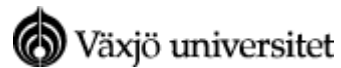


School of Management and Economics



Performance management process at Wica Cold AB

- towards an improved performance in the order-to-delivery process -

Thesis, Civilekonomprogrammet,

Business administration

Logistics, FE3094, Spring 2009

Author: Patrik Schultz 840222

Tutor: Helena Forslund

Examiner: Helena Forslund

Acknowledgement

The road to finish this thesis has been long and winding and it would not have been possible without all the people that supported and guided me on the way. Thereby I would like to express my gratitude to all the people that contributed to the research and made the creation of this thesis possible.

Firstly I would like to acknowledge the employees interviewed at Wica Cold AB for their helpfulness and support. Especially I would like to thank Gustaf Rosén my contact person at Wica Cold who has helped in getting all the empirical data needed. He has himself answered a lot of questions and also helped arrange meetings with the other employees interviewed. I hope this thesis can be useful for you in developing the PM-process. I would also like to acknowledge Marcus Johansson at Getinge Disinfection (for the benchmark study) for taking time answering my questions.

I would also like to thank my examiner and tutor Helena Forslund. She has been very helpful giving me a lot of advice and answering all of my questions. Without her this thesis would not have been as good and well structured as it is today.

My girlfriend is another person I would like to thank. She has listened to all my thoughts regarding the thesis and also giving me some advice. Finally I want to acknowledge my dog Marit since she many times during the long and sometimes lonely work of this thesis been my only company and she has supported me very well =>

Växjö, 28 May 2009

Patrik Schultz

Summary

Thesis, civilekonomprogrammet, School of Management and Economics at Växjö University, Logistics, FE3094, Spring 2009

Author: Patrik Schultz 840222

Tutor: Helena Forslund

Title: Performance management process at Wica Cold – towards an improved performance in the order-to-delivery process

Background: Performance measurement and the management of it have become of great importance for organizations in order to compete in today's business environment. The performance management process at Wica Cold AB is not very well developed and they would know like to know how it can be developed in order to improve performance in the order-to-delivery process. Performance in this thesis covers the aspects of efficiency, quality, deliveries, time, flexibility and improvements. The PM-process is in this thesis seen as measures used, collection and analyzing of data and make use and take action based on the measures. How to make use of the measurement information, what should be measured and that lack of resources is an important aspect for the PM-process in SMEs like Wica are the main problems identified.

Objectives: The objectives are to describe the PM-process at Wica Cold and the corresponding performance in the OTD-process. Furthermore the objectives are to find ways to develop the PM-process in order to improve performance in the OTD-process, also taking into consideration the characteristics of a SME regarding the PM-process.

Methodology: This thesis is a case study and it is both descriptive and explanatory. The main scientific perspective in this thesis is the positivistic and it has a deductive approach. Data is mostly collected through semi-structured interviews. The scientific credibility is secured by interviewing employees at different positions, consider many views (theory, the benchmark study at Getinge Disinfection and the variety of data collection at Wica) and by gather all relevant information for the thesis on my hard drive.

Results, conclusions: The current PM-process only has a few measures and it is not communicated to the employees very well. The performance in the order-to-delivery process is satisfying but can in many ways be improved. The PM-process can develop with some new measures and some small changes and additions in the current measures. One main aspect in this regard is to measure the amount of guarantee claims and percentage of orders delivered on time instead of only costs for backorders and guarantee claims. The measures should be published on a board on the shop floor as a way to make use and take action based on the measures. Meetings every other week should be in place to discuss ideas from employees and the value-added time. This improves performance since it highlights important aspects and common problems and a way to improve that performance can be found. The characteristics of a SME are taken into consideration for instance by limiting the amount of measures used and by making them simple and easy to collect.

Table of contents

1. Introduction.....	1
1.1 Background.....	1
1.2 Problem discussion.....	3
1.3 Research questions.....	5
1.4 Objectives.....	5
1.5 Limitations.....	5
2. Methodology.....	7
2.1 Research strategy.....	7
2.2 Scientific perspective.....	8
2.3 Scientific approach.....	9
2.4 Research method.....	9
2.5 Data collection.....	10
2.6 Scientific credibility.....	12
3. Theoretical framework.....	15
3.1 The PM-process and performance in the OTD-process.....	15
3.1.1 The PM-process.....	15
3.1.2 Performance in the order-to-delivery process.....	17
3.2 Framework for developing the PM-process.....	20
3.2.1 Investigate the current PM-process.....	21
3.2.2 Defining strategy.....	21
3.2.3 Select and design the measures.....	22
3.2.4 Implementation of measures.....	24
3.2.5 Managing the PM-process.....	25
3.3 Considering the SME characteristics on the PM-process.....	27
3.4 Analysis model.....	30
4. Empirical data.....	32
4.1 The current PM-process.....	35
4.1.1 Measures used.....	35
4.1.2 Collection and analyzing of data.....	36
4.1.3 Make use and take action based on measures.....	37
4.1.4 Current performance in the OTD-process.....	38
4.2 Developing the PM-process.....	43
4.2.1 Defining strategy.....	43
4.2.2 Select and design measures.....	43
4.2.3 Implementation of measures.....	44
4.2.4 Managing the PM-process.....	45
4.3 Considering the SME characteristics on the PM-process.....	46
5. Benchmark.....	47

5.1 The PM-process at Getinge Disinfection AB	48
5.1.1 Measures used.....	48
5.1.2 Collection and analyzing of data	49
5.1.3 Make use and take action based on the measures	49
5.1.4 Current performance in the OTD-process.....	51
6. Analysis	53
6.1 The current PM-process.....	53
6.1.1 Measures used.....	53
6.1.2 Collection and analyzing of data	54
6.1.3 Make use and take action based on the measures	55
6.1.4 Current performance in the OTD-process.....	55
6.2 Developing the PM-process.....	59
6.3.1 Defining strategy.....	59
6.3.2 Select and design measures.....	61
6.3.3 Implementation of measures	64
6.3.4 Managing the PM-process	66
6.3 Considering the SME characteristics on the PM-process.....	69
6.4 Recommendations for the new PM-process	70
6.4.1 Measures used.....	70
6.4.2 Collection and analyzing of data	70
6.4.3 Make use and take action based on the measures	71
6.4.4 New performance in the OTD-process	72
7. Conclusions.....	73
7.1 Answer to research questions	73
7.2 Reflections	75
7.3 Suggestions for future research.....	75
8. References.....	77
8.1 Books and scientific articles	77
8.2 Electronic references.....	81
8.3 Interviews.....	81

Appendix 1: Interview guide

Table of figures

p.15 - Figure 1: The performance management process and the position of the performance measurement system (Source: Bititci et al., 1997, p. 525)

p.16 - Figure 2: The performance management process. (Source: Smith & Goddard, 2002, p. 248)

p. 20 - Figure 3: Building up the analysis model, part 1. (Source: own production)

p.22 - Figure 4: Example of success map (Source: Neely & Bourne, 2000, p. 4)

p.23 - Figure 5: The performance measure record sheet (source: Neely et al., 1997, p. 1137)

p.27 - Figure 6: Building up the analysis model, part 2. (Source: own production)

p.29 - Figure 7: Building up the analysis model, part 3. (Source: own production)

p.30 - Figure 8: Analysis model (Source: own production)

p.33 - Figure 9: Map for the order-to-delivery process (Source: own production)

p.34 - Figure 10: Description of symbols for process map (Source: own production)

p.39 - Figure 11: The efficiency measure of hours/cabinet for wall cabinets, freezing counters and service cabinets (Source: Wica Cold)

p.42 - Figure 12: Summarized data for current PM-process and performance in the OTD-process at Wica Cold.

p. 46 - Figure 13: Summarized data for developing the PM-process at Wica Cold.

p. 52 - Figure 14: Summarized data for current PM-process and performance in the OTD-process at Getinge.

p.58 - Figure 15: Summarized analysis regarding current PM-process and the performance in the OTD-process.

p.60 - Figure 16: Success map of Wica Cold AB (Source: own production)

p. 68 - Figure 17: Summarized analysis regarding developing the PM-process.

Table of tables

p.12 - Table 1: Interviews conducted at Wica Cold and Getinge Disinfection.

Table of pictures

p.2 - Picture 1: A Wica-cabinet (Source: www.wica.se)

p. 32 - Picture 2: A Wica-cabinet (Source: www.wica.se)

List of abbreviations

PM-process	Performance management process
OTD-process	Order-to-delivery process
SME	Small or medium sized enterprises

1. Introduction

In this chapter an introduction of the chosen subject performance management will be presented. It starts in the background with an overall view of performance management and what it is. This is followed by the situation for the company Wica Cold AB in this regard. The problem discussion then highlights and discusses the problems identified; how to make use of the measurement information, what should be measured and that lack of resources is an important aspect for the PM-process in SMEs like Wica. This funnels the field down to the research questions and the objectives of the study. Finally some limitations are presented.

1.1 Background

“What you measure is what you get”

“You cannot manage what you cannot measure”

These quotes by Kaplan & Norton (1992, p. 71) respectively Tian et al. (2003, p. 4934) will work as a starting point for this thesis since it's focusing on performance management. Many authors agree on that this has become of great importance for organizations in order to compete in today's business environment (Folan & Browne (2005), Bourne et al. (2000), Nanni et al. (1992), Kaplan & Norton (1992) and Neely (1999)). The development in this field have according to Folan & Browne (2005) gone from merely measurement to also include a way to manage the measures (i.e. from performance measurement towards performance management). Finding an appropriate way to manage their measures is also one of the main problems for the studied company in this thesis, Wica Cold.

But what is then performance management? To be able to define this it is helpful to first define performance measurement. Neely et al. (2005, p.1229) describes a performance measurement system as: *“(...) the set of metrics used to quantify both the efficiency and effectiveness of actions.”* Bititci et al (1997, p. 524) describes it this way: *“The performance measurement system is seen as the information system which enables the performance management process to function effectively and efficiently.”* Performance

management is defined by Folan & Browne (2005, p. 674) as: “(...) *the use of performance measurement information to effect positive change in organizational culture, systems and processes.*” Additionally, Bititci et al (1997, p. 533): “*The performance management process is seen as a closed loop control system which deploys policy and strategy, and obtains feedback from various levels in order to manage the performance of the business.*”

The concept used in this thesis is the performance management process (PM-process). The PM-process goes beyond the performance measurement system and also makes use of the measurement data collected in the performance measurement system. The PM-process is in this thesis seen as the measures that are used to evaluate the performance, the collection and analyzing of the data and the process of making use and take action based on the measures.

The company in this case study is as mentioned above Wica Cold AB. They have 150-160 employees. Wica can then be characterized as a SME (small or medium enterprises) since Hong & Jeongs (2006) primary criteria of SME classification is a company with less than 500 employees. According to Garengo et al. (2005) and Hudson et al. (2001b) does certain SME characteristics have an impact on the PM-process which will be further discussed in the problem discussion. Wica Cold is producing refrigerated cabinets for stores with perishable items and is owned to 70 % by an Italian company named Arneg. They have been growing a lot the last ten years and feel that the PM-process needs to be developed. Production Manager Gustaf Rosén said that Wica doesn't measure that much now since they think the costs are too high and they could also make better use of the information from the measurement.



Picture 1: A Wica-cabinet (Source: www.wica.se)

What Wica Cold mostly wants out of this is according to Production Manager Gustaf Rosén to improve the efficiency in the production but also other aspects of performance and a motivated workforce. An important aspect for Wica Cold is also the additional service they give to the customer with transportation and installation of the cabinets.

Mattsson (2002) have identified seven core processes that can be found in a manufacturing company. These are product development, sales, order-to-delivery, acquisition, manufacturing, distribution, after sales. The order-to-delivery process covers according to Mattsson (2002) everything from the arrival of customer order until the product is delivered. The order-to-delivery process (OTD-process) is then the most appropriate one to study at Wica Cold and it's also what this thesis is going to do.

Performance is though a very wide concept with many aspects to consider. Performance can be linked to the OTD-process in many ways. The key dimensions of performance in the OTD-process are discussed by several authors. According to Olhager (2000) these are quality, efficiency, delivery accuracy and flexibility. Medori & Steeple (2000) suggest six different areas to consider: quality, cost, flexibility, time, delivery & future growth. Neely et al. (2005) discusses about performance categorized to quality, time, cost and flexibility. This thesis will consider performance in the areas of especially efficiency but also quality, deliveries, time, flexibility and improvements.

Performance can be improved in many ways whereof one of those is with the help of an appropriate PM-process (Medori & Steeple, 2000). Other ways are for instance Total Quality Management and Just-in-time (Callen et al, 2005 & Shrivastava et al., 2006) This thesis is only going to consider improvements of the performance in the OTD-process with the help of the PM-process.

1.2 Problem discussion

Norcross (2006) mention that to sustain and improve the performance one has to rely on more than the measurement of key indicators. It also requires something that make use of the information collected to take timely action before problems occur, which can be related to one of the problems expressed at Wica. Gustaf Rosén said that the measures they have can be used in a better way with for instance feedback and communication in order to improve the performance of the OTD-process. Today they have monthly meetings where the measures should be followed up with the employees, but it's not always this is done. How then can this be done in a better way?

Today Wica does not have a lot of performance measures in the production as explained by Production Manager Gustaf Rosén. They measure cabinets/day and hours/cabinet which are compared to the time studies made at the parent company Arneg in Italy. Some other measures are the costs for backorders and guarantee claims. Wica also have project accounting where the costs for transportation and installation are followed up. But are these appropriate measures? Folan & Browne (2005) stresses that the measures used should be relevant to managers and employees in performing their day to-day jobs. Bourne et al. (2000) mention that one important aspect is that the measures are derived from the strategy. Anthony & Govindarajan (2007) gives additional advice; there should be a mix between outcome and driver measures, financial and nonfinancial measures and internal and external measures. One should according to Anthony & Govindarajan (2007) also not use too few measures since it cannot control a complex system, nor too many since it then becomes uncontrollably complex. Neely et al. (2000) also suggest that there should be a balance between measures that gives an early indication of future business and such measures that express what has been achieved in the past. Are these aspects taken care of at Wica Cold? Could there be other or more measures?

Another important aspect to consider is the fact that Wica is a SME. According to Garengo et al. (2005) and Hudson et al. (2001b) can specific SME characteristics be obstacles to a well functioning PM-process. The most important characteristic as mentioned by Garengo et al. (2005) is the lack of resources (human and capital) in SMEs for this purpose. The lack of resources is also the main reason why Wica don't have an extensive PM-process at the moment. They feel like the cost of it is bigger than the benefit it gives. Still they feel like that there are benefits with a more developed PM-process, but then they want it to a low administrative cost and that it will be simple to use. How can the data for the measurement be made easy to collect and the process easy to administer?

Getinge Disinfection AB is a local company that produces washer-disinfectors and flusher-disinfectors. They are thereby in a similar business as Wica Cold. While discussing with the Production Manager and the Vice President at Wica Cold about possible benchmarking companies, Getinge Disinfection was one of the first companies

mentioned. Getinge Disinfection has approximately 240 employees and has experienced a steady growth the last years. Getinge Disinfection is then a bigger company than Wica Cold and should then also probably have a more extensive PM-process. What are they measuring and how do they make use of that information? Could any of this also be used at Wica? A benchmark study of how the PM-process at Getinge Disinfection looks like could then assist in developing the PM-process at Wica Cold.

From the discussion above I think there is of interest to make a study of the PM-process in the order-to-delivery process at Wica Cold. Can it and in that case how be developed to improve the performance in the order-to-delivery process and work as a motivation for the employees? Since there might be some difficulties securing that the employees really gets more motivated from the PM-process only the performance will be included in the research questions. If though the employee's gets more motivated the result would probably also be an improved performance. This leads to the following research questions that will guide my work through the thesis:

1.3 Research questions

RQ1: How does the performance management process (PM-process) in the order-to-delivery process (OTD-process) look like at Wica Cold AB and what performance is there now?

RQ2: How can the PM-process develop in order to improve the performance in the OTD-process also taking into consideration the characteristics of a SME?

1.4 Objectives

The objectives are to describe the PM-process at Wica Cold and the corresponding performance in the OTD-process. Furthermore the objectives are to find ways to develop the PM-process in order to improve performance in the OTD-process, also taking into consideration the characteristics of a SME regarding the PM-process.

1.5 Limitations

The thesis is not going to study the effects of the improvements in the PM-process since it takes time implementing and then to see the effects of it. Instead the improvements are going to be studied from a theoretical perspective (e.g. if theoretical references on how

performance in the OTD-process can be improved fits to how the developed PM-process looks like, the performance in the OTD-process will be improved.)

2. Methodology

This chapter consists of the research methodology used in this thesis. The research strategy, scientific perspective and approach, research methods, data collection and scientific credibility are presented. The sub-chapters start with a presentation of methodology-theory, followed by a discussion on how I deal with this in the thesis.

2.1 Research strategy

The case study is described by Yin (2003) as one of several ways of doing social science research. Other ways could be experiments, surveys, histories and the analysis of archival information. According to Yin (2003, p. 1) are: “(...) *case studies the preferred strategy when “how” or “why” questions are being posed, when the investigator has little control over events, and when the focus is on a contemporary phenomenon within some real-life context.*” A case study can be explanatory, descriptive or exploratory depending on the situation and they can also be used together in the same case study. Which one to use for instance depends on the type of research question posed.

According to Merriam (1994) is a certain case chosen because it's important and interesting or because it makes up some kind of hypotheses. Additionally the author does mention that to get started with a case study, the studied area and the problem must be chosen. The case can't be defined without having a research problem. In daily life is a problem something that causes uncertainties and difficulties and normally do people try to find solutions for their problems. The same is true for a research problem according to Merriam (1994).

Research strategy of this thesis

This thesis is a case study made at Wica Cold AB in Vislanda. The choice of doing a case study was very natural for me because of the fact that this kind of thesis is designed to help a company with a practical problem. A case study is then very well suited according to the definition from Yin (2003) mentioned above. The first research question is a “how” question, I have little control over the events and the focus is on a contemporary phenomenon within some real-life context.

For the first research question “How does the performance management process (PM-process) in the order-to-delivery process (OTD-process) look like at Wica Cold AB and what performance is there now?” a descriptive approach of case study is used. The reason for this is that it simply will describe the current situation of the PM-process at Wica Cold and the corresponding performance in the order-to-delivery process. The advantage of starting with the descriptive approach and describe the current situation of the PM-process is that one then from that can find ways to improve the performance. Without knowing the current situation is it difficult to know how it can be improved. The second research question “How can the PM-process develop in order to improve the performance in the OTD-process also taking into consideration the characteristics of a SME?” has more of an explanatory case study approach. Cause and effect assessment is in place here; a certain kind of improvement in the PM-process will lead to improved performance in the order-to-delivery process at Wica.

2.2 Scientific perspective

There are two general scientific perspectives. These are the positivistic and hermeneutic perspectives. They differ on the approach they have to the social reality. The positivistic perspective is built upon that a natural science perspective is applied when the social reality is studied. Science should also be free from values (objective). Due to the positivistic perspective is the role of science to test theories for them to be accepted as knowledge. The hermeneutic perspective is instead built upon interpretation and understanding. The researcher have to be subjective in his study according to the hermeneutic perspective since there’s a difference between people and the objects studied in natural science. (Bryman & Bell, 2005)

Scientific perspective of this thesis

The main scientific perspective used in this thesis is the positivistic. The reason for this is that theories of the PM-process and the development of it and the benchmark study of Getinge Disinfection are used to support the study of the PM-process at Wica Cold. The theories is first collected and presented, the benchmark study conducted and this is then used to study the research subject. Then there’s little room for subjective values. One of

the objectives is also to describe the PM-process which makes the positivistic perspective the most appropriate.

2.3 Scientific approach

Deduction and induction are the two main scientific approaches. The approaches discuss how theory and empirical data is related to each other. Deduction is the most common approach. Generally speaking is a deductive approach used when going from theory to make observations and the results are seen while the inductive approach is the other way around. In the inductive approach is theory the result of the research. Generalized conclusions are drawn from the observations made in the inductive approach. (Bryman & Bell, 2005)

Scientific approach of this thesis

In this thesis is a deductive approach used since it starts with theory and then are observations made and the results seen. Theories about how the PM-process is composed are used as a way to describe how it looks like at Wica Cold. Theories on how the PM-process should be developed to improve the performance and what a well performing OTD-process is, are used to evaluate if there have been any improvements of the performance. This will be presented in a “before and after-way”, comparing the current PM-process with the new PM-process.

2.4 Research method

Quantitative and qualitative are the two main research methods. They differ especially in what kind of data that is collected. Quantitative research is mostly collection of numerical data and use of methods from the natural science. Qualitative research on the other hand is more oriented on words while collecting and analyzing data. (Bryman & Bell, 2005) According to Andersen (1998) the purpose of knowledge does also differ between the methods. While the quantitative method searches for causality, the qualitative method has a more understanding viewpoint.

Research method of this thesis

Both qualitative method and quantitative method are used in this thesis, but with a larger focus on the qualitative method. As mentioned above do the methods differ especially in

what kind of data collected and qualitative data is mainly used in this thesis to be able to address the research questions in a good way. Even though the focus in this thesis is more to search for causality than have an understanding viewpoint, qualitative is the method mostly used. To be able to get an overview of the PM-process and find ways to improve the performance are data in the form of interviews needed which is the main source of data for this thesis. This is qualitative data. Quantitative data is collected mainly in the form of the ERP-system at Wica Cold.

2.5 Data collection

Except from the classification of quantitative and qualitative data, it can also be divided in primary and secondary data. Primary data is collected directly by the researcher for his purpose while secondary data is not. Secondary data can for instance be documents in organizations. (Andersen, 1998)

According to Yin (2003) data can be collected from a lot of different sources when making a case study. The most common ones are documentation, archival records, interviews, direct observations, participant observation and physical artefacts. None of these sources has a complete advantage over the others, instead are they highly complementary. In a case study is it preferable to use as many sources as possible.

Interviews can take many different shapes. They can be structured, semi-structured or unstructured. It depends on the degree of structure of the question and the control of the situation the researcher wants. The unstructured and semi-structured interview can give a deeper understanding of the situation while the structured is a more simple way and the impact the researcher might have in the interview is reduced. (Andersen, 1998)

Data collection of this thesis

Both primary and secondary data is collected for this thesis. Primary data is collected in the form of interviews and the type of interview used is mostly the semi-structured one. This since it gives enough flexibility and the possibility to get detailed answers. Interviews are held with employees in different positions at Wica Cold to get several viewpoints on the subject and give more rich data. All the interviews specified in table 1 below are in the form of face to face meetings. With the Production Manager at Wica

Could there also have been additional e-mail and telephone contact to clarify aspects not fully understood by the author during the interview. This is true also for the interview for the benchmark study with the Logistics Manager at Getinge Disinfection. The benchmark study was conducted at Getinge Disinfection to get input on how the performance in the order-to-delivery process can be improved with the help of the PM-process at Wica. For the benchmark study at Getinge Disinfection only the Logistics Manager is interviewed. This is though enough since a Logistics Manager often have good knowledge in this area and it gave good input on how to improve the OTD-process with the help of the PM-process. This thesis could have been made without conducting a benchmark study. Because of the difficulties regarding developing a well functioning PM-process I find it useful getting input from a similar company in this regard. The choice of Getinge Disinfection was mostly due to a suggestion made by the Vice President and Production Manager at Wica Cold.

Secondary data is collected in the form of documents at the company and Wica's ERP-system which assists them in their collection of measurement data. Most of the sources of data collection described by Yin (2003) are used in this thesis with focus on interviews, documents and direct observations. Observations are made at the production floor. That assists in the development of the PM-process since it helps in understanding the order-to-delivery process and the measures that can be used. The interviews conducted are presented in table 1.

Interviews Wica Cold AB

Name	Function	Date
Axelsson, Jörgen	Supervisor for sheet metal workshop and foaming	29/4-2009
Fransson, Anna	Final assembly worker	14/4, 29/4-2009
Hildingsson, Pelle	Supervisor for final assembly	29/4-2009
Kronstedt, Daniel	Final assembly worker	29/4-2009
Rindhagen, Niklas	Vice President	4/2, 2/4-2009
Rosén, Gustaf	Production Manager	13/11, 21/11, 1/12, 12/12-2008, 4/2, 2/4, 23/4, 29/4-2009
Samuelsson, Joanna	Final assembly worker	29/4-2009

Interviews Getinge Disinfection AB

Name	Function	Date
Johansson, Marcus	Logistics Manager	7/5-2009

Table 1: Interviews conducted at Wica Cold and Getinge Disinfection.

Collection of theoretical data (who also is secondary data) is mainly in the form of scientific articles. The search engines Elin and Business Source Premier accessed through Växjö University's library database is the place where the theoretical data was found. The words searched for was for instance "performance management", "performance management process", "performance measurement", "improve performance", "efficient production" and "improve efficiency – production" and "order-to-delivery-process.

2.6 Scientific credibility

The quality of a case study according to Yin (2003) can be judged by using certain criteria's. Four tests are commonly used to establish the quality of any empirical social research and they concern the validity and reliability. These four tests are also relevant for case studies. What Yin (2003) additionally brings to these tests are tactics on how to deal with the tests when doing case studies.

Three of these four tests are regarding the validity. Construct validity is about establishing correct operational measures for the concepts being studied and this is a test that is especially difficult in case study research. The tactics for the construct validity are

to use multiple sources of evidence, establish chain of evidence and let key informants review draft case study report. The second test is internal validity and here causal relationships should be established. Internal validity only applies to explanatory case studies. An important thing here is to consider many aspects to find correct causal relationships. If this isn't done there's a risk that an incorrect casual relationship between x and y are noticed not considering a third factor - z - that actually have caused y. The external validity is to establish the domain to which the results of the study can be generalized. The way to deal with this is to use theory in single-case studies and use replication logic in multiple-case studies. (Yin, 2003)

The final test concerns the reliability of the study. The objective with reliability is to be sure that another researcher following the same procedure would come to the same conclusion. The case study tactic for the reliability is to use a case study protocol and develop case study database. (Yin, 2003)

Scientific credibility of this thesis

The construct validity is strengthened by conducting many interviews with employees in different positions of the company and thereby getting multiple sources of evidence. Key informants are also reviewing the draft case study report.

With the second research question in this thesis causal relationship are established since these have the explanatory case study approach and it's only for them the internal validity is relevant. I'm well aware of the potential problem of establishing incorrect causal relationships and that's why many aspects are considered. The thesis considers many views; the theory, the benchmark study at Getinge Disinfection and the variety of data collection at Wica which helps in strengthen the internal validity. The cause and effect is established through specific improvements in the PM-process that will lead to improved performance in the OTD-process. Improvements in the PM-process are the cause and the effect will be shown in the performance of the OTD-process.

Since the purpose of the study is to solve a practical problem for Wica Cold is not the possibility to generalize the study very high. Theories are used though and some generalization can probably be made since the theories are applied on Wica's situation.

The benchmark study gives another view and makes the possibility to generalize a bit higher. The results can probably to some extent be generalized to and be useful for companies in the same size (SMEs who doesn't think an extensive PM-process are worthwhile because of the high administrative costs). It can probably also be generalized to some extent to other companies in the manufacturing industry and especially in the commercial refrigeration business.

Regarding the reliability isn't it absolutely sure that another researcher would come to the same conclusions if he followed the same procedure. This since Wica Cold is continuously growing and thereby also needs to change their PM-process which means other empirical data would probably be collected in the future. Interviews were also held with the ones I thought had the best knowledge and could give me the best information, but another researcher might have interviewed others. To compensate for these problems were interviews held with employees in different positions of the company. The tactics described by Yin (2003) are also used to strengthen the reliability. This thesis can be seen as a protocol where the course of action is described and all information gathered is collected on my hard drive as a database for the case study.

3. Theoretical framework

The theoretical framework used in the thesis is presented in this chapter. It starts with describing what the PM-process is and what performance in the OTD-process is (presented in subchapter 3.1.) This relates especially to the first research question: “How does the PM-process in the OTD-process look like at Wica Cold AB and what performance is there now?” Next is a framework regarding how the PM-process can be developed presented (3.2) which relate especially to the first part of the second research question: “How can the PM-process develop in order to improve the performance in the OTD-process (...)?” The characteristics for the PM-process in SMEs are then presented and what that can be done to overcome this and make the PM-process useful in SMEs (3.3). This relates to the last part of the second research question: “(...) also taking into consideration the characteristics of a SME?” Finally an analysis model (3.4) is presented and it’s also built up through the chapter.

3.1 The PM-process and performance in the OTD-process

3.1.1 The PM-process

To be able to define what the PM-process is, it is helpful to describe the differences between performance measurement and performance management. According to Bititci et al. (1997, p. 524) is: “The performance measurement system (...) seen as the information system which enables the performance management process to function effectively and efficiently.” This can be illustrated in figure 1.

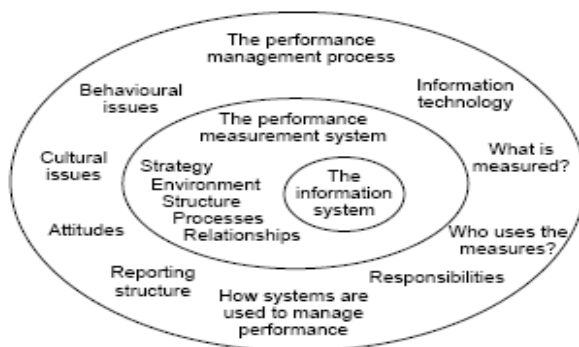


Figure 1: The performance management process and the position of the performance measurement system (Source: Bititci et al., 1997, p. 525)

Franco-Santos et al. (2007) have identified only two necessary features of a performance measurement system. These are “performance measures” and “supporting infrastructure”. That performance measures would be a requirement for a performance measurement system is according to the authors a tautology. A supporting infrastructure can be both manual methods of recording data and advanced information systems. A supporting infrastructure is also supporting procedures like for instance data acquisition, collation and sorting and the human resources needed to perform this. Neely et al. (2005, p. 1229) defines a performance measurement system as: “(...) *the set of metrics used to quantify both the efficiency and effectiveness of actions.*”

The performance management process goes beyond just measuring performance and the infrastructure needed to do this. According to Folan & Browne (2005, p. 674) is performance management: “(...) *the use of performance measurement information to effect positive change in organizational culture, systems and processes.* Bititci et al (1997, p. 533) have the following definition: “*The performance management process is seen as a closed loop control system which deploys policy and strategy, and obtains feedback from various levels in order to manage the performance of the business.*” The performance management process is illustrated in figure 2.

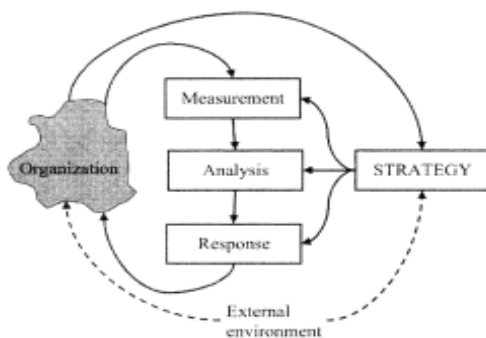


Figure 2: The performance management process. (Source: Smith & Goddard, 2002, p. 248)

According to Neely & Bourne (2000) is the performance management process focusing on improvements that it's crucial to use and take action based on the measures (i.e. the response-box in figure 2). Franco-Santos & Bourne (2005) mention for instance having feedback and communication regarding the measures is a way to manage this.

From the above discussion can be seen that the performance measurement system is about the actual measurement of the performance and procedures that makes this possible (i.e. the measurement and analysis-boxes in figure 2). The performance management process goes beyond this and also makes use of the measurement data collected in the performance measurement system (also including the response-box in figure 2). This explains what is meant by the PM-process in this thesis; the measures that are used to evaluate the performance, the collection and analyzing of the data and the process of making use and take action based on the measures (see figure 2).

3.1.2 Performance in the order-to-delivery process

The OTD-process is connected to performance in a lot of different areas. As mentioned in the background this thesis will consider performance in the areas of especially efficiency but also quality, deliveries, time, flexibility and improvements.

Radnor & Barnes (2007, p.385) defines efficiency this way: “*Efficiency is based around the notion of output divided by input which focuses measures around the productivity of a process and the utilisation of resources.*” **Efficiency** is according to Olhager (2000) output divided by input. That measure allows for changes in both input and output to improve the efficiency. A lower consumption of resources with the same output and the same consumption of resources with more output are the two ways to improve the efficiency according to Olhager (2000). Reducing or eliminating inefficient and negative elements in value-adding activities is a way to improve the efficiency according to Ax & Ask (1995). It’s also about securing that the utilization of resources and activities are efficient. Segerstedt (1999) mention that improving efficiency is simple, just eliminate everything that is unnecessary. The difficulties though lie in what is necessary and what is not. Bottlenecks that prevents total outflow exceeding a certain level of measured production should be identified is an example of this. Bottlenecks can be found in the theoretical capacities of the machines, but can also be found by other causes. Delays in supply and unexpected absence of key-personnel are examples of this. Another way is to reduce the operation times which can be achieved by new materials, new machines, different technology, new tools and equipment.

Neely et al. (2005) mention that **quality** traditionally has been defined as conformance to specification and the measures then have focused on number of defect products and the cost of quality. The true cost of quality has been identified as a function of the prevention, appraisal and failure costs. Focus has though shifted from conformance to specification to customer satisfaction and customer surveys etc. have been more commonly used. According to Olhager (2000) quality mostly is seen as a way to get revenue; “right” quality leads to more sales. Quality has though connections also to costs. Wrong quality, which requires waste and rework, leads to higher costs. At the same time costs must be concerned for eventual quality control. Anthony & Govindarajan (2007) adds to this discussion some indicators for quality. Examples can be the number of defective units delivered, rework and guarantee claims.

According to Mattsson (2002) **delivery** accuracy does determine to what extent delivery is performed at the time decided with the customer. This can be measured as the amount of deliveries in proportion to the amount of promised deliveries. Another measure is the amount delayed deliveries in proportion to total amount of deliveries. Anthony & Govindarajan (2007) mention that in this regard the amount of backorders and delivery schedules not met can be measured.

Neely et al. (2005) discusses about **time** and that it has been noted both as a source for competitive advantage and the fundamental measure of manufacturing performance. Examples of measures could be adherence to due dates, value-added time (as a percentage of total time) and cycle time.

Flexibility can be seen as a measure of the efficiency with which the manufacturing process can be changed (Neely et al. (2005). According to Olhager (2000) flexibility can concern three different aspects. Volume flexibility is the capacity to change production volume. Product mix flexibility is the capacity to change the model produced and the relative production quantities at given volume. Personnel flexibility is the last one and it's connected to the skill of the employees and the capacity to perform multiple tasks. The flexibility can be improved for instance by shorten the setup time and by having skilled and multi-talented employees. Examples of measures suggested by Neely et al. (2005) could be percentage of workforce trained to do two or more jobs, percentage of

workforce doing more than one production job in any given month and set-up time. According to Heyes (1996) does training that promote multi-skilling help improve the efficiency, but not necessarily. It depends for instance on how skills are utilized. Allwood and Lee (2004) though found out in their study that job rotation doesn't improve problem solving skills and neither the performance. The model used in their study though took no account of the operator's inclination to perform a task and assume that performance is always improved with repetition. Allwood & Lee (2004) argue that performance even though can be improved by job rotation in the long run since it helps motivate the employees in a better way than doing the same thing over and over again.

Anthony & Govindarajan (2007) suggest that **improvements** can be measured for instance as the amount of employee suggestions. Suggestions for instance can refer to change of the design of the product which makes it possible to add together or eliminate operations as mentioned by Segerstedt (1999). A change can often essentially simplify the production process. In the production department, the drawings are often seen as definite and impossible to change, which is not always the case. Working with continuous improvements and learning striving for reducing the errors is according to Ax & Ask (199) an important aspect.

Segerstedt (1999) suggest that to improve performance in general one should see the problems from a helicopter and ask questions like "What is the purpose?" and "Why are we doing it in this way?" That will help improving performance since it highlights the (often hidden) problems and one can find ways to do something about it. It is also suggested that the performance should be measured, since if things are not followed up they will seldom be achieved. (Segerstedt, 1999) Figure 3 will explain the most important aspects in this subchapter and also how it will be used in the analysis.

*It's around the three areas mentioned in 3.1.1 **measures used, collection and analyzing of data and make use and take action based on the measures** the PM-process will be analyzed. First is the **current situation of the PM-process** identified and investigated with **corresponding performance in the OTD-process**. The performance is investigated on what's good and what can be improved in the PM-process in the areas of **efficiency, quality, deliveries, time, flexibility and improvements**. After developing the PM-process (see 3.2 Developing the PM-process) there will be **a new situation** where the PM-process also is studied regarding the three areas mentioned above and the corresponding performance. From this there will be a comparison if there have been any improvements in the performance of the order-to-delivery process.*

Figure 3: Building up the analysis model, part 1. (Source: own production)

3.2 Framework for developing the PM-process

Several authors discuss about or have presented frameworks for how to develop the PM-process that will help to improve the performance in the order-to-delivery process (Bourne et al. (2000), Folan & Browne (2005), Kagioglou et al. (2001), Neely et al. (1997), Neely et al. (2000), Bititci et al. (1997), Flapper et al. (1996), Franco-Santos & Bourne (2005), Medori & Steeple (2000), Smith & Goddard (2002), Wouters & Sportel (2005), Garengo et al. (2005), Hudson et al. (2001a), Hudson et al. (2001b) and Hudson Smith & Smith (2007)). This is explained by Hudson et al. (2001b, p.1105) in the following way: “(...) *a well designed development process, with a clear focus and effective project management would improve efficiency and increase the likelihood of success.*”

In the following section is a review of the frameworks presented where the most important aspects according to me is included. From the frameworks have some steps been identified and these are also going to be followed and considered while developing the PM-process at Wica Cold. The steps are: investigate the current PM-process, defining strategy, select and design measures, implementation of measures and managing the PM-process.

3.2.1 Investigate the current PM-process

According to Wouters & Sportel (2005) it is important to look at existing measures and the management of it in the start of the development process. They argue that new measures only can be developed after understanding what is already in place. This is opposed to a “gap analysis” where the new process is first developed and then compared to the existing to identify gaps. What Wouters & Sportel (2005, p.1076) want to build an understanding of in this step is about: *“the precise definitions of existing measures; the rationales behind these; the data that were used for these; the limitations that people experienced with the existing measures; ideas that people are working on to improve the existing system; and changes of information system changes that could impact existing reports.”* By understanding these issues can assist in the development of new measures and the PM-process.

3.2.2 Defining strategy

The next step while developing the PM-process is to define the strategy (Bourne et al. (2000), Franco-Santos & Bourne (2005), Kagioglou et al. (2001), Medori & Steeple (2000), Smith & Goddard (2002) and Hudson et al. (2001a). The reason for doing this is that a company’s performance measures need to be related to the strategy, otherwise one will not know if the strategy is achieved (Medori & Steeple, 2000). Kagioglou et al. (2001) writes that this is one of the fundamental management activities since it provides a vision of where the company wants to be in the short and long term. The PM-process should therefore have strategy as the main input and the results of the performance measures could then be used to evaluate if the company have met their strategic goals.

Neely & Bourne (2000) have similar ideas and argue that a company not should start with the question “What should we measure?” when start developing the PM-process, but instead with the company’s success map. The success map explains the strategy and the manager’s view of how the business operates. It identifies the company’s success factors and is a cause and effect diagram. For a manufacturing company the success map might look like figure 4. The overall objective in the figure is to improve operating efficiency. This will be improved by improving delivery on time. Delivery on time will be improved

if lead time is reduced and stock control improved. Finally, the latter will be achieved by getting ideas from employees in this matter. (Neely & Bourne, 2000)



Figure 4: Example of success map (Source: Neely & Bourne, 2000, p. 4)

3.2.3 Select and design the measures

To decide what to measure is a discussion regarding the usefulness of existing measures and potential new measures needed (Wouters & Sportel, 2005). Neely et al. (2000) suggests that this is done in a brainstorming session. Furthermore Neely et al. (2000) think that a cost-benefit analysis should be in place for every measure to ensure that high pay-off measures are identified. The authors also think it's of importance with a comprehensiveness check to make sure that all important areas for measurement have been covered.

Another thing useful when selecting and designing measures is “the performance measure record sheet” developed by Neely et al. (1997) and it consists of ten elements. This can be found in figure 5 and it will also be used while developing the PM-process at Wica. “The performance measure record sheet” is also useful for some of the later stages when developing the PM-process. The elements “formula”, “frequency”, “who measures?” and “source of raw data” are useful for “3.2.4 Implementation of measures.” The two elements of “who acts on the data” and “what do they do” are useful for “3.2.5 Managing the PM-process”. First the authors suggest that every measure should have a title that explains what the measure is and why it's important. The purpose of the measures should also be specified and that's the second element. The rationale underlying every measure must then be defined and if a measure don't have a purpose it can be questioned whether it should be introduced. The next element described by Neely

et al. (1997) is to consider what overall business objective the measure is related to. As with the purpose it can be questioned if it should be introduced at all if it's not related to business objectives. The fourth element described by Neely et al. (1997) is that targets for all the measures are put in place, so that everyone knows what to aim for. Medori & Steeple (2000) also discuss about this and mention that a particular measure is of little value by itself, it must be compared against some reference value to be meaningful. The measure can either be compared over time in the company or in relation to a competitor (benchmark).

Details
Title
Purpose
Relates to
Target
Formula
Frequency
Who measures?
Source of data
Who acts on the data?
What do they do?
Notes and comments

Figure 5: The performance measure record sheet (source: Neely et al., 1997, p. 1137)

Regarding the selection of measures a lot of advice can be found in the literature. Hudson et al. (2001b) suggests that the measures should provide fast feedback and stimulate continuous improvement. Additionally does Neely et al. (1997) recommend that measures should employ ratios rather than absolute numbers, be exact about what being measured and they should also be objective (not based on opinion). Kaplan & Norton (1992) mention the importance of non-financial measures as a complement to the traditional financial measures. The involvement of employees in the development of the PM-process is something that Franco-Santos & Bourne (2005) have found important. This since there might be resistance against measurement by the employees but if they are involved in the development this resistance might be reduced. Folan & Browne (2005) stresses that the measures used should be relevant to managers and employees in performing their day to- day jobs. Anthony & Govindarajan (2007) gives additional

advice; there should be a mix between outcome and driver measures, financial and nonfinancial measures and internal and external measures.

3.2.4 Implementation of measures

According to Bourne et al. (2000, p. 758) is the implementation of measures a phase where: “(...) *procedures are put in place to collect and process the data that enable measurements to be made regularly.*”

Neely et al. (1997) mention that an important aspect is specifying the formula (the way the performance is measured) which is the fifth element of “The performance measure record sheet”. This since it affects how people behave. If one do not put enough effort in the formulation of the measures, might lead to sub-optimization of the objectives of the organization as a whole. The next element according to Neely et al. (1997) is to determine at what frequency the measures should be recorded and reported. The frequency depends on the importance of the measure and the volume of data available. Deciding the person who is to collect and report the data should also be identified. The source of the raw data should also be specified. A consistent source of data is crucial if performance is to be compared over time. (Neely et al., 1997)

Franco-Santos & Bourne (2005) and Neely & Bourne (2000) also discuss about information infrastructure and it's importance while developing a PM-process. According to Neely & Bourne (2000) is the lack of infrastructure in the organization a reason that implementation of the PM-process sometimes fail. The authors mean that the data to calculate measures often exists in one form or another, but that the problem is that it's spread throughout the whole company. To be able to get access to the data required in a simple and timely manner are crucial for a well functioning PM-process, but integrating all diverse data sets into a single database is something that require a lot of time, effort and resources. (Neely & Bourne, 2000) This is then a problem it's important to be aware of, one wants to have easy access to data for all the measures but do not want to put too much resources making this happen.

Franco-Santos & Bourne (2005) think the information needs of a PM-process should be defined and also the procedures that regulate the flow of information. Using an IT-system

to support the tasks of collecting, analyzing and reporting data efficiently is also important. Regarding this has it been noted that even though companies find non-financial measures important are they many times still not capturing data on these measures. The reason for this is often incapability in the information systems in collecting such data and that they are perceived as difficult to measure and therefore useless. Since non-financial measures has shown to be valuable for companies, does the authors think there is a need to develop the information system so that it can also process non-financial measures. (Franco-Santos & Bourne (2005)

3.2.5 Managing the PM-process

A problem often seen according to Neely & Bourne (2000) is that companies often fail to extract value from the performance measurement data. Even though the design and implementation of the PM-process have been successful, a very common problem is that nobody manages the measurement data. Neely & Bourne (2000, p.6) argue that: *“the whole process of measuring performance is completely wasted unless action is taken on the performance data that are produced.”* Management often fails to do this. The charts and reports are produced, but the failure lies in that the data is not analyzed and it's not decided upon what to do differently to improve the figures. It seems like managers are not aware of the tools and techniques available to help them use the measurement data to improve the performance. (Neely & Bourne, 2000) This will be handled right here below.

According to Franco-Santos & Bourne (2005) it is vital that people are encouraged by actions or activities to use the data provided in the PM-process in their day-to-day work and create the right attitude towards the system. These actions and activities can be informal (leadership and commitment of the management team) but they can also be formal (communication programs). The communication normally refers to the feedback of the measures' results to the employees. It also refers to verbal and non-verbal communication in the form of for instance presentations, manuals, newsletters and reports. These are used to clarify all aspects related to the measures and the PM-process.

Another aspect considered to be important by Franco-Santos & Bourne (2005) is the need for a continuous review of the measures (e.g. calculations and data collected), but also their results and their impact on goals and strategy. A focus on improvement and learning

in this regard is considered vital. Managers must be able to turn data into insights. After analyzing the gathered data should decisions be based on the data analysis results and finally is action going to be taken. This is a very important aspect of this stage, that the measures are managed and that one really uses the measurement information to make improvements. (Franco-Santos & Bourne, 2005)

A way to practically handle this has been presented by Neely et al. (1997) and their performance measure record sheet earlier discussed. The ninth element concerns that the person who is to act on the data should be identified. The tenth and last element is probably the most important element and it's called "what do they do". According to Neely et al. (1997, p. 1140) is it important: "(...) *not because it contains the most important information, but because it makes explicit the fact that unless the management loop is closed, there is no point in having the measure.*" The detailed action that should be taken if performance is either acceptable or unacceptable isn't always possible to define, since it's often context specific. However it is possible to in general define the management process that should be taken if performance appears to be either acceptable or unacceptable. Neely et al. (1997, p.1140) have presented typical entries that could be in this box:

- *"set up a continuous improvement group to identify reasons for poor performance and to make recommendations as to how performance can be improved;*
- *publish all performance data and an executive summary on the shop floor as a means of demonstrating commitment to empowerment;*
- *identify commonly occurring problems. Set up review team, consisting of sales, development and manufacturing personnel, to establish whether alternative materials can be used."*

How “**Developing the PM-process**” is going to be used and analyzed and what the most important aspects are is pretended here. The steps are presented one by one.

Defining strategy

-Need to be related to strategy to see if achieved, success map explaining how the different aspects of performance are linked

Select and design measures

-“performance measure record sheet”

-measures according to efficiency, quality, deliveries, time, flexibility and improvements

Implementation of measures

-enable measurement to be made regularly

-data collection, information infrastructure

Managing the PM-process

-communication and feedback

-improvement and learning

Figure 6: Building up the analysis model, part 2. (Source: own production)

3.3 Considering the SME characteristics on the PM-process

According to Garengo et al. (2005) have many studies shown that specific SME characteristics can be obstacles to the implementation and use of the PM-process. Hudson et al. (2001b) have also identified specific SME characteristics that may have an impact on the PM-process. Garengo et al. (2005) claim that one obstacle is the lack of human resources often experienced in SMEs. The staff is involved in managing the daily work and often don't have time for extra activities. SMEs also often don't have enough managerial capacity. A managerial culture needed to manage the PM-process is often lacking. The last obstacle identified by Garengo et al. (2005) is limited capital resources.

According to Hudson et al. (2001b) SMEs does differ from larger companies on some characteristics. These are for instance personalized management with little devolution of authority, severe resource limitations in terms of management and manpower as well as finance, operating in limited markets and flat and flexible structures. The reason why the

PM-process wasn't implemented successfully in the study of Hudson et al. (2001b) was that the development was too resource intensive.

What then can be done to overcome this (especially the lack of resources) and make the PM-process useful in SMEs? Hudson et al. (2001b) give some general advice. The PM-process and the development of it must be very resource effective and produce both short and long term benefits in order to keep the enthusiasm of the employees to the process. Hudson et al. (2001b) also think it should be relevant and easy to maintain, simple to understand and use. Garengo et al. (2005) have some more concrete advice. As already discussed should a step in developing the PM-process be to define the strategy. Garengo et al. (2005) argue that this is especially important in SMEs since they often lack formalized strategy. Developing the PM-process could then help to define the strategy of the company.

Additionally do Garengo et al. (2005) mention that clarity and simplicity is crucial for the PM-process in SMEs to overcome the aspects of especially limited resources. SMEs need focused, clear and useful information. They also lack the resources needed to implement complex models and they do not actually even need complex models. The following components are according to Garengo et al. (2005) the characteristics of a clear and simple development of the PM-process whereof some of these have already been described in the previous section. Therefore these are only briefly mentioned.

- Careful selection of the measures to be used. A problem is that it often is too much data and much of it is easy to collect but not useful. This makes it difficult to manage and this is especially true for SMEs. The number of measures used should therefore be limited.
- Clear definition of measures.
- Clear definition of how to gather and elaborate data. The aim in this case is to avoid that the quality of the gathered data won't be reduced.
- Use of relative instead of absolute measures. It's easier to read and understand relative data.

- Definition of how the processed information has to be presented. Information does somehow need to be communicated to the employees. A predefined format is recommended that support the understanding of the data. (Garengo et al., 2005)

*This thesis is going to consider these **SME-characteristics** while developing the PM-process at Wica Cold. It will in a way work as a **filter** between what could be used and what is optimal for a SME like Wica. The things that will be considered are mainly the **clarity and simplicity** aspect, **not use too many measures** and the **resource effectiveness**.*

Figure 7: Building up the analysis model, part 3. (Source: own production)

3.4 Analysis model

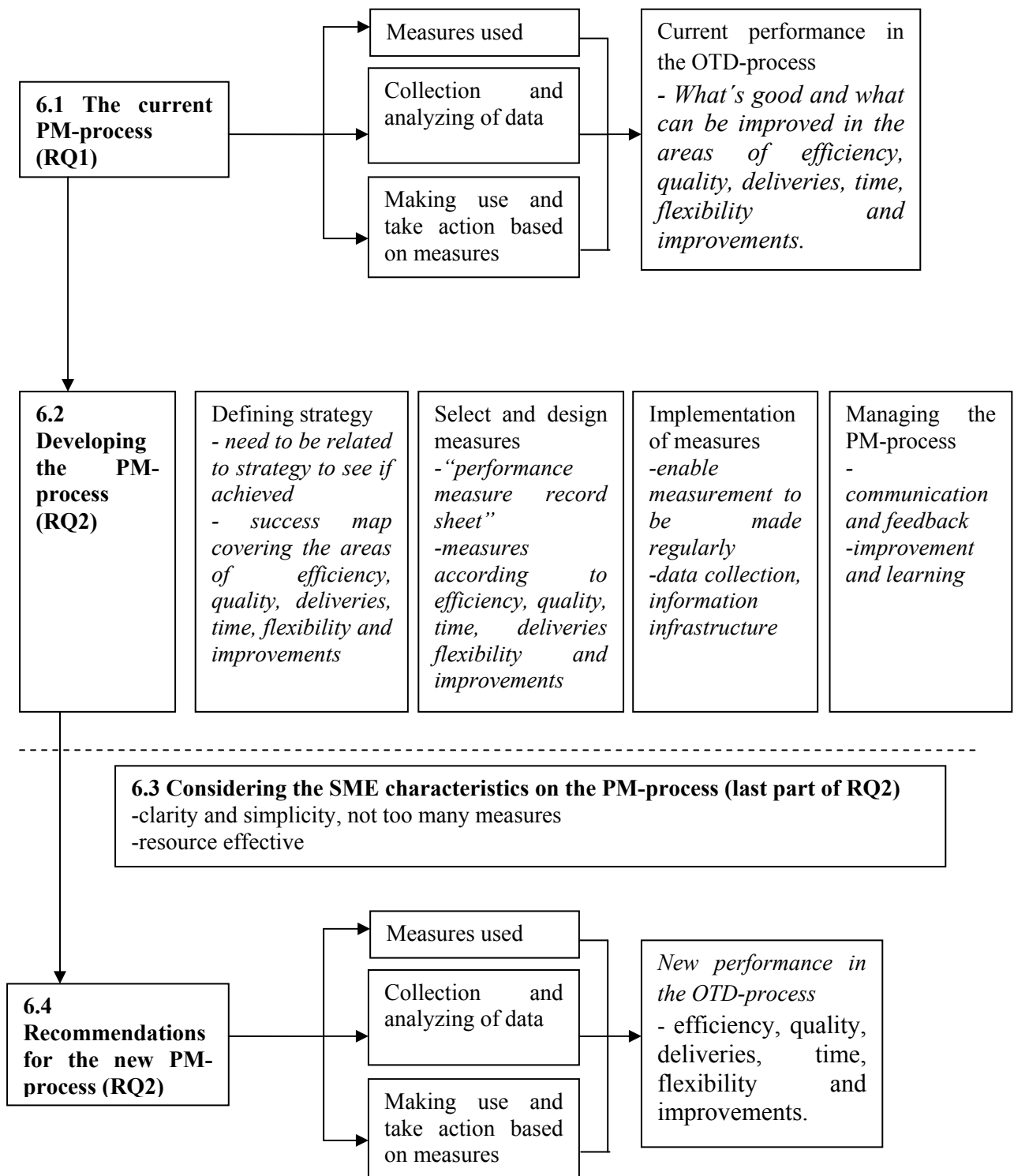


Figure 8: Analysis model (Source: own production)

With the analysis model (figure 8) I will describe for the reader how the thesis will be analyzed and also how it's structured. How the analysis-chapter is going to be structured is visualized in figure 8 with heading numbers. The analysis chapter has many inputs that should be considered and compared. The theoretical framework, the current PM-process at Wica Cold, inputs from Wica Cold on how the PM-process can develop and the benchmark study of Getinge Disinfection should all be considered.

Describing how the PM-process looks like is going to be analyzed according to the three parts mentioned in the current PM-process in the analysis model above. This relates to the first part of RQ1: "How does the PM-process in the OTD-process look like at Wica Cold AB (...)" There is also a corresponding performance in the OTD-process associated with this (relating to the last part of RQ1: "(...) and what performance is there now?") The next step is to develop the PM-process relating to the first part RQ2: "How can the PM-process develop in order to improve the performance in the OTD-process (...)" The development will go through the steps mentioned in the analysis model.

Since Wica Cold is a SME one needs to consider this while developing the PM-process relating to the last part of the second research question: "(...) also taking into consideration the characteristics of a SME?". This will in a way work as a filter for what is optimal (explaining the dotted line). Eventually would a more extensive PM-process be the best but since Wica is a SME there is a need for simplicity, clarity and low costs because of the limited resources experienced in SMEs.

From the development of the PM-process and the SME-characteristics there will be a new PM-process which also will work as recommendations for how the PM-process at Wica Cold can look like in order to improve performance in the OTD-process. The corresponding performance is also analyzed here. By measure, collect and make use of data regarding performance in the OTD-process through the PM-process, will create possibilities to improve the performance in the OTD-process. Highlighting important aspects of performance regarding the OTD-process in the PM-process will help this by structuring the work to improve that performance. Highlighting aspects of performance not that good at the moment in the OTD-process through the PM-process is another way to improve performance.

4. Empirical data

The empirical data collected is presented in this chapter. It starts with a company presentation and a description of the order-to-delivery process to get an understanding of Wica Cold and what they do. After that is the current PM-process presented and the corresponding performance in the OTD-process (4.1) relating to the first research question: “How does the PM-process in the OTD-process look like at Wica Cold AB and what performance is there now?” The data collected regarding the development of the PM-process is then presented (4.2) and this is related to the first part of the second research question: “How can the PM-process develop in order to improve the performance in the OTD-process (...)?” This is input from Wica Cold on how the PM-process can develop. This chapter does also present how the characteristics of a SME fits into the conditions at Wica Cold (4.3) relating to the last part of the second research question: “(...) also taking into consideration the characteristics of a SME?” In the end of the subchapters are the most important aspects summarized.



Picture 2: A Wica-cabinet (Source: www.wica.se)

Company presentation

Wica Cold AB is located in Vislanda outside of Växjö, and they are producing refrigerated cabinets for stores with perishable items. Wica was started in 1957 by Wilhelm Carlsson. At first they only produced refrigerators for private use but after Wica Cold got bankrupt in 1970 and later was taken over by Wilhelms' sons, they started with the commercial refrigeration. Wica Cold once again got bankrupt in 1990. Then the company was taken over by three of the workers and since then the company has experienced a steady growth. In 2005, Wica Cold sold 70 % of the company to Arneg and 30 % is still owned by two of the partners who took over the business in the 90s. Arneg is an Italian company and one of the leading companies in commercial refrigeration. They have approximately 10 % of the world market, a turnover of around 450 Million Euros and produces 40 000 cabinets each year. Wica Cold have 150-160 employees; have a turnover of 300 Million Swedish kroner and produces approximately 6 000 cabinets each year. Even if Wica Cold is a part of the Arneg group they still aren't

as controlled as many other companies within the group. Because Wica Cold is a part of the Arneg group they are assigned a certain market, the Nordic and Baltic market, this to not compete with other companies in the group.

At Wica Cold the workforce is divided into process teams depending on the production flow. They have a decentralized organization where they place a lot of responsibility on their employees. Wica Cold basically run their business independently but all research and development is made by Arneg. The meaning is that the customer won't see a difference if the cabinet is produced at Wica Cold or in any other of Arnegs' factories. They also buy on the same purchasing contract that Arneg have arranged with its' suppliers.

How the order-to-delivery process at Wica Cold looks like is presented below. A process map for the order-to-delivery process can be found in figure 9, and a description of the symbols is presented in figure 10.

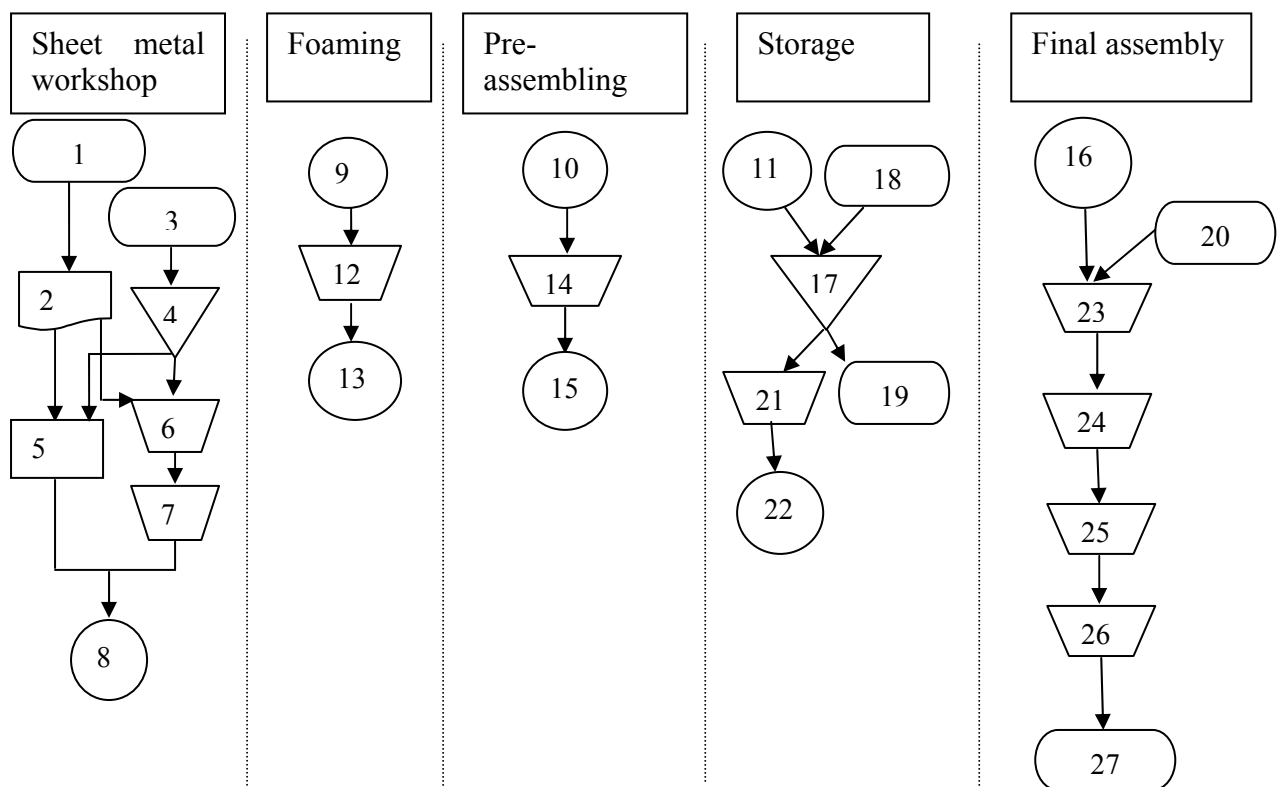


Figure 9: Map for the order-to-delivery process (Source: own production)

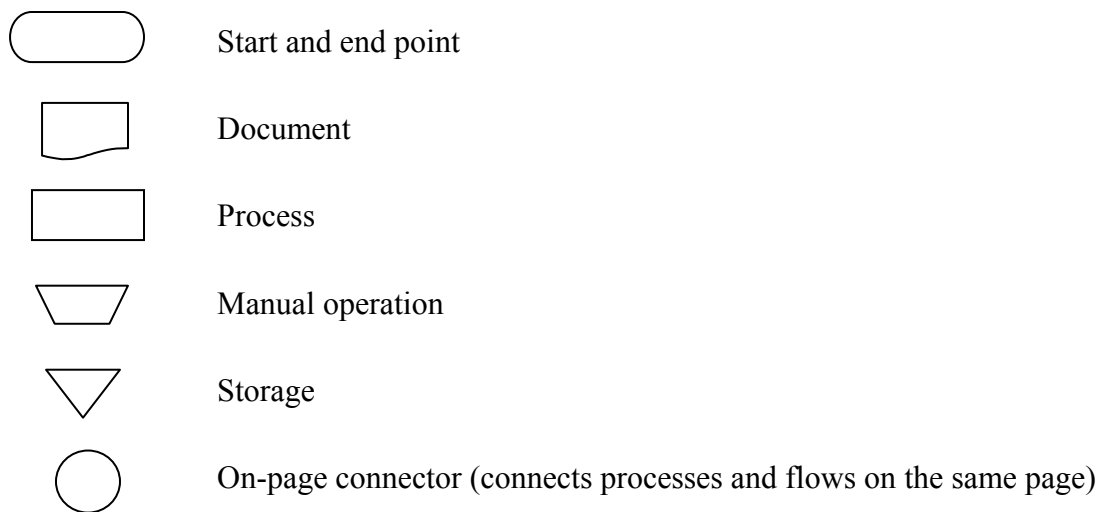


Figure 10: Description of symbols for process map (Source: own production)

The process start (1) with an order from customer (2), no production is started unless they have an order. Sheet metal has to be ordered from suppliers (3, 4). When they know what to do the process of bending and punching starts (5, 6, 7), this is done both manually and in a machine. They invested in this machine last year and it punches and bends approximately 50% of the sheet metal. The machine is running seven days a week; during the week days it's controlled by the employees and during the weekends some one start the machine and let it run. When the bending and punching is finished (8) some of the sheet metal goes to the foaming (9), some to pre-assemble (10) and some to the storage (11).

In foaming (12) two sheet metals are put together and foam is placed between the sheet metals to keep them together and as insulation. After this the sheet metals that are foamed goes to the storage (13, 11). Wica have a wish to move the foaming closer to the production to minimize the transportation needed and to get a better flow in the process.

Some components in the refrigerated cabinets are put together in the pre-assemble (14). Some of these components go to the storage (15, 11) and some goes direct to the final assembly (16).

The products in the storage (17) comes from the own production (11) and from outside suppliers (18). Wica produce most of the components for the refrigerated cabinets them self. Some sheet metals are sent to be painted (19), when they return they will go directly into production (20). Sheet metals and other components for one refrigerated cabinet are placed together on a wagon (21).

When all components for the refrigerated cabinet are on the wagon it's passed on to the final assembly (22, 16). There are three different types of cabinets and these are produced at different lines. These are wall cabinets (which include 70 % of all the cabinets produced), freezing counters and service cabinets. The first step (23) is just to assemble the parts on the wagon. It's only for the wall cabinets that the components are placed on a wagon but since this stands for 70 % of the cabinets produced, it's that flow that's presented here. This is a quite easy step because the employees in the storage are supposed to put all the components needed on the wagon. Then the electricity is connected and controlled (24) and after this shelves and sides (25) are put on place. The refrigerate cabinet is now ready to be packed (26) and sent to the customer (27). When the cabinets arrive to the costumer Wica has employees that install the cabinets in the store. They also perform service to their customer on already installed products.

4.1 The current PM-process

4.1.1 Measures used

One thing controlled and measured at Wica Cold is according to Production Manager Gustaf Rosén how many hours it takes to produce one cabinet and cabinets produced per day. Time studies have been made at Arneg in Italy regarding how long time it is supposed to take to produce one cabinet. The goal is to be able to produce within the time limits. The cabinets/day is compared to how much was planned to produce.

Another thing measured is something called a surplus which the bonus the employees have is based upon. The Production Manager explained that every cabinet have a certain

value called production value which is based on budget (these values are also revised when needed). That value times the amount of each type of cabinet produced every period is divided by the number of hours worked times a budgeted value of how much an employee costs. This surplus is then divided on the employees depending on how many hours they have worked (i.e. if you have worked more hours, you get a higher bonus). The production Manager explained that the surplus and the hours/cabinet over time will show the same result. The surplus is though weighted since it also considers the production value. If for instance easy cabinets is produced that can be produced very fast will lower the hours/cabinet but the surplus would probably not increase that much and vice versa.

Project accounting is also used to keep track of installation and delivery costs and 1 project is equal to 1 order where installation is included. According to the Vice President is project accounting used because it's easy to see costs of the actual production of the cabinets, but it's harder to see costs for installation and delivery. A lot of things can go wrong in these stages for example more deliveries than first expected, cabinets that do not fit in the store as supposed to and defect cabinets. This leads to higher costs and maybe also unprofitable orders. Wica doesn't take care of transportation themselves, instead do they buy this service from outside suppliers and include it in the package offered to the customer according to the Production Manager. At Wica Cold they are satisfied as long as the projects break even since this service they are offering is very important for them to have in order to attract and keep the customers. They make the most money on the cabinets but would of course like to make money also on the projects. Starting to account for the projects is a good thing according to the Production Manager, now they get to know why and how things went wrong.

The Vice President also told that something recently added is something called "non-performing costs" That simply means costs that doesn't bring any value to the customer. They have two types of non-performing costs and these are for backorders and guarantee.

4.1.2 Collection and analyzing of data

The Production Manager explained that all data are collected from Wica's ERP-system Monitor. The data for the hours/cabinet, cabinets/day and the surplus measures have to be

moved to Excel to calculate the measures. All the data is collected every month except the data for the bonus which is collected and rewarded on a two-week basis.

The data for the “non-performing costs comes from the invoices created when the guarantee claims is being performed and when backorders are needed. When this is being accounted for in Monitor it is also distributed to the one responsible for them (i.e. sales, purchasing, production etc.) “The non-performing costs” are also somehow related to the project accounting. The data from the project accounting regarding defects in the cabinets when they are being installed is also a part of the guarantee costs.

When the data for transportation and installation are accounted in Monitor through the invoices they get a project number for the project accounting. Every project is then compared to how much it is supposed to cost according to budgeted numbers.

The measures are followed through time to be able to see trends. Monthly meetings with all the office workers are held. This is where a lot of the analyzing work is being performed. If the goals aren't reached it's analyzed why.

4.1.3 Make use and take action based on measures

The monthly meeting with the office workers is where they try to make use and take action based on the measures as told by the Production Manager. Discussions are held regarding the measures. If not satisfying outcome they discuss what can be done to improve this figure until next month and it's decided what to do differently.

Monthly meetings with the employees in the production are also held. This is more like that they inform the employees about what's new and how the company is performing and the one responsible for those are Production Manager Gustaf Rosén. What's presented is the turnover for every month and also the accumulated turnover for the year. The backlog of orders is also told expressing how much there is to do in the nearest future. How many cabinets produced per day the last month is another thing told about.

One thing recognized by the Production Manager as not being good is the way the measurement data is communicated to the employees in the production. The problem with the monthly meetings is that no one dares to say anything. The information given is

neither very rewarding for the employees according to two final assembly workers except from that it's interesting to hear how the company is performing. The Production Manager would like more frequent and group-based feed-back that strengthens the sense of responsibility for the employees and makes them work together and find ways to improve the efficiency. One of the final assembly workers agreed with this and think it's important to highlight the problems in the production.

4.1.4 Current performance in the OTD-process

The Production Manager mentioned that the efficiency is pretty good right now, but it can of course be a lot better. Recently there have been a better flow in the production and been able to deliver the cabinets in time more often which was a bigger problem before and they have now to some extent improved in this regard. How the performance regarding efficiency in the form of the hours/cabinet currently is now and how this graph looks like can be found in figure 11. There is one for wall cabinets, one for freezing counters and one for service cabinets. One of the main reasons for the shifting outcome of the hours/cabinet is because of the different amounts and type of accessories in the cabinets.

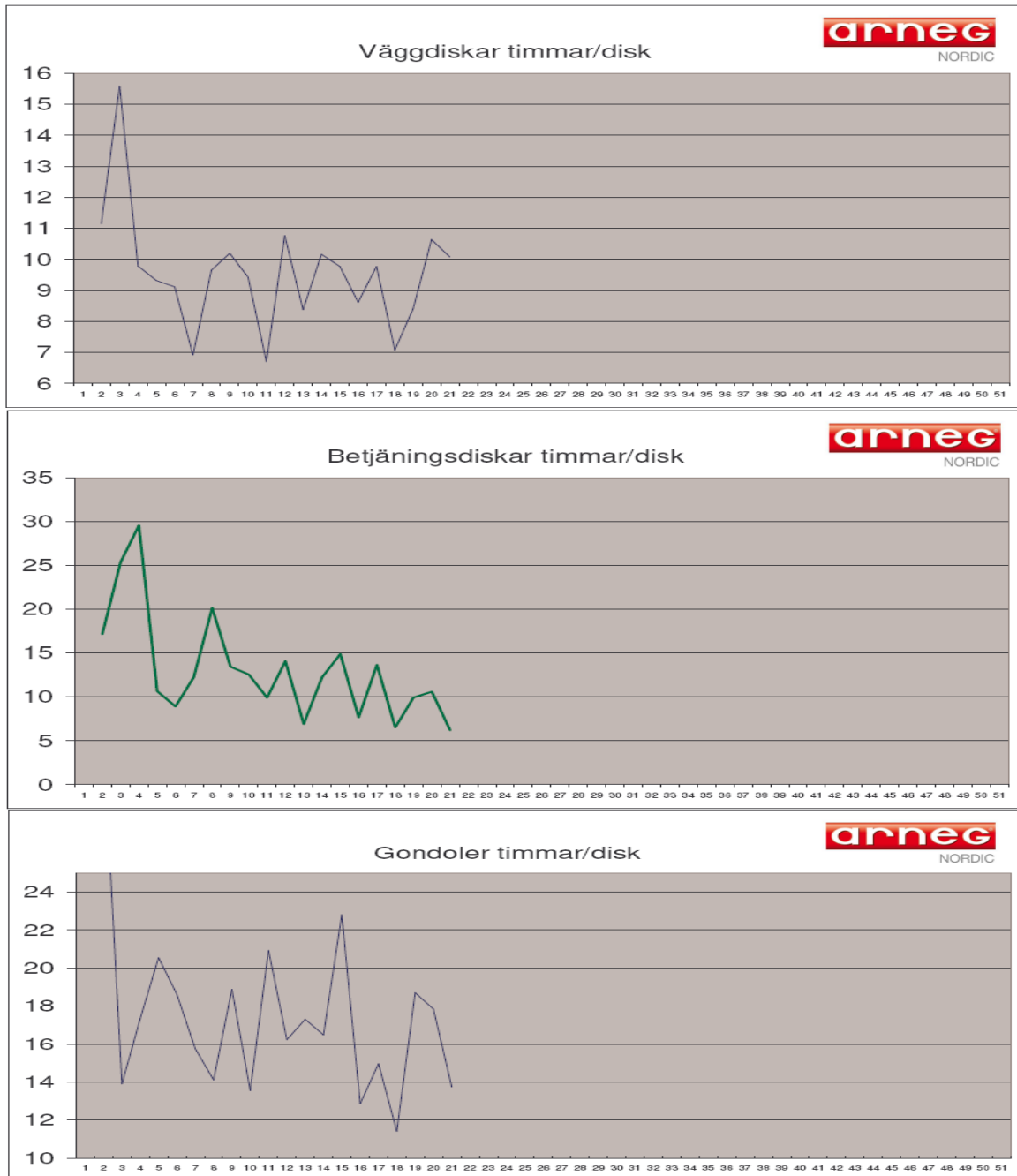


Figure 11: The efficiency measure of hours/cabinet for wall cabinets, service cabinets and freezing counters (Source: Wica Cold)

Only measure the cost for backorders is according to the Production Manager not enough information and the same is true for guarantee claims. The surplus is a very “fair” system according to the Production Manager. A problem is though as mentioned by one of the final assembly worker that she does not know how the surplus is calculated.

The planning of which cabinets to produce and when is at Wica Cold made by the Production Manager. He decides what models to produce two weeks ahead and the order one week before they will be produced. The time studies made at Arneg in Italy are used in the planning, it's planned so that the employees should be able to produce all cabinets if they produce within those times. The same model can though differ a lot on the time required to produce that cabinet depending on the amount and types of accessories wanted by the customer. This makes the planning difficult since it's based on times required to produce a "standard" cabinet and the time really required then depends on the amount and types of accessories. This is though to some extent considered by the Production Manager.

There are some problems with the quality but generally it is satisfying according to the Production Manager. The measure for the quality of the cabinets now present at Wica Cold is the guarantee. The Production Manager is aware of that this is a very late measure for the quality and that defect cabinets can be found very late and one have then done the same mistake on numerous cabinets. The most important stuff regarding the quality is technical aspects like that the electricity is working. This is now to some extent tested before the cabinet leave the factory, but the extent depends on what type of cabinet it is. The defects are though not documented in any way. If this doesn't work it will cost a lot of money for Wica since the installation takes a lot more time and the cabinets have to stand in the stores not working. This also creates unsatisfied customers. A Problem mentioned by one of the final assembly workers is that defects often are found when the cabinets are tested, but they get no feedback of what was wrong. They neither get any feedback on the guarantee claims; the Production Manager does only get to know the costs they had for this.

Flexibility is very important for Wica to be able to handle fluctuations in demand in an efficient way. This is not as good as they want since it takes a lot of time to teach new employees to keep the same pace as the regular workforce does. Wica need some people who are very skilled and can do everything and create work stations that are very simple who can be performed by extra staff hired when there are peaks in demand. The not very good flexibility can be seen in the measure hours per cabinet. It took a lot more time per

cabinet when there were a lot of new employees in the production. At Wica Cold they do try to make the employees rotate between the work stations according to one of the final assembly workers. This is though not working very well according to the final assembly worker since it's not done in a structured way and some people are satisfied only doing only one work station. This makes some employees invaluable since they perhaps are the only one knowing how to do that workstation.

The way they try to identify inefficient activities is by comparing how many hours it took for them per cabinet and compare that to the time studies made in Italy. If a model is produced a lot slower than in Italy it's investigated why by the Production Manager and his colleagues and what can be done to improve that figure. The focus is on the most popular cabinets, since if it's a model produced very seldom it's not worthwhile putting a lot of effort to improve that. A reason could be that bottlenecks were present as the absence of key personnel. One of the final assembly workers mentioned that when someone is sick or absent for other reasons, bottlenecks often occur in that work station. Bottle-necks in the production are a quite often occurring problem which limits the capacity otherwise possible. One of the final assembly workers mentioned that they very often have to search for material and do a lot of rework or that material is missing.

A system recently introduced is something called "yellow notes" where the employees in the production writes down things they think can be done in another way or things that don't work. What to be written in the note is the kind of model it concerns and what they want to have changed. It can concern stuff like small changes in construction that would simplify the production. These notes are collected every other week and they are distributed to the ones responsible for the problem and it can for instance be in purchasing or the construction. They also have meetings every other week where they go through the suggestions and either it's said that nothing is going to be done about it or what should be done about it and when. On these meeting the Production Manager, the supervisors, one from construction and purchasing, one from the different production lines and one from the sheet metal workshop, the foaming and the pre-assembling are present. This system is working well according to the supervisor in the final assembly and the supervisor for the sheet metal workshop and the foaming. Two of the final

assembly workers agreed with this and mentioned that their ideas on how to improve the performance are now considered in a faster and better way. In figure 12 below are the most important aspects in this subchapter summarized.

The current PM-process at Wica Cold:

Measures used: hours/cabinet, cabinets/day, “non-performing costs” of backorders and guarantee, project accounting

Collection and analyzing of data: data is collected through the ERP-system and some is transferred to Excel, most of the data is collected every month, analyzing work mainly in monthly meetings with office workers

Make use and take action based on the measures: Monthly meetings with office workers (well functioning). The performance is though not communicated very well to the employees in the production

Current performance in the OTD-process:

The efficiency is pretty good right now but the measure hours/cabinet is sometimes misleading because of the different amounts and types of accessories. Currently the hours/cabinet is 10, 14 and 6 for wall cabinets, freezing counters and service counters respectively.

The quality is acceptable, but sometimes there are problems experienced in this regard. Not satisfying information regarding quality defects.

Recently been able to deliver the cabinets on time more often but there are still problems in this regard. The delivery performance is documented with cabinets/day and costs for backorders.

Flexibility is not as good as they want. Takes a lot of extra time when new employees and not very good at job rotation.

Regarding time the employees often need a lot of this to search for material and fix stuff not right from the beginning.

Started to collect suggestions from employees regarding improvements from employees and this is working well.

Figure 12: Summarized data for current PM-process and performance in the OTD-process at Wica Cold.

4.2 Developing the PM-process

4.2.1 Defining strategy

According to the Production Manager is the strategy of Wica not explicitly formulated and a little bit fuzzy but although very simple: make money. For Wica it's important to work close and with their customers to make them stay as mentioned by the Production Manager. Wica take responsibility for the whole picture with installation of the cabinets and the full service to the customer which is seen as a main competitive advantage. They are also helping the customer find a solution that fits their specific needs.

Other important aspects regarding the strategy are to have a big variation of products, focus on design and customization. Time and quality are two important product attributes Wica puts a high value on. It is also a trade-off between quality and cost, if there's only a small cosmetic defect that the customer won't recognize or complain about, they aren't doing anything about it.

According to the Production Manager Wica Cold does also put a lot of responsibility on the employees since it's a flat organization with very few middle managers. Even if they have grown a lot lately they still have the characteristics of a family business. Since it's not competitive to transport the cabinets a long distance, Wica gains by having local production. The salaries are though higher in Sweden than in southern Europe where there are a lot of competitors and thereby does Wica need to work smarter and more efficient. Wica have an aim to be the leading actor of those markets but at the moment they are only in a market leading position in Sweden (Wica has 70% of the Swedish market).

4.2.2 Select and design measures

Discussion of the usefulness of existing measures and potential new measures needed were held especially with the Production Manager. He thinks the measures generally are good but that there can be small changes in them. Maybe also some additions so that there for instance can be more and better feedbacks to the employees in the production that will help motivate them.

They now measure the costs for backorders and guarantee and this is distributed to the one responsible for them. The cost is important information according to the Production Manager but he doesn't think that is enough. Then they don't know how many complaints there have been and where in the cabinet the complaint concerned. Discussed about also measure something like the amount of guarantee claims and what was the cause of the complaint. The same discussions were also held regarding the backorders. One of the final assembly workers agreed that this would be valuable information, since if one don't get information about what's wrong one keeps doing the same mistake thinking this is the right way of doing things.

The hours per cabinet for every type of cabinet were another measure with thoughts of implementing. This measure does already explicitly exist but it's not communicated to the employees. It's though only used for the monthly meetings for the office workers. This would help keep better track of how efficient the work with the different types were performed and would help get more group based feedback.

The supervisors for the final assembly and the sheet metal workshop and foaming wanted to measure something regarding fixing stuff that's not right from the beginning. This takes a lot of time that could be spent doing other things. Two of the final assembly workers agreed with this and also mentioned that they often have to search for material that should be included in the cabinets and that material often is missing. They though couldn't specify what and how this could be measured. Another final assembly worker mentioned that they very often have to search for and ask about where the material included in the cabinets is and thereby is interrupted in the regular work. She also mentioned that this is very tiresome and that there often also is material missing.

4.2.3 Implementation of measures

The formula for the hours per cabinet would in case of adding that measure be divided on the three types of cabinets. That would mean a measure for wall cabinets, one for freezing counters and one for service cabinets. Data on the amount of hours worked on the different types of cabinets can also easily be taken from the ERP-system. This is then transferred to Excel and divided by the amount of the different types of cabinet produced. Discussions were also made with the Production Manager regarding more frequent

collection of this data to get more up-to-date information. The one responsible for collecting and reporting the data would be either the supervisor in the final assembly or the Production Manager.

The potential formula for the backorders and guarantee claims was discussed with the Production Manager. It could for instance simply be the amount of backorders and guarantee arrangements and that will of course also be compared over time. What was the cause of the backorder and guarantee arrangement would also be specified here. This would be collected by the one responsible for the “non-performing costs”. The frequency of how often this data would be collected is either every week or every month.

4.2.4 Managing the PM-process

As already mentioned are they satisfied with the monthly meetings with the office workers where the measures are analyzed and it's eventually decided what to do differently. The Production Manager would like more frequent and group based feedback for the employees in the production. That would also be in place with the hours per cabinet measure on the different types of cabinets and by collecting this data every week. More official meetings to communicate the measures isn't something the Production Manager would prefer. Instead is something like publish the performance data on the shop floor a better way to handle this. Feedback on the amount of backorders and guarantee claims could also be presented in this way. The Production Manager also stressed the importance that the measures are communicated to the employees in a way that encourage them to perform better and not so that they feel criticized.

Regarding the hours per cabinet measure is a problem here that the hours needed to produce one cabinet depend on what model produced, how many of them produced and how much extra accessories wanted on the cabinets. This influence very much on how many hours it took to produce one cabinet. This was stressed both by two of the final assembly workers and also the supervisor for the final assembly. An important aspect regarding this is according to the Production Manager that some comments are included with the measure that explain why there was a good or bad figure for every week. It could be something that can't be influenced by the employees in the production, but the reason for implementing it would be to create a dialogue regarding the measure. Why it

was not that good this week and what can we do to improve that etc. could be included in those discussions.

Developing the PM-process

Defining strategy: make money, close relationship with the customer, the additional service, design, customization, quality, responsibility for the employees.

Select and design measures: measures generally good, but some changes and additions wanted; amount of guarantee claims and backorders and, hours/cabinet for every type of cabinet, something that captures time spent for rework and search for material.

Implementation of measures: more frequent collection of data, for the amount of backorders and guarantee claims could also what was the cause of it be specified. Data collected from the ERP-system.

Managing the PM-process: more frequent and group based feed-back, not too many official meetings, problem with the hours/cabinet measure is that the outcome of it is very shifting and could therefore include comments explaining the reason.

Figure 13: Summarized data for developing the PM-process at Wica Cold.

4.3 Considering the SME characteristics on the PM-process

The Production Manager agrees with the fact that one reason for a not very extensive PM-process is the limited capital and human resources. Still he would like the PM-process to be developed with more measures and more feedback. It's important though that it's kept simple and easy to use. He thinks that one should not have an employee spending all days doing reports and measure different aspects. Only measure the guarantee is another thing associated with limited resources. The quality could be measured earlier in the production but would require more employees who performed this control.

5. Benchmark

In this chapter is the benchmark-study of the PM-process at Getinge Disinfection AB presented. It starts with a company presentation. After that does it follow the same structure as the current PM-process in the conceptual model with 5.1.1 Measures used, 5.1.2 Collection and analyzing of data, 5.1.3 Make use and take action based on the measures and 5.1.4 Current efficiency in the order-to-delivery process. All information in this chapter is taken from the interview with Logistics Manager Marcus Johansson. In the end of this chapter are the most important aspects summarized.

Company presentation

Getinge was grounded in 1989 by Rune Andersson and Carl Bennet and the company was acquired from Electrolux. They are now then celebrating their twentieth anniversary. Getinge Group have 10 000 employees and a turnover of 16 billion Swedish kroner. Getinge Group delivers more or less everything needed for the health care except from the buildings and the employees. It operates in three different business areas and these are Extended Care, Medical Systems and Infection Control. Getinge Disinfection AB is a part of the Infection Control. Infection Control has 10 plants spread over the world; they have plants in Sweden, China, USA, Germany and France. Getinge Disinfection AB has about 240 employees, 160 in production and 80 in the office. The turnover has increased from 270 to 600 million Swedish kroner the last 10 years. The goal is to have a turnover of 1 billion Swedish kroner 2012. Getinge Disinfection AB produces disinfectors for the health care and has two different types of products they are producing. These are flusher-disinfectors and washer-disinfectors. The difference between these is that the washer-disinfectors make the washed material cleaner than the flusher-disinfectors (i.e. sterilized instead of just disinfected). Getinge has 40 % of the world market regarding the flusher-disinfectors and 25 % regarding the washing-disinfectors. Their products are mainly sold to hospitals but also for the eldercare and to laboratories and science. In the production there are 3 different lines, 1 that produces flusher-disinfectors and two that produces different types of washer-disinfectors.

5.1 The PM-process at Getinge Disinfection AB

5.1.1 Measures used

At Getinge Disinfection AB is the performance measured in three different dimensions according to Logistics Manager Markus Johansson. These are quality, efficiency and delivery accuracy.

The efficiency is measured as the time required producing one product. This is compared to how long time it is supposed to take according to time studies made by consultants. This is then measured for all products. It's of great importance the times are reached. The costing starts with what the customer is willing to pay, then how much the material costs, how long time it should take to produce the product (multiplied with the salary) and then there is a production expenditure and material expenditure markup ending up with the profit. If the times aren't reached will then lead to a lower profit.

The quality is measured as the amount of defects per tested product. All produced products are tested before they leave the factory. Another thing measured is the rework time needed to fix the products. The amount of defects are important but if one defect takes a lot of time to fix it costs a lot of money in the form of man hours.

The delivery accuracy is measured as how many products reported to the finished goods inventory compared to how much was planned. This is also measured in money to be able to steer the production against the budget. The amount of products times the value of those products is compared to the planned amount of products produced times the value. This is also presented in percent. If for instance the delivered value is 800 000 Swedish kroner and the planned value is 1 000 000 Swedish kroner gives 80 % delivered value against planned value delivered. The accumulated numbers for the period is also presented. These numbers are then broken down against planned man hours in the production, i.e. it should take 100 hours to produce 10 machines which gives 1 000 000 Swedish kroner in the finished goods inventory. This gives a planned value per man hour of 10 000 Swedish kroner. If there for instance only becomes a value of 850 000 Swedish kroner for the 100 man hours, and then give an efficiency number of only 85 %.

5.1.2 Collection and analyzing of data

The time required producing one product are taken from the MRP-system. This data is then transferred to Excel to get the measures right and to create the graphs. When a manufacturing order is created it gets in the list of what should be produced and when for the ones producing the products. It also creates a need for different components required for that product (a bill of material, BOM). Operations are needed to produce those components and in the end also the final product. The employees' clock in on an operation when they start and when it's finished they clock out. This data is collected monthly. The data is collected on the different products but it can also be measured on individuals to see if someone is producing a lot slower than the others. If someone does that it's not presented in public, instead a private meeting with the concerned employee is undertaken.

The quality is controlled by two production quality technicians who test all the products. The defects are then registered in a data base, the amount is registered but also what the defect concerned and the rework time needed. It's also registered differently depending on if it's the production that caused the defect or if it was in the material bought from suppliers. This data is collected continuously but presented to the employees once a week.

The delivery accuracy is collected every week. The numbers are taken from what's reported in to the finished goods inventory. These reports are made by the department of economics. The data is transferred to Excel in the same way as mentioned above.

The ERP-system is a necessity for being able to capture all these data (except for the quality then which is collected in a data base).

5.1.3 Make use and take action based on the measures

The time required producing one product is presented to the employees once a month. This is presented to them on a board for every line showing total time required and compares that to the time studies. A rolling average is also presented and all these figures are presented in a graph. It's important also that someone "owns" the measures. At Getinge Disinfection the supervisor for every line does own most of the measures and the

Logistics Manager hold him responsible to reach the targets. If the target isn't reached they have to find what the cause of it was and what can be done differently. There might for instance have been interruptions in the material or other interruptions.

The defects are presented to the employees every Friday, how many defects there were and also what the defects concerned. This is done for every line separately. The supervisor on every line, the quality technicians and the Logistics Manager also go through the defects and make sure common and expensive defects are corrected. This information is also presented on the board for every line. The board also shows a competence matrix, showing what operations the different employees are able to perform. It's marked green if the employee can perform the operation, red if he is under training and not marked at all if he cannot perform that operation. The production is then easier to plan and it can be seen when training is required, and one can decide upon how flexible one want the line to be.

The delivery accuracy is also presented on the board, showing delivered versus planned products. When a products is finished it's marked off on the board. The supervisor for every line has to "defend" their efficiency numbers that they got from the delivery accuracy and was broken down to man hours. If the outcome was bad they have to explain what the cause of it was, some percent can have been caused by interruptions in material and some by other interruptions. The supervisor will then have to find a way to improve that figure until next period if there are things they could influence upon themselves.

Meetings are also undertaken every Monday for every line. Here are economical numbers presented as the turnover and the goal for this. The backlog of orders, what's planned to do the next week and what was the outcome last week is also presented.

The Logistics Manager does also every day have a short meeting with the supervisors and what's discussed are how many they should produce today, what was the outcome yesterday, if there have been any material or other interruptions.

5.1.4 Current performance in the OTD-process

The Logistics Manager stressed the importance of measuring since one then in a better way really can see what's good and what need to be improved. It's also needed as a way of encouraging the employees to perform better. The ones who want to work hard like it better when they also can show how good they are. Managing the measures is also very important. An important aspect is transparent information. The employees should get to know as much as possible about the performance of themselves and the whole company in order get a good view and to know how to do things better.

Since the quality has started to be presented to the employees every Friday has the amount of defect products decreased tremendously. This started at the beginning of this year. The measure of efficiency used at Getinge Disinfection is very useful in order to improve that performance. The Logistics Manager thinks the efficiency is good.

An improvement council does also exist at Getinge Disinfection AB and some employees from every line, the supervisors, the production technicians and the Logistics Manager are included in this council. Suggestions are collected from the employees and discussed and if something is going to be done about it's determined what and when it's going to be finished.

Current PM-process at Getinge Disinfection:

Measures used: *time required to produce one product, amount of defects per tested product, amount of products reported to the finished goods inventory compared to plan.*

Collection and analyzing of data: *Data is collected through the ERP and MRP-system. The quality is collected in a database. The data is collected monthly or weekly*

Make use and take action based on the measures: *Most of the measures are presented on a board on the shop floor. The quality defects are followed up with the employees every Friday.*

Current performance in the OTD-process:

Importance of measuring and manage the measures, transparent information, quality improved since started measure, efficiency good, improvement suggestions from employees.

Figure 14: Summarized data for current PM-process and performance in the OTD-process at Getinge.

6. Analysis

This chapter is going to follow the structure from the conceptual model. This chapter has many inputs; the theory, the current PM-process at Wica Cold, input from Wica Cold how the PM-process can develop and the benchmark study. It starts with analyzing the current PM-process and the corresponding performance in the order-to-delivery process (6.1) relating to the first part of the first RQ: “How does the PM-process in the order-to-delivery process look like at Wica Cold AB and what performance is there now?” In the next section is how the PM-process can be developed presented (6.2) and this is related to the first part of the second RQ: “How can the PM-process develop in order to improve performance in the OTD-process (...)?”. This chapter does also analyze how the characteristics of a SME can be taken into consideration (6.3) relating to the last part of the second RQ: “(...) also taking into consideration the characteristics of a SME?” Next the new PM-process will be presented and the corresponding performance in the OTD-process (6.4) which is the result of the development (6.2) and the SME-characteristics (6.3). Here is also analyzed if there have been any improvements of the performance. This is also recommendations for the new PM-process. This is related to the second research question. In the end of every subchapter are the most important aspects summarized.

6.1 The current PM-process

6.1.1 Measures used

The measures used are the first part of the PM-process according to this thesis. The measures used at Wica Cold are hours/cabinet, cabinets/day, the surplus which the bonus the employees have is based upon, project accounting and “the non-performing costs” (guarantee and backorders). At Getinge Disinfection they do measure in the three dimensions efficiency, quality and delivery accuracy. The companies do have a similar measure for the efficiency. The quality measured at Getinge Disinfection AB has its counterpart at Wica Cold by the “non-performing cost” regarding guarantee. The main difference between them is that Getinge have a measure for the quality that’s “early” and it’s measured before the product leaves the factory. Wica measure the quality “late” in the form of complaints from the customer. Connecting this to the thoughts of Anthony &

Govindarajan (2007), the quality is for Wica Cold an outcome measure and for Getinge Disinfection a driver measure. The guarantee is also only measured in costs. The cabinets at Wica Cold are though to some extent tested before they leave the factory, but the defects are not documented in any way. At Getinge Disinfection they do measure how many products reported to the finished goods inventory compared to how much was planned and this is also measured similarly at Wica Cold. Regarding deliveries they do at Wica also measure the extra costs they get when backorders are required. Folan & Browne (2005) suggest that the measures should be relevant in the day to-day job which is not present at Wica Cold while only measure the cost for backorders and guarantee claims.

6.1.2 Collection and analyzing of data

Next step in the PM-process in this thesis is the collection and analyzing of data. At Wica Cold does all data come from their ERP-system Monitor although some data have to be transferred to Excel to get the measures. All data is collected every month except the surplus which is collected and rewarded on a two-week basis. The monthly meetings with the office workers are where a lot of the analyzing work is being performed. The collection and analyzing of the data is performed similar at Getinge Disinfection. The data is collected monthly for the efficiency and weekly for the quality and delivery accuracy. Excel is used sometimes also at Getinge Disinfection to calculate the measures and create the graphs etc. A difference between the companies is also that Getinge Disinfection uses something else than the ERP-system to collect their data (for the quality which is collected in a database).

At Wica Cold are most of the measures also costs (for instance “the non-performing costs”) while Getinge Disinfection uses non-financial measures to capture the performance in the aspects of quality and delivery accuracy. Anthony & Govindarajan (2007) suggest that there should be a mix between financial and non-financial measures. Regarding the quality this data is collected more ambiguous at Getinge Disinfection since they have two full time employees doing this and also specifies the cause of the defects. At Wica Cold, the only thing specified is the costs they have for guarantee. Regarding the efficiency Getinge Disinfection does have a more advanced system of capturing this data

since the employees “clock in” when they perform an operation on a product and “clock out” when finished. Franco-Santos & Bourne (2005) mention that a reason for not having many non-financial measures is incapability’s in the information systems. This could be a reason for the differences between the two companies in this regard; that the information system is more developed at Getinge Disinfection.

6.1.3 Make use and take action based on the measures

The monthly meetings with the office workers is the most common place where Wica Cold make use and take action based on the measures. They also have monthly meetings with the employees in the production but not many of the measures are communicated to them. This is where one of the main differences in the PM-process between the two companies is. At Getinge Disinfection the employees do get feed-back on all the measures and it’s also communicated to them on a board at the shop floor (one for every line). Getinge Disinfection does also hold the supervisors and the employees in their groups responsible for the measures and the outcome of them. This is not done at Wica Cold; instead the information is more or less kept by the one who collect the measure, at least it’s not communicated in the same formalized way. A reason for the lack of a well developed way of making use and take action bases on the measures at Wica Cold could perhaps be expressed by the thoughts of Neely & Bourne (2000). The authors mention that managers seem not to be aware of the tools and techniques available to use the data to improve performance.

6.1.4 Current performance in the OTD-process

Efficiency is according to Olhager (2000) output divided by input. At Wica Cold this is measured as hours per cabinet. This does though not a perfect measure for the efficiency because of the problem with the amount of and type of accessories in the cabinets. Currently the hours/cabinet is 10, 14 and 6 for wall cabinets, freezing counters and service counters respectively. The efficiency has though improved lately according to the Production Manager. Bottlenecks which are a sign of poor efficiency according to Segerstedt (1999) are though an often occurring problem at Wica Cold which limits the capacity. Ax & Ask (1995) mention that to improve the efficiency can be achieved by reducing or eliminating negative elements. At Wica Cold they try to do identify these

mostly through the hours/cabinet measure, and then try to do something about it. Since there are problems in the production, and these aren't always solved there might in my opinion be a need to make new time studies and not rely on the ones made in Italy. The production process is most likely different between the two factories which might make the times misleading for the conditions at Wica Cold. These time studies could also perhaps at least to some extent consider the amount of and type of accessories to keep track of the efficiency in a better way and not make the graphs so shifting in the outcome as it is today. Then it can in a better way be seen how efficient the production is and from that find ways to improve it. New time studies could also be helpful regarding the planning and the measure cabinets/day since these now are based on the time studies in Italy. Comments on the hours per cabinet measure as mentioned by the Production Manager are another and simpler way to handle this problem.

The **quality** of the cabinets is acceptable according to the Production Manager but sometimes there are problems in this regard. The way they make sure they get the "right" quality as mentioned by Olhager (2000) is by measuring cost for backorders and also by the close contact with the customers. The feedback to the employees in this regard is though not enough. Regarding the quality and its' connection to costs mentioned by Olhager (2000) this can be related to the situation at Wica Cold. Since the quality is not measured in the factory leads at least to some extent to costs for rework and waste. Costs for eventual quality controls must though be considered and these costs have to be weighted against each other. Anthony & Govindarajan (2007) mention that a measure for quality could be guarantee claims, at Wica Cold they measure the costs for guarantee claims.

Regarding **deliveries** they have at Wica Cold recently been able to deliver the cabinets on time more often, even though this is still at least to some extent a problem. This could be measured in several ways whereof the amount of backorders mentioned by Anthony & Govindarajan is similar since Wica Cold now measures the costs for backorders.

According to Neely et al. (2005) **time** is an important source for competitive advantage and a fundamental measure of performance. This is really not measured at Wica Cold

(the hours/cabinet is measured in time but this is more considered as a measure for efficiency.) Final assembly workers mentioned that a problem in the production is that they have to spend a lot of time for rework and also search for material.

To be **flexible** is very important for Wica Cold to be able to handle fluctuations in demand in an efficient way. This is not very good at the moment. Olhager (2000) mention different types of flexibility and the ones not very good at Wica Cold are volume flexibility and personnel flexibility. The way they keep track of the volume flexibility is by the measure hours/cabinet. Having skilled and multi-talented employees is a way to improve flexibility and according to Heyes (1996) and Allwood & Lee (2004) can this improve performance, but not necessarily. Using a competence matrix as used at Getinge Disinfection could though help keep better track of the skills in the company and what work stations the employees are able to perform and where training might be needed. This can also be linked to an aspect regarding efficiency discussed by Segerstedt (1999) namely the bottlenecks. One example of bottlenecks could be the absence of key personnel. Visualize the skills in a competence matrix could create the need for more job rotation which could help eliminate that some employees are invaluable since they are the only ones who knows how to do that work station.

Something recently started which is a way to get to the problem expressed above is the “yellow notes” where the employees write down suggestions for **improvements**. This is a simple and structured way of identify and do something about inefficient activities which is a way of improving performance according to Segerstedt (1999). Slightly change the design of a product is another thing mentioned by Segerstedt (1999) that can improve performance. Changes in the design are something the “yellow notes” can concern.

One thing suggested by Segerstedt (1999) to improve the performance was to see the problems from a helicopter to find the hidden problems in the production. One way of finding hidden problems at Wica Cold could be to use the measurement data to a bigger extent like done at Getinge Disinfection. If the performance was shown to be unsatisfying one would have to search for the cause of it. Problems not really aware of could then be identified and one will try to find a way to do something about.

This can also be related to another suggestion by Segerstedt (1999) namely to measure and especially follow up performance. Starting to account for the projects is another thing in this regard. Now they at Wica Cold get to know if things were more expensive than planned. Why and how things went wrong can then be analyzed.

Analysis of the current PM-process performance in the OTD-process

Measures used at Wica Cold: hours/cabinet, cabinets/day, the surplus, project accounting and “the non-performing costs” (guarantee and backorders). Somehow similar to the measures used at Getinge Disinfection especially regarding efficiency and deliveries. Only cost measured regarding quality at Wica Cold which is measured more sophisticated at Getinge Disinfection.

Collection and analyzing of data: Data is collected by the ERP-system weekly or monthly at Wica Cold, and similarly at Getinge Disinfection. The difference is that Getinge Disinfection captures more non-financial data which might depend on incapability in the information system at Wica Cold.

Make use and take action based on the measures: Main difference between Wica Cold and Getinge Disinfection is that at Getinge Disinfection the employees get feedback on all the measures and it is communicated to them on a board.

Analysis of current performance in the OTD-process

Efficiency acceptable but problem with how this is measured and for instance also with bottlenecks. Currently the hours/cabinet is 10, 14 and 6 for wall cabinets, freezing counters and service counters respectively. Quality acceptable but not fully tested and defects are not communicated, sometimes problems. Have been able to deliver more on time recently, but there are still problems. Problem spending time for rework and search for material. Flexibility not as good as wanted. Suggestions from employees regarding improvements is well functioning.

Figure 15: Summarized analysis regarding current PM-process and the performance in the OTD-

6.2 Developing the PM-process

6.3.1 Defining strategy

For instance Bourne et al. (2000) suggest that a company's performance measures need to be related to the strategy. The strategy at Wica Cold is characterized by the close relationship with the customer and the additional service given to them. Having a big variation of products, focus on design, customization and quality and giving the employees a lot of responsibility are other important aspects. Because of the higher salaries in Sweden than in southern Europe, Wica Cold needs to work smarter and more efficient. The measures used at Wica Cold are cabinets/day, hours/cabinet, the surplus which the bonus the employees have is based upon, project accounting and "the non-performing costs" (guarantee and backorders).

The measures now used are to some extent related to the strategy. They have a measure for the efficiency, quality and deliveries are considered in the measures even though this is only measured in costs. Giving the employees a lot of responsibility is in my opinion not really reflected in the measures. This mostly has to do with how the measures are managed. The Logistics Manager at Getinge Disinfection believes in the importance of transparent information to motivate the employees, which is not in place at Wica Cold. Getting the ideas from the employees and really pay attention to them is though something positive in this regard.

According to me the lack of sophisticated measures on for instance quality and that most of the measures are financial can contradict the strategy. Of course it is of great importance to try cutting costs as much as possible to compete with the low cost alternatives from southern Europe and because of the higher salaries in Sweden. This focus to cut costs does though have the risk to interfere with the factors that make the customers buy cabinets from Wica Cold. According to their strategy are Wica's competitive advantage the service and close relationship with their customers and also the quality and design. When deliver cabinets without fully test them before face the risk that the cabinets do not work as supposed to when it should be installed in the store. As mentioned by Olhager (2000) this might create costs for rework which eventually end up

higher than the cost for an eventual quality control. This might also create unsatisfied customers if they get cabinets standing in the store that is not working.

The company success factors wasn't explicitly specified by the Production Manager, but can though according to me be defined from the strategy defined and the other empirical data collected. The success map as explained by Neely & Bourne (2000) could for Wica Cold look like something as expressed in figure 16. This also covers the six areas of performance this thesis focus on; efficiency, quality, deliveries, time, flexibility and improvements.

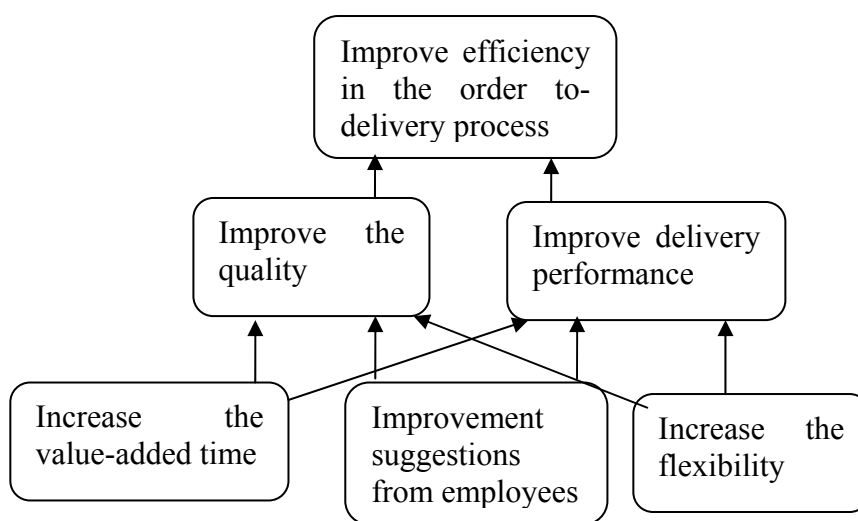


Figure 16: Success map of Wica Cold AB (Source: own production)

The most important aspect is according to the Production Manager to improve the efficiency in the order-to-delivery process. This will then be the overall objective for the success map. Improve delivery performance will be the next success factor in the map alongside with high quality products. Increase the value-added time as a percentage of total time (i.e. reducing the time needed for rework and search for material) and getting ideas from employees would be the factors in the bottom of the success map. Another factor on the bottom of the map could be to increase the flexibility. Motivating why this is the right success map for Wica Cold and how these factors can be measured is presented below under “Select and design the measures”.

6.3.2 Select and design measures

To decide what to measure is a discussion regarding the usefulness of existing measures and potential new measures needed according to Wouters & Sportel (2005). These discussions were held especially with the Production Manager. He thinks the measures generally are good but that there can be small changes in them and maybe also some additions. The following text in this sub-chapter is going to present and analyze measures according to the success map presented in figure 16, starting from the top and then moving down.

Measuring the hours per cabinet is the main way the overall goal “Improve **efficiency** in the order-to-delivery process” in the success map would be evaluated. This measure already exists today but there are two problems with this. It’s not communicated to the employees and the hours required to produce one cabinet depends on how many and what type of accessories wanted on the cabinets as expressed by the supervisors and the Production Manager. This could according to the Production Manager be solved by make a few comments what the reason for the outcome of the measure could be as it’s communicated to the employees. The title could simply be “hours/cabinet”. The purpose would be to improve the efficiency.

While the cabinets/hour measure only takes care of the **efficiency** in the production process the project accounting is according to me important to cover the entire order-to-delivery process. The project accounting considers the transportation and installation of the cabinets. This is also already measured and is according to me also well functioning. What could be added is in my opinion to in a more structured way keep track of to what degree the projects break even or make profit. The title could be “Percentage of projects that breaks even”. The purpose would be to in a more structured way keep track that the costs for the projects doesn’t get higher than budgeted. This is then also related to the overall objective in the success map in figure 16 “Improve efficiency in the order-to-delivery process”.

The **quality** has traditionally been measured as the number of defect products and the cost of quality according to Neely et al. (2005). At Wica Cold they now measure the cost for guarantee and this can be seen as a measure for the cost of quality defects. The

Production Manager would like to measure the amount of guarantee claims and what was the cause of the complaint as also suggested by Anthony & Govindarajan (2007). Regarding the “performance measure record sheet” made by Neely et al. (1997) could the title for this measure be “Amount of guarantee claims”. The purpose could be to giving feedback to the employees making them not keep doing the same mistakes. This is related to one of the middle boxes explained in the success map in figure 16 “improve the quality”.

The Production Manager is aware of that this is a late measure for the **quality** and that one can do the same mistake over and over before the defects are identified. The cabinets are today to some extent tested before they leave the factory. In my opinion could this also be documented the same way as the guarantee claims would. Testing all cabinets fully could in my opinion be to prefer especially considering Wica’s strategy to deliver high quality products. Of course it’s important to consider the costs and benefits of such an extensive measure as suggested by Neely et al. (2000). Testing all cabinets and documenting the defects costs a lot of money and one have to somehow make sure that the benefits outweighs the costs if implementing such a measure. But if this isn’t measured it might create extra costs for rework and guarantee. If adding this aspect to the quality measure, would look similar in the “performance measure record sheet” made by Neely et al. (1997). The only thing different would be that the title would be changed to “Amount of defects per cabinets produced”.

What’s measured today at Wica Cold in the sense of **deliveries** are the cost for backorders. The cost is important information according to the Production Manager but he doesn’t think that is enough. Discussions were made with the Production Manager about measure amount of backorders as also suggested by Anthony & Govindarajan (2007). Since Neely et al. (1997) recommend that measures should employ ratios rather than absolute numbers, could another way of measuring this be percent of orders delivered on time against total deliveries. Regarding the “performance measure record sheet” made by Neely et al. (1997) could the title for the measure discussed here be “percentage of orders delivered on time”. The purpose would be to keep track that the customer get their cabinets when desired. This is related to one of the middle boxes

explained in the success map in figure 16 “Improve delivery performance”. Another aspect regarding deliveries is the cabinets/day compared to plan which is already measured.

The supervisors at Wica Cold and the final assembly workers mentioned the problem with the rework needed and the constant search for material as a big problem. This could be solved by a measure according to time as suggested by Neely et al. (2005) namely value-added **time** as a percentage of total time. The problem with this measure is according to me that it’s difficult to measure this in an objective way as Neely et al. (1997) suggest the measures to be without a very sophisticated and costly way of collecting this data. Regarding “performance measure record sheet” made by Neely et al. (1997) could the title be “value-added time as a percentage of total time. The purpose would be to reduce the rework and search for material. It’s related to one of the bottom boxes explained in the success map in figure 16 “increase value-added time”.

The hours/cabinet measure do to some extent show the **flexibility** at Wica Cold as explained in the empirical data (this number increased when there were a lot of new employees in the production.) According to me would it be good to add something in this regard. One example of how to measure the flexibility is according to Neely et al. (2005) employees trained to do two or more jobs. In my opinion might just measure this not give many benefits. Though could in my opinion something used at Getinge Disinfection be useful in this regard namely the competence matrix. Even though not really a measure could the title of this simply be “competence matrix”. The purpose with this is to get an overview of the skills in the production and identify where training might be needed. It’s related to one of the bottom boxes explained in the success map in figure 16 “increase the flexibility”.

At Wica Cold they are now getting ideas from the employees with the according to the employees at Wica Cold well functioning system of “the yellow notes”. This is though not measured. Keeping track of this would in my opinion keep the focus clear and motivate the employees to contribute with more suggestions for **improvements**. Regarding “the performance measure record sheet” made by Neely et al. (1997) could the title be “ideas from employees”. The purpose would be to encourage the employees to

come up with new ideas on how to improve the performance. It's related to one of the bottom boxes explained in the success map in figure 16 "Improvement suggestions from employees".

All the measures should be compared in the company over time and targets would be good to have in place (the targets have to be decided by for instance the Production Manager) relating to the ideas of Neely et al. (1997) and Medori & Steeple (2000).

6.3.3 Implementation of measures

Another step in "the performance measure record sheet" made by Neely et al. (1997) is to specify the formula for the measure. The "hours per cabinet" measure regarding the **efficiency** has a formula the same as the title. It's also divided on wall cabinets, freezing counters and service cabinets. The Production Manager would like more frequent collection of this data and it would thereby be collected every week. The Production Manager would be responsible collecting this data and it's taken from the ERP-system and calculated in Excel. This also gives answers to the other elements in "the performance measure record sheet" made by Neel et al. (1997) in this section. These are at what frequency the measure should be collected, decide who is to collect and report the data and specify the source of raw data. These theoretical references will not be repeated again in this sub-chapter, but it's still going to be handled for all the measures.

"Percentage of projects that breaks even" is another measure for the **efficiency**. The formula would be percentage of the projects that at least breaks even in proportion to the total amount of projects. This would be collected by the one responsible for the project accounting and an appropriate collection of this data is according to me every month.

Regarding **quality**, the formula for the "Amount of defects in cabinets produced" could in my opinion be the amount of defects per cabinet produced. This would be collected regularly in a database by the one testing the cabinets and be reported every other week. If only "the amount of guarantee claims" is measured, the formula would be amount of claims. This information can be found in the ERP-system when the invoices are registered, and are collected by the one responsible for the non-performing costs. Included here could also the defects found while doing installation of the cabinets. This

information can then be taken from the project accounting. What's most important in this regard is though in my opinion that what the defects concerned is specified. Then this can be presented to the employees. This is also information wanted by one of the final assembly workers. This could be done no matter if "amount of defects in cabinets produced" or "the amount of guarantee claims" are measured.

For the measure "percentage of orders **delivered** on time" would the formula simply be as the title of the measure. In my opinion would it be enough to collect this data once a month. The raw data can be collected in the ERP-system where the amount of orders is specified and also the orders that need to be backordered. This would be collected by the one responsible for the "non-performing costs".

As mentioned by Neely et al. (1997) should a measure be subjective and not based on opinion. That creates a problem while specifying the formula for the measure "value-added time as a percentage of total **time**". The value-added time could be collected with an advanced computer system, but is in this case not appropriate because of the limited resources for the PM-process. A simple and possible suggestion would in my opinion be to use an extension of the yellow notes, letting one employee or the supervisor on every line and department specify on a note the interferences during the day and an approximate time spent on this. The risk is of course the honesty of the employees and the possibility to decide what value-added time is and what is not. This could then be collected and put together every other week and by the supervisor.

The "competence matrix" as related to **flexibility** wouldn't really has a formula to calculate, the idea with this is more to get an overview of the skills in the company and identify where training are needed. This to avoid bottle-necks which could be present when employees were absent as mentioned by a final assembly worker. This would be updated regularly by the Production Manager or the supervisor.

For the measure "ideas from employees" regarding **improvements** can the formula be the amount of suggestions handed in and the amount of suggestions executed. It could be collected every other week and by the supervisors as today. The source of raw data is simply the notes handed in by the employees.

6.3.4 Managing the PM-process

The importance of managing the measures pointed out by for instance Neely & Bourne (2000) has also been recognized by the Production Manager. He would for instance like more frequent and group based feed-back for the employees in the production.

Neely et al. (1997) mention that the person who is to act on the data should be identified. In my opinion would that be the supervisors with assistance from the Production Manager in accordance to how this is handled at Getinge Disinfection. The employees should also have a part here since these are given a lot of responsibility.

Neely et al. (1997) suggest that one way of manage the measures are to publish all performance data and an executive summary on the shop floor as a means of demonstrating commitment to empowerment. The Production Manager does also have similar ideas and this system is also used at Getinge Disinfection. Here can also some relations to the strategy be seen. For instance (Medori & Steeple, 2000) suggest that the PM-process should be connected to the strategy. Wica gives a lot of responsibility to the employees and by communicating the measures are then a way of showing this. According to me could there be a separate board for the different lines and departments to get the group based feed-back wanted by the Production Manager. Because of the problem with the hours/cabinet measure could some comments be included with the measure on the board that explain why there was a good or bad figure for every week as suggested by the Production Manager. In my opinion would it also be to prefer to communicate how the bonus is calculated so the employees get an understanding of this.

With “the yellow notes” they are now every other week going through the employees’ suggestions and which have been done something about and which hasn’t. If performance does show to be unsatisfying it is according to Neely et al. (1997) and Franco-Santos & Bourne (2005) important that it’s decided upon what to do differently to improve that. Except from publish the data on the shop floor could an additional way to handle this be to also set up a continuous improvement group to identify reasons for poor performance and make recommendations based on this as suggested by Neely et al. (1997) This could be in place for the measure “value-added time as percentage of total time”. In my opinion this could also be handled at the meetings where ideas from

employees are discussed. The exact time that's non value added time isn't the most important information to me in this regard. The most important information is to find the cause of the non value added time (i.e. the interferences) and this can be discussed at these meetings. The approximate time can though also give valuable information, since it highlights the severity of the problem and thereby also the importance of doing something about it. The quality aspect is something that can be told to all the employees every other week. These meetings could be separate for the different lines and also for the foaming and the sheet metal workshop to get the group-based feedback wanted by the Production Manager.

Analysis of developing the PM-process

Defining strategy: to some extent related to the strategy, responsibility to employees not reflected because of how the PM-process is managed, measure of quality not really reflected in strategy, company success factors identified, see figure x.

Select and design measures: Measures discussed are hours/cabinet, project accounting, amount of guarantee claims, amount of defects per tested products, percentage of orders delivered on time, value-added time as percentage of total time, competence matrix and ideas from employees. Some of these measures already exist in the company with some additions, some are changed to better capture the performance and one is added because of a problem expressed by a final assembly worker.

Implementation of measures: here the potential formulas of all the measures are specified, how often the data will be collected, who is to collect and report the data and the source of raw data. More frequent collection of data was suggested and most of the data can be collected from the ERP-system.

Managing the PM-process: can be handled by publish the performance data on the shop floor, short meetings every other week to discuss ideas from employees and interferences in the production. Tell about the quality defects to all employees every other week.

Figure 17: Summarized analysis regarding developing the PM-process.

6.3 Considering the SME characteristics on the PM-process

The lack of human and capital resources in SMEs to handle an extensive PM-process was stressed by Garengo et al. (2005). The Production Manager also agreed on this. This is also the reason why everything discussed so far maybe isn't appropriate to implement at Wica Cold. These aspects are presented below and will also consider the demand of the PM-process in SMEs regarding clarity and simplicity as suggested by Garengo et al. (2005). Especially the clarity aspect have to some extent already been considered in "Developing the PM-process" with for instance clear definition of measures and definition of how the processed information is going to be presented. The number of measures should also be limited in SMEs according to Garengo et al. (2005) which has been considered.

Two ways of measure the quality was discussed and because of the SME-characteristics do I think it is **enough to measure the "amount of guarantee claims"**. To test all cabinets before they leave the factory would though be to prefer (also relating to the strategy of Wica Cold) and in my opinion would it be good to have in mind to do that in the future. The costs for guarantee claims are already measured and it would not require a lot of extra work collecting this information.

New time studies were something also discussed to better match the production process at Wica Cold and make the planning easier. The cabinets/day compared to plan would also better match the cabinets/day to the potential of the workforce at Wica Cold. This since the planning is based on the time studies made in Italy and these times might not always be suitable for the conditions at Wica Cold. The **new time studies** could also to the extent possible also adjust to the amount of and type of accessories wanted. The capital resources needed for this is though very high, which is the reason that this though **won't be considered**. A way to handle this for the hours/cabinet is to make comments along with the measure that at least to some extent explains the outcome.

6.4 Recommendations for the new PM-process

6.4.1 Measures used

The recommendations for the measures to use are for the **efficiency** hours/cabinet and project accounting. The hours/cabinet measure already exists but it's not communicated to the employees. Project accounting is also already used but an addition would be to keep track of percentage of projects that breaks even. The project accounting also covers the aspects of efficiency in the OTD-process the hours/cabinet does not.

Regarding **quality** I do recommend to measure amount of guarantee claims in addition to the costs for these. Percentage of orders delivered on time is the recommendation for **deliveries**. This instead of the cost for backorders and ratios are also employed here as suggested by Neely et al. (1997). Cabinets/day will continue to be measured.

A recommendation regarding **time** is to keep track of value-added time as percentage of total time. The exact time is not the most important thing here, instead it is important to highlight interferences in the production and then try to solve them.

To keep track of the **flexibility** a recommendation would be to use a competence matrix as done at Getinge Disinfection. Performance can be improved by having skilled and multi-talented employees according to Olhager (2000) and using a competence matrix is a good way to visualize this and identify where training might be needed.

The "yellow notes" are a well functioning system for handling ideas from employees regarding **improvements**. To keep the focus up an addition here recommended is to measure amount of ideas handed in and the amount of ideas executed.

The measures should be compared in the company over time and targets would be to prefer to put in place.

6.4.2 Collection and analyzing of data

The hours/cabinet is recommended to be collected every week to get the fast feedback as suggested by Hudson et al. (2001b) and be divided on the different types of cabinets to get the group based feedback wanted by the Production Manager. Here would also some comments be included that to some extent may explain the outcome. The project

accounting can be collected every month and have the formula “percentage of orders that at least breaks even in proportion to total amount of projects”.

The amount of guarantee claims is recommended to be collected every other week and the amount of orders delivered on time every month. An important aspect in this regard is that it is specified what was the cause of it. The cabinets/day can be collected every week instead of every month as done at Getinge Disinfection. The competence matrix would be updated whenever there would be a need for it. The ideas from employees are recommended to be collected every other week as it is now. The value-added time (i.e. the interferences) would also be collected every other week and in a similar way. One employee or the supervisor from every line and department should specify on a note the interferences in the production and the approximate time spent on this.

All data except from ideas from the employees, competence matrix and value-added time as a percentage of total time can be collected by the ERP-system. It must though be transferred to Excel to get the measures right.

The supervisors and the Production Manager are recommended to collect most of the data. The amount of guarantee claims and percentage of orders delivered on time is though recommended to be collected by the one responsible for the “non-performing costs”.

6.4.3 Make use and take action based on the measures

A recommendation in this regard would be to publish the measures on a board on the shop floor as suggested by Neely et al. (1997) and wanted by the Production Manager. One board for the different lines and one for the sheet metal workshop and foaming are recommended. All the measures should be published on this board the competence matrix included in accordance to the conditions at Getinge Disinfection. The cabinets/day and the surplus which is already measured should also be published on this board. The ideas from the employees and the value-added time (i.e. the interferences) are recommended to be handled also on a meeting with the supervisors, the Production Manager and one from every department and line every other week. The quality defects should be told to all the employees every other week and for every line and department

separately. The monthly meetings with the office workers should continue in the same way just add the new measures as something to discuss.

6.4.4 New performance in the OTD-process

The hours/cabinet would if presented to the employees motivate them to improve the **efficiency**. Comments on the outcome of that performance would also help. Bottlenecks which are a problem could also be identified with this measure and also the value-added time measure which if done something about could improve efficiency. Improve efficiency is also the overall goal specified in the success map and improving the other measures should also help improve efficiency.

The **quality** is already acceptable but by measuring the amounts of guarantee claims and communicate to the employees the cause of the guarantee claims could help improve that performance helping not doing the same mistake over and over.

The same discussions also hold regarding the **deliveries** and the percentage of orders delivered on time measure.

With the competence matrix would the skills of the employees be visualized and having multi-talented employees is a way to improve **flexibility** according to Olhager (2000). There are now sometimes problems when key employees are absent and the competence matrix could help keep track of where training might be needed.

A Problem now existing is that the employees often have to do a lot of rework and search for material. By keep track of the value added **time**, what was the cause of the interferences and discuss what to do about it could help in this regard.

The “yellow notes” where ideas from employees are collected is now well functioning. To keep the focus and motivate the employees in this regard would be to measure amount of ideas for **improvements** and amount ideas executed.

Publishing all data on the shop floor would help to follow up performance and see the problems from a helicopter which is ways to improve performance mentioned by Segerstedt (1999).

7. Conclusions

This chapter will give an answer to the research questions for this thesis that was specified in the introduction chapter. Reflections regarding the work with this thesis and suggestions for future research are also presented.

7.1 Answer to research questions

RQ1: How does the performance management process (PM-process) in the order-to-delivery process (OTD-process) look like at Wica Cold AB and what performance is there now?

The measured used are hours/cabinet, cabinets/day, project accounting and the non-performing costs (guarantee and backorders). Most of the data is collected every month and is analyzed at the monthly meetings with the office workers. The performance is though not very well communicated to the employees in the production.

Regarding the current performance, the efficiency has recently improved but problem with this measure and for instance also bottlenecks. Currently the hours/cabinet is 10, 14 and 6 for wall cabinets, freezing counters and service counters respectively. Quality is acceptable but not fully tested and defects are not communicated, sometimes problems. Have been able to deliver more on time recently, but there are still problems. Another problem is spending too much time for rework and search for material. Flexibility not as good as wanted. Suggestions from employees regarding improvements is well functioning.

RQ2: How can the PM-process develop in order to improve the performance in the OTD-process also taking into consideration the characteristics of a SME?

The PM-process can develop with some new measures and some small changes and additions in the current measures. The hours/cabinet already exists but has previously not been communicated to the employees. To keep a closer track on the project accounting the percentage of projects that breaks even can be added to this. Regarding quality the amount of guarantee claims can be measured and regarding deliveries percentage of

orders delivered on time, instead of only the costs for these. Value added-time as a percentage of total time can be measured to help identify common interferences in the production and what can be done about it. A competence matrix could be used to keep track of the flexibility. Regarding improvements and the “yellow notes” the amount of ideas handed in and the amount of idea executed can be measured. The cabinets/day and the surplus would be continued to measure.

The data would be collected more often and give more group based feedback. The cabinets/day would be collected every week instead of every month. Comments to the hours/cabinet measure and what was the cause of the guarantee claims should also be specified. The measures should also be published on a board on the shop floor as a way to make use and take action based on the measures. Meetings every other week to discuss ideas from employees, and the value-added time is another aspect in this regard. The guarantee claims could also be told the employees every other week.

This improves performance in the OTD-process since the hours per cabinet measure is communicated to the employees and it will help motivate them improve that measure. Communicating the cause of the guarantee claims would help improve quality since the same mistake is not done over and over again. The competence matrix would help keep track of the skills in the company and identify if training might be needed in order to improve the flexibility. Keeping track what was the cause of the interferences and discuss what to do about it would help take away the bottlenecks and decrease the time needed for rework and search for material. To help keep the focus regarding ideas from employees regarding improvements would be to measure amount of ideas and amount of ideas executed help. Publishing all data on the shop floor would help to follow up performance and see the problems from a helicopter which is ways to improve performance.

The characteristics of a SME are taken into consideration by limiting the amount of measures used and by making them simple and easy to collect. Testing all the cabinets and document the defects was discussed but not recommended because of the SME characteristics. New time studies to better capture the conditions at Wica Cold where another thing discussed but not recommended for the same reason.

7.2 Reflections

Performance is a very wide term and even though this thesis only have focused on some specific aspects of performance (efficiency, quality, deliveries, time, flexibility and improvements), it is difficult to cover everything regarding these aspects. I do though think the most important areas for the situation at Wica Cold have been covered. Going more deeply into every aspect would require too much space in the thesis and too much time for the author getting together.

Even though the benchmark study of Getinge Disinfection gave valuable input to the PM-process at Wica Cold, would a benchmark study of the parent company Arneg be to prefer. Since Arneg are one of the leading actors in the commercial refrigeration business would they probably also have a more extensive PM-process than Wica Cold. Comparisons between the companies on different measures could then be in place which could motivate the employees at Wica Cold to perform better. This was originally the plan, but different circumstances made this not plausible.

As mentioned in the background of this thesis performance can be improved in many ways whereof one is with help from the PM-process. This thesis has only focused on improvements with help from the PM-process but while conducting the study other ways to improve the performance and especially efficiency were found. In my opinion could a more lean production oriented view help improve performance. This since lean production is good at attacking waste and exposes problems and bottlenecks which is a problem at Wica Cold, especially the problems of rework, search for material and material missing.

Regarding the external validity and the possibility to generalize a reflection can be added. Since many ideas from the PM-process at Getinge Disinfection was argued to be used also at Wica Cold the possibility to generalize the result of this thesis to SMEs in the same kind of business is strengthened.

7.3 Suggestions for future research

The main suggestion for future research is to do a following up study of the PM-process at Wica Cold. Then the effects of performance in the OTD-process by developing the

PM-process this way could be seen, instead of only finding out this from a theoretical perspective.

Since this thesis mainly have considered internal performance would it be interesting to also make a study regarding the external performance. This could look more to the customer and their opinion on the performance of the company in this study Wica Cold.

The measures appropriate to use in a company regarding the aspects of performance handled in this thesis does to big extent depends on what type of business the company is in. Thereby would it be interesting to study what specific measures that could be used in different types of businesses, which could help companies, find an appropriate set of measures for their company.

8. References

8.1 Books and scientific articles

Allwood, L.M. & Lee, W.L. (2004) The impact of job rotation on problem solving skills. *International Journal of Production Research*, Vol. 42, No. 5, pp. 865-881.

Andersen, I. (1998) *Den uppenbara verkligheten – Val av samhällsvetenskaplig metod*. Studentlitteratur, Lund.

Anthony, R. N. & Govindarajan, V. (2007) *Management control systems*, twelfth edition. McGraw-Hill, New York.

Ax, C. & Ask, U. (1995) *Cost management – produktkalkylering och ekonomistyrning under utveckling*. Studentlitteratur, Lund.

Bititci, U.S., Carrie, A.S. & McDevitt, L. (1997) Integrated performance measurement systems: a development guide. *International Journal of Operations & Production Management*, Vol. 17, No. 5, pp. 522-534.

Bourne, M., Mills, J., Wilcox, M., Neely, A. & Platts, K. (2000) Designing, implementing and updating performance measurement systems. *International Journal of Operations & Production Management*, Vol. 20, No. 7, pp. 754-771.

Bryman, A. & Bell, E. (2005) *Företagsekonomiska forskningsmetoder*. Liber Ekonomi, Malmö.

Callen, J., Morel, M. & Fader, C. (2005) Productivity Measurement and the Relationship between Plant Performance and JIT Intensity. *Contemporary Accounting Research*, Vol. 22, No. 2, pp. 271-309.

Flapper, S.D.P., Fortuin, L. & Stoop, P.P.M. (1996) Towards consistent performance management systems. *International Journal of Operations & Production Management*, Vol. 16, No. 7, pp. 27-37.

- Folan, P. & Browne, J. (2005) A review of performance measurement: Towards performance management. *Computers in Industry*, Vol. 56, No. 7, pp. 663-680
- Franco-Santos, M. & Bourne, M. (2005) An examination of the literature relating to issues affecting how companies manage through measures. *Production Planning & Control*, Vol. 16, No. 2, pp. 114-125
- Franco-Santos, M., Kennerley, M. & Micheli, P. (2007) Towards a definition of a business performance measurement system. *International Journal of Operations & Production Management*, Vol. 27, No. 8, pp. 784-801.
- Garengo, P., Biazzo, S. & Bititci, U.S. (2005) Performance measurement systems in SMEs: A review for a research agenda. *International Journal of Management Reviews*, Vol. 7, No.1, pp. 25-47.
- Heyes, J. (1996) A Formula for Success? Training, Reward and Commitment in a Chemicals Plant. *British Journal of Industrial Relations*, Vol. 34, No. 3, pp. 351-369.
- Hong, P. & Yeong, J. (2006) Supply chain management practices of SMEs: from a business growth perspective. *Journal of Enterprise Information Management*, Vol. 19, No. 3, pp. 292-302.
- Hudson, M., Lean, J. & Smart, P.A. (2001a) Improving control through effective performance measurement in SMEs. *Production Planning & Control*, Vol. 12, No. 8, pp. 804-813.
- Hudson, M., Smart, A. & Bourne, M. (2001b) Theory and practice in SME performance measurement systems. *International Journal of Operations & Production Management*, Vol. 21, No. 8, pp. 1096-1115.
- Hudson Smith, M. & Smith, D. (2007) Implementing strategically aligned performance measurement in small firms. *International Journal of Production Economics*, Vol. 106, No. 2, pp. 393-408.

- Kagioglou, M., Cooper, R. & Aouad, G. (2001) Performance management in construction: a conceptual framework. *Construction Management and Economics*, Vol. 19, No. 1, pp. 85-95.
- Kaplan, R.S & Norton, D.P. (1992) The balanced scorecard – measures that drive performance. *Harvard Business Review*, Vol. 70, No. 1, pp. 71-79.
- Mattson, S-A. (2002) *Logistik I försörjningskedjor*. Studentlitteratur, Lund.
- Medori, D. & Steeple, D. (2000) A framework for auditing and enhancing performance measurement systems. *International Journal of Operations & Production Management*, Vol. 20, No. 5, pp. 520-534.
- Merriam, S. B. (1994) *Fallstudien som forskningsmetod*. Studentlitteratur, Lund.
- Nanni Jr., A. J., Dixon, J. R. & Vollmann, T. E. (1992) Integrated Performance Measurement: Management Accounting to Support the New Manufacturing Realities. *Journal of Management Accounting Research*, Vol. 4, pp.1-20.
- Neely, A. (1999) The performance measurement revolution: why now and what next? *International Journal of Operations & Production Management*, Vol. 19, No. 2, pp. 205-228.
- Neely, A. & Bourne, M. (2000) Why measurement initiatives fail. *Measuring Business Excellence*, Vol. 4, No. 4, pp. 3-7.
- Neely, A., Gregory, M. & Platts, K. (2005) Performance measurement system design: A literature review and research agenda. *International Journal of Operations & Production Management*, Vol. 25, No, 12, pp. 1228-1263
- Neely, A., Mills, J., Platts, K., Richards, H., Gregory, M., Bourne, M. & Kennerley, M. (2000) Performance measurement system design: developing and testing a process-based approach. *International Journal of Operations & Production Management*, Vol. 20, No. 10, pp. 1119-1145.

- Neely, A., Richards, H., Mills, J., Platts, K. & Bourne, M. (1997) Designing performance measures: a structured approach. *International Journal of Operations & Production Management*, Vol. 17, No. 11, pp. 1131-1152.
- Norcross, L (2006) Building on success. *Manufacturing Engineer*, Vol. 85, No. 3, pp. 42-45.
- Olhager, J. (2000) *Produktionsekonomi*. Studentlitteratur, Lund.
- Radnor, Z. J. & Barnes, D. (2007) Historical analysis of performance measurement and management in operations management. *International Journal of Productivity & Performance Management*, Vol. 56, No. 5, pp. 384-397
- Segerstedt, A. (1999) Escape from the unnecessary - some guidelines for production management. *Production Planning & Control*, Vol. 10, No. 2, pp. 194-199.
- Shrivastava, R. L., Mohanty, R. P. & Lakhe, R. R. (2006) Linkages between total quality management and organisational performance: an empirical study for Indian industry. *Production Planning & Control*, Vol. 17, No. 1, pp. 13–30.
- Smith, P.C. & Goddard, M. (2002) Performance Management and Operational Research: A Marriage Made in Heaven?. *Journal of the Operational Research Society*, Vol. 53, No. 3, pp. 247-255.
- Tian, C., Chai, Y., Liu, Y. & Ren, S. (2003) Performance management in supply chain. *IEEE International Conference on Systems, Man and Cybernetics*, Vol. 5, pp. 4934-9.
- Wouters, M. & Sportel, M. (2005) The role of existing measures in developing and implementing performance measurement systems. *International Journal of Operations & Production Management*, Vol. 25, No. 11, pp. 1062-1082.
- Yin, R. K. (2003) *Case study research – design and methods*, third edition. Sage Publications, Thousand Oaks.

8.2 Electronic references

Home page of Wica Cold AB: <www.wica.se>. 2009-04-21.

8.3 Interviews

Axelsson, Jörgen. Supervisor for the sheet metal workshop and foaming at Wica Cold AB. 2009-04-29.

Fransson, Anna. Final assembly worker at Wica Cold AB. 2009-04-14, 2009-04-29.

Hildingsson, Pelle. Supervisor for the final assembly at Wica Cold AB. 2009-04-29.

Johansson, Marcus Logistics Manager at Getinge Disinfection AB. 2009-05-07.

Kronstedt, Daniel. Final assembly worker at Wica Cold AB. 2009-04-29.

Rindhagen, Niklas. Vice President of Wica Cold AB. 2009-02-04 & 2009-04-02.

Rosén, Gustaf. Production Manager of Wica Cold AB. 2008-11-13, 2008-11-21, 2008-12-01, 2008-12-12, 2009-02-04, 2009-04-02, 2009-04-23, 2009-04-29.

Samuelsson, Joanna. Final assembly worker at Wica Cold AB. 2009-04-29.

Appendix 1: Interview guide

The following questions were used for all meetings conducted with Production Manager Gustaf Rosén and Vice President Niklas Rindhagen. The questions for the current PM-process were also used while conducting the benchmark-interview with Marcus Johansson at Getinge Disinfection AB.

The current PM-process:

What are you measuring now in the order-to-delivery process?

How is the measurement data collected?

How often is it collected?

How are the measures analyzed?

How do you make use and take action based on the measures?

- Any formalized way?
- Examples on historical events in this regard?
- How are the measures communicated to the employees?

What do you think is good and what can be improved with the current PM-process?

What do you think about the performance in the OTD-process in the areas of efficiency, quality, deliveries, time, flexibility and improvements?

Good at reducing or eliminating inefficient and negative elements in value-adding activities? How do you do that (in general)?

Do you work with continuous improvements? How?

Are there many bottlenecks in the production? How do you identify (do you know where they are) and do something about it?

Do the employees think of the possibility to marginally change the design of the products that would simplify the production process?

Do you see the problems from a helicopter and ask questions like: what is the purpose and why are we doing it this way? How and who? How do you support that behavior?

Do you work with job rotation? How? How do you support it? Any formalized way and measures regarding this?

Developing the PM-process:

Strategy and company success factors:

What is the strategy of Wica?

Which are the company's success factors?

Selecting measures:

- Discussion of the usefulness of existing measures and potential new measures needed. Match with strategy and company's success factors (brainstorming session).
- Comprehensiveness check, have all areas been covered?
- Cost/benefit analysis of the measures
- What should be the title of the measures? Purpose? What does it relate to?
- Targets for the measures? Is benchmarking possible?

Implementing measures:

- How should the performance be measured (formula)?
- How often should the measures be reported (at what frequency)?
- Who is to collect and report the data?
- How can the data be collected? Source of raw data?

Managing the measures: "How can good possibilities to use the measures and take action upon them be put in place?"

- How can the feedback and communication of the measures be like?
- Who is to act on the data?

- “What do they do?” Define the management process that should be taken if performance appears to be either acceptable or unacceptable.
- Reward-system based on the measures?

SME-characteristics:

- How can the PM-process be made easy to maintain and simple to use?
- Clarity and simplicity
- How can it be made in a resource effective way?

The following questions were used while conducting the interviews with the two supervisors and the three final assembly workers at Wica Cold AB.

What do you think of the measures used today?

Do you think it’s meaningful and relevant to have those measures? What could be done differently?

Is there anything else you would like to be measured? What?

Do you think you get enough feed-back regarding your ideas on how to improve the efficiency today?

- Is the new system with the “yellow notes” working well?
- What could be done in a better way?

What do you think of the feed-back you get? Is it enough or would you like more?

If more, regarding what?

Would you like more group-based feed-back?

In what form would you like to have the feed-back? (more meetings, a board in the production showing the measures etc.)