**CZECH TECHNICAL UNIVERSITY IN PRAGUE**

**Faculty of Mechanical Engineering**
**Department of Management and Economics**

# INCREASING THE SYSTEM EFFECTIVENESS OF ORDERING SPARE PARTS

Bachelor Thesis

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|---|---|
| Study Programme: | Theoretical Fundamentals of Mechanical Engineering |
| Field of Study: | The programme has no field of study |
| Thesis Supervisor: | Ing. Miroslav Žilka, Ph.D. |

**Šimon Chudý**

Prague 2016

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# Affidavit

I hereby confirm that my thesis entitled Increasing the system effectiveness of ordering spare parts is the result of my own work. I did not receive any help or support from commercial consulting organization. All sources of information and materials used are listed and specified in the thesis.

Furthermore, I confirm that this thesis has not yet been submitted as part of another examination process neither in identical nor in similar form.

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Prague, 29. 7. 2016 Šimon Chudý

# Acknowledgment

First, I would like to thank to my supervisor Ing. Miroslav Žilka, Ph.D. for professional advices while writing my thesis. Also my thanks are belonging to my co-workers for their priceless knowledge of systems running in Coca-Cola HBC and for their patience during discussions. Last but not least, I am thanking to all authors of used literature for their wisdom and advice written in their literature works.

# Annotation List

| | |
|---|---|
| *Author's Name:* | **Šimon Chudý** |
| *Thesis Name:* | Increasing the System Effectiveness of Ordering Spare Parts |
| *Název Práce:* | Zvyšování Efektivity Systému Objednávání Náhradních Dílů |
| *Year:* | 2016 |
| *Study Programme:* | B2342 Theoretical Fundamentals of Mechanical Engineering |
| *Field of Study:* | The programme has no field of study |
| *Department:* | Department of Management and Economics |
| *Thesis Supervisor:* | Ing. Miroslav Žilka, Ph.D. |
| *Bibliographic information:* | number of pages 49<br>number of images 29<br>number of tables 5<br>number of attachments 0 |
| *Keywords*: | spare parts, maintenance, lean system, ordering processes, inventory management |
| *Klučová slova:* | náhradní díly, údržba, štíhlý systém, procesy objednávání, řízení skladu |
| *Abstract:* | Description and analyzation of spare part processes with focus on ordering system. Using primarily lean approach, thesis is completed with proposals and recommendations for improving effectiveness in ordering and managing spare parts. Enriched by research orientated on operation management and spare part processes. |
| *Anotace:* | Popis a analýza procesů náhradních dílů so zaměřením na systém objednávaní. Použitím především štíhlého přístupu je práce doplněna návrhy a doporučeními pro zlepšení efektivity objednávání a správu náhradních dílů. Práce je obohacená o rešerši zaměřenou na řízení provozu a řízení procesů náhradních dílů. |

# Table of Contents

# List of Figures

# List of Tables

# List of Consultants

This list is consisting of employees working in Coca-Cola HBC, who had been consulted during the time of writing this thesis. In order to provide deeper knowledge and inside look on processes performed in the manufacturing plant, situated in Prague. Their experience and guidance had profoundly helped in process of creating this work. Suggestion, ideas, observation, information and knowledge gathered during the consultations had been used in this thesis.

(I) Ing. Michaela Kerak Bryxová, *Country Sustainability Manager CZ/SK*

(II) Mgr. Jiří Doubrava, *Maintenance Planner*

(III) Peter Gajar, *Indirect Procurement Buyer*

(IV) Ing. Tomáš Jirásek, *Manufacturing Plant Manager*

(V) Ing. Filip Kostka, *Maintenance Manager*

(VI) Ing. Ondřej Pekárek, *Production Manager*

(VII) Ing. Jiří Petráň, *Maintenance Specialist*

(VIII) Ing. Šárka Poláková, *Procurement Administration Key User*

(IX) Ing. Ondřej Šole, *PET Production Manager*

(X) Aleš Waloszek, *Maintenance Supervisor*

(XI) Václav Zeman, *Maintenance Stock Keeper*

# 1 Introduction

The purpose of this thesis is to assess and recommend better approach to system of ordering spare parts. This project is not only about procurement and purchase as someone might think but it also includes more important aspect e.g. maintenance, logistic, inventory management, warehouses, storage system or systems used for storing dates for those operations. These and many more aspects will be included in my work in purpose to explain, understand and analyse given system in the best possible way. This all would be done with focus on increasing effectiveness in spare parts processes in order to improve ordering, managing, decrease deliver times and outline a better system for storing spare parts. From these would not only benefit ordering of spare parts but also maintenance and production as well. Because a well-designed and well-set system of spare parts processes are essential for every manufacturing plant.

This thesis was performed as a part of Theoretical Fundamentals of Mechanical Engineering program at the Czech Technical University in Prague with collaboration of Coca-Cola HBC[1] as part of Trainee Program. Coca-Cola HBC does not reserve the right to protect their proprietary information. With their consent I would further in text include all information concerning the topic of spare parts. The following section provides closer information about company and thesis as general.

## 1.1 Company Overview

Coca-Cola HBC (together with its subsidiaries from time to time called "CCH") is one of the largest non-alcoholic drinks bottlers and vendors of The Coca-Cola Company's and Monster's products in the world, and the largest based in Europe. CCH is operating in 28 countries in three continents and it is headquartered in Switzerland, as seen in Figure 1. While the company has over 140 facilities across the world, the focus of this thesis is on one particular plant [1] [2].

[1] Hellenic Bottling Company

**Figure 1:** Map of countries operating under Coca-Cola HBC
(Each colour is representing one of 4 Regions of Coca-Cola HBC)

source: internal documents [2]

## 1.2 Plant Overview

Plant in which I am working is situated in Prague, Czech Republic. In this very same plant is also placed headquarters for the Czech and Slovak division of CCH. The division serve approximately 15 million consumers across the whole East Europe. It operates one bottling plant, and channel products through 14 warehouses and distribution centres in the two countries. The country division sales reached in 2015 approximately 280,3 million € in net sales. More than 1,500 people are directly employed and indirectly up to 10 times more jobs are maintained in company's value chain [3] [4].

From a technical point of view manufacturing plant in Prague consists from 5 different production lines and 4 different machines for preform injection. The full product plant portfolio contains of 116 different products in more than 12 volumes and 9 different packages, which are making together 431 producing combinations. Some examples of mentioned product are given in Figure 2 for better imagination with what we are dealing exactly. New products, sizes or designs are implementing in average every three months. The newest and fastest production line no. 8 can produce 36 000 finished products in one hour. Plant is operating 24 hours per 7 days in week and in this week, whole plant is in average producing more

than 800 000 finished products ready to by delivered in 20 countries across the whole East Europe. Spare parts for the plant are sourced from a mix of global and local suppliers, including internationals vendors specialise in technology and machines for food and PET industry e.g. Krones, Sidel or Husky [5] [6] [7] [8] [9].

**Figure 2**: Portfolio of The Coca-Cola Company


*source: internal presentation*

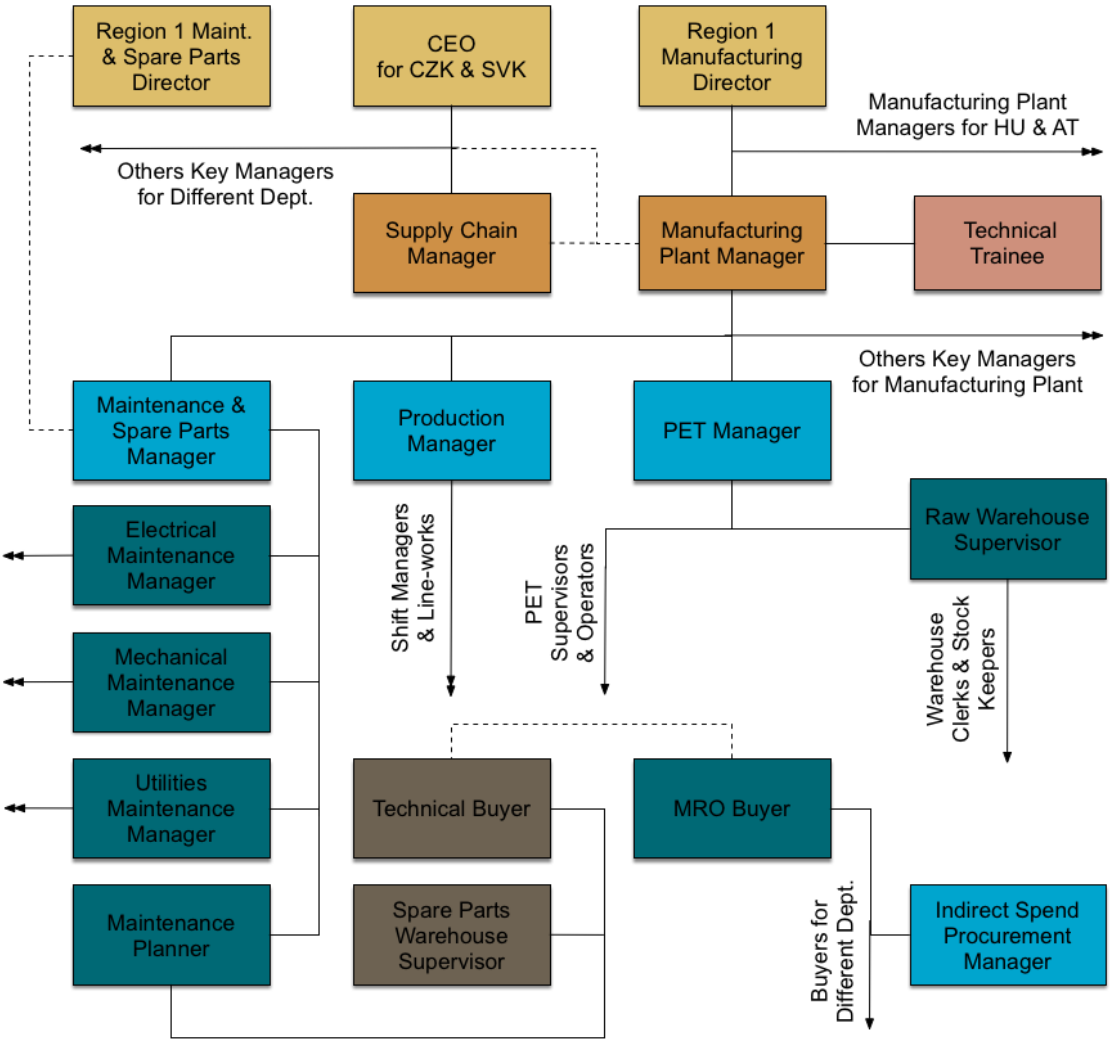
As a division we fall under Region 1, where also belong Hungary and Austria. The reason why is this structure important is that we as manufacturing plant are no longer reporting directly to our CEO for Czech and Slovak division but we are under the Region 1 Director. This is particularly important in way of setting goals for each plant. We are no longer working as plant for only ourselves but we are working as one big organism together to reach the best possible result. This has a big impact on the whole Supply Chain, where belongs also spare parts. In today's world it is getting common for the big corporations. The question if it is actually better or even if it is working is not the subject of this theses and I would leave it to others. But it is just a next step to total globalization.

The structure in most of the plants in CCH is called matrix structure of organization or matrix management. It is a way of managing people with more than one reporting line. That means spare part management belongs under maintenance, above which is manufacturing department as whole. But spare part management has also his own manager for Region 1. But that it is not all, logistic dept.[2] is also connected with manufacturing dept. in some way.

[2] department

Concerning of spare parts processes, there is also involved procurement dpt. And we all belong under each own region managers plus under each country CEO. At last, we are all part of supply chain. Part of this structure is seen in Figure 3.

**Figure 3**: Matrix structure of technical division in Prague plant,




*source: own elaboration, based on internal documents* [2]

## 1.3 Background and Motivation

In 4th of January I have started to work for CCH as a Technical Trainee[3]. One of my first tasks was to manage ordering of spare parts. As I had no knowledge about this matter what so ever I had struggled and the begging. But after few weeks, I have found this task very enriching for me and I have dived in to the universe of spare parts. That is also why I had

[3] an official employee that is being trained within a company

chosen this topic for my thesis. On which I will refer further as a project because truly speaking it is a project, which is summarised in this thesis.

To better understand my view on the project, I had in previous section describe the structure of company. My view on chosen topic would be mostly from maintenance point of view as in CCH is structure made in this way. It is important to understand in beginning that work in progress inventory and finished goods inventory belongs in logistic dept. On the other side raw material inventory and spare parts inventory belongs in manufacturing dept. Nevertheless, I would sometimes concern this project from logistic point of view but maintenance and production would definitely dominate as there is direct connection with spare parts processes. The reason why I am mentioning this is mainly because it cloud get little bit confusing sometimes and is good to set it right in the beginning.

## 1.4 Thesis Goals

The primary goal of the project is to the set current state of spare parts processes[4] within the company's department. Afterwards analysing these spare parts processes with focus on increasing effectiveness. This would be done with main focus on ordering and managing orders of spare parts. Next, recommending possible improvements in field of spare parts processes as general. These goals would be accomplished through the studied literature and trends in field of spare parts, by tracking up the process and discussing issues with people in management as well as with front line staff, whom is actually working in these process. Mainly, these could lead to improving ordering system of spare parts while maintaining and increasing effectiveness of inventory system. Furthermore, decrease deliver times and improving parts availability in the right time on the right place. In addition, it could lead to decrease held value in spare parts.

The reason why I would not strictly focus on ordering and purchasing systems is very simple. I had hinted this in the begging of this chapter and I will finalize this thought. Spare parts processes are a complex issue, where is one thing connected to another. Together they are creating an organism, on which must we look as a whole. Yes, we can choose on part of it and more or less focus on it but we must not forget about others parts as well. Because a system is only good as the weakest link in the chain. We must not also forget that

[4] under process is meant ordering, storing, managing, suppling etc.

spare parts belong in operations field and I could not more agree with this quote *"Operations aren't about doing things right. They're about doing a lot of things right at the same time"* [10].

## 1.5 Thesis Structure

*Chapter 1* provides introduction to the company and background of the chosen theme.

*Chapter 2* sets theoretical background for thesis and describes necessary theory concerning of spare parts.

*Chapter 3* identifies the current state of the company's spare parts processes and further analysing them and discussing accrued issues

*Chapter 4* provides context on opportunities for improvement and recommendations on increasing effectiveness by applying spare parts management practices

*Chapter 5* summarizes the project finding and recommendations, it also assesses the thesis in general

# 2 Theoretical Background

This chapter will review the most essential terms concerning theme of spare parts. These descriptions would be enriched by examples from the studied department. It is done with the intention to help the reader connect theory and real usage. Personally, I find this very helpful and meaningful given the chance to use materials from running system. It would be shameful to overload reader with poor theory without giving any example, on which is the theory best describe and understood. In addition, main methods for approaching improvement in ordering of spare parts will be presented.

## 2.1 Operations Management

The fact that SPP[5] belong under operations was mentioned earlier. But what are really operations in business organizations and what can we imagine under this term. "***Operations** are processes, which are transforming inputs in to outputs by adding value to them"* [11]. And this is the most essential function of operations. Operations are producing goods and/or providing services. In CCH we are producing non-alcoholic beverages, which are goods, hence I will refer to operation only as production of goods. But let's not forget that operations determine the quality, cost and timing of the producing goods. Thus, operations are the core division of every technical organization. And the core is managed by operations management. Metaphorically speaking**, operations management** is like neurological system of human body. With operations is intrinsically linked supply chain and no technical organization could exist without both [10] [11].

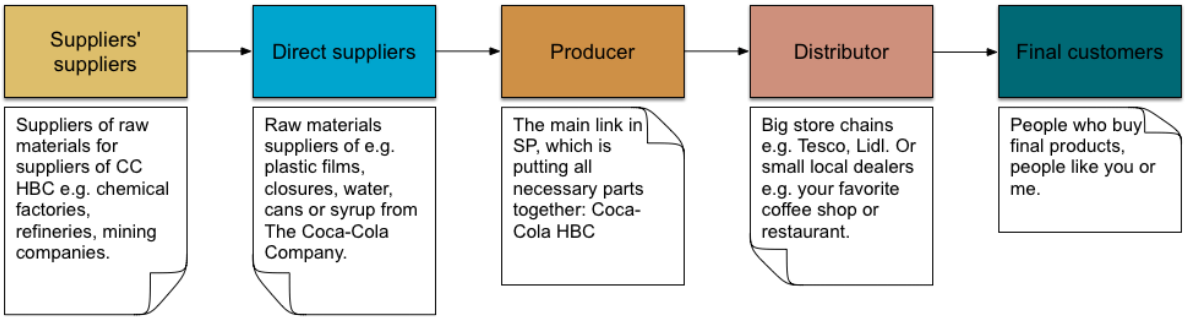
### 2.1.1 Supply Chain

A supply chain is one of the most essential systems in today's world. Because there is no single organization, which is mining materials, processing them in necessary shapes and sizes and afterwards assembling them all together and even selling them to end customer. It is not even possible in today's world, which is all about specialization. Thus, **supply chain** is sequence of organizations and their divisions, which are responsible for their operations. The sequence begins with basic suppliers of raw materials and extends all the way to the final customer. In Figure 3 is seen skeleton of supply chain with some examples of possible

[5] spare parts processes

companies, which are involved with CCH in supply chain. Therefore, supply chain is responsible for delivering the right goods/services for the final customer. That is the main reason why well-working supply chain is important. *"A product or service is only good as the weakest link in the supply chain"* [10]. Thus, unreliability supplier of closures for PET bottles, which is delivering goods out of specification and in bad condition is stopping production from producing goods within the quality specification in due time. The supplier is make complications, with which must deal the management as well as line-workers and by that slowing down the whole production on given production line [11].

**Figure 4**: Simple scheme of supply chain




source: own elaboration based on [11]

### 2.1.2 Manufacture

Manufacture as terms is sometimes confused with term of production. These are two different things in field of operations and is good to understand the different between them. When we look on exact description of them in Cambridge English Dictionary, the different can be seen clearly.

- manufacture *verb* - to produce goods in large numbers, usually in a factories [12]
- production *noun* - the process of making or growing goods to be sold [13]

Therefore, manufacture is whole system concerning of manufacturing goods and production is the essential process and one of many subdivision belonging under manufacture. This could be seen in Figure 2 above, where is the structure of manufacturing plant shown.

### 2.1.3 Lean Operation

Lean approach in manufacturing would be one of the key theories, which will be used through this thesis. In this subchapter would be lean as a system introduce and further in text will be discussed particular approaches for improving effectiveness in ordering and managing spare parts.

To truly understand the lean approach is essential to discover its origin. Lean system of manufacturing began in the 19th century. It was developed by Japanese automobile company Toyota. It was influenced by Japanese culture itself and by Japanese mentality. Surpassingly enough, influence of Henry Ford and his production system of General Motors was also very crucial.

Ford's system is called JIT[6] and it was operational 60 years before the Japanese had started to learn from him. However, they did not only learn but took his system and make it better by using their culture and thinking, which was mainly cause by lack of recourses. Thus, lean system is aimed on eliminating waste and by that improving effectiveness continuously with goal to reach excellency. Therefore, lean approach is not about productivity but it is about removing waste from the manufacturing processes and building quality and by those actions improving productivity. Moreover, lean system is also a philosophical approach, which is essentially in implementations and in sustainability over long period of time. Summary of lean basic elements would these: minimalist approach in every flied, flexibility, elimination of waste, quality and continuous improvement.

Helping ensuring these elements had Japanese developed many methods e.g. Muda, Kanban[7], Heijunka[8], Kaizen or Jidoka[9]. These methods are only names of each elements approach as for example Kaizen is continuous improvement of the system or Muda is waste and inefficiency. It is very important to realized that not all steps of lean are good for every production plant. Also you do not have to use these terms to use have a lean approach. In my opinion, is critical to understand the idea of lean and its philosophical approach on things. Than you can customise it according to yours conditions and use only those things,

[6] just-in-time
[7] a manual system that signals the need for parts or materials
[8] workload levelling
[9] quality at the source - autonomation

which will improve your processes. Thus, making such a decision is crucial in every implementation of new system and it takes true wisdom to decide right [11] [14].

## 2.2 Maintenance

In the scheme of manufacturing, maintenance is one of the youngest part, which has not been long around. It is mainly because there was not really something to maintain. At least not in the way as we see it today. "***Maintenance*** *is a sequence of actions, which are taking care of facilities, machines or equipment"* [11]. It is done with intention to extend their life duration, keep them in good-working order so they can produce products in requested quality as was intended and mainly to prevent breakdowns[10] and when they occur being prepared for fast and swiftly fixation. Moreover, maintained also includes the very fact of planning, which essential for it because there is not really a way of maintaining something without prediction of failure.

As can be clearly seen by its very nature maintenance was not really necessary till the industrial revolution or it was not used in the right way. By the time machines and tools started to become more complicated and the need for accurate and quality product has started. Main share on developing maintenance has also the military industry as on most things. During the first world war occur the need for good and stable function of equipment and the best way to ensure it was by regular maintenance. Later in 20th century, companies have started producing their products with the fact that they need to be later repaired and regularly maintained. So the real maintenance was born and it became an essential part of manufacturing industry [15] [11] [16].

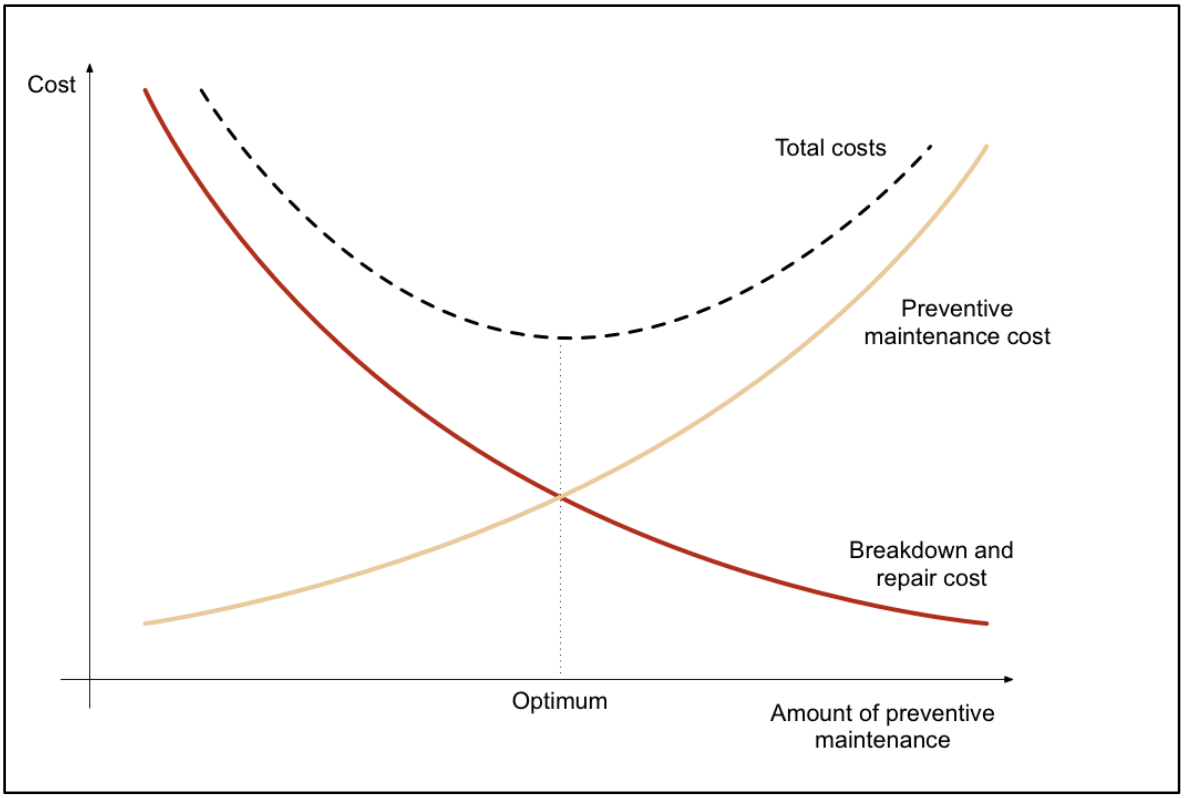
Today, in manufacturing plant is maintenance same as production one of subdivision belonging under manufacture. We can organize maintaining activities in to categories: (1) **buildings and grounds** and (2) **equipment and machines** maintenance. In this thesis will be concern only maintenance of machines due to very nature of spare parts. The essential goal of maintenance is to keep the production system working at lowest possible cost. Before it was just mode run to failure and buy or made a new one. But as we develop as a civilization we had found out that it is much easier and cheaper to just take good care of

[10] failure of machine or one of its part in such a way that production cannot continue

equipment. By keeping this goal, we had developed waste system of planning and scheduling maintenance [15] [11] [16].

There are two basic approaches for maintenance. One is **breakdown maintenance**, which is dealing with breakdowns or repairs when they occur. The second one is dealing with preventing those breakdowns or failures through a system of lubrication, cleaning, monitoring, inspection, and replacement of parts before their break down. This is called **preventive maintenance**. It is really a proactive approach with intention to prevent bigger losses, what is the key act of maintenance. However, in a certain point, the cost of preventive maintenance activities exceeds their benefits. For example, lubricating and monitoring machines by technics every day would be very costly, it would prevent the machines from production and it probably will not make much different. Machines are constructed with intention to endure sometime. On the other hand, not caring about the and waiting till they breakdown will not have good consequences either. Thus, the best approach is to seek balance. This idea is illustrated in Figure 5 [15] [11] [16].

**Figure 5**: Function of total maintenance cost depending on preventive maintenance effort




*source: own elaboration based on* [11] [14]

### 2.2.1 Preventive Maintenance

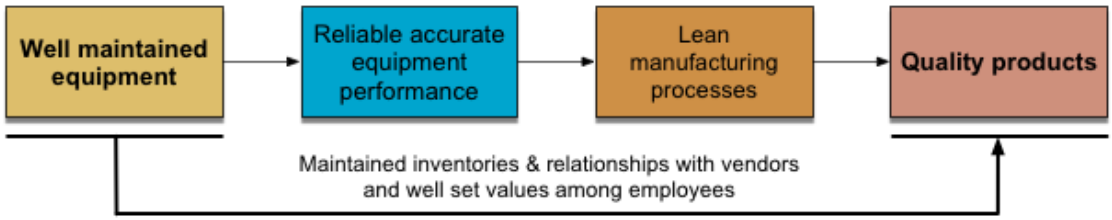
As is written above, the goal of preventive maintenance is to reduce the risk of breakdowns or failures in the plant. Thus, to keep this possible is necessary to maintain inventories of spare parts, repair tools or equipment and repair technics. By this very fact we are getting to the point why is maintenance responsible for spare parts. Preventive maintenance is carried periodically. Its scheduled and planned most of the times way ahead. It is done with intention on the operating hours, experiences of the line-workers or depending on frequency of failing parts [11].

### 2.2.2 Lean Maintenance

In previous subchapter 2.1.3 had been briefly touched the main idea of "Lean Manufacturing.", where Taiichi Ohno is generally acknowledged as the father of Toyota's lean production system. Key law of lean maintenance is saying that properly maintained manufacturing equipment makes many products (concerning given production) in required quality. Therefore, lean manufacturing can never achieve the best results without proper lean maintenance. By its very definition, lean means production of goods in required quality at the least possible cost. Thus, without maximum equipment reliability can be never achieved maximum product quality. This idea is illustrated at Figure 6.

Many authors agree on idea the in manufacturing system have to be first implement lean maintenance on best possible level and then can start transformation to lean manufacturing, as seen at Figure 6. In my opinion, it should be done concurrently with focus on maintenance. Therefore, lean approach in ordering and managing spare parts is crucial for running production plant. Without it can be produce quality products, in required time and volume. Thus, we are getting to do main point of this thesis and that is improving effectiveness of ordering spare parts. Now can be clearly seen why it is so important and crucial in every modern manufacturing plant. More particular improvements will be included in next chapters but the key one can be seen already in Figure 6 [11] [14].

**Figure 6**: Lean manufacturing in concept of maintenance and spare parts processes




*source: own elaboration based on* [12]

## 2.3 Spare Parts

Focus in this chapter will be on nature of spare parts with examples from concerning plant. Business of spare parts has become in couple of years very profitable among big producers of equipment. It is based on fact that organizations are constructing unique machines, thus no one only you can sell the necessary spare part to keep those machines running. Hence, you had secured business for long time period if you can manage to sell at least few equipment. Your customer will be forced to buy parts only from you because no one on the market will offer them and also only you will train technicians for implementing these parts. Of course it will be possible to implements adjusted parts but it will not runner smoothly as with the origin parts. Additionally, the possible value of other parts might be decreased due to internal mechanisms in machine. Step by step you will pay the new machine many times over and over by buying new spare parts.

Thus, the question of finding the right moment to buy a new machine has appeared. This is one of those question, which take true wisdom to decide right. In CC HBC as in many origination is more reasonable to buy continuously spare parts of smaller values. And when it is absolutely necessary than buy new machine or equipment in much bigger amount of money. Making this decision takes lot of conserving fact like financial situation, possible improvement, refund of money by better production etc. But this is theme for another project. In this thesis, the point is to realised how complex is the system of spare parts. It is due to fact that almost all components used in manufacturing plant must have its own spare part. Thus, types and number of spare parts or in other words calcification is significant in order to manage them properly. But what exactly is really a **spare part**? It is an extra part of function system, which is put a side and used in replacement of broken or damaged parts when machine cannot longer operate [17] [15] [18] [19].

### 2.3.1 Classification of spare parts

In field of classification for spare parts can be find vast number of methods. As usually, not all of them are good for every environment and is necessary to decide right in order to have right spare parts ready on time. The most used classification in maintenance is by criticality of spare parts [18].

- **critical parts**: without these cannot machines operated, high failure rate and have a long procurement times
- **noncritical parts**: machine can by operate (at least on lower level), high level of reliability, can be purchased in short time, can be made from scratch or by modifying other spare part and high rate of applicability

In inventory management are spare parts classified in two categories as well.

- **non-stock material:** SP which are recorded in system but are not placed in inventory,
- **stock material:** SP stored in inventory under specific number and place

In those categories can be placed both critical as well as noncritical. The decision has to be made by gathered evidence consisting of historical data, price, delivering time etc. For example, injector of nitrogen on production line 8 had been classified as critical part. But is not placed in the inventory even that machine cannot work properly without it and it has long deliver time. On the other side, it has a low failure rate and its very expensive. Thus the criticality of SP does not determine its position in inventory. Moreover, SP are classified in these two categories [18] [20]:

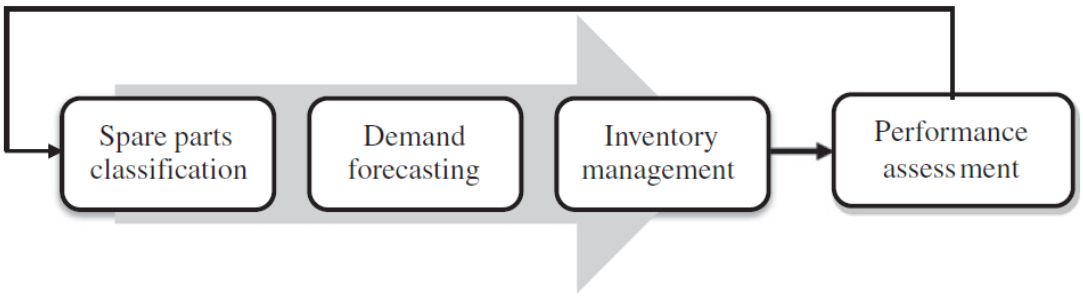
- **repairable:** SP which can be repaired and use again
- **non-repairable:** SP which must be after failure replaced be a new one

This is not the over, there are more and more possible classification of SP e.g. by price, by impact on product quality, by life cycle, by suppliers, and many more. Important is to decide the right parameters for particular production. For these decision is used spare parts management [21] [20].

### 2.3.2 Spare Parts Management

Spare parts management is dealing with all decision, which can occur in fields of SP. It includes e.g. inventory management, ordering policy, forecasting and predictions methods, equipment tracking and reporting or a failure prediction system. The biggest problem, whit which is SPM[11] facing is the problem of keeping large quantities of SP in stock, resulting in unreasonably high financial value held in inventories. However, it is not the main issue, with which are maintenance managers dealing on regularly basis. It is due to very nature of spare parts and inventories. This problem is not felt immediately and has not direct impact on production. Even, it may be seem sometimes as it is rather helping the production. But it just an illusion and soon or later every maintenance manager has to face this issue in order to improve operation of maintenance department. Thus, some organization may decide to implement separate position in organization structure, who will be conserving with SPM only. Possible approach of spare parts manager is shown in Figure 7 [21] [22].

**Figure 7**: An approach to spare parts management,

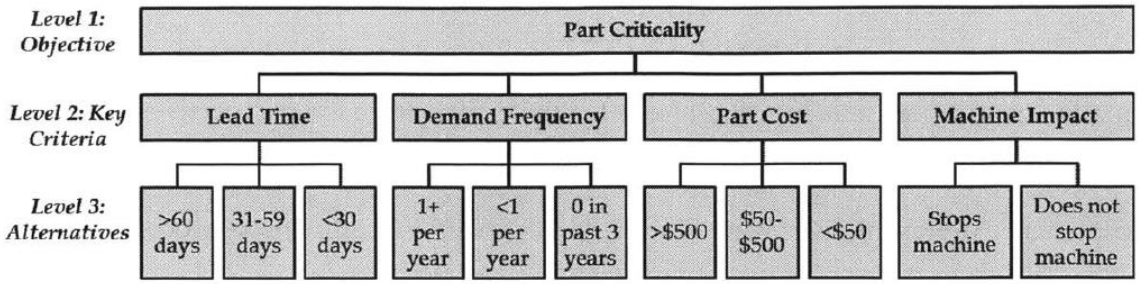



*source: literature* [22]

Further continuing with previous topic of classification, comes SPM in place. Today are used many different approaches or methods concerning of even more many different parameters. As was sad before the crucial point is adapt them for particular industry and particular plant. These methods are best shown in process diagram such as one, which can be seen in Figure 8 [20] [21].

[11] spare parts management

**Figure 8**: Spare Parts Criticality Classification

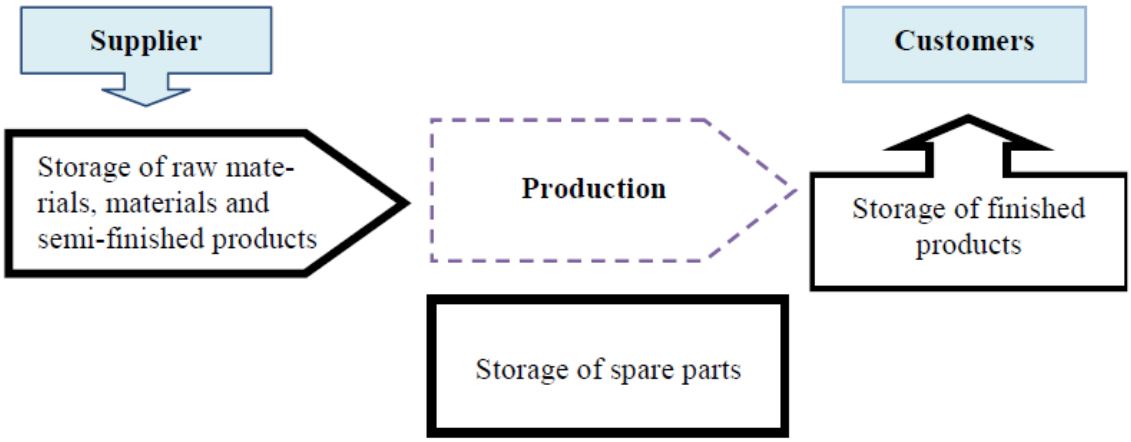



*source: literature* [17]

### *2.3.2.1 Inventory Management*

Spare parts inventory as was briefly mentioned in part 2.3 is needed for maintenance and repair of final equipment, industrial machines or other tools used in plant. It is principally requiring high investments without immediate profit. Moreover, collected value in SPI[12] is creating redundant financial losses due to the annual taxation. Inventory management is part of SPM managing and controlling inventories of spare parts. It is very complex system of parts due to the large number of different items and low demands. Right from the beginning is crucial to point out that SPI are different from other types of inventories in companies. Thus, the methods and knowledge applied on spare parts inventories have to be adjust. In Figure 9 is put this fact in concept with others inventories in manufacturing plant.

**Figure 9**: Stages of inventory formation in manufacturing plant




*source: literature* [23]

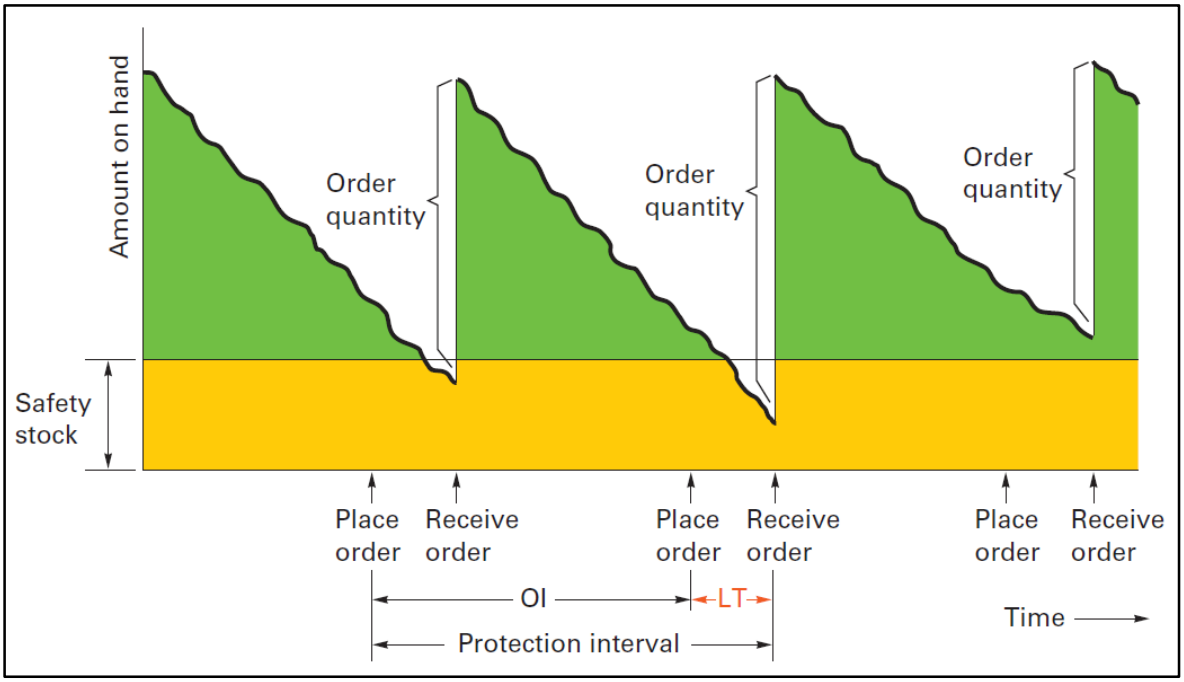
[12] spare parts inventory

In the analysis of inventory have to every good manager of spare parts answer the following questions [23] [19] [24]:

*What is the best classification to use?*
*Which spare parts to stock or not to stock?*
*How many pieces to keep in stock?*
*How many to order them and when?*
*Which spare parts need safety stock?*

In the field of inventory management must have each spare part his own identification, by which it can be stored in inventories. Where it can be easily find with all necessary information, which are connected to the number e.g. history of purchase, price development or equipment documentation. Traditionally, **stock-keeping** unit or SKU is used as this identifier. Thus, SKU is a specific number referring to a particular stored spare part at an exact location. But SKU as term is not bound for inventories, its broadly used in all manufacturing plants as a number of identification [23] [19] [24] [25].

**Figure 10**: Safety stock reduces risk of stock out during lead time




*source: literature* [11]

One of broadly used methods in SPI or in inventories general is safety stock. It is not something very complicated but on the other hand very efficient. **Safety stock** is extra amount of parts held in inventories in order to reduce the probability of stock out during lead time - LT. In Figure 10 is this term shown, where OI is referring to order interval [11].

#### *2.3.2.2 Ordering of Spare parts*

Ordering is another important part of SPC. It is the front line of every organization, when speaking of SPC. It caused by the fact that technical buyer is the person, which is most of the time communicating with vendors and he is making the first impression. He is also building relationships, negotiating prices, choosing from whom to buy or try to lower down delivery times. But the main problem is that we are getting on the edge between two different department videlicet procurement dept. and maintenance dept. Traditionally, the problem is who is responsible for what exactly. Thus, is good to set clear boundaries between these two departments. Best possible outtake is when they are working efficiently together. Usually, to manufacturing division is referring as **MRO** in procurement. Which means maintenance, repair and operation.

### 2.3.3 Software

Through the sections 2.3.1 and 2.3.2 had been discussed all main information concerning of spare part processes and how to manage them properly. But there was not mention any software for gathering all that information and producing useful outputs. So let's have a look on couple of them.

#### *2.3.3.1 SAP*

One of the best and most used software is SAP. The acronym means **Systems applications** and products and it is translation from German: Systeme, Anwendungen, Produkte. *"SAP, started in 1972 by five former IBM employees in Mannheim, Germany, states that it is the world's largest inter-enterprise software company and the world's fourth-largest independent software supplier, overall"* [26].

It is software used broadly across many different companies. Mainly effective for big corporations, hence it was designed with intention on managing large amount of data, processing them and producing useful outputs. Frankly speaking, in today's world I think it is not able to manage large amount of data without any software like SAP. Thus, Coca-Cola HBC is not an exception. Moreover, SAP is also useful rather sad critical in ordering of spare parts. It is the essential point where is everything gathering and processing. Hence, it is the best tool for technical buyer to help him manage request, orders or intakes.

In addition, SAP is used as an essential tool not only in ordering but across the whole company for plenty of different operations. More on how is SAP used in spare part process and what it takes to work with it, is included in section 3.1. Where would be analyse and discussed SAP in real usage.

#### *2.3.3.2 Other Software*

The market is offering couple of alternatives for SAP even the immediate choice for most companies is SAP. As it was for Coca-Cola HBC. Thus, there is no real option of changing the BI[13] software also there is even no need for it, the overview had been written on in informative sense. Traditionally, the opinion is that SAP and **Oracle** are the only good options on the market, but that's just not true. Because do not forget that, there are also small or medium business, which does not need over complicated system such as SAP or Oracle. Moreover, there software specialized in just one particular usage e.g. HR, IT or planning.

The first on the list is **IBM Cognos**. "*It is a large, sprawling suite of BI tools and infrastructure best suited to the needs of large organizations, and most likely those with an existing IBM commitment*" [27].

Or software from Microsoft Corporation like **Microsoft Dynamics AX**: "*Designed for midsize to large enterprises, this solution is a primary competitor to Oracle and SAP. Because it requires significant customization, the implementation period can be lengthy*" [28].

And his alternation, **Microsoft Dynamics GP**: "*While this system is ideal for small to midsize organizations, it is more functional out-of-the-box and requires a lot less customization than AX*" [28].

And there are many more other alternatives e.g. Intacct, NetSuite ERP, Micro Strategy, QlikView, SAS BI, JReport, Sage 300 or Sage X3. If the reader is interested in exploring further these software, I can recommend web page[14], which I had find really interesting [28] [27].

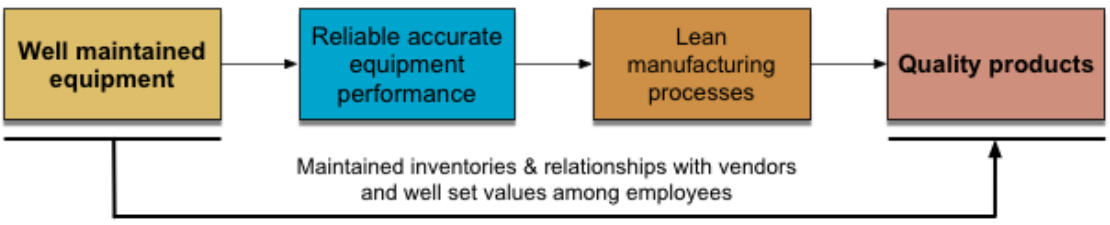
[13] business Intelligence
[14] *https://www.g2crowd.com/products/sap-erp/competitors/alternatives*

### 2.3.4 Lean Approach

Step by step we are getting to the point of implementing the ideas of lean system, therefore it would be good to summarize the key idea of lean approach. It means transformation of the whole organization culture, hence thinking of employees. Not only managers on high position but every sing stuff member operating in organization. Including line-workers, who are absolutely crucial because they are actual doing the work. If they do not get the main message of lean system, it cannot work properly. It is not a simple thing to do and is necessary to realise the main point as it was written by Ricky Smith and Bruce Hawkins: *"Lean Transformation is a journey, not a destination. Sustainment of the continuous improvement characteristic requires dedicated, committed leadership. It requires continual training and upgrade of skills, to include broadening those skills to cover diverse and non-restrictive job tasks"* [14]. In implantation of lean system in manufacturing facilities is important to explain and make sure that line-workers had also understood this main idea. Thus, workers need to be trained not only to function in the system but also to continuously improve it and that cannot be done without lean thinking [14] [11].

In previous chapters 2.1.3 and 2.2.2 had been described the key points of lean system and necessity of well implementing lean maintenance. Now we will look on the key factors of application lean system on spare part processes. Moreover, how we can improve them by lean approach. Thus, improving the whole final product because the system is only good as its weakest point. The key areas for improvements were already mentioned in 2.2.2. For better clarity the same illustration is given in Figure 11.

**Figure 11**: Lean manufacturing in concept of maintenance and spare parts processes




*source: own elaboration based on* [12]

In the matter of spare part processes, there are two key approaches in the name of lean manufacturing. It is close relationship with vendors and minimization of inventory storage.

And from the first look on these fields it is clearly seen the core of lean, it is about waste reduction and elimination. Thus, let's look on each of them in closer view [14] [11].

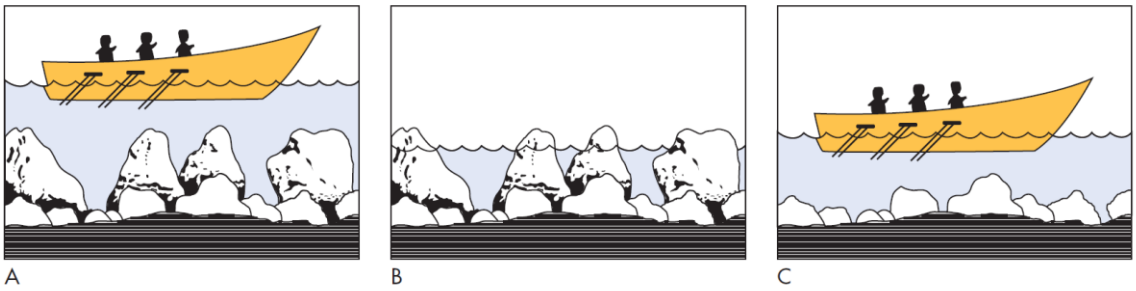
#### *2.3.4.1 Minimization of Inventory Storage*

When speaking about waste reduction, in lean philosophy is inventory storage a waste. Inventory is a shield, which tend to cover up recurring problems that are never resolved. Mostly because as was point in 2.3.2 it is caused by the nature of inventories itself. Problem with inventories are not oblivious and mistakes or mismanaging inventories cannot be seen immediately. Large inventories can be judged as perfect from narrow point of view. For example, when a machine breaks down, it will not be judged as wrong if there is a plenty of spare parts in inventory for the machine. But from a much broader point of view and mainly from lean point of view it is absolutely wrong and we have to focus on the cause of problem not gathering SP to keep solving these problems.

The use of inventory as the "solution" can lead to increasing amounts of spare parts, therefore gathering large amount of money held in inventories. A better solution from lean perspective is to investigate the causes of machine breakdowns and focus on eliminating them. Minimization of inventories under lean philosophy means to pare down inventories continuously in order to uncover the problems, which are hidden in inventories. Once these problem are uncovered and solved, the system can function better with less inventory and wider ranger.

A useful analogy was used in William Stevenson in his 11th edition of Operation Management. This illustration is seen at Figure 12. Large rocks are representing the problems that can block production, which is the boat. They are hidden by a high water level (inventory) in A. When is the water level lowered, the largest rocks are the first to appear and they are the largest problems themselves. Those problem can be such as bottlenecks, gathering waste, bad planning or poor timing. Hence, by removing the large rocks is the water level (inventory) lowered (C). Thus, lean inventories are bracing the idea that: *"Low inventories are the result of a process of successful problem solving, one that has occurred over time"* [11].

**Figure 12**: Metaphorical illustration of inventory improvement,




*source: literature* [11]

### *2.3.4.2 Close Relationship with Vendors*

The idea of eliminating waste in inventories was quite clear but to understand it in concept of relationship with vendors is not that easy. To understand it properly let's have a look what it means in lean concept. For lean systems is typical to have close relationships with less amount of vendors that in ordinary manufacturing plant. From these small number of close suppliers are excepted deliveries of high quality products in the shortest possible delivery time. All done with fixed price, which are mostly negotiated ahead. This all is built on good and close relationships between buyers and sellers. Traditionally, a spirit of cooperation between buyer and seller is somehow different. It is built only on one major factor and that is price. Thus, multiple scale of vendors is necessary in order to keep up with the price determinant. *"In this way, buyers play vendors off against each other to get better pricing arrangements or other concessions"* [11]. And this is holding down common sense and friendly relationships, which are key in lean manufacturing. Buyers cannot rely on vendors and vice versa. They do not trust each under and it is slowly building up problem after problem. Thus, the idea of eliminating waste means to sort out vendor list and start to working up good relationships, which are built on trust. In order to improve ordering system, by lighting it up from vast scales of vendors [11] [14].

## 2.4 Summary

Goal of this thesis is really to improve ordering of SP[15], where is already assumed that SP are classified in right way, inventory management is well set, maintenance is running smoothly and everything is going according to plan. As was written above, these processes are strictly connected and I do not want to contradict myself but there is no space for this

[15] spare parts

subject. It could be written thesis on its own and it might be still not enough. Thus I tried to simplified things as much as was possible but still stay true to the subject in order to explain terms as clearly as possible in bigger scheme. By bigger scheme I mean maintenance and manufacturing as division.

# 3 Analysis

Aim of this chapter is description of existing spare part processes in Coca-Cola HBC from an ordering point of view. Moreover, the analysis of these processes will be given based their analysis. Primarily focus of analysis will be on improving effectiveness of process by implementing lean approach and knowledge gained during spent time in department. This knowledge is based on my own observation, on discussion with other workers and on information collected form studied literature and internal documents. Chapter is built from two major parts that is to say from inventory and actual management of orders. These two parts are closely connected also because there are belonging under management of one person. Ultimately, it is built on theoretical knowledge mainly consisting from section 2.3 and its subsections.

## 3.1 SAP

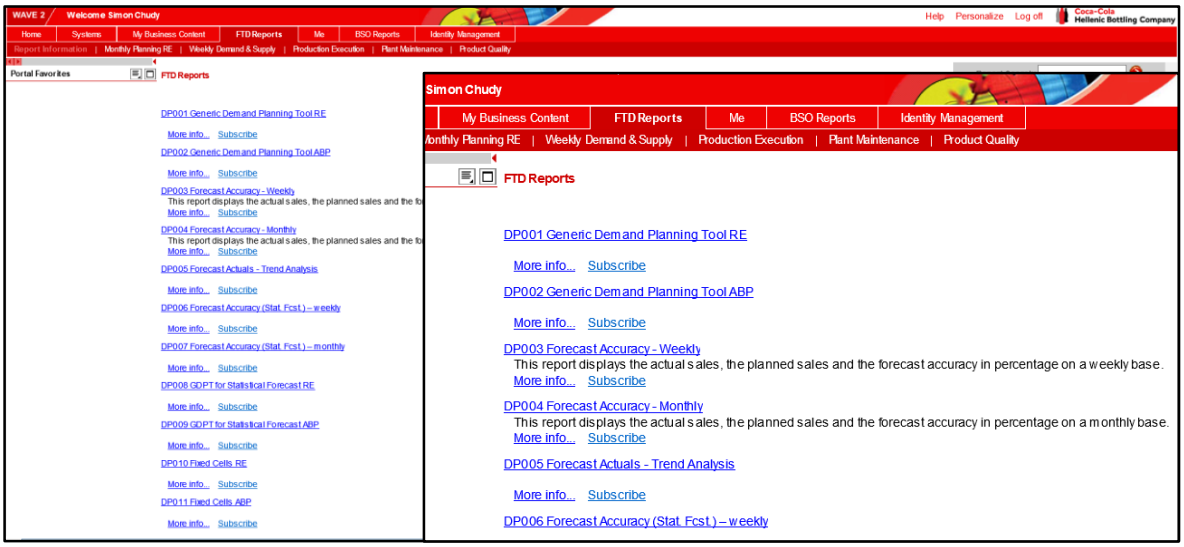
Thought the chapter will be mentioned SAP system as the main software for managing data as was already mentioned in section 2.3.3.1. Thus, is good to set the ground before the beginning. By that is meant defining what version is actually in usage and what it can do.

The SAP implementation started in year 2005 called as wave 1 and it was only concerning the manufacturing department. And as it was judged as success, wave 2 had followed in year 2008, which was not that smooth as everyone had hoped. There had accrued big problems with deliveries and invoices for the customers during couple of months. Thus, there had been financial losses but it had not ruined the company, rather it had shown how strong is the company. Moreover, after tuning the system up, it had helped the company in significant way. After all, everyone will agree on this with me, that today can no one imaging working without SAP.

At this very moment is used by supply chain R/3 ERP version of SAP system. The main implemented modules are Finance (Fl), Controlling (CO), Material management (MM), Sales & Distribution (SD), Production Planning (PP), Warehouse Management (WHM). There are two interfaces or variation of this version in use. One is implemented in web browser (Figure 13) and the other is the software itself (Figure 14). Regarding the spare part processes is used mostly the second. It is because the second variation is used from inputting data and

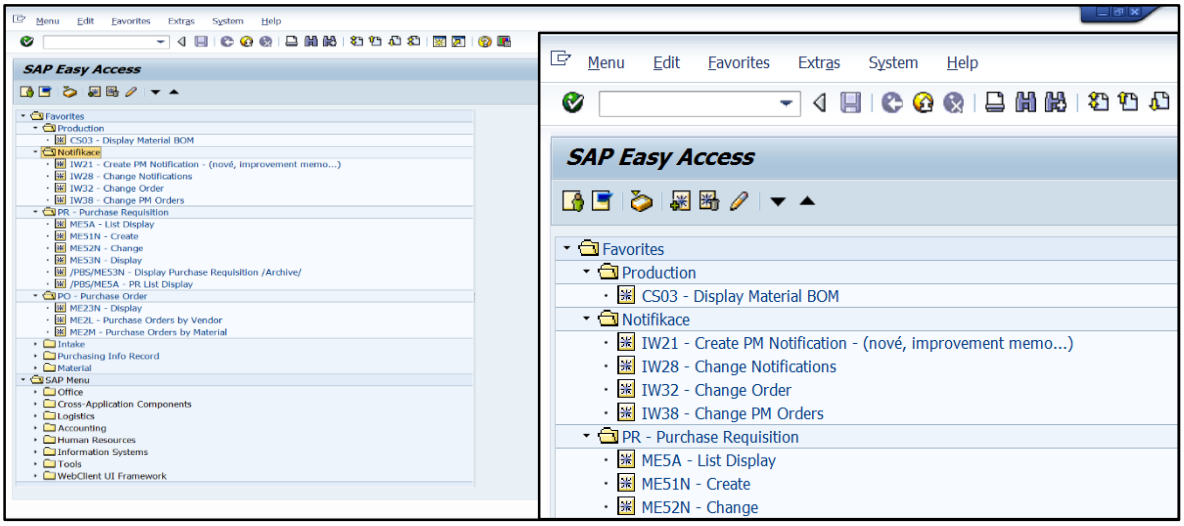
working with them. The first variation is used for showing and working with the outputs of these data e.g. by SAP generated graphs, statistics or overviews.

**Figure 13**: Interface of SAP Portal




*Source: Coca-Cola Hellenic Bottling Company*

**Figure 14**: Interface of SAP ERP Software




*Source: Coca-Cola Hellenic Bottling Company*

## 3.2 Inventory of Spare Parts

Spare parts warehouse in Coca-Cola HBC is placed in the best possible position and that is as for every inventory type just front of the production area. Where are part near and accessible when there is a need for them. Warehouse is consisting from two floors where on each floor are placed storage systems such as shelving units or stand etc. On ground floor are situated part which are using more frequently than others. For example, expendable

materials, material waiting to be placed in to the shelves or spare part waiting to be used directly in production. Whole inventory is taking 430 $m^2$ of space. For better imagination of what we are dealing with, can be seen picture of inventory in Figure 15.

**Figure 15**: Photo of spare parts inventory


*Source: Coca-Cola Hellenic Bottling Company*

As was written in 2.3.3.1, there are many ways of SP classifications. But for a point of inventory and also from point of buyer are SP divided in two parts. That is **stock material** and **non-stock material**. Then there are applying other distribution criteria such as production lines, machines, areas of production or others. As this thesis is focusing on inventory management, further in the text will be commented only stock materials.

### 3.2.1 Inventory System

Key information about spare parts inventory used in ordering processes is defiantly providing identification. By that is meant the way they are organized and labelled. Thus, from these labels or numbers can be gained information about storage location, historical data, pricing, usage in production etc. In the concerning plant are used three types of number or

identifiers. We can refer to them as SKU but this term is not used in field of spare parts inventory in Coca-Cola HBC. But for better illustration and understanding, can reader think about these three types of numbers as SKUs. Additionally, to internal labels is every bigger supplier of spare parts using his own numbers, which have to be kept as well. Thus, communication with vendors is much easier and faster, when each side know what exactly to deliver. Moreover, the risk off delivery errors is rapidly decreased. So, let's have look on these three types of numbers.

#### *3.2.1.1 SAP Number*

Fundamental number on which are linked all others is **SAP number**. As is not hard to guess this number is created by SAP, therefore it is used in every spare part process. Every item kept in inventory has to have this number.

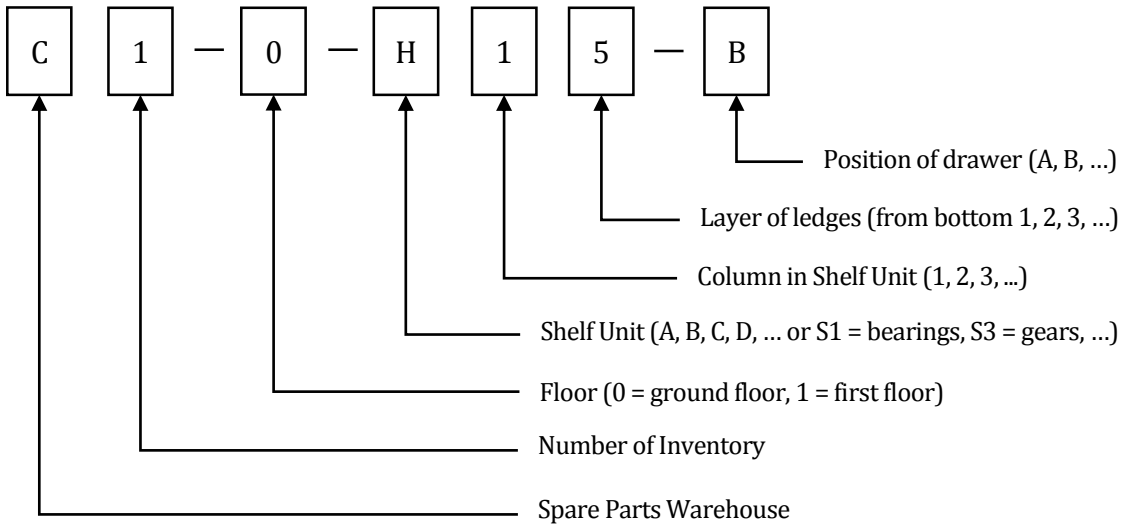
Process of creating SAP number is fully automatic. The random generation is controlled by the team handling SAP master data[16], which is situated in Sofia, Bulgaria. We are referring to them as BSO team, which means business service organisation. They are separate organization hired by Coca-Cola HBC. More information concerning BSO is included in section 3.3.2. This number has always 8 position, starting with number 6 each team (shown in Table 1, page 39). SAP number has not a real logic or other hidden meaning beside holding all required information. Therefore, the need for other identifications is required.

#### *3.2.1.2 Inventory Number*

These additional identifications are provided by second main number, **inventory number**. It is referring to a specific location within the storage itself. In contrast with SAP number, inventory number has definitely logic. It is consisting from seven characters and its logic is shown in Figure 16 and some examples are shown in Table 1, page 39. This number is handy mostly when is the need of finding particular spare part, in order to check if the number of pieces is accurate, taking the part for use or when storing newly bought piece.

[16] core data on which is standing SAP software

**Figure 16**: Inventory number description

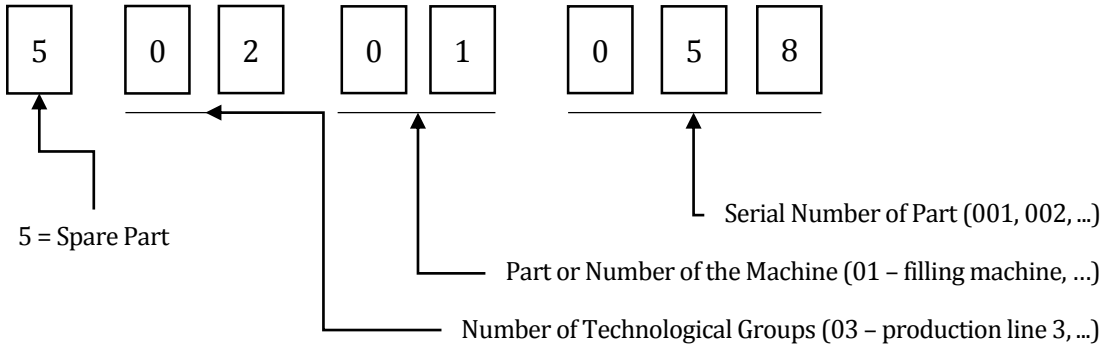



*Source: own elaboration based on internal documents*

### *3.2.1.3 Part Number*

In the last number is stored its real usage in production. By that is meant, where is the part exactly used in production. This number is called **part number** and is useful for mechanics and electronics working with these spare parts. The logic in this number is rather say unavoidable in order to have meaning, as seen in Figure 17. It is consisting from eight numbers and some examples are shown in Table 1, page 39. This information can be used among other things for finding the spare prat in documentation.

**Figure 17**: Part number description




*Source: own elaboration based on internal documents*

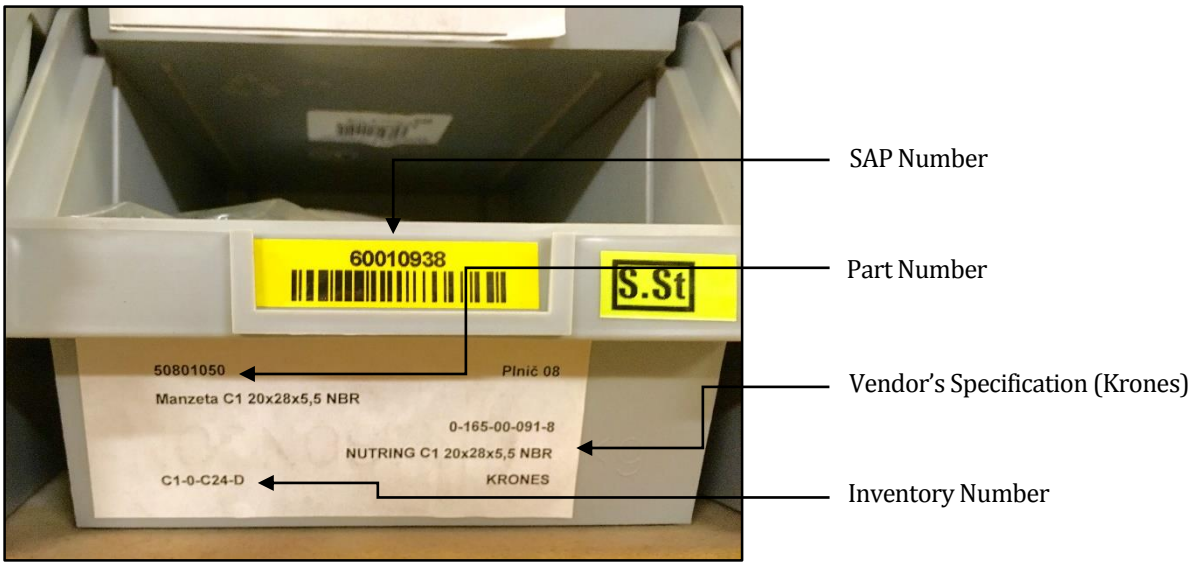
In order of summarizing this labelling had been created Table 1, where are shown these numbers as they are used in work flow. Moreover, an overall interpretation of this labelling in real usage can be seen in Figure 21.

**Table 1**: Examples of stocked spare parts

| SAP Number | Description | Inventory number | Part Number |
|---|---|---|---|
| 60041661 | Worm gear | C1-0-I13-E | 50201097 |
| 60186822 | Sliding Block | C1-0-I43-Z | 50202090 |
| 60045559 | Rotating nozzle | C1-0-B52-C | 50801158 |
| 60007448 | Toothed belt 20x1040 | C1-0-H34-Z | 50604004 |
| 60002546 | O-ring 19x2 EPDM-PEROX | C1-0-C22-K | 50801123 |
| 65000955 | Elastic Ring | C1-1-E44-E | 58303011 |
| 60010919 | Blanking Fittings | C1-0-B32-C | 50818052 |

*Source: own elaboration based on internal documents*

**Figure 18**: Example of labelling




*Source: own elaboration based on premises of Coca-Cola Hellenic Bottling Company*

### *3.2.1.4 System of Storing*

Now is good time to look on the system of storing spare parts in storage itself. This system was shown by describing the Inventory number. But no particular examples ware given.

Frankly speaking, system of storing is well designed and even well set. The parts are divided in different shelf units. Which are placed in groups consisting from couple of these shelf units. Divided mainly by production lines or, as seen in Figure 18A. As in all system

there are exceptions e.g. gears are gather together at specific location (Figure 19A) also expendable materials are put together as they are universal and do not need to be set for each production line (Figure 19B).

**Figure 19**: Photos of different groups of spare parts


*A* *B* *C*

*Source: own elaboration based on premises of Coca-Cola Hellenic Bottling Company*

Furthermore, each shelf unit is divided in to columns, which are divided horizontally by ledges (Figure 20B).

**Figure 20:** Shelf unit and its detail on further seperation


*A* *B*

*Source: own elaboration based on premises of Coca-Cola Hellenic Bottling Company*

For bigger parts this is the final line, but for smaller parts there is on last final level of division by separating them in small drawers, as seen in Figure 21.

**Figure 21:** Last level of separation for smallest parts


*Source: own elaboration based on premises of Coca-Cola Hellenic Bottling Company*

When thinking about improvement there is not real way of doing it rather there is no real need of doing it. The only cause of problems is that this system is not used properly by all people using inventory. For more information, see section 3.4.

### 3.2.2 Implementing New Parts

If there is a need for setting new spare part in inventory, it is not problem. There have to be filled up form with necessary information, which will be putted in SAP master data by BSO team. All information concerning a particular part e.g. name, SAP number, inventory number, part number, vendor etc.

### 3.2.3 Safety Stock

What safety stock means and how it works in theory had been explained in section 2.3.2.1. As was mentioned before, it is really simple future but on the other hand very effective.

This option is not default for every part in inventory. It can be set as additional future for chosen spare parts. The process of setting safety stock is very similar to process of implementing new part in inventory. There just need to fill up form with necessary information and then send it to BSO team, who will change master data in SAP according to the form.

After that will SAP automatically order the set value of pieces' ones had total value exceed minimum value. This is essential in increasing effectiveness in ordering processes, because

no one have to do nothing more. Yes, there is sometimes the need to fill up some additional information or just to approve it. But no one has to care and control it periodically. Thus, everything is done by well set system. And indeed is this system set well and helping each day the maintenance dept. But as always, there is one downside, which will be further describe in section 3.4.

**Table 2**: Spare part with safety stock

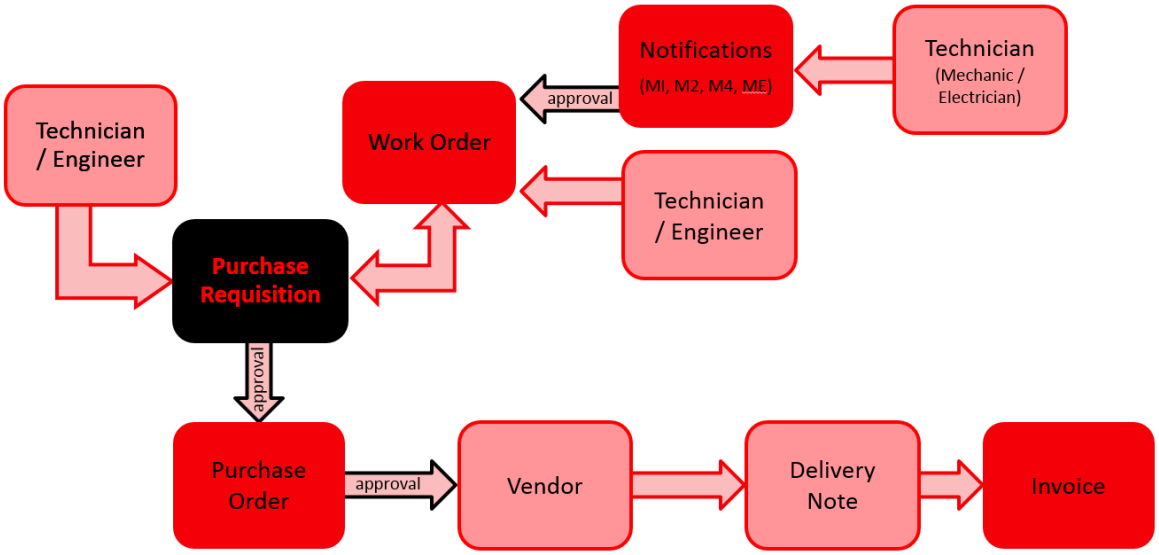
| SAP Number | Name of Vendor | Number of Vendor | Vendor's Number of SP | Price EUR | Safety Stock | Quantity |
|---|---|---|---|---|---|---|
| 60041661 | 4000001628 | 0-955-90-055-5 | KRONES | 4 124,52 | 1 | 1 |
| 60186822 | 4000001628 | 0-901-41-918-1 | KRONES | 1 002,00 | 3 | 3 |
| 60045559 | 4000001599 | 38855912 | ECOLAB | 1 014,00 | 4 | 3 |
| 60007448 | 4000003781 | - | ZAMBELLI SRL | 36,41 | 12 | 1 |
| 60002546 | 4000001945 | - | DIMER SRO | 10,60 | 105 | 10 |
| 65000955 | 4000004469 | Elastic ring | SIDEL | 3,74 | 117 | 0 |
| 60010919 | 4000019486 | 6-9613050502 | TETRA PAK | 14 858,22 | 1 | 1 |

*Source: own elaboration based on internal documents*

## 3.3 Ordering System

Primarily, let's have a look on ordering system itself, how is created the notification for spare part, how it is processed and what are the outcomes. System such a complicated as in Coca-Cola HBC is best illustrated by process flow chart, seen in Figure 22. The whole process is taking place within the SAP and there is no way of avoiding it. There are several possible beginnings of spare part notifications or any other purchase request for equipment needed in manufacturing dept. But concerning the title of this thesis, will be mentioned only spare parts.

**Figure 22**: Flow diagram of ordering system




*Source: own elaboration based on internal documents*

### 3.3.1 Process of Ordering

As can be seen from Figure 22 there is a main flow into which can line-workers, technicians[17] or engineers insert notifications / requests for spare parts. Therefore, people working in the field are those who are knowing what is exactly needed to buy. Sometimes the process of writing it down in to the SAP are doing their supervisors but when is something not clear the best way is to communicate with worker or technician. But back to the main flow, where we will luck on each part separately.

#### *3.3.1.1 Notification*

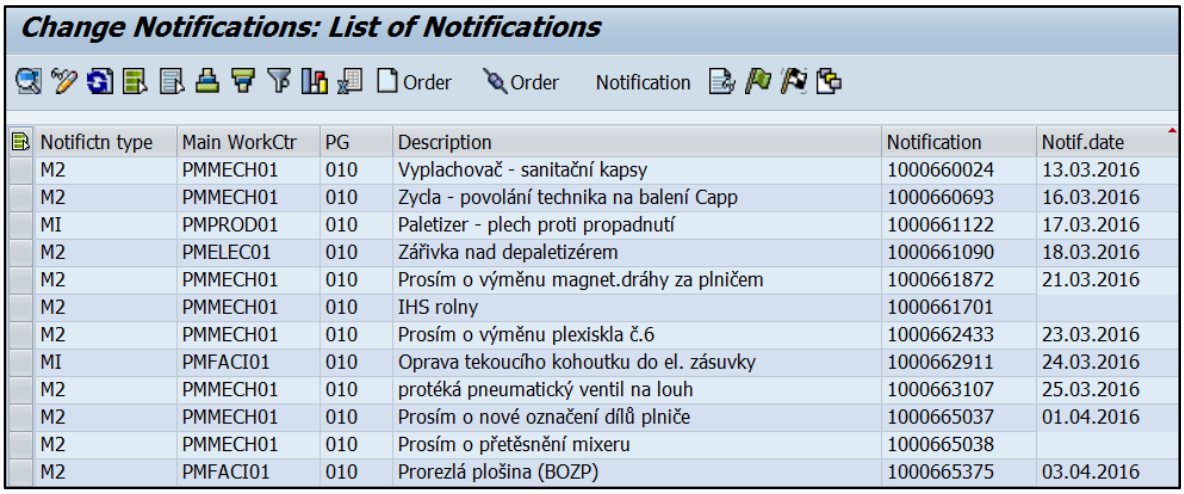
Process can be set off from three possible start lines. First route is beginning with a **notification**. It is really just a notice about the need of buying something or having something done. There are several types of notification such as MI - improvement memo, M2 - malfunction report or M4 - preventive maintenance. The type of notification is determining its purpose. This part is not standardly used for ordering spare parts but it is possible to do it.

After the creation of notification in the SAP, maintenance planner will consider its purpose. If he finds out that the notification has meaning, he will move it further in to the system and by that changing it in to the work order. He can add some additionally data or suggestion of

[17] skilled workers with focus on either mechanic parts or electric part

vendor for technical buyer. But once he had moved it further, it is responsibility of technical buyer.

**Figure 23**: List of notifications sorted by date



**Change Notifications: List of Notifications**

Order Order Notification

| Notifictn type | Main WorkCtr | PG | Description | Notification | Notif.date |
|---|---|---|---|---|---|
| M2 | PMMECH01 | 010 | Vyplachovač - sanitační kapsy | 1000660024 | 13.03.2016 |
| M2 | PMMECH01 | 010 | Zycla - povolání technika na balení Capp | 1000660693 | 16.03.2016 |
| MI | PMPROD01 | 010 | Paletizer - plech proti propadnutí | 1000661122 | 17.03.2016 |
| M2 | PMELEC01 | 010 | Zářivka nad depaletizérem | 1000661090 | 18.03.2016 |
| M2 | PMMECH01 | 010 | Prosím o výměnu magnet.dráhy za plničem | 1000661872 | 21.03.2016 |
| M2 | PMMECH01 | 010 | IHS rolny | 1000661701 | |
| M2 | PMMECH01 | 010 | Prosím o výměnu plexiskla č.6 | 1000662433 | 23.03.2016 |
| MI | PMFACI01 | 010 | Oprava tekoucího kohoutku do el. zásuvky | 1000662911 | 24.03.2016 |
| M2 | PMMECH01 | 010 | protéká pneumatický ventil na louh | 1000663107 | 25.03.2016 |
| M2 | PMMECH01 | 010 | Prosím o nové označení dílů plniče | 1000665037 | 01.04.2016 |
| M2 | PMMECH01 | 010 | Prosím o přetěsnění mixeru | 1000665038 | |
| M2 | PMFACI01 | 010 | Prorezlá plošina (BOZP) | 1000665375 | 03.04.2016 |

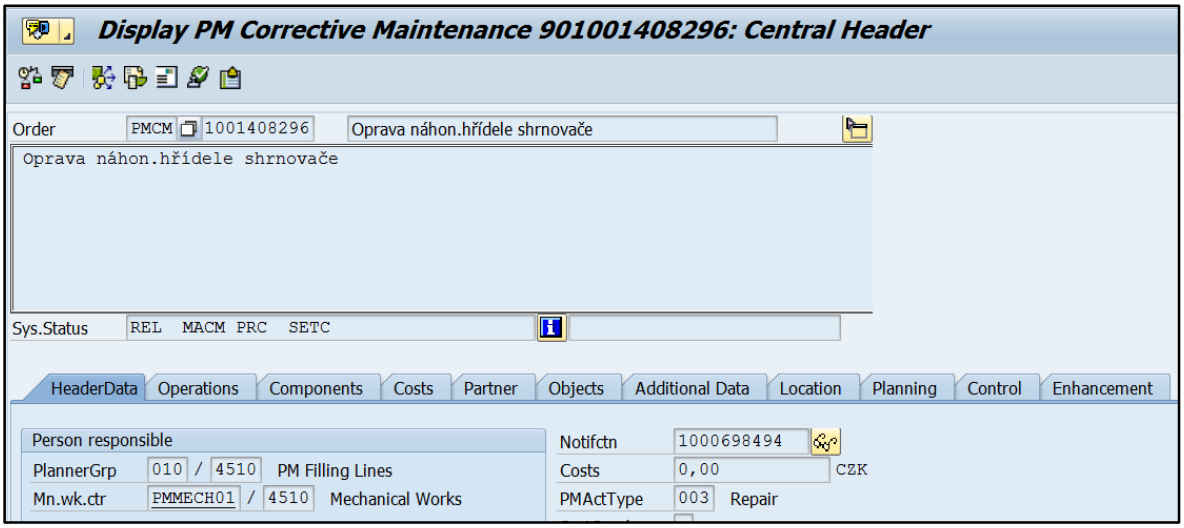
*Source: own elaboration based on internal documents*

### *3.3.1.2 Work Order*

Work orders and purchase requests are connected directly in the SAP. That means when a work order is created, automatically is created a purchase request connected with the work order. The reason is simple. **Work orders** are helping to set a traceability for additional control in future. Thus, in the work order as well as in notification is the problem described and are attached needed information e.g. picture, pdf document, place or equipment. This is significant as will be sad for the audit needs. Additionally, work orders are helping to organize purchase requisitions, in case when they are produce separately under different PR's[18] number. Thus, work order is set for one particular work and is unique in his way but on this particular work order can be attached many other PRs.

[18] purchase requisition

**Figure 24**: Look inside the work order

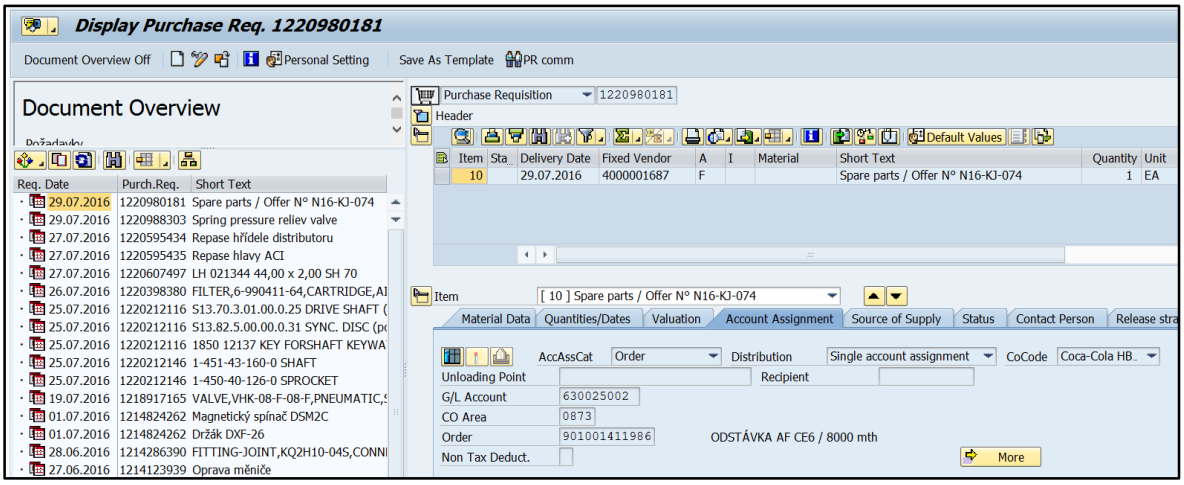



*Source: own elaboration based on internal documents*

### *3.3.1.3 Purchase Request*

Now the task of technical buyer is to gather all necessary information needed for vendor and for further approvals. The interface of **purchase request** from SAP is shown in Figure 25, where all required data are highlighted. Thus, technical buyer is the key position of this chain. Because he is in the centre. He has to know every information concerning every order and make sure it is right, because he is the responsible person. Moreover, he is choosing the vendor and communicating with him. Additionally, he is also communication with all the technics or their managers in order to get the right part they need. Hence, this position is very important rather say crucial in spare part ordering.

**Figure 25**: Display of purchase requisitions in SAP




*Source: own elaboration based on internal documents*

#### *3.3.1.4 Purchase Order*

When all data is gathered, technical buyer can approve the purchase request and by that action moving it to BSO team. They will repeatedly inspect the request in the sense of How to Buy Policy. H2B[19] is set of rules establish by company management. More on BSO and H2B is included in section 3.3.1. Their purpose is simple, control over every order. Mainly finding possible mistakes or ways of cheating the company. When they find it correct, they will create from it the **purchase order**. Which is send back to Prague for additional approval from concerning managers. Where every key manager has his own purchasing group to look after. This groups and their managers are shown in Table 3.

**Table 3:** Purchasing groups using is SAP

| **Purchasing Group Number** (SAP Number) | **Department** | **Responsible Manager** |
|---|---|---|
| 100 | Production | Ondřej Pekárek |
| 140 | Clothing | Naďa Šmídová |
| 185 | Quality Control | Zuzana Uherková |
| 190 | MRO | Filip Kostka |
| 380 | Capex | Filip Kostka |
| 405 | PET Production | Ondřej Šole |

*Source: own elaboration based on internal documents*

Depending on the amount of money are gradually attaching higher placed managers for additional approval. Where every line of manager has to approve the purchase request. These criteria can be seen in Table 4. If the purchase order is approved, it is send automatically by SAP to vendor's email address.

**Table 4**: Managerial approval criteria

| **Financial criteria** EUR | **Quantity of approvals** | **Responsible position** |
|---|---|---|
| 0 - 3 000 | 1 | First line of Managers – listed in Table 2 |
| 3 001 - 50 000 | 2 | Manufacturing Plant Manager |
| 50 001 – 100 000 000 000 | 3 | Region Manufacturing Plant Manager |

*Source: own elaboration based on internal documents*

These managerial approvals are not a source of problems or complications. Because they understand the purpose of the requests, therefore they are working in the environment.

[19] How to Buy

Moreover, many purchase orders are discussed in daily meetings. Thus they have overview on what is needed to buy. If there is a problem, they can always ask for explanation from technical buyer, who is siting three meters from them. They are mostly reminding technical buyer about the need for traceability in future. Thus, the need for adding sufficient reasons for purchase is necessary. To put it in context, if the audit will suddenly accrue in 2-3 or 6 month, no one will remember all requisite information.

But what is causing problem is BSO approvals. Significantly, when a member of BSO team considers particular purchase request as incorrect and by that sending it back to technical buyer for completing additional information. The reasons why this particular operation is making complications is given in section 3.4 in order to have this analysis clear and smooth.

#### *3.3.1.5 Finishing Steps*

Now when we look on the whole process as it is, is clear that buy managerial approval is mostly the process of ordering finished for Coca-Cola HBC. Yes, there are some additional action such as intake or sending the invoice to accounting department if it ends up in our department. But they are concerning the process of receiving of goods, for which is responsibility of stock keeper (for stock material only). But simply sad after delivering the goods by vender, must be done GR[20] based on delivery note. That can be process the payment.

### 3.3.2 BSO Team

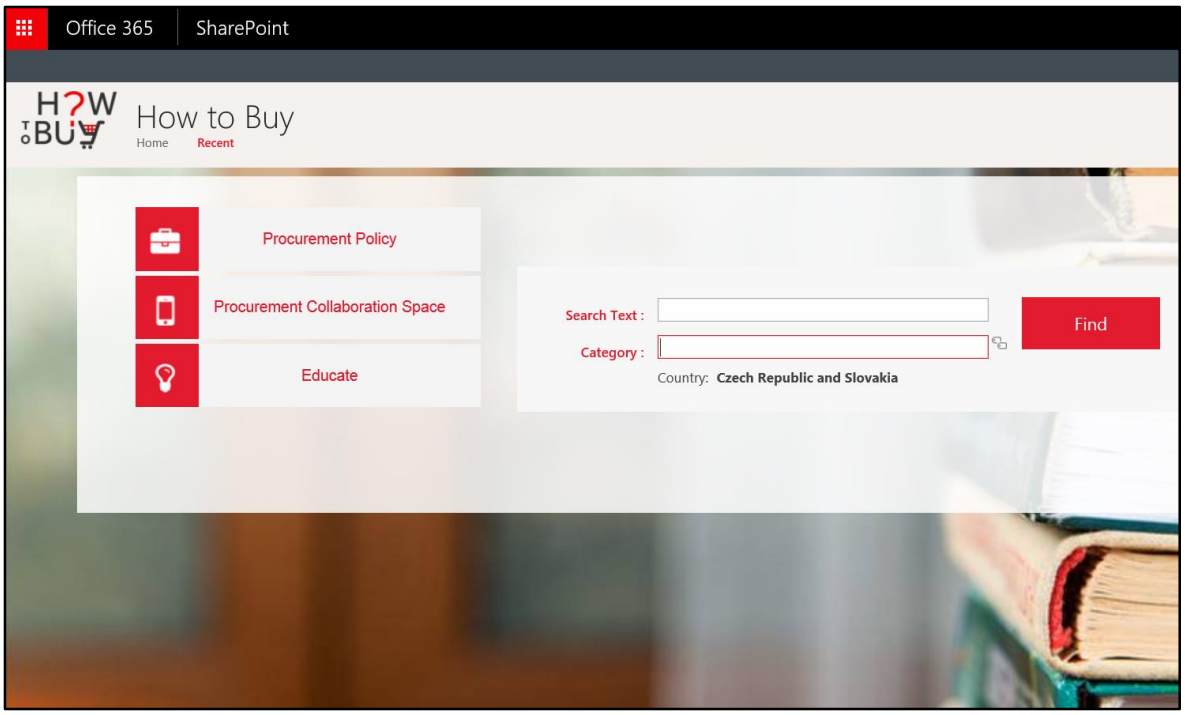
As was mentioned earlier, BSO is separate organization hired by Coca-Cola HBC. It is situated in Sofia, Bulgaria. Coca-Cola HBC is sequentially moving parts of bossiness out of other countries and centralizing them in BSO. So simply speaking, they are actually outsourcing. Therefore, for reaching good results in field of saving a new phase number 3 had been implanted in Prague plant two months ago. This phase was concerning of ordering processes. Thus, manufacturing division could not have been missed. And unfortunately it was not. Why this is such a source of complication will be discussed in section 2.4.3. Now will be described the inventions they had come with BSO Phase 3.

[20] goods receipt

### *3.3.2.1 How to Buy Policy*

The whole point of BSO integration is done in order of controlling money and saving money therefore decreasing cots. And the best way to do it is by developing set of rules, which everyone must follow. Thus, these set of rules are contained the H2B policy. H2B is integrated in share point, thus it is working in web browsers. Look of H2B interface is shown in Figure 26. Next, will be highlighted most important parts form H2B.

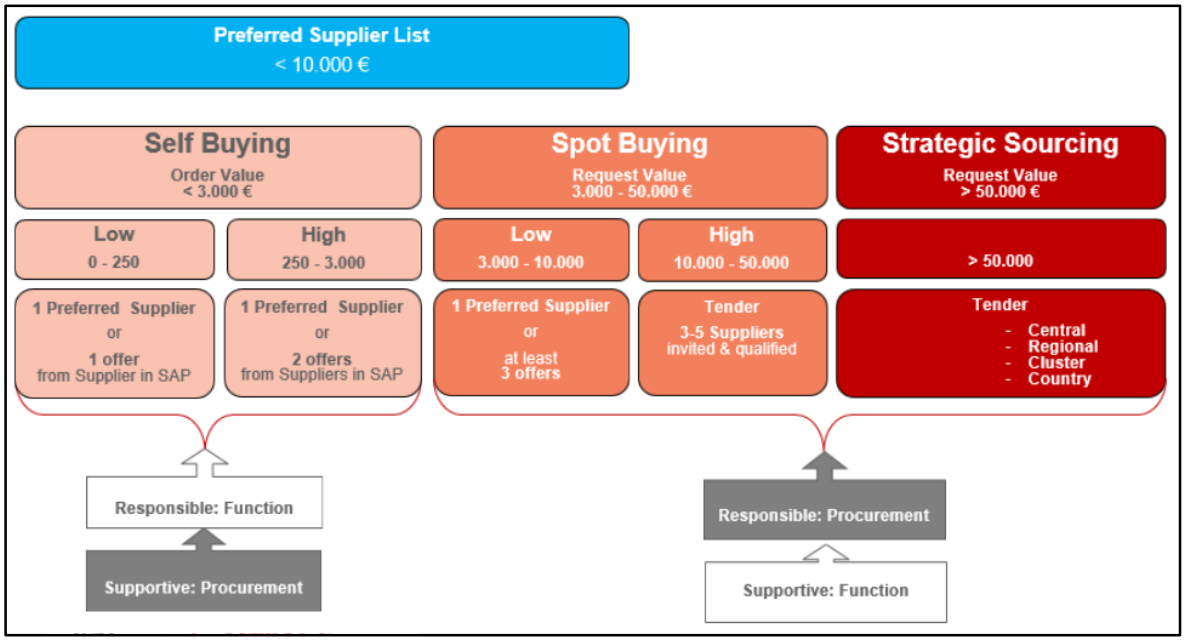
**Figure 26**: Interface of H2B




*Source: internal documents*

First of all is the ruler of how many offers you need for purchase order, called as sourcing process. Illustration of this rule is shown in Figure 27. Where by function is meant particular division of company from example MRO, which had made a purchase requisition.

**Figure 27**: Sourcing process




*Source: internal presentation*

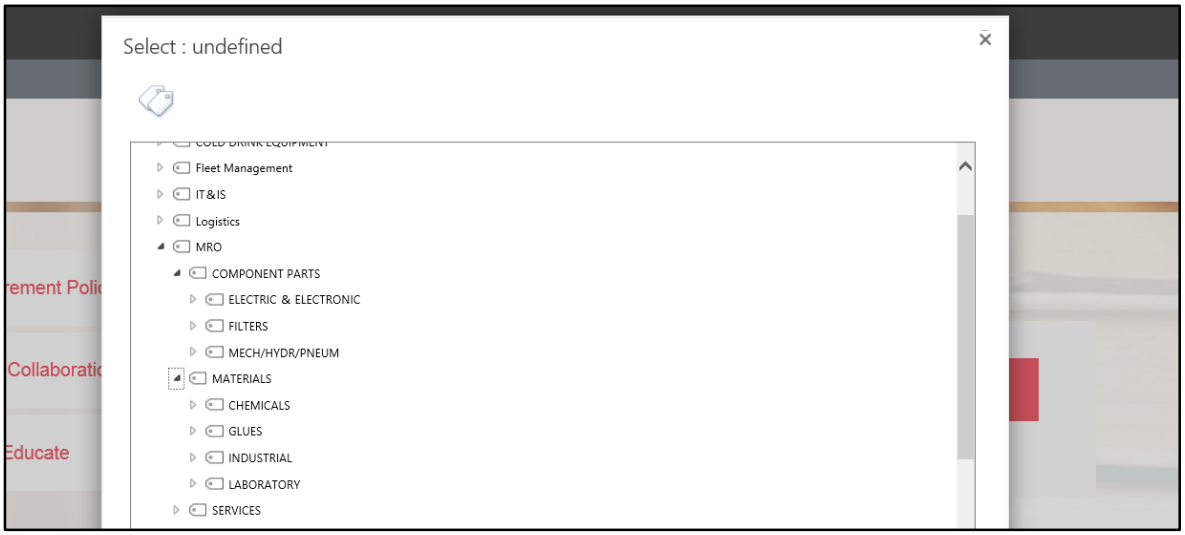
Therefore, the list of preferred suppliers was needed. Those vendors, which are not fulfilling all rules but are already in our database are set in category called active vendors. And those vendors, which are unique for given parts or material groups are called OEM vendors. Thus, OEM vendors are set out off this rules, because once they are unique there is no one to make a counter offer. Finally, list of all suppliers/vendors was created and implemented in to the H2B. As seen in Figure 28, in H2B is possible to search among material groups (Table 4). Each of these section is containing list of vendors applying for particular material groups.

**Table 5**: Material groups for MRO

| Material Group | SAP Number | Example |
|---|---|---|
| **Spare Parts** | | |
| Electric & Electronic | 03010101 | Alfa Laval s.r.o., Kodys spol s.r.o., Filco |
| Filters | 03010301 | AJ Albrecht s.r.o., Pak Česká Republika, s.r.o. |
| Mech/Hydr/Pneum | 03010201 | ECOLAB HYGIENE SRO, Jaga spol. s.r.o. |
| **Materials** | | |
| Chemicals, Glues, Industrial or Laboratory | | |
| **Services** | | |
| Production or Laboratory | | |
| **Tools** | | |
| Hand & Machinery or Laboratory | | |

*Source: own elaboration based on internal documents*

**Figure 28:** Searing in H2B for desired material group




*Source: internal documents*

Thus the overall meaning is to find out quickly and easy the right supplier. Moreover, find out what rules are applying on him and in which list is he integrated for which material groups. Such a section belonging under Mech/Hydr/Pneum material group is shown in Figure 29. From the first glance not only on the last figure but on the whole section is quite clear that not all is set as it should be. Thus. This issue can be find is section 3.4.3.

**Figure 29**: List of vendors in H2B

Selected suppliers related to this category are:

ADVA SRO, AIR CONTROL INDUSTRIES LTD., AJ ALBRECHT S.R.O., AKROS, S.R.O., ALBERTINA TRADING SRO, ALFA LAVAL s.r.o., AMMERAAL BELTECH SRO, AMPO SRO, ATLAS COPCO SRO, AVENTICS,SPOL. S R.O., BIA VERDER s.r.o., BIBUS SRO, BOHUMIL CARDA /FYZICKA OSOBA, BRAMMER CZECH A.S., C.O.S. SERVIS, SPOL. S.R.O., C+C SERVIS S.R.O., CFT S.p.A, CONTRA PRAHA SRO, CONTROL TECHNIQUES BRNO SRO, DENIOS S.R.O., EL INSTA BH SPOL. S.R.O., ELESA+GANTER CZ S.R.O., ENDRESS-HAUSER CZECH S.R.O., E-PLAST SRO, EURO SITEX SRO (SITOS), F.B.L. FOOD MACHINERY SRL, FESTO S.R.O., FLUIDTECHNIK BOHEMIA SRO, G.T. BIG S.R.O., GEA PROCESS ENGINEERING s. r. o., GRUBER GMBH, GUMEX SPOL SRO, HANSA FLEX SPOL. S R.O., HOERBIGER ZANDOV SRO, HUSKY INJECTION MOLDING SYSTEMS S.A, Chriwa Wasseraufbereitungstechnik, CHRIWA WASSERAUFBEREITUNGSTECHNIK G, IDEAL- TRADE SERVICE, SPOL. S.R.O., IFM ELECTRONIC SPOL SRO, IMAHA SRO, IMI INTERNATIONAL S.R.O., IVO RADA, KAISER KRAFT KK, KaV ELEKTRO A.S., KHS GmbH, KIC KRONES INTERNATIONALE, KOSTECKA GROUP SROL SRO, KRONES AG, KRONES S.R.O., LAMPIR JAN, LANFRANCHI S.R.L., LIFTMATE CZ KAREL KRAJČA, MICROCOMP SPOL. S.R.O., MILAN LIGOCL UNIPACK, MILAN MAREK, MIROSLAV HOLUB, ML TUNING SPOL.S.R.O., MORAVIA SYSTEMS AS, MP DIMS A.S., MURRELEKTRONIK CZ SRO, MURTFELDT PLASTY SRO, MUTE S. R. O., MW CHRAST S.R.O., NEUMO GMBH & CO.KG, NORDSON CS SRO, PEG SRO, PETR ZACEK CZ PODNIKOVA PRODEJNA, PIOVAN CENTRAL EUROPE GMBH, PLEXI PLUS, S.R.O., POSPISIL JIRI, PRAGOMETAL SRO, PRAHER ARMATURY SPOL.S.R.O., PROMINENT DOSIERTECHNIK, PUMPA A.S., REGOM INSTRUMENTS SRO, ROLLCONTECH s. r. o., Roman Radikovsky, SEOK S.R.O., SERVIS STROJU A LINEK MIROSLAV ZIKA, SEW-EURODRIVE CZ, SIDEL BLOWING & SERVICES S.A.S., SMC INDUSTRIAL AUTOMATION, SPX FLOW TECHNOLOGY s. r. o., STRO.M PROPAGACE SRO, SVOBODA TOMAS, TECH CON CZECH REPUBLIC S.R.O., TECHSEAL S.R.O., TETRA PAK ČESKÁ REPUBLIKA, S.R.O., TME CZECH REPUBLIC S.R.O., TUKAN RG S.R.O., UHLIR VLADIMIR, UNIKOL CZ SRO, WEICON-SAFARIK S.R.O., WESICO SERVIS S.R.O., WURTH SPOL.S.R.O., ZAE-ANTRIEBSSYSTEME GMBH CO., ZAMECNICTVI NASTROHARSTVI.

*Source: internal documents*

## 3.4 Issues

Aim of this subchapter is to merge all issues that had accrued during the analysis. This was done in order to make things better organize and classified under similar topic so the reader can slip forward or backwards as he might be interested in some particular sections. Thus,

in this subchapter would be included only descriptions of issues. Proposals or recommendations can be find in Chapter 4, under the same title as their issues.

### 3.4.1 SAP

Overall, SAP is great tool in big corporation like Coca-Cola HBC. Therefore, they need to work with great amount of data and for this was SAP born. Yes, there some negatives about SAP but is there software or system which does not have them? No. Thus, based on my experiences and on experiences of other, who had worked before or the SAP or during the implementation period, I can say it is worth it.

Nevertheless, there is one particular problem, with which is not only manufacturing department meeting but most of the departments as well. The problem is that not all data are accurate in SAP. Thus, the electronics equipment are not working all the time perfectly or even humans makes sometimes mistakes. Hence, it is good not to rely fully on the system. Yes, sometimes it is not possible but when the intuition is saying you that the number of pieces held in inventory are not right you better check it before placing order. Thus, it may result in problem with ordering or in other departments in some worst results.

### 3.4.2 Inventory

The problems which are accruing in inventory are mmainly caused by the people, whom are moving inside the inventory are not monitored in proper way. By that is meant, that technicians for external companies are using the inventory as well. And these are the kind of people, who are not respecting the set system and causing all kind of problems e.g. miss placing equipment, not making a note of part removal or making one but then putting it back without note again.

The worst result of these issues are mainly felt after the stock-taking. Where is usually missing big amount of money. Another result is that SAP can be registering three pieces of particular spare part but when there was not put a note of removal, the software has no way of knowing if it is accurate or not.

Nevertheless, the inventory is working correctly due to well design and well set system. Thus, when the system is set well there is only the need to follow it correctly. And there is beginning of all the troubles. People are not all the time following the processes correctly.

Either knowingly or unknowingly. But that does not matter the result is always the same – issue. When a person or employee is thinking that there is a better way of doing particular action in implemented system, he should go to his manager or supervisor and discuss it. And if the manager finds it worth it, all employees will follow the change. That way will be ensured that everyone is doing every action same.

### 3.4.3 Ordering

In my opinion, ordering process are well set as other systems in Coca-Cola HBC. But as always there is couple of minuses. For ordering process is the bottleneck definitely BSO. Yes, there are several other ways, which can be improved but in my opinion they are not that significant as BSO.

Thus, the problem which is causing BSO is too much control with any reasonable explanations (besides of the control itself). The reason why this is the biggest source of problem is that they are sitting 1 300 kilometers away and had seen the production pant maybe ones in their life and even that is optimistic to say. Thus, they are using for judgment only the H2B Policy without any common sense.

Such an approach is reducing people to just economic objects. Thus, common sense, intuition and moral decisions are lost. Someone might disagree with me as say that it is absolutely necessary to do such a thing because people are making mistakes, people are cheating and trying to rob you. But the final step of this approach would be to replace all of us by computers.

Among the other main negatives, which were not included belong:

- long times for approving purchase requisitions (up to 17 days)
- slow and bad communication all must done in English (not suited for all employees)
- not understanding the production, therefore its needs, therefore the purpose of purchase requisition
- ethical impact on vendors in Czech Republic (BSO is only communicating on English with them)

## 3.5 Summary

After the analysis is the right time to point out the fact that it was not the brightest time for such a project. During the time of working on this thesis had begun many changes, primarily in ordering systems. This changes are not for improvement of effectiveness as you might except but rather say for improvement of inspection, as will know by this time I talking about BSO. But it is only result of globalization and centralization in order of gaining absolute control over every single part of vast system in corporation such as Coca-Cola HBC. Moreover, from the beginning of year 2016 had started wave of changes in employee positions, as well. By that is meant that some people had left company, some had moved upper in organization structure, some had change positions or new people had joint the team of manufacturing plant in Prague. This all was crowned by implementation of new matrix structure, which absolutely did not help in this wave of changes. Thus, it was not an easy time for manufacturing department as whole. Primarily, it was not the best time for my project. But now, as I am finishing this thesis had finally all things stabilized and better times are lying before manufacturing department in Prague.

It is also important to state that described process are actual to the day of submission of thesis. And all analysis was done on actually running process. The old process and ways of managing orders were not taken in account during the description or analyzation, mainly due to fact that they are now the past. But non the less, the judgment might be rather certainly was effected by them.

# 4 Proposals

Purpose of this chapter is to join the section 3.4 in solving and discussing issues that had appeared during the analysis. This would be done by giving proposals and recommendations for solving particular issue. Or just mentioning opportunities for improvement by saying what could be done differently or better. All with focus on increasing system effectiveness, particularly in ordering processes.

## 4.1 SAP

*Issue: Not all data are accurate all the time in SAP*

There are few things that can be done in order to avoid it. Mainly each of us have to precise when putting data in SAP. Managers have to be sure that people are using the right data and right procedures. Or that ale other systems and equipment is set well, therefore functioning like it was design to. But there also factor, which are hard to influence e.g. works from other companies, human factor or device error.

In my opinion, the best thing what can do organization right now is to secure that all employs are aware of the impact of their possible mistakes and they know exactly how to work with SAP in order to prevent mistakes. Next, insure that all equipment using SAP are working as they should. And if they are not working properly, improve it by pushing on IT services or other concerning department. Because when you need the equipment most it will certainly let you down.

Therefore, by making sure that employees know how much and what is in inventory held, can be improved the overall effectiveness of ordering spare parts. Because there would be less miss placed orders or unnecessary orders.

## 4.2 Inventory

*Issue: Real data in inventory are not corresponding with SAP data due to bad attitude of workers*

When looking on the possible solution, it can be seen as a deadlock. Hence, our people are trained and are aware of the system and of its usefulness (at least the majority, but frankly

speaking, there are also workers among internal employees, whom are causing problems too). But there is not enough people to control external works or inventory itself.

Investing in redesigning of inventory in order to set it as not self-service but rather the opposite, plus in hiring at least three more works, whom will control the inventory will not be a cheap option.

Next possible approach cloud be to block entry for all external works. But then, they could not work efficiently and quickly as is excepted from them. Because, they would have to wait for stock keeper[21] or for member of maintenance to get them the right part. But that would block those people and it is creating vicious circle. Thus, the need of idea which will not take lot of money or will not just shift problem from one person to another is needed.

Such a possible idea is making regularly stock-takings based on every given period. They do not have to be official stock-takings, just a regular checks by sections, for example. And when mismatch is found it can be set right in time before any damage is caused. This idea is simple, easy to do as much as possible and it is not taking extra resources. Thus, the only large effort has to be given in setting of the process right and making sure that the person, who will be doing it, will fully understand the reasons why it is necessary to have it done.

Thus, the result of making this improvement is very similar to section 4.1. Moreover, it is also helping to decrease costs during the stock-takings.

## 4.3 Ordering

*Issue: BSO Phase 3 implementation*

It is really hard to find any possible solution for this issue due the fact that as manufacturing department we have little control over it. I guess that not all things can be change and sometimes you just have to clench your teeth and not give up.

The conclusion in my opinion, is that BSO will after all the struggle not helped and after while it will be changed again. That is the main problem that it was not implemented as improvement in order to increases effectiveness. To put it in contest, SAP had brought much

[21] current the only member of maintenance dept. whom is managing spare part inventory (besides others important tasks)

more trouble during the implementation than BSO but it had helped after words and now can no one imagine work without it. But BSO will not change after any period of time rather it could get worse by stricter control.

But do not get me wrong. I am not putting the guilt on BSO team itself, they also have their managers, who are requiring work from them and also they did not make up this system. Rather the guilt is on people who had design the system and did not test it properly before implementing it in Prague. Maybe the overall thought was good bad it ended badly.

And last note for topic of BSO. When we take under consideration the fact that it was all done in order to save money, we have to ask the questions: is it really saving any money? Will it be really worth it after a while? Or after some changes of positions on higher places will someone consider that it was not that good idea and better would be the old way?

## 4.4 Summary

In this summary I would like to point out more possible improvements for further consideration. They are applying for ordering processes as a whole and that is why they are summarized at the end.

The analysis had definitely raised the question of implementing new position in department structure. This position will be responsible for spare parts management. But it is not that easy as it might sound. There are couple of counter considerations e.g. will be this position useful from longer time period? Is the process that badly set that it needs such a care? Is not better to invest in others things, which are in far worse conditions?

Next, there is definitely too much controls in the process of ordering spare parts, which are slowing down the system. But are these controls necessary? Is there really something we can do about them? Would not be better to look on ourselves and consider better attitude by following all rules and giving all necessary information? Thus make the controls smoother and not so much time consuming.

Ultimately, as I had sad many times before the system is well set but it needs to be followed by the people. But essentially, people working in the processes have to understand it, its purpose and its meaning. Therefore, they can work more productively, with bigger joyfulness and improving the process not for the company but for themselves.

# 5 Conclusion

As I mentioned in introduction I was working as Technical Trainee. Since my first moth my priorities had quickly changed and I had not put so much time and effort in this thesis as I would wish. Moreover, straight form the begging I had chosen bad tactic. Even though, I was cautioned not to fall deep in theoretical chapter but rather focus on analysis and practical things. But I did this mistake. I can say it was due the deep interest and trying of writing everything by my own words and make everything simple as possible etc. But the result is still the same, next time I will know how to manage the tasks properly.

Furthermore, I would like to mention couple of observations, which I had find out during the process of writing.

Firstly, I had noticed that this is not a problem to be solved in days or weeks rather in months because precisely analysing, disusing and then improving processes is crucial in all companies. But essentially, doing this continually over and over the time. That is the way of increasing effectiveness in all processes.

Next, is one thing to understand given issue and had many ideas how to improve it, but other thing is to know how to do it exactly. Thus, to master the art of connecting theory and practical usage with real results of improvement, is not an easy thing to do.

The ultimate achievement for me is firstly that I had managed to finish it on time. Then, that I managed to study and put together all the knowledge of operation filed as it was for me whole new filed. Many may find this goal to weak as I did at the beginning but after couple of weeks working on this thesis I had realized that it would be great jus to do that. One thing is to read vast numbers of literature another is to understand them and totally different thing is to put your thoughts on paper with intention on sententiousness and simplicity. Thus, the art of professional art has raised in my eyes to a much higher level.

Nevertheless, I had finish this work best as I could in given time and circumstances. I had fulfilled the goals, which I had set at beginning best as I could. Thus I am appropriately proud of my creation. The only thing I regret is the fact that it cloud be better, more in depth and more precise. But it would be never perfect.

At last, I would like to say that there is so much more to discover, learn, analysis, discuss and further improve but there is no place for all those thing. Even, I would really like to go much deeper in all this issues and analysis them better with far bigger scope. Thus, maybe finding different conclusions or better ones.

*On the end, I would like to make one last statement. During the writing of thesis, I had used these literatures in manner of formal guidance: [29] [30] [31] [32] [33].*

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