Politecnico di Torino

Master of Science in Engineering and Management



Master of Science Thesis

Warehouse Management Analysis and Optimization

Case Study: MECAB di Alessandro Boeris

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Abstract

The actual situation of the MECAB di Alessandro Boeris company is far from the best possible situation. Nowadays, it has many criticalities and problems that can be solved with the application of simple tools and employees' commitment, they are mainly evidenced in the warehouse area and the cost analysis. The objective is to enhance the working environment and increase the productivity.

The used methods are quality tools and methodologies of simple application such as 5S, quality circles or One-Point Lesson. They are applied in critical areas to prove their power and the achievable results.

The results reached in the few months of this thesis are in accordance with the objectives concerning the working environment and productivity. However, it is just the start of the company enhancement regarding the countless possibilities.

As a conclusion, it is possible to see the power of the methodologies and tools, and it is strongly suggested their spread over the entire company. In spite of the long application time required the reachable results can truly improve the nowadays situation.

In addition, there are other areas with different problems to the object of this thesis that can bring huge results in terms of waste reductions that can be analysed in the future.



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Introduction

The company in analysis works in the machining sector producing different moulds and providing services. Its working environment and employees share the commitment to achieve better results day after day.

In this project several criticalities have been identified and some of them were solved in a broad way.

These criticalities are mainly the problems with the warehouse management and related to the cost analysis. The purpose of this thesis is to solve the main warehouse problems, such as the material differentiation and the working environment, among others.

In the objectives of this thesis are included:

-Enhancement of working environment.

-Reduction in material wastes.

-Decrease of working times and interruptions.

-Increase in the inventory control.

The methodologies applied are recognized in all the world because of their results and the achieved ones in this project are not the exception. These include the 5S system application in where it is mainly focused the order and cleanliness, the PDCA Cycle as the continuous improvement wheel, One-Point Lesson that has a strong but simple application, and the quality circles to increase the employees' participation and creativity to solve problems.

Through the application of these tools in the company's problems, several results are achieved to improve the nowadays situation of the company.

Moreover, several proposals are suggested as a future action plan to the company with the purpose of continue its improvement.

The thesis is structured in 7 chapters and its conclusion in where:

-The first chapter explains the company activity and its organization structure.



-The second one presents the market features of the company, such as the main customers and competitors.

-The third chapter explains the nowadays position of the company through the analysis of its main indicators.

-The fourth chapter describes the company's processes and the interrelationship among them.

-The fifth chapter evidences the criticalities of MECAB and classify them considering their criticality.

-The sixth one includes the methodologies and tools used to solve the criticalities and improve the company productivity and working environment.

-The seventh chapter shows the results of the methodologies and tools applied, and the possibility of continuous improvement in these criticalities.

-In the conclusion are evidenced the results and if the objectives were correctly achieved. Moreover, there are suggestions of future proposals to solve other criticalities.



Chapter 1: MECAB di Alessandro Boeris

1.1 MECAB's General Description

MECAB is a small company, which is performed in the machining sector, and it produces sheet metal dies, moulds for plastic injection, aluminium casting, among others. Also, it offers milling machining and turning machining services to third parties. It works five days each week, from Monday to Friday, with two work-shifts of eight hours per day.

The company was founded in January 1997, from an idea by Alessandro Boeris, as a small mechanical workshop specialised in turning and milling machining contract work on small and medium-sized batches. He started alone and over the years he hired different employees because of the rising needs.

Nowadays, the workforce is composed of 14 people, divided in two shifts of work, daily engaged in production and supported by an accounting officer. In addition, it employs the collaboration of mechanical designers for the study and realization of automatic machines.

Over the many years of experience, MECAB has increased its knowledge in machining to customer specification, design and manufacture of dies for sheet plate elements for industrial and automotive industry. Also, it has gained extensive experience in fields as diverse as, rolling stock construction, agricultural mechanization, oil goods, automation in general, parts handling systems and original equipment manufacturing. (MECAB di Alessandro Boeris, 2015)

As a result, of its commitment and constant rising, the business decided to obtain a certification for the Quality Management System a few years ago, this is the norm UNI EN ISO 9001:2015. The last renew was done in the late July of 2018.

Over the years MECAB was able to strengthen its position in the automotive market, becoming a partner of OEMs (original equipment manufacturers).



The business is mainly based on numerically controlled turning and milling machining of small and medium production runs, tooling, prototypes and dies.

Its in-house engineering office handles all tooling design and feasibility studies. Also, its youthful and dynamic team is committed to customer satisfaction, day in and day out. (MECAB di Alessandro Boeris, 2017)

The company is governed by the form of a one-person company (OPC), that in Italian would be "Ditta Individuale", therefore there are no partners and the entrepreneur, in this case Alessandro Boeris, is the sole responsible for the management of the business and it will run all the related risks. (Debitoor, 2013)

From an economic point of view, the company presents a growing welfare. The last year annual sales were around of $\leq 1,500,000$ and the net income was close to $\leq 250,000$.

The company well performance over the years, due to the high quantity of satisfied orders, good relationships with customers and suppliers, and of the quality in its products and services, built a recognized image in their market sector. Also, this allowed the company to survive different crisis, and gave it the opportunity to generate positive expectations for the future of the company's development. (MECAB di Alessandro Boeris, 2018)

1.1.1 Vision of the company

A vision statement describes what a company desires to achieve in the long-run. This time frame varies, and it could be of five to ten years, or even longer. It illustrates a vision of what the company will look like in the future and sets a defined course for the planning and execution of strategies. (CFI Education Inc., 2015)

Nowadays, MECAB does not have a vision statement, so this can be an aspect to add in a near future.



1.1.2 Mission of the company

A mission statement defines the kind of business of a company, and why it exists or what purpose it serves. It is suggested that every company have a specific statement of purpose that gets people excited about what the company does and motivates them to become part of the organization. (CFI Education Inc., 2015)

The mission statement is in the same case of the vision statement, the company does not have one at the present.

1.1.3 Core Values of the company

A value is a belief that guides your choices and actions; a principle that makes a difference of what is right and what is wrong.

In a business context, core values are the highest values that guide a firm's actions, bond its employees, and define its brand. (Recruiting Social, 2012)

These guiding principles are typically communicated in writing as a core values statement, in the case of MECAB, they are communicated through a board in the "Workshop A" near to the coffee machine and they are the following ones:

- "Collaborazione (Collaboration)"
 - o "The active participation by everyone in our daily work is necessary."
- "Impegno (Commitment)"
 - "It is the will to go beyond the obligations to make the collaboration effective and accountable to others, commitment and collaboration help each other in the necessary and continuous training."
- "Qualità (Quality)"
 - "Must live in everything we do, for our personal satisfaction and to measure concretely our abilities, as individuals and as team."



- "Fiducia (Trust/Reliance)"
 - "Having confidence means relying on us and always feeling the support of others."
- "Riservatezza (Confidentiality)"
 - "Beyond the statutory obligations we have the duty to respect the work of our colleagues. Divulging confidential news or expressing outside judgements about who works in MECAB is contrary to trust and collaboration".

They are situated there because it is a common place in where the breaks are taken, so everyone can see it whenever he/she wants. (MECAB di Alessandro Boeris, 2018)

1.2 Location and Facilities

MECAB is situated in Via Pralafera 36, Luserna San Giovanni. It is a strategic location, close to its main customers and suppliers, reducing logistic costs. However, there are some customers and suppliers that are not comfortable with the location. Also, close to the employees' residence, allowing the company to have a small percentage of absenteeism.

The company started in this position because of the space availability, and no because a strategic decision.

This machining company has a production by orders, its broad spectrum of different products and costumers makes this kind of production the best alternative to properly achieve all the requests made.

In consequence of this, the most suitable layout would be one arranged by processes and, in fact, MECAB's has this kind of layout with the different facilities mentioned below:

• Offices: These are the ones where the design of the pieces, the accounting, the quality management, the human resources management and the sale management is done.

There are 2 offices:



- ✓ A) Design and Quality Office: Here are kept all the previous designs and the information related to the norms, the quality manual and the suppliers (See Figure 1). (COLOUR REFERENCE IN ILLUSTRATIVE LAYOUT)
- ✓ B) The Accounting and Human Resources Office: This office is divided into three sectors, the first one for the legal and accounting issues, the second one for human resources and the general management of the company, and the last one for the meetings of the company (See figure 2). (COLOUR REFERENCE IN ILLUSTRATIVE LAYOUT)



Figure 1: Design and Quality Office



Figure 2: Accounting & Human Resources Office



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 Workshops: They are the ones in which the production activities are developed

There are 3 workshops:

✓ Workshop A: It is the one for the manufacturing with CNC milling machines, and inside this one, it is the metrology room. Also, in this workshop there is the warehouse for the resin and some pipes. (See Figure 3 and Figure 4). (COLOUR REFERENCE IN ILLUSTRATIVE LAYOUT)



Figure 3: Workshop A (a)







✓ Workshop B: This one is equipped with the electric saws and electrode erosion machines for the first and intermediate machining of the raw material, and the hardening chamber for the heat treatments of intermediate and final components, inside this workshop, it is possible to find intermediate processed material. (See Figure 5). (COLOUR REFERENCE IN ILLUSTRATIVE LAYOUT)



Figure 5: Workshop B

✓ Workshop C: And the last one is used for the final assembling of the components, this is entirely separated from the other facilities, excepted for the canteen (See Figure 6 and Figure 7). (COLOUR REFERENCE IN ILLUSTRATIVE LAYOUT)





Figure 6: Workshop C (a)



Figure 7: Workshop C (b)



- Warehouse: There is not a specific building for this, but most of the warehouse of the enterprise is situated between the first two workshops described above. The greater part of the raw material is kept outside of the buildings but inside of the company's propriety. However, there is also material kept inside the workshops. (COLOUR REFERENCE IN ILLUSTRATIVE LAYOUT) There are different warehouses depending on the different materials or orders. They are:
 - Warehouse A: Final Products, also some intermediate products, this space is not well exploited, and it is not clearly defined (See Figure 8).



Figure 8: Warehouse A

 Warehouse B: Material for Conto Lavoro Orders, these are a kind of order in which the customer supplies the material and the company provides the design and machining service (See Figure 9)





Figure 9: Warehouse B and Health and Safety Room

• Warehouse C: It is where the stainless steel is kept (See Figure 10).



Figure 10: Warehouse C

 Warehouse D: Different Metals are kept in this space, with different shapes and sizes (See Figure 11).





Figure 11: Warehouse D

 Warehouse E: In this space the resin raw materials are kept, and eventually, there are some pipes. This warehouse is inside the workshop A (See Figure 12).



Figure 12: Warehouse E

Warehouse F: Unused Material is kept near to the entrance of the company, also the different chips are stored in containers (See Figure 13).





Figure 13: Warehouse F

 Warehouse G: Steel with different iron and carbon composition, and other tools are kept in this space inside the workshop B (See Figure 14).



Figure 14: Warehouse G



 Canteen: It is the place where the employees have lunch or dinner depending on the work-shift (See Figure 15). (COLOUR REFERENCE IN ILLUSTRATIVE LAYOUT)



Figure 15: Canteen

 Health and Safety Room: In this room, there is the industrial compressor of the company, all the health and safety equipment, and, finally, there is some of the warehouse material such as the cellophane to cover the final products (See Figure 9). (COLOUR REFERENCE IN ILLUSTRATIVE LAYOUT)

An illustrative company layout is shown in the Appendix A.

The company over the years achieve an interesting number of machines, they are the following:

- Automatic sawing machine
- Manual sawing machine
- Semi-Automatic saw
- Electrode erosion machine
- Wire erosion machine
- Compressor
- 2 Forklifts

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- 6 milling machines
- Grinding machine

- Welding machine
- Turning machine
- Hydraulic press

The machines used, and the products manufactured by them, are of high-quality. In order to continue manufacturing products like this, a maintenance cost for the correct function of all the machines is intended and it is around 1% of the net sales. (MECAB di Alessandro Boeris, 2018)

1.3 Structure of the organization

1.3.1 Organizational Chart

The traditional organizational chart (or hierarchy chart) is the way in which the organization's structure is graphically represented. The organizational chart main purpose is to demonstrate the relationships and hierarchy of the job positions within the organization. The things that are usually included in it are employee names and/or job positions, mainly in boxes or circles, with lines linking them to other employees and departments.

It is possible to obtain a quick understanding of the organization, its design and number of levels and where each employee fits in it by looking at the organizational chart. (Pingboard, Inc., 2018)

The different functions in the company are defined by the General Management and from it the different tasks and responsibilities are assigned. The Nominal Organizational Chart (Organigramma Nominale) represents the hierarchical structure of functions and shows the names of those responsible. The dependence gives authority of decision to those in a higher position over the ones below them.

Annually the General Management, at the management review period, verifies the need to insert, remove or replace the functions in the functional and nominal organizational chart.

The MECAB's organizational chart is shown in Appendix B. (MECAB di Alessandro Boeris, 2018)

1.3.2 Functional Description of the Working Positions

The tasks and competences of all the subjects present in the company are defined by the General Management. The responsibilities and tasks of each subject are the following ones:

- Direzione Generale (DG) (General Management): The person in charge of this position is the general manager and it is the sole responsible for the management of the business and it will run all the related risks; Participates in the periodic meetings; Approve documents.
- Responsabile Qualità (RQ) (Quality Manager): Management, verification and maintenance of the quality management system (QMS) are some of its responsibilities; Manages the internal and external QMS documents; Issues the quality manual; Issues and approves the documents of the QMS; Prepares the data necessary for the review of the management; Checks the progress of the objectives; Manages the objectives presented by the heads of the bodies; Issues the annual plan for internal audits and conducts them; Management of preventive and corrective actions, and verification of their implementation is done by this one; Issues, manages and transmits non-conformities; Manages and responds to customer complaints; In charge of the measurement of customer satisfaction, evaluation and qualification of suppliers; Coordinates staff training; Issues the annual training plan; Records the Minutes of meetings; Prepares the quality plans according to internal requests and customer requests.
- Responsabile Servizio di Prevenzione e Protezione (RSPP) (Head of prevention and protection service): Identification of risk factors, risk assessment and identification of measures for the safety and healthiness of working environments are some of its responsibilities; The preventive and protective

measures and the control system for such measures shall be processed by it; Elaborates the safety procedures for the various business activities, informs and coordinates the training programmes for the workers; Participates in consultations in the field of health and safety at work, as well as the periodic meetings; Provides information to workers.

- Rappresentante dei Lavoratori per la Sicurezza (RLS) (Security Workers Representative): Accesses the workplace where the working is carried out; It is consulted beforehand and promptly with regard to risk assessment, identification, programming, implementation, verification of prevention in the company; It is consulted on the designation of the person responsible and of the personnel for the preventive service, the fire prevention activity, the first aid, the evacuation of the workplace, among others; Shall be consulted on the organisation of the training; Receives the information and the company documentation relating to the risk assessment and the relative preventive measures, as well as those relating to dangerous substances and preparations, to the machines, to the organization and to the work environment, to the accidents and occupational diseases; Receives adequate training; Promotes the elaboration, identification and implementation of preventive measures to protect the health and physical integrity of workers; Participates in periodic meetings regarding Health and Safety; Makes proposals on the prevention activity; Warns the company responsible for the risks identified in the course of its activity; May appeal to the competent authorities if it considers that the measures taken to prevent and protect against risks are not capable of guaranteeing safety and health at work.
- Responsabile Risorse Umane (RRU) (Human Resources Manager): Guides and manages the overall provision of Human Resources services, policies, and programs for the company; Manages areas such as: compensation and benefits administration, employee relations, organization development, recruiting and staffing; Participates in executive, management, and company

staff meetings and attends other meetings; Maintains human resource staff by recruiting, selecting, orienting, and training employees.

- Responsabile Commerciale (COM) (Sales Manager): It is responsible for the: search and contact with customers, trade negotiations; verification of feasibility of technical requirements, offers' preparation; Reviews the offer and sends it to the customer, reviews if the customer order is consistent with the offer; sends order confirmations when prompted.
- Responsabile Acquisti (ACQ) (Purchase Manager): Selects and evaluates the suppliers (with the Quality Manager collaboration); Issues the orders; It is responsible of the contact management with suppliers/representatives and checking the correspondence of the material arrived with the order; Controls the arrived material; Prepares the offers;
- Responsabile di Produzione (RP) (Production Manager): It is the responsible of the: production management, supervision of production staff, management of the ordinary and extraordinary maintenance program; Manages the control phases in process, also, the external machining and contact with suppliers; Helps in the warehouse management.
- Amministrazione e Contabilità (AMM) (Administration and Accounting): It is in charge of billing customers and suppliers, the general ledger, management of customers' and suppliers' accounts and of banks; Manages the payments and receipts.

- Ufficio Tecnico (UT) (Technical Department): It has the technical knowledge of the customer's products; It is jointly responsible, with the Sales Manager, for the feasibility analysis; It oversees the drawing management on files.
- Controllo Qualità (CQ) (Quality Control): It controls the quality of the: products and materials at the reception; Uses the dimensional control machines; Records controls and resolution of products.
- Responsabile Officina (ROF) (Head of Workshop): Responsible for planning and scheduling of the machining; Manages the technical and workshop staff; Programmes and manages the machine load; Management of internal operating phases.
- Responsabile Magazzino (MAG) (Warehouse Manager): It is responsible for the warehouse management; Controls the inventor and the material at the reception.
- Operatore di Produzione (OPR) (Production Operator): It is in charge of the use of machining machines, CNC code generation and Fastening of raw material.

In addition, every worker has its own training plan, including the training card and the training course, related to the needs required from the company. Depending on whether the course was correctly taken or not, an indicator is calculated. Past years' analysis have shown positive results. (MECAB di Alessandro Boeris, 2018)

Chapter 2: Company's Market Features

2.1 Classification and location of the market sector to which it belongs

Enterprises are usually classified in different categories according to their size; for this purpose a different criteria could be used (e.g. number of persons employed, balance sheets, investments, among others), but the one most common in a statistical context is number of persons employed:

- Small and medium-sized enterprises abbreviated as SMEs are defined in the EU recommendation 2003/361. The main factors determining whether an enterprise is an SME are (See Table 1):
 - Staff headcount
 - Either turnover or balance sheet total

Company category	Staff headcount	Turnover	or	Balance sheet total
Medium-sized	< 250	≤€ 50 m	≤	⊊€ 43 m
Small	< 50	≤€10 m	1	≨€ 10 m
Micro	< 10	≤€2 m	1	⊊€2 m

Table 1: Companies' Classification

• Large enterprises: 250 or more persons employed.

The number of persons employed should not be confused with employees or full-time equivalents; 'persons employed' includes employees but also working proprietors, partners working regularly in the enterprise and unpaid family workers. (European Commission, 2018)

According to this classification MECAB fall in the small company category inside the SMEs, because of its staff headcount number.

Small and medium-sized enterprises (SMEs) represent 99% of all businesses in the European Union (EU). An SME gives access to finance and EU support programmes targeted specifically at these enterprises.

Businesses also obviously differ by what they do. Usually a business is distinguished by industry or sector. An industry is a group of businesses that are related in terms of their main activity, for example manufacturing furniture or selling provisions. Smaller industries can be grouped into larger industry sectors (for example, the manufacturing sector in general). A business is classified as belonging to a certain industry based on its main activity.

Economists often distinguish three broad sectors of the economy:

- The primary sector involves extracting and harvesting natural products from the earth.
- The secondary sector consists of processing, manufacturing and construction. In other words, the secondary sector takes the products from the primary sector and does something more with them.
- The tertiary sector provides services, such as retail services, entertainment or financial services.

In the MECAB's case, the company operates in the secondary sector. Despite the service provided could be placed between the secondary and tertiary sector, its main activity, that is the production predominantly of moulds for plastic injection and sheets metal dies, corresponds to the sector mentioned above. (The Open University, 2014)

The enterprise in study is not the leader in the sector to which it belongs, it has a small market share in comparison to the big companies.

2.2 Products and/or Services

The Alessandro Boeris' company has two main products and a service.

The products are metal sheet dies and moulds for plastic injection, each one can have a specific design but in general inside this two big groups. As mentioned at the beginning, the products made are, usually, for industrial and automotive industry, for instance, rolling stock construction, agricultural mechanization, oil goods, automation in general, parts handling systems and original equipment manufacturing.

The variety of the designs depend on the customer requirements and needs, and for this reason it is possible to have as many products as customer orders.

The service provided is the machining of pieces for third parties, either by milling or turning.

In the following images (Figure 16 and Figure 17) some of their final products are shown. (MECAB di Alessandro Boeris, 2015)

Figure 16: MECAB's Product

Figure 17: MECAB's Product

2.3 Main Suppliers

The first stage of the supply chain is composed by the different suppliers. They are the first and a very important link in the whole production line. MECAB's suppliers first selection is made by evaluating the following main criteria:

- Sample supply verification (or first supply)
- Value for money
- > Documentation required with the supply
- Respect of delivery times
- > Non-conformity detected

The good relationship with its suppliers and the high performance of them, in terms of the company's indicator, allows the company to continue producing quality products and increasing the variety of its goods.

In this case, the company chose to separate, in three branches, the different suppliers. These branches are the following:

- Product suppliers(A): Suppliers of standard products, consumables, marketed, among others, are part of this category;
- 2. Service suppliers(B): Consultancy, technical assistance, heat and surface treatments, etc. are part of this category, and;
- 3. Suppliers of machining(C): The outsourced suppliers for the realization of mechanical machining are part of this kind of suppliers.

MECAB has a huge variety of suppliers, which can be categorized as a "very reliable", "reliable" or "non-reliable" supplier depending on their performance. Nowadays, all the company's suppliers are in the "very reliable" category and they have a very good performance in terms of conformity in deliveries and on delivery in time.

In the following table (Table 2) are shown the main actual suppliers indicating at the first column the legal name of the supplier, in the second column the product or service supplied from each of them, and, finally, in the last one the category to which they belong (MECAB di Alessandro Boeris, 2018):

NAME	Product/Service Supplied	CATTEGORY	
SIDACCIAI	CONSUMABLES	А	
CV S.A.S.	DOORS	A	
REMA CONTROL SRL	MACHINE TOOLS	A	
CUNEO INOX	RAW MATERIAL	A	
INGERSOLL	RAW MATERIAL	А	
METALPLAST S.R.L.	RAW MATERIAL	А	
MODELRESINE SPA	RAW MATERIAL	А	
OCAT ALLUMINIO	RAW MATERIAL	A	
CA-BE	STANDARDIZED FOR MOULDS	A	
CF TORINO SRL	STANDARDIZED FOR MOULDS	A	
STRACK NORMALIEN	STANDARDIZED FOR MOULDS	A	
ARCISA SRL	TOOLS	A	
FAITO S.R.L.	TOOLS	А	
GIORGIO RONCO MITSUBISHI	TOOLS	A	
LA TORNUOVA DI BARRAL ELVIO	TOOLS	A	
SCATTO	TOOLS	А	
SECO TOOLS S.P.A.	TOOLS	A	
TECNO E.D.M. S.r.I.	TOOLS	А	
TECNOLOGICA	TOOLS	А	
VAR FRATELLI BRUNO	TOOLS	А	
SERVIZI ECOLOGICI	CONSULTANCY	В	
P.E.I.	MACHINE TOOLS REPAIR	В	
PROSYSTEM ENGINEERING	MACHINE TOOLS REPAIR	В	
LESAL SRL	WELDING	В	
OFFICINE RIGAUDO SERGIO	CUT COMPONENTS	С	

Table 2: List of MECAB's Suppliers

2.4 Main Competitors

A competitor is any person or entity which is a rival against another one. In business, it is a company in the same or in a similar industry which offers a similar product or service. Their existence usually reduces the prices of goods and services as the companies aim to gain a larger market share. Competition also makes companies to become more efficient in order to reduce costs. (WebFinance Inc., 2018)

In the MECAB's case there are four main competitors and they are:

- 1. *Giolitto Stampi*: This is a competitor mainly in plastic moulds production, it is situated in Vigone and it offers: Plastic injection moulds, low pressure injection moulds and thermoforming moulds. (La Giolitto Stampi s.c., 2018)
- CO. VI.: It was founded on 1981 as a manufacturing company of sheet metal moulds and it is situated in Settimo Torinese. It works in different fields, such as, the motor-cars, aeronatics-naval, food, domestic, mechanical, plants. (CO. VI. sas, 2016)
- 3. *Moresco SNC*: It is a competitor in the sheet metal mould field, it is situated in Barge, it works by orders and the products offered are the ones requested by the customers. (Moresco snc, 2018)
- Officine Negri: It was created on 1960, and it is also a competitor in the sheet metal mould field. It is situated in Garzigliana and it also works by orders. (Officine Negri S.R.L., 2018)

The geographical distribution of MECAB and its competitors is shown in the Figure 18.

Figure 18: Competitors Location

2.5 Customers

The value of a company, generally, is best measured in terms of the current and future value of cash flows from clients and this makes customers the most valued asset, they are the revenue of the company.

There are other existing assets, such as products and facilities, but customers represent the revenue of a company and without revenue it is impossible to achieve an income, that is the principal purpose of a business. So, saying this, the customer management is one of the most important challenges for a company giving the possibility to obtain a significant competitive advantage. (Lax, 2017)

Each company should adapt its products and services to the customer requirements and needs, this is also, of course, the case of MECAB that constantly tries to do such thing. The customer indicator shows a high percentage of satisfaction with their orders, around the 99.5%. Most of MECAB's customers are Italians, but also has foreign customers, in France for instance.

Even though MECAB's customers changed over the time, there are other customers that have remained reliable since its origins, such as, SICAV, FILTERS S.R.L., EUROFORK S.R.L and TEMI S.R.L. Briefly describing them, SICAV is a company that produces components to the Volkswagen group, FILTERS S.R.L. is a supplier of the oil industry, EUROFORK S.R.L. supplies the industry of warehouse management, and finally, TEMI S.R.L. is also a supplier of the Volkswagen group, but also of McLaren.

The last two years customers that represent more than the 80% of the net sales are the shown in the table below (Table 3), where the first and third column show the customer name and the second and fourth column the percentages of the net sales (MECAB di Alessandro Boeris, 2018):

	FATTURATO		FATTURATO
OLIENTE	%		%
SICAV	26.37%	PMT	2.28%
FILTERS S.R.L.	19.87%	SUPERTINO	2.12%
EUROFORK S.R.L. ù	17.12%	GILETTA	1.53%
TEMI S.R.L. vw mc laren	8.63%	PEZZOLATO	1.37%
LYDALL	6.98%	LICAT	1.01%



Table 3: Main MECAB's Customers

It is worth to say, that there are some customer's orders which are managed under the type of "conto lavoro". In this kind of order, the customer provide the material to MECAB and the latter design the product and takes care of the final machining. The customers that adopt this type of order are mainly FILTERS S.R.L. and EUROFORK S.R.L. (Mediavilla, Interview with Quality Manager, 2018)

2.6 SWOT Analysis

SWOT is a commonly used tool to evaluate the internal and external environments of a company and is part of a company's strategic planning process. In addition, a SWOT analysis can be done for a product, place, industry, or person. It introduces opportunities to the company as a forward-looking bridge to generating strategic alternatives.

A SWOT analysis is divided into two main categories: internal factors (Strengths and Weaknesses) and external factors (Opportunities and Threats). (CFI Education Inc., 2015)

Internal factors:

Strengths: Characteristics of a business which give it advantages over its competitors.

Weaknesses: Characteristics of a business which make it disadvantageous relative to competitors.

External factors:

Opportunities: Elements in a company's external environment that allow it to formulate and implement strategies to increase profitability.

Threats: Elements in the external environment that could endanger the integrity and profitability of the business.

Strengths:

MECAB has different strengths that could be some advantages against other companies, such as, customer satisfaction and loyalty, reliance in their work, capacity



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Dipartamento di Ingegneria Gestionale e della Produzione of the company to produce bigger batches than the present ones, available space so as to organise the production, flexible staff to confront the absenteeism, flexible machines for the different customer needs, high tech machines, communication channels between the highest level of the company organisation with the lowest one.

The consumer perceives a delivery on time and quality, a good image of the company. Some of them perceives as a positive aspect the location, also, it is one of the few producers of moulds with an extensive experience in the market.

Weaknesses:

The company lacks a complete cost system, so this can be a problem of feasibility, the warehouse is not properly controlled and managed, the operational efficiency is extremely low in some critical processes.

The staff competences can also be considered a weakness because of the rising demand of this kind of staff, in addition, there is key staff that is crucial for the well function of the company. Despite of considering the location as a strength with some customers, this last one can also be considered a weakness with different customers.

Opportunities:

The business is in a good position against the appearance of new markets, new products and new customers, because of its high flexibility.

In the case of innovation in products, it has an easy adaptation, also, the case of change in customer needs and, finally, the one of machining different materials.

Threats:

As any company, MECAB has threats, for instance, the appearance of new competitors, rising needs of technological knowledge, incapability of satisfy a huge demand of different products.

In the case of competitors, the main problem are the prices, this business offers products of high-quality at a higher price, this is a problem with some customers.

All these threats put at risk the profitability of the company, so it is important to keep special attention to these ones. (Mediavilla, Interview with Quality Manager, 2018)



2.7 Competitive Advantages

The competitive advantages are the ones that situate a company in a better position against another company.

In MECAB's case, the main competitive advantages which differentiate from the competitors are two. The first one is its flexibility, this is the possibility to change the production plan in such a way that it can add a different order with higher urgency, this is the reason why some customers choose MECAB. The second one is its quality, the company offers high-quality products that permits differ from the competitor products and, also, supply to well recognized companies. (Mediavilla, Interview with Quality Manager, 2018)

2.8 Future of the Company

Nowadays, the company is situated in a good position, but it is important to say that in the future it has positive expectative to increase its efficiency and profitability, also improve its quality as it has the philosophy of continuous improvement.

In the case of future projects, the company is trying to get new customers with its new technology, it aims at the complexity of dies and equipment. In addition, the company may try to get into new markets such as the serial production of different components. (Boeris, 2018)



Chapter 3: Actual Performance

3.1 Explanation of the company situation in a general way

Over the years MECAB acquired, due to its high performance, an important image in their market sector. In general terms, the company presents a constant a growing welfare in the last years.

The workforce is made up of skilled and trained employees that gives to the company certain flexibility in case of absence, but the presence of key staff is also necessary in the daily performance.

The owned technology is the necessary to satisfy the customers' needs, it has not been extremely developed so most of their equipment has between 5 and 10 years. However, MECAB has recently purchased a last technology milling machine to confront the arising customers' needs.

3.2 MECAB's Indicators

Indicators are essential tools for observing the evolution of the process and its context. Also, they are supposed to be a representation model of a generic system/process. Consequently, they are the basis for evaluations, judgments or decisions.

An indicator, similarly to a measurement, can be considered as a "map" from an empirical system (the "real world") into a symbolic system (usually, a numerical system). (Franceschini, F., Galetto, M., Maisano, D., 2019)

The company use different indicators to know its actual state in the different areas. The ones presented in this chapter are in the quality manual, and therefore, they are related to the quality certification. (MECAB di Alessandro Boeris, 2018)



3.2.1 Net Sales and Net Income

Net sales are the sum of a company's gross sales minus its returns, allowances, and discounts (Investopedia, LLC., 2018). In the company's case (See Table 4 and Figure 19) they shown, in general, a growing tendency (MECAB di Alessandro Boeris, 2018):

FATTURATO	2013	2014	2015	2016	2017
TOTALE	€ 972,500.00	€ 1,160,927.48	€ 1,506,789.53	€ 1,341,849.30	€ 1,448,904.00
%		19.38%	22.95%	-12.29%	7.39%
OBIETTIVO		≥ 10.00%	<mark>≥ 10.00%</mark>	≥ 0.00%	≥ 5.00%
DIFFERENZA DA OBIETTIVO		9.38%	12.95%	-12.29%	2.39%



Table 4: MECAB's Net Sales

Net income is the excess of revenues over expenses. This measurement is one of the key indicators of company profitability, along with gross margin and before-tax income (Investopedia, LLC., 2018). The company presents the following (See Table 5 and Figure 20), and they are accorded to the direction's expectations (MECAB di Alessandro Boeris, 2018):



Figure 19: Net Sales Progression

	2013	2014	2015	2016	2017
UTILE	€ 191,000.00	€ 34,767.27	€ 187,868.00	€ 79,685.00	€ 269,233.00
%	19.64%	2.99%	12.47%	5.94%	18.58%
OBIETTIVO	≥ 10.00%	≥ 3.00%	≥ 5.00%	≥ 5.00%	≥ 5.00%
DIFFERENZA DA OBIETTIVO	9.64%	-0.01%	7.47%	0.94%	13.58%

Table 5: MECAB's Net Income



Figure 20: Net Income Progression

3.2.2 Customer Satisfaction

It is an indicator that involves the analysis of deliveries in conformity and non-in conformity, and deliveries on time and late deliveries.

In the next table (Table 6) the weight of each parameter is shown; these ones are necessary to calculate the average value of the customer satisfaction using the "ISC" formula (MECAB di Alessandro Boeris, 2018):

REF	PARAMETER	WEIGHT
Α	NUMBER OF DELIVERIES IN CONFORMITY	100
В	NUMBER OF DELIVERIES NOT IN CONFORMITY	0
С	NUMBER OF PUNCTUAL DELIVERIES	100
D	NUMBER OF DELIVERIES DELAYED	50
E	NUMBER OF TOTAL DELIVERIES	/

Table 6: Parameters' Weights



The result obtain from the previous formula will be a number between 0 and 100 and depending on that result the satisfaction of the customer is calculated according to the Table 7.

VALUTAZIONE	VALORE "ISC"
MOLTO SODDISFATTO	≥ 95
PIUTTOSTO SODDISFATTO	≥ 90
APPENA SODDISFATTO	≥ 85
PIUTTOSTO INSODDISFATTO	≥ 80
MOLTO INSODDISFATTO	< 80

Table 7: Customer Satisfaction

The list of the main customers' satisfaction is shown in the next table (Table 8), and all of them show the highest possible value that is "MOLTO SODDISFATTO" (MECAB di Alessandro Boeris, 2018).



CLIENTE	FATTURATO	N° ORDINI	Nº RITARDI DI	Nº RESI /	INDICE SODDISFAZIONE CLIENTI		
	%	EVASI	CONSEGNA	RECLAMI	ISC	VALUTAZIONE	AZIONI INTRAPRESE
SICAV	26.37%	73	1	0	99.66	MOLTO SODDISFATTO	NESSUNA
FILTERS	19.87%	206	6	0	99.27	MOLTO SODDISFATTO	NESSUNA
EUROFORK	17.12%	108	1	0	99.77	MOLTO SODDISFATTO	NESSUNA
темі	8.63%	19	0	0	100.00	MOLTO SODDISFATTO	NESSUNA
LYDALL	6.98%	13	0	0	100.00	MOLTO SODDISFATTO	NESSUNA
РМТ	2.28%	5	1	0	95.00	MOLTO SODDISFATTO	NESSUNA
SUPERTINO	2.12%	28	3	0	97.32	MOLTO SODDISFATTO	NESSUNA
GILETTA	1.53%	22	1	0	98.86	MOLTO SODDISFATTO	NESSUNA
PEZZOLATO	1.37%	31	3	0	97.58	MOLTO SODDISFATTO	NESSUNA
LICAT	1.01%	29	5	0	95.69	MOLTO SODDISFATTO	NESSUNA

Table	8:	Customers'	ISC
i abio	Ο.	00010111010	100

An average is calculated from the sum of the ISC, this indicator does not consider the weight of the different customers, such as number of orders requested or percentage of the net sales, however, is used to have some notion of the actual situation. The Table 9 and the Figure 21 show the results.

SODDISFAZIONE CLIENTI	2016	2017
∑ ISC	969.00	499.00
N° CLIENTI ANALIZZATI	10	5
ISC MEDIO	96.90	99.80
OBIETTIVO	≥ 80.00	≥ 80.00
DIFFERENZA DA OBIETTIVO	16.90	19.80

Table 9: Average ISC





Figure 21: ISC's Bar Chart

The results shown are positives in relation to the objectives of the company, the latter is constantly trying to keep these values (MECAB di Alessandro Boeris, 2018).

3.2.3 Suppliers

It is similar indicator to that of customer satisfaction, and, also involves the analysis of deliveries in conformity and non-in conformity, and deliveries on time and late deliveries, the only difference is the weight given to each parameter.

In the next table (Table 10) the weight of each parameter is shown; it is the same case as the previous one, and these weights are necessary to calculate the average value of the supplier general judgement using the "IQF" formula (MECAB di Alessandro Boeris, 2018):

REF	PARAMETER	WEIGHT
Α	NUMBER OF DELIVERIES IN CONFORMITY	100
В	NUMBER OF DELIVERIES NOT IN CONFORMITY	50
С	NUMBER OF PUNCTUAL DELIVERIES	100
D	NUMBER OF DELIVERIES DELAYED	70
E	NUMBER OF TOTAL DELIVERIES	

Table 10: Parameters' Weights



(A*100) + (B*50) + (C*100) + (D*70)

IQF= ____

E*2

The result obtain from the previous formula will be a number between 0 and 100 and depending on that result the supplier judgement is selected according to the Table 11.

VALORE "IQF"	GIUDIZIO	COLORE
IQF > 95	MOLTO AFFIDABILE	VERDE
90 ≤ IQF ≤ 95	AFFIDABILE	GIALLO
IQF < 90	NON AFFIDABILE	ROSSO

Table 11: Suppliers' Judgement

The following suppliers are the most important ones of the last year, and the results obtained are excellent, as it is possible to see in the next table (Table 12) (MECAB di Alessandro Boeris, 2018):

RAGIONE SOCIALE FORNITORE	REQUISITI	PER LA RIQUAI ANNUALE	IFICAZIONE	GIUDIZIO FINALE	
	N° DI ORDINI EMESSI	N° CONSEGNE NON CONFORMI	N° CONSEGNE IN RITARDO	IQF	GIUDIZIO
ARCISA SRL	283	0	7	99.63	MOLTO AFFIDABILE
CF TORINO SRL	171	0	3	99.74	MOLTO AFFIDABILE
CUNEO INOX	38	0	2	99.21	MOLTO AFFIDABILE
FAITO S.R.L.	19	0	0	100.00	MOLTO AFFIDABILE
INGERSOLL	20	0	0	100.00	MOLTO AFFIDABILE
OCAT ALLUMINIO	15	0	1	99.00	MOLTO AFFIDABILE
OFFICINE RIGAUDO SERGIO	15	0	0	100.00	MOLTO AFFIDABILE
SIDACCIAI	280	0	4	99.79	MOLTO
TECNOLOGICA	16	0	1	99.06	MOLTO



Table 12: Suppliers' ISC

An average is calculated from the sum of the IQF, as the previous case, this indicator does not consider the weight of the different suppliers, such as number of orders requested, however, is used to have some notion of the nowadays situation. The Table 13 and the Figure 22 show the results.

INDICE QUALITA' FORNITORI	2015	2016	2017	2018
TOTALE FORNITORI VALUTATI	37	33	85	24
SOMMA IQF	3694.86	3295.71	8480.66	2396.42
IQF MEDIO	99.86	99.87	99.77	99.85
OBIETTIVO	≥ 95.00	≥ 95.00	≥ 95.00	≥ 95.00
DIFFERENZA DA OBIETTIVO	4.86	4.87	4.77	4.85





Figure 22: ISC's Bar Charts

Although it is possible to increase the results, an initial effort in this section will be meaningless with respect to other possible critical areas (MECAB di Alessandro Boeris, 2018).

3.2.4 Offers transformed into Orders

The following indicator is one of the most important because it is directly related to the competitors, the customers and the efficiency. If the company increases the



POLITECNICO DI TORINO Dipartamento di Ingegneria Gestionale e della Produzione number of offers transformed into orders this can mean an increase in any of the previous aspects, such as, an increase in the customer satisfaction with respect to its offer. In addition, an increase, mean that MECAB's has a better proposal of its main competitors and this can result in an improvement of the company's position with respect to the last ones. It is worth to say that, if the company wants a more attractively offer it will have to improve its efficiency, in order to reduce costs and offer more competitive prices. The results of the last years are shown in the Table 14 and the Figure 23 (MECAB di Alessandro Boeris, 2018).

CONVERSIONE OFFERTE IN ORDINI (NUMERO)	2014	2015	2016	2017
NUMERO OFFERTE	70	84	90	138
NUMERO ORDINI	34	35	40	60
%	48.57%	41.67%	44.44%	43.48%
OBIETTIVO	<mark>≥ 40.00%</mark>	<mark>≥ 40.00%</mark>	≥ 40.00%	≥ 40 <mark>.00%</mark>
DIFFERENZA DA OBIETTIVO	8.57%	1.67%	4.44%	3.48%

Table 14: Percentage of offers converted into orders



Figure 23: Progression of offers transformed into orders



POLITECNICO DI TORINO Dipartamento di Ingegneria Gestionale e della Produzione This indicator is similar to the previous one, the only difference is that this one is directly related to the sales of the company, as it is possible to see in the next table (Table 15) and line chart (Figure 24):

CONVERSIONE OFFERTE IN ORDINI (VALORE)	2016	2017
VALORE OFFERTE	€ 569,964.00	€ 605,927.00
VALORE ORDINI	€ 263,575.00	€ 250,000.00
%	46.24%	41.26%
OBIETTIVO	<mark>≥ 40.00%</mark>	<mark>≥ 40.00%</mark>
DIFFERENZA DA OBIETTIVO	6.24%	1.26%

Table 15: Percentage of offers converted into orders in economic terms



Figure 24: Progression of offers converted into orders in economic terms

Both results, of the first and the second indicator, are consistent with the company's objectives, however, these two indicators are worth to improve because of the importance they have in the company's performance (MECAB di Alessandro Boeris, 2018).



3.2.5 Productivity

Productivity is normally defined as a relation of a volume amount of output to a volume measure of input use. There are several different productivity measures. The choice between them depends on the purpose of productivity measurement and, in numerous instances, on the availability of information. Generally, productivity measures can be classified as single factor productivity measures (involving a measure of output and a single measure of input) or multifactor productivity measures (relating a measure of output to a pack of inputs) (OECD, 2001).

In the MECAB's case, the productivity is classified as a single factor productivity, that only considers the ratio between the net sales and the worked hours, the results are shown in the Table 16 and the Figure 25 (MECAB di Alessandro Boeris, 2018).

RAPPORTO TRA FATTURATO E ORE LAVORATE	2014	2015	2016	2017
FATTURATO ANNUALE	€ 1,160,927.48	€ 1,506,789.53	€ 1,341,849.30	€ 1,448,904.00
ORE LAVORATE	19,119	26,344	34,943	26,950
€/h	€ 60.72	€ 57.20	€ 38.40	€ 53.76
OBIETTIVO	≥ € 40.00	≥€ 50.00	≥€ 50.00	≥ € 50.00
DIFFERENZA DA OBIETTIVO	€ 20.72	€ 7.20	-€ 11.60	€ 3.76

Table 16: MECAB's Productivity



Figure 25: Bar charts of MECAB's Productivity



The results tend to be in line with the objectives except for the ones of the year 2016. A single factor productivity does not involve other critical factors, for instance, the waste of material, so it is possible to improve this indicator considering new parameters if the data base allows that.

3.2.6 Risk

A matrix is used to calculate the different risks, this one is shown in the appendix C. The matrix considers the risks involved in each process, analysing the effects and causes of them. A value between 1 to 3 is used with the purpose of assessing the gravity and the likelihood, then if an improvement activity takes place the new values for gravity and likelihood are calculated. The matrix has no major risks to consider. (MECAB di Alessandro Boeris, 2018)

3.2.7 Training Course

A register of the courses done by the employees is necessary in order to calculate this indicator. There are only few courses provided so the percentages change hugely when one of these courses is not taken (See Table 17 and Figure 26).

RISPETTO DEI PIANI FORMATIVI	2014	2015	2016	2017
CORSI PREVISTI	3	2	3	1
CORSI EFFETTIVI	3	1	2	1
% CORSI CONCLUSI	100.00%	50.00%	66.67%	100.00%
OBIETTIVO	≥ 60.00%	≥ 60.00%	≥ 60.00%	≥ 60.00%
DIFFERENZA DA OBIETTIVO	40.00%	-10.00%	6.67%	40.00%

Table 17: Training Courses over the years





Figure 26: Bar Chart of Training Courses over the years

As few courses are planned, it will be worth to give an additional weight to each course such that the meaning of the result be more precise. (MECAB di Alessandro Boeris, 2018)

3.2.8 Maintenance

The maintenance indicator is of great importance to the company because of its offered products and services. A percentage of the net sales is selected as the maximum value of cost incurred in the maintaining tasks, it is important to keep this percentage as low as possible in such a way that the profitability be as high as possible, but without influencing the performance of the machines.

COSTO DELLE MANUTENZIONI	2014	2015	2016	2017	2018
COSTO MANUTENZIONE	€ 15,680.00	€ 13,971.00	€ 7,183.17	€ 7,500.00	€4,000.00
FATTURATO ANNUO	€ 1,160,927.48	€ 1,506,789.53	€ 1,341,849.30	€ 1,448,904.00	€ 674,333.00
% COSTO	1.35%	0.93%	0.54%	0.52%	0.59%
OBIETTIVO	< 2.00%	< 2.00%	< 2.00%	< 2.00%	< 2.00%
DIFFERENZA DA OBIETTIVO	0.65%	1.07%	1.46%	1.48%	1.41%

Table 18: Maintenance Costs





Figure 27: Bar Charts of the Maintenance Costs

The costs incurred in the past years are consistent with the objectives set by the company. (MECAB di Alessandro Boeris, 2018)

3.3 The Quality Management System: Results of the last audit in detail

The norm certificated by MECAB is the ISO 9001:2018 which had a surveillance on 2017, and on July of 2018 was renewed.

The renew was done in all the facilities of the company and analysing different samples. The different objectives sought were correctly achieved, the observations and comments of the surveillance of 2017 were done in accordance to the proposals.

Furthermore, in the results of the last renew there were no observations nor nonconformities, but there was a comment. The comment is related with the maintenance of the equipment.

The next audit will be on week 25 of 2019, and the company is continuously trying to improve its quality management system. (MECAB di Alessandro Boeris, 2018)



Chapter 4: The business processes

4.1 Interrelationship between processes



Figure 28: Interrelationship between the processes



POLITECNICO DI TORINO Dipartamento di Ingegneria Gestionale e della Produzione A process is a series of actions which are carried out in order to achieve a particular result (Collins, 2018). MECAB's has several processes as any company, and they are interrelated between them. In the previous figure (Figure 28) is shown how the processes are related in a general perspective. (MECAB di Alessandro Boeris, 2018)

These are the main processes and it is possible to find other processes inside them, such as, warehouse management, cost analysis, maintenance, among others.

A flow chart with the production, from start to finish, of a general mould is shown below (Figure 29):



Figure 29: General Flow Chart

Even if the company offers different goods, the manufacturing activities for each product follow a similar logical path. (Mediavilla, Processes' Interview, 2018)



4.2 Description of the process

4.2.1 Sales and Customers Management

The purpose of the process is to guarantee the feasibility of the product/service and the fulfilment of the requirements specified by the customer through the verification and approval of orders and estimates.

This process applies to the commercial sector which, the sales manager together with the production manager, verifies the possibility of dealing with consistent contracts in the time and re-examines the customer's orders for the verification of contractual requirements. (MECAB di Alessandro Boeris, 2018)

a) Definition of product requirements

The planning for the realization of the product/service is carried out determining its requirements and the necessary resources to achieve them; and by determining, maintaining and preserving the documented information. (Mediavilla, Processes' Interview, 2018)

b) Communication with the customer

Customer requests come through different channels, for instance, telephone, e-mail, fax or in company meetings.

c) Management of the commercial process

The customers and potential customers send their requests to the sales manager. Then, the feasibility analysis is done, by the sales manager or the production manager, for the price definition and the technical feasibility of the lot production. A supplier may



eventually be contacted so as to verify the feasibility of the estimate that once drafted is approved by the sales manager before being sent to the customer. (MECAB di Alessandro Boeris, 2018)

d) Estimate

The estimate is proposed to the customer on his express request and are described on it: The number and date, date of delivery of the product, description, quantity, price, discount and supply conditions.

In the need, of the organization or the customer, to modify the estimate it is necessary that the sales manager and the customer report these changes in writing. These are issued, verified and approved by the sales manager. In the case of major changes, the estimate will be refilled. (Mediavilla, Processes' Interview, 2018)

e) Customer Orders

After accepting the estimate, the customer sends the written order to MECAB. The documentation is reviewed, verified and approved to ensure that any differences between the specifications in the order and those listed in the reference quote are resolved. (Mediavilla, Processes' Interview, 2018)

The conditions and constraints to be considered as the basis of the contract are: the agreed prices; terms of payment; and delivery. Upon customer's request, following the final approval, the sales manager sends the order confirmation with his signature as evidence of the contract's review. (Mediavilla, Processes' Interview, 2018)

f) Customer Complaints

The customer complaints are managed as non-conformities by the sales manager.



4.2.2 Design

Its purpose is to plan and develop the process related to the design of moulds and equipment for the supply in production. (MECAB di Alessandro Boeris, 2018)

a) Planning of design and development

For the design of moulds and equipment for the customer are defined and reported, by the person in charge of the technical department, timing and modalities of development and the phases of review, verification and validation of the project.

Then, it begins the drafting of the project respecting the specifications agreed with the customer. The project consists in drafting preliminary drawings of the mould to be realized. (Mediavilla, Processes' Interview, 2018)

b) Input of design and development

The input elements of the design are established, evaluated and registered in order to establish: Functional and performance requirements; information deriving from previous or similar projects; and other essential requirements for design and development. (Mediavilla, Processes' Interview, 2018)

c) Design and development controls

At this stage, the technical department responsible is met with the production manager for a first review of the phases, and to verify the changes made and/or to make, the evaluations and the decisions of the definitive drawings.

Then, they proceed to verify the results with the initial requirements to validate the project, verifying that the project meets the needs of those who will make and use it.



The final validation takes place with the sample mould test and the customer's approval. (MECAB di Alessandro Boeris, 2018)

d) Output of design and development

The elements coming out of the design have the following characteristics: Meet the input requirements for design and development; provide adequate information for procurement, production and supporting; contain the acceptance criteria for the products; and specify the essential characteristics for the correct use. (MECAB di Alessandro Boeris, 2018)

e) Modifications in design and development

The technical department responsible decides the changes to be made during the design, questioning if necessary, the customer.

The customer must be consulted whenever the modification changes the specifications. Changes that vary them are always authorized in writing by the customer by e-mail. (Mediavilla, Processes' Interview, 2018)

4.2.3 Supply

The organisation has prepared a procedure with the purpose of guaranteeing supplies that are appropriate to the requirements for production. The products and services purchased must therefore comply with the specifications given in the procedure. (Mediavilla, Processes' Interview, 2018)

Suppliers to whom the organisation is intended shall be assessed before being included in the list of qualified suppliers to ensure that they possess the essential requirements defined by MECAB.



The purchase data is indicated in the order documents and provide the information necessary to identify the ordered products.

The product purchased is verified based on the requirements agreed with the supplier. (MECAB di Alessandro Boeris, 2018)

a) Selection, evaluation and qualification of suppliers

The suppliers are selected according to the following main criteria: Sample supply verification (or first supply); Value for money.

Then, there are different kinds of suppliers and they are valuated with IQC criteria as was said in the previous chapter (Section 3.2.3).

The supplier assessed as "unreliable" may be sent a communication with the request for corrective actions to return "reliable" if the organisation decides to continue the supply relationship with this one. Also, a supplier may be excluded when the actions taken are not effective or if it is decided to not use that vendor anymore. (MECAB di Alessandro Boeris, 2018)

b) Orders to Suppliers

The purchase manager collects all the necessary information, then prepares the purchase order after selecting the most suitable supplier (prices, delivery times, availability). This order, which is issued by telephone, or by fax contains the following information: Code, quantity; Timing and delivery mode; and price.

The order is verified and signed by the purchase manager, and the paper orders are kept for one year in the archives. (MECAB di Alessandro Boeris, 2018)



c) Verifying the product purchased

The verifications contemplated, the modalities and the responsibilities have been defined according to the type of product supplied:

- I. Document correspondence control (quantity, product, code).
- II. Visual controls on the status of the product and the packaging.
- III. Control of any required attached documents.

The material arriving in the company is deposited in the area of acceptance by the warehouse manager or the quality control responsible in order to be checked and identified before being stored.

In the event of discrepancies or deficiencies the purchase manager will decide whether to withdraw the material or reject it. The controls are of the document type and of the product. (MECAB di Alessandro Boeris, 2018)

4.2.4 Production

Its purpose is to plan and develop the processes required for the realization of the product, in accordance with the requirements of the other ones involved.

The processes carried out by MECAB concern mechanical machining on small and medium-sized batches. (MECAB di Alessandro Boeris, 2018)

a) Production process

In this process is important to keep under control the different production activities and their validation, as well as, the identification and traceability of products and their preservation, finally, to maintain the customer property in optimal conditions.

The responsibility of establishing the logistic organization of the spaces destined for production is entrusted to the production manager that, using head of workshop's



collaboration, must ensure that the controlled conditions are defined to exercise the activities of manufacture.

The planning of the production processes is to define the characteristics of the process in which the organization's products will be realized. (Mediavilla, Processes' Interview, 2018)

b) Warehouse Management

There are different storage areas: Reception/Shipment area in the external square of the company; Consumables area consisting of drawer units located inside the workshop; Oil storage area inside the workshop; and raw material storage area in the external structure.

For materials and products received the warehouse manager applies the requirements and conservation provisions indicated by the manufacturer on the label, in the manuals and documents of use, or in the enclosed documents.

In view of long permanence within the organization of the finished products, the necessary precautions are taken to ensure that is not subject to oxidation, dents, among others. (Mediavilla, Processes' Interview, 2018)

c)Production order management

Depending on the delivery date, the production manager programs the dates of start and end of processing, and the resources to be used.

When he decides to start the processing of a production order, he picks up and makes available the material to the production operator and organizes the beginning of the processing. (Mediavilla, Processes' Interview, 2018)

This document must be prepared, completed and affixed to the production machine by the production manager before granting the approval of the new product first batch manufacture.



The document authorizing the warehouse manager to levy the raw material for the production must be issued.

The material used in the production phase is moved, based on size and weight, taking it from the prepared area and transferring it to the production area.

For this end, the different means used shall consist of: Forklift with guide on board; Trans-Pallet with manual movement; and Jib cranes.

The instructions that define the production methods are described in the production order, and the operators have the necessary documents for the processing (draws, forms) provided by the production manager.

Throughout the entire process the operators are coordinated and receive verbal instructions from the head of workshop.

In the case of anomalies, it is responsibility of the operators to contact the production manager who is responsible for authorizing any action for management of nonconformities.

The identification and traceability of components and materials during the production is managed by the operators through a copy of the design and the production order that follow the component during machining.

The monitoring and control of the process takes place during the production phases, it is done by head of workshop, verifying the quantities produced according to the corresponding cycle time. (MECAB di Alessandro Boeris, 2018)

d)Controls during the production phases

The tests of the machining are carried out by the operators on the basis of the tolerances indicated on the drawings of the customers. In the absence, of specific tolerances, the operators verify the dimensions in drawing by reference to general dimension tolerances on the norm UNI EN 22768-1. (Mediavilla, Processes' Interview, 2018)



e) Final checks and product validation

After the production phase and its controls, the product is subjected to a final control phase.

Depending on the batch size, it is decided whether to control all the production or to carry out a sample check.

The hours used for the construction of the moulds are recorded. For the testing of a new equipment or mould, there is a check-list that shows the checks carried out on the equipment/mould.

It is necessary the official validation of the customer of the new equipment as a result of positive testing. (MECAB di Alessandro Boeris, 2018)

f) Packaging and shipping

The finished product, with the production and testing phases completed, is marked.

The packaging is carried out in the production area taking into account the size and the weight of the product to be packaged, the shipping method, the presence of delicate parts of the product and whether or not it is protected from oxidation for a long time. The standard packaging operations of the finished product, in general, use: Cardboard; Bubble Wrap; Newspapers; Plastic bags; Stretch film. (MECAB di Alessandro Boeris, 2018)

g) Delivery to customer

The document authorizing the output of the product for sale is the transport document. For the fulfilment of the customer order the product is taken from the production area and delivered to the carrier or transported directly to the customer by company means. (MECAB di Alessandro Boeris, 2018)



4.2.5 Direction Management

This process consists on how the different strategies are adopted by the company and how to determine the risks and opportunities that need to be addressed to provide assurance that the expected results can be achieved.

It also defines ways to plan goals and actions for achieving them as well as modifications and improvements. (MECAB di Alessandro Boeris, 2018)

In the company this process is done by the general manager, usually with the collaboration of the other managers.

It also involves the project management, where the different decisions about the future are taken.

a) Actions to address risks and opportunities

In the planning of the actions, the general manager considered the external and internal factors and the context of the organisation and determined the risks and opportunities that need to be addressed in order to achieve the expected results, to increase the desired effects, prevent or reduce the undesired effects and achieve a constant improvement.

The general manager, in cooperation with the quality responsible and the sector managers, during the review of the management, defines and updates, for each business process, the risk and opportunities, establishing for each of these: Risk Description; Risk Area; Risk Analysis; Risk Assessment; Treatment of the Risk (Risk control and reduction, opportunities); Assessment of Residual Risk Level (Acceptable residual risk level, State of risk).

Only once the risk on a project is understood, identified, and quantified the project team can take appropriate steps to manage risk. Basically, responses to be used towards risk may be drawn in four directions: avoid, transfer, mitigate, and accept risk. (De Marco, 2011)



The matrix used for the risk analysis is presented in the Appendix C, and it shows the last risk analysis done by the company with no major risks involved.

The opportunities may include the adoption of new practices, the launch of new products, new markets, the targeting of new customers, the creation of partnerships, the use of new technologies and other desirable and practicable possibilities for meet the need of the organization customers. (MECAB di Alessandro Boeris, 2018)

The taken actions are always proportionate to the potential impact on the conformity of products and services. (Mediavilla, Processes' Interview, 2018)

b) Objectives

As before, the general manager, with the same collaboration, schedules annual objectives for each process/sector so as to ensure a continuous improvement.

The management of the objectives is as follows, first, the evaluation and approval of the plans by the general manager is required. Then, the implementation of activities to achieve the objectives take place. After that, the monitoring of the implementation is done by the quality responsible. Finally, the verification of the results achieved and if they are according to the settled objectives take place. (MECAB di Alessandro Boeris, 2018)

Periodically, these objectives are defined and approved. The general manager and the process managers establish the activities to achieve them, the resources requested, the manager in charge and how the evaluation of the results is done.

In the annual review, the achievement of the objectives of the past year and the proposals for the new objectives for their approval are assessed. (Mediavilla, Processes' Interview, 2018)

The actual objectives results are shown in the Chapter 3 through the different indicators analysed.



c) Planification of the modifications

Any necessary modification is normally analysed in the direction review, considering the purpose of the modification and its potential consequences, the availability of resources, the allocation or reallocation of responsibilities and authorities. (Mediavilla, Processes' Interview, 2018)

4.2.6 Support processes:

The following processes are used to increase the productivity of the company and support the production. There are different ones and they are necessary to keep the high quality of the company and its products.

They are important to maintain the production efficiency of the machines at the highest possible level, to avoid human mistakes and to stick with the subject of continuous improvement.

Within these processes, the management of personnel and their responsibilities and tasks, the management of the infrastructure, equipment, measuring instruments and working environment and the management of documented information are covered. (MECAB di Alessandro Boeris, 2018)

a) Human Resources Management

MECAB guarantees the necessary people for the effective implementation and control of the defined processes.

The staff performing the activities influences the quality of the product and shall be competent on the basis of an adequate degree of education, training, skills and experience.

Through the nominal organigram and the written skills and competences, the interaction between the persons who occupy specific functions and tasks is established.



POLITECNICO DI TORINO Dipartamento di Ingegneria Gestionale e della Produzione The recruitment of the personnel without experience is subject to an interview and a possible practical test, a positive result confirms the assumption of the best candidate.

The recruitment of staff with working experience is subject to an interview that has given a positive outcome and a possible practical test. At the same time the actual training level is verified. (MECAB di Alessandro Boeris, 2018)

The training needs are analysed and assessed by the general manager and human resources manager on the review of the management, so to determine the resources to be committed for the training of staff or for any new recruitment. However, it is possible to have additional training needs to those planned, and them must be approved by the human resources manager.

With the purpose of assessing that the training has been done effectively by the staff, there will be training tests at the end of the course with internal managers or practical audits. In the event of negative outcomes, the human resources manager, together with the sector managers, will consider whether to repeat the course or to deepen only the unclear arguments.

So as to manage the staff, the company collects individual information such as: Previous work experience; The position covered in the company; The remuneration and economic evolution; and the formative evolution.

The tasks and competences of all subjects present in the company are defined by the human resources manager with the general manager. The responsibilities and authorities of each function defined in the organizational chart are deductible from the assigned tasks. (Mediavilla, Processes' Interview, 2018)

b) Instrument Calibration

The measuring instruments must possess characteristics, techniques and precision, exceeding the level of necessity required by the plant to be tested.

Not all the measuring devices and instruments are used to verify the conformity of the system or the service, only those who have to ensure the conformity and reliability of



the measures are verified and/or calibrated in such a way that their accuracy is compared with nationally and internationally recognized samples.

The instruments subject to periodic verification have technical characteristics and precision exceeding the level of necessity required by the products to be tested.

The calibration frequency is established for each instrument according to the conditions and the frequency of its use.

When, during or after a measure performed, the operator has doubts that the measured dimension is not real or that the instrument has abnormal behaviour, it must request the intervention of the quality manager to assess the situation. (MECAB di Alessandro Boeris, 2018)

c) Maintenance

The company maintenance is composed by two kinds of maintenance: The scheduled maintenance and the unscheduled maintenance.

For each machine, plant or means of handling subject to programmed maintenance, the production manager prepares the corresponding maintenance cards. In these ones, the programmed maintenance operations, the frequency of execution, and the responsible of the maintenance execution are indicated. (Mediavilla, Processes' Interview, 2018)

The maintenance card is placed, when possible, on board the machine or near the system covered by the maintenance. It is responsibility of the production manager for the implementation of maintenance operations, and the recording of all the interventions, programmed or not programmed, carried out on the machines/systems.

The scheduled maintenance is defined for each machine by the production manager and he is responsible for executing within the planned dates the scheduled maintenance operations indicated on the cards that are then signed by the person who performed the operation.

The unscheduled maintenance takes place in case of breakage of one of the machine components and/or implant anomalies, the production manager decides whether the intervention can be carried out inside or from an external supplier. The intervention is



followed by a functional test to ensure the total restoration of the functions for which the machine has been repaired. (MECAB di Alessandro Boeris, 2018)

d) Internal Audit

The internal quality audits are carried out on all processes, products and services of the company.

In order for an audit to be effective, it is important that some fundamental criteria be met: Prepare an internal audit plan; Set up a list of feedback, that must comply with the provision of the procedures and the system documents; To critically review the results by identifying the weaknesses of the quality management system and nonconformities.

The internal audits plan is done by the quality manager. The audit officer, to whom the responsibility for carrying out internal audit is entrusted, shall be qualified on the basis of training and experience.

During the audits the objective evidence of the individual activities is recorded. In the presence of a non-conformity, the contents are summarily described. (Mediavilla, Processes' Interview, 2018)

At the end of the audit a meeting is held with the general manager and with the responsible for the functions intervened. The main purpose of this meeting is to present the observations in such a way as to ensure that the results are clearly understood. (MECAB di Alessandro Boeris, 2018)



4.2.7 Continuous Improvement

MECAB determines and selects opportunities for improvement and implements every action necessary to meet customer requirements and increase satisfaction, improving services to meet the requirements, as well as addressing the needs and future expectations. (Mediavilla, Processes' Interview, 2018)

The improvement consists in opening corrective actions, improvement plans, objective plans, investment for innovation and reorganization.

The business promotes the continuous improvement by evaluating and analysing the suitability, adequacy and efficacy of the different processes through the results of the analysis and evaluation, and the outputs of the management review, to determine whether there are any needs or opportunities that must be considered as part of the continuous improvement. (MECAB di Alessandro Boeris, 2018)


Chapter 5: Processes' criticalities

5.1 Diagnose

5.1.1 General processes development

As many companies of this type and size, there are existing criticalities in almost every process, however, it is important to understand and differentiate the most critical ones with the purpose of focusing the improvement to these ones.

The general process (considering Figure 29) starts with the customer offer request and the feasibility study, the company presents different cases in which the cost analysis is not properly reviewed in depth and there could be hidden cost and overhead cost higher than the expected ones.

Then, the planning and development of design is carried out, this process does not evidence major problems, the previous designs are properly stored, and the office is well-equipped.

After that, the supply process takes place, which does not point out criticalities, neither in the supplier selection nor the material arrivals. The problems could be in the arrival material storage, also, in the company's current inventory. To summarise and it will be pointed out after, in the warehouse management.

Next, in the production planning the company uses previous products done in order to estimate the new plans. MECAB has certain flexibility with its plan and this is considered as a positive aspect by many customers. As this is a positive aspect at the present, it could become a problem in the future if the production is saturated. At the present the company schedule the production considering mostly the delivery date. However, there are customers who constantly changes the delivery date and in these cases the production is scheduled on a "day-to-day" basis.

Subsequently, the product machining appears and there are involved the set-up process, in which the code generation and machine calibration are done, and



mechanical machining. The actual set-up process could be considered long because the code generation, and the machine calibration is done with almost each type of product. The mechanical machining does not present major inconvenient, the only observation could be to have, despite having one at the present, a more accurate work-time data base.

Finally, in the process control there are not important problems, and this determines if a re-machining is needed, and with respect to the final product storage until the delivery does not manifest problems because its space is well-defined.

There are also support processes, such as maintenance and human resources management that also present some problems or improvement opportunities. The basic maintenance tasks are carried out internally, while the most complicated ones are done by an external. This could be a point of improvement for the future increasing the internal maintenance because it is the operator the one who really knows the machine (Autonomous maintenance). In the other hand, regarding human resources management, there are several tasks and information that are only known and handled by key staff. This turns into a problem in case of staff absence, and it is why it would be suggested to record this information so that the rest of the personnel could manage this kind of situations in the future. (Mediavilla, Interview of the criticalities, 2018)

5.1.2 The most important criticalities of the different processes

As was explained before, the company manifest many criticalities, problems or improvement opportunities. The most important ones can be summarised in the following list, and this list includes the first selection of the criticalities:

- 1. Cost Analysis
- 2. Warehouse Management
- 3. Production Scheduling
- 4. Set-up Process (Code generation and machine calibration)
- 5. Key-Staff Information



1) Cost Analysis

Nowadays, the company has no a detailed cost structure. However, there are some identifiable costs. One kind of cost is the work-time cost, which is divided in set-up work-time and machining work-time (the company does not have a differentiation between machining time and the raw material fastening time), and the cost per hour is calculated as an estimative considering previous years. Another costs, is the raw material cost and the tool cost, the last one calculated also as an estimative and many times it is not included in the analysis. Finally, the overhead costs are involved in cost per hour of the work-time, but they are estimative and not calculated and prorated with a promptly criteria.

In this criticality, it could be possible to identify a lack of analysis in depth of the costs incurred, and many hidden costs could not be involved in the determination of the final price, presenting a lower profit margin than the one believed resulting in a lower net income, or, on the other hand, the final price could be higher than the reachable one, and this does not allow the company to offer more competitive prices.

2) Warehouse Management

The second problem, the one to analyse in depth and the main objective of this thesis, is that the warehouse management does not have that, a management. The warehouse manager has started to work at the company in October 2018 with the purpose of solving this inconvenient. The main problems are the warehouse space determination, it is necessary to establish in a better way the different warehouses; another one, it is the material differentiation, in where many materials are too similar to the human eyes and mistakes are done in the selection of the adequate material to work; then, there is no order in the tools and equipment in the workshop A and in the workshop B (See Appendix B); finally, there is not an inventory properly controlled and checked, so the lack of inventory is found when the material is required.



3) Production Scheduling

The production planning, nowadays, is done according to the delivery date, however, there are customers which do not respect this condition and work in a day-to-day basis.

The criticality in this process is that the company many times could have a better allocation of the production orders according to other criteria, for example, could be a mix of weights between, weight of fine if the customer has received them with a delay in the delivery, a delivery-date-weight, order-size-weight, among others. This is because many times there are dead-times in the production schedule that could be filled with other production batches.

With the purpose of achieving this goal a set of parameters must be determined, such as the different weights of the previous paragraph, and a new customer management for the customers which work in a day-to-day basis is needed.

4) Set-up Process

First of all, the set-up process has two main internal processes: The code generation and the machine calibration.

The code is generated depending on the product, the problem in this process is that the codes are not recorded and many times for equal or pretty similar products the code has to be generated again wasting a large amount of time.

The machine calibration must be done when the production lot is change, and it does not count with a starting point, such as, representative images of how the calibration must take place, or, which ones are the external tasks that can be done when the machine is producing (SMED method).

The company is constantly trying to solve everything said above because of the amount of time lost that results in a cost increment, in fact, its performance has improved in the last months.



5) Key-Staff Information

In this case, the staff in charge of some key-activities, does not do them with a standardized procedure or following a determined path. This is a problem if, in the future, this key-staff leaves the company.

The activities are done based on their experience or learned from previous workers, but it would be of good practice to standardize this information. An example could be, the customer management considering the way in which each one works, day-to-day basis or delivery date for instance.

5.2 Possible Solutions and Improvement Opportunities

The critical areas of previous section (Section 5.1.2) present a similar feature and this is the lack of recorded information, and this is the first step to control and eventually improve something.

In the following table (Table 19) are shown the different main problems and opportunities for each of the five criticalities mentioned above.

Criticality	Main Problems		Possible	Possible
			Solutions	Results
Cost Analysis	Variety of costs incurred and their lack of differentiation.	The estimated cost could possibly be far away from the real incurred cost.	Establish a new cost structure with a more detailed analysis	Offer more competitive prices or avoid loses and facilitate the cost deployment and focus improvement analysis
Warehouse Management	Lack of management and inventory control. Mistakes in the material selection.	Difference between a constant and harmonic production flow instead of an interrupted one.	Apply a storage control, "5S" and material differentiation.	Reduce mistakes in material selection and wastes in time, improve in working environment and in the production flow.



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	Oscillation of	Actual	A better	Production at a
Production	the production	oscillatory	capacity	constant level
	capacity	production	saturation	avoiding overtime
Scheauling	between high-	distant from	through a	and low-level
	level periods	one at a	different	production.
	(saturated)	constant level.	criterion of	
	and low-level		allocation.	
	periods.			
	Starting with	High set-up	Standardization	Reducing
Set-up	no previous	times	of processes	considerably actual
Draaaa	information,	considerable	and record of	set-up times,
Process	involving	distant from	previous works.	therefore, the
	extra-time in	reachable lower	Application of	production is
	developing the	set-up times.	SMED (Single-	smoothed if there is
	same tasks		Minute	a demand of many
	done before.		Exchange of	products and the
			Die)	costs are reduced.
	There are	Tasks done by	Standardization	A more distributed
Kev-Staff	tasks that only	only a specific	of processes,	task load can be
Information	can be done	person could be	and record of	achieved, and a
mornation	by determined	delegated to	the different	background base is
	staff, and	another	applied	generated for future
	many times	relieving the	methods.	employees.
	they are full of	workload of that		
	work without	person.		
	the possibility			
	of delegating			
	tasks.			

Table 19: Gaps and opportunities of criticalities

As many companies in transition period, this one counts with many criticalities. Nowadays, the two more important ones are the warehouse management and the cost analysis, this last one includes the large set-up time.

In the following section (Section 5.3), both of them are explained in detail so as to have a better perspective of their reality and problems, and also, the improvement opportunities that can be done in the company to improve its performance.



5.3 Description in detail of the main criticalities with their best opportunities

5.3.1 Cost Analysis

The lack of analysis could result in a different reality for the company, for this reason it is important to analyse in depth the present structure. There are different problems and the main ones are the following:

a) Cost structure

The structure used by the company shows a division into 3 or 4 columns, the set-up cost, machining cost, raw material cost, and sometimes the tool cost. It could present a problem because many times there are other costs incurred or the focus of improvement is not clear. For example, there are cases in which the tool cost or the design cost are not included.

b) Cost per hour based on experience

The company, in order to calculate the total cost, uses a cost per hour that is calculated in accordance to previous years. This allowed the company to have a continued growth but could present a problem in the future if it is not calculated based on the real costs incurred by the company.

c) Overhead Cost

It is related to the previous item b), there is no a base to prorate the overhead costs, it is roughly calculated, and, in this case, many hidden costs could be present. A better identification of the overhead costs could allow the company to reduce the ones who are wastes for the company, increasing its productivity.



d) Set-up time

Even though, this was considered a different criticality, it could be included in the cost analysis in terms of a deeper differentiation inside it. At the present, the set-up time is only one for the code generation time and the calibration time, and it is a pretty large time. This does not allow the company to identify where is the main problem, that could be present in either of them. A division in them could bring new opportunities to improvement because they are different activities in the production process, and the possible solutions are sought for each of them.

e) Production time

This problem is similar to the previous one, but in this case the time is only one for the component fastening to the machine and the machining of the component. In this case, the focus of the improvement would be in the fastening time because the reduction in the machining time could be a more difficult task at the present. Maybe in the future this would be the focus of improvement.

f) Cost incurred vs Price

The last problem identify in this criticality, is that many times the hidden costs added to a product result in a total cost higher than the sell-price, this means that the company, with only a few products, is working at losses. The company does this because of the relationship with different customers but this is not profitable. In the other hand, there also cases in which the company offer prices much higher than the total costs, losing the competitive advantage of offering lower prices with the possibility of attracting new customers or increasing the number of offers transformed into orders.



The best opportunities to improve the Cost Analysis

- New Cost Structure: It is important to add in the new structure the subdivision of the set-up cost and the production cost, and the tool cost. This would present to the company a better perspective of the cost division.
- Cost Per Hour: With a deeper analysis the company could reach to a more accurate cost per hour based on the total cost of the company, including the overhead costs in detail.
- Code Generation Time and Calibration Time: These represent a large amount of time in the total production time, and a differentiation would allow the company to know the different times incurred. Then, they could be reduced by standardizing tasks as the record of previous codes for similar or equal products and images showing the way in which the machine should be calibrated. All this could reduce considerably the times.
- Material Fastening: It is the time needed to take a piece out of the machine and put another, this can be reduced with a standardization of the fastening activities.

5.3.2 Warehouse Management

As was explained in a previous section, the Warehouse Management does not have that, a management. If all the common path is followed from a warehouse perspective, different problems are seen many times. The main ones are explained below:

a) Material Differentiation

When the raw materials are received, they are separated by their main material, for instance, stainless steel, resin or other metals. There is no a problem with the stainless steel and resin because they remain differentiable to the naked eye, the problem appears with the other category, "other metals".



In other metals, there at least 3 different metals that are constantly confused, and the result of this are components with a different hardness, or other physical properties to the ones required by them, and many times, this ends up with the components broken in the production.

It is also a problem for the different machines, the feed rate is different for different materials for instance, this can result in a decrease of the useful life of the machines and tools.

Finally, the shapes and sizes are not separated, are all stored in each category, and when a material is required, an important time is needed for seeking and measuring the specific one. This problem appears in all the different materials.

b) Inventory Control

The company does not count with a stock control of their inventory, and this sometimes leads to an interrupted production flow.

There are different materials, and without a differentiation it is not possible to control the quantity of each raw material/component.

If there is not a control of the materials, they can run out stopping the production, or a supply order could be issued when, actually, the required material is available, increasing inventory costs.

c) Machine Cleaning

In the used machines there are material wastes that, usually, are not cleaned, this is a problem for the next person in charge of using the machine. He/she must initially clean the machine before its use, spending an extra time from the planned one.

It is also possible the case in which the work in process is left in the machine until it is used in the following production process.



d) Tool Storage

As a machining company, the number of tools used is considerable. There are common tools for all the company and specific tools in each facility.

The problem appears when the necessary tool is not found in its habitual place, using production planned time in searching the specific tool.

Moreover, the tool identification is difficult because of poor labelling, taking additional time to prove in a practical way if the selected tool is the appropriate one for the necessary purpose.

e) Warehouse Space

The illustrative layout shown in the Appendix B represents the different spaces designated to the warehouse storage. The differentiation is crudely done, and they are not properly respected.

Many times, the final-products storage or the conto-lavoro storage are used for common raw material. In addition, in the Workshop B the material is stored in areas that are not designated to that end, interrupting the inside road.

Moreover, the resin does not have a determined space and it is frequently changing it.

The best opportunities for the enhancement of the warehouse management

There are different opportunities in the case of the warehouse and the most important ones are:

• Material Labelling: This could reduce the wastes in material selection increasing the productivity.



- Material Control Sheet: With a more controlled inventory the production flow of the company is more continued avoiding interruptions, also, a reduction in the inventory costs and a better acknowledgment of the costs.
- 5S: The application of this methodology could bring remarkable results in terms of working environment, a cleaner one for instance, a reduction in the wastes of time used to clean a machine before its use. The 5S are also important to identify and select the appropriate place of each tool facilitating the sought of them.
- Re-assignation of the warehouse spaces: A better allocation of the machines in the facilities could enhance the working environment generating new spaces for the warehouse, for instance the work-in-process of the Workshop B could be better allocated having its own place instead of storing it in the first available place.



Chapter 6: Possible Methodologies and tools to Implement

6.1 Possible Methodologies and tools for the main criticalities

6.1.1 5S

5S is a tool that many companies use so as to organize, order, clean, standardize and continuously improve a work area. The origins of its name came from five activities beginning with the letter S, which were derived from five Japanese words. The words are Seiri, Seiton, Seiso, Seiketsu and Shitsuke, which when translated mean Sort, Set in Order, Shining, Standardize and Sustain, respectively.

Sort is the one that helps to eliminate all unneeded items: only what is required stays. Set establishes places and amounts needed for efficient operation. Shine refers to the act of cleaning through inspection. Standardize implements visual images and controls. Sustain helps to preserve the organization effort in place through training and total employee involvement. (R.S. Agrahari, P.A. Dangle, K.V. Chandratre, 2015)

6.1.2 Quality Circles

Quality Circles are small groups of employees of the same work area, doing similar work that meets voluntarily and regularly to identify, analyse and resolve work related problems.

This small team, where each member of the circle participates, solves different problems on their area, utilising problem-solving techniques to reach control or improvement in the work area. In addition, it helps to the development in the process.

The concept of the Quality Circle is based on "respect for the human individual" as against the traditional assumption based on suspicion and mistrust between management and its employees. (Nikhila C., 2012)



6.1.3 SMED

It is the abbreviation for Single Minute Exchange of Dies, which is a process with the aim of reduce the changeover (setup) time. It classifies elements as internal or external to a machine's operating time and then converts the internal elements so they can be done externally (while the machine continues to operate). Its purpose is to reduce the setup time from many hours to less than 10 minutes, this is the ideal situation. Nevertheless, there are setup times that cannot be completed be completed in single-digit minutes, this is the goal, and it can be achieved in a high percentage of cases.

The key is to transform as many setup tasks from internal setup (tasks that can only be performed when the machine is down) to external setup (tasks that can be performed when the machine is running), then reduce the time needed to complete the internal tasks. (Business Performance Improvement (BPI), 2018)

6.1.4 Poka Yoke

A poka-yoke is a mechanism that prevent human error. The purpose of a poka-yoke is to prevent, correct or highlight an error as it occurs. It roughly means "avoid unexpected surprises" or "avoid blunders" in Japanese. In English, a poka-yoke is sometimes referred to as "mistake-proof" or "fool-proof."

Basically, a poka-yoke is a safeguard that prevents a process from proceeding to the next step until the proper conditions have been met. Poka-yokes can be either warning mechanisms or control mechanisms. Warning mechanisms provide an alert that is designed to prevent additional errors or defects from happening. Control mechanisms stop the next step of a process from occurring. (Rouse, 2016)

6.1.5 PDCA Cycle

The PDCA cycle is a technique for making changes to work processes and improving standards. The letters PDCA stand for Plan, Do, Check, and Act.



The PDCA cycle is continuous. This means once it is completed, people can begin looking for further solutions to implement in the future. This tool is a significant part of kaizen (continuous improvement), as it provides a framework for carrying out constant changes. (American Society for Quality, 2018)

It involves systematically testing possible solutions, assessing the results, and implementing the ones that are shown to work.

The four phases are:

- *Plan:* Identify and analyse the problem or opportunity, develop hypotheses about what the issues may be, and decide which one to test.
- *Do:* Test the potential solution, ideally on a small scale, and measure the results.
- *Check/Study:* Study the result, measure effectiveness, and decide whether the hypothesis is supported or not.
- Act: If the solution was successful, implement it. (Mind Tools Ltd, 2018)

6.1.6 One-Point-Lesson

It is a simple, yet powerful operational tool used to educate operators in an organization and improve product or service quality. The key point of learning for a certain process is written in one to two sentences, complemented by simplified but illustrative diagrams. Usually, the one-point lesson is prepared within half an hour, comprehended in 10 minutes and has 80% diagrams and 20% text. (Mba Skool, 2011)

6.1.7 Just in-Time

Just-in-Time, or JIT, is a methodology that helps your business reduce waste in production. It aims to make just what is needed, when it is needed, and only in the amount needed. (Gartenstein Devra, 2018)



JIT inventory supply system is a shift away from the older "just-in-case" strategy where producers carried large inventories in case higher demand had to be met. In strictly economic terms, JIT helps improve a company's return on investment as it reduces in-process inventory and the carrying costs that come with it. (Raymond Handling Concepts Corporation, 2018)

6.2 Advantages and Disadvantages of the Methodologies and Tools

The different advantages and disadvantages regarding the case in study of MECAB are shown in the following table (See Table 20):

Methodology/Tool	Main Advantages	Main Disadvantages
5 S	Enhancement of the work environment, reduction in material and time wastes.	It is required a change in the work methodology, and there are sectors in which it could be difficult to apply.
Quality Circles	Improvement of quality and productivity, use of employees' wisdom and creativity, encouragement of team spirit.	Further responsibilities and task for employees and managers.
SMED	Lower set-up times, smaller lot sizes, lower inventory levels.	Large time study is required, at the present, a depth change seems complicated, it should be kept simple.
Poka Yoke	It is economic and decreases the wastes. Facilitate the inspection.	It only prevents human errors, not mistakes from designs and machine codes.
PDCA Cycle	It allows the company to test a process change on a small scale and then expand to the rest of the company.	It is a continuous improvement tool, and a constant change in the work environment could present a problem for the human resources.
One-Point Lesson	Easy to apply and interpret, standardization of processes.	Employees must be used to do what is in the diagrams and images.
Just in-Time	Reduction in work-in- process. Improvement in quality and maintenance.	It is necessary a huge change in the management and philosophy.

Table 20: Methodologies and Tools



Trough the seven mentioned alternatives, the most adequate ones are the following: 5S, Quality Circles, PDCA Cycle and One-Point Lesson.

These were selected based on the problem to solve, that will be initially the warehouse management because of the time horizon of application and its complexity.

It is possible that these methodologies or tools be used directly or indirectly, this is, for instance, that a 5S program is carried out (directly) and inside this program different tools are used, such as Quality Circles (indirectly).



Chapter 7: Improvement Actions and Results

7.1 Improvement Actions Proposal

7.1.1 5S in the Workshop B

The application of a 5S program on this workshop that is less saturated than the others could bring great results and motivation to spread the program all over the company.

The possible results are an increase in the productivity and a reduction in timewastes, also an improvement in the working environment and the safety.

The proposal will be an initial differentiation between the used materials and tools against the unused ones. Then, the allocation on a specific position with the purpose of facilitating the sought of tools and materials. After this, the maintenance of the clean environment is necessary. The fourth step of the 5S program is explained to the workers so as to apply them in a near future, and it would be possible spread the program to the next company sector starting from the first step. The last step is the sustain of the program over the time, and the results for this step will be seen in the mid-term future, 1 or 2 years, if the program is hold correctly.

7.1.2 Material Differentiation with labels

The material differentiation program appears in the "other metals" storage, the proposal suggested in this case, is the labelling of the materials in the arrival with different colours or tags.



This will allow the employees to avoid mistakes in the material selection depending on the work requirements, looking at a sheet with the different relation of materialcolour (One-Point Lesson).

Initially, the differentiation will be only by the type of material, and then, could be by the shape and size.

7.1.3 Reorganization of warehouse spaces

The problem is mainly presented with the work-in-process storage, that it is usually stored in the roadmap of employees.

A rearrangement of the machines and unused tools could leave a new space for the work-in-process in different stages of the production.

This proposal could be done collectively with the 5S program, where the latter can generate new spaces because of the reallocation of tools.

7.1.4 Set-up time reduction

The proposal for this problem is a program for the record of previous codes generated with the goal of reducing considerable the time involved for such a thing.

The record of the codes could be explained with a One-Point Lesson so as to facilitate it and remind the employees to do it.

With the same tool, One-Point Lesson, different images could be used to calibrate the machine in a faster way.

7.1.5 Stainless Steel Control Sheet

The control sheet suggested is only to the stainless steel because of its ease to differentiate and control.



It is suggested to begin with an easy-start in order to motivate employees and see the possible results, and then, spread the control sheet for the different materials, equipment and tools.

The one to develop and the scope of this thesis are the proposals 7.1.1, 7.1.2 and 7.1.5, and they are explained in the following section.

7.2 Development of the best and more suitable alternatives

7.2.1 Development of 5S program in the workshop B

The first alternative to improve the warehouse management and the working environment will be the application of the 5S program in the workshop B.

It started in the October beginnings with the hiring of the new warehouse manager, the first step was the "sort". The warehouse manager together with the different managers select the material that were unused, making a first differentiation and leaving the materials or tools with a dubitative use.

With this approach, in the future if the dubitative material or tool is used, a place will be found for it, and if it is not used, its disposal takes place. With the purpose of solving this problem, it is possible to use the quality circles such that other problems appear, and with them, their solutions.

In this step, a great number of boxes and waste materials were disposed, leaving more space for the used material and allowing to the reallocation of the different tools. A new special place was determined for the different garbage, facilitating the dumping.

The workshop without the excess of material allows the company to reallocate the machines and tools, providing with a new space for the work-in-process warehouse of this workshop and concluding the second step.



The next step will be the maintenance of the workshop, its visual cleanliness and the different tools in its correspondent places. After this, with the settlement of the first three steps, the program can be spread to another office, workshop or warehouse.

The fourth step, the standardization, assigns regular tasks, creates schedules, and posts instructions so these activities become routines. The results of this step will be seen in the near future, approximately 6-9 months, it is important to convert that regular tasks in habits. It is important to have constant reviews or audits so as to assess the situation of the workshop and avoid the previous mess.

Sustain is about making 5S a long-term program, not just an event or short-term project. Ideally, 5S becomes a part of an organization's culture, this is the final goal. If this point is achieved the positive results will be constantly noticed.

As it will be possible to see, the first, second and third steps are correctly achieved and done, leaving the possibility to the company to continue the program in the future.

7.2.2 Material Differentiation with Labels

The other alternative developed is the material labelling, in this case, the materials to analyse are the "other metals". The management exhibit its rising concern with the mistakes in the material selection.

The solution in this case is pretty simple, with different colour sprays and a One-Point Lesson explaining the correspondent relation of material-colour the problem could be solved. The difficult part of this problem is that the materials are already mixed among them, so the help of the production operators and managers is needed with the aim of separating them correctly. However, the labelling started with the different materials in arrival.

7.2.3 Stainless Steel Control Sheet

Finally, the last alternative selected is the stainless-steel control sheet, this material was selected because of its availability to control and count.



The solution proposed here is a control sheet with the number of pieces of a specific shape and size, and a periodically control, once a week for instance, and then with a better knowledge of the production demand of each piece calculate a security stock in order to reduce the stock levels and the inventory costs.

A lot of time is required initially to inventory the existing material, but then the process gets easier and the cost and time involved are reduced considerable.

The main aim of this proposal is spare all over the company the control sheet using this area as an example.

With all the gathered information, the company could sort the materials, depending on the demand and cost, by their criticality. For instance, divide the items into three categories, A, B and C: A being the most valuable items, C being the least valuable ones.

The company, with this categorization, could have a higher or lower security stock depending on their demand and their cost.

The procedure applied to solve this problem was a PDCA cycle with the following steps:

PLAN: The identification of the problem was the first step, and it was the lack of control on the inventory. The initial solution proposed was to make a first control of the existing inventory with an easy and identifiable material, such as stainless steel, and the creation of a control sheet to forecast its production demand and calculate the security stock.

DO: The control sheet use is a simple one, explaining the material specifications, the existing quantity and its weekly demand. It was used to control the material consumption over 10 weeks.

CHECK: Verify the results, if they are accord to the expectations, the control will increase the production flow, because of material availability. If they are accordingly with the expectations continue to the ACT step and calculate the security stock and the material category, in any other case start again.

ACT: Spread the plan over the different existing materials of the company until an inventory control is done to every material.



7.3 Results of the selected actions

7.3.1 Results of 5S program

The cleanliness of the workshop is highly increased, and the visual aspect improved, the tools are reached faster and easier, the roadmap is not interrupted by work-inprocess pieces.

The first two steps have been done correctly, and with the use of quality circles, the unused materials and tools are constantly disposed. The third step is on transition and the clean of the workshop B is overseen by the warehouse manager, who is correctly maintaining it. The idea for the future is that every employee has its own place clean.

The different results achieve are shown in the following figures, where they show the situation "before" the application of the 5S program and "after".

The following two figures (Figure 30 and Figure 31) show the impact in the automatic saw where the work-in-process was left every time the machine was used. At present the one who uses the machine maintain it clean and without material when is not being used.



Figure 30: Semi-Automatic Saw Before 5S





Figure 31:Semi-Automatic Saw After 5S

The tool carriage of the Figure 32 shows how it was used as a "tool storage" or "tool box", and nowadays it is only used to transport or support the necessary and used tools of every task.



Figure 32: Tool Carriage, Before and After 5S

Even though, huge changes are not seen, the work table seen in the Figure 33 was reallocated leaving a less loaded path, in where the circulation of the employees is more fluid. In addition, the work-in-process is not further left on this table.





Figure 33: Work Table, Before and After 5S

In the oil tank of the next image (Figure 34) different materials and sheets were left on it, but after the application of the program, it was cleaned, and the different materials were disposed or situated in another position leaving the tank free whenever it is necessary.



Figure 34: Oil Tank, Before and After 5S

The box shelving has a huge visual change, all the old and dirty boxes were disposed, only remaining the ones ordered, also it change its location to a less circulated area in order to avoid interruptions in the people circulation. (See Figure 35)





Figure 35: Box Shelving, Before and After 5S

The images presented next have the different steps of the program applied to a shelving with different raw material and tools. The first image (Figure 36) has the initial situation, the second one (Figure 37) the first step of the program, the "sort", and the last one (Figure 38) the "set in order" step where the different materials where ubicated in different boxes.





Figure 36:Shelving Initial Situation



Figure 37: Shelving after the "Sort" step





Furthermore, there was done a reallocation of machines and shelving depending on the use-frequency. (Figure 39 and Figure 40)



Figure 39: Initial locations



Figure 40: Locations after the 5S application



7.3.2 Results of Material Differentiation trough Labels

The initiative was done buying the different colour sprays and the materials were sorted by the different types of metal.

A One-Point Lesson was done to facilitate the understanding of the material-colour relation, and it was situated in the spray box and in the "other metals" warehouse. Through the application of this, the materials will remain reachable easier avoiding possible mistakes. It is possible to see on it the different metals used by the company with its corresponding colour.

Even though, the sprays were bought, and the One-Point Lesson done, the differentiation of the existing metals was not done yet because of the production operators' necessity and the lack of identification of the existing metals. However, the arrival materials were correctly separated and identified among them.

In the figures presented below are shown: The spray box (Figure 41), the One-Point Lesson of the spray box (Figure 42), and the "other metals" warehouse with its One-Point Lesson inside a red box (Figure 43) and a nearer view of the One-Point Lesson (Figure 44).





Figure 41: Spray Box



Figure 42: One-Point Lesson of Spray Box





Figure 43: "Other Metals" Warehouse



Figure 44: One-Point Lesson of "Other Metals" Warehouse



There were not previous data of the mistakes done in the material selection, but with this approach and proposal the identification of different materials remains easier avoiding possible future mistakes and reducing the search-time of materials, also, nowadays, the employees are committed to record the different mistakes done.

7.3.3 Results of Stainless-Steel Control Sheet

		Stainless-Steel Stick	Length	Diameter
		Existing Material	1500 mm	18 mm
	Demand	117		
1° Week	4	113		
2° Week	0	113		
3° Week	3	110		
4° Week	2	108		
5° Week	4	104		
6° Week	3	101	Weekly Con	sumption
7° Week	0	101	3.2	1
8° Week	5	96		
9° Week	8	88		
10° Week	2	86		

The control sheet, with the compiled data, used is the following (Table):

The results shown that the material selected is sporadically used, so it could be categorized as "C" material, and the security stock (S.S.) is calculated accordingly to the category and the weekly consumption with the following formula:

S.S.= Weekly Consumption * Supply Time * Category

In the case in study, the categorization was done qualitative and subjective through different interviews with the production manager. Depending on the category a coefficient is used to fill the previous formula and it is the one corresponding with the table below (Table 22), this table is used as an example and it is an initial suggestion that can change in any moment:

Category	Coefficient
А	3
В	2
С	1.5





The increasing in the importance of the material leads to an increase in the security stock so as to not stay out of material when the production line demands it.

The security stock for stainless-steel stick with a length of 1500 mm and a diameter of 18 mm, with a supply time of one week, a category coefficient of 1.5 and weekly consumption of 3.1 units per week are 5 units. It is pretty a small number considering the initial amount and this can have a huge impact in the workers but could be an initiative to reduce the security stock quantity to 20 units instead of 5 units, it is not the theoretical number, but it is a significant reduction in the stored material of the present and implies an important reduction in its costs.

When the inventory reaches a specific quantity a supply order, which depends on the category, order size possibilities and its costs, is issued to restore the inventory. For example, this can be, if the order size allows it, when the stock level reaches the 30 units an order is issued for 20 units, so it will arrive when the quantity is roughly 25 units reaching again an initial quantity of 45. The average formula will be:

Average Stock = Security Stock + (Max Quantity – Min Quantity)/2

In this case the Min Quantity will be the security stock that is equal to 20 units and the Max Quantity is approximately 45 units, so the average stock will be 33.

The approach is to focus on the reduction of the average stock by reducing the security stock and order size gradually.



7.4 Continuous Improvement of the Proposals

The company has many possibilities for the future with respect to the improvement actions done, the 5S program could be done for all the company spreading the environment achieved in the workshop B and using it as an example for the other sectors. Moreover, it could become the initial point of an autonomous maintenance done by employees.

It is a powerful and simple tool that optimizes the work-time, the productivity, the safety and the working environment. The employee in charge of the cleaning of a specific area has a sense of belonging and that all the effort has its results.

In the case of material labelling, in where the One-Point Lesson is used, could be the start of the application of this tool for other activities in order to simplify their understanding. If the results are enthusiastic, the colour differentiation can be done in other workshops with the different tools or materials.

With respect to the control sheet used, it could be used as a prove of inventory control and the spread to other stored material could give to the company a better perspective of its nowadays position regarding storage levels. Additionally, this will allow the company to identify costs that maybe were not controlled or added to the total incurred costs.



Conclusion

As a culmination of the project done, it is possible to say that sometimes there are big problems which can be solved with the application of simple tools without the requirement of high-technology or high-skilled workers. The only requirement for their application is the employees' full commitment with the goal.

Moreover, the different proposals suggested work under the same principles of starting in a specific sector or area and if their results are optimistic, they are spread to other areas, this gives to the company the possibility of achieving results in an economic way, and then it can decide to spread the improvement activities to other sectors or not.

This can also work as motivator using as an example the results achieved in the specific sector.

The planned objectives at the beginning of this thesis were correctly reached, the working environment and safety have been increased considerably in the workshop B as can be seen in the previous images, after a qualitative analysis the time required to search a tool has been reduced considerably and the unused materials or tools were disposed. The material differentiation is done in an easy way with the different colours, and finally, the inventory control has shown positive aspects and left the possibility to control in some way the different stored materials.

It is suggested to the company to continue with the remaining two proposals of the reduction in set-up times and the reorganization of the warehouse.

The reduction in set-up time proposal requires more time to achieve results but it will give to the company even a higher flexibility with its customers, moreover, the reduction in the total costs could be considerably. Also, the implementation of a record program for the machine codes is suggested, at least of the most important or frequently ordered products.

The application of One-Point Lesson in this problem could help to achieve better results because of its simplicity to transfer information, indicating the way in which the codes are recorded for instance.



Furthermore, the application of the SMED methodology is recommended because of its power to reduce set-up times in a simple way.

With respect to the warehouse reorganization, the work-in-process will have its own place, and roadmap will not be interrupted. In addition, this will be helpful for 5S program implementation in other sectors of the company.

Additionally, the application of the PDCA Cycle as the main tool to solve future problems could help the company to achieve better results in a more organized way, and more important to record the information. This last point is important for the future because it is a starting point to compare.

The PDCA Cycle application in conjunction with the standardization are the pillars of the Kaizen method (continuous improvement) and the application of them together can achieve countless benefits and improvements.

Finishing, the company has many improvement opportunities, it is important to focus on them and solve its problems continuously in order to reach the best possible position in the eyes of its existing and potential customers and its competitors.


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Appendix A: MECAB's Organizational Chart







Appendix B: MECAB's Illustrative Layout







Appendix C: Risk Matrix



RESIDUO	TO DEL SCHIO	att Abile	TT ABILE	ITT ABILE	ITT ABILE	att ABILE	ACCETTABILE	
RISCHIC	STA	ACCE	ACCE	ACCE	ACCE	ACCE		
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	CONTROL LO / RIDUZIONE DEL RISCHIO	HESSUNO	4ESSUNO	4ESSUNO	4ESSUNO	4ESSUNO	VESSUNO	
ALUTAZIONE DEL RISCHIO	PONDERAZIONE DEL RISCHIO	ACCETTABILE	ACCETTABILE	ACCETTABILE	ACCETTABILE	ACCETTABILE	ACCETTABILE	
	RAPP RESENTAZ.	CRAVITA'	CRAVITA'			CRAVITA'		
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	× 9	3 ×	2 ×	2 ×	33 33	2 ×	2	
ANALISI DEL RISCHIO	EAM DI LAVORC	BOERIS A.	BOERIS A.	BOERIS A.	BOERIS A.	BOERIS A.	BOERIS A.	
	CAUSA POTENZIALE	ERRATA DEF NIZIONE DEGLI OBIETTIMI	MANCANZA DI LIQUIDITA'	MANCATO MONITORAGGIO SU CLIENTI INAFF DABILI	ERRORINELLA TRASCRIZIONE DELLE SPECFICHE DA PARTE DEL COMMERCIALE	TEMPIDIRISPOSTA NON RAPIDI. PREZZI NON CONCORRENZIALI E TERMINI DI PAGAMENTO TROPPO RISTRETTI	SOVRASTIMA DEL POTENZIALE PRODUTTNO AZIENDALE	
	EFF ETT O POT ENZIAL E DEL RISCHIO	DMINUZIONE EFF ICIENZADEL SISTEMA DI GESTIONE	MPOSSIBILITA' DI NVESTIRE N NFRASTRUTTURE E AMBIENTE DI LAVORO	MANCATO INCASSO	AL CLIENTE	PERDITA DELL'ORDINE DEL CLIENTE	MPOSSBILITA' DI EVADERE L'ORDNE NEI TEMPI STABILITI CON IL CLIENTE	
01	NAMISARINA TAG 8105/10/6		8102/10/62	8102/10/22	06/12/2016	06/12/2016	06/12/2016	
DESCRIZIONE DEL RISCHIO		MANCATO RAGGUNGMENTO OBETTIVI	MANCATO ACCESSO AL CREDITO BANCARIO	INSOL VENZE PAGAMENTI CLENTI	MANCATA SODDISFAZIONE DELLE SPECIFICHE RICHIESTE DAL CLIENTE	RITARDO NELLA COMUNICAZIONE DEL PREVENTIVO AL CLIENTE	SUPERAMENTO DELLA EFFETTIVA CAPACITA' PRODUTTIVA DELL'AZIENDA	
PROCESSO		DREZIONE			PROCESSO			



ACCETTABILE	ACCETTABILE	ACCETTABILE	ACCETTABILE	ACCETTABILE	ACCETTABILE	ACCETTABILE	ACCETTABILE	ACCETTABILE
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e 1	e	m	m	e	5	m	8	~~~~~
OVITIROA								
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100								
53/03/2018								
RIORGANIZZ AZIONE DELL'UFFICIO TECNIC CON INGERMENTO DI UNA RISORSA E REDISTRIBUZIONE DEI COMPITIE DEI CARICI DI LAVORO	NESSUM	NESSUM	NESSUM	NESSUM	NESSUM	NESSUM	NESSUM	NESSUWA
VESSUNA	VESSUNA	VESSUNA	VESSUNA	VESSUNA	VESSUNA	VESSUNA	VESSUNA	VESSUNA
IIGL DRAMENTO DELL'EFFICENZA EL PROCESSO DI PROGETTAZIONE	ESSUNO	ESSUNO	ESSUNO	RESSUNO	ESSUNO	ESSUNO	ESSUNO	ESSUNO
	ACCETTABILE	ACCETTABILE	ACCETTABILE	ACCETTABILE	ACCETTABILE	ACCETTABILE	ACCETTABILE	ACCETTABILE
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e ×	× +	×	× -	× -	× 1	× 1	× 1	× -
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GOI	GOI	BOE	BOE	BOE	BOE	BOE	BOE	BOE
ERRATA VALUTAZIONE DEI CARICHI DI LAVORO N FUNZIONE DELLE REORSE DISPONIBLI	COMPETENZE NON SUFFICIENTI AD EFFETTUARE UNA CORRETTA PROGETTAZIONE	MANCATO RISPETTO DELTERMINI DI CONSEGNA DEL FORNITORE	DIFFICOLTV: A REPETTARE I TEMPI RICHESTI IN PERIODIDI MAGGIORE RICHESTA DA PARTE DEI CLIENTI	NON PREVISTI TUTTI GLI INTERVENTI DI MANUTENZIONE PREVENTIVINECESSARI A RIDURRE I GLASTI NON PREVEDBILI	NSUFFICENTIREORSE DISPONIBLI PER GLI AUDIT NTERNI	NOSSERVANZA DELLE PRESCRZIONIR PORTATE NELLA PROCEDURA DI RIFERMENTO	MANCATO CONTROLLO DEL RISPETTO DEL PIANO DI MANUTENZIONE	MANCANZA DI RISORSE ECONOMICHE, ERRATA DEF NIZIONE DELLE TEMPISTICHE PUMIFICATE
RITARDO CAUSATO AL CLENTE NELLA COSTRUZDNE E MONTAGGIO DI QUANTO PROGETTATO	PRODUZIONE	RITARDINELLA PRODUZIONE / CONSEGNA AL CLIENTE	RITARDO NEL MONTAGGIO DEL PRODOTTO	RITARDO NEL MONTAGGIO DEL PRODOTTO	NON RISPETTO REQUISITO DI NORMA	MANCATA/TARDIVA REPOSTA AL CLIENTE NCOMPLETA ANALISI DATI	PRESENZA DI GUASTI SULLE MACCHNE ED INCREMENTO DEI COSTIDIMANUTENZIONE	MANCATO RISPETTO DI RECUUSITI DI LEGGE (E.S. SCUREZZA) E MANCATO RAGGIUNGMENTO DELLE COMPETENZE NECESSARIE
06/12/2016	9102/21/90	9102/21/90	59/01/2016	9102/21/90	9102/21/90	9102/21/90	8102/10/62	06/12/2016
MANCATO RISPETTO DEI TEMPI DI CONSEGNA	ERRORIDI PROGETTAZIONE	RITARDINELLA T CONSEGNA DA PARTE DEI FORNITORI	RITARDO DI CONSEGNA AL CLENTE	FERMO PRODUZIONE PER ROTTURA MACCHINARI	MANCATO RISPETTO DEL PIANO DI AUDIT	MANCATA GESTIONE NC/RECLAMI	MANCATO RISPETTO DEL PIANO DI MANUTENZIONE	MANCATO RISPETTO DEL PIANO DI ADDESTRAMENTO
PROCESSO DI PROCESTAZIONE STAMPI E ATTREZZATURE		PROCESSO DI APPROVVISINAMEN: 0	PROCESSO DI	PRODUZIONE	ALL MIC			01404400

