

OPTIMIZAÇÃO DA ESTRATÉGIA DE SERVIÇO PÓS-VENDA DA PERUZA

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OPTIMIZATION OF THE AFTER-SALES STRATEGY OF PERUZA

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Instituto Superior de Engenharia do Porto

Mechanical Engineering Department

Master's in Industrial Engineering and Management



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OPTIMIZATION OF THE AFTER-SALES STRATEGY OF PERUZA

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Dissertation presented to the Institute of Engineering of Porto to fulfil the necessary requirements to obtain the degree of master's in mechanical engineering, conducted under the guidance of Professor Maria Teresa Pereira, professor of the Institute of Engineering of Porto.

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Instituto Superior de Engenharia do Porto
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Key Words

After-Sales; Maintenance; Customer Service;

ABSTRACT

The aim of the study is to develop and optimize the process of after-sales from PERUZA, a Latvian company inserted in the food industry specializes in manufacturing equipment for processing and transforming the fish. The company produces and commercializes its products in the Latvian market as well as in international markets such as Southeast Asia, Europe and North America. The after-sales activities of a manufacturing company plays an important role in the success of the business, as after the machine is purchased the quality of the service offered is the gate for new purchases and good feedbacks that spread among the markets and increase the reliability and reputation of both product and company.

The project was developed based on a research-action methodology through a six-month internship in Latvia. During that period multiple activities were performed that allowed to acquire enough information and knowledge to develop a new strategy aiming to increase the after-sales revenues and the relationship with the existing clients. To begin the study, the current after-sales process was analyzed in order to identify the issues and possible improvement opportunities that could be implemented later on. From that analysis and after some discussions with the department managers it was carried an analysis that aimed to understand the customer's opinion of the current after-sales services offered. With the data collected and analyzed a series of improvement proposals was made and discussed with the company manager to obtain its approval for the further actions. At a later stage of the internship new improvements were implemented such as the introduction of new services, development of new process diagrams and optimizations of the spare parts management strategy. To conclude the study the new services were offered and presented to the customers and the trial period for the new after sales methodology started.

During that time PERUZA collected information based on the feedback of the customers and continued to work on optimized the new strategy implemented, aiming to achieve a stage where the process is capable of increasing the company's revenues as well as keeping a good reputation and reliability of its products and services offered.

RESUMO

O objetivo do estudo é desenvolver e otimizar o processo de pós-venda da PERUZA, uma empresa letã inserida na indústria de alimentos, especializada na fabricação de equipamentos para processamento e transformação do peixe. A empresa produz e comercializa os seus produtos no mercado da Letónia, bem como em mercados internacionais como o Sudeste Asiático, Europa e América do Norte. As atividades de pós-venda de uma empresa de produção desempenham um papel importante no sucesso dos negócios, pois, após a compra da máquina, a qualidade do serviço oferecido é a porta para novas compras e bons feedbacks que se espalham pelos mercados e aumentam a confiança e reputação do produto e da empresa.

O projeto foi desenvolvido com base numa metodologia de pesquisa-ação através de um estágio de seis meses na Letónia. Durante esse período, foram realizadas diversas atividades que permitiram adquirir informações e conhecimentos suficientes para desenvolver uma nova estratégia, visando aumentar as receitas pós-venda e o relacionamento com os clientes existentes. Para iniciar o estudo, o atual processo de pós-venda foi analisado para identificar os problemas e possíveis oportunidades de melhoria que poderiam ser implementadas posteriormente. A partir dessa análise e após algumas discussões com os gerentes de departamento, foi realizada uma análise que visava entender a opinião do cliente sobre os atuais serviços pós-venda oferecidos. Com os dados coletados e analisados, uma série de propostas de melhoria foram feitas e discutidas com o gerente da empresa para obter a sua aprovação para novas ações. Numa fase posterior do estágio, novas melhorias foram implementadas, como a introdução de novos serviços, o desenvolvimento de novos diagramas de processo e as otimizações da estratégia de gerenciamento de peças de reposição. Para concluir o estudo, os novos serviços foram oferecidos e apresentados aos clientes e o período de teste para a nova metodologia pós-venda foi iniciada.

Durante esse período, a PERUZA coletou informações com base no feedback dos clientes e continuou a trabalhar na otimização da nova estratégia implementada, com o objetivo de alcançar uma etapa em que o processo seja capaz de aumentar as receitas da empresa, além de manter uma boa reputação e confiança dos seus produtos e serviços oferecidos.

LIST OF SYMBOLS AND ABBREVIATIONS

List of Abbreviations

| | |
|----------|---------------------------------|
| OEM | Original Equipment Manufacturer |
| SERVQUAL | Service Quality |
| R&D | Research and Development |
| CDC | Central Distribution Centres |
| DC | Distribution Centres |
| FLS | Field Stock Locations |
| IB | Installed Base |
| CRM | Customer Relationship Manager |
| PDCA | Plan; Do; Act; Control |

GLOSSARY OF TERMS

| <Term> | <Designation> |
|--------------|--|
| Pelagic Fish | Pelagic fish are coastal fish that inhabit sunlit waters up to about 655 feet deep |

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INTRODUCTION

1 Introduction

This master thesis was conducted in a business context at PERUZA SIA in the technical sales department, in the form of curricular internship. The title mentions Optimization, but in reality the project is based on continuous improvement of the after-sales strategy of the company. The proposed challenge was to analyse the current after-sales process and develop a new strategy to be implemented, improving the companies trust and reliability as well as obtaining extra income from after-sales activities.

This first chapter will explain the context of the problem under analysis, the objectives, the research motivation and finally, the thesis organization.

1.1 Aim

The elaboration of this case study aims to obtain the degree of master's in engineering and Industrial Management at the Higher Engineering Institution of Porto. Therefore, the main objective of the work is to analyse and develop a new strategy for the after-sales department of PERUZA SIA.

During the last years, organisations within the manufacturing industry started to view service as an important and profitable part of their business.

Before this period the focus was mostly aimed at production, marketing and management of physical goods and service was viewed differently and as separately area. Previously it was viewed as a supportive element and not a specific business area, but as the market changed, mainly because of globalisation, manufactures had the possibility to produce and deliver, faster, at a better quality, and at cheaper price, because of the new production possibilities (technology, outsourcing etc.).

Driven by increasing competition; technological changes; new customer demands; decreased sales margins; and availability of lower-cost alternative products, manufacturing firms are forced to shift their traditional business focus from product offerings to integrated products and to create an alternate competitive advantage rather than just product specifications, quality, or price.

1.2 Objectives

A set of objectives have been identified as follows to achieve the overall aim of this study:

- To analyse the after-sales approaches currently used by the case organization and described in literature.
- To evaluate the current after-sales service based on the customers opinion and statistics analysis.
- To develop a new strategy based on continuous improvement, to improve the efficiency and effectiveness of the after-sales service.
- To implement the proposed improvements, aiming to obtain better feedback and higher income from the after-sales activities.
- To develop a more organized and detailed process flow diagram for the new after-sales strategy implemented.

1.3 Research Motivation

The motivation for this study stemmed from a real case company, named PERUZA, a Latvian manufacturing company who is providing equipment for fish industry worldwide.

Due to current perceived growth in the emerging markets, the case organization is focusing on developing their after-sales services in order to create a competitive advantage that can differentiate them from the competition.

One of the main motivations for performing the study in a Latvian company, was the opportunity to experience international work environment, as well as acknowledge new business ideologies that could be useful for the working career.

1.4 Thesis Organisation

The structure of the dissertation is divided into 6 chapters with the following contents:

- Chapter 1 - addresses the scope of the work performed, its objectives, the methodology used and a brief characterization of the company;
- Chapter 2 - refers to the literature review and presents all the theoretical framework that supports the present work;
- Chapter 3 - describes the methodological procedures used to justify the defined objectives;
- Chapter 4 -describes the current after-sales process as well as all the analysis performed to find the issues associated with it;
- Chapter 5 - identifies improvement proposals and their outcomes;
- Chapter 6 - presents the main conclusions of the work.

Literature Review

2 Literature Review

2.1 Connecting service Quality to Customer Loyalty

Satisfied customers will repurchase (Kotler, 2008). This simple affirmation that seems obvious for most people was a topic of countless studies and investigations over the past four decades. The relation between service quality, satisfaction and loyalty are more complicated than what was initially thought to be, as it is affected by various factors such as country, economic sector, and even company or customer group (Kotler, 2008). Other than the upsides of the after-sales services, there are a few challenges that manufacturers face, for example, the multifaceted nature of the process of raising the customers' expectations towards the services offered and its preferences and quality (Winnefeld M., 2012). To understand better how these topics, connect, it is required to get a deeper understanding of them.

2.1.1 Service Quality

Service quality is a concept that has triggered countless studies over the past years because of the difficulties in measuring it and defining it with no consensus emerging on either (Wisniewski, 2001).

There are several different "definitions" of what service quality is meant by.

This concept is usually defined as the extent to which a service meets customers' needs or expectations (Lewis and Mitchell, 1990). From a customer perspective, service quality is the degree and direction of the difference between a customer's impressions and his or her expectations (Gupta & Zeithaml, 2006). If the expectations are higher than performance, the perceived quality is less than reasonable, then customer dissatisfaction occurs (Lewis and Mitchell, 1990).

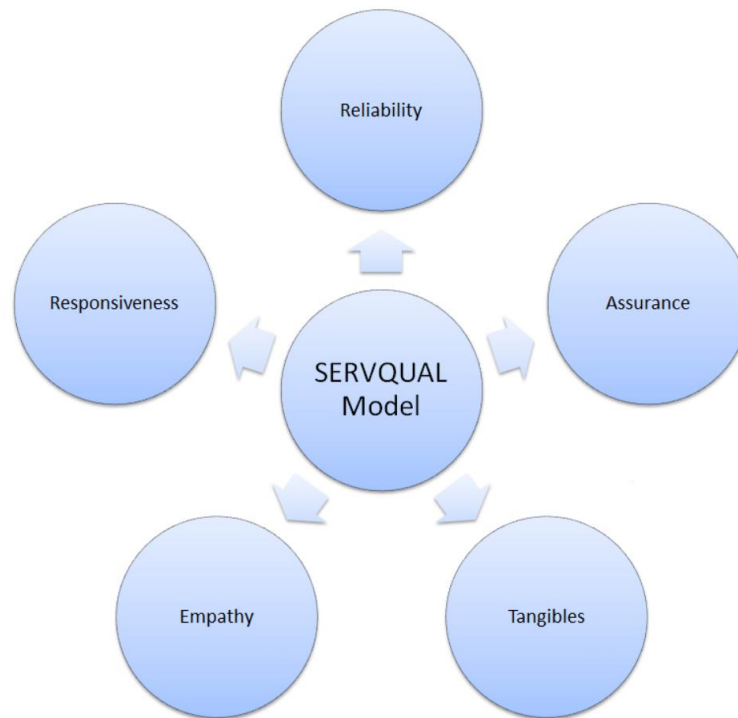


Figure 1 - The five dimensions of SERVQUAL; (Source: www.marketingstudyguide.com)

2.1.2 Customer Satisfaction

To fully understand the meaning of satisfaction we need to go deeper into the definition of customer satisfaction.

In a bumpy commerce environment, to sustain the growth and market share, companies need to understand how to satisfy the customers, because customer satisfaction is critical for establishing long term client relationships (Patterson et al., 1997).

Customer satisfaction is the emotional response resulting from the evaluation of service quality after one business transaction (Vavra, 2003). It's the result of the emotional and cognitive assessment. These disparity results are the so-called disconfirmation paradigm introduced by Oliver in 1980. If a customer's expectations are exceeded, it will result in satisfaction (positive disconfirmation), and if they are not met, it will result in dissatisfaction (negative disconfirmation).

2.1.3 Customer Loyalty

Customer loyalty is commonly defined by repeated purchase behavior, but repeated purchase can be explained by various factors such as availability, contractual bonds, no alternatives, technical matters, or switching costs (Homburg & Koschate, 2007). There are two levels of customer loyalty: Retention (when the customer for various possible reasons cannot switch to another supplier) and compromise (when the customer is psychologically and emotionally linked to the supplier and doesn't want to change) Schreiber (2010).

Thomas and Tobe (2013) highlight that "loyalty is more profitable." The expenses to gain a new customer are much more than retaining an existing one. Loyal clients will convince others to purchase from you and think more than twice before altering their opinion to buy from different producers. To achieve customer loyalty, it is required a customer-centred approach by the company (ibid).

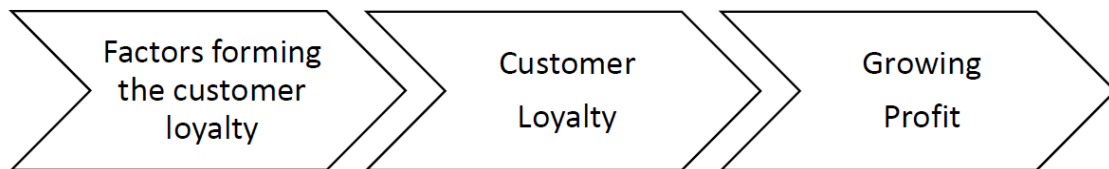


Figure 2 - Model of customer loyalty (Adapted from the loyalty model 2012)

2.2 After-Sales Relationship

Relationships between buyers and sellers are similar to the one between husbands and wives (Levitt, 1983). The quality of the "Marriage" decides if there will be continued or expanded business, or troubles and divorce. In some cases, divorce is not possible, as when a major construction or installation project is underway. If the marriage that remains is laden, it damages the seller's reputation (Levitt, 1983). This can easily relate to the dynamics of services and products handled in a transaction between the seller and the buyer (ibid). Because of the developing complexity of the products, organizations must offer greater assurances (Ettorre, 1994). The buyers of automated equipment, unlike buyers at a street market, expect installation services, application aids, spare parts, repair and maintenance, R&D, to keep the products productive and updated. (Levitt, 1983). The seller needs to plan and define a strategy to manage the "Partner," before the "wedding."

2.3 After-Sales in Manufacturing Context

OEM's have recently perceived that there is a significant economic potential of offering aftersales support and services along with the main products (Mahmoodzadeh, 2009). This is acknowledged by the high number of 65 % of OEM's offering aftersales services and support (Neely, 2008). The aftersales services have turned into an extremely fruitful segment of OEM's for representing a significant role in the profit of the companies. Organizations can generate more than 60 % of total profits by offering services in addition to the principal products. Past this, it is conceivable to achieve EBIT edges more than 11 %. Unexpectedly, the spare parts business that was the previous driver of after deals service is managing declining incomes and profits (Roland, 2013). However, the main advantages of aftersales services over the main products are the low impact of financial cycles and economic crises (Dombrowski, 2012). Customers' expectations are rising, so the quality of the services offered have to improve as well, but the price of the provided services still has remained low to attract customers attention and achieve its satisfaction (Allway, 2002).

The aftersales services usually offered by OEMs are repair and spare part delivery and installation, preventive check-up, inspection, service contracts, warranty and request management, modernization and staff training (Turunen, 2011).

2.3.1 Customer Care

Customer care is generally depicted as an action which provides specialized information and services; usually, warranty extension and complaint management to the customers (Saccani, 2007). There are diverse types of customer care, and it is dispersed on various dimensions; it tends to be distributed through a centralized call centre, through the manufacturer site and through the nearby repair centres that give functional data to the customers.

The customer care activities have changed from being principally providing simple task, for example, giving simple information and dealing with requests, to now, being more complex and taking care of assignments such as providing counsel in money related issues or fortifying and dealing with the association with key accounts (Kantsperger and Kunz, 2005). This has prompted understanding the significance in customer care as an agent device towards a strategic role in customer relationship.

Most of the organizations know that it is the clients' appraisal that matters and that the high competition among the associations boosted the focus on customer (Kahn, 1995). This has led to that organizations need to develop themselves consistently to endure competitive markets.

2.3.2 Field Technical Assistance

Field technical assistance is the support given from dealer to purchaser where the purchaser can get services such as installation, warranty interventions, and out-of-warranty repairs, product disposal, infield check-ups and repairs (Saccani, 2007). To stay competitive and able to profit and survive in the market, companies had to outsource, which resulted in rapid growth in outsourcing during the last decades. From the 1990s and onwards, outsourcing became a common activity in companies, especially in the technical field activity, because the logistics and management of it are very costly and consumes a lot of time and resources. This approach has been trendy in firms which need to serve a wide range of customers that are geographically dispersed (Armistead and Clark, 1991).

Business-to-business clients expect a high level of accessibility from the vendors' side because of possible technical issues that can cause severe difficulties for the customers (Russell, 2008).

This is partially provided by warranties offered to the clients from the manufacturer's side. The primary goal for guarantees is to give an after-deal solutions for the customer when an item neglects to meet its proposed accomplishment during the provided warranty time (Chien, 2007).

The warranty has also been characterized as a contractual commitment made by the manufacturer, where the producer is committed to guaranteeing the excellent function of the sold item (Blischke,1992). Warranties are known for being exorbitant for producers: the warranty contracts must be precisely calculated to provide a long-term warranty to the client at a minimum cost for the producer (Chien, 2007).

2.3.3 Spare Parts distribution

Spare parts distribution is in charge of stock management, client request management and conveyance of spare parts (Saccani, 2007). Kennedy (2002) stated that spare parts are not intermediate or last products to be sold to the client. The supplier usually aims to achieve a specific turnover ratio and, in the meantime, satisfy the needs of numerous clients with a different and large number of spare parts. The manufacturer needs to settle on what sort of level they want to distribute their spare parts, central distribution center, local warehouses, regional warehouses, field stockrooms, retail outlets, and merchants. It is said that pricing spare parts are one of the biggest challenges of after sales when it comes to mechanical products. The main reason for spare parts distribution is to ensure the maximum availability of spare parts to the customer with the lowest costs for the provider. On the other hand, by having a stable and efficient

spare part distribution, the manufacturer will achieve the customer's satisfaction and increase its aftersales revenues (Gopalakrishnan, 2004).

Spare parts inventory will lower the downtime of a machine when it is damaged and needs to be replaced. It is difficult to precisely define how many spare parts a customer should keep in stock, but the downsides of not having any in stock are much more than to invest in a minimum stock of spare parts. There are also consequences of unscheduled repairs such as big production losses and a significant increase in repair costs. To prevent this kind of situations a safety stock policy is mandatory (Kennedy, 2002)

2.4 *Business Context of After-Sales*

It is essential to keep a continuous interaction between the manufacturer and the customer throughout the post-purchase life cycle. The revenues generated from after-sales services can represent big profit margins the OEMs (Cohen, 2006). In this chapter, it is explored the business side of the services provided after the product is sold, as well as the best strategies to achieve the efficiency of the services.

Many aspects influence the terms of the services provided to the customer; one of them is the heterogeneity of the customer base. Many elements contribute to this heterogeneity, and they will be discussed along with the next sections in further detail.

2.4.1 *Warranty & Service Contracts*

By the time the equipment is sold to the client, this service is formalized by a mutually agreed warranty or service contract. All the aftersales strategy is influenced by the agreed terms of the warranty or service contracts, the customer base and the type of product that was sold (Cohen, 2006). The literature identifies various theories regarding the definition of warranty contracts. The exploitative theory states that the terms of a warranty contract are defined for services provider advantage. The signal theory holds the view that by providing a warranty contract the manufacturer shows precise signals of product reliability (Spence, 1977). Priest (1981) defends the theory that the warranty can be viewed both as a maintenance contract and Insurance policy.

In practice are evident two different types of warranty contracts: Replacement contracts where the service provider agrees to replace and repair (Free of charge) any part or some specified parts of the product that get damaged during the agreed period. Rebate Contracts where the service provider decides to refund a specific amount if any part gets damaged before a previously agreed date after the purchase (Blischke, 1994). The standard base warranty is necessary for the sale of the item and is usually included in

the cost of the equipment. Also, some manufacturers offer the possibility to extend the warranty period exceptionally on the moment when the material is purchased by an additional cost or later on, the option of service contracts (Maintenance contracts) by charging a yearly service contract fee (ibid).

2.4.2 Geographical Distribution of Customers

Usually, the clients are dispersed through a geological area. If the warranty or service contract guarantees on-site maintenance service, that such dispersion outcomes in different travel times and transportation costs for each client, the variation of the price on this contract might be significant if the deal promises a fast response to the client. This geographical dispersion might represent a big price difference in spare parts distribution Cohen and Agrawal (1999).

2.4.3 Spare Part Criticality

The criticality of a demand request may originate from the engineering related characteristics of a specific part and related machine model. Process criticality is related to the outcome of the failure; for example, the downtime resulting from a part failure in a machine. It is usually challenging to determine the downtime cost of the machine, but it's expensive enough to justify having a minimum stock of spare parts to minimize the costs of having non-productive equipment. The part's criticality for the general machine's accessibility additionally presents different reaction time prerequisites for every one of these machine models. We can think about that relying upon the criticality of the part we can have various lead times for fixing it. The variance in the criticality of the spare parts also introduces different response times for each of these different models. As so, depending on the criticality of the part, the repairing times and spare parts lead times can be different (Kennedy,2002).

2.4.4 Slow Moving or Sporadic Demand

Spare parts logistics often have to deal with slow moving or intermittent demand patterns for spare parts. These facts represent a big challenge for the after sales management, as the demand patterns are hard to predict (Snyder, 2002).

As the stock turnovers are low, it is essential to have optimized stock management to have the correct positioning of stock units throughout the service network (Cohen, 2006).

2.5 Maintenance

The two main types of maintenance policies discussed in the academic and practice literature are Preventive Maintenance and Corrective Maintenance.

Corrective maintenance is usually viewed as the firefighting approach of the maintenance service. This theory states that equipment should run until failure. When some failure or malfunction is detected, then it is repaired or replaced. The repair time of the machine is high and can cause a significant loss in production. Also, the repair costs can be significantly higher compared to other maintenance policies. On the other hand, preventive maintenance policies are the strategy of performing maintenance actions before the actual failure occurs, such as preventive repair or replacement of wearable parts, lubrication routines, inspection, and diagnostic check-ups. This policy is based on reducing the downtime and repair costs as well as increasing the reliability of the equipment (Venceslau Correia, 2019)

2.5.1 Performance measurement in after sales service

There were identified a few KPI that measures the aftersales performance:

- **General Costs:** All the costs that contribute to the overall after sales cost, for example, shipping costs, stock management costs, transportation costs, repair costs.
- **Total Revenues:** All the revenues generated from after-sales services such as Spare parts sales, Service contracts or warranty extension fees and customer support incomes.
- **In-field Assistance and Repair time:** In-field assistance time determines the time required for the technician to arrive at the customer's facilities. The repair time specifies the time taken by the technician to complete the repair service.
- **First Time Repair:** This service measure determines the validity of the repair job performed by the technician.
- **Maintenance Engineer idle time:** Time used in planning the human resources for after-sales maintenance services.
- **Fill Rate:** Measures the availability of the spare parts in the inventory. Also determines the stockout ratio.
- **Parts Delivered on-Time:** This indicator measures the number of spare parts delivered within the expected lead times. (Cohen and Agrawal, 1999)

2.6 Strategy for After-Sales Management

At the strategic level, a company is concerned with the decisions that involve after sales service strategy. Usually, these changes affect long term decisions that are typically associated with very high costs on short notice.

2.6.1 Maintenance service // Territory design

Dividing the service area into sub-regions and allocating the required service resources to get a balance between the overall costs and the quality of the service offered represents one of the most important and challenging decisions faced by the aftersales managers. Usually, the service area is divided into service regions that can also be divided into sub-territories, that will have allocated a technician responsible for the maintenance of all the machines located in that territory (Candas, 2007).

The sub-regions or Service territories are usually organized by country, region, geographical boundaries such as rivers or mountains and customer distributions. Transportation costs and time represent an essential role in the design of service territories (Simmons, 2001).

2.6.2 Spare Parts Distribution Management

It is belief that the spare parts should be strategically positioned throughout the regions to easily supply spare parts to the customers in case of emergency.

Four spare parts logistics networks are very often used in practice:

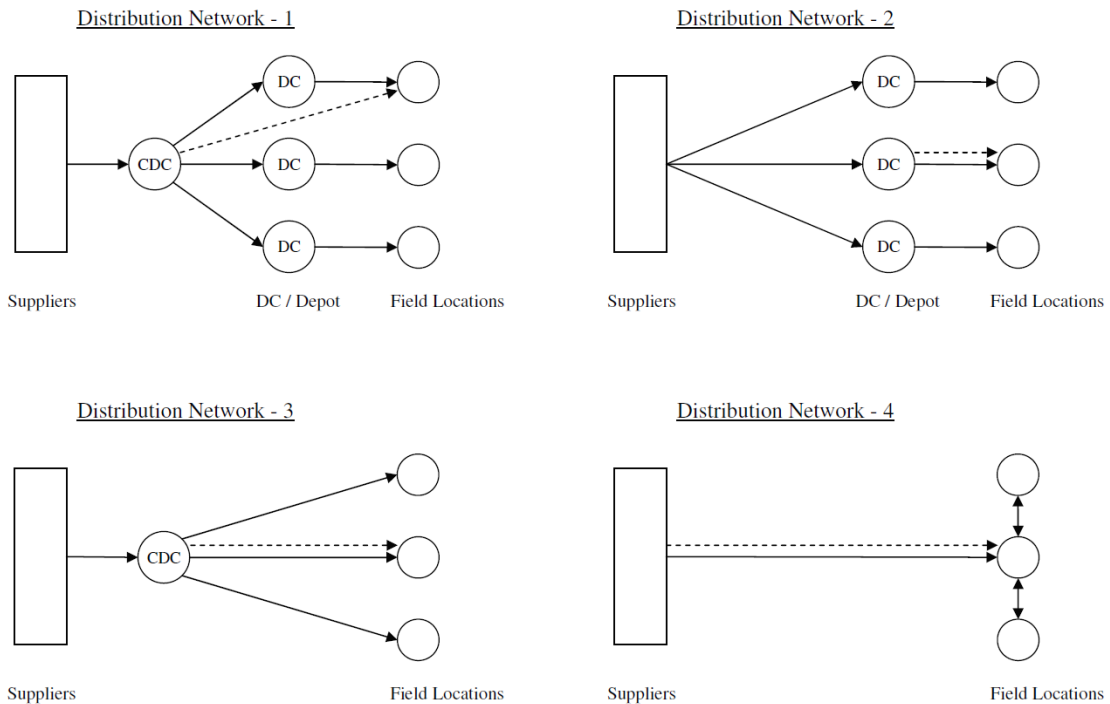


Figure 3 - Spare Parts Logistics Network; Source: Cohen and Agrawal, 1999

In the *Figure 3* it's possible to find multi-level structures that have Central distribution centres (CDC), several Distribution centres (DC) that supply different field stock locations (FLS), but also network where the suppliers distribute directly to the (FSL). The function of DC and CDC is to supply FLS faster on emergencies (Cohen and Agrawal,1999). If the company's strategy is to provide infield assistance, then this topic is not essential as there is no distribution of spare parts. On the other hand, spare parts, when requested by the customer, have usually strict and short deadlines. To fulfil the customer's request, it's required a responsive and cost-efficient spare part distribution network. Are frequently observed various transportation modes, both slow (truck, train, cargo ship) and Fast (taxi, airplane, and courier), (ibid).

2.6.3 Information management in After-Sales service

The correct use of information about the customer is considered an enabler for better performance in after-sales services, Vigoroso, M., (2003).

As a result of frequent customer interaction, the service provider is capable of adapting its services to meet the expectations and requirements of the customer base. Two primary tools allow the service provider to manage the customer information correctly: (IB) Installed Base that contains the customer location information, service agreements, parts, machine type or model, and (CRM) Customer Relationship Management that includes customer contacts, purchase history, specific client characteristics. this data can be used to obtain more precise costs and design a customer service strategy that will benefit both parties (Oliva and Kallenberg, 2003)

Methodology

3 Methodology

The proposed challenge required participation in the company's processes and functions as it was a problem inserted in the industrial business context. Thus, the action-research methodology was used, where the researcher actively participates in the action.

This methodology can be defined as “an approach in which the action researcher and a client collaborate in the diagnosis of the problem and in the development of a solution based on the diagnosis” Bryman, A. & Bell, E. (2011). In other words, one of the main characteristic traits of action research relates to collaboration between researcher and member of organisation in order to solve organizational problems.

A variety of forms of action research have evolved (Carr & Kemmis, 1986). All adopt a methodical, iterative approach embracing problem identification, action planning, implementation, evaluation, and reflection. The insights gained from the initial cycle feed into planning of the second cycle, for which the action plan is modified, and the research process repeated

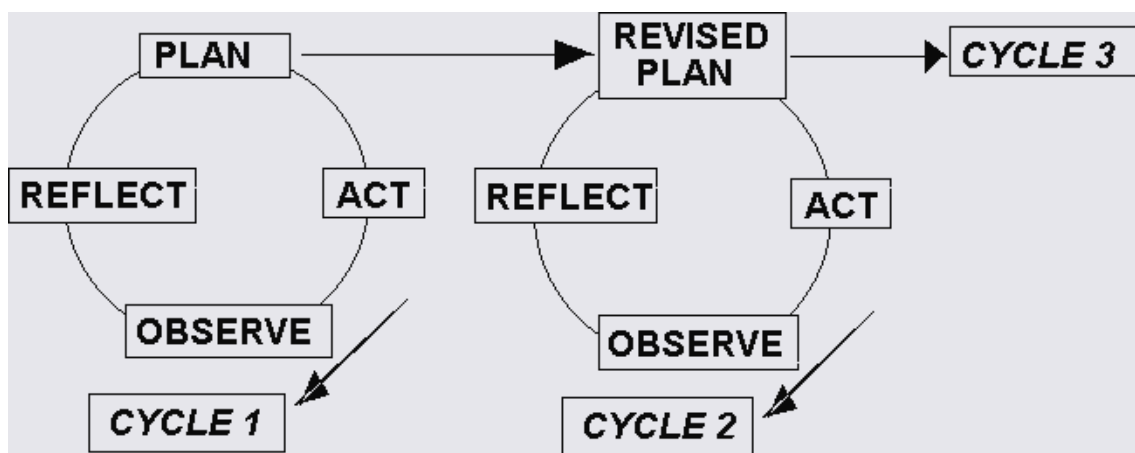


Figure 4 - Action-Research Methodology (Kolb 1984)

The starting point for developing a new strategy of after-sales for PERUZA was to diagnose possible issues in the current After-sales strategy. The first phase of the internship was mainly understanding how the current process was and what the working methodology of the company is. In order to better understand the process, many visits to customers were made as well as some time spent in each different department of the company to obtain a general overview of the company's ideology and work methodology. To support the information obtained, some process flow diagrams were used as well as other tools to consolidate all the data.

On a second phase, with all the process understood, it was carried a survey to both customers and competitors, to understand first what is the feedback from the current after-sales process, by other words, what do the customers think about the quality of the after-sales service offered by PERUZA, and secondly how PERUZA stands in comparison with similar manufactures regarding after-sales services offered and revenues resulting from the After-sales activities.

In order to obtain answers for the survey, the top 100 customers was contacted individually and for the survey associated with competitors, 50 companies were contacted as well.

On the third phase, with all the relevant information obtained and with extra knowledge acquired through literature research it was possible to develop an improvement action plan that could be implemented. That action plan was supported with technical analysis to the equipment as well as some experimentation in different fields of After-sales. Thus, together with the technical information and the feedback from suppliers and customers, an improvement proposal was developed and presented to the department responsible, for further analysis and approval.

Finally, with the proposal approved, some improvements were implemented and tested, like creating pilot projects and offering the first maintenance contracts to the customers. With all the feedback the solutions were discussed and evaluated, and the process was implemented.

CASE OF STUDY

4 Case of Study

4.1 Introduction of the Company

PERUZA was established at 1991 by experienced engineer Mr. Arnis Petranis, It's located in Riga, Latvia. It has more than 25 years of experience in 20 countries around the world and more than 1500 successful projects. PERUZA is the preferred supplier of fish processing systems to the industry by meeting each customer's individual requirements. Its products reduce workforce efficiency loss. It will be fast payback time and easy operable.

The main target of this company are the companies that process or distribute Pelagic fish (Small fish such as Sardines, Mackerel, Anchovies, Herring and others). As mentioned in the previous chapter, PERUZA is one of the world leaders in the production and manufacturing of equipment and process lines for this specific type of fish industry. Lately the company is innovating and trying to enter in different markets, such as the market of logistics and automatic palletizing and depalletizing lines as well as new robotic pilot projects for various purposes.

Currently PERUZA is focusing on standardizing the equipment, reducing the number of customized machines, as it makes very difficult the process of managing all the information.

The company doesn't do all the process indoors, as the strategy consists in doing the engineering, design and assembly/welding indoors and outsource the rest of the operations, such as Laser cut, bending, Complex machining and Programming.

The board of the company is built by 82 people that are divided in 2 big sectors, the operational and the administrative sectors. The operational department is built by welders, machine operators, Electricians and Mechanics. The administrative sector includes the Sales department, the Project manager Department, Engineering Department, Financial department, Procurement and Stock management Department and finally the Administration.

PERUZA is characterized for being a medium size small/medium size company.

The company is located in an industrial region on the suburbs of RIGA. The main building on the ground floor contains the storage and production plants, the first floor has 2 meeting rooms, one big and one small, one room for the sales department, 2 rooms, one for each of the chairman's of the board, 1 room for the financial department and a big open office where the project manager, design engineers and production managers are located.

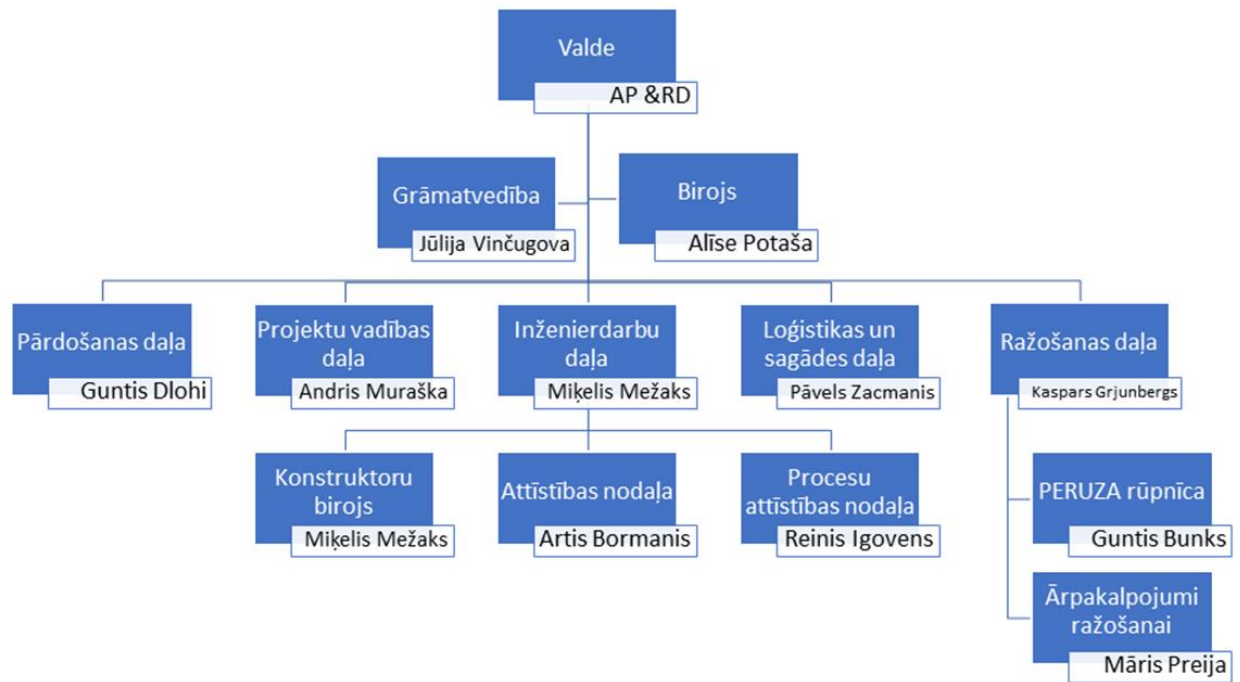


Figure 5 - PERUZA's Organigram



Figure 6 - PERUZA's Company Logo

4.2 Case of Study

PERUZA has been developing a lot the fields of work and improving the quality of their products and services, but there was one field that was forgotten, as it was not priority that was the field of After-Sales. PERUZA knew that after-sales should be improved but was delaying it as the focus was in developing new projects and not missing the scheduled delivery dates with the clients.

In 2018 when the research for possible companies interested in having an intern focused on developing or improving any kind of field related with industrial engineering started, PERUZA manifested interest. The proposal was to research and develop all the after sales system of the company, aiming to improve the trust and loyalty with the existing and upcoming customers, as nowadays after-sales and customer support can be the competitive advantages that can play an important role when the customer is choosing the supplier for their equipment.

The internship had a total length of 5 months, period where I was focusing on this on this project 40h per week.

In the following chapters, it will be explained how the after sales process was by that time and what were the resources that the company had.

4.3 Current State of After-sales

The first step was to make a research about the current aftersales process that was in force and understand what the condition of the system was and understanding the areas where I will have to work and improve.

After some research it was possible to identify the current problems and future opportunities of improvement.

There were identified multiple problems in different areas of the after sales process, that will be described during this chapter.

4.3.1 Information Management

The issue identified related with the information management, was the existence of multiple sources of information regarding client profiles, purchase history, Contacts, Warranty dates, etc, that were not interacting with each other and were lacking or containing double information.

There were available 5 sources of information: Excel file, Pipedrive, Axapta and recently they acquired Odoo, as well as the server folder where they save the project files, with the technical information and administrative documents of each purchase order.

4.3.1.1 Excel File

The purpose of this document is to register the purchase history of the ongoing and completed projects, containing valuable information like Delivery dates, Warranty expiration dates, Quantities and types of equipment sold, Project numbers and Serial numbers.

After going through this file, it was clear that there were a lot of issues with finding the information you need, as there were no criteria in inserting the data the process was manual and didn't have any restrictions. The name of the customer or the equipment could be written in many ways, that when researching by the original name, some information was not appearing. It was also common to find missing information about some projects, that was valuable to understand the client profile and equipment owned.

4.3.1.2 Pipedrive

This software is used to manage and keep track on the sales matters and keep important information about the clients, such as, historic of emails and calls as well as failed and successful deals. Also, all the possible future customers are registered on this system, and when the profiles are well created it's possible to get a clear search and easily access the information we need about contacts and sales.

Regarding this software, there was a specific problem encountered, although it was functioning well and it was a valuable help for the sales tasks and management, there was missing a lot of information regarding the client contacts. It was possible to find 4 different contacts in one company profile, with both name and number, but the position of each of them was lacking, which means that when it was necessary to discuss after-sales or technical issues with the client it was impossible to know who was the appropriate one, ending wasting time questioning project managers about which one would be the best person to contact. It was also common to find companies with only the name and without any contacts or other valuable information.

4.3.1.3 *Axapta*

This major ERP system is the brain of all the company's information. It connects the Project management, with the procurement, with the after-sales and Stock Management. Everything that exists indoors or that goes in or out of the company must be available in the database of this system. In theory that's how it should be done, but practically it's not how everything was working during the time I was in PERUZA. Multiple problems were identified, some because of software limitations others because of wrong use.

The first problem identified was the poor system of labelling and identifying the equipment and parts. Everything that was manufactured didn't have an Axapta code, but only a project code, everything that was just purchased had only Axapta code. From the project codes it was impossible to identify the parts as the only information available was the description (that was not always understandable) and the components and materials used to manufacture it. This made almost impossible the task of identifying the parts requested and purchased by the client.

Also, there was not a logic way of creating the codes, every time a new part is inserted in the system, an automatic sequential code is generated and added to this specific part. Due to this fact it was impossible to identify the family or subfamily of the part only by reading the code, delaying the process of search and identification of the required parts. Axapta contains a lot of double information that is already available on the excel file, the problem is that none of it is fully complete and updated, so sometimes it is necessary to search in both the same thing, to be sure that the information collected is reliable or not, as any of it can contain misleading information that can cause really big troubles. Another problem that was identified was the fact that the process of creating quotations or invoices directly from Axapta was not an automatic process. The software didn't allow to automatically create a quotation based of the parts required by the client, it was only used as a data base to consult the price and input the data manually on an excel template.

4.3.1.4 *ODOO*

This software is a free to use and totally customizable ERP system, with access to multiple apps and extensions online. By being customizable allows the user to tailor the software to match their needs and make it easier and faster to use. It allows to manage projects, record production process times, register sales, manage spare parts, create automatically invoices and more.

By the time I arrived this software was already operating for 3 months and it was in a very experimental period.

The Idea of this software is to substitute all the other means of information, avoiding double and/or misleading info and optimizing the management process.

4.3.2 Spare Parts Management

Regarding spare parts management, multiple problems were identified, some were already described before, other because of bad process flows or wrong ideologies about after sales.

Since most of the equipment that is manufactured in PERUZA being customized to client's needs, the process of managing the spare parts becomes a very hard task to perform in an effective way. The fact that every equipment is similar but at some stage has some differences in dimensions or specifications blocks the possibility of creating a spare part package for each model or each equipment. Also, it's not economically viable to keep stock of all kinds of spare parts, as the variety is so much that it would involve big investments in parts that can be used exclusively by a specific clients, and would be taking valuable stock space in our storages and might never be needed.

This issue is very common in small size Original Equipment Manufacturers (OEM's), tailoring the products to fit customer profile becomes big competitive advantage when comparing with companies that produce standardized equipment. The consequences regarding management of a company with this ideology are very significant at a later stage when the number of clients and equipment manufactured is big and the parts differ between them.

Although the machines have differences in the parts that they use, the system and functionality and composition is the same between them, which allows to make a study about what are the most wearable parts of each type of equipment. The problem is that there was not a study made about that, the information was collected and stored but not analysed. As result of that, it was noticed that there was not an active sale of spare parts, just simply a response to the client complains and requests. The income provided by active sale of spare parts can represent a big percentage of the total price of the equipment and helps to develop a more trustful relationship with the client and of course, reduce the lead times for supplying the parts needed and as consequence reducing the down times of the equipment. As mentioned previously, the diversity in the parts used in machines of the same type together with an absence of a study of most wearable parts results in massive lead times that can create very big production losses to the clients when having a maintenance issue.

Some other issues regarding the process of supplying spare parts were identified. The process was confusing and not continuous, resulting in higher costs, downtimes and lead-times.

The process starts with a complain / request from the client, usually the information is not enough or due to the lack of information in the user manual or because the qualification of the workers of the client's company are too low to identify the problems independently. If the information is enough the after-sales responsible analyses the request, researches the machine in our server, finds the responsible design engineer asks opinion, comes back asks stock manager or procurement to order the par or

production to manufactory, sometimes the order is waiting for more than 3 days just because of low efficiency, as soon as the part is requested the after sales responsible makes the offer and sends it to client, the client approves and must pay before, then as soon as the part is ready, the shipment offer is made and sent to the client and the part is delivered after the client's payment.

There are a lot of problems, due to missing information in the server, like missing drawing files or other project information, dependency in information from other people that are not always available and taking their time means losses, and inefficient invoicing methodology and communication with client. One positive aspect is the existence of region representatives, that facilitate the communication with the clients and can provide faster support if needed, when we are dealing with customers across the world.

4.3.3 Customer Communication

The efficiency and quality of the communication I halfway to get a more trustful and happy relationship with the customers. The fast and objective reply may also improve significantly the time spent in identifying the issues and in consequence reducing the lead times.

The communication with the client improved a lot since an employee was contracted to assume the communication with the client, regarding warranty and after-sales issues, but due to the poor organization previously, the clients are still confused about who to call or write in case of a warranty or maintenance situation.

Once again, the fact that not all the customer contacts are correct or complete in our software, sometimes simple tasks that could have been resolved in little time, took long times just because of spending too much time in understanding who to call and who has the contact of that responsible person.

The exchange of technical information is very confusing sometimes because of the way it is provided. There are several options, some clients want a Paper user manual, some want a 3D exploded view file, some want a PowerPoint and it becomes a confusion when you must manage and understand multiple types of ways of exchanging technical information.

The website does not contain a specific page or separation specifically for after-sales, which makes it even harder for the client to understand who to contact, and what kind of services we provide and so on.

4.3.4 Service Management / Customer Support

The services provided to support the customer in after sales issues were not a big asset for PERUZA. The after-sales services provided were mainly, spare parts supply, diagnostics, and rarely spare parts replacement. Also, the client who purchases a new equipment has a warranty period where PERUZA covers the costs of the damage of parts that would fail due to technical mistakes of manufacturing.

Together with the installation of the equipment a small staff training is provided in order to explain the functionalities of the machines to the operators and give some advices and tips for working and keeping the machine well maintained. However, this training is usually not as useful as the client is too excited about the new equipment that does not pay attention or it is not even interested in maintenance information about the equipment. Also, after visualizing current maintenance issues that happened because of wrong use of the equipment made us realize that, that small training might not be enough.

As mentioned before, the after-sales support consisted mainly in just responding to client requests, but that's not enough for accompany with this dimension as PERUZA. Regarding this topic it was noticeable that there was no preventive maintenance services ever registered, the organization of the schedules of assistance was very poor, the maintenance team was only one making all the system not as efficient and profitable as it could be.

The process of pricing was very confusing, there was not a fixed price table that indicates the hourly price of each activity, the price of transportation and the profit margin of the sold spare parts. As the prices were not previously studied or evaluated appropriately, it resulted in client's dissatisfaction.

The active sale of after-sales service was left apart as the main focus was in demanding the equipment requested on time with the best quality, but the support to the client was always a secondary interest and something that should have been present through all the process of producing and selling the machine.

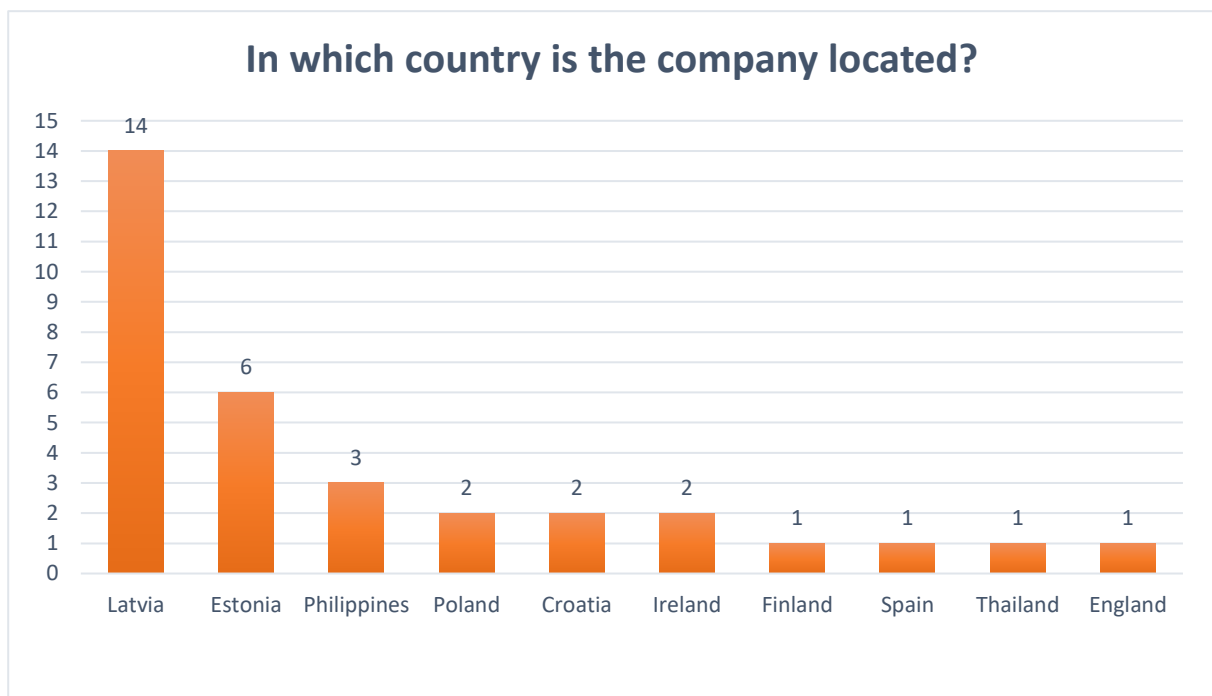
After 1 or 2 years of warranty, the equipment required minimum 1 or 2 general preventive maintenance check-ups or interventions, and as that service was not offered, the amount of issues and demand of spare parts was so big, that we couldn't supply it all in time, and once again resulting in big downtimes that mean big losses and costs for the client.

After identifying all the previous problems and mistakes, it was possible to clearly understand that the After-sales was completely forgotten for the las years, and fast changes should be made, to improve the relationship with the client, and increase the productivity and efficiency to both, client and supplier, generating more profit for both parties.

4.4 Customer Satisfaction Survey: How the customers evaluate the After-sales Service provided by PERUZA?

Initially, to support the proposition of implementation of the improvements in the after-sales process of PERUZA, a Satisfaction survey was carried out, see attachment II. The aim was to understand from the client's point of view what is their opinion about the after-sales products and services offered and in what PERUZA can improve. This research was sent to PERUZA's Top 100 clients, from which only 64 were contacted due to multiple handicaps as missing contacts or unavailability or lack of interest, and from these total, only 33 answered and submitted their response. The survey was available for a period of 1 month from 04/03/2019 until 04/04/2019, by means of a structured questionnaire from google forms that was sent to the interested clients by email. The responses from 10 different countries contributed for obtaining a worldwide view of the quality of the after-sales services.

Figure 7 - Answers per Country



On the (Figure 7) it is possible to understand that the majority of the answers were from customers located in the Baltic States.

This result was expected as PERUZA has the majority of the clients located in those areas. As mentioned previously only 50% of the contacted costumers submitted a response to the survey, which already indicates that after-sales and maintenance is either something not important or interesting or the knowledge about it is too low to understand its importance.

Philippines are the second biggest market where PERUZA's equipment are present but due to the lack of knowledge and technological resources most of the companies couldn't respond to the survey.

In this way, when asked to rate the after-service, from a general point of view, the customers answered:

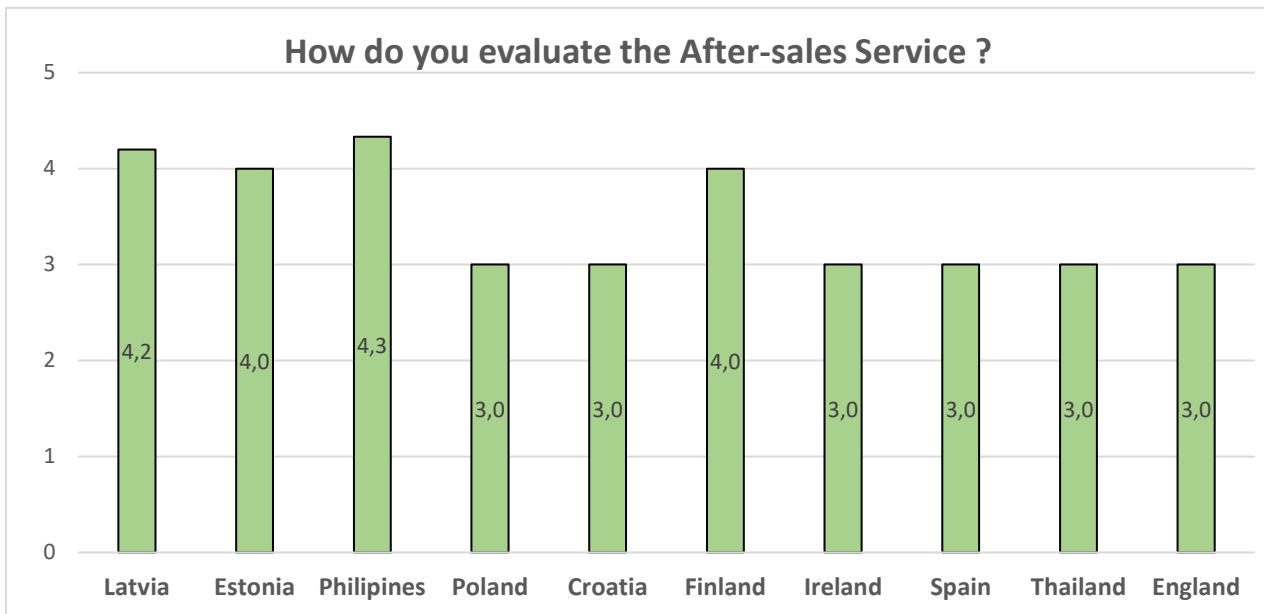


Figure 8 - After-Sales Service Evaluation

As shown on the (Figure 8), the evaluation is positive in general with a global average of 3,5/5, with a maximum of 4,3/5 from Philippines and a minimum of 3,0 from Poland, Croatia, Ireland, Spain, Thailand and England. From this graphic it is possible to conclude that the clients are neither very satisfied or very unsatisfied with the quality of services provided by PERUZA, but it is clear that there is still a big margin for improvement, turning after-sales in a big competitive advantage and increasing the happiness and improving the relationship with the client.

The following question of the survey was focused on understanding the level of satisfaction the clients have with the offered prices for the required services. When questioned to evaluate the after-sales prices, the customers answered:

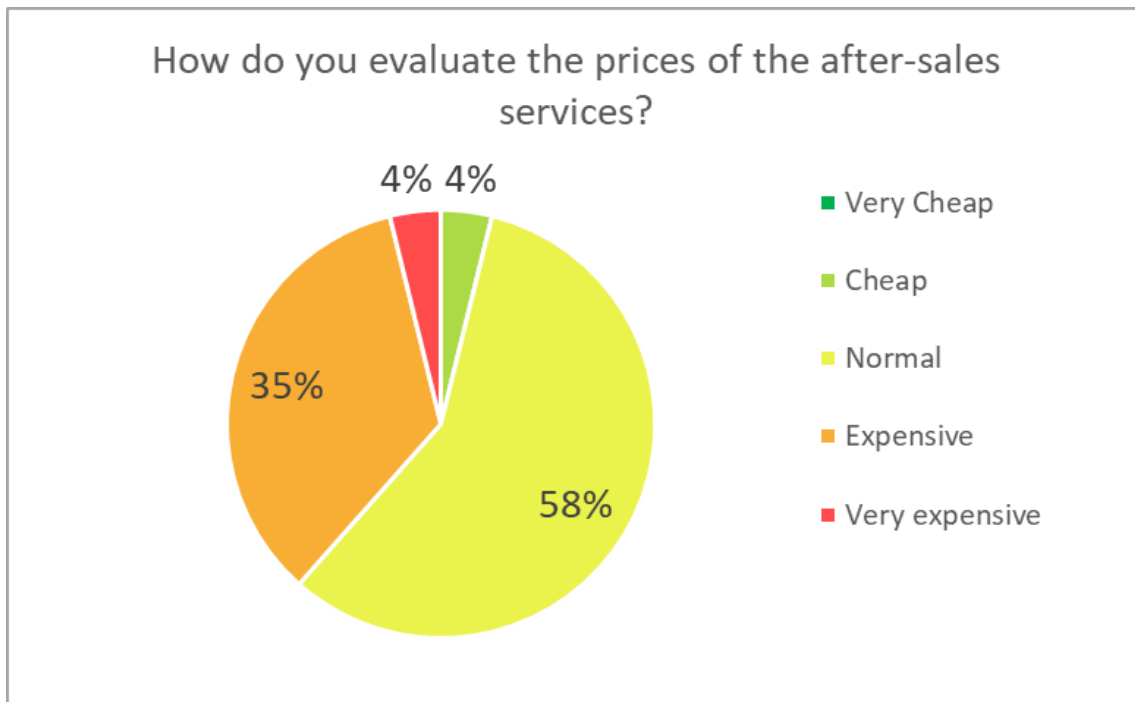


Figure 9 - After-Sales Price Evaluation

According to the (Figure 9), the majority of the customers, 58%, consider the prices offered normal when comparing with the expected prices of the after-sales services and 35% considered the prices expensive. Only 4% of the participants considered the prices very expensive and 4% very cheap. From this data it is possible to conclude that the price level might be a bit higher than the expected, this conclusion might be the consequence of the problems previously identified regarding the inefficient and unorganized pricing process of the after-sales services.

The next question available on the survey requested the customers to evaluate the lead times of the spare parts delivered to their facilities since the request was processed until the part was successfully delivered to their location, and the answers were the following:

How do you evaluate the lead times?

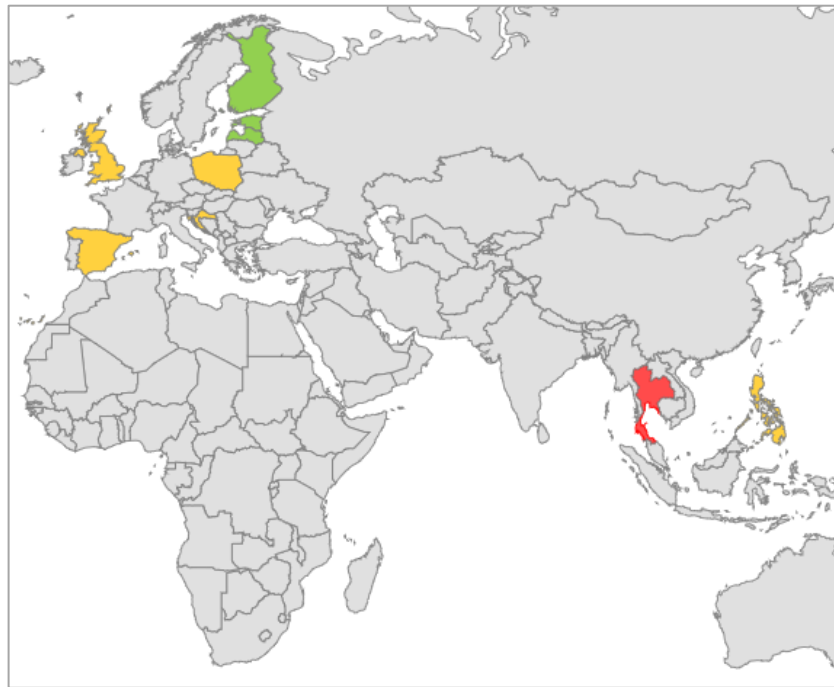


Figure 10 - Lead Time Evaluation per Country

The (Figure 10) shows the evaluation of the lead times per country, in a color scale represented in a world map. The red color represents a negative evaluation, the yellow color represents a neutral evaluation and the green color indicates a positive evaluation. The customers located in Finland and Baltic States are very satisfied with the lead times, and the other countries located in regions far from Latvia don't share the same opinion about the lead times of the spare parts. These results were expected, as there is not a designed and optimized spare parts supply chain that guarantees short lead times of spare parts supply in countries that are in regions far from Latvia. Also as mentioned on the previous chapter, the process of spare parts management has problems that must be solved in order to improve the response and spare part lead times. The most satisfied country was Latvia and the least satisfied one was Thailand. It's important to mention that the big lead times sometimes result from customer mistakes and delays in providing the necessary information for PERUZA to quickly identify the correct parts to supply.

Staff training was one of the few after-sales services offered by PERUZA. The following question had the objective of evaluating the quality of the staff training provided to the customer right after the installation of the purchased equipment. The answers were the following:

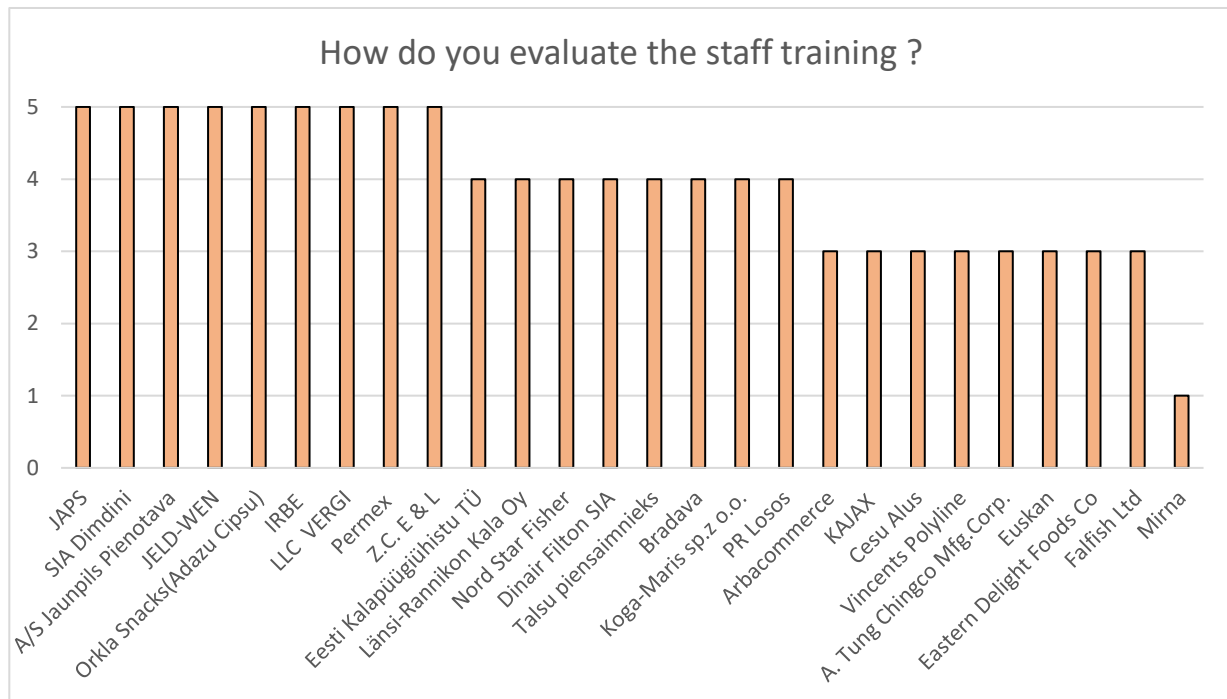


Figure 11 - Staff Training Evaluation

As shown on the (Figure 11), it is evident the satisfaction of the majority of the client as the average evaluation is approximately 4 out of 5. Even with a good evaluation of the staff training, some reports were made stating that it was good but not enough time to prepare the workers good enough to run the machine safely and efficiently. This opens an opportunity for improvement that could bring extra income for PERUZA and reduce the number of reported malfunctions and break downs resulting from misuse of the equipment or lack of care in the equipment maintenance. Many companies do not have maintenance teams responsible for keeping the equipment clean and supervised, in this case the operator of the equipment is in charge of the equipment maintenance and most of the times this task is ignored and the machines are running days without a single stop for cleaning. In these cases, it would be recommended to have a specific maintenance training to aware him of the risks and importance of keeping the equipment well maintained.

The communication is a very important aspect in the relationship with the client and the efficiency in troubleshooting. Two questions were available on the survey that aimed to evaluate the quality of the communication, and identify the best method of exchanging technical information:

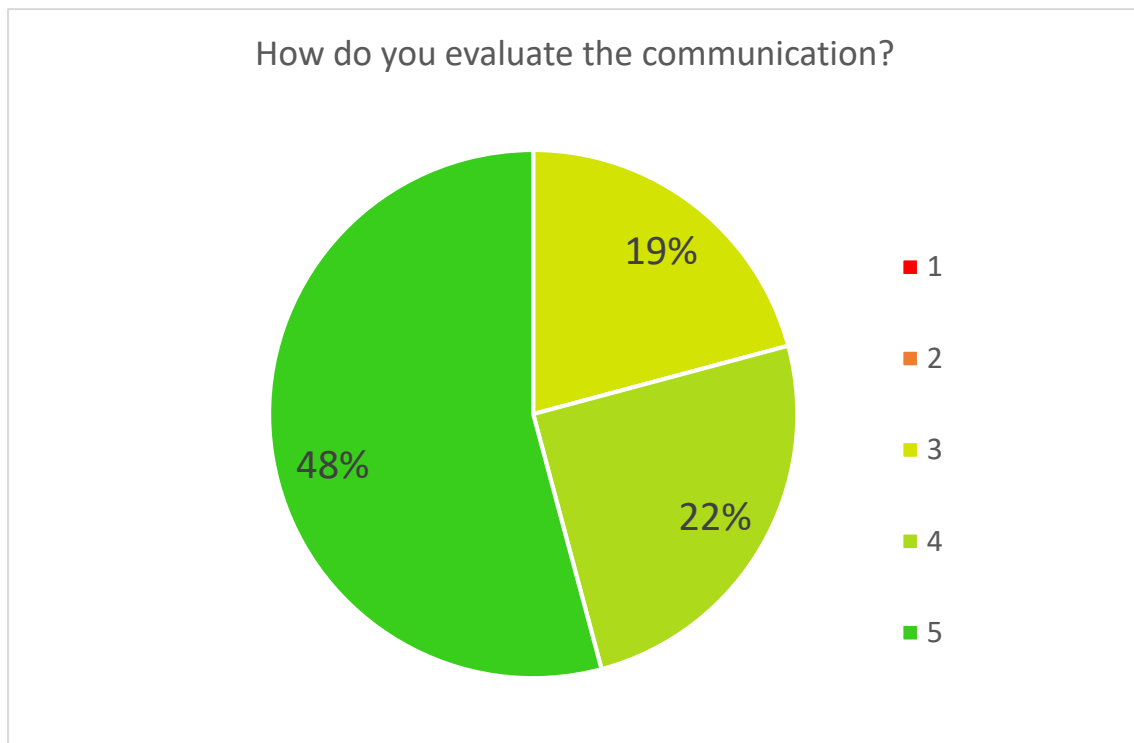


Figure 12 - Evaluation of Communication

The (Figure 12) shows that the communication is very well rated, and this result is due to the fact that PERUZA in early 2019 contracted an employee to manage and respond to the client's requests regarding the after-sales issues. This change improved response time and consequently the trust with the client, as they knew that PERUZA had someone always ready to respond as fast as possible to their needs. Some companies still commented that the exchange of technical information could be improved because sometimes the methodology used it is not the most efficient.

Thus the next question of the survey aimed to identify which is the method that satisfies the big majority of the clients;

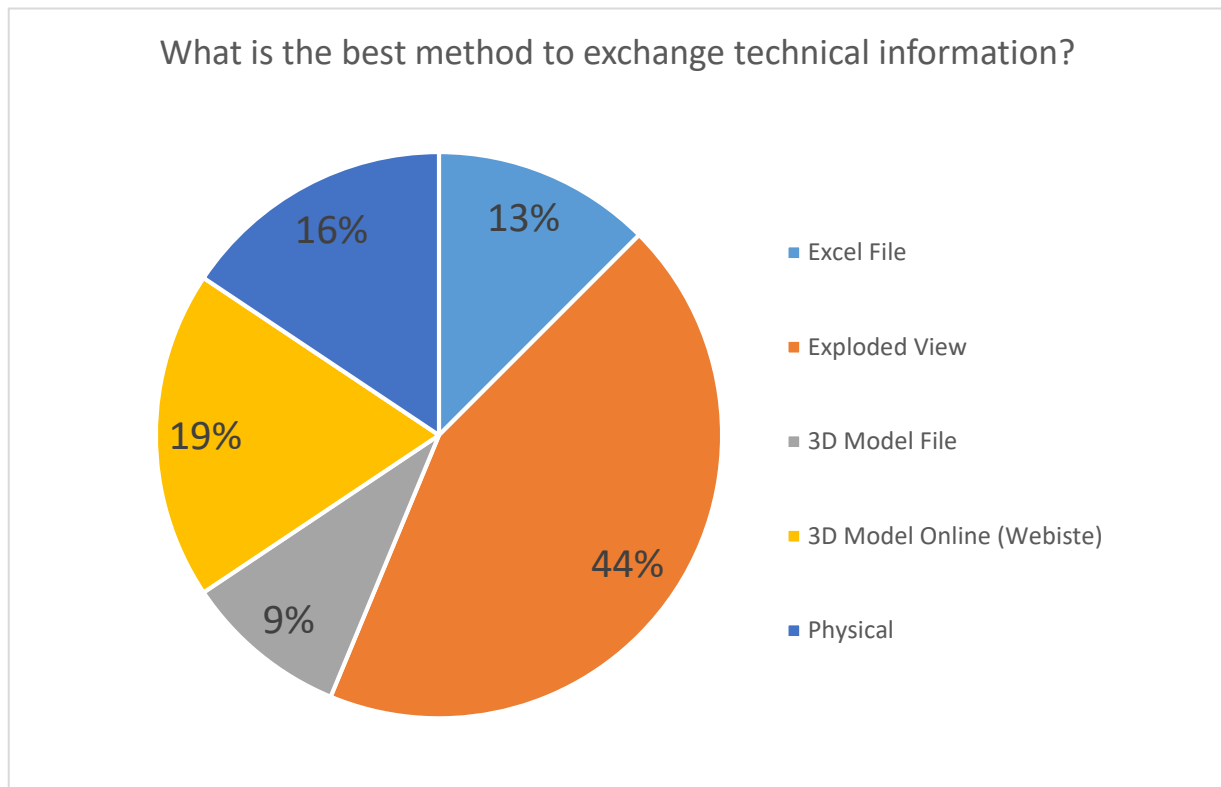


Figure 13 - Technical Information Exchange Method

The (Figure 13) shows multiple answers that represent the wide range of options PERUZA has offer regarding the exchange of technical information. On the one hand it is great to have such a variety of possibilities because it can serve almost all the client's intentions and expectations, on the other hand it raises problems when managing all that information. The aim of this question was to find out what is the option that fits most of the clients and define a single way or methodology of exchanging that information. Almost half of the customers that answered the survey selected the exploded view as the best way to identify and diagnose damaged parts, followed by the 3D model of the equipment. Internally the 3D model option would be the best option as it doesn't require any extra work, while the first option requires extra working hours to develop the exploded file. Some companies in underdeveloped countries, prefer the paper version, as not every factory has access to computer or knowledge to work with 3D files.

The last question from the survey aimed to understand if PERUZA's customers were interested or not in having After-sales service agreements, and if yes, what kind of features they would like to have in it:

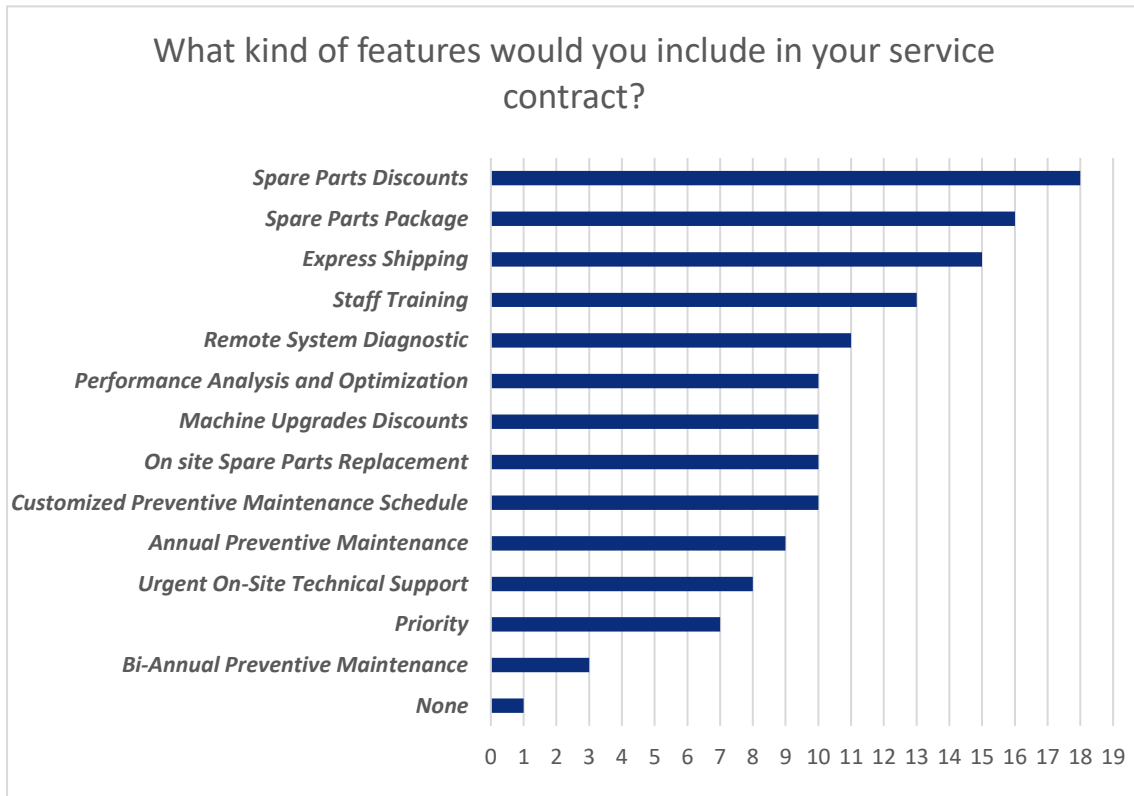


Figure 14 - Services Available in Service Contracts

In the (Figure 14) it is possible to view many different features that could be part of an after-sales service agreement. The most rated ones are directly related with spare parts, spare parts discounts and packages of the most wearable parts from each equipment.

4.5 After-Sales Statistics Analysis

As the complexity of the systems and equipment improves, the assistance required to keep that systems well-functioning must improve as well. This creates the opportunity to increase the revenues generated from after-sales services.

In order to understand how PERUZA can improve the after-sales revenues it was necessary to first analyse the current situation. The following analysis was based on data collected from previous years that was available on the server and ERP systems:

Table 1 - Revenues and Expenses from After-Sales Services

| Repairs | | Warranty | |
|---------|-------------|----------|-------------|
| Year | Revenues | Year | Expenses |
| 16.RE | 43 340,93 € | 16.GD | 16 348,47 € |
| 17.RE | 76 943,05 € | 17.GD | 29 470,51 € |
| 18.RE | 14 169,66 € | 18.GD | 59 484,75 € |

The (*Table 1*) shows how variable the expenses and the revenues can be, it is explained by the fact that there is no active sale of services, so the demand depends only from client's requests and complains. The warranty expenses were much higher in 2018 because a new market segment was introduced, and multiple new projects were designed and manufactured. During this year the focus was mainly on developing new lines and equipment for logistics and pallet transportation as well as automatic palletization and depalletization resulting in a small revenue from after-sales services. At first sight the warranty expenses seem to be quite high, but when compared with the total gross yearly revenue of that year, it represents only around 2%. On the other hand, the revenues generated from after-sales services could be much higher as they also represent only 2% of the total revenue of that year.

4.6 Current After-Sales Process Flow Diagram

The process diagram is a very important organizational tool that indicates the general flow of plant processes and equipment. The diagram can be designed in many ways using different symbols and structures, but all of it aim to make the process more efficient and precise, avoiding delays. It is also important to mention that when a process is standardized and the diagram is designed, every employee knows exactly what tasks they are responsible and makes the adaptation process easier as well.

During the first month of the internship going through the process of understanding the after-sales process was the initial step and one of the essential tools to get to understand it better was the After-sales and customer relationship management process flow diagrams. The process flow diagram from the after-sales department that was being used by the time I arrived PERUZA was the following:

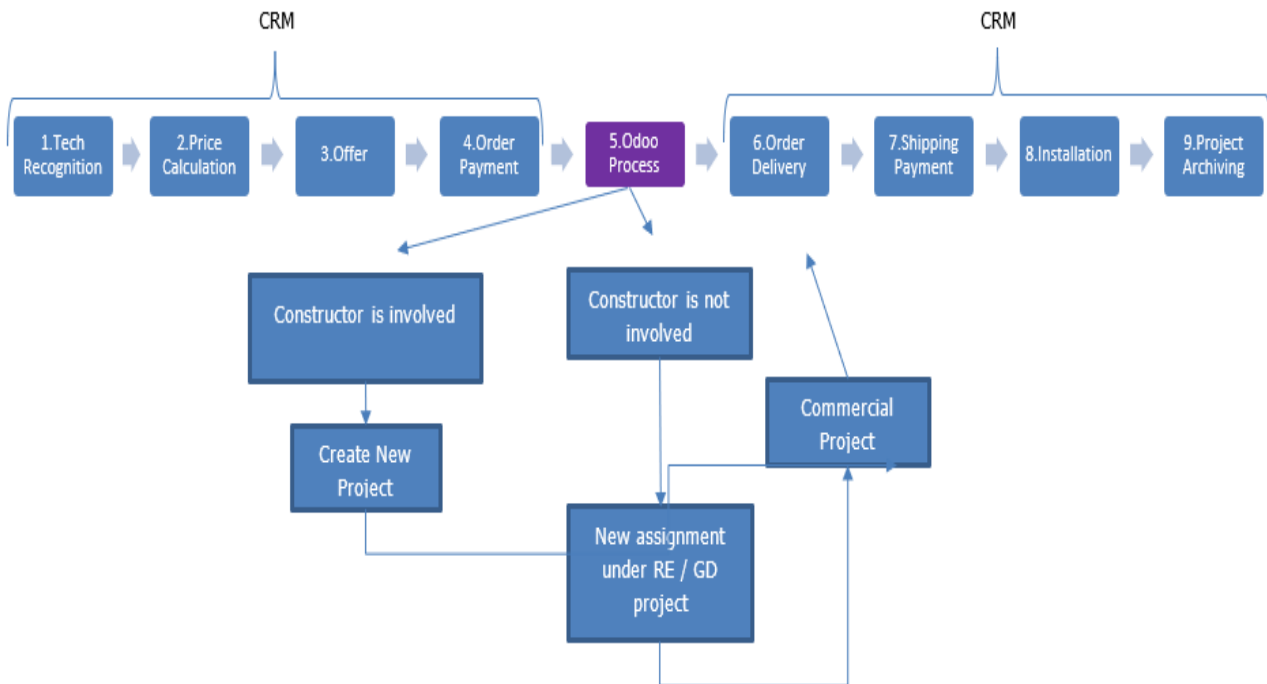


Figure 15 - First After-Sales Process Flow Diagram

The (Figure 15) illustrates the flow of the after-sales process that was in force by the time the Intern arrived PERUZA. The first impression from this process was that it seemed organized and easily understandable, but it lacked of information and only mentioned the process of replying to the customer requests.

As mentioned in the previous chapter, the only after-sales activity that was practiced was the response to client's requests and complains. This explains the simplicity of the diagram.

The first step consisted in making the technical recognition of the issue reported by the client. During this step the after-sales manager gathers enough technical information to diagnose the issue and define a solution for it. Followed is the internal price calculation, where the manager requests quotation to the suppliers when the part is purchased or request quotation to production when the part has to be manufactured internally. Immediately when the quotation is completed the price offer is presented to client and after it is approval the pre payment must be finalized by the client in order to move to the next step.

When the payment is confirmed a new after-sales project is created on the ERP system ODOO and assigned to different departments to follow the manufacturing or purchase operations. As soon as the order is ready to deliver, the shipping payment is received and the goods are delivered.

Finally the parts arrive the destination and are installed on the equipment, this task can be done by PERUZA's or Client's maintenance technicians. To conclude the process the project is finalized and archived on the server and ERP systems.

As mentioned on the previous chapter, this process not always works as it is shown on the flow chart in figure 15 and many improvements should be implemented in order to create an optimized process and increase the efficiency of the after-sales services.

4.7 Competitors Service Evaluation: How do similar companies to PERUZA offer their after-sales services?

In this chapter, empirical data collected from the survey is presented. The aim of this survey was to compare PERUZA's current after-sales strategy to similar OEM's. It discusses each case starting from the small size organization to medium size organization and proceeds to the large size organization. Each company is briefly introduced, and the gathered data is presented in accordance with the study's theoretical concepts; namely, customer care, field technical assistance, spare parts distribution.

This research was sent to 40 companies, from which only 10 answered and submitted their response. The survey was available for a period of 1 month from 04/03/2019 until 04/04/2019, by means of a structured questionnaire from google forms, see Attachment I, that was sent to European OEM's that operate on the same segment as PERUZA. The responses from 6 different countries contributed for obtaining general view of the after-sales services offered by companies just like PERUZA.

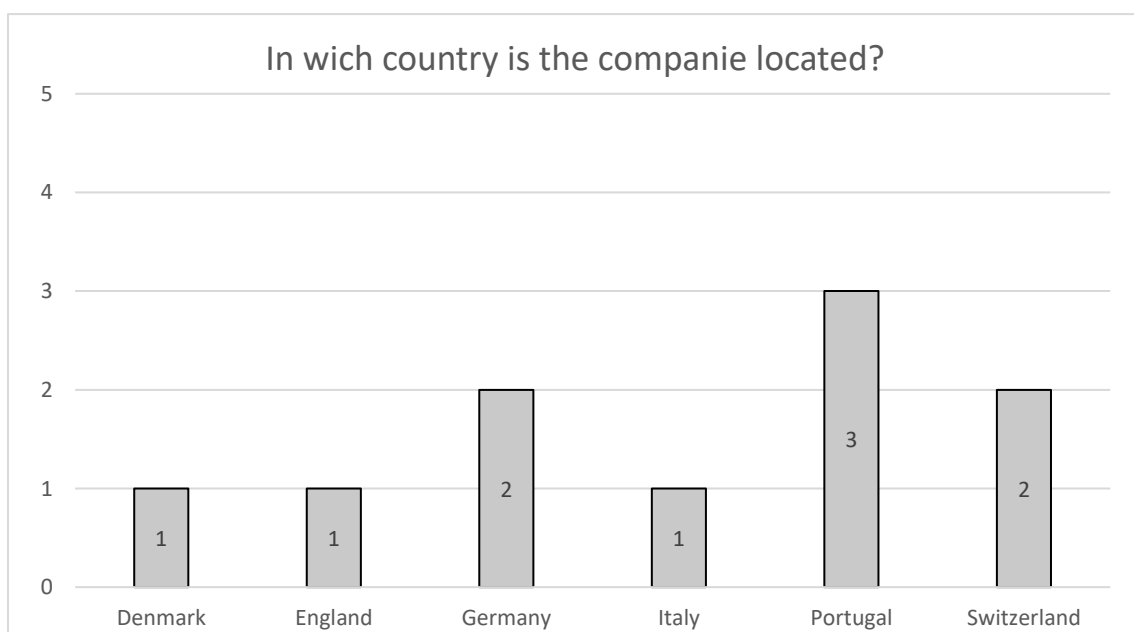


Figure 16 – Company Location

The (Figure 16) shows the 6 different countries that answered the survey, Denmark, England, Germany, Italy, Portugal and Switzerland. The most frequent answer was Portugal, followed by Germany and Switzerland. Only 25% of the contacted companies answered and submitted the survey, and it is explained since most companies were not interested in sharing private information or reveal internal after-sales strategies.

Depending on the size of the company, different after-sales strategies are used, the budgets are different, the focus and importance of after-sales may change and have different aims and targets. In order to understand their differences the survey divided companies in 4 groups depending on how many employees the company has:

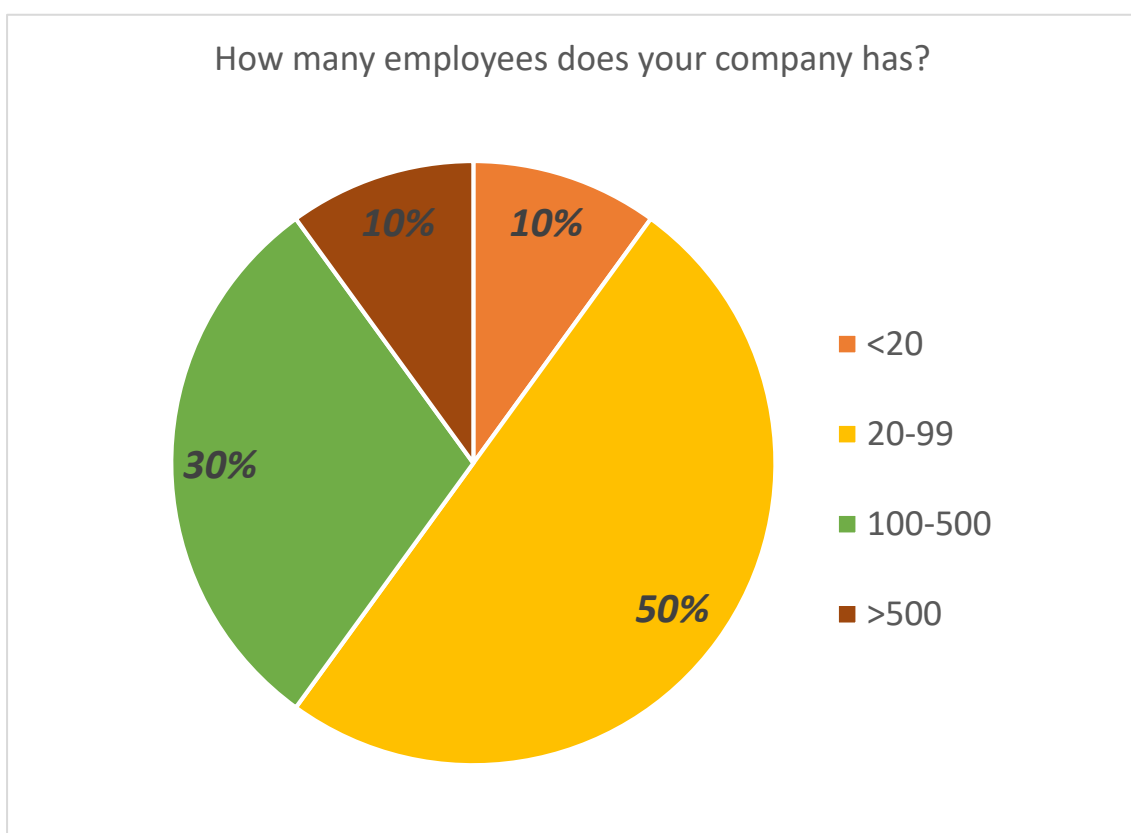


Figure 17 - Company Size

As mentioned previously, the survey separates the companies in 4 different groups depending on the number of employees it has. As shown on the graphic 10 first group represents companies with less than 20 employees and only one company from this size answered to the survey constituting 10% of the total population. Followed by the second group that represents most of the answers 50% and englobes companies with 20-99 employees.

The third group and second most frequent represents companies that employ from 100 to 500 people and constitutes 30% of the total answers from the survey. Finally, the last group representing 10% of total answers are the companies that have 500 plus employees.

PERUZA initially was just replying to customer requests and complains and providing a warranty period where any damages or anomalies caused by manufacturing or engineering mistakes were covered by the manufacturer. No other after-sales services were offered creating big competitive disadvantages for them. In order to understand what kind of services most of the competitors or companies with similar business models use, it was questioned on the survey what kind of after-sales services companies offer and the answers were the following:



Figure 18 - After-sales services offered

According to the (Figure 18) the most frequent services offered are Spare Parts Package and Warranty services followed by Diagnostics, Preventive Maintenance and Equipment Upgrades. Finally, Remote control and equipment rental. All the services mentioned by the participants represent only a small percentage of the full list that it is possible to find on the market and its part of the after-sales strategy of many companies in many different industries. From this graphic it is possible to conclude that spare parts, maintenance and diagnostics are the core business of after-sales and are the main target of the companies when developing or improving their after-sales strategy.

The services can be offered in many ways that approach the client at different levels. Understanding what the best way could be to offer those services can improve the chances to sell those services, developing a more trustful relationship with the client and at the same time becoming a more organized and reliable seller. The next question of the survey aims to figure out how the participants sell their after-sales services, and the answers were the following:



Figure 19 - Offer approach

The most common approach for offering after-sales services is through maintenance contracts. This kind of contracts may include multiple royalties and different services that can or not be customized by the customer to fit its needs. The graphic 12 proves that, as the most frequent answer was maintenance contracts.

The active sale of spare parts was the second most frequent answer. This activity is responsible for most of the revenues generated from after-sales and plays a big role in keeping the machine productive and well-functioning. Having a minimum safety stock can improve the down times of the machines and reduce the maintenance expenses.

Just like PERUZA some companies only perform services when the client requests, strategy where there is no active sell just proactive response. By just attending to clients complains the company increases the risk of failing to respond to clients need and expectations putting in cause the relationship and trust with them. Moreover, the revenues are lower, and the demand is not predictable, causing numerous management problems to the after-sales department when dealing with multiple requests and different issues simultaneously and struggling to provide services to each client on time. Some companies also offer the option of extending the warranty period to reassure the client.

Once Identified that maintenance service contracts are the most used method to offer the after-sales contract, it is important to understand what kind of features are usually offered on those agreements, and that is what the next question of the survey aimed for:

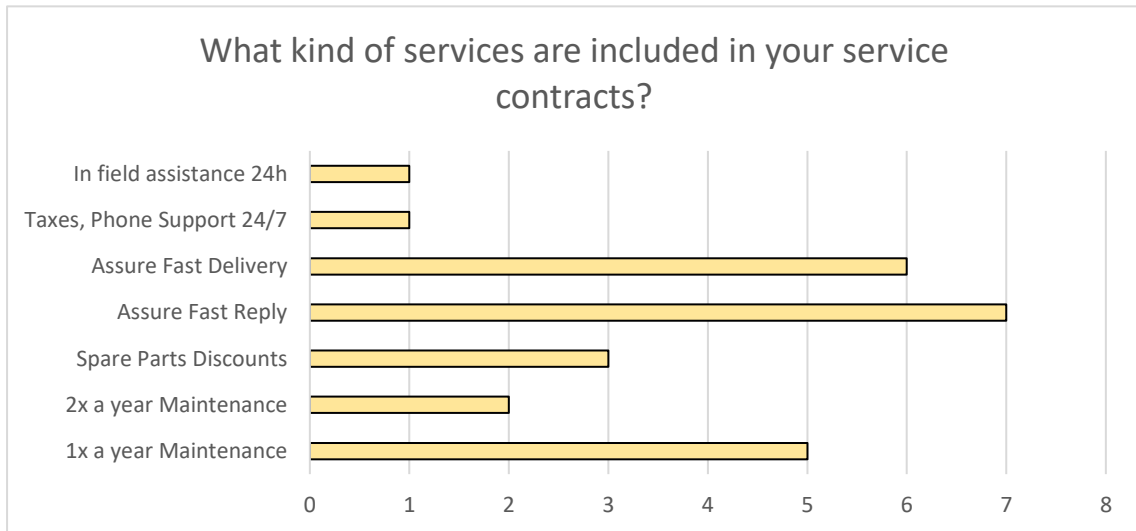


Figure 20 - Services Offered on Service Contracts

As shown on (Figure 20), most of the companies include on their service contract preventive maintenance interventions, once or twice a year, assure fast reply and fast delivery and provide 24h on sight assistance or phone support. Some also apply some special discounts on spare parts.

One of the main problems PERUZA had was supplying the requested spare parts on time. The lead times were too big due to the huge number of requests and limited resources. In order to understand how PERUZA's spare parts lead times are compared with other companies, the following questions were included on the survey, the first that aims to understand the average lead times on national market and the second that explored the lead times for supplying to foreign market:

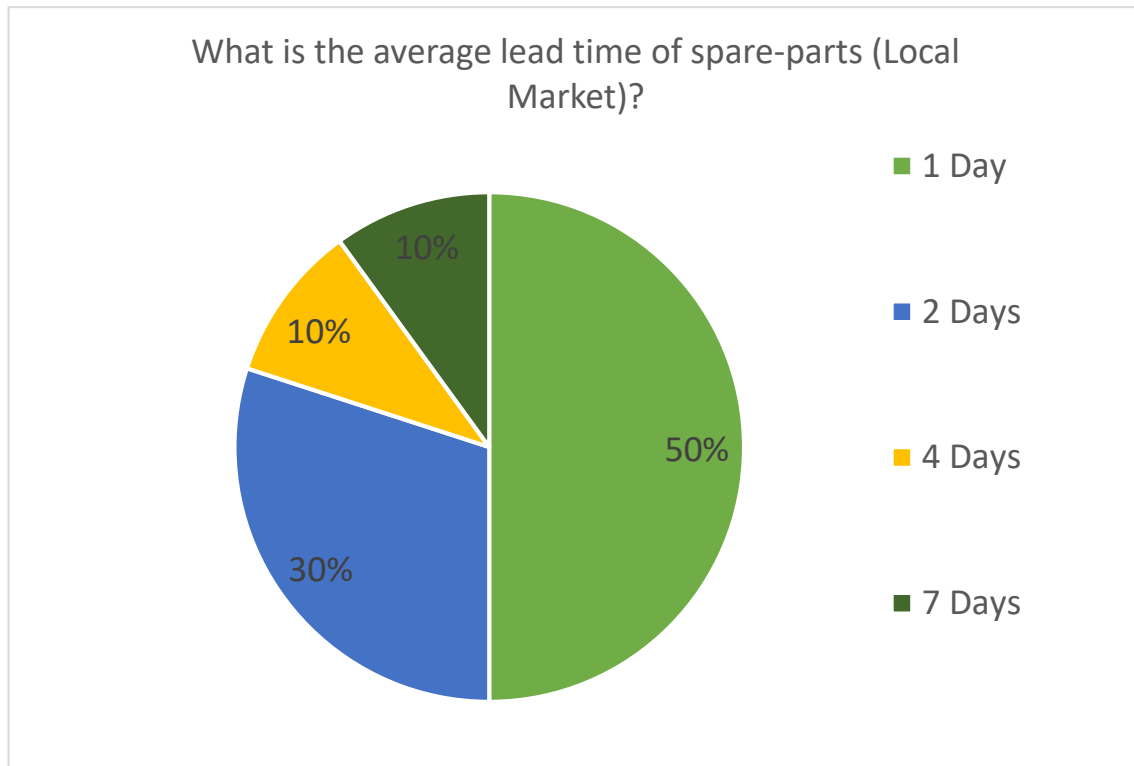


Figure 21 - Average Spare Parts Lead Time (National Market)

From the (Figure 21) it is possible to understand that at least half of the participants manage to supply a spare part in 1 day since the request arrives. This means that the supply system for delivery and manufacture are both optimized and efficient otherwise it would be impossible to achieve that number. Having a standardized product may also interfere on the lead times as it might be possible to keep spare parts in stop indoors, making it fast and easy to supply within a day. Also 30% replied that manage to supply in 2 days which is also an acceptable lead time for supplying a spare part on local markets. Only 20 % of the participants have lead times above 2 days, one with 4 days and another with 7 days, companies that seem to not have the supply chain optimized and have opportunities to improve and develop new strategies to decrease the lead times.

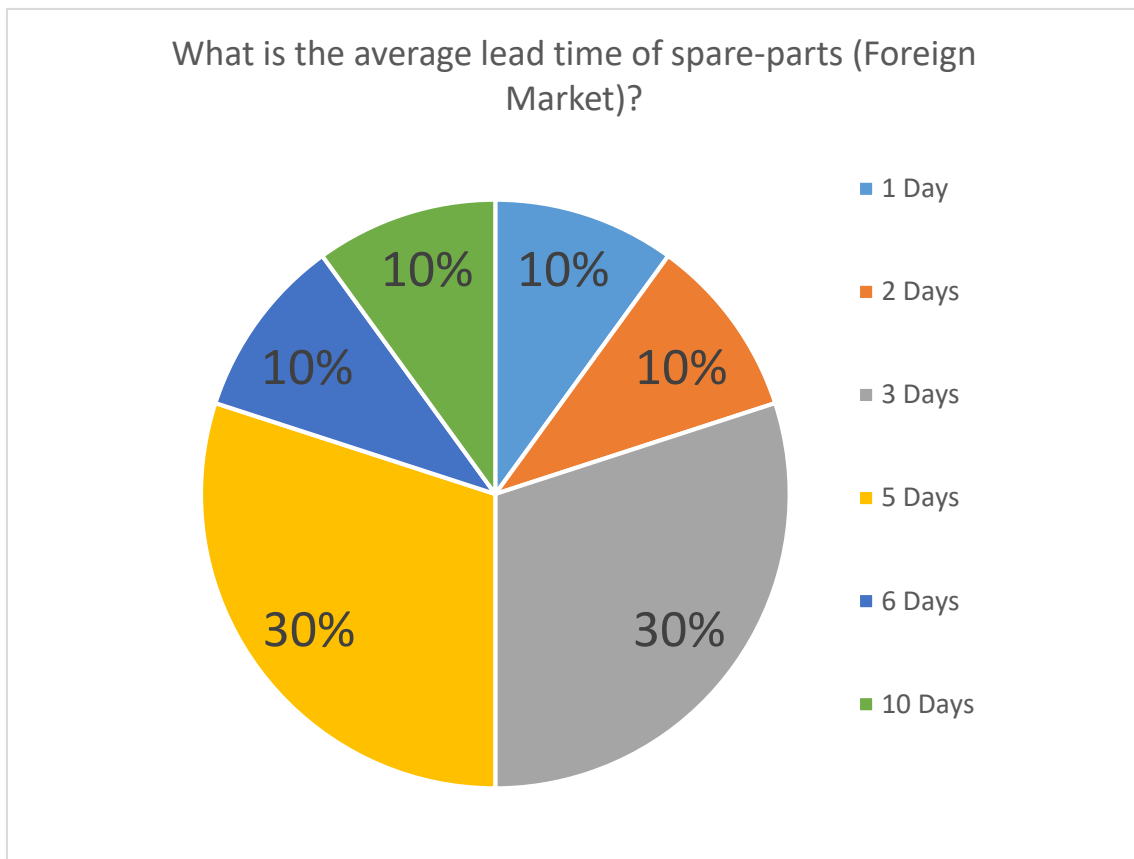


Figure 22 - Average Spare Parts Lead Time (Foreign Market)

The (Figure 22) shows the average lead times for supplying spare parts to foreign markets. The range of answers is big due to many factors such as, distance, type of spare part requested, quantity and strategy. The big majority of the participants manage to supply spare parts worldwide between 3 to 5 days, numbers that are considered normal and acceptable as transport time might take multiple days.

The companies that replied with 1 and 2 days are companies that have multiple storages that keep the most wearable parts in stock and easily can distribute to any part of the world on short notice, but not all the companies can afford to have different storage united distributed around the world.

The solution for those companies is to convince the client to keep the main wearable parts in stock, assuring fast response and small downtimes when the machines is damaged or stopped for maintenance interventions.

Finally, the last question from the survey is focused on the relation between the total revenues and the after-sales revenues and warranty expenses. When asked what the percentage was of after sales revenues and warranty expenses from the total income of the year, the participants replied:

Table 2 - Percentage of revenues/expenses from after-sales/warranty services

| Company Size | After-Sales Revenues | Warranty Expenses | Country |
|--------------|----------------------|-------------------|-------------|
| 100 - 499 | 10% | 4% | Germany |
| 20 - 99 | 15% | 2% | Switzerland |
| 20 - 99 | 20% | 10% | Switzerland |
| 20 - 99 | 2% | 2% | Portugal |
| 20 - 99 | 5% | 5% | Portugal |
| < 19 | 10% | 2% | Portugal |

Only 6 from the total 10 participants agreed on sharing the information regarding the percentages of revenues and expenses from after-sales services and warranty.

When comparing the numbers shown on table 2 with PERUZA's numbers, it is possible to conclude that competitors have much bigger percentage of after-sales revenues but also bigger percentage of warranty expenses. From those numbers it is possible to conclude that PERUZA can optimize the after-sales revenues by developing a better strategy and focusing more on this area.

Regarding the warranty expenses, PERUZA has the lowest number from the numbers shared by the participants, and it indicated that the engineering and manufacturing process are solid and performed with good quality and reliability.

4.8 SWOT Analysis

To identify the key strengths, weaknesses, opportunities and threats of the after-sales processes of Peruza SIA, a SWOT analysis was performed as shown on the table 3:

Table 3 - SWOT Analysis

| Strengths | Weaknesses |
|---|---|
| Great Service and spare parts prices | Spare parts management issues |
| Qualified staff and good staff training | Big lead times |
| Communication is fast and efficient | Incomplete process flow diagram |
| Good technical skills and Knowhow | No focus on preventive maintenance and related activities |
| | Inefficient resources management |
| | Poor data collection and analysis |
| Opportunities | Threats |
| Standardization of the equipment and it's spare parts | Worse after-sale support than competitors |
| Introduction of maintenance contracts | Dissatisfaction of the customer |
| Creation of spare parts packages for active sales | Hich costs for the company |
| Development of new ERP systems for data collection | Potential risks of damaging the equipment |
| Reorganization of the Process Flow Diagram | |
| | |

The main strengths of the after-sales process are the great prices offered for any kind of after-sales activities, great communication and fast response to the client requests and finally good technical skills and knowhow than even though it's not used in its potential it's created big opportunities for improvement.

As weaknesses were identified the poor management of the production and supply chain of spare parts as well as all the available resources that are various but are managed correctly, the big lead times that are explained by the bad organization of the process flow, the poor data collection and analysis that blocks the manager from understanding if the process is or not under control and finally the lack of interest in preventive maintenance activities.

The main opportunities are the possibility of introducing new after sales services such as spare parts packages and maintenance service contracts that can easily increase the after-sales revenues and also create an opportunity for standardizing the after-sales products and services, the development of a more detailed and better structured process flow diagram, and finally the improvement of the ERP systems that are customizable, to fit in with the new strategies developed by the company

Finally, threats include the fact that competitors may have better after-sales support, the customer can get unhappy and stop purchasing new equipment, the lack of maintenance can create big costs to the company and increases the risks of damaging the equipment.

Improvements

5 Improvement Implementation

Once analysed the problems from the current strategy of after-sales in PERUZA and identified the opportunities of improvement it is time to start implementing and developing new concepts that could improve and optimize the system and make the after-sales a more profitable and efficient department.

For the elaboration of the after-sales plan of the company PERUZA, the tool “PDCA” was used as support, in order to make clear the processes to be executed in order to achieve the proposed results for the research. This cycle is divided into four stages that involve: Planning; Execution; Verification and Action, mentions that the PDCA means: P: establish guidelines for all management levels; D: implementation of measures with higher priority and that are sufficient; C: verification of the results obtained and the degree of progress; A: reflection on the results regarding the goals and also on possible corrections; thus, it is observed that what PDCA can be used in solving problems, because it is seen as a method of decision making. It shows the path that the company must follow so that the proposed goals can be achieved. During the next chapter it will be described all the improvements implemented on PERUZA’s after-sales strategy, during the internship.

5.1 ERP System Improvement (Customer Profile)

Having the complete profile of the customers is the first step to be able to proceed to next after-sales stages. This register must be the most complete as possible, including contacts, positions, locations, historical purchases etc.

5.1.1 Customer Profile Improvement Proposal

As mentioned previously, there were 3 software (ERP systems) operating simultaneously which made the task of compiling all the data much harder. After some discussion, it was agreed that only one ERP system would be operating in the system and all the other software would be discontinued. The selected software was ODOO and that is the one where most of the improvement was done.

This database favours the company by providing initial information about its future customer, improving the relationship with him. However, for its operation to be effective, it must be constantly updated so that the sources of contract are not lost, which does not occur in PERUZA, so to be able to create a client profile on the system it is necessary to complete some mandatory fields that would make the client’s profile fulfilled of valuable information for further use on both after-sales and sales activities. In other words, the operating system itself acquired by the company has the registration form, with fields for filling in the most relevant information such as the name of the company, invoicing address, shipping address, country, at least one contact, as well as

other tools that ensure knowledge about the profile of the customer. Some other fields were added to the profile form in order to provide more information regarding ongoing projects and historical repairs and/or purchases.

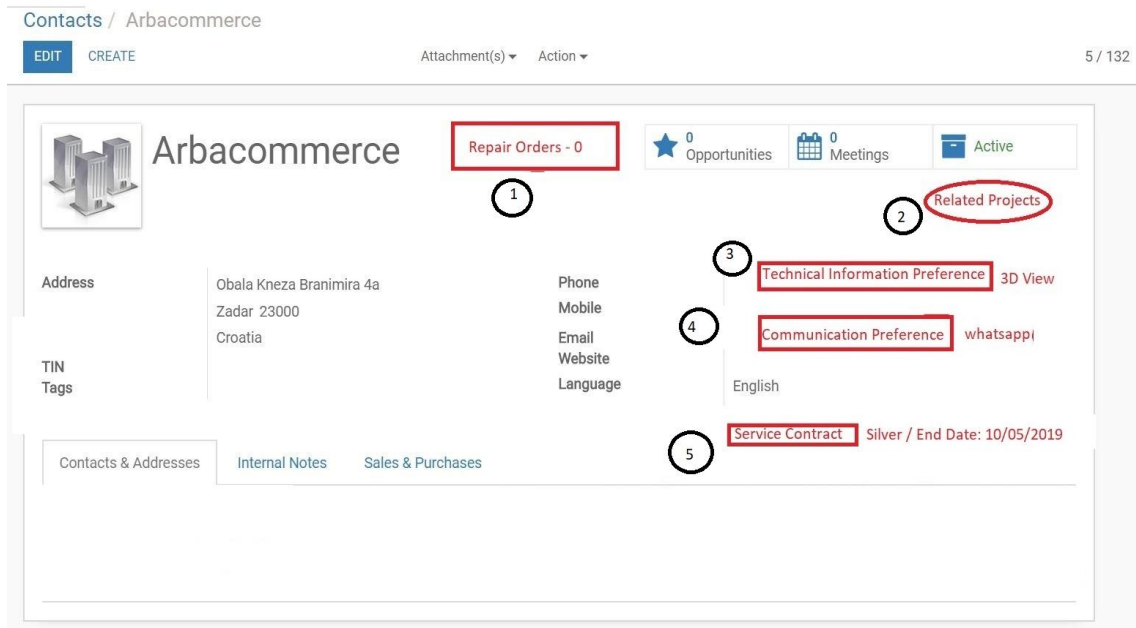


Figure 23 - Customer Profile Example

The (Figure 23) shows the first improvement proposal, where, as mentioned previously, some fields were added in order to complete the client profile.

1 – It was suggested the possibility of having a field that indicates how many repair orders are active for a specific client. That should be connected to the Repair App

2- It was suggest having also a button that would inform what are the related project with the client and the respective equipment. The following pictures explain how this improvement would look like on the system:

Table 4 - Repair Order Status

| PR Number | Client Name | Project Name | Project Manager | Designer | Start Date | End Date | Warranty End Date | Planned Hours | Actual spent Hours |
|-----------|-------------|------------------|-----------------|----------|------------|------------|-------------------|---------------|--------------------|
| 19.34 | Peruza | Autofeeder Line | Maksims | Antonio | 10.05.2018 | 20.12.2018 | 20.12.2019 | 09.02.1900 | 06.02.1900 |
| 19.40 | Peruza | Autonobbing Line | Maksims | Antonio | 10.05.2018 | 20.12.2018 | 20.12.2019 | 09.02.1900 | 06.02.1900 |
| 19.58 | ... | ... | ... | ... | ... | ... | ... | ... | ... |

On the (Table 4) it is shown the list where it should be possible to view all that information and also allow the user to click on each project and see the list of equipment's that project contains, as shown on the table 5:

Table 5 - Equipment List

| PR Number | Client Name | Project Name | Project Manager | Designer | Start Date | End Date | Warranty End Date | Planned Hours | Actual spent Hours |
|-----------|-------------|------------------|-----------------|----------|-------------------|----------------|-------------------|---------------|--------------------|
| 19.34 | Peruza | Autofeeder Line | Maksims | Antonio | 10.05.2018 | 20.12.2018 | 20.12.2019 | 09.02.1900 | 06.02.1900 |
| | | Equipment ID | Equipment Name | Quantity | Equipment Version | Cad Files | | | |
| | | PR.2919 | Orientator | 2 | Old or Latest | Link to server | | | |
| 19.40 | Peruza | Autonobbing Line | Maksims | Antonio | 10.05.2018 | 20.12.2018 | 20.12.2019 | 09.02.1900 | 06.02.1900 |
| 19.58 | ... | ... | ... | ... | ... | ... | ... | ... | ... |

- 3- Together with the mandatory fields regarding customer location and contacts there is also other important data to collect, to facilitate the process of exchanging the technical information. Through the data acquired by a google survey it is possible to collect this data. As so, it was suggested to include a field on the customer profile where we could write down the preferred method of technical information exchange between PERUZA and the client.
- 4- Just like the previous topic, the information about the communication with the client is a really important factor responsible for having a direct and effective after sales process. It was suggest having also a field for fulfilling the communication method preferred by the client. This data can also be collected from the survey.
- 5- As one of the after-sales improvement suggestions was the possibility of offering after-sales service/maintenance contracts was important to understand which clients are covered or not by this kind of contracts The system should alert when the service contract is close to finish, so that the client is automatically alerted to repurchase or upgrade the contract.

5.1.2 Customer Profile Improvement Implementation

After discussed with the responsible for managing the software the suggestions were approved and the improvements were executed. On this chapter the updated client profile and project information are shown.

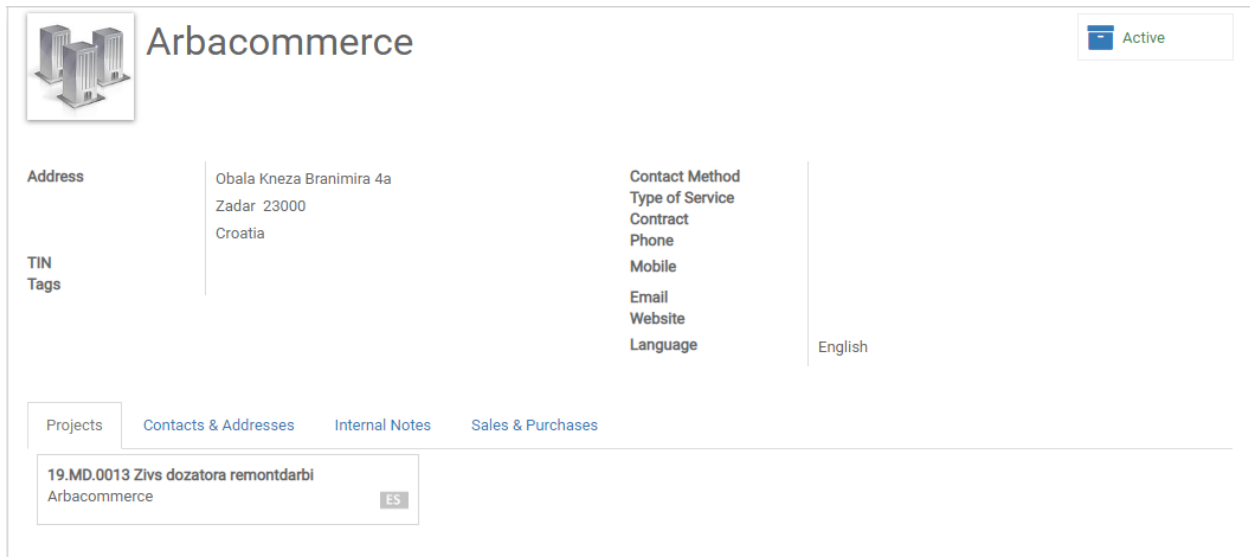


Figure 25 - Updated Customer Profile

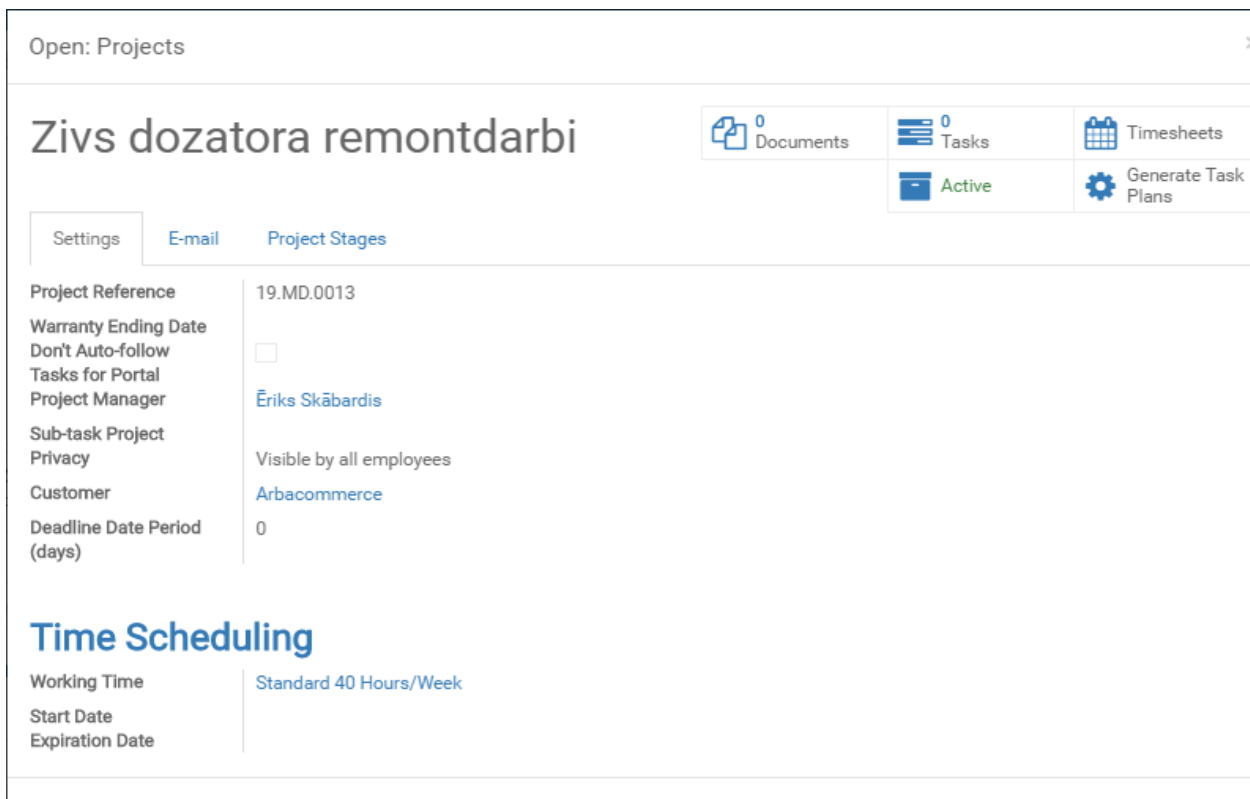


Figure 24 - Related Projects

The figures 24 and 25 show the final version of the customer profile, after applied some improvements suggested during the internship period. The new version is organized, contains the information required to communicate with the client effectively and saves time.

Together with this new update, the website was also improved. It was also suggested the possibility of connecting the website with the ERP system allowing the customer to communicate and report directly with the after-sales responsible and create a request containing all the required information through a form available on the website.

5.1.3 Odoo Extensions

One of the best features of ODOO software it is the availability of being easily customizable, allowing the user to tailor the software in order to meet its needs.

The software allows the installation of apps and extensions from various field and different purposes, including an after-sales and repair app.

The installation of this Repair App brought many advantages and made the after-sales management process a more organized and easily managed activity.



Figure 26 - Repair App

This app included several features that improved the process of managing after-sales requests and client complains. This app allowed to keep track of the ongoing repair orders, allowed the manager to associate the tasks to the respective responsible and create and send quotations and invoices directly from the app to the customer's email.

One of the previously identified problems was the fact that the invoice system was very confusing and unorganized, and with this app the process became much more efficient, organized and allows keeping record of all the repairs made in the past.

The data containing the prices and suppliers of all the parts that were ordered at least once in the past was imported to the system, allowing the software to generate automatic prices and delivery dates for the selected products from the updated list.

5.2 Collection of Customer Data

With the system updated it was possible to progress to the next stage of implementing the new after-sales strategy in PERUZA.

Even though the system was ready to be used at its full potential, the data available on the multiple software that were on use was not enough to fulfil completely the customer profile, either because there was lack of information or the information that was available was old and not trustful. Therefore, to be able to gather the missing information some activities were performed, such as collecting from the different sources of information, all the basic information from the client: Name, Phone number, Responsible Person, Email and Country.

It was also carried out the activity of analysing from all the clients list which are still active, and which are not. By doing this simple task the clients list became updated and organized, containing only the important clients that still collaborate with PERUZA, avoiding the existence of excessive and not useful information that hinders the management tasks. From a list of approximately 150 customers, only 100 were active and still doing some business with PERUZA or were potential clients to sell some equipment in the future.

In order to achieving a better organization regarding client's data, an analysis to client purchase history was carried out. This analysis consisted in consulting different sources of information and compiling it into a Microsoft excel table.

As soon as all the data was collected, it was all imported to the ODOO system by using the import tools available of the software, that allow to directly import excel format tables to the system.

5.3 After-Sales Service Contracts

An after-sales service contract offers several advantages for individuals purchasing large appliances. Repairs and ongoing maintenance can add up, but a service contract can counteract those expenses and keep the equipment well-functioning. Nowadays we rely on machinery and equipment during any given workday. System failure represents a significant downtime, which is a cause for concern. Having a maintenance contract agreement can help saving money over the life of the contract. Most service companies offer discounts to clients who sign a maintenance service agreement, as well as, other kind of benefits.

Having a contract maintenance agreement also increases the equipment longevity and reliability. A maintenance routine schedule can identify problems before they become serious, expensive issues, reduces the chances of an unexpected breakdown or system

failure and the equipment is operating at peak efficiency. One of the best aspects of having a maintenance agreement is the access to emergency services. Often Clients who have signed these agreements are given priority over other customers.

Finally, a maintenance service agreement gives access to expert technicians who understand the equipment and machinery inside and out, providing the support needed from trained experts in their field, so they never waste time learning about your system's needs.

PERUZA never had or offered any kind of maintenance contract, so all this preventive maintenance field represents a new field that the company has no knowledge about.

During the internship period, it was suggested to develop this idea of including maintenance contracts and preventive maintenance interventions as part of the offered after-sales services.

From all the data collected from the competitor's strategies and feedback from the customers, multiple versions of maintenance contract were developed in order to satisfy the majority of clients and improve the relationship with them.

During this chapter, all the tested options will be presented as well as the different approaches and methodologies used to create the final version of the maintenance contract agreements.

5.3.1 Development of the First After-Sales Service Contract

The first version of the contract was developed based on the information collected from survey responses, customer feedbacks and supplier's strategy.

Initially, as the interests of the clients were quite different it was thought that having only an option for a maintenance contract might not be the ideal approach to get clients attention and motivate them about this new service PERUZA had to offer. As so, the first version of maintenance contracts consisted in having 3 different levels, Bronze, Silver and Gold, each of them covering different service options and having more benefits associated.

Together with the board of the company, the first version of the after-sales maintenance was approved, and it offered the following services:

Table 6 - First Version After-Sales Service Contract

| General Service Table | Service Coverage Levels | | |
|---|-------------------------|-------------|-------------|
| Support Options | Bronze | Silver | Gold |
| Priority | ✓ | ✓ | ✓ |
| Free Shipping * | ✓ | ✓ | ✓ |
| Diagnostic ** | ✓ | ✓ | ✓ |
| Upgrade Discount | 5% | 10% | 15% |
| Labour Price Discount | 5% | 10% | 15% |
| Spare Parts Discount | 5% | 10% | 15% |
| Staff Training Discount | 5% | 10% | 15% |
| Preventive Maintenance | | 1x per year | 2x per year |
| On-site Spare Part Replacement Service **** | | | ✓ |
| On-Site Response Time | | 48h | 24h |
| Price | - | - | - |

As shown on table 6, there are 3 different types of service contracts, Bronze, Silver and Gold.

All the contracts include Priority, free shipping and diagnostics.

5.3.1.1 Priority

With the priority any customer that has purchased any type of maintenance contract has support and assistance faster and their requests are processed and assisted before the requests of non-contract holders. Having this kind of privilege can reduce the downtime of the equipment when stopped for repair and increases the trust and reliability of the service provider.

5.3.1.2 Free Shipping

One of the main reasons why the lead times of supplying spare parts are too big is that the shipping method selected by the customer is usually the longest and cheapest way, but assuring free shipping we assure that the part is shipped on time and with the adequate type of delivery method for that specific situation. This privilege has only one condition, its valid only if the value of the purchased parts is equal or higher than 250 €. This number was calculated based on the average delivery price for a standard medium box size, delivered to European countries.

5.3.1.3 *Diagnostics*

When the customer has an issue usually tries to diagnose the issue by him or when not possible PERUZA must interfere and either goes to the customer's facilities or tried to identify the problem by distance. This intervention is usually charged and is multiple times contested by the customer because sometimes there is no issue, but just some misuse or operation mistake and the customer must pay for that time and travelled distance. By purchasing a service contract, the customer has right to have diagnostic calls free of charge up to 2 times per year. By other words, whenever the client has issues with PERUZA's equipment, he has right to call on field assistance up to 2 times per year, where all the travelling and workforce costs are covered by PERUZA.

5.3.1.4 *Discounts*

All the 3 types of maintenance contract also include 4 types of discounts: Spare parts, Upgrades, Labour price and staff training. The only difference between the Bronze, silver and gold contracts is that the discounts are 5%, 10% and 15% respectively.

5.3.1.5 *Preventive Maintenance*

As previously mentioned, maintenance services are the main reason of existence of this contract, however not all the companies mentioned interest in having such option, as they already have maintenance teams or department that already performs that kind of interventions on their purchased equipment. Thus, the bronze type contract was designed to provide services to the customers not interested in preventive maintenance services. The Silver contract includes once a year a preventive maintenance intervention and the gold includes twice a year.

On this maintenance intervention, PERUZA's maintenance team goes to the customer facilities on a previous scheduled date and perform a diagnostic. Most of the consumable parts are changed, such as belts, rolls, nozzles and others, and the other items will be inspected and analysed, and if is advisable to be changed, an offer is made to the client and based on their decision the items are replaced or not. All the items replaced during the maintenance intervention are paid by the customer, but with significant discounts.

5.3.1.6 *On-site spare part replacement*

This feature is only available for the gold type service contract owners and consists in replacing the purchased spare parts on the customer facilities free of charge. The number of free replacements is limited and previously agreed with the contract buyer.

5.3.1.7 *On-Site Response Time*

Finally, the silver and gold type contracts assure on site assistance in 48h and 24h respectively. With this feature client can be sure that in any emergency they will get assured assistance in short notice.

5.3.2 *Customer Feedback from First Version of After-Sales Service Contract*

When complete, the contract was shown and presented to some customers in order to get some feedbacks and opinions about the current version of service maintenance contracts.

The first impression was positive, the range of options was good, services seemed to be okay and structure of the contract was well organized as well. Despite all those positive comments, some negative and very important aspects were mentioned:

- Bronze contract has almost no interest to the majority. It would be better to sell those services individually if the customer is interested in any of those.
- Most of the customers were focused on the silver contract, as it was probably way cheaper than the gold one and the difference is not so big between both.

From the feedback of the customer another analysis of the first version of the service contract was performed, in order to carefully identify what could be changed.

Starting from the customer point of view, it actually made sense to initially offer only one single type of contracts and only include extra services when requested by the customer that would immediately eliminate the option of having three types of service contracts, but one standardized with the possibility of adding extra services.

Secondly it was agreed that having the free diagnostics as a service was just increasing the price too much and could be in future a very big bottle neck for managing efficiently the after-sales teams and tasks, as the resources were limited but the demand could be very big, and none of that could be programmed. Also, the travel expenses associated with the diagnostics would be too high and PERUZA could end up losing money and time on something that in the end of the day could be resolved if distance by video or phone

calls. The same ideology was applied for the spare parts replacement services represented on the gold type contracts.

In order to simplify the contract structure, all the different discount types were excluded and a discount percentage of 15% was included in the price of any kind of service required by a contract holder.

The features such as priority and free shipping kept the same as previously agreed.

5.3.3 Second Version of After-Sales Service Contract

When applied the previous changes, the new simplified and more optimized version of the service contracts offered by PERUZA was created as shown on the following illustration:

Table 7 - Second Version After-Sales Service Contract

| No. | Description | Quantity |
|-------------|---------------------------------------|----------|
| 1 | Main features | |
| 1.1. | Preventive Maintenance | - |
| 1.2. | Equipment calibration | - |
| 1.3. | Fundamental Training program | - |
| 2 | Additional features | |
| 2.1. | Spare part discount | 15% |
| 2.2. | On-Site diagnostics & repair discount | 15% |
| 2.3. | On-Site response time | 48 hours |

As shown on the (Table 7), there are some features that were removed and some new that were added. The main features consist in preventive maintenance, as described on the previous chapter. The only difference is that on this new version the amount of preventive maintenance interventions can be decided by the customer and it varies the price of the final contract.

Together with the purchase of a preventive maintenance intervention the customer will automatically obtain equipment calibration service and has access of a fundamental preventive maintenance training program for the operator of PERUZA's equipment.

By purchasing the contract some additional features are included such as 15% discount on spare parts, diagnostics and repairs. Also, a maximum on site response of 48h is assured to the buyer.

5.3.4 Service Contract Pricing Methodology

When decided the final structure of the maintenance service contracts, it was necessary to develop a pricing strategy that could be beneficial for both Supplier and Customer, a price that would motivate them to purchase the service contracts and at the same time assure some extra income to PERUZA. The worst-case scenario is the one when the client has got the services as they expected and PERUZA didn't lose any money or valuable time that could involve losses in other business areas. A formula was developed to automatically determine an optimized price that can fulfil the expected results and assure income to PERUZA. This formula was developed in Microsoft Excel and will be described in during this chapter:

5.3.4.1 Customer Info

The price for each client varies depending on the data inserted by the manager on the formula. In order to obtain the final price, the manager must introduce required information regarding the client's profile that will automatically generate the maintenance contract selling price for that specific customer.

The required info is divided in 3 big groups: Client's Name, Client's Equipment and Other variables

5.3.4.1.1 Client's Name

This Field must be filled with the correct name of the client, as it is written on the ERP system, in order to avoid misunderstanding as there are many ways of writing customer names and many customers with similar names.

Table 8 - Client's Name

| Client Info | |
|-------------|----------|
| Client Name | EstoFish |

5.3.4.1.2 Client's Equipment

PERUZA has a wide range of equipment; some of it standardized some customized. Due to the fact that the system didn't allow knowing the amount and type of purchased equipment, a previous study was made in order to collect the precise number and type of equipment. With that study complete, it was possible to easily fulfil the required data for this formula. The equipment included on the list was selected based on that study and consists in a total of 34 types as shown on the table 9:

Table 9 - Customer Equipment List

| Client Equipment | |
|----------------------------|-----------------|
| Type | Quantity |
| Grading Line | 0 |
| Nobbing Line | 0 |
| Defroster | 0 |
| Autonobbing Line | 0 |
| Autofeeder Line | 0 |
| Volume Batching Line | 0 |
| Weight Batching Line | 0 |
| Packing Line | 0 |
| Palletizing Line | 0 |
| Depaletizing Line | 0 |
| Pre-roller grader | 0 |
| Shellfish Line | 0 |
| Style Grader | 0 |
| Fish waste Grinder | 0 |
| Fish washing machine | 0 |
| Glazer Line | 0 |
| Bottle/Box washing machine | 0 |
| packing conveyor | 0 |
| Jam mixer | 0 |
| Jar turnover | 0 |
| Ice dispenser | 0 |
| Steaming machine | 0 |
| Salmon deslimer | 0 |
| Salt water Dispenser | 0 |
| Spice dispenser | 0 |
| Cheese cutter | 0 |
| Vacum Packing Sistem | 0 |
| Auto Packer | 0 |
| Trasnporter | 0 |
| Cabage Container | 0 |
| SEAC FPM-500 | 0 |
| Manual Pocket Machine | 0 |
| Lift conveyor | 0 |
| Manual Packing Line | 0 |

5.3.4.1.3 Other Variables

The variables that can affect the price of the service contract can be various, although the only required variables for the basic service are only the Distance and the number of preventive maintenance interventions and trainings that are desired by the client. As previously mentioned, the customer has the possibility to add some extra features to the service contract and on that case other variables might be required such as the number of diagnostics, spare part replacement services, and emergency on sight assistance.

The equipment value of the client exists only for understanding the ration between the amount the customer might spend in maintenance and the total value of the equipment purchased.

Table 10 shows the variables that can be fulfilled and will influence the final price of the service contract:

Table 10 - Other Variables

| Other Variables | |
|---|----------|
| Type | Quantity |
| Number of Free diagnostics | 0 |
| Distance | 0 |
| Number of Planned emergency flights | 0 |
| Number of Free spare parts Replacement services | 0 |
| Equipment Value | 0 |
| Number of Preventive Maintenance | 0 |
| Number of Trainings | 0 |

5.3.4.2 Preventive Maintenance Average Times

Together with the maintenance team and product designers, a list with all the important equipment's and the average preventive maintenance time dispended on the intervention was estimated, see table 11. Those times were based on previous repair interventions times and experience.

Table 11 - Average Maintenance Repair Times

| Type | Time (h) | Unit Price |
|------------------------------|----------|------------|
| Grading Line | 8 | - € |
| Nobbing Line | 8 | - € |
| Defroster | 4 | - € |
| Autonobbing | 5 | - € |
| Autofeeder | 2 | - € |
| Volume Batching Line | 8 | - € |
| Weight Batching Line | 8 | - € |
| Packing Line | 4 | - € |
| Palletizing Line | 2 | - € |
| Depaletizing Line | 2 | - € |
| Pre-Roller grader | 2 | - € |
| Shellfish Line | 4 | - € |
| Style Grader | 2 | - € |
| Fish waste Grinder | 1 | - € |
| Fish Washing Machine | 1 | - € |
| Glazer Line | 6 | - € |
| bottle / Box Washing Machine | 1 | - € |
| Packing conveyor | 1 | - € |
| Jam Mixer | 1 | - € |
| Jar Turnover | 1 | - € |
| Ice Dispenser | 1 | - € |
| Steaming Machine | 1 | - € |
| Salmon Deslimer | 2 | - € |
| Salt water dispenser | 1 | - € |
| Spice dispenser | 1 | - € |
| Cheese Cutter | 1 | - € |
| Vacum Packing System | 4 | - € |
| auto-packer | 3 | - € |
| Transporter | 2 | - € |
| Cabage Container | 0 | - € |
| SEAC FPM-500 | 0 | - € |
| Manual Pocket Machine | 0 | - € |
| Lift conveyor | 3 | - € |
| Manual Packing Line | 0 | - € |

The most complex equipment usually takes a day (8h) as it requires more care and it more difficult to disassemble and assemble the parts. All the other lines required an average of half day (4h) and the simplest equipment require between 1 or 2 working hours.

5.3.4.3 Diagnostic Average Times

The same analysis was made for the diagnostic times for each equipment. Those times were selected based on the historical diagnostics that were performed on customer facilities. For que equipment that had no history of inspection or diagnostic the times were estimated based of the constructor and maintenance teams' experience

Table 12 - Diagnostic Average times

| Diagnostics | | |
|------------------------------|-------------|-------------------|
| Type | Time | Unit Price |
| Grading Line | 2 | - € |
| Drum Nobbing Line | 2 | - € |
| Defroster | 2 | - € |
| Autonobbing | 2 | - € |
| Autofeeder | 2 | - € |
| Volume Batching Line | 2 | - € |
| Weight Batching Line | 2 | - € |
| Packing Line | 2 | - € |
| Palletizing Line | 2 | - € |
| Depaletizing Line | 2 | - € |
| Pre-Roller grader | 2 | - € |
| Shellfish Line | 2 | - € |
| Style Grader | 1 | - € |
| Fish waste Grinder | 1 | - € |
| Fish Washing Machine | 1 | - € |
| Glazer Line | 2 | - € |
| bottle / Box Washing Machine | 1 | - € |
| Packing conveyor | 1 | - € |
| Jam Mixer | 1 | - € |
| Jar Turnover | 1 | - € |
| Ice Dispenser | 1 | - € |
| Steaming Machine | 1 | - € |
| Salmon Deslimer | 1 | - € |
| Salt water dispenser | 1 | - € |
| Spice dispenser | 1 | - € |
| Cheese Cutter | 1 | - € |
| Vacum Packing System | 1 | - € |
| auto-packer | 1 | - € |
| Transporter | 1 | - € |
| Cabage Container | 1 | - € |
| SEAC FPM-500 | 1 | - € |
| Manual Pocket Machine | 1 | - € |
| Lift conveyor | 1 | - € |
| Manual Packing Line | 1 | - € |

5.3.4.4 Price Rates

One of the previously mentioned problems was the nonexistence of standardized prices and profit margins for any kind of service or spare part. The process of pricing was always confusing and most of the mimes created managerial problems and conflicts with the client.

With the aim of standardizing those prices and obtaining a more efficient process of pricing a table 13 was created:

Table 13 - Price Rates

| Price rates | |
|-----------------------------------|----------|
| Price/ Km | 0,90 € |
| Price/h (Techn.) | 50,00 € |
| Flight ticket 48h (Europe) | 50,00 € |
| Price/h (Admin) | 6,00 € |
| Priority | - |
| Flight ticket 24h (Europe) | 500,00 € |
| Staff Training Price/h | - € |
| Discounts | 15% |
| Spare parts package Profit Margin | 100% |
| Calibration Price | 200,00 € |
| Training Price | 100,00 € |

As shown on the previous table, the prices of each of the variables related with after-sales service were standardized with the approval of the general manager of the company. All those prices were selected based on the marked price for that industry in Latvia.

The standardized prices allow the new ERP system to automatically create quotation or invoices for after-sales activities, making the process faster and more trustful avoiding issues and conflicts with the client.

5.3.4.5 Calculator

With all the prices tabled and all the variables and average intervention times analysed and selected it was time to develop an excel formula capable of combining all that data and providing a final price that, in the end its will be, what will matter the most for the customer.

From the interaction of various sums and products of all the existing cells, a table 14 was designed that represented the final price of each type of activity, based on the customer information inserted by the user on the formula previously explained.

Table 14 – Price Calculator

| Calculator | | | |
|---|-----------------|-------------------|--------------------|
| EstoFish | Quantity | Unit Price | Total Price |
| <i>Distance Diagnostics</i> | 0 | 0,90 € | - € |
| <i>Distance Preventive Maintenance</i> | 0 | 0,90 € | - € |
| <i>Distance Spare Part Replacement</i> | 0 | 0,90 € | - € |
| <i>Diagnostics</i> | 0 | 140,00 € | - € |
| <i>Priority</i> | 0 | 0% | 0% |
| <i>Preventive Maintenance</i> | 0 | 1 120,00 € | - € |
| <i>On-site Response Time (48h)</i> | 0 | 500,00 € | - € |
| <i>On-site Spare Part Replacement Service</i> | 0 | 280,00 € | - € |

5.3.4.6 Final Price Example

The company selected for testing the formula was ESTOFISH, an Estonian company that transforms and processes fish.

Following it will be presented an example, table 15, Table 16 and Table 17 of how the formula looks like when completely fulfilled as well as the final selling price:

Table 15 – EstoFish Client Name (Example)

| Client Info | |
|-------------|----------|
| Client Name | EstoFish |

Table 16 - EstoFish Client Equipment List (Example)

| Client Equipment | |
|----------------------------|----------|
| Type | Quantity |
| Grading Line | 2 |
| Nobbing Line | 1 |
| Defroster | 0 |
| Autonobbing Line | 0 |
| Autofeeder Line | 1 |
| Volume Batching Line | 0 |
| Weight Batching Line | 0 |
| Packing Line | 0 |
| Palletizing Line | 0 |
| Depaletizing Line | 0 |
| Pre-roller grader | 0 |
| Shellfish Line | 0 |
| Style Grader | 0 |
| Fish waste Grinder | 0 |
| Fish washing machine | 0 |
| Glazer Line | 1 |
| Bottle/Box washing machine | 0 |
| packing conveyor | 0 |
| Jam mixer | 0 |
| Jar turnover | 0 |
| Ice dispenser | 0 |
| Steaming machine | 0 |
| Salmon deslimer | 1 |
| Salt water Dispenser | 0 |
| Spice dispenser | 0 |
| Cheese cutter | 0 |
| Vacum Packing Sistem | 0 |
| Auto Packer | 0 |
| Trasnporter | 2 |
| Cabage Container | 0 |
| SEAC FPM-500 | 0 |
| Manual Pocket Machine | 0 |
| Lift conveyor | 0 |
| Manual Packing Line | 1 |

This company has bought 6 lines: 2 grading lines, 1 auto-nobbing line, 1 auto-feeder line, 1 glazer line and 1 manual packing line. It also possesses some extra equipment such as a salmon deslimer and 2 singular transporters.

Table 17 - EstoFish Other Variables (Example)

| Customer Variables | |
|---|----------|
| Type | Quantity |
| Number of Free diagnostics | 0 |
| Distance | 800 |
| Number of Planned emergency flights | 0 |
| Number of Free spare parts Replacement services | 0 |
| Equipment Value | 0 |
| Number of Preventive Maintenance | 1 |
| Number of Trainings | 1 |

The distance (Return) is 800 Km and the number of preventive maintenance interventions per year is 1. Also, the contract only includes 1 staff training program. There are no diagnostics included in the service agreement as well as free on site spare parts replacements.

By inserting the previous variables on the formula the calculations are automatically generated and are expressed as a form of table, as shown on table 18:

Table 18 - EstoFish Price Calculation (Example)

| Calculator | | | |
|---|----------|------------|-------------|
| EstoFish | Quantity | Unit Price | Total Price |
| <i>Distance Diagnostics</i> | 800 | 0,90 € | - € |
| <i>Distance Preventive Maintenance</i> | 800 | 0,90 € | 1 008,00 € |
| <i>Distance Spare Part Replacement</i> | 800 | 0,90 € | - € |
| <i>Diagnostics</i> | 0 | 490,00 € | - € |
| <i>Priority</i> | 1 | 0% | 0% |
| <i>Preventive Maintenance</i> | 1 | 2 765,00 € | 2 765,00 € |
| <i>On-site Response Time (48h)</i> | 0 | 500,00 € | - € |
| <i>On-site Spare Part Replacement Service</i> | 0 | 280,00 € | - € |

The final price of the service contract is the result of the sum of all those individual prices shown on the previous table.

Table 19 - EstoFish Final Price (Example)

| Prices | |
|--------------------------------------|-------------------|
| Planned Maintenance | <i>Unit Price</i> |
| <i>Preventive Maintenance Visits</i> | 3 773,00 € |
| <i>Calibration</i> | 200,00 € |
| <i>Training</i> | 150,00 € |
| Total | 4 123,00 € |

The service contract price for the company ESTOFISH would be 4123,00€ annually. That price results from the total sum of the maintenance and repair prices together with the calibration and training interventions. It's important to mention that it was just a test and it was not offered to the client.

The total value of the PERUZA's equipment owned by ESTOFISH is approximately 385 000,00 €, that means that the cost of the maintenance service contract represents around 1,2% of the total value of the equipment. To the total price are added all the replaced parts during the preventive maintenance interventions as well as extra services that are not mentioned on the service agreement.

With the formula ready to be used, some offers were ready to be made to the customer and start the process of selling the service contracts.

5.4 Spare Parts

The spare parts business in many industries is as important as the main products, for example, the automotive industry. A good and proactive sale of spare parts can increase exponentially the company's revenues especially the after sales revenues. Also, the profit margin from that kind of parts can be high and usually the demand is very big.

PERUZA never considered trying to sell to the clients customized spare parts as a way of increasing the revenues and reducing the number of requests that usually create big problems to both sides, customer and supplier.

In order to improve that aspect of after-sales strategy, a new concept of selling spare parts was developed and it will be described on this chapter.

5.4.1 Critical Spare Parts Analysis

The first step to start implementing the new strategy of spare parts management was to analyse what are the spare parts that are critical on each equipment.

There were made 2 different analysis, the first one where together with the construction engineers it was studied and analysed what were the weak points and what parts should wear the most, and the second one that identifies, using the purchase history, what are the most requested spare parts per type of equipment, and the second one

As not all the equipment produced by PERUZA is standardized, it's practically impossible to define a specific spare parts list for every specific equipment. Due to such reasons, and because the time was limiter, the analysis was more focused on the standardized equipment.

The data used for this analysis was from 2016 until the present date, all the historical spare part requests and purchases were analysed, and the information was compiled.

As previously mentioned, the analysis was carried through many different equipment, such as autofeeders, autonobbing lines, filleting machines and grading and batching equipment. On this chapter it will be presented an example of the analysis made for the roller grader machine.

A roller grader, shown on the figure 27, is a machine that is used to separate the fish by size, where the gap between the concentric rolling rolls gets bigger letting the smaller fish fall before than the bigger ones.

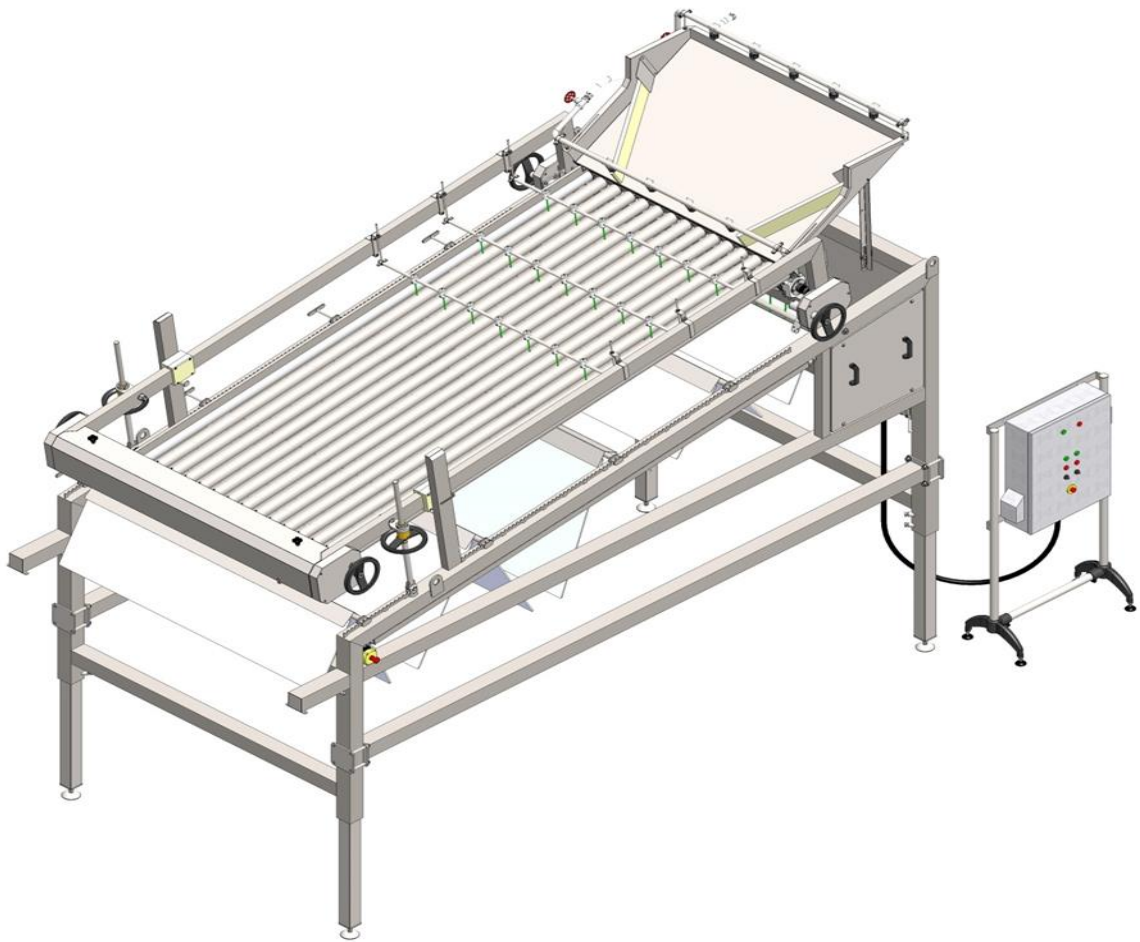


Figure 27 - Roller Grader

5.4.1.1 Technical Analysis of Roller Grader

The first analysis to be presented is based on technical information about the machine, information that was given by the equipment constructors.

5.4.1.1.1 Sealing Rings

When operating with fish, all the equipment must be waterproof, as liquid is constantly flowing throughout the process and the machines must be prepared to resist it. For that the critical mechanical parts need to have sealing rings in order to block those liquids from entering and possibly damaging the systems. It was considered essential to have 2 type of sealing rings as part of critical spare parts list, sealing that protect the transmission and gears, as well as the rolls, see figures 28 and 29.

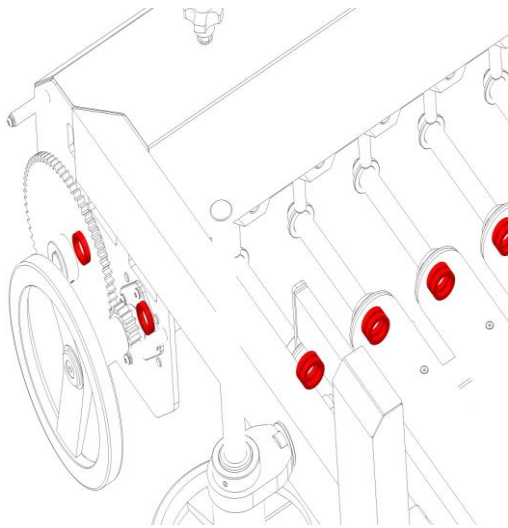


Figure 28 - Sealing Ring 25x35x7 (mm)

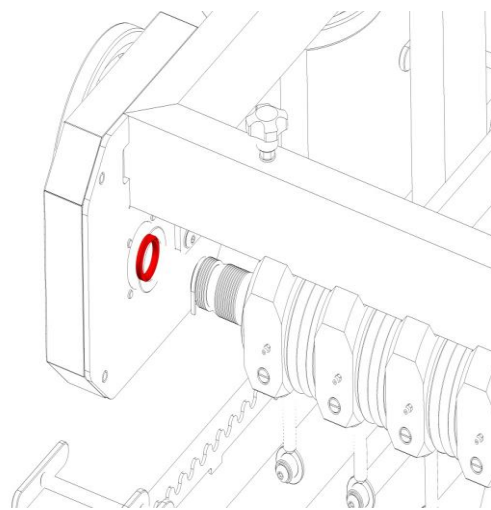


Figure 29 - Sealing ring 35x45x7 (mm)

5.4.1.1.2 Bearings

As for most of the machine with rotating movement, bearings are fundamental parts, as it allows the parts to smoothly rotate at high speeds with precision. In order to keep that well-functioning having healthy bearings it's mandatory, and for this specific equipment, that is rotating full time, the bearings must be part of the critical spare parts list.

From the analysis it was decided that there are 4 types of bearings that wear the most, the ones connected to the rolls and axis, and the ones connected to the transmissions and gears, see figures 30 and 31.

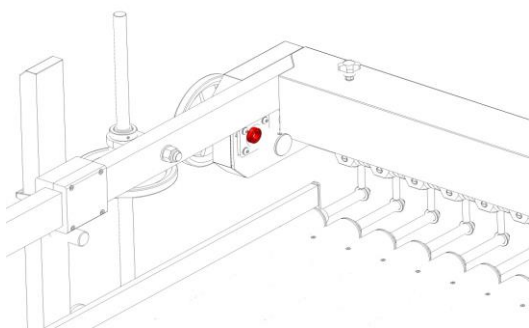


Figure 31 - Bearing 6203-2RS

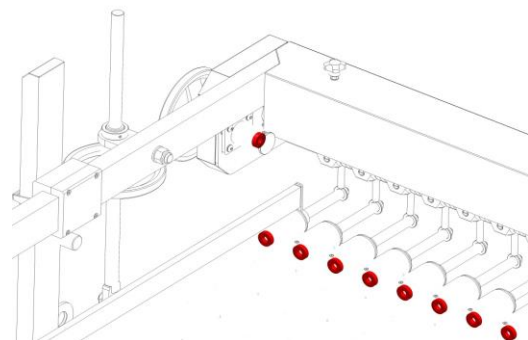


Figure 30 - Bearing 6004-2RS

5.4.1.1.3 Bearing Housing

As the core of the machine are the rolls, its mandatory to have bearing housings that are responsible for the alignment between the dolls and fixing and supporting the rolls on the shaft.

For such reasons it was considered essential to keep at least one bearing house of each time on stock, because it is a part where there is a lot of stress and can wear rapidly, damaging the machine or not allowing it to work properly, see figures (32 to 35).

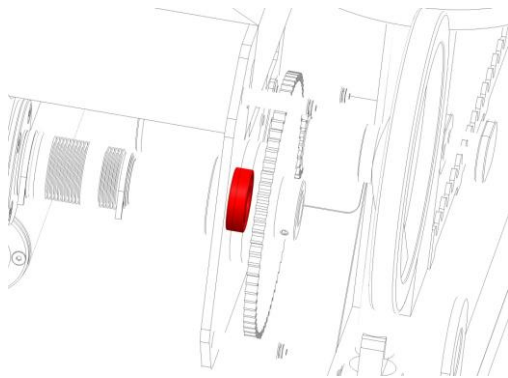


Figure 33 - Bearing 6205-2RS

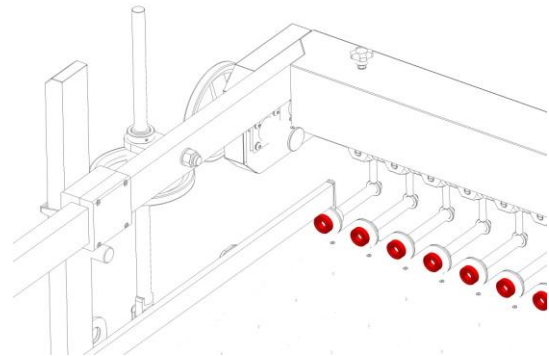


Figure 32 - Bearing 6204-2RS

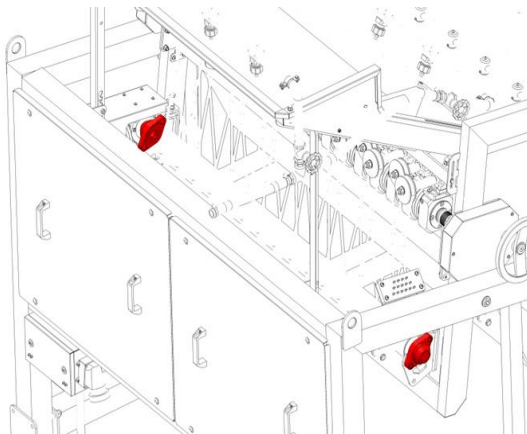


Figure 34 - Bearing Housing UCFL206C-81066

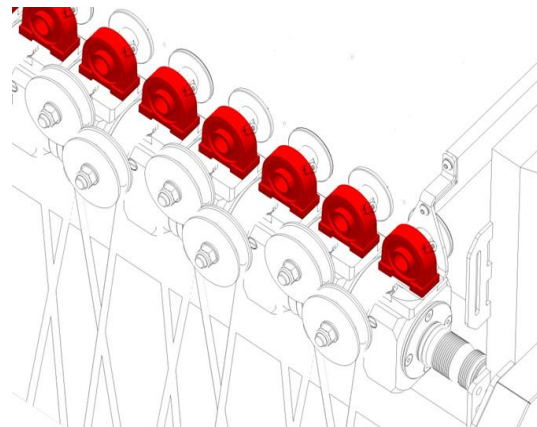


Figure 35 - Bearing Housing UPCA205SS-LDI

5.4.1.1.4 Belts

The belts are an essential item for any kind of transporter or conveyor that has movement associated. The belts can be modular, can be chain belts, round belts, there are multiple types each of them associated with different kinds of movement or product to be transported.

On the particular case of roller grader, the existing belts are the ones that act as transmission chains, transmitting the rotation of the motor reductor to the rolls. That kind of transmission is made by using round belts made of rubber. The diameter of the round belts is 10 mm for the first figure and 8 mm for the second. As the belts can be cut and repaired with connectors, it's only necessary to have at least 1.5 m length of belt for repairing any possible damaged belt, see figures 36 and 37.

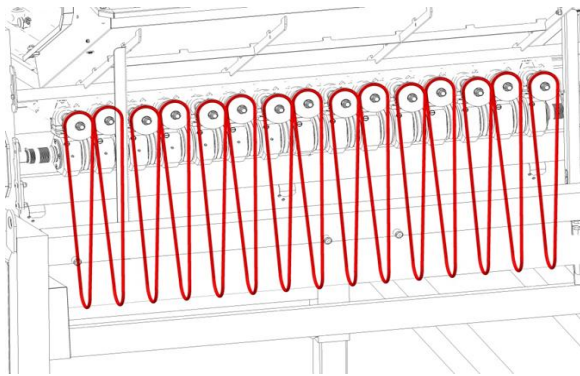


Figure 37 - Round Belt 10 mm

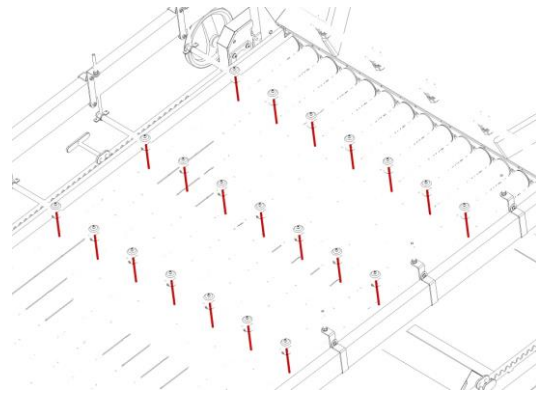


Figure 36 - Round Belts 8 mm

5.4.1.1.5 Motor-Reducer

The motor-reducer is the soul of the equipment, it's the source of all the movement of the machine and without it it's not possible to run the machine. Even though that kind of equipment last a long time, sometimes all the life span of the equipment, sometimes it has problems, and as previously mentioned without it the machine is stopped. That part is one of the most expensive spare parts and usually it's not possible for the client to have it in stock, anyway, once again because of its importance on the well-functioning of the equipment, it was included on the critical spare parts list, see figure 38.

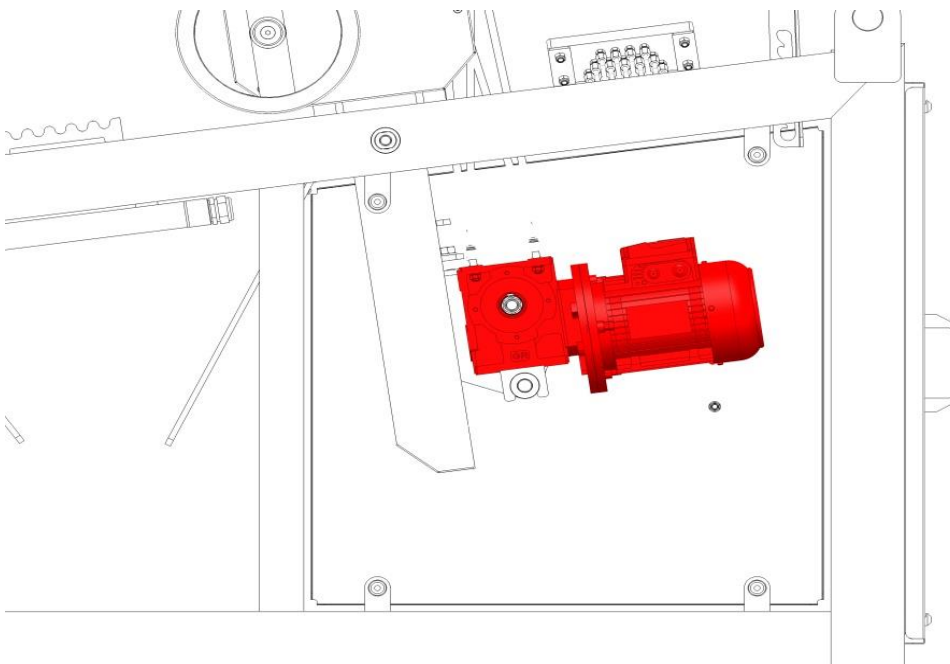


Figure 38 - Motor-Reducer

5.4.1.1.6 Other Parts

Some extra parts could be included, parts that are more related with the structure of the machine, more than the mechanical or electrical parts. The parts that were considered important to include on the list were (see figures 39 to 42):

- Foot
- Locks
- Handles
- Lubricant Connectors

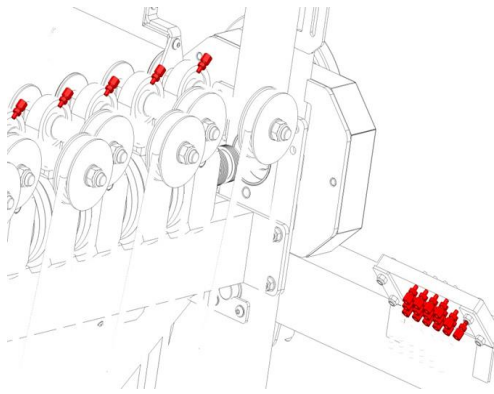


Figure 40 - Lubricant connectors

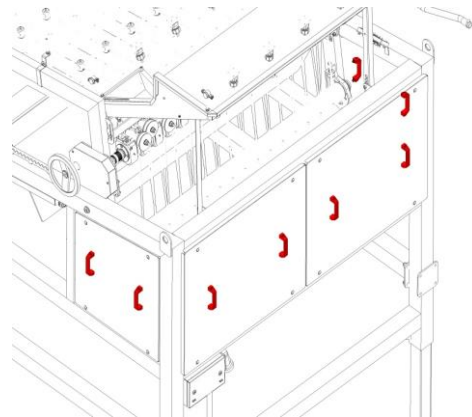


Figure 39 - Handles

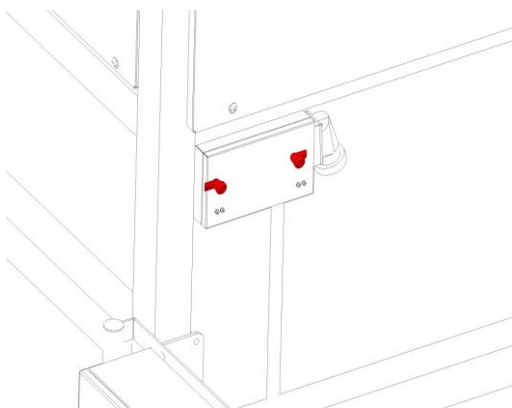


Figure 42 - Locks

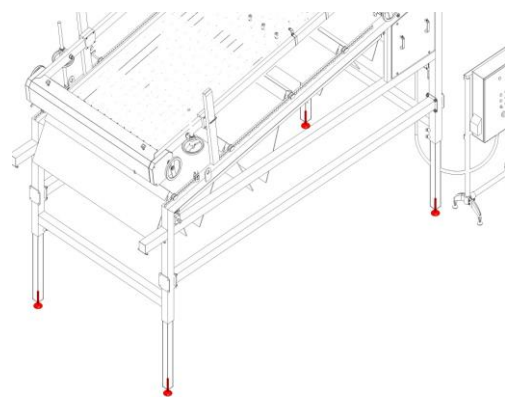


Figure 41 - Foot

5.4.1.2 Spare Parts Purchase History Analysis

During the internship period, it was carried an analysis to the purchase history of the spare parts from the last 3 years. That analysis was focused on finding out what are the most consumed spare parts, collecting enough data to develop a critical spare part list, that together with the information acquired from the technical analysis, results in a complete and trustful spare parts package that can be offered to the customer, assuring that the parts that are most likely to wear are included and in almost all the possible damages the downtimes will be much shorter.

There were types of equipment analysed, even though the only example that will be represented is the roller grading Line, see table 20.

Table 20 - Spare Parts Purchase History

| Equipment/Parts | Belts | Chains | Fixators | Motor Reducer | Bush | Bearings | Gears | Bearing Housing | Sealings | Nozzles |
|---------------------|-------|--------|----------|---------------|------|----------|-------|-----------------|----------|---------|
| Roller Grading Line | 32 | 21 | 200 | 8 | 14 | 120 | 11 | 32 | 80 | 42 |

As shown on the (Table 18) the most requested parts for repairing damages or replacing used parts were Belts, Chains, Fixators, Motor Reducers, Bushes, Bearings, Bearing Housings Sealing and Nozzles. When comparing with the technical analysis previously presented, its possible to notice some parts that are mentioned on both, the bets, motor reducers, bearings, bearing housings and sealing.

In order to create the final critical spare parts list for the roller grading line, it was necessary to research the specific items for that equipment and collect the respective storage codes (Item codes) so it can be used for future machines similar to the one analysed on this study.

5.4.1.3 Critical Spare Parts List (Example)

With the analysis complete, and all the important codes collected, it was possible to define the critical spare parts list for the roller grading line. Some extra parts were added because the roller grader has some transport conveyors associated to it to input and output the fish. That parts that were added were selected based on the same methodology used for analysing the roller grader, see table 21.

Table 21 - Critical Spare Parts List for Roller Grader

| Type of Spare Part (Eng) | Type of Spare Part (LV) | Axapta code | Quantity |
|---|-------------------------|---------------------------|----------|
| Grading Line - spare parts Package | | | |
| Rubber Transmitters (m) | Apalgumija | HAB.RPN-10 | 5,00 |
| Rubber Transmitters (m) | Apalgumija | VOL.RPN-8 | 1,00 |
| Chain Belt (m) | ķēžlenta | 18PPPA66182WMPB1628BDEEAB | 1,00 |
| Sprayer/nozzle (unit) | Sprausla/Smidzinātājs | S0019-51450 | 2,00 |
| Chain Belt (m) | ķēžlenta | 19PEPA66222NCNB0305 | 2,00 |
| Gears | ķēžrats | 193PA6CNB18221LG00 | 2,00 |
| Drum roll | Motorrullis | TM100B25-0425PL2CR-310-4 | 1,00 |
| End rolls (Pulley) | Gala Rullis | - | 2,00 |
| Foot | Peda | TEC-92-7785 | 2,00 |
| Gears | ķēžrats | 183PA6MPBH10111LG00M060S | 2,00 |
| Plastic rolls | Rollītis | - | 2,00 |
| Bushes | Busi | - | 2,00 |
| Foot | Peda | TEC-18.7055 | 2,00 |
| Foot | Peda | TEC-97.7555 | 1,00 |
| bearing | gultnis | GUL.6004-2RS | 1,00 |
| bearing | gultnis | GUL.6205-2RS | 1,00 |
| bearing | gultnis | GUL.6204-2RS | 1,00 |
| Bearing house | Gultņojums | GLN.UCFL206C-81066 | 1,00 |
| Bearing house | Gultņojums | GLN.UCPA205SS-LDI | 1,00 |
| Fixators | Fiksators | TEC-288-82563 | 2,00 |
| Fixators | Fiksators | TEC-288-82568 | 2,00 |
| Fixators | Fiksators | S0612-692962 | 2,00 |
| Leg | Kāja | TEC-202.80627 | 1,00 |
| Gland | Blīvslēgs 25x35x7 | BLS.25x35x7 | 1,00 |
| Gland | Blīvslēgs 35x45x7 | BLS.35x45x7 | 1,00 |
| Side Board | Borts | - | 1,00 |
| Drum roll | Motorrullis | TM100B25-0425PL2CR-310-4 | 1,00 |
| Motor Reductor | Motorreduktors | MRV50-71C2-0.75-175 | 1,00 |
| Motor Reductor | Motorreduktors | MRIV81-2-90L4R-1.5-13.8 | 1,00 |
| Sealing Ring | blīvējuma gredzeni | BLG.35x45x7 | 5,00 |
| Sealing Ring | blīvējuma gredzeni | BLG.25x35x7 | 5,00 |

5.4.1.4 Pricing Spare Parts

The politics of the company regarding the price of spare parts is very simple; it consists only in applying 100 percent profit margin to the buying price when it's a purchased part and quoting manufactured parts just like the equipment they produce.

From the feedback of the customer the prices are acceptable when comparing with the market price for the same products, however it was decided that, to motivate the

customer to buy the spare parts package the prices had to be reduced, otherwise it would be very difficult to sell. Thus, the pricing structure was improved.

For any contract holder all the spare parts have a discount of 15% from the original selling price, that is 100% from the buying price, in case of purchasing the suggested spare parts package the client has access to a higher discount from the total price of the spare parts package, the total discount on that circumstances is 30%. The main idea of increasing the discount is to motivate the client to purchase the package, as for both it can bring many benefits, such as reduced downtimes, faster response, stable income for supplier and reduced prices for the buyer.

For the non-contract holders, the packages also have a discount of 15% although every spare part that is ordered occasionally, without any pack associated, is sold at the normal price that is the buying price plus 100% profit margin.

5.4.1.5 Spare Parts Selling Strategy

The biggest improvement on this matter was the introduction of a new concept of selling spare parts, the active sale. Till then only the requested parts were sold or parts that got damaged and had to be replaced. This new concept consists in actively suggesting the customer to purchase spare parts as a package showing the benefits of acquiring it and assuring a constant income for the supplier and protecting the customer equipment and production.

5.5 New After-Sales Process Flow Diagram

With all the after-sales improvements complete, it was necessary to create a new process flow diagram, where all the activities and processes are explained. One of the weakness previously mentioned on the study, was the existence of an incomplete and not updated process flow diagram for after-sales. As with the introduction of new after-sales activities the customers are now divided in 2 groups, the ones that hold an after-sales service contract and the ones that doesn't. On this chapter both new process diagrams will be presented, together with the process flow chart for the preventive maintenance interventions and the warranty type interventions.

It was also developed a general after-sales process diagram that shows all the different activities that must be executed from the moment a customer creates a request, that redirects the manager to the respective process diagrams, see figure 43.

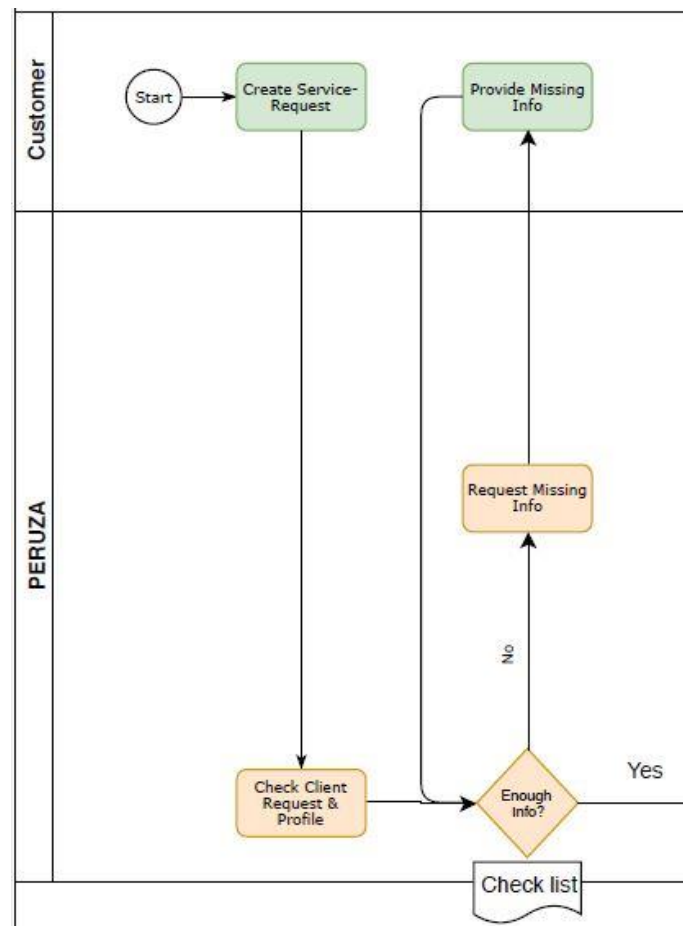


Figure 43 - General After-sales Process Diagram (Part 1)

The process starts when a customer creates a request, it can be from various reasons, but all of it is process the same way until it is understood what kind of intervention will be required. The next step is to check and understand which client is requesting and what kind of profile it has. When checked, it's time to process the information requested by the customer, that many times is not enough to understand the issue, if not then the missing information is requested and the cycle repeats until the missing information is gathered. When the information is enough to understand the issues, it's possible to move to the next step.

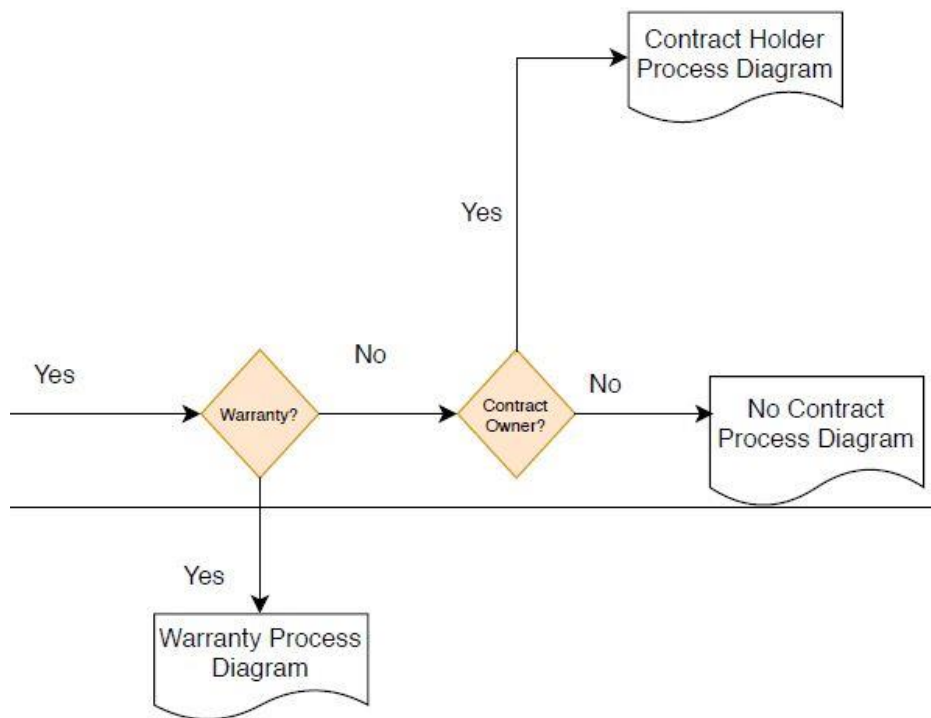


Figure 44 - General After-sales Process Diagram (Part 2)

It is on this step where the route of the request is separated, based on the type or profile of the customer in cause.

There are 3 big groups, see figure 44, each of it with different process flows, the customers that are in warranty period, the ones that are not in warranty and don't have any kind of service contract and finally the service contract holders.

On this chapter each of the 3 different process flows will be presented and explained.

5.5.1 Contract Holders

In figure 45, the first process to be presented is related with the after-sales approach for the customers that subscribed for service contract.

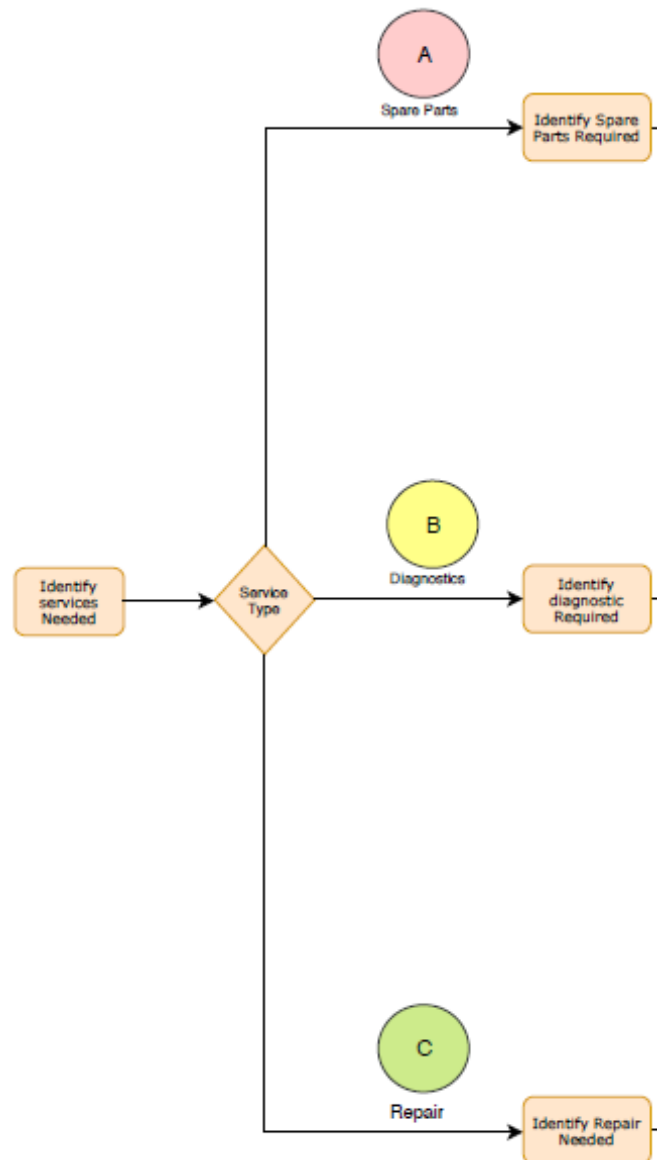


Figure 45 - Contract Holders Process Diagram

With the customer identified and all the necessary information acquired, it's time to identify what kind of service is required to attend to the customer request. There are 3 different possibilities, Spare parts (A); Diagnostics (B); and Repairs (C);

5.5.1.1 Spare Parts Request (A)

Figure 46 explains the process flow for a spare part request made by a customer holding a service contract:

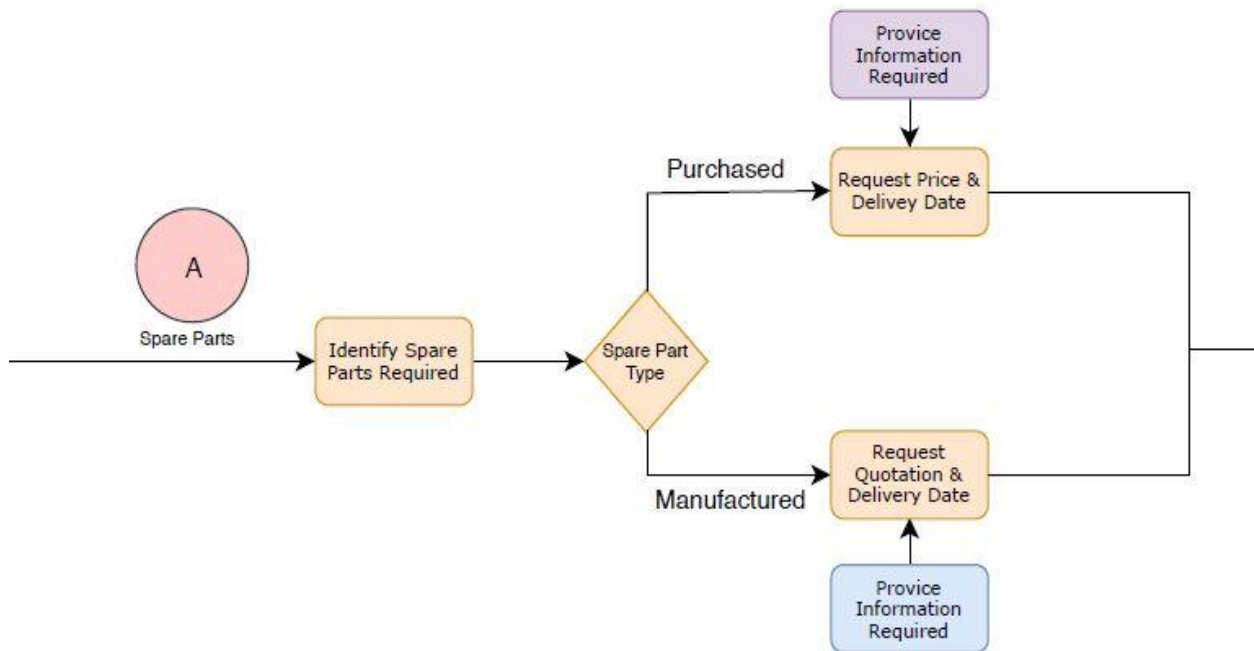


Figure 46 – Spare Parts Process Diagram (Part1)

The first action to be performed is to identify what kind of spare part is required. There are 2 groups of parts, the ones that can be purchased or the ones that must be manufactured internally. For the parts that are purchased the procurement responsible requests price and delivery date to the supplier, and for the manufactured parts the after-sales manager requests to the production responsible a quotation and delivery date as well. It's important to mention that PERUZA does not hold stocks of spare parts for any kind of equipment, due to a big diversity of customized equipment models, but sometimes extra purchased or manufactured parts can be found in stock, and on that case, it does not need to be bought.

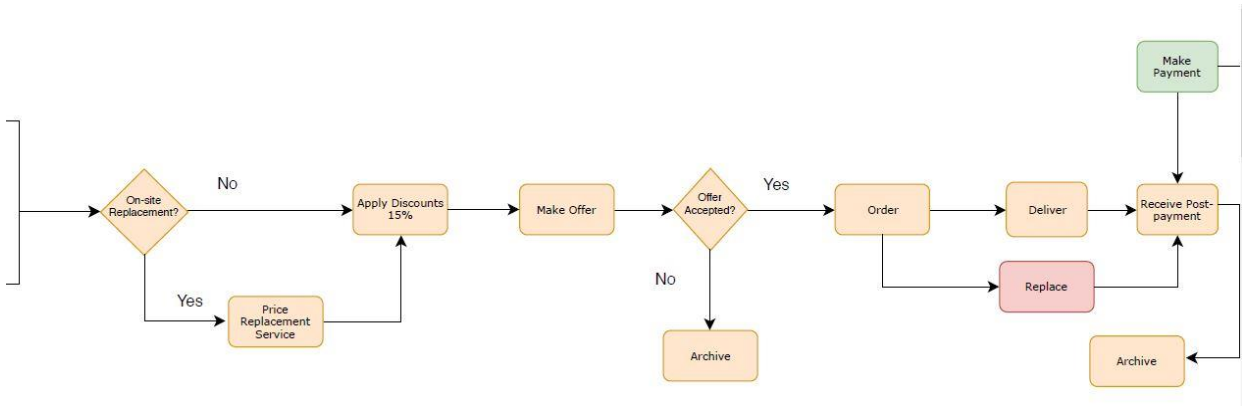


Figure 47 - Spare Parts Process Diagram (Part 2)

The next step is to understand if the customer needs or not on-site replacement of the requested spare part, see figure 47. Some customers do not have a maintenance team capable of replacing the requested part, and on that case, usually an onsite replacement service is needed. On that case the service is quoted with a 15% discount applied due to the fact of being a contract holder.

When the offer is complete, it is presented to the customer and its acceptance is awaited. If the customer does not accept the offer, then the process finishes with the archive, if the offer is accepted, then it's ordered and delivered or replaced in the case when on-site replacement is necessary. The Process finished with the receiving of the post-payment and archive.

5.5.1.2 Diagnostics Request (B)

The following figures, 48 and 49, explains the process flow for a diagnostic request made by a customer holding a service contract:

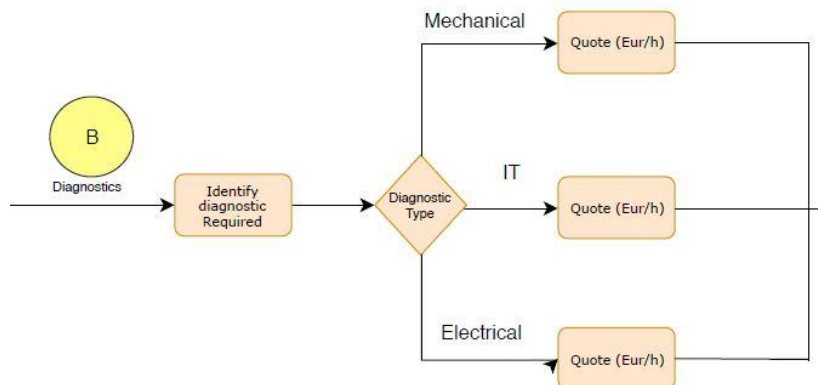


Figure 48 - Diagnostics Process Diagram (Part 1)

Just like the spare parts process, the first step is to identify what kind of diagnostic is required. It can be a mechanical issue, electrical or IT. As each type of diagnostic has different prices, a quotation is required.

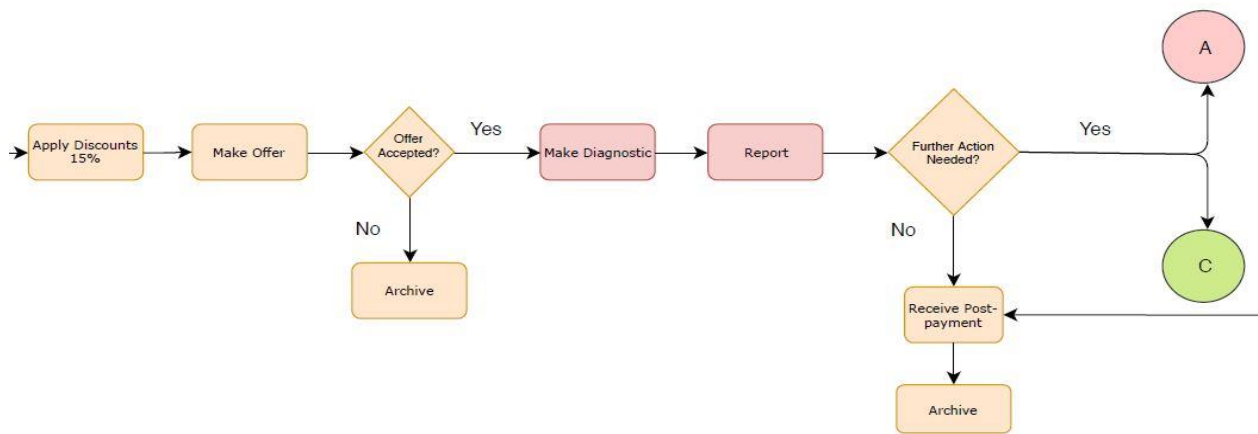


Figure 49 - Diagnostics Process Diagram (Part 2)

Once again as the customer in cause is a contract holder, a discount of 15% is added to the quoted price of the required diagnostic service. With the quotation completed, the offer is made to the customer and again the progress of the process depends on its acceptance. If the offer is rejected then the process is finished and archived, if it is accepted then the diagnostic is performed. From the report of the diagnostics the manager will understand if there are further actions required or not. When there are no possible actions required the payment is received and the process is archived, in case of need for more actions then the process used is the same as shown on the Spare parts (A) and Repairs (C).

5.5.1.3 Repair Request (C)

The following figure 50 explains the process flow for a diagnostic request made by a customer holding a service contract:

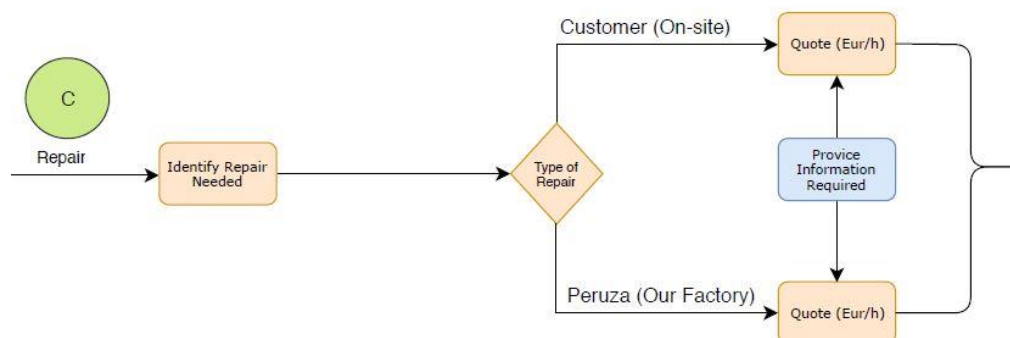


Figure 50 - Repair Process Diagram (Part 1)

When dealing with a repair, it's necessary to first identify where the repair is going to be performed, It can be a repair of the customer facilities or a part that needs to be repair at PERUZA's facilities. For both cases a quotation must be performed, see figure 51.

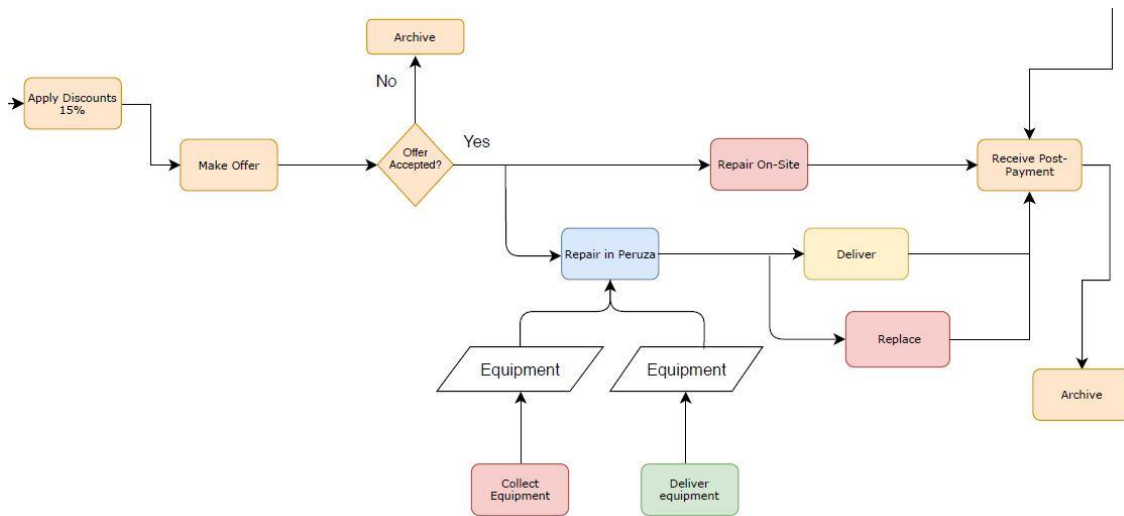


Figure 51 - Diagnostics Process Diagram (Part 2)

Before the offer is ready to be presented to the customer, a discount of 15% must be applied to the price. Following the offer is offered to the customer and when rejected the process is archived but when accepted it can proceed through 2 different ways.

When the repair is performed on customer facilities, PERUZA's maintenance team moves to customer facilities and performs the repair. When the repair has to be performed at PERUZA's facilities, the part must be either deliver or collected, then is repaired and again either delivered or replaced on-site if the customer requires such action.

Finally, the payment is received, and the process is archived.

5.5.2 No Contract

5.5.2.1 Spare Parts Request (A)

For the customer that does not hold any kind of service contract, the process has some changes. The first one is that there is no added 15% discount to the price, second the payment of the spare part must be performed before the part is ordered (Pre-payment) and the shipping payment is covered by the customer and it must be performed right before the delivery of the requested spare part. In case of on-site replacement service, the payment can be received after the service is completed, se figure 52.

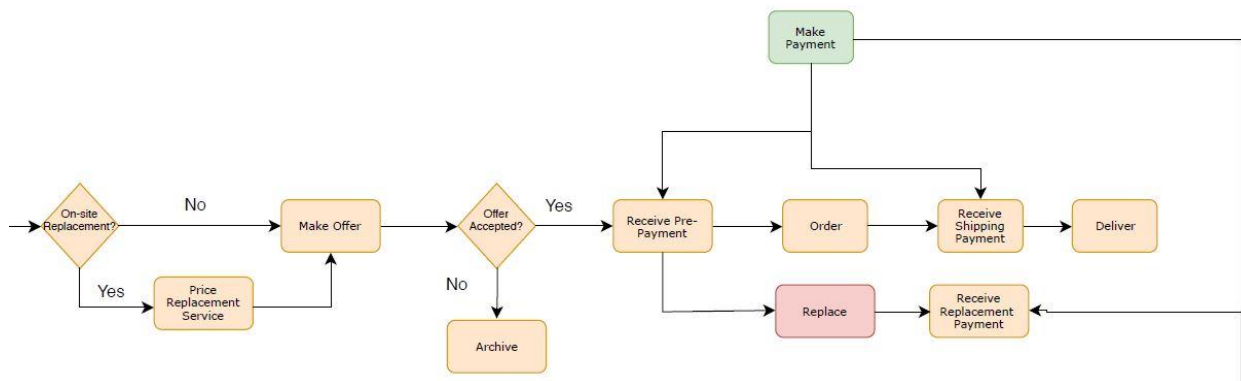


Figure 52 - No contract Spare Parts Process Diagram

5.5.2.2 Diagnostics (B) / Repair Requests (C)

The only difference in the process of diagnostics and repair between the contract holders and non-contract holders is the nonexistence of any kind of discount on the price of the service for the customers that did not subscribe to any kind of service contract offered by PERUZA, see figure 53 and 54.

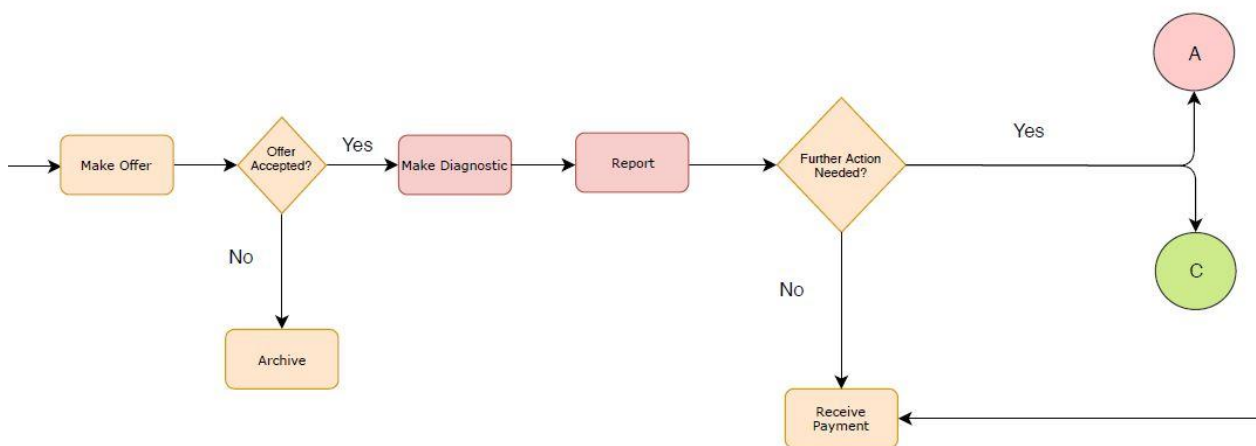


Figure 53 - No contract Diagnostic Process Diagram

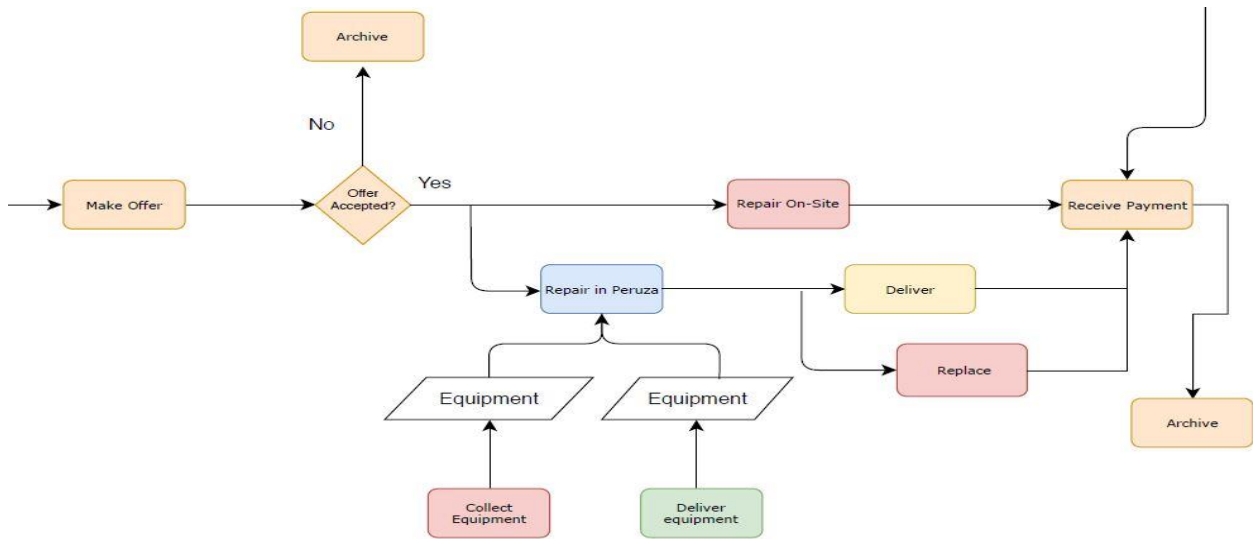


Figure 54 - No contract Repair Process Diagram

5.5.3 Warranty

For the warranty interventions the process flow is equivalent to the one shown for the non-contract holders, with a slight difference, that all the costs associated with the intervention are covered and assured by PERUZA, as it was agreed on the contract signed on the purchase of the equipment.

5.5.4 Preventive Maintenance Process Flow Diagram

The preventive maintenance intervention is a completely new activity for PERUZA, something that has never been performed but that is now part of the possible services offered.

The process flow of maintenance interventions was carefully studied in order to be as effective as possible and make the customer satisfied with the minimum costs, see figure 55.

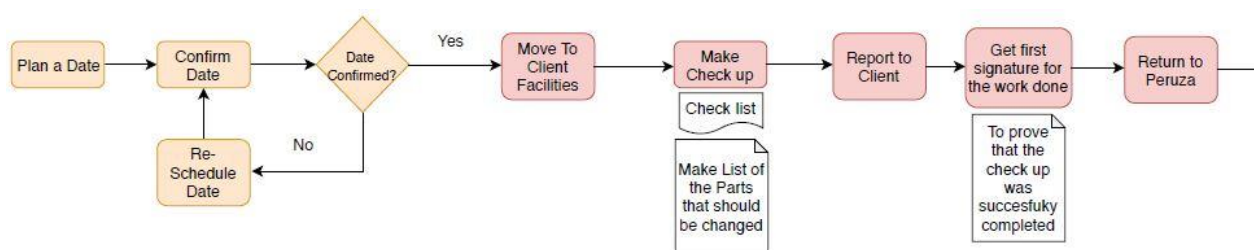


Figure 55 - Preventive Maintenance Process Diagram (Part 1)

The process starts with scheduling a date with the customer, date that should be booked with anticipation, so that both customer and service provider can be prepared for it. Closer to the date, the aftersales manager must confirm the date with the customer, if the customer for some higher reason is not available on that previously scheduled date, then another date is rescheduled and the process repeats, if the customer accepts then PERUZA's maintenance team move to customer facilities to start the intervention.

The intervention starts with a check up to PERUZA's equipment. The aim of that check-up is making a general evaluation of the equipment conditions and make a check list of parts that should be changed.

As soon as the check-up is complete a report is made and presented to the customer, at this stage the customer should sign the agreement that proves that the check up as successfully performed as stated on the service contract.

With the agreement signed, the technicians return to PERUZA, see figure 56.

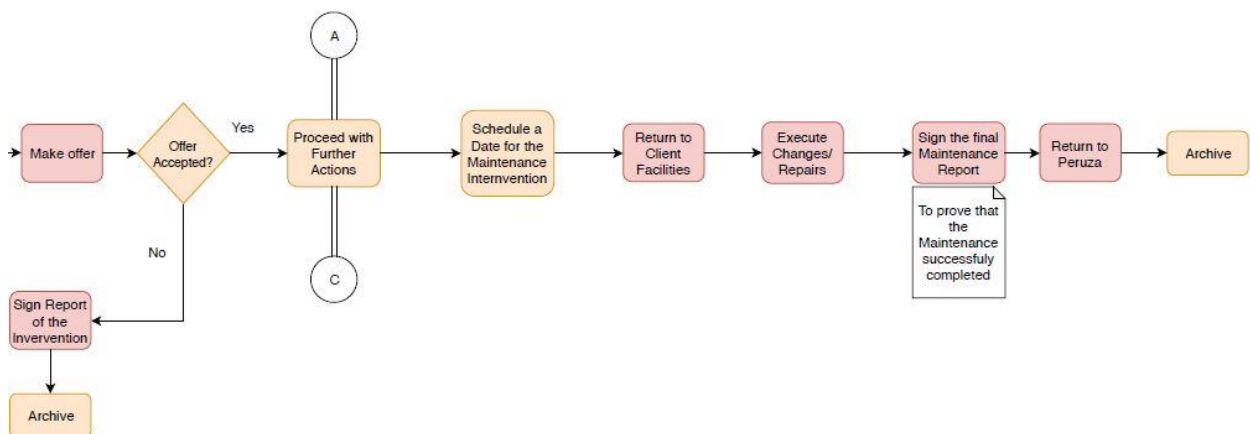


Figure 56 - Preventive Maintenance Process Diagram (Part 2)

With the report analysed PERUZA creates an offer for the customer with the parts that have to be changes and the parts that should be changed. It's the customer the one who decides from all the parts stated on the list, which ones want or don't want to change. If the offer is not accepted the process ends with the customer signing the report mentioning that the process didn't proceed, and the project is archived. If the offer is accepted, then the process proceeds with further actions. When there are spare parts needed the process is equivalent to the one mentioned on the previous chapter (A) and for repairs it follows the process (C). With all the parts ready and all the tools, a new date for the second part of the intervention is scheduled and PERUZA moves to customer facilities and execute the necessary changes.

With all the parts replaced/repared, the final maintenance report is signed by both parties, proving that the maintenance intervention was successfully complete. To finish, the technicians return to PERUZA and the process is archived.

With the improvements implemented, it was possible to offer the new services to the customers, with the objective of selling the first maintenance contract in the history of the company. Fortunately, and still during the internship period, a customer from Poland agreed to be part of the first pilot project regarding maintenance contract and spare parts package. This contract was focused only in one kind of equipment, the roller grading line, in order to understand in practice how the process is and try to optimize it the most.

Conclusion

6 Conclusion

The After-sales management was field of work that was almost forgotten by PERUZA and due to the complexity of the new equipment and high demand of requests by the customers, it was necessary to start looking at it, the same way to other fields such as production and sales.

The opportunity for the Internship appeared exactly due to the need to have someone completely focused in improving the after-sales strategy of the company, aiming to increase the revenues as well as improve the trust and reliability of their services.

During the internship many new ideologies regarding spare parts and resource management, as well as maintenance and customer service, were acquired and played an important role by allowing me to better understand and analyse the issues of the current after-sales methodology and implement the necessary changes to obtain better results.

Throughout the project many improvement proposals were presented and some of it were approved and implemented, such as the introduction of preventive maintenance service, the creation of spare parts packages and the development of a totally new process flow diagram.

By the time the internship ended, and together with the board of the company, it was noticed that the objectives of the study were achieved and the opportunity of continuing to work for the receiving organization, PERUZA emerged, where I would be responsible for managing the after-sales service and negotiate contracts and spare parts with the customers.

Even though the study was successful, there are some fields that need further research, such as the standardization of the products, with the objective of implementing lean approaches to the management of the company, also the continuous research of new maintenance methodologies and finally the introduction of the new strategy for companies placed in other continents, as in terms of resources and logistics it raises new challenges and barriers that need to be studied and analysed.

To conclude, I can say that this project associated with the international experience contributed a lot for my personal and professional development, many concepts associated with industry and business were acquired and will be valuable for my career in the future as an engineer.

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Appendices

8 Appendices

8.1 – Attachment I

Optimization of the After-sales Service in a Manufacturing Company

Hello,

My name is Antonio Mota, and I am studying Master's in Industrial Engineering and Management in ISEP Porto, Portugal.

I am writing a thesis about the optimization of the after-sales service in a OEM (Original Equipment Manufacturer), so I would be very grateful if you could take 5 - 10 minutes of your time to answer to this survey and help me with my work.

Thank you very much.

***Required**

1. How many people do you employ? *

Mark only one oval.

- < 19
- 20 - 99
- 100 - 499
- > 500

2. Do you provide any After-sales/Customer Service ? *

Mark only one oval.

- Yes *Skip to question 3.*
- No *Stop filling out this form.*

After-Sales Service Description

3. What kind of services do you provide after selling the equipment? *

Tick all that apply.

- Preventive Maintenance
- Spare parts replacement
- Modernization or Upgrade of Products
- Staff Training
- Remote Control
- Warranty
- Inspection

4. How do you offer your services? *

Tick all that apply.

- Provide Maintenance Contracts
- Just Attend Client Requests
- Suggest Purchase of Spare Parts
- Provide Maintenance Instructions Book
- Other: _____

5. If you provide Maintenance Contracts, what is included?

Tick all that apply.

- 1 time a year Inspection
- 2+ times a year Inspections
- Spare Parts Discount Price
- Assure fast reply
- Assure fast delivery of spare parts
- Provide detailed Maintenance Instructions to the technicians
- Other: _____

6. Do you have a dedicated department just for after-sales services? *

Mark only one oval.

- Yes
- No

7. How many employees has your after-sales team?

8. What is the average lead time (Days) for a spare part replacement in local market?

Please insert numbers only

9. What is the average lead time (Days) for a spare part replacement in worldwide market?

Please insert numbers only

10. What is the approximate percentage of revenues generated just from after-sales services, compared to total revenues ?

Please insert just the number without the percentage symbol (%)

11. What is the approximate percentage of expences from warranty services, compared to total revenues?

Please insert just the number without the percentage symbol (%)

12. How do you exchange the technical information with the client, regarding the parts that need to be replaced?

13. Do you use any ERP or CRM system to manage the after-sales service information? *

Mark only one oval.

- Yes Skip to question 14.
- No Skip to question 15.

ERP/CRM System

14. Wich ERP/CRM system do you use?

Skip to question 15.

Extra Information

15. Please insert country where the company is located

16. Please write your e-mail if you want to receive the results of this survey. Thank you for your time.

8.2 – Attachment II

Evaluation of After-Sales Service Quality

***Required**

1. Have you ever used or had the need for our after-sales services? *

Mark only one oval.

Yes

No

Skip to question 15.

After-Sales Service Evaluation

2. How do you evaluate the After-Sales/Customer Service? *

Mark only one oval.

1

2

3

4

5

Very Unhappy

Very Happy

3. What do you Like/Dislike about the services offered?

4. Have you ever had the need for spare parts? *

Mark only one oval.

Yes

Skip to question 5.

No

Skip to question 7.

Spare Parts Service Evaluation

5. Are you happy with the lead times? *

Mark only one oval.

| | | | | | | |
|--------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|------------|
| | 1 | 2 | 3 | 4 | 5 | |
| Very Unhappy | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Very Happy |

6. How do you evaluate the prices? *

Mark only one oval.

| | | | | | | |
|------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------------|
| | 1 | 2 | 3 | 4 | 5 | |
| Very cheap | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Very Expensive |

Customer's Maintenance Evaluation

7. Do you have a specific person in charge of equipment maintenance in your company? *

Mark only one oval.

- Yes Skip to question 8.
 No Skip to question 9.

Customer's Maintenance Responsible Evaluation

8. In your opinion, has PERUZA provided enough training for maintaining your PERUZA's machines? *

Mark only one oval.

| | | | | | | |
|------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|--------|
| | 1 | 2 | 3 | 4 | 5 | |
| Not enough | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Enough |

9. Do you have the need to collect data about your production performance? *

Mark only one oval.

- Yes
 No Skip to question 14.

Data Collection Analysis

10. How important is this topic for you? *

Mark only one oval.

| | | | | | | |
|---------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------------|
| | 1 | 2 | 3 | 4 | 5 | |
| Not Important | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Very Important |

11. If the machine would collect this data would it be relevant to improve your business performance? *

Mark only one oval.

- Yes
 No

12. Would you be willing to share the data with PERUZA? *

Mark only one oval.

- Yes
 No

13. What kind of data would you be interested in collecting from the process?

Communication

14. How happy are you with the communication? *

Mark only one oval.

| | | | | | | |
|--------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|------------|
| | 1 | 2 | 3 | 4 | 5 | |
| Very Unhappy | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Very Happy |

Communication Evaluation

15. What would be the best way to communicate with you? *

Tick all that apply.

- Phone Call
 WhatsApp
 Email
 Skype
 Other: _____

16. Regarding technical information, which format would you prefer to identify the necessary spare parts? *



Mark only one oval.

- Digital Skip to question 17.
- Physical (Paper) Skip to question 18.

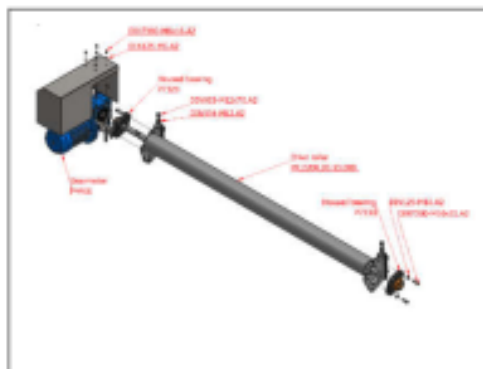
Types of Digital Formats

17. In which kind of digital format would you like to receive the technical information? *

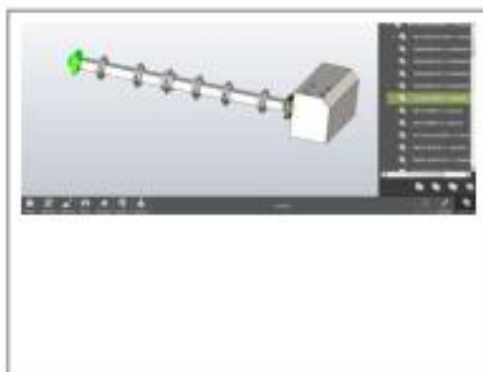
Mark only one oval.

| Pictures | Equipment | Name | Quantity |
|--|------------------|---------------------------------------|----------|
|  | Operador PL 3011 | Holder belt P=120 | 1,7 |
|  | Operador PL 3011 | Motorbomba K022 0.12kW (3~) 50-50mm-1 | 0 |

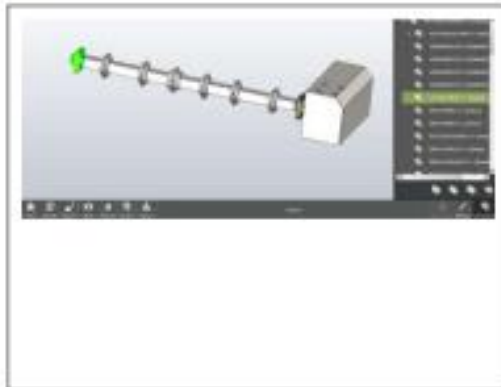
- Excel File (Where you identify and fill in how many parts you require)



- Exploded View (Where you identify necessary parts available on the picture and send email where you specify the parts and quantities needed)



- 3D Model File (Free software that allows to 3D view the machine and measure, explode view, move the models and identify the Part Numbers)



- 3D Model available on our website (Free software that allows to 3D view the machine and measure, explode view, move the models and identify the Part Numbers)
- Other: _____

After-Sales Service Contracts

18. **If we would provide Annual Service/Maintenance contracts which of these services would be relevant for you? ***

Tick all that apply.

- Annual Preventive Maintenance
- BI-Annual Preventive Maintenance
- Customized Preventive Maintenance Schedule
- Staff Training
- Spare Parts Package (Parts more frequently wearable)
- Spare Parts Discount
- Faster Spare Parts Delivery
- On-site Replacement of Spare Parts
- Faster Response
- Fast On-site Technical Support
- Machine Upgrades and Improvements
- Remote System Diagnosis
- Performance Analysis and Optimization
- None
- Other: _____

19. **Please write the country where the company is located ***

20. **Please write the name of the company ***

8.3 – Attachment III

PERUZA
Service Contracts

Equipment to profit

- Spare Parts Management
- Maintenance & Repair
- On-Site Diagnostics
- Upgrades & Optimization

“Protect Your Investment, Your Budget and Increase the Lifetime of Your Equipment”

Write a small text about service and peruza (General).