

Final Report

Project: Quality Management System according to AS9100-C

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Table of Content

List of Figures	4
List of Tables.....	4
List of terms and abbreviations.....	5
Foreword	6
1. Executive Summary	7
2. Introduction	8
2.1 Project Motivation	8
2.2 Thesis Structure.....	8
3. AS 9100-C Overview	9
3.1 AS 9100-C Historical Development	10
3.2 The survey on the value of certification.....	11
4. Implementation of AS 9100 Standard at Case company	13
4.1 Case company Background	13
4.2 The role of Company X.....	13
4.3 Implementation Phases.....	14
4.4 Certification Process at Case company	14
4.5 Methodology to implement AS 9100 at Case company.....	15
5. Project Activities.....	17
6. Structure and process model of Case company.....	18
7. ISO 9001:2008 Quality Manual and Procedures.....	19
8. Non-conformances between the QMS of Case company and AS9100-C.....	22
9. Selection of a process for detailed evaluation.....	24
9.1 Constraints	24
9.2 Motives for the purchasing process selection	25
10. Purchasing as a process for detailed evaluation.....	26
10.1 Current situation: Purchasing process at Case company.....	26
10.2 Requirements for purchasing process in the AS9100 Standard.....	26
11. Impact Analysis on changes in purchasing process.....	27
12. Change Management Procedures.....	29
12.1 Types of Changes.....	29
12.2 Change Management Procedures Identification	29

12.3	Purchasing Procedure according to AS 9100.	32
13.	Implementation plan.....	34
13.1	Specifications of implementation	34
13.2	Action Plan	35
13.3	Implementation approach	36
13.4	Communication plan	37
13.5	Implementation Checklist	37
13.6	Training.....	37
14.	Conclusions	38
15.	Recommendations	39
	Bibliography	40
	List of Appendices	42
	Appendix A: Plan of Approach	43
	Appendix B : AS 9100 Checklist	77
	Appendix C : Information Stream Template	78
	Appendix D : Process Model of Case company.....	80
	Appendix E : Purchasing Procedure according to ISO 9001	84
	Appendix F : Outsourcing Procedure according to ISO 9001	86
	Appendix G : Purchasing Procedure according to AS 9100-C	88
	Appendix H : Release of Suppliers Procedure according to AS 9100-C.....	90
	Appendix I : Monitoring of Suppliers Procedure according to AS 9100-C	92
	Appendix J : Company Supervisor Evaluation	94

List of Figures

Figure 1 The Process Approach Model.....	9
Figure 2 The survey on the value of certification.....	11
Figure 3 Documentation structure tiered model.....	19
Figure 4 Flow Chart used for writing the procedures	20
Figure 5 Flow Chart used for writing the purchasing procedure according to AS 9100 Standard.....	33
Figure 6 PDCA cycle.....	36

List of Tables

Table 1 Historical development of AS9100-C Standard.	10
Table 2 The separation of primary, secondary, and strategic procedures.	21
Table 3 Action plan for the implementation of changes in purchasing process of Case company.	35

List of terms and abbreviations

AAQG	American Aerospace Quality Group
AECMA	European Association of Aerospace Industries
AS	Aerospace Standard
DVI	Industrial Validation File (Dossier de Validation Industrielle)
EDM	Electrical Discharge Machining
EEC	European Economic Community
ERP	Enterprise resource planning software
FAI	First Article Inspection
FMEA	Failure Mode and Effects Analysis
ISO	International Organization for Standardization
MKG	Metaal Kennis Groep ERP Software
MPP	Microsoft Project Plans
NADCAP	National Aerospace and Defense Contractors Accreditation Program
OASIS	Online Aerospace Supplier Information System
PDCA	Plan-Do-Check-Act or Deming Cycle
PEPS	Computer-aided manufacturing software for designing geometrical models
QMS	Quality Management System
RASCI	Acronym derived from the five key responsibilities most typically used: Responsible, Accountable, Supportive, Consulted, and Informed.
SAE	Society of Automotive Engineers
TC	Technical Committee
TÜV	Technischer Überwachungsverein, the international service corporation
VISI	Computer-aided design, computer-aided manufacturing software

Foreword

This document is the final report of the graduation internship completed on the final year of the Double Degree Programme in Industrial Management. The fulfilled project called “Quality Management System according to AS9100-C” is a part of a bigger AS9100 implementation project at Case company.

This thesis is the final work for the Bachelor Degree that shows the ability to use the knowledge obtained during studies as well as represents the results of the graduation project.

I would like to thank all the people who supported me with executing this final project and without whose help this thesis would have been impossible.

1. Executive Summary

Case company is specialized in the field of spark technology and supplies its customers with EDM solutions. The company also produces for the aerospace customer that has recently required Case company to obtain AS9100 certification. For this reason, the implementation project was set up and started at Case company. It included the following phases: design of a new QMS, training and implementation.

This thesis is conducted as a part of the main AS9100 implementation project. And its goal is to prepare the company for AS 9100-C implementation as soon as possible in order to satisfy customer's requirements. The first part of this thesis includes evaluation of current QMS according to ISO 9001 and analysis of non-conformances between the QMS of Case company and requirements of AS 9100. The second part is focused on the purchasing process and its improvement in order to comply with the standard.

During the project, the process model of the company was made, QMS of Case company analyzed, and procedures built up. Based on the gathered information, AS9100 Standard and Gap Analysis the non-conformances were defined and diagnosed.

Furthermore, the decision was made to concentrate the thesis on the purchasing process of Case company. And first of all impacts of changes in purchasing were determined. The change procedures were created afterwards and described together with the modifications that had to be applied during the purchasing process.

Besides, the thesis presents the way of application of the AS9100 requirements in the form of an implementation plan. From the gained knowledge, conclusions were drawn, and the findings of the research and advices for implementation of changes in the purchasing department of Case company were described.

2. Introduction

2.1 Project Motivation

The benefits of the AS9100 standard are highly estimated by many companies around the world. Some of the reasons of its implementation at Case company were the following: requirements of the customer, higher level of process and quality control, competitive advantage, increase of profit.

The AS9100-C implementation project was started in Case company in August, 2014. And to support it the subproject called “Quality Management System according to AS9100-C” was arranged. The reason is that the new QMS had to be built for the successful implementation of the standard. Gap analysis and AS9100 Checklist were the starting point of this project. The business consultant compared the current QMS according to ISO 9001 and AS 9100-C Checklist and defined the gaps - requirements that are not fulfilled by Case company at the moment.

There is a big variety of methods and approaches to meet the requirements of AS9100 and implement it in a company. And “Quality Management System according to AS9100-C” project was essential to apply the best of practices and plan the smooth and fast implementation. Later it was decided to focus the project on the purchasing process that in case of the company requires significant modifications.

2.2 Thesis Structure

The report is structured in 15 Chapters. The first two Chapters include the Executive Summary and Introduction to this thesis.

Chapter 3 provides the description of the AS9100, its specifications and ways of implementation. It gives the general overview of the standard and its benefits.

In the Chapter 4 the implementation of AS9100 in the case of Case company is discussed. The company’s background and implementation structure of the standard are provided.

Chapter 5 is devoted to the project activities that were conducted by me. They are described in Chapters 6 to 13 and contain the following:

- Structure and process model of the company
- ISO 9001:2008 Quality Manual and Procedures
- Non-conformities between the QMS of Case company and AS9100
- Selection of a process for detailed evaluation
- Purchasing as a process for detailed evaluation
- Impact Analysis on changes in purchasing process
- Change Management Procedures
- Implementation Plan

Finally, the conclusions and recommendations are presented in Chapters 14 and 15.

3. AS 9100-C Overview

The AS9100 is the international management system standard for the Aircraft, Space and Defense industry and provides suppliers with a comprehensive quality system for safe and reliable products to the aerospace sector. AS9100-C- is the revision of the Aerospace Standard (“AS”) containing the requirements for establishing a quality management system.

The AS9100 Standard includes 8 clauses that are listed below. First 3 clauses are the introduction of the requirements that are described in the last 4 clauses.

1. Scope
2. Normative references
3. Terms and definitions
4. Quality management system
5. Management responsibility
6. Resource management
7. Product realization
8. Measurement, analysis and improvement

AS9100 is focused on a process approach. According to the Standard, the process is defined as a “set of interrelated or interacting activities which transforms inputs into outputs”. SAE International defined process approach as “the application of a system of processes within an organization, together with the identification and interactions of these processes, and their management to produce the desired outcome”. Thus process approach ensures an ongoing control of all the system of processes and its interactions.

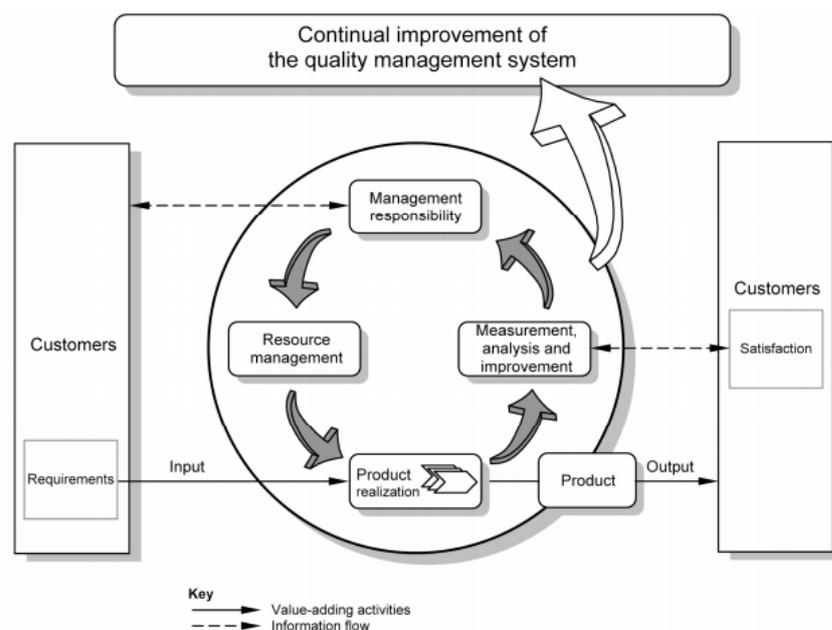


Figure 1 The Process Approach Model. Source: Quality Management Systems: Requirements for Aviation, Space and Defense Organizations. S.I.: Sae International, 2009.

The model above contains all the requirements of the AS 9100 Standard and represents how the processes, described in clauses from four till eight, are interrelated and linked. According to the figure, customer satisfaction is one of the most important goals of AS 9100 Standard. The model also illustrates that it can be reached only if the requirements (that can be also defined as inputs) are met and the customer is satisfied with a product or service (output).

3.1 AS 9100-C Historical Development

AS 9100 Standard was developed globally in the United States, Europe and Asia by such organizations as International Organization for Standardization (ISO), the American Aerospace Quality Group (AAQG), and the European Association of Aerospace Industries (AECMA). The Standard was first published in 1999 by the Society of Automotive Engineers (SAE) and included both ISO 9000 and specific aerospace requirements. The latest revision of the standard was published in 2009 and consisted of ISO 9001:2008 and additional aviation, space and defense industry requirements. In the table below the historical development of AS9100 is presented.

1957	Six European countries form Common Market (EEC)
1979	ISO 9000 TC (Technical Committee) 176 formed
1987	ISO 9000:1987 adopted by fourteen countries
1994	ISO 9000:1994 Second revision released
1996	Ninety countries adopt ISO 9000 as national standard
Jan. 1997	D1-9000:1997 Rev A released
Jan. 1998	AS9000:1998 released
Nov. 1999	AS 9100:1999 released
Dec. 2000	ISO 9000:2000 Third revision release ISO 9000 incorporates major organizational and philosophical changes; AS9000 rewritten
Jul. 2001	AS 9100 Rev A Update to ISO 9000:2000
Jan. 2004	AS 9100 Rev B Update to ISO 9001:2000 References to ISO9001/2, 1994 removed
Jan.2009	AS 9100 Rev C Update to ISO 9001:2008

Table 1 Historical development of AS9100-C Standard. Source: Graham, John. The Easy and Cost Effective Way to AS 9100 Certification. 2007, p.6.

The AS9100 is the first standard that was globally acknowledged. According to the Quality Magazine website, “The standard quickly found acceptance at major aerospace manufacturers including The Boeing Co., General Electric Aircraft Engines and Rolls-Royce Corp”.¹

¹ "The New AS9100 Lifts Off." *Quality Magazine*. 19 May 2003. Web. 20 Oct. 2014.
 <<http://www.qualitymag.com/articles/84265-84265-the-new-as9100-lifts-off>>.

3.2 The survey on the value of certification

AS9101, AS9120 and AS9110 are also the members of the AS9100 family. AS9101 defines the Audit Requirements for Aviation, Space, and Defense Organizations. The AS9110 aerospace standard contains the requirements for maintenance organizations. AS9120 is for stock lists and distributors of parts to manufacturers that supply the aerospace industry.

AS9100 is applicable to all the aerospace companies of any size and type, including distribution, maintenance and manufacturing. The standard addresses not only aerospace but also civil and military aviation needs.

By obtaining the AS9100 certification companies enhance customer satisfaction and also establish a high level of controls. Organizations can prove to its customers that with their QMS they can produce and also continually improve safe and reliable products on time. Furthermore, AS9100 certified organizations are able to reach competitive advantage, better performance of internal operations, improve quality and documentation systems. Decreased cost and financial security for the company and its employees are also the benefits of AS9100 certification. (Harold J. Steudel, 2003)²

The survey was conducted to define the value of AS9100/9110/9120 certification and the results were published on the Quality Progress website in July, 2013. The outcome of this survey is presented in Figure 1 and illustrates that 91 per cent of registered organizations find the certification valuable.

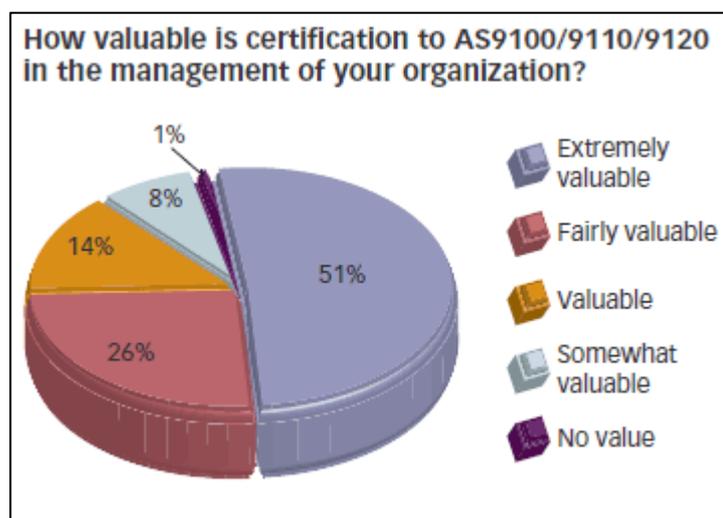


Figure 2 The survey on the value of certification. Source: "Standards Outlook: Road to Revision." Quality Progress. 1 July 2011. Web. 14 Nov. 2014. <<http://asq.org/quality-progress/2013/07/standards-outlook/road-to-revision.html>>.

² Steudel, Harold J., and Terry Mann. *What Every Employee Needs to Know about AS 9100C: A Pocket Guide to the Basics*. 3rd ed. Madison, WI: Steudel & Schultz, LLC, 2003. Print.

3.3 AS 9100 Implementation

Three organizations were chosen for this study to analyze the approaches of AS9100 implementation.

The first selected organization was TÜV Rheinland Group³, international service provider of certification services. The second organization was BSI Group⁴, the business standards company. And the third company was AS9100 Store⁵, the provider of standard's products.

According to "A Guide to Making the Right Choices for an Efficient and Profitable Transition"⁶ presented by TÜV Rheinland, there are two approaches to archive AS9100 Certification. First, is to certify or recertify the company to the old standard and then upgrade. The second approach is to obtain the AS9100 Certification directly.

After the evaluation of the websites and guides of these organizations, it was concluded that they all provide similar certification plans. These plans consist of steps required to achieve AS9100 Standardization and vary from seven to ten and in general contain the same information.

As a result of summarizing the information from the mentioned three resources, the following implementation steps can be listed:

1. Perceive the requirements of AS9100C.
2. Conduct a Gap Analysis.
3. Make planning and define quality objectives.
4. Organize training.
5. Develop and document a new QMS according to AS 9100.
6. Fulfill the requirements and adapt AS 9100 QMS.
7. Use a new QMS, keep the records and ensure continuous improvement.
8. Perform readiness audit.
9. Perform registration audit and achieve certification.

³ "TUV Rheinland Netherlands - English." *TUV Rheinland Netherlands*. Web. 18 Nov. 2014. <<http://www.tuv.com/en/netherlands/home.jsp>>.

⁴ "Implementing AS9100 Aerospace Quality Management." *BSI*. Web. 18 Nov. 2014. <<http://www.bsigroup.com/en-US/AS9100-Aerospace/Implementing-AS910091109120-Aerospace/>>.

⁵ "Steps to AS9100 Certification(and AS9110/9120)." *AS9100 Store*. Web. 18 Nov. 2014. <<http://as9100store.com/steps-to-as9100.aspx#Learn-About-AS9100>>.

⁶ "AS9100C: How to Effectively Interpret the Evolving Quality Management Requirements in the Aerospace Industry." *TUV Rheinland*. Web. 18 Nov. 2014. <<http://www.tuv.com/media/usa/whitepaper/as9100c.pdf>>.

4. Implementation of AS 9100 Standard at Case company

4.1 Case company Background

Case company was established in 1990. Now the company is specialized in Electrical Discharge Machining (EDM) techniques. Case company does not offer traditional grinding, milling or heat treatment, but provides its customers with EDM solutions. Case company can accommodate work pieces weighing up to 3000 kg and cut contours measuring up to 500 mm in thickness.

Case company is certified according to ISO 9001: 2008 since 1997 that allows producing the high-quality parts for the Aerospace industry. But recently the aerospace customer has required Case company to get AS9100 Certification. That is why management of Case company has decided to make the next step in the quality assurance process and obtain the AS9100 (EN9100) certificate.

4.2 The role of Company X

Company X is an organization specialized in management and project coaching and in the improvement of companies' processes. They also provide guidance through certification processes and training.

The business coach from Company X supported Case company with AS9100 coaching and training of employees. His responsibilities were to:

- Guide the implementation of AS9100 at Case company.
- Conduct Gap Analysis.
- Make training schedule for managers and employees of Case company.
- Organize consulting meetings at Case company concerning documentation, procedures, planning, training, etc.
- Create and check procedures.

Procedures or other documents that were built up according to AS9100 by me or employees of Case company were systematically checked by the business coach. After the reviews he concluded if documents conform to the standard or not.

Furthermore, business coach created such procedures as process development and change management for the reason that employees of Case company do not have enough experience and knowledge to do it internally.

4.3 Implementation Phases

The project concerning the implementation of the standard at Case company was divided into three phases:

1. Structure

During this phase the process model and procedures have to be adjusted. The documentation of Case company has to be reviewed and structured, and RASCI has to be applied to define the responsibilities.

2. Process control

During the second phase it is important to establish the control of processes according to AS9100, and to make the process predictable. FMEA, DVI, FAIR and Control Plan have to be applied at Case company and coaching sessions organized.

3. Implementation

The last phase includes the implementation of the standard requirements and training of managers and employees.

After these phases, the auditing activities were planned.

4.4 Certification Process at Case company

After the implementation of the Standard, an external quality organization has to audit the company on fulfillment of AS9100 conditions. If audits prove that the organization meets the Standard's requirements the company receives the certification.

QMS of Case company will be assessed by Company Y, an external quality organization, in order to establish compliance between ISO 9001 and AS9100 Revision C. Company Y is a part of the Company Y⁷ in London. The organization's goal is to promote and "ensure the quality construction and operation of critical infrastructure". In the Netherlands Company Y provides certification, projects management and training services.

Stages of assessment that will be conducted by Company Y at Case company:

Assessment 1: Readiness Audit

During the first assessment the following will be checked: compliance of QMS with AS9100, the documentation and relevant data (manual, procedures, etc.), the readiness of Case company for a registration audit.

Assessment 2: Registration Audit

The second assessment is called registration or implementation audit. It takes place only if the QMS according to AS9100 has been implemented for at least three months and the records have been generated. The effectiveness of the implemented system will be verified by interviewing employees and

⁷ The information is confidential.

recording the results. If during the registration audit the non-conformances have not been identified, the AS 9100 Certificate is granted.

Surveillance audits

Surveillance assessment is a post certification process that will be made annually in a period of three years to assure that the management system is still conforming to the standard; it is effective, and continually improved.

Recertification process

Every three years, after the last surveillance audit the AS 9100 certificate will be reviewed. The QMS will be assessed and if the results are satisfactory the renewal of certification will take place.

4.5 Methodology to implement AS 9100 at Case company

“QMS according to AS 9100” is a change oriented project that has to be supported with a transition approach. There are many definitions of change management in literature and that is why it is complicated to define the term clearly. It depends on various factors such as the field of research or situation.⁸ One of the examples is Information Technology. In this field change management belongs to the control and revisions of hardware and software.

The definitions presented below were defined as appropriate for the field of this study. The first describes Change management as “the strategy of planned and systematic change, which is achieved by the influence of the organizational structure, corporate culture and individual behavior, under the greatest possible participation of employees” (Gabler, 2006)

Another definition is provided by Prosci⁹, the research company that developed the change management methodology and tools. Prosci concludes that, “change management is the application of a structured process and set of tools for leading the people side of change to achieve a desired outcome”.

The third definition of the term was given by Kostka and Mönch (2002)¹⁰ and according to them:

Change Management means to plan, to realize, to reflect and to stabilize (...) fundamentals and far-reaching processes. Change Management aims on a mid-term to long-term basis at effective changes of behavior patterns and abilities in order to optimize processes and communication structures.

As described in the Plan of Approach, the action research was chosen for this change management project. The research model that will be applied is presented in the Plan of Approach, page 57 and illustrates five phases that all together create the cyclical process of action research. On the next page is the explanation of the phases.

⁸ Kneer, Christian. Change Management Enhance the Ability to Survive. München: GRIN Verlag GmbH, 2009.

⁹ Prosci. Web. 7 Dec. 2014. <<http://www.prosci.com/change-management/definition/>>.

¹⁰ Kostka, Claudia, and Annette Nch. *Change-Management: 7 Methoden Für Die Gestaltung Von Veränderungsprozessen*. 2. Aufl. ed. München: Hanser, 2002. Print.

1. Diagnosing phase:

- Investigation of the current situation.
- Defining and diagnosing of problems.
- Determination of the project's outcome.

2. Action Planning phase:

- Developing the plan of action to solve the defined problems.
- Selecting the frameworks and methods to support the research.
- Making the Gap Analysis.

3. Action Taking phase:

- Creating the system to reach the goals.
In the case of this project, the QMS has to be built and designed during this phase.
- Implementation of the plan.

4. Evaluating phase:

- Results evaluation.
- If the outcome is not satisfactory the cycle has to be repeated. It means that if the audit of Case company is not successful and non-conformances are identified, the implementation team has to start over the cycle.

5. Specifying Learning phase:

Last phase belongs to the post implementation period.

- Application of the gained knowledge in the organization.
- Training of employees how to evaluate and continuously improve the system.
- Establishing of continuous improvement and control of the new QMS.

5. Project Activities

As mentioned in the subchapter 4.5, the cyclical model of action research was applied to the whole AS9100 implementation project. But within the framework of this thesis, the activities that belong only to the first three phases were completed.

In the Plan of Approach, the main activities were defined and separated into six steps. But during the project, after the third step called “Analyze the non-conformities between the QMS of Case company and AS9100” the decision was made to focus the research particularly on purchasing process. The motivation for this is described later in the report.

So two more steps were added and as a result the project was fulfilled in 8 steps instead of 6. The following activities created a structure for the thesis:

Diagnosing phase:

1. Define the structure and process model of the company.
2. Analyze ISO 9001:2008 Quality Manual and Procedures.

Action Planning phase:

3. Analyze the non-conformities between the QMS of Case company and AS9100.
4. Select a process for detailed evaluation.
5. Purchasing as a process for detailed evaluation.
6. Conduct Impact Analysis.

Action Taking phase:

7. Create Change Management Procedures.
8. Perform Implementation Plan.

6. Structure and process model of Case company

According to the standard, “process is a set of interrelated or interacting activities, which transforms inputs into outputs”. To define the structure and make the process model of the company was the first step of the research. It was done in order to:

- Understand how Case company operates.
- Define the job roles and responsibilities.
- Get the interaction between processes clear.

To complete this task the appointments with the representatives of every department were made. The purpose of interviews was to find out the following information:

- Input and output of every employee.
For instance: received order from customer, planning made in ERP system, etc.
- Software or ERP system used at Case company.
Examples of software that is applied in the company: MKG, PEPS, VISI, EXCEL, MPP.
- Persons, who were internally or externally contacted by the employees of Case company.
- Required documents and specifications.
It can be planning of operators and machines, measurement protocols, drawings, etc.

In the Appendix C the template that was used to document all the results of the interviews is attached. After gathering the information the process model was created in a format of a flow diagram. It is a common business process mapping tool that defines the flow of the production cycle from the offer to the product delivery. The process model is a base of the quality management system of Case company, and it is presented in the Appendix D. The description of the main business process of the model is presented in the next paragraphs of the chapter.

First, the administration department receives the request for quotation from the customer, usually all the necessary specifications, drawings, attachments are also included. This information is registered in the ERP system (MKG) and forwarded to the sales department. A salesman analyzes the information from a customer, discusses the details if necessary and then calculates the price of order depending on the material, roughness, tolerance, delivery time, etc. Then he sends the quotation to the customer.

If the quotation is accepted, the sales department conducts the validation of the price. When the order is sent to Case company, work preparation is the next process step. Purchasing of materials or outsourcing (for example, milling or drilling) is also a part of this step. Moreover, a job card also has to be made during the work preparation process.

Then specifications, drawings, measurement protocols are forwarded to the programming department where the start and head programmes are written in PEPS. After the purchased goods are received and checked during the incoming goods inspection, the production can be planned.

When the machines and employees are planned to fulfill the required project, the production starts. Operators receive the drawings, programmes, customer’s specification, job cards and produce according to them. After the products are ready, they are checked during the final inspection. A complete report and sent invoice are the output of this step. Then the goods are moved to the dispatch area for packaging and sending the product to the customer.

7. ISO 9001:2008 Quality Manual and Procedures.

For structuring of documentation the tiered model was chosen. ISO Standard does not require the implementation of this approach, but it has been applied for many years already, and approved by registers and experts.

As the Figure 3 illustrates, first tier includes quality manual and policy, second tier - procedures, tier three consists of work instructions, specifications, etc., and the last tier is made of forms, record, and manuals.(Denise E. Robitaille,2010)



Figure 3 Documentation structure tiered model. Source: Robitaille, Denise E., and Denise E. Robitaille. ISO 9001:2008 for Small and Medium-sized Businesses. 2nd ed. Milwaukee, Wis.: ASQ Quality, 2010.

Case company applies ISO 9001:2008 Manual as a QMS. All the documents that are used in the company are presented there. It consists of:

- KMS (Quality Management Handbook)
- KMP (Quality management Procedures)
- KMI (Quality Management Instructions)
- KMF (Quality Management Forms)

These documents are mostly in Dutch. And to start working with them all the documents required for the project were translated into English.

In the manual not all the procedures are clear, some of them are not complete enough for AS 9100 or flowcharts do not reflect the input and output of processes. Another issue was to understand the responsibilities of employees as it also was not definitely stated in the Manual. To evaluate if these procedures comply with AS9100 it was necessary to build them up. Procedures were created in Microsoft VISIO using the template that consists of input, process description, output, and RASCI. The example of the written procedure is attached to the appendix. On the next page the flow chart (Myhrberg, Crabtree 2006)¹¹ that was used for writing the mentioned procedures is presented.

¹¹ Myhrberg, Erik V., and Dawn Holly Crabtree. A Practical Field Guide for AS9100. Milwaukee, Wis.: ASQ Quality, 2006. Print.

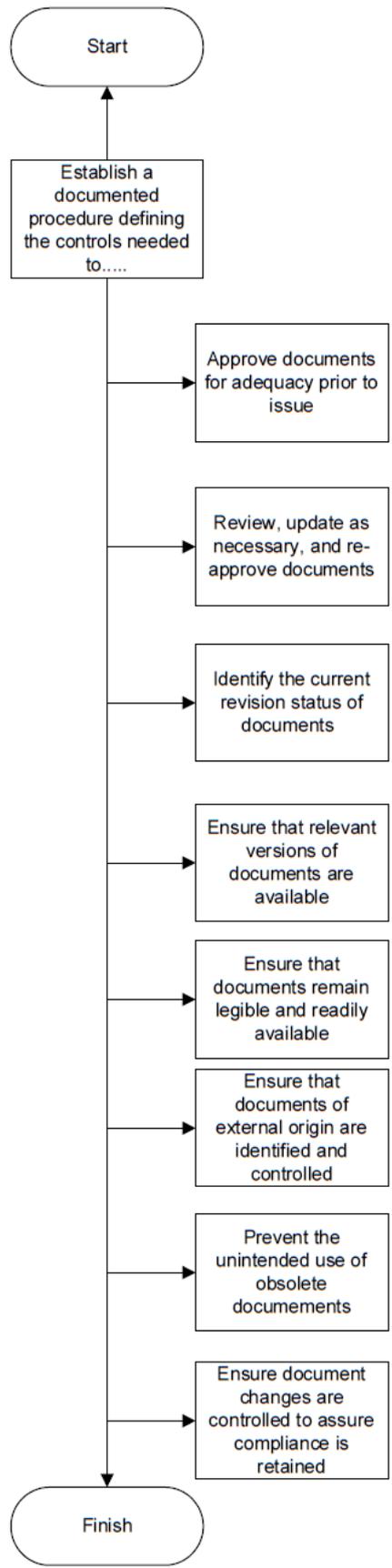


Figure 4 Flow Chart used for writing the procedures (Myhrberg, Crabtree 2006)

The procedures of Case company can be divided into three groups: primary, secondary, and strategic. The table below represents how the procedures are allocated to the processes. Most of the listed procedures were written by me, others were conducted by the employees of Case company.

	PRIMARY PROCESSES	SECONDARY PROCESSES	STRATEGIC PROCESSES
1.	Offer	Calibration	Management policy
2.	Order	Customer Property	Management review
3.	Outsourcing	Suppliers Evaluation	Legislation
4.	Purchasing	Inspection Protocol	
5.	Work Preparation and Planning	Preventive Maintenance	
6.	Production	Customer Satisfaction Report	
7.	Programming	Management of Documentation	
8.	Handling, storage and shipping	Training	
9.		Internal Audits	
10.		Preventive Actions	
11.		Meetings Structure	
12.		Employees Evaluation Meetings	
13.		Quality Management	

Table 2 The separation of primary, secondary, and strategic procedures.

8. Non-conformances between the QMS of Case company and AS9100-C.

The non-conformances with AS9100 were defined by the company consultant and the Gap Analysis can be found in the attachment. Based on these documents and the quality manual of Case company the gaps were evaluated and allocated to the processes of Case company.

To define the change that has to be implemented the following steps were followed:

- Read the requirement of the AS9100 standard and the non-conformance pointed by the business consultant.
- Match the non-conformance with the Quality Manual of Case company.
- Define the process, procedure or document that does not conform to the standard or does not exist.
- Make a list of actions required to bring the QMS of Case company on the Level of AS 9100.

The action plan presented below includes 23 articles that have to be improved or changes during the change management process. The AS9100 Checklist (Appendix B) consists of 5 clauses that are linked to the action plan between the brackets.

1. Legislation Procedure has to be made to identify changes in legislation and regulations, guidelines, standards, etc. (4.1)
2. Identification of processes, its interaction and sequence was not clear at Case company. This problem was solved during the first project activity, structure and process model were defined. So KMS 009 (interaction of processes flowchart) can be improved and completed. (4.1 a, b, 4.2.1 d)
3. Procedure to identify external documents (customer drawings and specifications) has to be created(4.2.3)
4. Responsibilities and job roles of employees have to be defined and documented. RASCI is used for these purposes (5.5.1)
5. Explanation of “organizational freedom and unrestricted access to top management to resolve to quality management issues” has to be performed in the policy of Case company(5.5.2)
6. Management of infrastructure process (including buildings, workplaces, equipment and supporting services) has to be added to Maintenance Procedure. (6.3)
7. Process Development Procedure that is related to primary processes has to be made. This procedure has to include or to be linked to:
 - Project Management (7.1.1)
 - Risk Management (7.1.2)
 - Determination of requirements related to the product (7.2.1. and 7.2.2)
 - Purchasing process (7.4.1 d, e, f) and information (7.4.2 a, b, c, d, e, f)
 - Control of production and service provision (7.5.1)
 - Production Documentation and First article inspection as output (7.5.1.1)
 - Control of process equipment, Tools and Software Programs (7.5.1.3)
 - Validation of processes for production and service provision (7.5.2)
 - Preservation of product (7.5.5)
 - Control of Monitoring and Measuring Equipment (7.6)
 - Measurement, analysis and improvement (8)
 - Monitoring and measurement of improvement (8.2.4)

- Preventive Action (8.5.3)
8. A Change Management Procedure that is related to secondary processes has to be made and include:
 - Configuration Management (7.1.3)
 - Control of Work Transfers(7.1.4)
 - Control of production process changes (7.5.1.2)
 9. The purchasing process has to be improved. (7.4)
The purchasing process and outsourcing process have to be separated. The difference is that outsourced materials have to be checked during Incoming goods inspection (4.1). And purchased goods are located at stock after delivery.
 10. A Release and Monitoring of suppliers procedure has to be made and include registration of suppliers (7.4.1 a), verification of purchased product (7.4.3), customer property (7.5.4).
 11. Process to control the documents of supplier is absent. A list of registrations has to be created (4.2.4)
 12. An improvement or replacement of Service Level Agreement that includes purchasing information (7.4.2 g,h,i,j) has to be completed.
 13. The Procedure of Training has to be improved and linked to Skill Matrix. (7.5.1)
 14. Two procedures have to be completed to control CNC and tooling (7.5.1.3)
 15. An Identification and Traceability Procedure has to be made (7.5.3)
 16. Customer property has to be included into Release and Monitoring of suppliers procedure and human resources procedure (7.5.4)
 17. An improvement of Complaint Procedure including recall (7.4.3, 8.2.3).
 18. An improvement of Housekeeping Procedure (7.6 e)
 19. An improvement of Calibration Procedure (7.6 c)
 20. An improvement of Audit Procedure (8.2.2)
 21. An improvement of Corrective Action Procedure (8.3)
 22. Make an Internal Non-conformances Procedure (8.3)
 23. Improve a Preventive Action Procedure and connect to FMEA (8.5.3). Also preventive action has to be mentioned in the Change Management Procedure and the Non-conformances Procedure.

9. Selection of a process for detailed evaluation.

9.1 Constraints

During the research the following constraints were faced:

- Lack of time.
In the timeline of the project there is not enough time to eliminate all 23 gaps described in the Chapter 8.
- Lack of experience.
Change management of some processes is impossible because of lack of experience and training. For example, one of the gaps was Process Development. It is one of the most significant changes that have to be implemented to achieve the certification. This process does not exist at Case company at the moment, but it has to be created and then linked to other processes such as purchasing, work preparation, planning, etc. But experience of working with AS 9100 certification and procedures is required in order to implement this change. Business consultant worked on Process Development Procedure and its implementation.
- Lack of resources.
The amount of literature about AS9100 implementation is limited, and Internet resources provide only general information. Hence coaching of a business consultant was necessary to complete the project successfully.

9.2 Motives for the purchasing process selection

Purchasing was chosen as a process for detailed evaluation due to the following reasons:

- Purchasing is one of the processes that contained most of the non-conformances at Case company. Purchasing requirements of AS9100 are presented in the clause 7.4 and separated into three groups: purchasing process, purchasing information, and verification of purchase product. As concluded in the Gap Analysis, most of these requirements are not fulfilled at Case company at the moment.
- The research on purchasing process at Case company had already been conducted and the procedure was made during the first phase of this study. As a result, it made it easier to work on change implementation having the analysis of existing purchasing process done.
- For Case company quality of product and customer's satisfaction play an important role. That is why a sustainable purchasing process has to be established in the company and comply with AS9100. Furthermore, Case company puts a lot of attention into selecting the appropriate suppliers. The vision of the company stated the following "By collaborating with other specialists in a smart way, we (Case company) will be able to remain the right strategic supplier for the future". Management of suppliers is also a problematic field for many other companies that pursue the AS 9100 certification. Eugene M. Barker, technical fellow at The Boeing Co. responsible for quality industry association interfaces, mentioned in his article for Quality Digest that "managing suppliers throughout the aerospace supply chain remains a major challenge for the industry" and "because the industry is so dependent upon this supply chain, it isn't surprising that AS9100 includes a number of additional expectations for identifying and maintaining suppliers."¹²

¹² Barker, Eugene M. "Aerospace's AS9100 QMS Standard." Quality Digest. Web. 3 Nov. 2014. <<http://www.qualitydigest.com/magazine/2002/may/article/aerospaces-as9100-qms-standard.html>>.

10. Purchasing as a process for detailed evaluation.

10.1 Current situation: Purchasing process at Case company

At the moment purchasing and outsourcing at Case company is done according to ISO 9001:2008. These two procedures were built up by me during the second project step called "ISO 9001:2008 Quality Manual and Procedures". (Appendices E and F)

These procedures are simple and do not reflect, for example, how the suppliers are selected and evaluated or the connection to Service Level Agreement is not visible. All the gaps between the current purchasing process of Case company and AS9100 requirements are presented in the Checklist attached to the Appendix B.

10.2 Requirements for purchasing process in the AS9100 Standard

Clause 7.4 in the AS 9100 Checklist contains the purchasing requirements. In the clause 7.4.1 the requirements for purchasing process are described and to meet these companies have to:

- Ensure that the quality of purchased products is appropriate.
- Control and evaluate the suppliers, monitor the suppliers list, establish the control level.
- Forecast and analyze the risk when selecting and collaborating suppliers.

In clause 7.4.2 the purchasing information requirements are listed. In order to comply with them companies are required to:

- Provide the suppliers with all the information that they can use to satisfy the company's demands.
- Assure that suppliers have all the information concerning the requirements of the customer.

In clause 7.4.3 requirements for the purchased product verification are stated. They include obligation for:

- Quality check of purchased products.
- Records of the quality inspection results.

But before starting the change management process and implementation planning of purchasing requirements, the impacts of the changes were investigated and explained in the following Chapter.

11. Impact Analysis on changes in purchasing process

As mentioned in the Plan of Approach, McKinsey 7S Framework was used as a checklist to define the impacts of changes that have to be implemented at Case company. The framework consists of seven elements that have to be aligned in order to make the company operate successfully. McKinsey 7S explains the interrelation of the organizational elements that are also divided into two groups. Hard elements are strategy, structure and systems that are fundamental for the organization, it is easy to define and manage them. Hard elements are style, skills, staff, and share values that are more difficult to identify and control.

The description of each component is presented according to the book "Strategic management: A Conceptual Framework"¹³. The illustration of the management model is attached to the Plan of Approach in the Appendix 1.

Strategy: Plans – for the allocation for firm's scarce resources –to reach identified goals: environment, competition, customers.

Structure: The manner in which the organization's units relate to each other: centralized, functional divisions (top-down); decentralized (the trend in larger organizations); matrix; network; holding; etc.

Systems: The procedures, processes, and routines that priorities work in the arenas of: financial systems; hiring, promotion and performance appraisal systems; information systems.

Skills: Distinctive capabilities of personnel or of the organization as a whole.

Staff: Numbers and types of personnel within the organization.

Style: Cultural style of the organization and how key managers try to achieve the organization's goals.

Share Values: The inter-connecting center of McKinsey's model is that of shared values. What the organization stands for and what it believes in. Central beliefs and attitudes of firm need to be highlighting.

Based on the McKinsey 7S Checklist, the impacts on purchasing process of Case company were distinguished. The processes that will be influenced by the AS9100 implementation are presented below.

1. Structure of processes

Structure of processes in the purchasing department will be more comprehensive and described in the procedure. Besides, it will be also linked and influenced by the new procedure - Process development.

2. Organizational structure

RASCI matrix will be implemented in the company in order to clarify the organizational structure and responsibilities of employees. All in all, organizational structure of purchasing department will not be changed. Case company is a small company that has only one purchaser; however the roles of internal auditors will be well defined and documented.

¹³ Strategic Management: A Conceptual Framework. Tata McGraw-Hill Education. Print.

3. Relationship with suppliers

The impact on suppliers will be serious: level of controls and performance ratings will be expanded, for example, risk analysis, or approval process. Furthermore, vendor's certificates and other documentation will be systematically reviewed and archived.

4. Audits

Management of Case company will have to establish the process control in the organization and first of all improve the Internal Audit Program. Process audits will be an internal control to ensure that employees follow the new requirements and work according to procedures. Vendors will be also controlled by audits organized by Case company.

The organizational culture of the company is collectivism and it will stay the same after the implementation of the new QMS.

5. Verification activities

The control of incoming goods will be increased. AS9100 provided the examples of verification methods that are aimed to restrict the inspection process (check of test records, certificates, receipts, etc.)

6. Documentation

Procedures and documents of purchasing department Case company have to be reviewed and improved in order to reach the requirements of AS9100. These changes seem to be challengeable, will take a lot of time, and moreover will influence both customers and suppliers. The monitoring of data is another issue and it will be done in the ERP system of Case company. It is obligatory by the standard to archive the documents of vendors, customers, or data from external resources.

7. Functions of employees

As a reason of high requirements of AS9100 and changed procedures, employees will get more responsibilities and paper work. For example, a purchaser will have to use such documentation as FAI, DVI, etc. or follow the new release and monitoring of suppliers procedure (selection, evaluation, re-evaluation of suppliers, risk analysis etc.)A purchaser will also have to monitor the List of Approved Suppliers and be in charge of periodical reviews or external data evaluation.

8. Training

The process of work will be different, employees will have to adapt to new documentation and a way of performing their responsibilities. Consequently, training of managers and employees is required to operate according to the standard. Process control and implementation coaching will be provided by Business consultant, consultant from Company X.

9. Strategy and policy of Case company

Quality of products and process control play an important role at Case company. Thus implementation of AS9100 requirements in purchasing will help the company to reach these goals and bring the company on a higher level and reach the customer's satisfaction.

12. Change Management Procedures

12.1 Types of Changes

Changes in purchasing process of Case company can be divided into 2 groups:

1. Changes in Procedures and documents of Case company.

According to the Business Dictionary¹⁴, procedure is “a fixed, step-by-step sequence of activities or course of action (with definite start and end points) that must be followed in the same order to correctly perform a task.”

To comply with requirements of AS 9100 it is necessary to:

- change the procedures of Case company (Purchasing Procedure of Case company),
- or create new procedures.(Release and Monitoring of Suppliers Procedure).

A part of documents will be also changed or updated (work instructions, complaint document), and some of them will be made (List of Approved suppliers).

2. Job Roles Changes.

As Case company will operate in accordance with AS 9100 Standard, the company’s employees will get new responsibilities or will have to change the process of working. For example, purchaser will have to complete Risk Analysis using FMEA, or metrologist will have to verify the incoming goods according to the AS 9100 requirements.

The change management procedures described below were checked and approved by the process engineer of Case company. After that the implementation plan of the required changes was submitted.

12.2 Change Management Procedures Identification

1. Incoming Goods Inspection.

Case company has to ensure that purchased goods meet the purchase requirements. So it has to be defined 1) when and 2) how the goods are checked after the delivery.

All the outsourced goods are checked during the Incoming Goods Inspection Procedure. Thus the description of the procedure has to be stated in the Work Instruction for incoming inspection.

2. Process of complaint.

Recall has to be added to Corrective Actions Procedure in order if the product does not meet the requirements.

3. Create Release and Monitoring of Suppliers Procedure.

The following changes are related to this procedure and also have to be applied:

¹⁴ Business Dictionary. Web. 5 Dec. 2014.
<<http://www.businessdictionary.com/definition/procedure.html>Change management procedures>.

- A Supplier's List (KMF 011) has to be linked to approval status and scope of approval (product type, process family, etc.).
- The List of Approved Suppliers has to be made. Criteria for selection, evaluation and re-evaluation are needed at Case company; records of evaluation have to be archived. Supplier quality data can be used for the evaluation of suppliers (external audit), after that they can be added to the List of Approved Suppliers.

The List of Approved Suppliers should include:

- Name of the company,
 - Company's information,
 - Information on products /or services supplied,
 - Quality Management System of supplier,
 - Approval status : approved, conditionally approved, or disapproved,
 - Scope , reasons of approval,
 - Classification of supplier (critical, key, underperforming, etc.),
 - Risk analysis on supplier/ supplier's products.
 - Other specific information that is necessary for Case company
-
- When releasing and evaluating its suppliers, Case company has to check them external sources. For instance these external sources can be, TÜV, Nadcap, Oasis, etc. After that suppliers can be added to the List of Approved Suppliers.

Furthermore, a new rating system should be established to define:

- The minimum quality level of purchased goods,
- And delivery time for suppliers.

The records on quality and delivery of suppliers also have to be kept in the List of Approved Suppliers.

- Make procedure for periodical review of suppliers and establish the level of controls. The suppliers have to be assessed during Purchasing Process Reviews and Management Reviews. The schedule for the mentioned reviews has to be made at Case company and performed in the Manual.
- Case company also has to decide and document why the supplier can be replaced to the category of "underperforming". For instance, if the vendor does not react on Corrective Actions Appeals, or systematically delays the delivery.
- The underperforming vendor has to be deactivated from the List of Suppliers. It means the Corrective Action Procedure has to be applied. The vendor also has to be informed about this action; reasons have to be provided by the purchaser of Case company. But the process of re-certification also should be established. So the disapproved vendor can be released again.

- Release and Monitoring of Suppliers Procedure is new for Case company. So employees that are responsible for release of suppliers have to be defined (Training Database of Case company can be used).
 - If necessary, Case company can purchase products from the suppliers that are not approved. After a purchase order was proceeded to supplier, he obtains the status “conditionally approved”. For example, supplier can prove the quality of its product with DVI or FAIR documentation. And if purchasing requirements are met and Case company is satisfied with the supplier’s performance he can be added to the List of Approved Suppliers.
 - Risk Analysis on released suppliers has to be completed. For this purpose, the questionnaire/checklist based on FMEA can be used.
4. General procedure of purchasing includes verification activities that are necessary to ensure that purchased product meets specified purchase requirements. Inspection of purchased goods is a responsibility of Case company. The following verification methods can be used¹⁵:
- Obtaining objective evidence of product quality from suppliers (certificates of conformity, test records, etc.)
 - Inspection of product upon receipt.
 - Delegation of verification to the supplier or a supplier certification. This has to be stated in purchase order together with verification requirements.
 - Inspections or audits at the supplier's premises
If it is defined in the contract, Case company has to arrange the quality inspection and methods of verification, create purchasing documentation and keep the records.
 - Reviewing required documentation or certifications
5. Service Level Agreement.
- Clause 7.4.2 is related to purchasing information that has to be defined in the Service Level Agreement. The title of the Service Level Agreement used at Case company is “Title”. This document is provided by Company Z, the Dutch employer’s organization for small and medium-sized enterprises in the metal industry. At the moment “Title” document consists of 20 articles that describe general delivery and payment conditions. This document was analyzed and it was concluded that Case company does not fulfill the requirements stated in clauses 7.4.2 g, h, i, and j.
- The requirements based on AS9100 that have to be added to the Service Level Agreement of Case company are listed below¹⁶:
- Requirements for approval of product, procedures, processes and equipment.
 - Requirements for the qualifications of personnel.
 - QMS requirements.
 - Identification and applicable issues of specifications, drawings, process requirements, inspection instructions, and other relevant technical data.
 - Requirements for test specimens for design approval, inspection, investigation or auditing.
 - Requirements for design, test, inspection, verification

¹⁵ Appendix B: AS9100 Checklist, clause 7.4.3, page 93.

¹⁶ Appendix B: AS9100 Checklist, clauses 7.4.1-7.4.2, pages 91-92.

- Requirements for the supplier regarding to notifying of nonconforming product, and arrangements for Case Company's approval of nonconforming materials disposition. Any non-conformances, delays, etc. have to be recorded in the List of Approved Suppliers.
- Requirements for the supplier to notify Case company of changes in product and process definitions, and obtain the approval as necessary.
- Requirement related to records retention at Case company.
- Right of access by Case company, its customers, and appropriate regulatory authorities to all facilities involved in the order, and their records.
- Requirements for the supplier to flow down applicable requirements to sub-suppliers in their purchasing documents, including key characteristics where required.
If a contract with a customer requires the use of a specific source for a special process, those requirements shall be flowed down to sub-suppliers through our purchase order. It is the responsibility of the buyers to periodically verify that suppliers are meeting flow down requirements.

The listed requirements can be added as an additional article to the Service Level Agreement.

12.3 Purchasing Procedure according to AS9100.

Purchasing and Release and Monitoring of Suppliers Procedures (see Appendices G,H, and I) were made by me after the identification of change procedures. To define whether the existing purchasing procedure contains the requirements of the AS 9100 Standard, the AS 9100 Checklist from business consultant, and the AS 9100 Standard itself were used. The flowchart (Myhrberg, Crabtree 2006) located below describes the process of rewriting the purchasing procedure.

After Purchasing and Release and Monitoring of Suppliers Procedures were conducted by me, they were assessed and improved by the business consultant and process engineer of Case company.

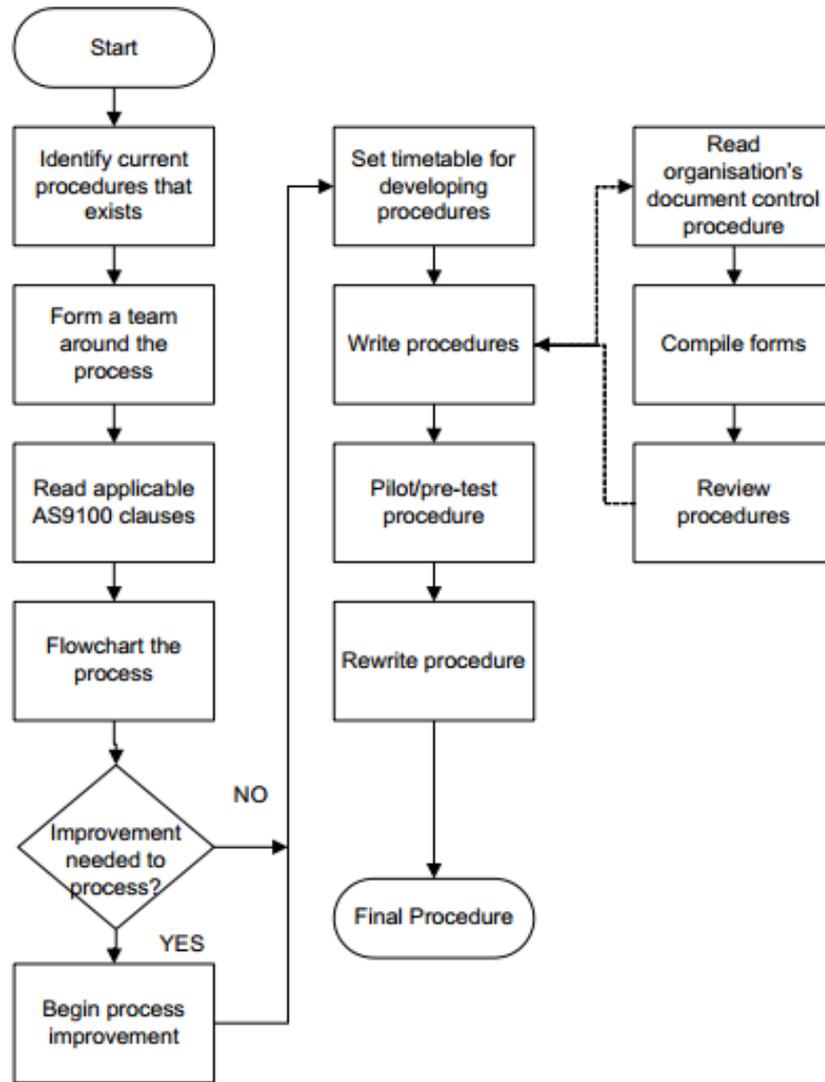


Figure 5 Flow Chart used for writing the purchasing procedure according to AS 9100 Standard (Myhrberg, Crabtree 2006)

13. Implementation plan

In this Chapter the implementation plan for changes in purchasing process of Case company is presented. Implementation planning is fundamental to determine the activities, timeline, communication strategy and responsible employees required to conduct the implementation of the project successfully.

The implementation plan was divided into 6 parts:

1. Specifications of implementation.
2. Action plan.
3. Implementation approach.
4. Communication plan.
5. Implementation checklist.
6. Training plan.

13.1 Specifications of implementation

- Most of items of clause “7.4 Purchasing” are the gaps for Case company. The additional requirements of AS9100 are shown as bold italic type in the attached Checklist. And it can be seen that almost all of the requirements for the purchasing process, the purchasing information and the verification activities are added to ISO 9001 and new for Case company. So they are stated as gaps in the checklist.
- Process Development and relevant documentation. As mentioned before, process development will have the link to most of the processes at Case company, and new documentation will be also applied at Case company. Purchasing is one of these connected processes. Consequently, FMEA, DVI, and FAIR documents will be used now in purchasing to control the risks or to prove the conformity of products. Furthermore, process development and purchasing have to be implemented simultaneously because they are interrelated and depend on each other.
- Development of new procedures is required. To comply with AS 9100 not only changes in processes had to be made, but also new procedures. For example, release and monitoring of suppliers will be a new documented procedure for Case company.
- Size of the company. Case company is small sized company, so implementation will be completed relatively fast in comparison with middle and large companies. On the other hand, only two employees internally will work on change management and implementation.
- Complexity of the process. Case company is specialized on EDM production, it is a complex and innovative process .And purchasing of materials plays a significant role and requires the high level of control.

13.2 Action Plan

According to the planning of Case company, the documentation according to AS9100 Standard has to be ready till the first of February. The implementation of changes in purchasing process will start 5th of January.

The action plan is presented below and based on the change management procedures that give the detailed explanations of required changes.

Activities	Responsible	Time frame
1. Study and analyze the purchasing process requirements	Process engineer	5.01-9.01
· Improve Work instructions for Incoming Goods Inspection	Process engineer	5.01-9.01
· Choose methods for verification activities	Process engineer	5.01-9.01
2. Study Release and Monitoring of Suppliers procedure	Purchaser	5.01-9.01
· Register the suppliers and link the Supplier list (KMF 011) to approval status and scope of approval	Purchaser	5.01-9.01
· Create concept List of Approved Suppliers	Purchaser	5.01-9.01
· Establish criteria for selection, evaluation and re-evaluation is needed at Case company	Purchaser	5.01-9.01
· Make a new rating system for evaluation	Purchaser	5.01-9.01
· Keep records archive the results	Purchaser	5.01-9.01
· Get access to external resources: TUV, Nadcap, Oasis, etc.	Purchaser	8.01-12.01
· Establish the process for periodical review of suppliers: Purchasing process reviews and Management reviews	Purchaser	8.01-12.01
· Create approach for re-certification of suppliers	Purchaser	8.01-12.01
· Define RASCI for Release and Monitoring of Suppliers process	Purchaser	8.01-12.01
· Establish approach for proceeding the conditionally approved vendors	Purchaser	8.01-12.01
· Prepare Risk Analysis on released suppliers :FMEA based	Purchaser	8.01-12.01
· Suppliers released by the Director	Director	8.01-12.01
3. Study and analyze the purchasing information requirements	Purchaser	8.01-12.01
· Contact Company Z and discuss the possibility of adding the articles that will satisfy the purchasing information requirements.	Process engineer	8.01-12.01
· Change Service Level Agreement: add the articles	Purchaser	8.01-12.01
4. Improve Process of complaint		
· Change Corrective action procedure: Add recall	Process engineer	5.01-9.01
· Create approach for processing underperforming suppliers: Corrective Action	Purchaser	5.01-9.01
5 Check the implementation results	Purchaser/Process engineer	15.01-16.01
6 Final Check of the implementation results	Business consultant	17.01-19.01

Table 3 Action plan for the implementation of changes in purchasing process of Case company.

13.3 Implementation approach

PDCA cycle is a suitable approach for implementation of changes at Case company as it provides the continuous improvement of the process. The figure below presents the four stages of this method.

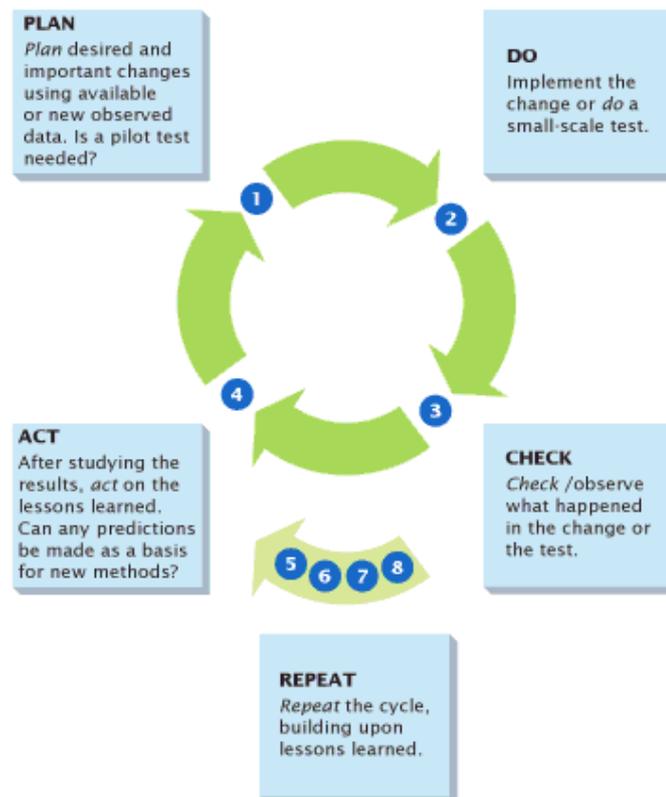


Figure 6 PDCA cycle .Source: Kreitner, Robert. Principles of Management. 11th ed. Cengage Learning, 2008, p. 482.

The purchasing process changes are planned to be implemented from 5th of January till 31st of January.

Phase one is the implementation planning that is conducted by me and described in this chapter.

Phase two is the actual implementation. It will take place in first two weeks, from 5th of January till 16th of January. The changes described in the change management procedures have to be applied.

The third phase takes place from 19th till 23rd of January and contains the verification of the implemented changes. The goal is to comply with AS9100, so the results of the implementation have to be registered. For this purpose the auditor checklist can be used by the team members to ensure that the required changes were implemented. Then they can be checked by Business consultant for conformity with AS 9100.

In the fourth phase from the 22nd till 26th of January, all that was successfully applied can be approved and used at Case company on daily basis, and the changes were not adequately implemented have to be revised and improved. In the second case the cycle has to start again and continue till the changes are implemented successfully.

13.4 Communication plan

At Case company the purchaser is responsible for the whole purchasing process, and verification activities are the responsibility of the metrologist. The production Leader is accountable for the purchasing process. The employees involved into change management of purchasing process:

1. Internally:

- Process Engineer
- Purchaser

2. Externally:

- Business consultant, Company X.

The changes have to be communicated to the following employees:

- Metrologist , who is responsible for Incoming Goods Inspection activities.
- Production Leader, who is accountable for the purchasing process.
- Director, who, together with Process Engineer, is determined as an internal auditor for purchasing process at Case company.
- All the employees of Case company, who also have to be aware of the changes.

13.5 Implementation Checklist

After the implementation, it will have to be checked if the following documented procedures conform the Standard:

- Purchasing Procedure.
- Release of Suppliers Procedure.
- Monitoring of Suppliers Procedure.
- Corrective Actions Procedure.

And if the following documents are also completed:

- List of Approved Suppliers.
- Service Level Agreement.
- Incoming Goods Inspection instructions.

For detailed check of conformity to the AS9100 the Auditor Guidance Material presented by IAQG can be used by implantation team. This checklist was found during the research and describes what the auditor will check or what questions he can ask. The document can be accessed through this link: http://www.sae.org/iaqg/projects/9100_auditor_guidance_material.pdf.

13.6 Training

Training was planned and will be conducted by Business consultant. At this moment, specific training on purchasing is not scheduled, but can be a part of “Basic training process control according to AS 9100-C Employees” that is also planned by Business consultant.

14. Conclusions

Implementation of AS9100 Standard is a time consuming and complex process that requires many issues to be considered. The successful completion of the implementation in a shortest period of time is a goal of every company that has decided to become AS 9100 certified.

This chapter concludes this thesis in one line with the problem and goal from the Plan of Approach and presents the outcome of the “Quality Management System according to AS9100-C” project.

In general, this thesis can be divided into three phases. The first one included gathering of necessary information, company research, study of its processes, and analysis of the ISO 9001 manual. The second phase was about applying the gained knowledge, gaps evaluation, impacts identification, and change management procedures completion. And the last phase performed the implementation planning of defined changes.

As described in the report the decision was made to focus the research on purchasing process of Case company. The reasons for this were also pointed out in Chapter 9. Thus the problem was solved, the goal reached and expected results achieved concerning the gaps in purchasing process.

The problem and goal of the project were defined in the Plan of Approach and presented below.

- The problem of the project was to plan the successful implementation of AS 9100-C.
- The goal of the project was to prepare the company for AS 9100-C implementation as soon as possible in order to satisfy the customer’s requirements.

This thesis discusses the gaps in the QMS of Case company and then focuses on one particular field-purchasing. This process plays a significant role at Case company as the company is responsible for the quality of its products and on time delivery. And AS9100 Certification is a perfect solution to bring this process on a higher level and eliminates all the existing problems in this department. And to comply with the requirements of the standard the process was assessed and analyzed, gaps defined, change procedures written and as a result the implementation plan for purchasing process was completed.

It was concluded that there are about 23 general non-conformances in the company that can be allocated to the different processes of Case company and purchasing is one of the most problematic areas that requires a big number of changes to comply with AS9100.

The problem of the thesis was solved in a way of creating the implementation plan based on

- impact analysis that showed how the changes influence the company and employees
- and change management procedures that described how the purchasing process has to be modified

The goal was reached by establishing the base for implementation: making of process model and procedures, and preparing the purchasing department for changes. As for timeline, the project was completed according to initial planning so the implementation can start in the beginning of January.

To sum up, this thesis presents the guidance for implementation team and provides the approach of implementation of AS 9100 on the example of purchasing process. My timeline and knowledge allowed me to cover one field in my research, but the same methods and practices can be applied to the other processes of Case company.

15. Recommendations

- Training

The first and one of the most important recommendations will be to pay extra attention to training of managers and employees. Apparently, AS 9100 Standard will change the documentation system, the process of work of departments, and consequently the employees' responsibilities or job roles. In the beginning, for the employees of Case company it can be complicated to adjust to a new QMS and as a result the quality of work or production time can decrease. To prevent that it is necessary to start involving people into the process of change and spread the information about the new standard requirements through the company in advance. For this the engagement and commitment of top management is highly required. All in all, the strong educating and training system during the first phases of implementation will play a crucial role in the success of AS 9100 application.

- Quality Manual

The problem of most companies is that implementing QMS that they keep a big quantity of unnecessary or inappropriate documents, forms or manuals. It will be convenient for Case company to keep only the documentation required from the standard and discard the obsolete papers. It will also help to get through external audits easier and faster. Thus the new Manual of Case company should be brief and precise.

- Audits

Process control is the main characteristic of AS 9100, and to comply with it Case company has to establish a strong system of internal audits. Furthermore, verification of suppliers is also mandatory. Hence the vendor's audit program can be a suitable method of systematic evaluation that will help to ensure the quality of purchased goods.

- Process development

Many procedures in the company will be changed or removed, but Process Development will be a completely new process for Case company. It will affect many primary and secondary procedures (Change Management, Purchasing, etc.) and begin with the order from the customer and end with FMEA and Control plan. Process Development will be connected to FMEA, DVI, and FAIR documents. As a result, employees of Case company will need to work according to new procedures and documents. It will be helpful for Case company to provide a clear explanation of a new process to employees and ensure that it is accepted and understood.

Bibliography

Books:

- Anderson, Linda S., and Dean Anderson. The change leader's roadmap: how to navigate your organization's transformation. 2nd ed. San Francisco, Calif.: Pfeiffer, 2010. Print.
- Arter, Dennis R., and Charles A. Cianfrani. How to Audit the Process-based QMS. Milwaukee, Wis.: ASQ Quality, 2003. Print.
- Bartlett, John. Project risk analysis and management guide. 2nd ed. High Wycombe: Association for Project Management, 2004. Print.
- Harrington, H. J. Change Management Excellence: The Art of Excelling in Change Management. Chico, Calif.: Paton, 2006. Print.
- Kneer, Christian. Change Management Enhance the Ability to Survive. München: GRIN Verlag GmbH, 2009.
- Kostka, Claudia, and Annette Nch. Change-Management: 7 Methoden Für Die Gestaltung Von Veränderungsprozessen. 2. Aufl. ed. München: Hanser, 2002. Print.
- Kreitner, Robert. Principles of Management. 11th ed. Cengage Learning, 2008.
- Myers, Michael D.. Qualitative research in business and management. Los Angeles: SAGE, 2009.
- Myhrberg, Erik V., and Dawn Holly Crabtree. A Practical Field Guide for AS9100. Milwaukee, Wis.: ASQ Quality, 2006. Print.
- Paton, Rob, and James McCalman. Change Management: A Guide to Effective Implementation. 2nd ed. London: Sage Publications, 2000. Print.
- Quality Management Systems: Requirements for Aviation, Space and Defense Organizations. S.l.: Sae International, 2009.
- Schlickman, Jay J. ISO 9001:2000 Quality Management System Design. Boston: Artech House, 2003. Print.
- Strategic Management: A Conceptual Framework. Tata McGraw-Hill Education. Print.
- Kreitner, Robert. Principles of Management. 11th ed. Cengage Learning, 2008

Websites:

- "9100 Auditor Guidance Material." IAQG, 26 Sept. 2011. Web. 7 Nov. 2014.
<http://www.sae.org/iaqg/projects/9100_auditor_guidance_material.pdf>.
- "AS9100C: How to Effectively Interpret the Evolving Quality Management Requirements in the Aerospace Industry." TUV Rheinland. Web. 18 Nov. 2014.
<<http://www.tuv.com/media/usa/whitepaper/as9100c.pdf>>.
- "Implementing AS9100 Aerospace Quality Management." BSI. Web. 18 Nov. 2014.
<<http://www.bsigroup.com/en-US/AS9100-Aerospace/Implementing-AS910091109120-Aerospace/>>.
- "Steps to AS9100 Certification (and AS9110/9120)." AS9100 Store. Web. 18 Nov. 2014.
<<http://as9100store.com/steps-to-as9100.aspx#Learn-About-AS9100>>.
- "TUV Rheinland Netherlands - English." TUV Rheinland Netherlands. Web. 18 Nov. 2014.
<<http://www.tuv.com/en/netherlands/home.jsp>>.
- Barker, Eugene M. "Aerospace's AS9100 QMS Standard." Quality Digest. Web. 3 Nov. 2014.
<<http://www.qualitydigest.com/magazine/2002/may/article/aerospaces-as9100-qms-standard.html>>.
- Prosci. Web. 7 Dec. 2014. <<http://www.prosci.com/change-management/definition/>>.
- Standards Outlook: Road to Revision." Quality Progress. 1 July 2011. Web. 14 Nov. 2014.
<<http://asq.org/quality-progress/2013/07/standards-outlook/road-to-revision.html>>.

List of Appendices

Appendix A: Plan of Approach

Appendix B: AS 9100 Checklist

Appendix C: Template

Appendix D: Process Model of Case company

Appendix E: Purchasing Procedure according to ISO 9001

Appendix F: Outsourcing Procedure according to ISO 9001

Appendix G: Purchasing Procedure according to AS 9100-C

Appendix H: Release of Suppliers Procedure according to AS 9100-C

Appendix I: Monitoring of Suppliers Procedure according to AS 9100-C

Appendix J: Company Supervisor Evaluation

Appendix A: Plan of Approach

Plan of Approach

Project: Quality Management System according to AS9100-C

Student	Thesis Supervisors	Project Supervisor	Date	Version
Valeriya Bulaeva	Ruud Wijlhuizen		27.10.2014	Version 3
	Frank van Oostrum			

Table of contents:

Bibliography	40
List of Appendices	42
1. Introduction	47
2. Company description.....	48
2.2. Definition of Electrical Discharge Machining Process	49
2.3 Organization	50
3. Company information	51
3.2. Goal	51
3.3. Mission.....	51
3.4. Vision.....	51
3.5. Value disciplines	52
4. Assignment description.....	53
5.1. Problem definition.....	55
5.2. Goal of the project.....	55
5.3. Expected results.....	55
5.4. Preconditions of the project	55
5.5. Starting Point	55
6. Research questions.....	56
6.1. Main research question.....	56
6.2. Derived research questions.....	56
7. Project activities	57
1. Define the structure and process model of the company.	58
2. Analyze AS9001:2008 Quality Manual and Procedures	58
3. Analyze the non-conformities between the QMS of Case companyand AS9100	58
4. Conduct Impact Analysis	59
5. Create change management procedures.....	60
6. Perform Implementation Plan	61
8. Scope.....	62
9. Risk Analysis.....	63
10. Planning	64

11. Research methods	66
12. Personal goals	68
List of terms and abbreviations.....	69
List of figures	70
Appendix 1	71
Appendix 2	72
Appendix 3	74
Appendix 4	75
Bibliography	76

1. Introduction

The project will be conducted by me, Valeriya Bulaeva, in the Case company and supervised by Company Supervisor. Business consultant from Company X will participate in the project as a coach.

The stakeholder of the project is the organization. The successful results of the project will lead to a higher level of the Quality Management System.

The action plan will be controlled by the company supervisor, the first thesis supervisor, Ruud Wijnhuizen, and the second thesis supervisor, Frank van Oostrum.

In the following chapters the most important issues concerning the project will be described. In the first four chapters, the company's background information, organogram, goal, mission, vision, and value disciplines are presented. Then problem definition, goal of the project, expected results, scope, preconditions, research questions, and planning are defined. List of terms and abbreviations, bibliography, and list of personal goals are described in the last chapters.

Case company contact information:

2. Company description

Case company was established in 1990. Now the company is specialized in Electrical Discharge Machining (EDM) techniques. Case company does not offer traditional grinding, milling or heat treatment. But the company provides its customers with EDM solutions that are mentioned below.

- Wire EDM
There are 18 wire electrical discharge machines at the moment. In 2013 the capacity was 125.000 hours.
- Sinker EDM
There are 5 die sinking machines at Case company. In 2013 the capacity was 35.000 hours.
- Hole Drilling EDM
There are 3 hole drilling machines, the capacity was 20.700 hours.
- Micro Hole EDM Milling
There are 2 micro milling machines, the capacity was 13.800 hours.
- Lasermicrojet
Lasermicrojet machine was bought in 2014.

For example, the capacity of 18 wire electrical discharge machines was 125.000 hours, and Case company provides products and services for the following industries:

- Semiconductor industry
- Medical industry
- Aerospace
- Energy supply
- Offshore industry

Turnover of Case company in 2013 was 3 672 000. The following chart illustrates the turnover by sector:

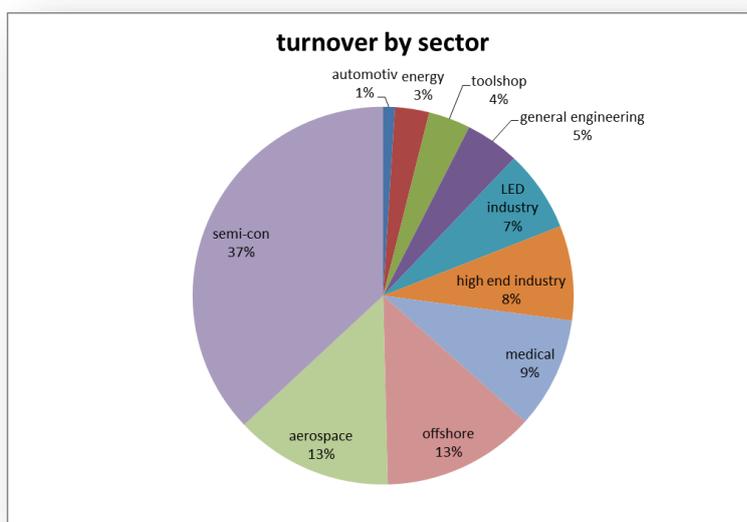


Figure 1. The turnover by sector, Case company, Management Presentation, 2013.

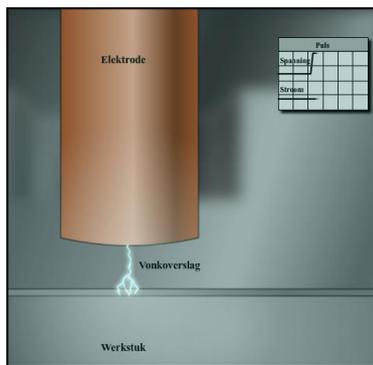
2.2. Definition of Electrical Discharge Machining Process

EDM is the process of machining electrically conductive materials by using precisely controlled sparks that occur between an electrode and a work piece a dielectric fluid. The electrode may be considered the cutting tool. Die-sinking type EDM machines require the electrode to be machined in the exact opposite shape as the one in the work piece. Wire-cut EDM machines use a continuous wire as electrode. Sparking takes place from the electrode wire-side surface to the work piece.¹⁷

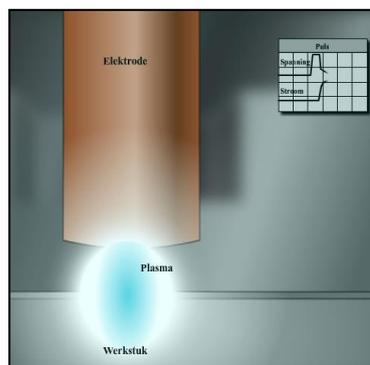
Picture 1. Spark occurs between two electrodes.

Picture 2. Electrode and work piece material vaporization.

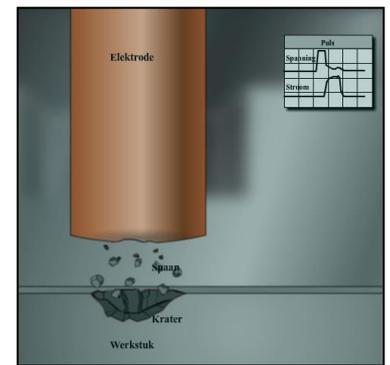
Picture 3. Plasma melts/evaporates the work piece, resulting in craters.



Picture1.



Picture2.

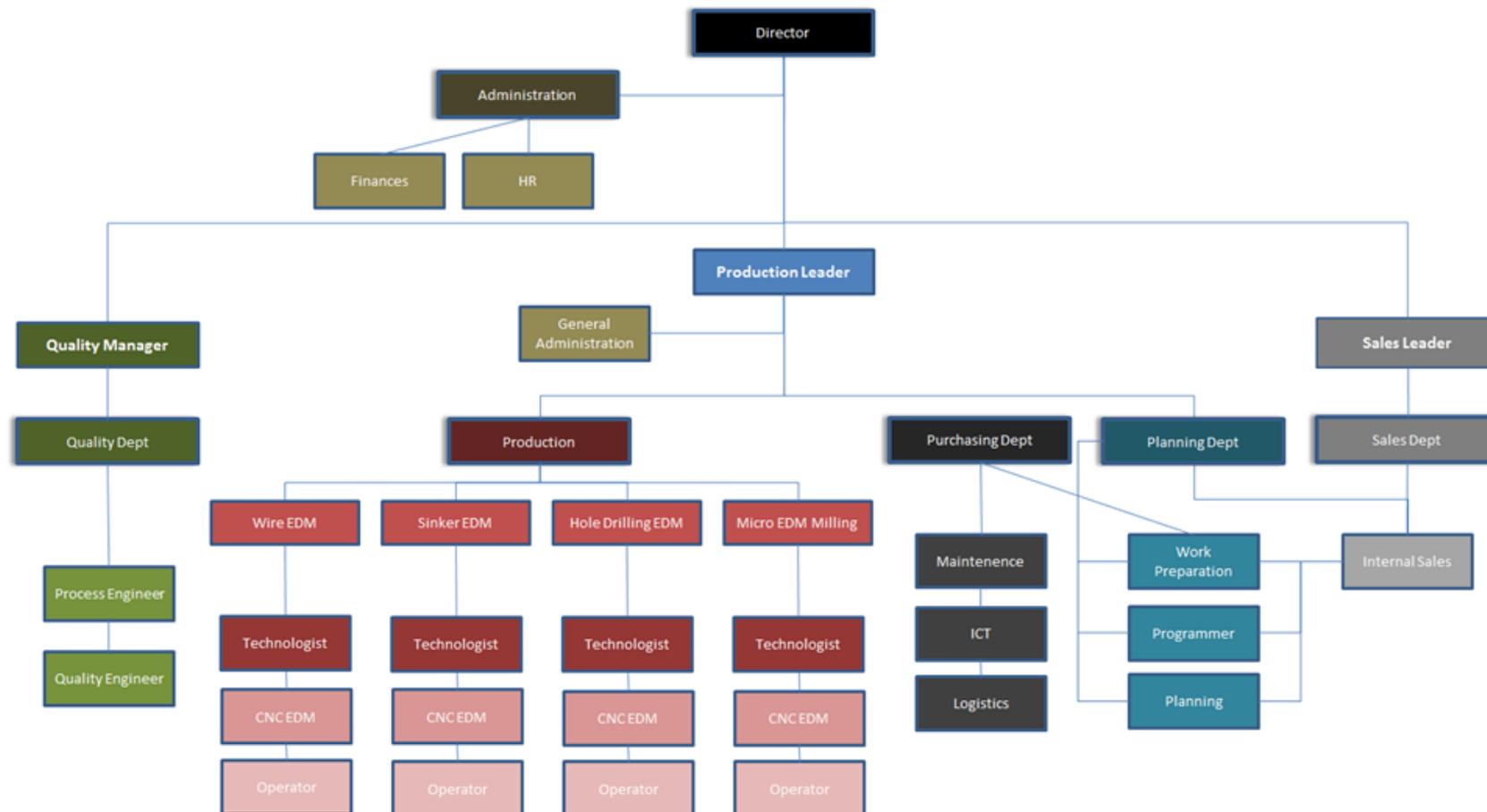


Picture3.

¹⁷ Jameson, Elman C. Electrical discharge machining. Dearborn, MI: Society of Manufacturing Engineers, 2001.

2.3 Organization

Holding B.V. is a holding company of Company N. It is divided into two subsidiaries: Case company and Case company B.V. The current assignment is conducted at Case company. Below the organizational Chart of Case company is presented.



3. Company information

3.2. Goal

Case company's goal is not only to evaluate results afterwards, but also to check the critical processes during the production. It means that feed forward process control takes an important place in organization and can be reached by obtaining AS 9100-C certification. The quality of the product has a priority in the company's strategy.

The policy of Case company is focused on long-term economic success and fulfilling market needs through strategy, human resources, growth and efficiency. Case company believes that only an all-encompassing quality management system can guarantee long-term success.

3.3. Mission

"Case company is a strategic supplier in the spark technology field, which supports its clients in realizing "impossible" solutions. With our 25 years of experience we are Europe's biggest independent spark technology specialist. We want to use the technologies of wire EDM, ram EDM, EDM drilling and micro-cutting exactly to the micron with our clients and further develop these processes. Case company is a reliable partner for System Suppliers and OEMs. With our specialism we can completely remove all of our clients' concerns regarding supplying high-quality products. By collaborating with a specialist like Case company our clients can concentrate on their own area of expertise. This has proven to create a win-win situation for everyone. It is very important to us to involve our specialism in the preliminary stages. Even engineers at leading companies in various market segments are often amazed at what is possible with our technology. Case company therefore closely follows the latest developments in spark technology."

3.4. Vision

"Case company believes that there is sufficient rationale in the Netherlands for a manufacturing industry. Specialization and collaboration is a must in this. Because of our specialism and years of experience, Case company is ready for the future. From the start, Case company has always presented itself as flexible and reliable. The people in the organization have the knowledge; that's why time and energy is always spent on training. Case company wants to further expand its specialism in market segments that don't yet have any experience with the solutions that Case company can offer. The QLTC, Quality Logistics Technology and Costs, are an important link in this, to ensure that our processes seamlessly connect to those of our clients. Shorter turnaround times and reliable production processes are constantly being adjusted. The theme of sustainability is also an important one. Our children must be able to live in a healthy environment. The current generation is responsible for this. For this reason, Case company wants to ensure that the internal processes meet the environmental standards. Order and cleanliness play an important role in this. Investing in environmentally friendly solutions is a big priority for Case company. By investing in the most up-to-date production resources we will be able to produce sustainably in the future. By collaborating with other specialists in a smart way, we will be able to remain the right strategic supplier for the future. In all this, people will always keep playing a central role and training our people will always be important to us."

3.5. Value disciplines

According to the model created by Michael Treacy and Fred Wiersema, three generic "value disciplines" of Case company can be evaluated.

Product Leadership is the most important value discipline for Case company. Product innovation and development are critical for the company.

Then Customer Intimacy and Operational excellence take place. The primary focus is on the needs of customers, their specifications and preferences. Short delivery time and process development is also an essential part of Case Company's organization.

Case company possesses itself as flexible, precise and reliable company.

- Flexibility - the client is always first.
- Precision - every detail of the process is under control.
- Reliability - always consistently perform its required functions.

4. Assignment description

Case company produces high quality parts for the Aerospace industry. The quality management of Case company is based on the guidelines as defined in the international quality standard BS EN ISO 9001: 2008. But management of Case company has decided to make the next step in the quality assurance process and obtain the AS9100 (EN9100) certificate.

AS9100 is the international management system standard for the Aircraft, Space and Defense industry and provides suppliers with a comprehensive quality system for safe and reliable products to the aerospace industry. AS9100-C- is the revision of the Aerospace Standard ("AS") containing the requirements for establishing a quality management system.

The AS9100 Certification is needed to be implemented at Case company due to the following reasons:

- Aerospace Customer requires Case company to get AS9100 Certification. It is a mandatory standard for aerospace industry.
- Case company is willing to achieve the higher level of process and quality control.
- Competitive advantage perspectives.
- Contracts with new customers in various industrial sectors.
- Minimize costs, maximize profit.
- Increase of Value Added features.

The Gap analysis was already completed by the auditor and gave a complete insight in the current situation in relation to the requirements of AS9100. According to the report of auditor, the interaction between processes of Case company is not clear enough for AS 9100-C. That is why, it is complicated to identify and control risks. . At this moment, the responsibilities of employees are not clearly defined. It is necessary to define who in the process is responsible, accountable and who supports, consults and must be informed. For this purpose Case company together with Company X made a decision to implement RASCI.

A RASCI chart clarifies stakeholder participation by the various roles needed to complete project tasks or deliverables. It outlines which stakeholder, or stakeholder group, has what participating role(s) for key project activities:

Responsible(R) - the stakeholder who owns the project activity and does the work to achieve the desired result. The responsible person should have the appropriate resources to be able to fulfill the project task or complete the project deliverable.

Accountable (A) -the stakeholder who is ultimately accountable for the completion of the project activity or deliverable. The accountable person possesses ultimate management accountability, has decision authority, and can allocate resources to achieve the project activity or deliverable.

Supportive(S)- the stakeholders who provide resources or play supporting roles in the execution and completion of a project activity. There may be several supportive individuals contributing to a project activity.

Consulted(C) - the stakeholders who possess the information, knowledge, or capability that is needed to complete a project activity. These individuals must be consulted on a regular or pre-defined basis to obtain information, guidance, recommendations, or other valuable input to guide the execution and completion of a project activity.

Informed (I) - the stakeholders who are notified of the results of key projects activities and decision, but are not consulted. These individuals are usually informed after the decision has been made or the activity has been accomplished.¹⁸

The biggest issue is the difference between current situation at Case company and requirements of AS 9100-C. To control the processes in the company according to AS9100 the following action plan has to be applied:

Phase 1. Adjust process model and procedures: complete a new QMS.

Phase 2. Control the processes according to a new QMS and training.

Phase 3. Implement AS 9100-C and training.

Above the overall plan of AS9100-C implementation is presented. The assignment is only focused on the first phase that has to be completed within the framework of the project.

¹⁸ Resch, Marc. Strategic project management transformation delivering maximum ROI & sustainable business value. Ft. Lauderdale, Fla.: J. Ross Pub., 2011. Print.

5.1. Problem definition

The problem of the project is to plan the successful implementation of AS 9100-C.

5.2. Goal of the project

The goal of the project is to prepare the company for AS 9100-C implementation as soon as possible in order to satisfy customer's requirements.

5.3. Expected results

For this project, the research has to be completed to define and eliminate the gap between the current Quality Management System at Case company and the requirements of AS 9100, and plan the implementation process.

The project provides a representation of the research in a form of recommendation report. This report describes how the research process is conducted and what the results of the project are. In the end of internship period the final goal has to be met, and problems solved. As a result, conclusions and recommendations will be provided.

5.4. Preconditions of the project

- Access to data provided by Case company such as quality manual, documents, certificates, etc.
- Ability to interview employees of Case company
- Ability to collaborate with employees, connected to the project
- Ability to get support from company and university supervisors
- Ability to complete the assignment no later than the fixed deadline
- Availability of literature that will be a base of the research

5.5. Starting Point

- AS 9100-C as a new QMS standard.
- Gap analysis conducted by the business consultant.
- AS 9100-C Checklist.
- Data concerning ISO 9001:2008 that is used at Case company as a QMS.
- Project timeline.

6. Research questions

6.1. Main research question

Considering the existing QMS at Case company, what change management process has to be conducted so that the implementation plan of AS 9100-C can be performed?

6.2. Derived research questions

- What is the difference between ISO 9001:2008 and AS9100?
- How to analyze the non-conformities between the QMS of Case company and AS9100?
- What is the best solution to exclude gaps between current QMS and requirements of AS9100?

- How does the process model of Case company have to look like?
- What is the best way to make the interaction of the processes clear?
- How to define the process owners for every procedure?

- What are the impacts of changes?
- What are the risks of changes?
- How to control the consequences of changes?

- How to plan the implementation of AS 9100-C?
- What literature or web resources have to be used?
- What conclusions and recommendations can be made in the end of the project?

7. Project activities

The activities of this project are separated into following steps:

1. Define the structure and process model of the company.
2. Analyze AS9001:2008 Quality Manual and Procedures.
3. Analyze the non-conformities between the QMS of Case company and AS9100.
4. Conduct Impact Analysis.
5. Create Change Management Procedures.
6. Perform Implementation Plan.

This project includes the change process that has to be managed and controlled. So it was necessary to find the research method that will be applied to complete this project. . The criteria that were used to select the suitable methods are presented in the final report. For this purpose the action type of research was chosen According to French and Bell (1970), action research is the collaboration of researcher and practitioner in the diagnosis and evaluation of problems existing in the practical setting. This research is change oriented; it aims to solve practical problems and has a cyclical nature. Gerald Susman (1983) created a research model that explains the cyclical process of action research. This model is presented below.

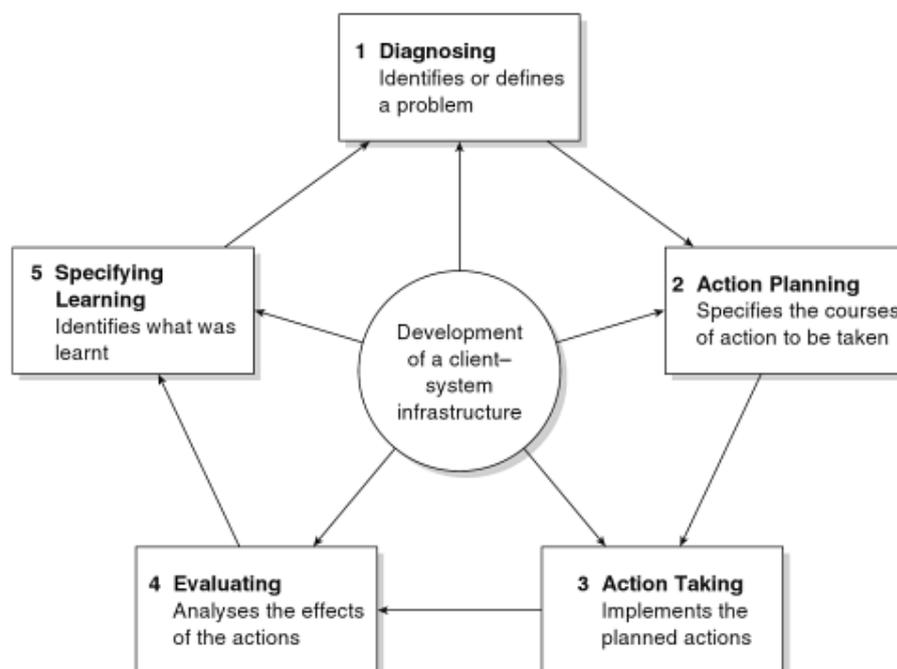


Figure 2.The cyclical process of action research. Source: Myers, Michael D.. Qualitative research in business and management. Los Angeles: SAGE, 2009.

Beckhard and Harris (1987) defined two parallel and separate structures to manage the change process—one that keeps the operation running effectively and one that oversees the change, including the design of the new state, the impact analysis, and implementation planning. So the action research model has to be supported with the change tools that can be applied in order to fulfill successfully every phase of the model.

Below the description of project activities is presented.

1. Define the structure and process model of the company.

Get the interaction between processes of Case company clear and control the risks.

The main idea is to understand the company's structure and how it operates. At this moment Case company applies ISO 9001:2008. The focus is on the processes and activities that take place in the company and on its interrelation from receiving the order till the shipping of the final product. These data will be used as a base for further research.

For this purpose, qualitative methods will be used. The best way to study the organization is to interview employees and make an overview of the relevant documents.

Study the process model: separation of processes must be clear.

A clear flowchart has to be made in order to define primary, secondary (support) and strategic processes of Case company, documents used, and input and output for every process. As a result of this phase, the basic process model has to be adjusted with all the processes and interactions.

Flow diagram will be used as a mapping tool.

2. Analyze AS9001:2008 Quality Manual and Procedures.

Build up the procedures.

The procedure for every group of processes (primary, secondary and strategic) has to be built up. Microsoft Visio has been chosen as relevant software for this purpose.

Define an owner for every procedure in accordance to RASCI.

Employees are connected to the process according to their responsibilities. For instance, for the work preparation procedure the employees, who are supportive, responsible, accountable, consulted, or informed, will be defined. RASCI matrix is used for this task.

3. Analyze the non-conformities between the QMS of Case company and AS9100.

After the procedures are built up the nonconformities between the QMS at Case company and requirements of AS9100 can be evaluated. The company's business coach, Business consultant, consults Case company about the gaps that have to be eliminated. The design of the future state is a first part of the Gap Analysis. To reach the requirements of AS 9100-C and perform the plan of implementation is a desired result and a future state of the project. Evaluation of the current situation is the second part of the Gap Analysis. Process model of Case company and procedures have to give an overview of a current situation and as a result gaps can be defined and bridged. Checklists from auditor and AS 9100-C requirements are used as a starting point.

4. Conduct Impact Analysis

Bohner and Arnold (1996) defined impact analysis as “identifying the potential consequences of a change, or estimating what needs to be modified to accomplish a change”.

To perform Impact analysis first it is necessary to define the areas that will be affected by changes. According to the process model of Case company, eight main processes are defined: administration, sales, work preparation, programming, planning, production, final check, and expedition. The impact analysis will be conducted in a way that the impact on each process will be evaluated first. After that, the impact on different stakeholders will be considered.

The goal was to choose the tools that can evaluate all the areas of organization. So three methods were selected. First is The McKinsey 7S Framework that defines the main areas of every company, second is The Initial Impact Analysis Audit Tool that provides a detailed checklist based on two areas of interest, and third is the CATWOE method used to concentrate on the stakeholders that can be influenced by changes.

The first tool for impact analysis is The McKinsey 7S Framework. This tool can be used to reach different goals, for example, to analyse how future changes can affect a company or to define how to implement the strategy in the best way. This tool is also widely used to conduct Impact Analysis and aims to give an overview of all the areas that were impacted by changes. The model is presented in the Appendix.

Below the components of The McKinsey 7S Framework are presented:

Strategy	A plan or course of action undertaken in response to or in anticipation of changes in the external environment. It leads to the allocation of the organization's finite resources to reach specific goals.
Structure	How people and the work are formally organized. It relates to the nature of the formal hierarchy, reporting relationships, and other design factors that go into the formal structure (e.g., span of control, degree of centralization).
Systems	The formal and informal processes and procedures used to flow information and facilitate decision making and action.
Style	How the managers behave (their style, what they pay attention to, how they treat others) in the pursuit of organizational goals. At a more macro level, it means the nature and strength of the culture (norms, shared beliefs, and values) that develops over time and influences behavior.
Staff	How human resources are developed and categorized over time.
Shared Values	Longer-term vision and shared values that shape what organization members do and the destiny of the firm.
Skills	The dominant attributes and distinctive competencies that exist in key personnel and the organization as a whole.

Figure 3. Source: “Structure is Not Organization,” by R. Waterman, Jr. Business Horizons, 23(3), copyright © 1980.

The Initial Impact Analysis Audit Tool created by Linda Ackerman Anderson and Dean Anderson was chosen as a second tool to conduct Impact analysis. The advantage of this tool is that it lists most of the impact areas that are divided into two groups: business/organizational impacts and personal/cultural impacts. To use this tool it is needed to review all the items and mark those that can be impacted by the change. The direct impact is marked with "D" and indirect with "I". The tool is presented in the appendix.

The CATWOE model was ranked as the third Impact analysis tool. It was created by Peter Checkland as a part of his Soft Systems Methodology. CATWOE is a checklist for decision making. The purpose of this model is to define the impact on people involved to change process. The following areas can be analysed using this tool:

- C- Customers or clients are stakeholders that are affected by changes.
- A-Actors are the people who are involved in a process of change.
- T-Transformation process includes the activities that transform input into output
- W-World view is the organization's objectives
- O-Owner is a decision maker who takes the responsibility for a change process
- E- Environmental constraints that influence a company externally

5. Create change management procedures

According to Alexis Leon (2000), there are four change management activities:

1. Change initiation and classification.
2. Change analysis.
3. Change acceptance or rejection.
4. Change implementation and verification.

To complete the mentioned change management activities the change management procedures have to be made. Stephen Armstrong suggested that a valuable change management procedure should include mechanisms for requesting, tracking, evaluating, approving, and implementing changes.

After all the impacts of changes are defined the change procedures have to be completed. Furthermore, tracking system has to be used for defining the status of the change, its characteristics, and specifications. Every change procedure, which can be made in a format of spreadsheet or log, has to be approved by the director of Case company. There are two documents that have to be used for a change process: the change request form and the project change log. The decision concerning the format of mentioned documents was made on the base of "The Handbook of Project Management: A Practical Guide to Effective Policies, Techniques and Processes", Trevor L. Young. After that, implementation plan can be prepared.

The change request form.

This form includes impacts and risks of change and states its status. All the data that is needed for approval process has to be in this form. The example of the change request form is attached to the Appendix.

The project change log.

A change log is a record of change requests that were submitted for all changes in a company. It consists of the following information:

1. Change request number
2. Change description
3. Originator
4. Status of change:
 - O- open
 - R-rejected
 - C-completed
5. Impact assessment information
6. Approval of Change
7. Dates

The change log example is presented in the Appendix.

6. Perform Implementation Plan

Based on impact analysis and change management decisions the implementation plan can be made. Below the components of the implementation plan are listed:

1. Define project team members
2. Define implementation activities
3. Created action list
4. Make schedule and budgeting
5. Analyze milestones
6. Develop communication strategy with stakeholders of the project
7. Define resources needed for implementation
8. Ensure continuous improvement of the process
9. Conclusion and recommendations

Training is an essential part of the implementation plan, and it has already been planned by the management of Case company and business consultant.

The Implementation plan including all the mentioned elements has to be delivered in one file.

8. Scope

The project is focused on current QMS of the company, its manual and gaps between AS9100. That is why, this project requires communication and collaboration with all the departments of Case company in order to interview employees and gather relevant data concerning quality control. Project constraints include deadlines, access to company's information, supervisor's support and guidelines, and literature necessary for the research.

Research is carried out to improve the current QMS and prepare the company for AS9100 implementation. According to the planning the project will reach pre-audit stage and will not include process control and standard implementation activities.

The project started on 25-08-2014 and is completed on 24-12-2014.

Successful completion of the project requires support of people mentioned below.

Case company:

Name	Position	Contact information
	Director	
	Production leader	
	Quality engineer	
	Process engineer	

Windesheim University of applied Sciences:

Name	Position	Contact information
Ruud Wijlhuizen	First thesis supervisor	
Frank van Oostrum	Second thesis supervisor	

Company X:

Name	Position	Contact information
	Consultant	

9. Risk Analysis

Project deadlines

According to the planning the project has to be completed in the end of January. If deadlines during the execution of the project are not met, the final goal cannot be reached. The consequence can be a failure of the project. Progress meetings, reports and planning are used as preventive activities. Every step of the project is discussed and checked by the company supervisor or the QMS coach. If progress is not registered or it is not sufficient, the change of planning or corrective actions will be implemented.

Communication and cooperation

Insufficient communication with company employees and supervisors can cause lack of information and documentation. As a result, difficulties with completion of the assignment can occur. This risk can be eliminated by convenient planning the appointments and progress meetings with the company supervisor and others involved in the project.

Lack of data concerning the project

If unreliable or insufficient information concerning the project is provided, it can cause delays or unsatisfactory results. Awareness of employees and their support, everyday communication with people involved to the project, and planned progress meetings are the best solutions to prevent this sort of risk.

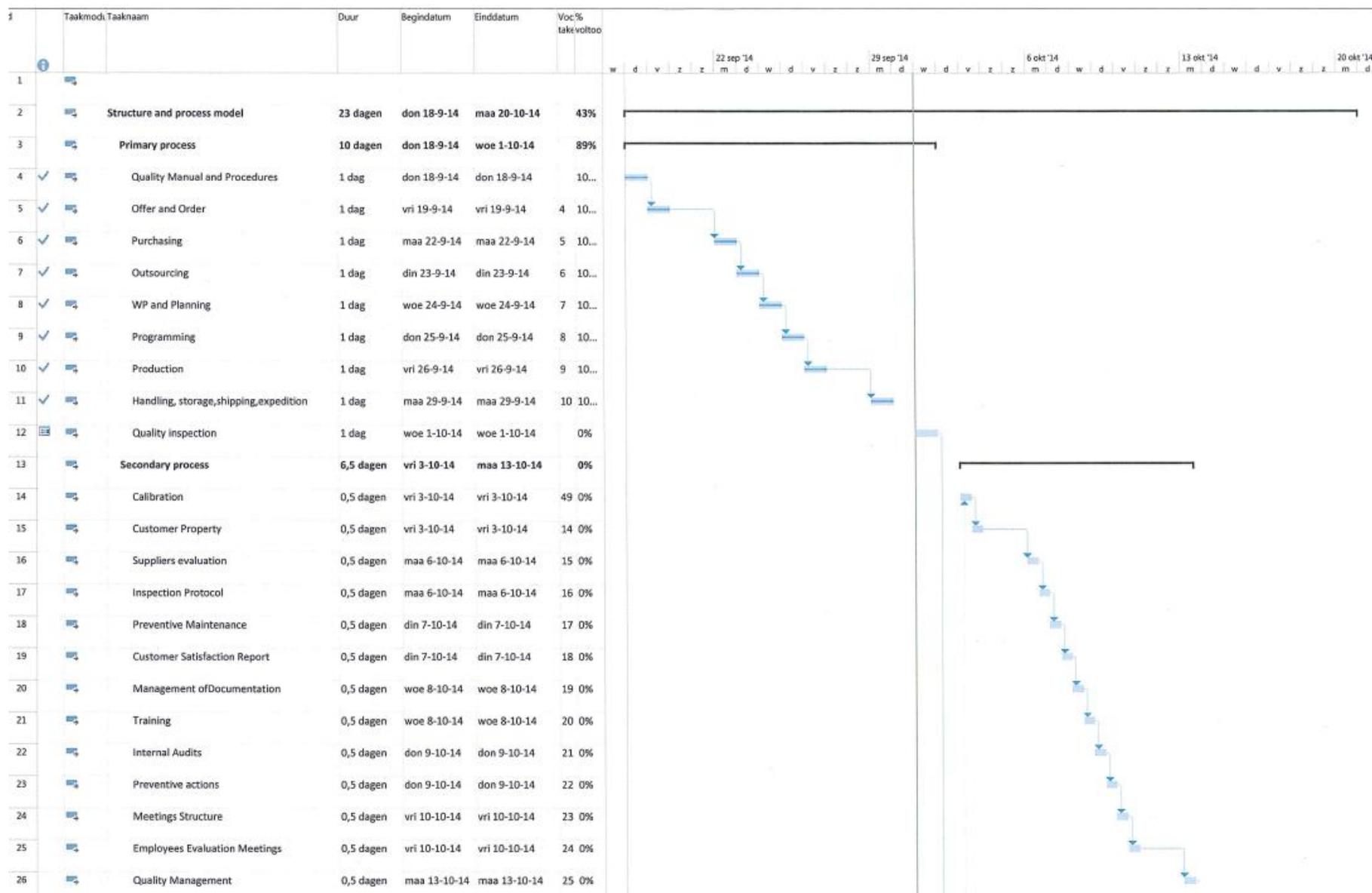
Language problems

Most of the documents and manuals are written in Dutch language, and the assignment output will be presented in English. In this project, translation of information is a preparation activity for every project step. Help and support from employees is required to avoid language limitations.

Time limit

Building up the procedures is a time-consuming task. All of them have to be checked and approved by the project supervisor and QMS coach. Furthermore, studying of production processes and translations requires additional time. So flexible and accurate planning is necessary to complete the tasks on time.

10. Planning



11. Research methods

1. Interview method

The first phase of the project is to study the process model of the company, so an interview method can be chosen. Employees are the best information resource to start the project and to get to know the structure and processes of the company. Also a questionnaire for employees can be created to gather the following data:

- Process model steps
- Responsibilities of employees
- Input and output of every department and employee
- Documents and specifications used by employees
- Software and programs used in the company
- Time limits of every department

In Case company appointments are usually made within the digital agenda (Microsoft Outlook) or direct calls to personnel. Employees, responsible for administration, finances, sales, work preparation, programming, planning, production, quality, expedition will be interviewed. But during the project it is important to collaborate with the following people on daily basis:

Name: general project information and guidelines.

Name: production information.

Name: QMS and AS900 coaching.

Name: information related to internal processes at Case company.

Name: information related to quality.

The received data will be documented and presented in reports, flowcharts and timetables

2. Literature review

The necessary part of the research is to study quality manual and documents used in the company. For example, quotations, measurement reports, checklists, etc. Furthermore, quality management books or cases will be used to support the research and gather additional information.

Literature concerning implementation of AS 9100 will be also used, but there is not a lot of it exists at the moment.

3. The Gantt Chart will be applied to make a scheduling for the project. Microsoft Excel will be used as software.

4. Project validation

The execution and performance of the project will be discussed every week with the company supervisor. The plan and timeline for every project step should be prepared and approved. If necessary, the adjustments can be made. The results of the research will be presented in digital form and provided to company supervisor and QMS coach every week. Required reports also will be provided to thesis supervisors.

5. Action research methods

- The McKinsey 7S Framework.
- The Initial Impact Analysis Audit Tool.
- The CATWOE Checklist.

The methods above are described together with project activities in the Chapter 7.

12. Personal goals

Speaking about my strengths, I believe that I am a well-organized, determined, and confident person. Furthermore, I possess strong analytical and planning skills that will be useful to complete the project. I am supposed to be a fast learner and can adapt to new environment and people quite easily. I think there are also very important skills that I need for studying and working abroad.

Before starting the project I determined goals that I want to reach in order to develop myself on personal and professional level. I believe that to achieve this result it is necessary to set up priorities in advance and make the planning according to them. What is more, in the end of a working day it is important to have at least one reached result, completed task or developed skill.

My primary goal is to gain as much experience as possible because I have not worked in many companies before. Moreover, I am an exchange student and internship in a foreign country can be a valuable asset to my CV and also a good opportunity for self-development. The other competences that I want to improve or develop are mentioned below.

The project requires from me the ability to evaluate the current situation, make research and forecasts; and be able to choose the best solutions. The decision making phases of the project are impact analysis, change management process and implementation plan. I believe all these tasks can help me to express myself as a decision maker, critical thinking and open-minded person.

What is more, I also want to develop communication competency that includes oral, writing, listening, presenting skills; and also the ability to express clearly all the ideas and results during the project. The meetings with the stakeholders involved are conducted every week, so it helps to reach communicative competency.

For me it is also important to work on my ability of managing stress that occurs because of big amount of work that I have to complete in a short period of time. Time management and assistance of coordinators can help me to cope with these difficulties.

Besides, I want to become more independent, be able to make improvements or changes during the working process, take decisions and reach the defined goals by myself. But to fulfill the project I am also required to work in a team with employees of Case company on a daily basis. So to be successful in it I intend to develop my teamwork competency and establish strong working relationships.

List of terms and abbreviations

AS9100-C- is the revision of the Aerospace Standard ("AS") containing the requirements for establishing a quality management system.

CATWOE-is an acronym for Customers, Actors, Transformation process, Worldview, Owners, Environmental constrains.

EDM- Electrical Discharge Machining

FAI- First Article Inspection

FMEA- Failure Mode and Effects Analysis

ISO- International Organization for Standardization

QMS- Quality Management System

RASCI is an acronym derived from the five key responsibilities most typically used: Responsible, Accountable, Supportive, Consulted, and Informed.

List of figures

Figure 1: The turnover by sector, Case company, Management Presentation, 2013.

Figure 2: The McKinsey 7S Framework

Figure 3: The Initial Impact Analysis Audit Checklist

Figure 4: The Project Change Request

Figure 5: Project Change Log

Appendix 1

The McKinsey 7S Framework.

Source: Business Horizons, Vol.23,R. Jr "Structure is not Organization", pp. 14-26

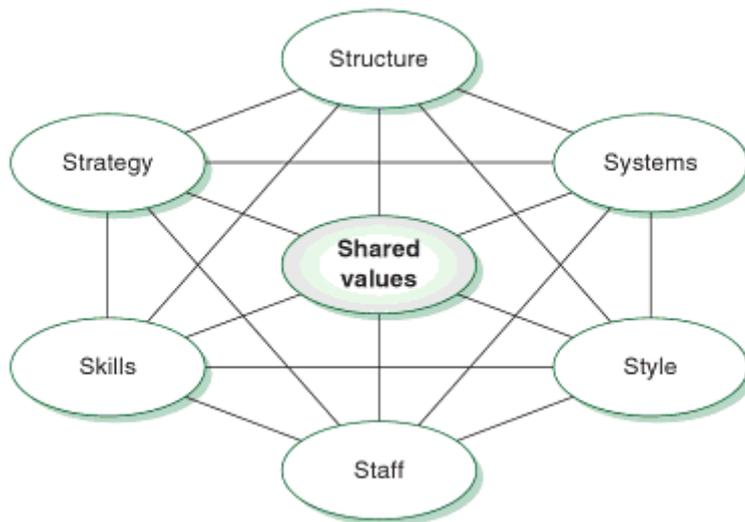


Figure 4.The McKinsey 7S Framework.

Appendix 2

The Initial Impact Analysis Audit Checklist.

Resource: Anderson, Linda S., and Dean Anderson. The change leader's roadmap: how to navigate your organization's transformation. 2nd ed. San Francisco, Calif.: Pfeiffer, 2010.

BUSINESS/ORGANIZATIONAL IMPACTS:

- Purpose/Vision/Mission
- Business Strategy
- Market Posture
- Organizational Structure
- Management Systems and Processes
- Technology/Equipment
- Tasks/Job Definition/Job Levels
- Products and Services
- People: Numbers/Skills/Systems
- Policies/Procedures
- Resources Needed/Resources Available
- Space Requirements/Layout/Moves
- Image (How we are perceived by others)
- Identity (Who we are; how we see ourselves) Customer Service
- Union Activity
- Response to Government Regulations
- Merger or Acquisition
- Splits/Divestitures
- Downsizing
- Growth/Expansion/Start Ups
- Management Succession
- Work Flow

___ Governance and Decision Making

___ Team Structures

___ Technical Skills

___ Current Skills Training

___ Communication Systems

PERSONAL/CULTURAL IMPACTS:

___ Resistance and Anxiety

___ Sadness at Letting Go of Old Ways

___ Motivation and Commitment

___ What People Are Recognized for

___ Inclusion/Exclusion Issues

___ Politics and Power Plays

___ Perceptions of Fairness

___ Values

___ Expectations

___ Employee Mindset, Attitude ___ Norms

___ Need for Learning and Course Correction

___ People Skills

___ Changes in Relationships

___ Leadership Style/Executive Behavior

___ Employee Behavior

___ Team Effectiveness

___ Leader Mindset, Attitude

___ Management Development/People

Appendix 3

The Project Change Request.

Recourse: Young, Trevor L.. The handbook of project management a practical guide to effective policies, techniques and processes. Rev. 2nd ed. London: Kogan Page, 2007. Print.

COMPLETE DATA REQUESTED

WHO IS ORIGINATING THE REQUEST? ORIGINATOR COMPLETES FORM AS FAR AS POSSIBLE

PROJECT CHANGE REQUEST Issue: 0

TITLE OF PROJECT: _____

PROJECT MANAGER: _____

PROJECT SPONSOR: _____

PROJECT CUSTOMER: _____ PROJECT NUMBER: _____

ORIGINATOR: _____ PROJECT KEY STAGE(S) AFFECTED: _____ CHANGE REQUEST No: _____ Date: _____

DESCRIPTION OF CHANGE REQUIRED/RECOMMENDED: _____

GIVE CONCISE DESCRIPTION OF CHANGE REQUIRED

INDICATE KEY STAGES AFFECTED

BENEFITS: _____

WHAT ARE THE BENEFITS TO BE GAINED FROM THE CHANGE?

EFFECT ON PROJECT SCHEDULE: _____ CONSEQUENCES OF DOING NOTHING: _____

LIST MAJOR IMPACT ON CURRENT SCHEDULE

IDENTIFY CONSEQUENCES IF REQUEST IS REFUSED

IMPACT ON PROJECT COST: _____ DOES THE CHANGE AFFECT THE BUDGET? _____

IMPACT ON PROJECT CONSTRAINTS: _____ DOES THE CHANGE AFFECT CURRENT CONSTRAINTS? _____

RESOURCE IMPLICATIONS: _____ ARE THERE ANY EFFECTS ON RESOURCE NEEDS? _____

ANY HIGH RISKS ASSOCIATED WITH THE CHANGE: _____ DOES THE PROPOSED CHANGE HAVE ANY NEW RISKS? HAVE THESE BEEN ANALYSED? _____

RISK MGMT FORMS ATTACHED: YES NO

INDICATE IF RISK MANAGEMENT FORMS ARE ATTACHED

DECISION RECORD:	APPROVALS	Name	Position	Signature	Date
REJECTED: <input type="checkbox"/>	Accepted by:				
ACCEPTED: <input type="checkbox"/>	Approved by:				
REJECTED: <input type="checkbox"/>	Approved by:				

INDICATE THE CR STATUS

CR CLOSE-OUT APPROVED WHEN IMPLEMENTATION OF CHANGE IS COMPLETE

ENSURE APPROVALS ARE COMPLETED BEFORE TAKING ANY ACTION TO CHANGE THE SCHEDULES

Figure 5. The Project Change Request.

Bibliography

Books

Anderson, Linda S., and Dean Anderson. The change leader's roadmap: how to navigate your organization's transformation. 2nd ed. San Francisco, Calif.: Pfeiffer, 2010. Print.

Armstrong, Stephen C.. Engineering and product development management: the holistic approach. Cambridge, UK: Cambridge University Press, 2001.

Bartlett, John. Project risk analysis and management guide. 2nd ed. High Wycombe: Association for Project Management, 2004. Print.

Born, Matthias. User guidance in business process modelling. Berlin: Logos-Verl., 2012. Print.

Gitlow, Howard S.. Quality management systems: a practical guide. Boca Raton, Fla.: St. Lucie Press, 2001. Print.

Holt, Jon. A pragmatic guide to business process modelling. 2nd ed. Swindon: British Informatics Society, 2009. Print.

Jameson, Elman C. Electrical discharge machining. Dearborn, MI: Society of Manufacturing Engineers, 2001. Print.

Leon, Alexis. A guide to software configuration management. Boston: Artech House, 2000. Print.

Myhrberg, Erik V., Dawn Holly Crabtree, and Rudolph Hacker. A practical field guide for AS9100C. 2nd ed. Milwaukee, Wis.: ASQ Quality Press, 2010. Print.

Raheja, Dev. Design for reliability. Hoboken, N.J.: Wiley, 2012. Print.

Resch, Marc. Strategic project management transformation delivering maximum ROI & sustainable business value. Ft. Lauderdale, Fla.: J. Ross Pub., 2011. Print.

Roth, Chris. Using Microsoft Visio 2010. Indianapolis, Ind.: Que Pub., 2011. Print.

Schlickman, Jay J.. Iso 9001 2000 Quality Management System Design.. Norwood: Artech House, 2006. Print.

Young, Trevor L. The handbook of project management a practical guide to effective policies, techniques and processes. Rev. 2nd ed. London: Kogan Page, 2007. Print.

Readers

Windesheim, TBL final project handbook, part B.

Websites

"AS9100C." QMS Global Group. N.p., n.d. Web. 3 Sept. 2014. <<http://www.qms.net/as9100>>.

"How to Become AS9100 Certified." FREE AS9100 Training and Presentations AS9100C Standard, AS9110B standard, AS9120A Standards, QMS & Certification. N.p., n.d. Web. 9 Sept. 2014. <<http://as9100store.com/>>.

"Project Planning a Step by Step Guide." Project Smart. N.p., n.d. Web. 11 Sept. 2014. <<http://www.projectsart.co.uk/project-planning-step-by-step.php>>

Appendix B: AS 9100 Checklist

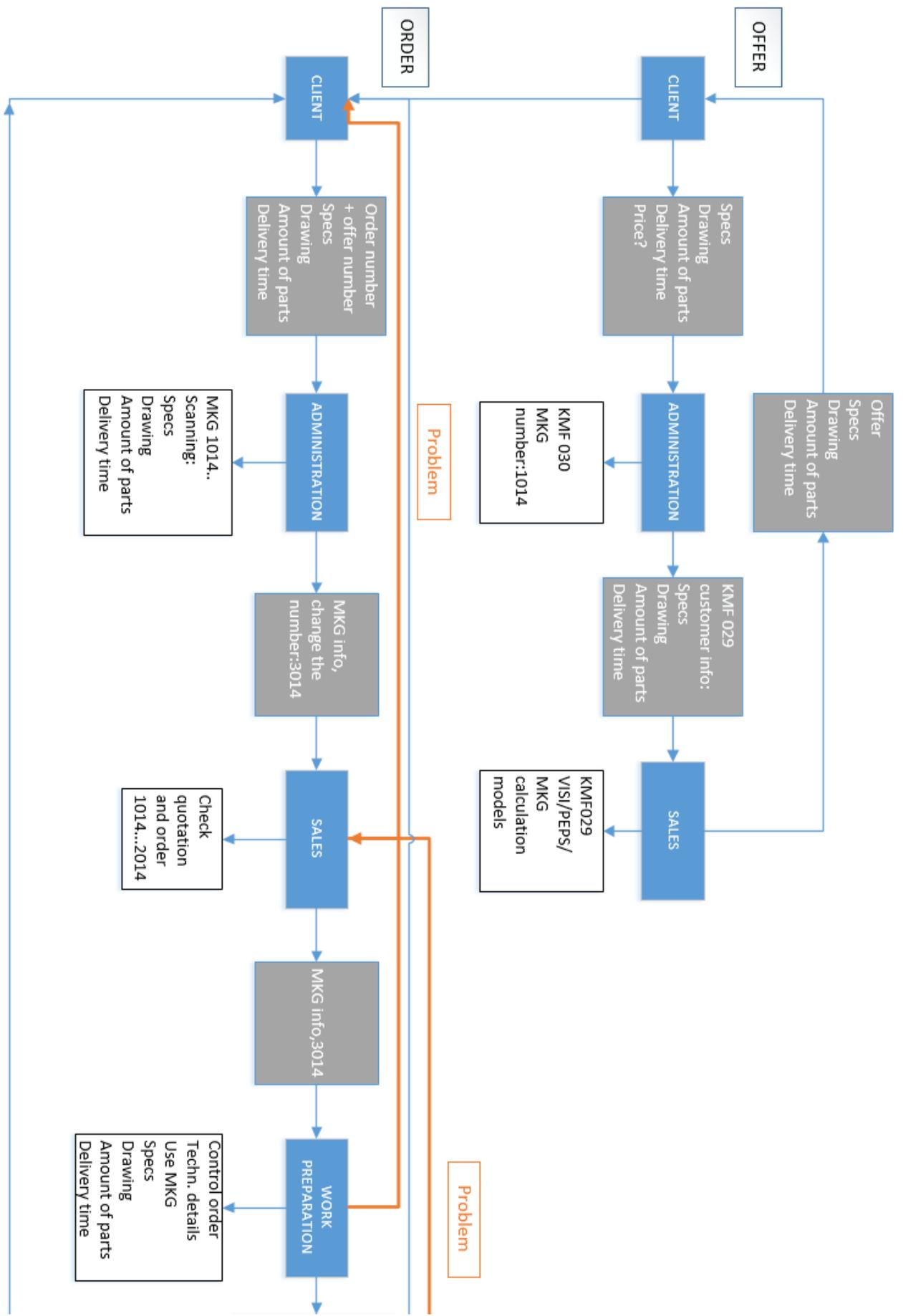
Conducted by: Business consultant, Company X.

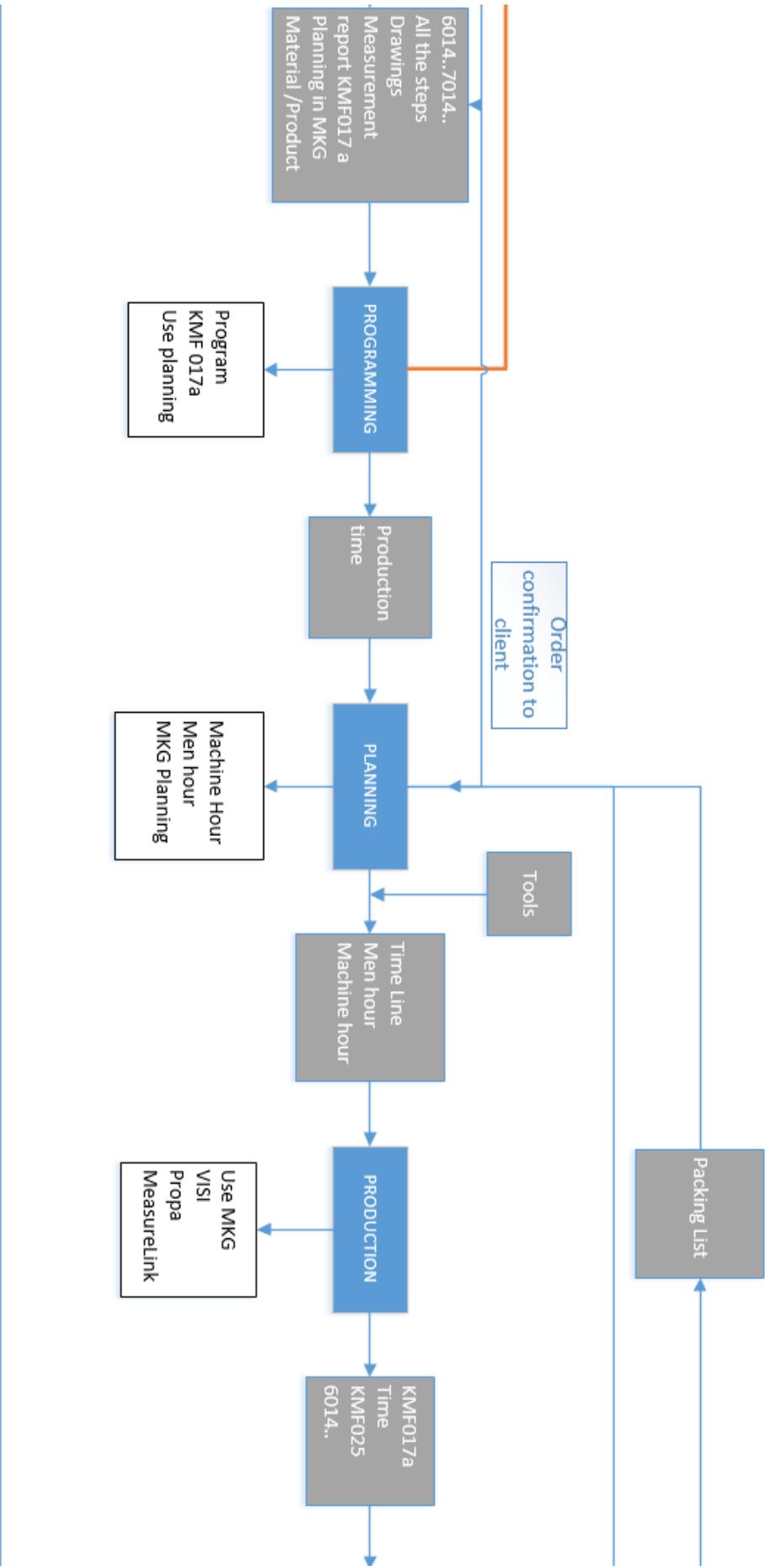
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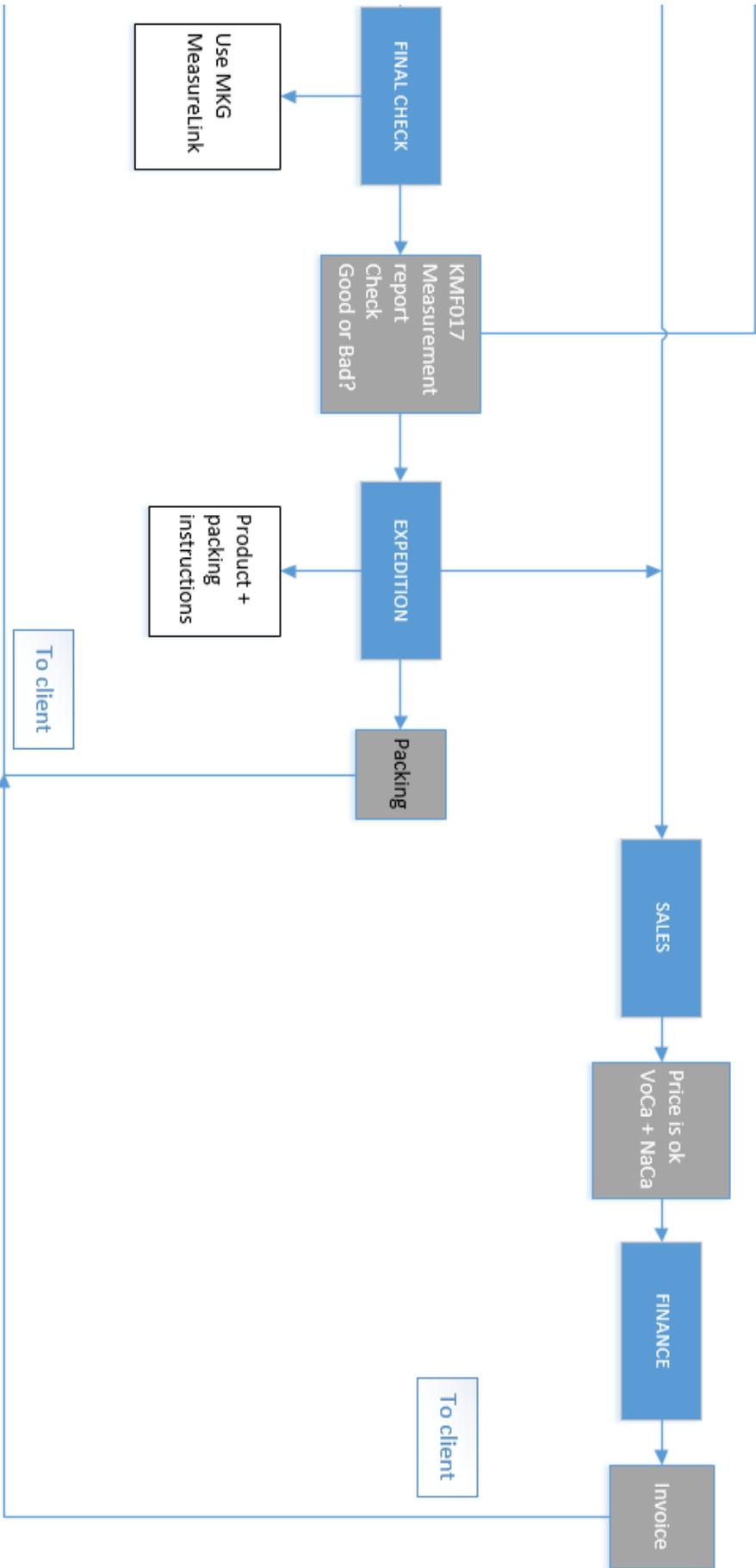
Appendix C: Information Stream Template

Department	Input	Output	Documents
Administration	- Customer order/specs	- Book order, MKG - Register the order - Print the order	- KMF029 Checklist Offerte - KMF030 Checklist Order - KMF026 Snipperaanvraag - KMF025 Urenformulier
Sales	- Customer order/specs - Drawing from the customer, information, specifications	- Calculation (calculation modules : MPP / EXCEL / VISI) - Drawing - Quotation	- KMF029 Checklist Offerte KMF019 Offerteformulier - KMF016 Openstaande offertes
Work Preparation	- Customer order/specs - Drawing from the customer, information, specifications - Calculations	- Job Card- Ordergeleidekaart - Purchased/outsourced products	- KMF 029 Checklist Offerte - KMF 019 Offerteformulier - KMF 038 norm uitvoering werk - KMF 011 Leverancierslijst
Programming	- Order info/specs - Drawing - Planning MKG (machine planned) - Measurement protocols - Ordergeleidekaart	- Figure(s) in PEPS/VISI - Start Hole Programme - Head Programme - Diskette if needed - Intern Measurement report	- KMF017 Meetrapport Internal - KMF038 norm uitvoering werk - Signed Ordergeleidekaart
Planning	- Order info/specs - Drawing - Measurement protocols	- Order confirmation with customer - Planning made in MKG: machines, delivery, employees	- KMF017 Meetrapport Internal - Ordergeleidekaart for expedition
Production	- Drawing - PEPS Drawing - Order info/specs - Internal Measurement report - Ordergeleidekaart	- Internal Measurement report - Drawing	- KMF017 Meetrapport - Ordergeleidekaart signed
Final Check	- Order info/specs - Internal Measurement report - External MR - Programme	- Internal Measurement report - External MR - Drawing - (8D Analysis in some cases)	- KMF 017a Intern Controle Rapport - KMF017b External Meetcontrole Rapport - KMF032/033- 8D Analysis - VAK 8 D registratie EXCEL - Ordergeleidekaart - (some cases KMF001Klacht)
Expedition	- Drawing	- Checked packages - info in MKG - Product sent	- Packing list - Proforma (if shipping is outside EU)

Appendix D: Process Model of Case company







Appendix E: Purchasing Procedure according to ISO 9001

		MANAGEMENT SYSTEM							
					Pag 1 –Pag 1				
					Rev. 16-12-14				
Procedure:		Monitoring of suppliers			Functions				
Process owner:		Production Leader							
Purpose:		The purpose of this procedure is to describe the process of purchasing and outsourcing at . And to perform the processes of releasing and monitoring of suppliers.							
INPUT	PROCESSTAP	OUTPUT	Referentie / opmerking	Production leader	Purchaser	Administration	Direction	Quality engineer	
				A	R	S	-	S	
				A	R	S	-	S	
				A	R	S	-	S	
				A	R	S	-	S	
				A	R	S	I	S	
				S	S	S	A	R	
				A	R	S	-	S	
				A	R	S	-	-	

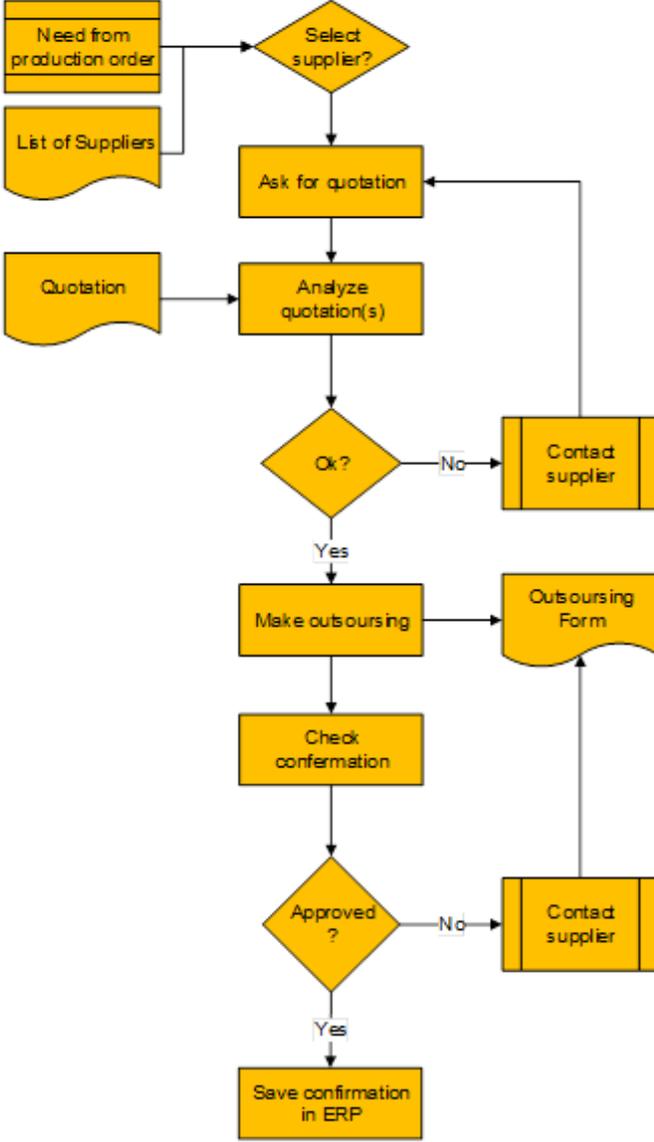
RASCI = Responsible, Accountable, Support, Consulted and Informed

Processowner: Production leader

Printed versions are only valid on the date of printing

Printing date:

Appendix F: Outsourcing Procedure according to ISO 9001

MANAGEMENT SYSTEM				Functions			
Procedure:		Outsourcing					
Process owner:		Production Leader					
Purpose:				Director	Production Leader	Purchaser	
This procedure aims to describe the outsourcing process.							
INPUT	PROCESSTAP	OUTPUT	Referentie / opmerking				
 <pre> graph TD I1[Need from production order] --> D1{Select supplier?} I2[List of Suppliers] --> D1 D1 --> P1[Ask for quotation] P1 --> P2[Analyze quotation(s)] I3[Quotation] --> P2 P2 --> D2{Ok?} D2 -- No --> O1[Contact supplier] O1 --> P1 D2 -- Yes --> P3[Make outsourcing] P3 --> O2[Outsourcing Form] P3 --> P4[Check confirmation] P4 --> D3{Approved?} D3 -- No --> O3[Contact supplier] O3 --> O2 D3 -- Yes --> P5[Save confirmation in ERP] </pre>	<p>Director is consulted if outsource is more than 15000 euro</p>						
RASCI			Processowner: Production leader				

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Appendix G: Purchasing Procedure according to AS 9100-C

Appendix H: Release of Suppliers Procedure according to AS 9100-C

Appendix I: Monitoring of Suppliers Procedure according to AS 9100-C

		MANAGEMENT SYSTEM						
				Pag 1 –Pag 1				
				Rev. 16-12-14				
				Functions				
Procedure:		Monitoring of suppliers						
Process owner:		Production Leader						
Purpose: The purpose of this procedure is to describe the process of purchasing and outsourcing at . And to perform the processes of releasing and monitoring of suppliers.				Production leader	Purchaser	Administration	Direction	Quality engineer
INPUT	PROCESSTAP	OUTPUT	Referentie / opmerking					
	B							
List of approved suppliers	Determine Periodical evaluation interval	Supplier evaluation planning		A	R	S	-	S
VAK registration form Costs, delivery reliability, etc Supplier evaluation planning	Periodical evaluation of suppliers	Audit Planning		A	R	S	-	S
	Supplier complies requirements?	List of approved suppliers		A	R	S	-	S
	Up-date supplier release period			A	R	S	-	S
	Archive			A	R	S	-	S
	END							
	Block supplier in ERP-system	List of approved suppliers Corrective actions		A	R	S	I	S
Corrective actions	Can supplier be released?	Delete supplier from list of approved suppliers		S	S	S	A	R
	Up-date supplier release period	List of approved suppliers		A	R	S	-	S
	Archive	Archive		A	R	S	-	-
	END							
RASCI = Responsible, Accountable, Support, Consulted and Informed			Processowner: Production leader					

Appendix J: Company Supervisor Evaluation

The information is confidential.

