creating a new BOM, which only registers the material used for the rework.

New EPN-label
When reworking a pallet it is very important to print a new EPN-label with the new correct amount of products instead of using the old EPN-label. If this is not done correctly it could lead to inventory discrepancies.

Production Sin Bin
Production Sin Bin is not always used correctly. People at the production do not know how or why to use it. The Production Sin Bin does not physically have enough space for enough pallets at some production lines.

Forgets to perform rework
Products without an EPN-label that are brought back in production for rework are sometimes forgotten. It takes too long before the products are handled. CCES has a requirement, which states that they do not sell products with too short best before dates.

Systemically errors
These errors could for example be that operators do not know what to do in the different systems as a result of not being so familiar with them. The problems that might occur are numerous, but an example is if during a rework an operator forgets to update the blocking database after a rework is completed. Another example is if an operator gives a reworked product the wrong production date or best before date, which results in losing the traceability.

5.2.2. Analysis
The existing production works almost flawlessly and rework is something that occurs rarely. This makes it even harder for operators to remember the rework procedures, which can be a reason why mistakes happen. Many physical errors and system errors can occur because the operators are not used to handle rework.

There has to be a change in the operators' normal behaviour to be successful during rework. In order to get the operators to do the right things during rework, there needs to be a change, so the procedures will be done correctly. Communication is a key point in order to successively implement a change. The communication between different areas in the company e.g. QESH, production, warehouse, is also important and is something which is currently not functioning perfectly at CCES. Some examples of flaws in the existing communication are; different areas are using their own words, people are speaking different languages, different skills in Swedish and English etc.

It is a waste to perform rework of defect products according to Lean production and the 7+1 types of waste. The reason for why rework procedures are done incorrect is because of several causes. The management, education and training, instructions and routines all have a big impact on why the rework fails.

5.2.3. Possible measures
In addition to what is written at paragraph 5.1.3 there are some other possible suggestions regarding rework.

By having instructions that are easy to follow and remind operators to not forget making key steps it would result in less mistakes happening. To increase the visual improvement a large board with information regarding different types of rework is another idea.

Increase the physical Production Sin Bin area to make room for more pallets. Currently there is not enough room to fit more than two pallets at certain lines, which is way too little. Increase the visibility by painting the area on the ground with a specific colour. After each shift is completed the Production Sin Bin area should be cleared.

5.3 Traceability

5.3.1. Findings

The traceability backwards and forwards at CCES is very important because they have an obligation towards consumers and customers, by EU legislation, Swedish legislation, and The Coca-Cola management system (KORE). If there would be any sort of a defect, CCES needs to know exactly where those products are, to whom they have gone to, what raw material have been used, and when they were produced. If it is necessary, a recall could be required in order to get back all the concerned products.

The existing situation regarding the traceability is that it can sometimes get lost during for example rework or if an operator in the warehouse decides to mix products with different production date on a pallet. This is not allowed to do anymore but it might happen anyway. It is also important to wait until the ongoing batch is completed before putting on defect products for rework.

The traceability backwards usually works well, which means CCES can get information about when certain products were produced and what raw materials have been used. But tracing the products forwards to know where they currently exist can be difficult if the rework procedure regarding traceability is not done correctly.

5.3.2. Analysis

It is important for every manufacturing company to have an ability to trace their products. By having an ISO standard they need to follow it is easier to get guidance and to show customers and consumers that they are concerned about certain questions. ISO 22000 concerns food safety management and CCES are certified at ISO 22000 since 2009. One part of ISO 22000 is ISO 22005:2007 which concerns the traceability in the feed and food chain.

CCES takes the traceability very seriously and wants the rework procedures to be done correctly for maintaining it. Sometimes what happens is that the rework procedures are not done according to the instructions and routines and then the traceability might get lost, which is a serious circumstance.

5.3.3. Possible measures

There has to be some type of education concerning the importance of the quality and traceability. The management has to frequently push on in order for the operators to know how important it is. The top management knows the importance of traceability and it is their assignment to pass on the knowledge to the operators in order to not lose the traceability. The top management can also give information about the worst scenarios that could happen for the company if the traceability gets lost. Regular training is also important so that the operators do not forget anything important.

5.4 Instructions and routines

5.4.1. Findings

Instructions and routines regarding e.g. rework are currently not always followed by the operators. There are several identified reasons for why this may occur.

Some significant reasons are:

1. Complex instructions

Some instructions may be hard to follow because they are complex. For new employees some parts of the instructions may be difficult to understand due to for example imprecise abbreviations. Some key-points in the instructions, which might be obvious for the ones who wrote them, are sometimes missing from the instructions.

2. No clear instructions and routines for how to rework

The level of quality may differ from instruction to instruction regarding rework. Some instructions and routines are very precise and accurate compared to others, which does not completely cover all the necessary key-points.

3. Updated instructions and routines

Instructions and routines are constantly updated which sometimes leads to people not knowing exactly which instructions or routines that are existing. Sometimes people decide to change certain parts of instructions or routines and not update this. As a result this leads to incomplete instructions and routines.

4. Handling of documents

The current handling of documents is not working perfectly. Several documents regarding the same type of process could be active in the database simultaneously. This makes it difficult to know which document and version is the active one.

5.4.2 Analysis

The instructions and routines at CCES sometimes have implied information which may affect the operators understanding of doing a specific task. The operators need to have the same common understanding of what to do in order for the company to have a consistency. There cannot be too complex instructions or unclear instructions, because it prevents a consistent understanding of how to rework. According to Mats Alvesson and Stefan Sveningsson a common mistake when writing instructions is that there is a belief that everyone reacts predictably and consistently, which they do not (Alvesson & Sveningsson, 2008). Some instructions have been limited, which has not always made everything clear.

A way to improve the consistency in a company according to Michel Greif is to improve the instructions and to make the phases in a process easier to understand by making everything more visually accessible (Greif, 1997). Currently there is not always enough visual information for the operators to satisfy their needs to successively find information about performing rework. If information is easier to access due to increased visibility it will also work as a possibility for the operators to be reminded of how to execute procedures if they are not done often.

When companies constantly improves and updates documents, it is important that everyone is aware of the active version that is currently used. There has to be a good way of handling documents to make sure that all concerned personnel is informed.

5.4.3. Possible measures
Increase the visual instructions by for example implementing the use of a board with information about how to perform rework of certain defects. Checklists could be placed next to the board, which the operators bring along with them when they are doing rework.

Increase the visual information by clearly marking the pallets, which shall be reworked with special notes with special colours. There are several different ways to do this, but the meaning of it is to decrease the risk of operators getting confused and mixing together different products etc.

Mark a special area where defect products who shall be reworked shall be placed once they enter the production again. The existing area, which is called Production Sin Bin is too small.

Write the routines and instructions again to make them easier to understand. Formulate the routines after each area where they are used. To implement flow-charts in the routines to increase the understanding of certain processes is another idea.

Make sure that only one document is active at one time in the QMS. This is to prevent misunderstandings from happening.

Some procedures might be easier to understand if there were pictures or videos available to show how to perform certain activities.

To make more operators follow the instructions and routines a new mandatory task could be implemented regarding to fill in a CAR or C/C form if the procedures are not followed.
The purpose of a CAR or C/C is not to punish operators but to make them realise that the management actually cares about mistakes. If a rework procedure has been done incorrectly, it will become easier for the operators to remember how it should be done if they write it down. Also if it is mandatory to fill in a CAR or C/C the operators might considering to take extra care when doing rework in order to make everything work smoothly so they do not have to fill in "annoying forms".

5.5 Education and training

5.5.1. Findings
The existing education and training does not cover everything, for example some crucial aspects regarding rework might not be included. Defects and incorrect rework can occur because there has not been enough focus on those parts. Some things are unclear and it is not certain that everyone has understood all the necessary key points regarding how some procedures are done.

The training and education is considered to be too short to teach everything that is important for the new operators. Some key points could be missed. Many things are learned at scene, which means that summer workers might miss some key points because of not having the time to learn all the necessary key points during summer.

Some procedures that are handled poorly are:

Manual EPN-label
Problems might occur if operators do not manually make an EPN-label for the last pallet with products from a production batch if that pallet is incomplete. For example if the last pallet from a production batch contains 80 out of the normal 90 product items this pallet is incomplete and a manual EPN-label is required. What happen sometimes is that the operators miss to notice this and that an automatic EPN-label is printed out which says that the mentioned pallet contains 90

products. This leads to material discrepancies because systemically there are now 90 products but in reality it is only 80 products.

Not using the Production Sin Bin correctly
See 5.2.1

Not using the systems correctly
It could for example be not updating the blocking data base, using an old BOM instead of making a new one, not knowing how to change back to an old production date which leads to printing out labels with wrong production dates etc.

5.5.2. Analysis
According to Jörgen Sandberg and Axel Targama the operators understanding of something is formed from previous experiences that they can relate to (Sandberg & Targama, 2013). That means that the training and education has to be designed so that everything becomes clear and the focus is on the right things. The right things to focus on in this case are everything that is important during rework that often could lead to future errors and mistakes.

All operators need to know how they affect the quality in the whole supply chain and what quality actually means for the entire company. The importance of quality has to be transparent and shared by the employees in the entire company in order to continuously produce products with high and consistent quality.

The training and education has to be formed so it can change people's behaviours regarding rework. To implement some parts from "the eight-stage change process" by Kotter, when conducting a training program is a good way to drive for change. It is according to Kotter a successful way of changing people and conduct a change.

5.5.3. Possible measures
Better education and training, which covers all the important knowledge needed to perform, e.g. rework. Focus on things that usually lead to wrong doings. More comprehensive education could be held to cover more information. Have an education of more than two weeks with the new operators so it is sure that they have learned everything important.

Follow up training and education for example each six months. This is to repeat the procedures in order to make sure that everybody knows what to do.

Show how the rework procedure works on each line so that they have seen with their own eyes how it works. By seeing how it works with own eyes and learn by doing is a great way of remember the training.

5.6 Management & Leadership

5.6.1. Findings
The top management has previously not succeeded with tackling the problem concerning rework of defect products and to point out for the employees the importance of a maintained traceability. The reason for this could be that the top management has not been prioritizing these kinds of problems because other problems might seem more important. But they have been aware of that there needs to be some type of change. They have received signals that something is not functioning perfectly and want to tackle the problem. That is why they have given two students the assignment in form of a thesis to document how the rework procedures are currently done.

To develop a new procedure and give a presentation regarding how important it is to have a maintained traceability and to perform rework correctly has been a signal that the management wants change to happen.

5.6.2. Analysis

Many of the identified problems from the previous sections can be traced upwards in the organization all the way to the top management. According to Jörgen Sandberg and Axel Targama top management needs to create clear standards in order to make the operators understand what their specific tasks are (Sandberg & Targama, 2013). Standardization is the fourth step in the 5S process and is considered to be an agreement that the way of working is accepted and should be followed by everyone. Currently operators are not always following instructions during rework of defect products. According to the fifth and last step in the 5S process, which is called “sustain”, the hardest process is often to get the operators to follow the routines and to change attitudes and behaviours. It is the same approach as John P. Kotter advocates regarding change (Kotter, 2012).

According to John P. Kotter, management has often been referred to as the most important concept in order to make a change possible. This might not be entirely true because there also has to exist good leadership to educate the operators and to learn and teach them to remember how to act during rework. According to John P. Kotter, there should be approximately 70-90% of leadership and 10-30% management to change the operators in a corporation. The existing leadership higher up in the hierarchy at CCES is currently not always working flawlessly regarding to follow-up previous implemented changes. An example of this could be regarding the Production Sin Bin during rework and not to mix products from different production dates on the same pallet. By using the eight-stage change process from Kotter could have resulted in successful changes. But by not having created the guiding coalition that was needed in order to implement a change it has resulted in some operators not knowing some of the new changes that has been made. They have not received enough information about the changes and thus they do not know that they even exist. According to Mats Alvesson and Stefan Sveningsson a reason for it could be that those who have been responsible for the change has thought that all the operators have understood the changes and reacted consistently (Alvesson & Sveningsson, 2008). This has not always been the case. It might not always be easy to convey information to an entire organization, which is a reason why it exist a lack of consistency and some procedures are unclear. According to Kotter’s “the eight-stage change process” there is a need to create a sense of urgency within the organization in order to make the operators realize that a change is required.

Everyone needs to understand the change vision, which Kotter calls it, in order for it to be successful. It is important to involve the employees in the process of change. If this is not done the operators who are working closest to the daily production process might not get a chance to suggest their proposals for improvements. Michel Greif talks about the importance of management and employees to have the ability of communicating freely in order for every employee to take action for improvements (Greif, 1997). If the communication between workers and the management is poor it is known as "waste of intellect" in the 7+1 types of waste in the Lean production philosophy. By not taking advantage of the knowledge that the operators possesses the company risks losing both employees and missing out on good ideas on improvements. Currently there might not be enough time or will to implement all the ideas that the operators suggests. The company might also lack the driving force from the top management, which is needed for changes to really happen and to sustain.

All companies are constantly trying to improve and progress. Thinking differently leads to different results according to Rolf Smith (Smith, 2007). Everything can always be done better

and more efficiently and that is why the company has to think in terms of continuous improvements. This means that it is a constant process of change going on in the companies.

5.6.3. Possible measures

The problem regarding rework of defect products has to be prioritised more than before. Everyone needs to be aware that it takes time to really implement changes.

There has to be different thinking to change how some procedures are currently done. A good way is by using the 7 levels of change.

Make sure that the top management and human resources has the required information and knows how the rework procedures are done. If the top management does not know the rework procedure, then who does?

Some necessary information that is within the human resources at the top management level is not shared with the operators in the production. Try to implement that information for the operators in the production. The top management needs to get those who have the information to document it so that all have access to it. There needs to be consistency and good communication.

The top management needs to make it possible for everyone to get the education to learn how to perform rework correctly.

Implement a certain team that are responsible for the improvement work. This team could analyse the problems in depth, implement changes, perform follow up and finally report back to the top management.

5.7 The new procedure

A new general procedure on rework of defect products in production has been made in order to improve and clarify the understanding for all concerned employees. The previous procedure was included in another document. The new procedure is separated from any other document and is now an individual document.

The instructions have been adjusted in different ways in order to increase the understanding and improve the visual information by e.g. numbering the activities, highlighting keywords, and decreasing the number of abbreviations. Reminders have also been implemented to decrease the risk of the instructions not being followed by for example missing to perform an activity.

A new flow-chart has been constructed and implemented in the document in order to enhance the understanding of what is happening in different parts of the production and warehouse.

With the new procedure, there is a standardized way of performing rework of defect products that has passed through the EPN and is brought back in to production again. The new procedure was presented to employees from team leaders in production, QESH, and the warehouse. It was done in form of a presentation.

The new procedure can be found in the appendix.

6. Discussion

In this section the outcome of the bachelor thesis is critically reviewed and discussed by the authors. Explanations to how findings were made and why certain methods were used to find data are included. Furthermore this section concerns if the thesis answered the set problem definition, purpose and goals. A reflection regarding how the thesis could have been made differently in order to receive more accurate results is also included. Finally the new procedure, which has been developed by the authors, is discussed.

6.1 Gathering of information

The findings in this thesis report were gathered by viewing the existing situation at scene, interviews with employees, talking to employees, and examining routines and instructions. All the ways of gathering information were chosen because they were considered to be the best ways by the authors. They were very effective and gave a good overview of how the existing situation works. All the findings were then compared to the collected theory and got analysed to define the results.

6.2 Analysing the gathered information

Due to the fact that this thesis only comprehended 10 weeks resulted in that the authors had to rely much on the interviews in order to analyse the gathered information and define results. The viewing of the existing situation at scene was made in order to confirm that the gathered information from the interviews matched the real situation.

The purpose of the thesis was to define the current situation regarding rework and the associated traceability and furthermore to define a common procedure for rework. By relying mostly on the collected data found through the interviews has mainly formed the result. The results could have ended up differently if other or more people had been interviewed. On the other hand, many people had the same view regarding the current situation. Considering that the thesis was constructed during a relatively short time period, the interviews were probably the best way of gathering information. This was especially the case in the beginning when the authors did not know so much about how rework was done and what the existing problems were.

The goals has all been answered by the construction of flow-charts for each rework procedure. The flow-charts themselves were constructed by firstly mapping the processes with post-its and then writing them down on paper by hand, subsequently followed by inserting them digitally via the Microsoft Visio program.

The questions under “scope” have all been answered continuously through the work with the project. They were primarily answered through the interviews, routines and by talking to employees.

6.3 Results based on the analysed information

The suggested improvements were based on the findings from the interviews and from detected flaws by the authors during the thesis. These flaws could for example concern parts of routines, instructions, education etc. All identified flaws were compared to the theory and thereafter analysed, which subsequently lead to the results.

All of those who were interviewed had the sufficient knowledge to answer the questions. Some people did not want to participate in the interviews because they thought that they did not have enough knowledge about their specific line. Instead they referred to other people with more experience and knowledge. This was even said by team leaders on certain production lines, which could indicate that there is currently not enough education and training for the operators

and team leaders regarding certain parts in the production. The top management probably needs to take more responsibility in order to tackle the problems with training and education regarding e.g. rework. They also need to follow up and analyse how the improvement work is proceeding in order for them implement counter measures etc.

The outcome could have been different if there had been group interviews where people could have been discussing and come up with a common answer. In a group interview, people can remind each other about things, which could have resulted in different answers on the questions that were given. In this thesis, only individual interviews were conducted, which means that a reason for why some answers were different was maybe because they forgot to mention certain things. On the other hand, it can be a better way to really get into what an individual is thinking by having individual interviews. It is a good way to know what just that person is thinking and that person does not get affected by anyone else.

The operators working in the production might not consider the problem with rework of defect products to be such a vital problem because they might not see the whole picture. Usually everything works well in the production and defect products occur infrequently. Higher up the in hierarchy in the company it is however considered a bigger problem.

Many were pointing out the importance of having better education in the introduction and to inform about the importance of that the rework is done correct. Especially in the summer periods, there has to be better education. Considering that rework is not done that often comparing to the normal production, there has to be some sort of repetition of how to rework.

6.4 Source criticism

It could have been interesting to perform benchmarking to get another point of view of how rework can be done. It could have been good to see how another company was doing their rework procedures to form a result. But due to the fact that this thesis had a limited time, other activities were prioritised higher which led to no place in the scope for a benchmarking.

If several improvement tools had been used it might have resulted in other results. During this thesis however it was mandatory by the authors to use flow-charts because it was a demand by CCES. Flow-charts gives a good overall view of the concerned procedures. If there had been more time, improvement tools like SIPOC and cause effect diagrams would most likely also have been used.

Statistical fluctuations are always an issue when collecting data by e.g. conducting interviews. If more people had been interviewed it would give the authors more accurate data.

It is not certain that the interviewees really said everything they knew. They might have "held back" due to e.g. fear for the managers. They might not have been sure that everything they said was 100% correct and true. The authors chose to compare answers from several interviewees and make a summary where the most overlapping answers were compiled. This means that individual answers that stood out were not always brought up in the summary. Answers which were basically the same from several interviewees were considered to be important due to the fact that there were told from different sources.

Another thought is that the questions that the authors asked might not have brought up all the essential information that could have been needed. The authors might have missed out on key information due to the fact that the questions may not have grasped everything that was necessary.

6.5 The new procedure

One of the goals with this thesis was to develop a common procedure for rework of products with an EPN label and that needs to be brought back into production for rework. It was conducted as the last step in the thesis when all the information had been gathered. One limitation was that the authors could not purchase any new equipment, which resulted in that not all of the suggested future recommendations could be implemented. The authors basically needed to focus on the previous instructions to find new improvements concerning these.

The improvements that were made only concerned what the authors found being possible to implement. The new procedure could be improved further because these are only the authors' improvements and some people might consider that they are good and some might say they are bad. Some might argument that the procedure itself needs more information or less information. One improvement that the majority of the employees should find useful is that the new procedure now has a flow-chart as a complement.

7. Conclusion

In this section the problem definition, purpose, goals and scope are intertwined with the analysis, results, and discussion in order to conduct a conclusion. Initially an overview of the existing problems and risks is presented. Followed by identified causes for why the problems may occur. Finally the root cause is presented.

7.1 Overview

The existing problem is that defect products, which are brought back into production for rework, are not always handled the way they are supposed to be handled. If they are not handled correctly the important traceability may get lost. To have a maintained traceability is important for CCES. Firstly as an obligation towards the customers and secondly due to the fact that if there would be any sort of defect, CCES needs to know exactly where those products are, to whom they have gone to, what raw material have been used, and when they were produced. If the rework is not done correct, CCES may not be able to trace them, which could be devastating.

7.2 Causes why rework procedures are done incorrect:

- Flaws in instructions and routines
- Flaws in training and education
- Flaws in handling of documents
- Flaws in the communication
- Flaws due to human factors
- Flaws due to machine based problems

These flaws are the most common ones, which are found in an extent that needs action.

7.3 Root cause

The complexity of the problems has made it hard for the management to succeed with tackling the problems regarding rework of defect products. There have been signals about that it is not working perfectly and that it why they have started to take action for improvements.

CCES needs to address the problems regarding rework and to point out the importance of having a maintained traceability. If they do not succeed with doing this it could lead to a bad reputation, a negative corporate image, a decrease in demand. If bad products have been shipped and there is no traceability on them it could result in financial losses.

7.4 The new procedure

The previous procedure was found in a document about blocking, but now it is separated as an individual document.

The instructions have been adjusted and simplified by for example numbering activities, highlighting important keywords, implementing reminders, and decreasing the number of abbreviations.

The new procedure also contains a flow-chart to enhance the visual information and increase the understanding of how the rework procedure works.

8. Future recommendations

In this section the recommendations that have been identified by the authors are presented in order to further improve the operation at CCES. The recommendations are all based on the possible measures from the analysis and results section.

8.1 Further analysis

In order for CCES to get genuine improvements, it is essential to further analyse the problems regarding defect products, rework, lost traceability, flaws in instructions and routines, inadequate education and training, and insufficient management and leadership.

8.2 Top management

- Increase the priority of the problem with rework of defect products.
- Recognize that it takes time in order to implement a real sustainable change.
- Get all important information documented.
- Make sure that all concerned operators are able to perform rework correctly.
- Implement a team which are responsible for the improvement work.
- Increase the communication between different parts of the company

8.3 CAR and C/C

- The operators should fill in a CAR or C/C in order to prevent errors from reoccurring.

8.4 Production Sin Bin

- Increase the physical area to make room for more pallets.
- Increase the visibility by painting the area on the ground with a specific colour.
- After each shift the Production Sin Bin area should be cleared.

8.5 Marking pallets

- Mark pallets with colours to increase the visibility for the operators and decrease the chance of defect products being mixed.

8.6 Checklist

- Use checklists to avoid misunderstandings in the communication and to make sure that everything is done correctly, in the right way and in the right order.

8.7 Information Board

- A special board with information about how certain rework procedures are done, describing pictures, and clear instructions.
- Checklists could be placed next to the board.

8.8 Only one active document in QMS

- It is crucial to only have one active document in the QMS system regarding certain rework procedures.
- Everybody needs to know which version is the active one and is currently used in order to avoid misunderstandings.

8.9 Clear instructions and routines

- Only involve the essential steps, nothing should be written implicitly, avoid abbreviations.
- Adjust the instructions and routines by recipient and purpose.
- Adding pictures and flow-charts for describing different procedures.

8.10 Training, education and repetition

- Focus on preventing known activities that may lead to errors.
- Have continuous repetition of all the key points from the training and education.
- Show how the rework procedure works on each line so that they have seen with their own eyes how it works.

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Images

Appendix

A. Common rework procedure

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Common rework procedure in the production

This document describes the common rework procedure in the production regardless of which line that the rework shall be conducted at. A flow chart is also included in order to increase the understanding of what shall be done.

- When defect products are identified they need to be **blocked** in the blocking database. **Call and notify the MIX** at number: 0703-762191 and control that the products are successfully blocked.

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1. Production plans **how** the rework procedure shall be conducted. This is written down in the blocking database in section 1 as a bulleted list.
2. * After a decision of how the rework procedure shall be conducted is made, the production needs to create a **new BOM** at least 1 day before the actual rework is conducted. This shall be done immediately after the planning of how the rework procedure shall be conducted. Make sure that it has been conducted before rework.
3. The production notifies production planning about **the number of pallets** that shall be reworked.
4. **Plan the time** for when the rework shall be conducted and the amount of pallets that shall be reworked.
5. **Call the MIX** at number: 0703-762191
   Notify them with this information:
   - The blocking number
   - The amount of pallets and which pallets that shall be reworked
6. **The MIX** delivers the pallets and moves these physically and systemically to the **Production Sin Bin**. Each line has an area where they shall be placed.
7. The production makes **RTP** (Return To Production) on the pallets that are brought back for rework. This is done systemically.
8. **Control** in the blocking database how the rework shall be conducted. Make sure that the current batch is finished before putting on the intended products for rework.
9. **Conduct the rework** and thereafter update the blocking database in section 2 with this information:
   - the amount of reworked collis/pallets
   - the amount of approved collis/pallets
   - the amount of collis/pallets that shall be destructed
   - the datum for when the rework was conducted
   - the responsible person who has conducted the rework must sign

   It is the operation managers responsibility that the blocking database always get updated after every rework is completed.

10. If pallets that have been delivered to production for rework **has not been reworked** they need to be sent back to the warehouse. This needs to be announced to the MIX.

11. For reworked pallets that have been **approved**, and for not full pallets that have been approved, the following needs to do:

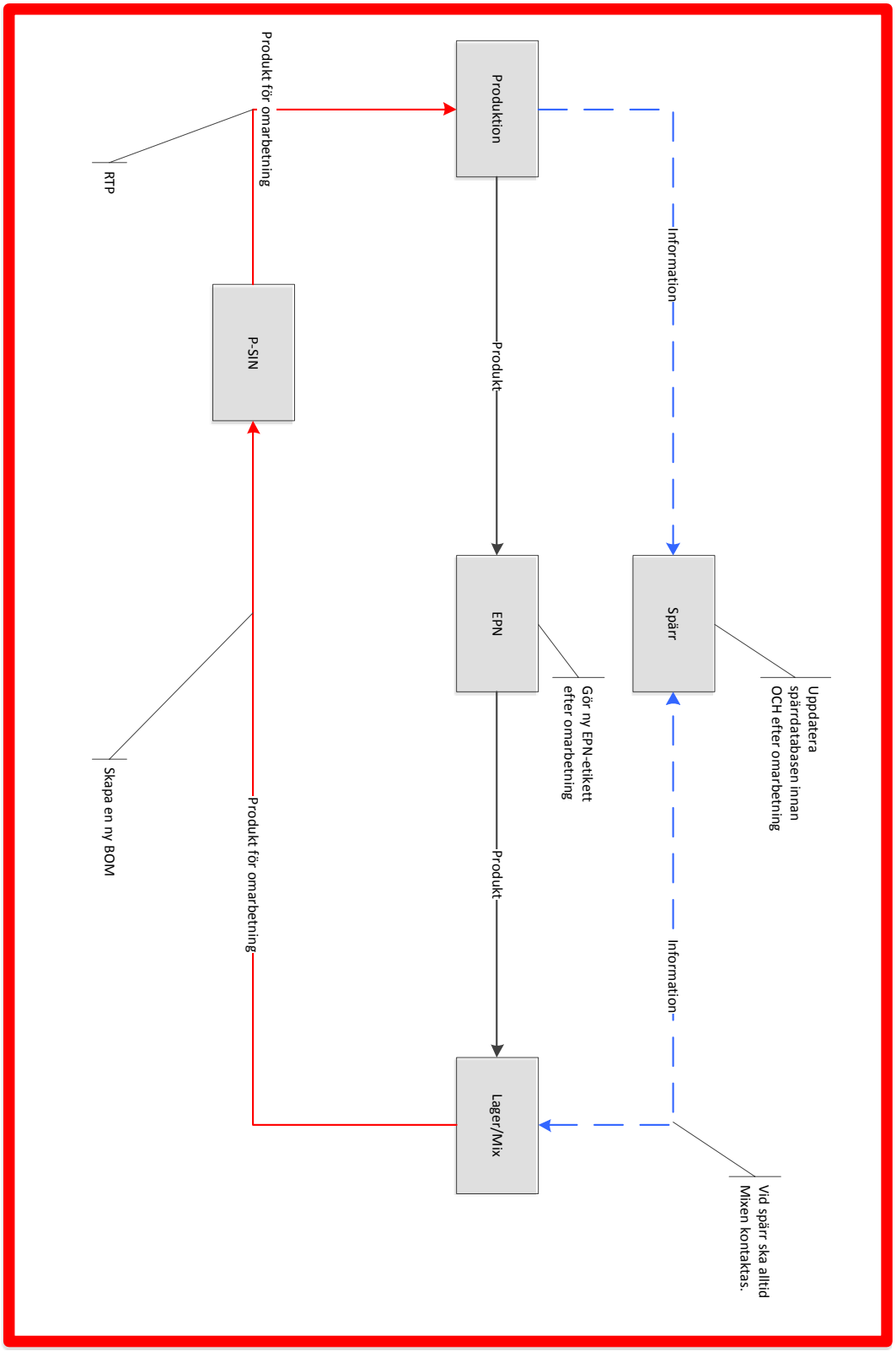
- Manually print out a **new EPN labels** for the reworked pallets and the not full reworked pallets. These get new pallet numbers.

- The operations manager **updates** the blocking database with the new pallet numbers.

12. Check that everything has been done correctly according to the routines.

13. For the products that cannot be reworked and needs to be **destroyed**:
- Put these in the red tubs
- The production needs to update the blocking database. Remember to after each new notation to **click on** "Click this button to mailsend a link to this document to the mailgroup sparrar" in section 1.

14. To **resume** with rework of blocked products, start from *


Produktion
Produkt för omarbetning
RTP
P-SIN
Information
Produkt
EPN
Spärr
Gör ny EPN-etikett efter omarbetning
Uppdatera spärrdatabasen innan OCH efter omarbetning
Skapa en ny BOM
Produkt för omarbetning
Produkt
Information
Lager/Mix
Vid spärr ska alltid Mixen kontaktas.

B. Interviews

Production

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2014-11-07

Questions for interviews to employees at production

1.) What kind of items do you have to rework on your production line?

2.) How does the rework procedure work?
- Is the reworking process a comprehensive process?
- How do you handle products that need to be reworked?

3.) Mention the most common causes that lead to rework?

4.) Why do you think that the traceability when re-working is sometimes lost?

5.) Is it machine-based problems or operator-based problems that leads to defect products?

6.) Do you have any ideas on solutions for the problem you´ve mentioned?

7.) Which time of the year is it most common that defect products occur? What do you think the reason is for this?

8.) Is the communication an issue that leads to misunderstandings?

9.) How do you handle destruction of products in the production?

10.) Is it bad training from Coca-Cola that leads to uninformed personal, which leads to defect products?

Warehouse

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2014-11-07

Questions for interviews to employees at the warehouse

1.) What kind of problems do you have with defect products in the warehouse?

2.) What do you think the reason is that defects occur in the first place?

3.) What do you do when defects occur?

4.) What do you do with products that need to be reworked?

5.) How does the recall procedure work?

6.) How does the destruction of products work?

7.) What are the causes to not find a specific pallet?

8.) How does the traceability work in the warehouse?

9.) If you could change something in the warehouse, what would it be?

10.) Which time of the year is it most common that defect products occur?
-What do you think the reason is for this?

Quality

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2014-11-07

Questions for interviews to employees at Quality

1.) What assignments do those who work with quality have?

2.) How does quality assure that defect products does not occur?

3.) Why do you think that defective products occur?

4.) What do you do when you discover defect products (from a quality perspective)?

5.) What is your role in rework of defect products?

6.) How does it work to do a recall of defect products?

7.) What do you do from a quality perspective during destruction of products?

8.) What do you do from a quality perspective to make sure that the traceability is not lost when reworking defect products.

9.) How does it work when you put defect products on hold?

10.) How are the employees informed about the importance of quality?
- Is this mentioned in the introduction training for new employees?

11.) If you could change anything regarding the quality, what would it be?

12.) Which time of the year is it most common that defect products occur?
What do you think the reason is for this?

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2014-11-07

Questions for interviews to employees at LAB

1.) What assignments do you who work in the LAB have at this company?

2.) What do you do when you discover defect products from a LAB point of view?

3.) Do you have any role regarding re-work?

4.) Do you have any role in the recall procedures of defect products?

5.) What do you do from a LAB point of view regarding destruction of products?

6.) Are you in any way linked to the traceability of products?

7.) How does it work when you put defect products on hold?

8.) Is it required to have more frequent intervals of quality controls on the production lines?

9.) If you could change something in the LAB, what would it be?