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MASTER THESIS

TITLE: Lean Implementation at Cerveza Artesana Homebrew S.L

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Summary

English

This final project develops theoretical and practical foundations of lean management in a small company of the craft beer industry, focusing on the distribution of raw materials to other companies.

First we analyze the current state of the craft beer industry in Spain and the opportunities for growth in it.

Later, exposed all the theoretical basis used in the project, adapting and applying Lean tools to the case.

After analyzing the areas to be addressed in the project and the processes in each area, locating wastes and problems in each case, and the value it brings to each client. Later we objectivize problems and value if they really need improvement, looking more susceptible processes. Once selected processes object of improvement we propose improvements for each of them.

Finally an economic analysis of the project is done to see the viability of it, quantifying the costs associated with carrying it out and appreciating the benefits that impact.

At the end, in the conclusions we explains how the project has affected the company, proving once again the value and usefulness of it.

Catalan

Aquest projecte final de carrera desenvolupa les bases teòriques i pràctiques del Lean Management a una petita empresa del sector de la Cervesa Artesana, centrant-se en la part de distribució de matèria prima a altres empreses del sector.

En primer lloc s'analitza l'estat actual del sector de la cervesa artesana a Espanya i les oportunitats de creixement en el mateix.

Posteriorment, s'exposa tota la base teòrica utilitzada en el projecte, aplicant i adaptant les eines Lean al cas concret.

Després s'analitzen les àrees a tractar en el projecte i els processos de cada àrea, localitzant malbaratataments i problemes en cada cas, així com el valor que aporta al client cada un d'ells. Posteriorment s'objectivitzen els problemes i es valora si realment necessiten una millora, buscant els processos més susceptibles. Un cop seleccionats els processos objecte de millora es proposen millores per a cada un d'ells.

Finalment s'acaba amb un anàlisi econòmic del projecte, per veure la viabilitat del mateix, quantificant els costos associats per dur-lo a terme i valorant els beneficis que repercuteix.

Finalment en les conclusions s'exposa com ha afectat el projecte a la empresa, demostrant una vegada més, el valor i la utilitat del mateix.

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1. Introduction

1.1 Project Objectives

The aim of this project is to improve costs, reduce stocks, improve lead times, quality and improve the general management of the warehouse so we improve the quality of service that Cerveza Artesana gives to his customers.

To achieve the objectives we will apply the concepts Lean methodology learned during my studies, demonstrating the benefits they can add to the company and his services, creating value for the customers and removing wastes. We want to show that with lean, Cerveza Artesana can have better services and results with fewer resources, giving to the customers what they really need, how they need, when they need, with the minimum costs and without wasting resources.

Mainly, to improve a company in a sector (craft beer) which is not been developed, in order to facilitate and guide his growth.

The Challenge of this Project is that there is no bibliography of companies with the same characteristics (in terms of sizes) in the craft beer market that apply lean methodology.

1.2 Future Projects

Because one of the functions of Cerveza Artesana is to advise Microbreweries of all their business, the same tools applied in that project can be applied to new customers that ask for advises.

With them, they will be able to have their raw material always fresh, minimizing stocks and increasing quality and times.

2. Foreword

This project explains the result of the implementation of lean technology in Cerveza Artesana Homebrew s.l, a company where I'm working since 2012.

I knew Cerveza Artesana because I was a homebrewer and I bought them a lot of products, I saw some leaks in management and stock control so I tried to help them. Then I started working in the company.

After learning the power of lean methodology with Oriol Cuatrecasas and Nestor Gavilan I asked them to guide me in order to achieve good results in my projects, because I wanted to work in a real case and have real results, so I can apply to the real world.

2.1 Motivation

I'm Working in Cerveza Artesana Homebrew for 2 years, I've grown in that company and developed myself, now, my bosses asked me to improve the warehouse so I decided to apply lean management in the company so I can see real results.

The Spanish Craft beer sector is a very young and there are not companies that can professionally attend the demand. That fact presents an opportunity to well organize a company in order to give good services to craft beer lovers (homebrewers and microbreweries) so they can have a provider that facilitates the daily work there, raw materials necessary for them and advise them of how to solve problems.

3. The Company Cerveza Artesana HomeBrew s.l

3.1 Company Origins and evolution

The company Cerveza Artesana Homebrew S.L was founded on 2010 as an association of 2 of the workers; Nereo Garbin and Daniel Fermun, who started an online shop in order to distribute craft beer products for homebrewers (people that brew his own beer at home). This little shop provided all kind of tools and raw materials in order to make himself a place in the craft beer market. At the same time, they were setting up some micro-breweries and accompanying customers during the assembly and learning process of their breweries.

At 2003, Nereo Garbing bring the craft beer movement into Spain, using Italian providers that supply him (and after, the company) with all the necessary tools and materials. Firstly the company had just 2 providers, one for microbreweries and another for homebrewers.

The warehouse was initially inside the office, fact that allow the workers to complete different tasks like: the order reception, preparation, and delivery, the telephonic assistance, to make offer making, looking for new customers, the microbrewery attendance, etc. The stock, management and selling system was all with the online shop software.

With all of that, during his first year of life, the company has obtained an annual turnover volume of 150.000€.

It quickly start increasing, duplicating the turnover volume during 2012 and tripling it during 2013 until the present, where the annual turnover volume is about 2 million euros. All that also represents and increasing in number of workers until now, that there are 10 people.

Until now we had been working with monthly demand forecasts made without a clear precedent of how the sales could be estimated, which generated a large volume of stock of certain products and breaking stock in other products that had more rotation.

Periodically we perform a manual review of the products in order to identify those in which stock is broken and must place an order. This system produces a high delivery delay orders to consumers and also sometimes we do not include all that would be necessary, which causes another order and thus significantly increase the costs associated with shipments.

Until now, estimate of the order that had to be done were done considering intuition, watching what was ordered last time and what was sold and making an estimate of what should be bought. So we had not a clear system of how to make the orders.

Another point to note is the significant increase of products offered at the request of the market; we have gone from 100 initial references to over 600.

These two factors together have led to a situation in which the stock in the warehouse has increased exponentially, which makes the space more and more limited and result also to an increase of the storage costs.

Apart from this, this warehouse should be able to receive and unload quite large machines and this happens every time a factory is open (about once a month), and therefore these machines remain stored shortly.

Despite assuming storage costs as the volume of stock you have, the store is currently full, which complicate the mobility of workers and causes a lower efficiency of the working time of employees, causing them to achieve fewer orders per day and this fact cause a necessity to increase the staff in order to compensate this effect. Another consequence that this mismanagement has caused is the reduction of the variety of products, because there are products that have a low demand and is quite expensive to stock and manage them.

Therefore, in the company we face a need to adjust the stock of each product to avoid unnecessary amounts of stock, to reduce storage costs and increase the efficiency of the company. Yet another reason to consider this fitting is that often, excessive storage time of some products makes these products to exceed the expiry date and lose their properties. Therefore, we have to decrease the stock time and increase the rotation.

Moreover, the volume of orders per day with the method of preparing them currently makes that no one person can handle the warehouse. It should also be clarify that on several occasions, errors occur in many orders and these errors lead to an increase in the shipping orders, sometimes orders are shipped in 2 or more batches, causing an increase in shipping costs and a discomfort in the clients. Another reason for these errors is that the employee is required to prepare orders in a short time without having an established order or the fact that for example, when preparing an order of materials they are not ready or even they had not been weighted previously, this leads to erroneous orders delivered weights.

There are two types of stock and orders, wholesale orders, which supplies involve weight and volume orders, stored on a pallet storage area, where there are few references in each order, 4 items on average in each order; and online orders, which are small elements located in the picking area (separated from the pallet storage area) where each order has about 10 different items on average.

There are different suppliers, but these can be grouped in two categories, those who order every 2 weeks and those who order every 2 months.

3.2 Creation of a new Organization

The organizational expansion produced because of the increasing of the turnover volume between the 2010 and 2014 (from 150.000€ to 2.000.000€) makes necessary a change in the organizational and structural model. This new

model must be able to absorb the expansion in working lines and in working volume.

In order to complete the change, we will identify correctly the costs and gains per line as well as the wastes in each lines, as well as processes that are possible to externalize.

As well we must see if the increasing of production means at the same time an increasing of headquarters and distributors, because is not the same to have just one office with 5 workers than having when you have a turnover volume of some thousands than when is transgressed the threshold and start to speak for millions.

Another point to take care of it should be the normalization and standardization of the working tasks. Now, the working tasks are not defined neither reguled. When the company is really small this can't work but when it starts having some workers and grows, the need of standardization becomes necessary and evident as bigger the company becomes. In addition, the disorganization of the office makes that people not always find what are looking for or if it is, they've lost working time. On the other hand each worker has many interruptions in several ways because it takes a lot of work in parallel lines without any order or preference, all the jobs are urgent.

In reference to this point, is undertook the great effort that workers are doing, they spend more hours than they should, according to their workday. This is just one example of the need for standardization of the jobs.

Therefore, we propose a new situation in which we work with a minimum stock, so we should have a clear control of the situation and the lead times of each supplier and product.

Second, he must establish schedules and redefined tasks for each of the jobs through a standardization of work processes as well as the results, avoiding excessive interruptions for phone calls.

Third, it is important to mention that in its origins competition was nonexistent, but gradually other emerging companies have also entered to this sector. Some companies offer better prices through the online store, faster service or an online store with better pictures and product descriptions. Therefore, although we still have a strong presence in the sector (being the online shop and company most influential in its sector), we should be able to minimize costs and delivery time to improve customer service, a significant fact is that we have many first sales, but it is hard to promote loyalty among online clients. The fact of stock control and order should provoke cost reductions, improvement in the delivery time and an increase in the promotion of the clients' loyalty.

Fourth, we want to implement self-management of the online store. This implies that the same warehouse employee could be capable of serving the orders and pass the list of products to be ordered. In this way, the rest of the employees should not be aware of whether there is a need to make an order or not, or the

status of a customer order. It would also be a good point if the same employee could also answer calls of doubts about our products, avoiding the amount of interruptions to the rest of the company.

Finally, it would be important to make a good follow of the wholesale customer, ie, small and medium companies engaged in the development of craft beer, both, those who have started their business with our help and those who have started their business on their own. A good monitoring improves customer confidence that values the interest you are giving and encourages repeated purchases. This monitoring will give us information of how many liters of beer they are producing and selling, making able to know whether they are buying raw materials only to us or to some other competitor, if they need new equipment to control the stability and improvement of the quality of their products and we could also help them with the distribution of their products with our network without stocking their products (we have created a section in the online store where customers can advertise and reach direct orders).

4. The product

4.1 Beer

For most of us, beer is a refreshing alcoholic drink that should always be drunk cold and very gassy. The truth is that craft beer is not a refreshing drink, it's a foodstuff, full of vitamins and nutrients, and you can drink it with a few gasification and at room temperature, or even warm.

4.1.1 Considerations of the Product needed to be taken in account during the project

Hops

To ensure a properly conservation of the hops and their alpha acids and to maintain Hops in best conditions there are some storage conditions that we need to apply:

- Preserve from the light: So a good option is to use non transparent packages
- Storage colder than 4ºC
- Storage without oxygen: Some industries use other gases (as nitrogen) to storage hops and avoid from oxidation. What is also used and more affordable is to close them in vacuum packets.

Malt

The conservation of the malt must be done in a dry place and always under 20ºC in order to avoid any possible infections.

Yeast

Both types have different storage requirements, but yeast always must be stored in a cold place (around 5ºC).

4.1.2 The Spanish Market

In Spain, the market is really young, there are not a lot of companies dedicated to the craft beer and it's a good opportunity to create a company that becomes important in the craft beer sector as we can see in the following table.

Number of microbreweries each year:

Year	2010	2011	2012	2013	2014
# microbreweries at 31 Dec	4	23	68	109	220

Figure 4.1 Number of microbreweries evolution

There are two main markets:

The homebrewer market:

In that market, the customer is a homebrewer: a person that wants to brew beer as a hobby at his house. They use to have a little budget and want to create different beers, so they tend to buy very different products so they can try all of them.

The professional market (microbreweries):

In that market the customer is a company: their aim is to have some different kind of beers and to brew always the same. They have better budget and equipment than homebrewers, but is very important to send them the raw material when they need because a delay in delivery means that they won't be able to brew, so they will have economic loses.

4.2 Homebrewers products

First of all we will focus in the online shop.

There are 2 main branches in that part:

- The products that the employee has to produce (create, manipulate), usually using material from the pallet warehouse
- The products that must be served as they has arrived to the picking zone

For the first part, the most relevant articles are:

- Malt/grain bags (5kg and 2Kg from a 25Kg sack)
- Hop bags (100g, 250g and 1Kg from a 5Kg sack)
- Caps bags (100 u and 1000 u bags from a 10.000u box)

For the second parts we have too many products from different providers, but we can resume in the following:

- Cans
- Little Tools
- Big Tools
- Kits

In the following table we can see the most sold products:

Product	Units sold
Best Malz Pilsen 25Kg	150
Best Malz Pale Ale 25Kg	170
Botella de Cerveza 500 ml Moby Dick	264
Levadura SAFALE S-04 11,5g	165
Levadura SAFBREW S-33 11,5g	167

Figure 4.2 Most sold products

5. Lean Manufacturing

5.1 What is lean?

Lean is a production practice that tries to maximize or preserve the value reducing or optimizing the costs. It is centered from the customer's point of view, the target that will receive a product or a service, to ensure it will receive the best possible result. That result is achieved following some principles whose goal is cost reduction by the elimination of waste. These principles are: pull processing, perfect first-time quality, waste minimization, continuous improvement, flexibility, load leveling, production flow and visual control.

Lean manufacturing was born in the Japanese manufacturing industry, basing his core in the Toyota Production System.

For many, lean is a set of "tools" that assist in the identification and steady elimination of waste. As waste is eliminated quality improves while production cost and time are reduced. Some of that "tools" set would be: SMED, Value Stream Mapping (VSM), Five S, Kanban (pull systems), poka-yoke (error-proofing), Total Productive Maintenance, elimination of time batching, mixed model processing, Rank Order Clustering, single point scheduling, redesigning working cells, multi-process handling and control charts.

In this project we will use Value Stream Mapping and Kanban wich will be explained later on.

5.2 The 5 Principles

Toyota's view is that the main method of lean is not the tools, but the reduction of three types of waste: muda ("non-value-adding work"), muri ("overburden"), and mura ("unevenness"), to expose problems systematically and to use the tools where the ideal cannot be achieved. From this perspective, the tools are workarounds adapted to different situations, which explains any apparent incoherence of the principles above.

5.2.1 Value

The value is always defined by the customer, it's not generic, it's specific for each service that the company provides. The best way to define the value is to put yourself in the customer point of view and ask the following:

Will I pay that amount for this service?

If the answer is negative, we're in front of a waste, because there is something that is not the minimum working time, place, equipment information or material absolutely necessary to add to the service, to the service our customer expects.

The wastes are also known as non-value-add activities (NVA). There are two types:

- The “necessary” waste, that which can’t be removed yet.
- The waste, which is sometimes hidden, but could be removed.

It’s very important that the value is well defined, so the service is provided around a wrong value concept, although it’s correctly done, would become a waste.

5.2.2 Identify the value chain

The value chain is the set of actions that must be done in the appropriated way, with the required sequence in the necessary moment to create the value for the customer.

Each of the processes that are done in the company are part of the value chain of the service that they offer.

5.2.3 Continuous Flow

This principle implies that the work in a process must flow like a river, moving from one adding value activity to another easily and visible, removing the rocks and artificial barriers (waste) to reach the sea (the customer).

Some of the elements which difficult the flow are; the bad designs, the variation in the processing time, the people and used method performance, the errors (and the re-works they develop) and the unnecessary transitions between people or departments.

The tools that improve it are: register de Lead Time, balancing workloads (Heijunka), standardization, the 5’S and the visual management boards.

5.2.4 Pull Flow

Thins principle involves that you must provide value just when customer needs it. So you must not accumulate stock of an article that has no demand from the customers.

To achieve a correct implementation of the pull system, a relation one-to-one between the information and the action must be created. It must ensure that any action is done until the next step ask for it and must check that the action is the required action.

5.2.5 Perfection

This principle implies that each and every person working in the company must continually look for perfection, that is, the value specified perfectly without incurring any waste.

Because of that, we must apply continuously the 4 principles just explained using a philosophy of continuous improving. The perfection must be the final objective of the continuous improvement in order to delete wastes.

5.3 The Strategy: Quality, Volume and Cost

In order to achieve the excellence in the service, it's no enough to work with efficiency, you must maximize all the potential of the organization to achieve the business objectives.

It's the addition of being able to **satisfy your customers**, having a **human team** able to meet their activities and fully **committed to the business** and to provide to the customer the service that he expects and values with the maximum efficiency.

The satisfaction of a customer is achieved offering him the value of the service he expects, as he desires, with the amount he requires, always he needs and with the minimum costs possible, so we can summarize it as: quantity, volume and cost.

5.3.1 Quality

Be aware of the state of quality in the entire value chain of a business and protect the customers from the low quality it's an essential element of the lean strategy. Align the quality of the organization system with the needs of the customer is the first step of the lean implementation strategy, and is the basic condition to improve other aspects related with the customer satisfaction and the efficiency of the processes.

This requirement not only refers to the quality service the client receives final but each of the elements, systems and resources that interact in the value chain; work methods, standards of service, facilities, people, tools, raw materials, etc.

5.3.2 Volume-Supply

Once understood the required quality by our customers and verifying that we have the necessary capacity and stability in the whole organization to complete it, the next phase of the Lean implementation strategy is to give the amount of service required within the time agreed or expected by the customer. Once again, we must satisfy the customer but knowing that the final objective of the company must be to obtain economic benefits.

At this stage of the implementation should try to achieve the principle of flow through balancing the rate of production or "Takt Time". The first objective to perform successfully the stage of "Supply" is getting a continuous flow both in service and information. As for the service, we continue to make a continuous flow with minimal wastes. As important as the service will be the flow of information as it requires that orders services are regularly scheduled in time, given by the same transmitters to the same receivers and using the same communication channels.

5.3.3 Cost

The operational excellence allows customer satisfaction with minimal cost and resources and maximum performance.

It should not be the goal but continues to be an essential element. Keep in mind that competitors are also struggling to achieve this goal in their operations, therefore not consider it is going backwards.

6. Methodology and tools

6.1 Methodology

The methodology represented below has been defined to be a guide of lean application. It's formed by two principal steps.

1. Identification of the areas or processes of the value chain to improve
2. Implementation of the Lean system to the identified areas

Area or processes of the value chain to improve identification methodology

This first step has the objective to identify those areas of the company that require an improvement and will be the base of the Lean introduction work to the company. To achieve it we must resort all the processes of the value chain identifying in which "lean phase" is each area.

The "Lean Phases" follow this sequence:

Figure 6.3 Process identification methodology

Standardization

Is the phase which identifies the stability level of a process or service. Is the base of the following phases because without a systematic repeatable (though not the best) and predictable is not possible to advance in the improvement.

Flow

Discusses the transmition state of the elements of the process, whether material between two processes (eg: warehouse - picking) or information in service order (eg: new customer order, new purchase order, etc.).

Visual Management

It refers to the existence of lessons and visual elements that help interpret the defined system to take the more advantage of it possible.

Operating System and Tools

Is the phase that is the level of training and knowledge that people have working that can be drawn about the system and how they can use it. It's based on the existence of metrics to monitor and control the system and the use of them from the people in the company, the necessary tools to create and maintain the system and processes with continuous flow.

Map of Quality Management

It is based on the existence of a quality map so that all the improvements and actions derived from the philosophy of Lean continuous improvement framed within a system of quality assurance.

Once identified the phase where each process belongs will be necessary determine in which must improve before, considering that the realized work in each will be the phase of Lean introduction to the company.

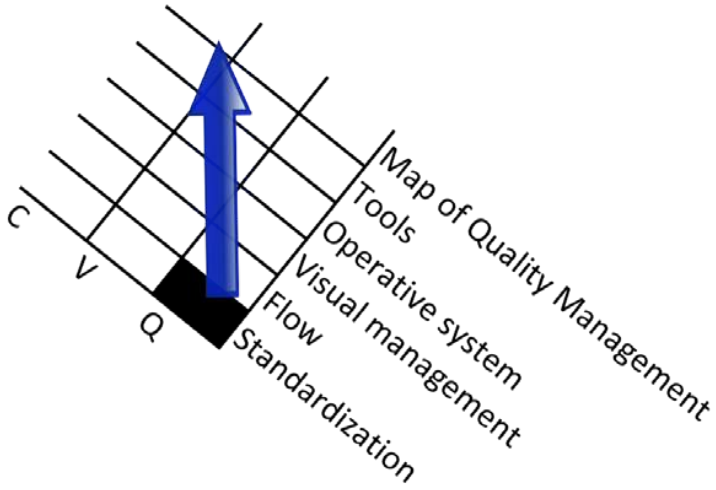


Figure 6.4 Matrix Phase-Strategy

To determine this we must consider the initial state and the sequence order of the matrix phases which results from the integration of the strategy developed in the chapter 5.3 with the Lean phases analyzed in the chapter 6.1, hereafter Phase Matrix - Strategy.

The improvement should raise it from the base and the logical sequence that sets the matrix avoiding to forget any cell because each of the cells establishes an improvement to the company. If we develop an improvement project in a superior cell without having solved all the cells below it, the project won't be sustainable and will fall to a lower phase requiring immediately to work on the base phases to make it sustainable For example, in the same way that a Cost problem can't be solved before acquiring the stability (Q), neither will be able to

implement an operative system without having established which are the value flows. So, combining them, we won't be able, for example, solve a Volume+Flow problem (establish flows in the company if we don't have well defined the quality and flow, in other words, work with not stable flows) and Volume+Standardization (if the Volume or subministration is not stable).

6.1.1 Tools

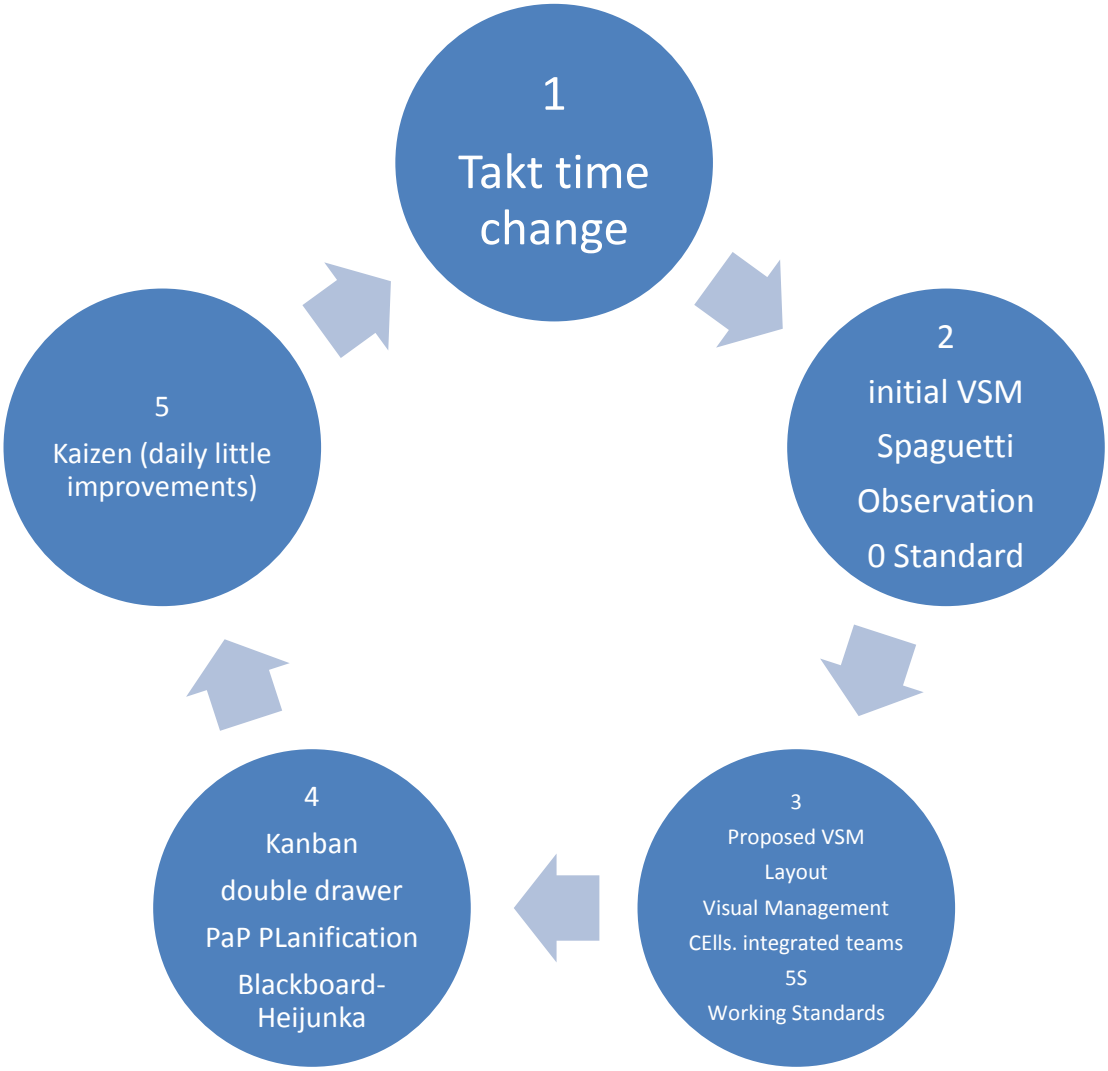


Figure 6.5 Lean Tools

In order to carry out the phases of analysis, improvement and control Lean has a set of tools. Below is a brief introduction to the basics of these;

Standardization

Consists in the creation of stability in the processes of the value chain. Is the base of the following steps since without a systematic repeatable (although is excellent in principle) and predictable is impossible to continue improving.

Visual Management

Once the standardization exists, there are required some procedures or visual lessons which help the workers, supervisors and directors to interpret and remember the system standard in order to apply it faithfully. It's an essential element of the standardization because it provides the necessary support in order to meet the best practice available in a specific place or activity.

5'S

Is a methodology that improves the organization and order to maintain a safe environment and high performance workplaces. Its aim is to show, reduce and eliminate wastes and residues in order that they don't repeat in the future. [BOM Consulting Group, 2010b, p.6]. The methodology is based in 5 basic principles:

- **Seiri (classification):** Maintain just what's necessary for the process. Eliminate the rest.
- **Seiton (order):** Order all the necessary elements and label them for their easy access and use
- **Seiso** (cleaning)
- **Seiketsu (standardization):** Application of standards in the practice of the three first 'S'. This principle is strongly related to creating habits in order to keep the workplace in perfect conditions.
- **Shitsuke (self-discipline, maintenance):** Continuous improvement to maintain the system.

Value Stream Mapping

Mapping the value chain is a tool through symbols and graphs showing the sequence and the movement of information, materials and different operations that make up the value chain. In this mapping Lean indicators are assigned on each transaction in order to know the current status and to identify improvement opportunities.

Kanban

Is a Lean tool in the form of visual support system that combines customers demand with the service or supply of materials by the provider. There are the cards that customer uses to give a replacement signal to provider indicating who, when and how much to supply.

Kaizen

Is a basic tool for the continuous improvement of the company based on teamwork: project management by multidisciplinary teams and teams of

permanent improvement, as supporters of responsiveness and adaptation to changing customers' needs and promoters of the culture of continuous improvement.

In sessions Kaizen companies move away from traditional pharaonic projects and concentrated in small but constant improvements to make in their processes. Much of time is devoted to "make things occur." In these sessions the Kaizen participants not only have powers to determine or suggest improvements, but what is more important, to make it. Kaizen in action is the most important.

6.2 Sustainability

6.2.1 Commitment to Lean culture

The principles and tools are needed for a successful transition to Lean culture, but not enough. Lean culture involves the desire, the capacity and the responsibility to improve continuously by all employees at all levels of the organization. Without Lean culture will not benefit the organization, these are isolated cases or not take effect on the whole organization.

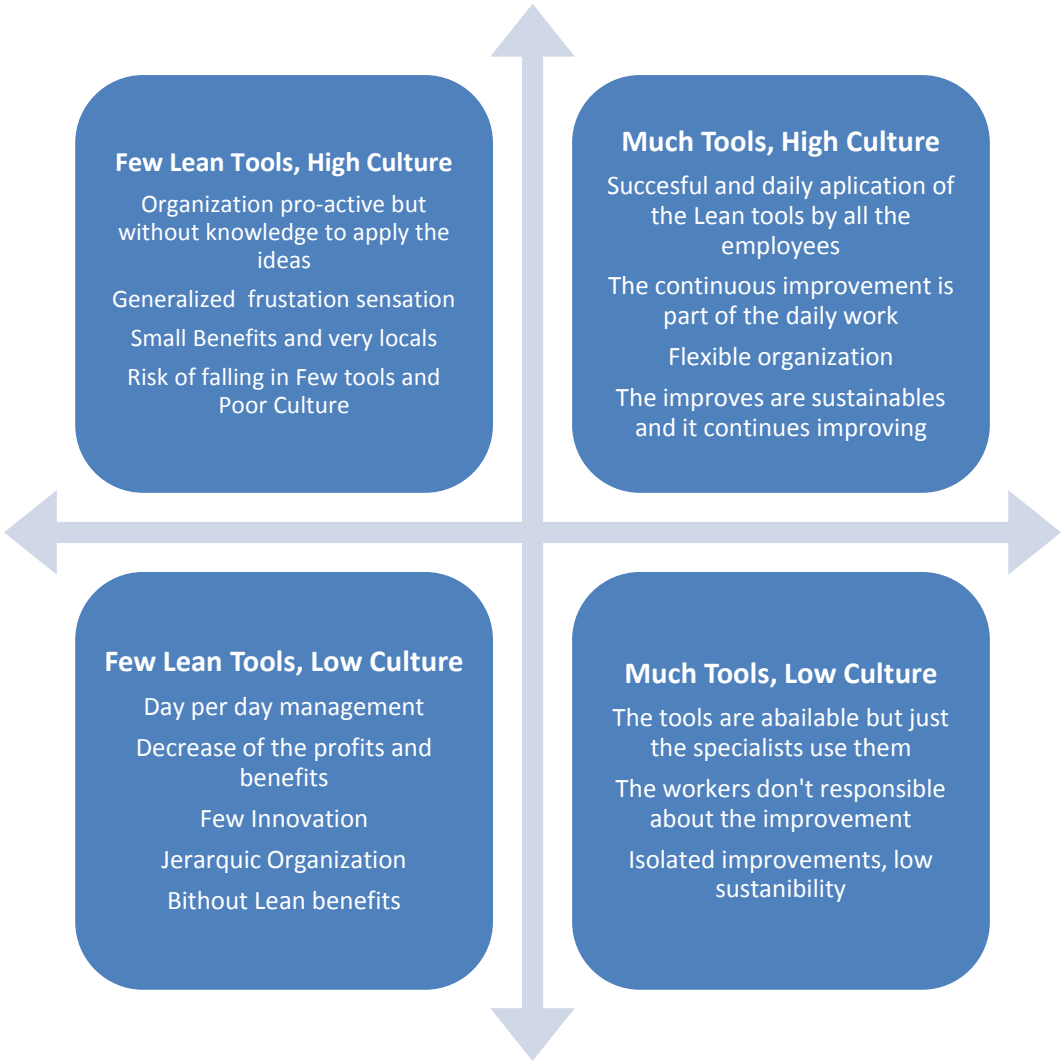


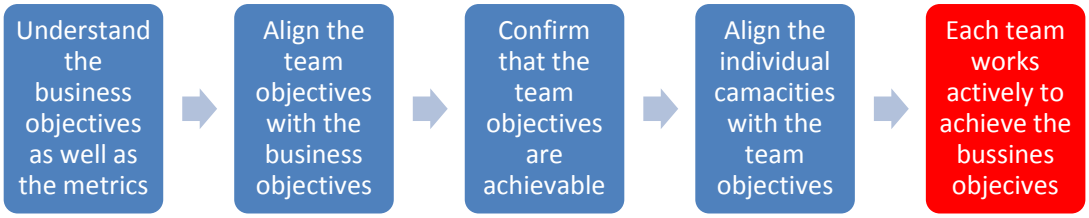
Figure 6.6 Sustainability Matrix

The challenge is that, almost by nature, people who make up the workforce in organizations tend to see improvement and Lean culture as a way of cut costs, and consequently, eliminate jobs. Therein lies a paradox, the deployment of Lean culture requires a commitment to people, although many see it sometimes as a threat.

This situation requires strong leadership and good transmission mechanisms of objectives throughout the organization to get everyone committed to improving business for everyone.

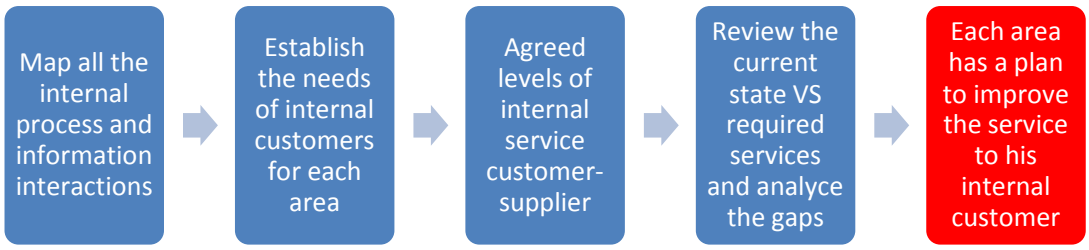
Aims to achieve a process of three phases;

Phase 1: Align the organization objectives with the individual ones



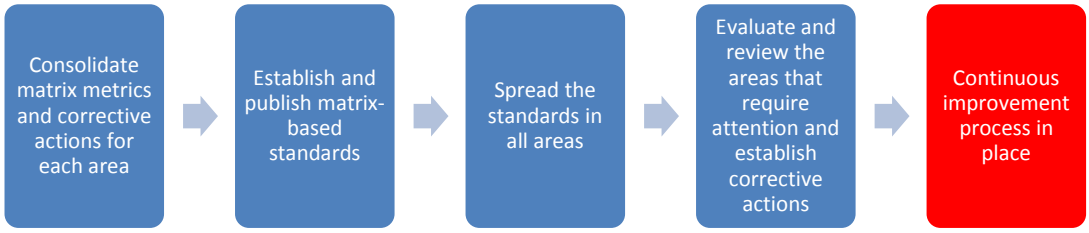
This enables individual teams to work actively towards the achievement of business objectives. However, this phase is not enough because it would be many departments isolated fighting each other to achieve their own results.

Phase 2: Establish an effective internal relationship towards the customer-supplier



The objective is to achieve that each team understands his role while supporting other teams in order to achieve their objectives. The improvement plans are agreed and followed. At this point, you get to meet customer applies both from an external as internal perspective.

Phase 3: Establish a continuous circle of communication and improvement in the company



To achieve must be a total communication between teams of the business objectives, internal improvement plans and service level customer-supplier.

6.2.2 Kaizen (or continuous improvement)

Kaizen is the concept that involves the methodology, strategy, practices and tools analyzed in this chapter, within a philosophical and strategic framework, which allows continuous improvement inside the organization.

Kaizen's essence is simplicity as a way of improvement of the productive and management system standards. The capacity to analyze, motivate, direct, control and evaluate is the rationale of Kaizen. "The simpler and easier, the better".

Improve the standards means establish higher standards. Once achieved this, the maintenance work consists on ensure that new standards are understood and observed. The continuous improvement is just achieved when people works on highest standards.

Kaizen generates process oriented thinking, since the process should be improved before obtaining improved results.

The continuous improvement is achieved through all daily actions, for small these are, and processes that allow the company and the processes to be more competitive in customer's satisfaction. The speed of change will depend on the number of improvement actions done daily and the effectiveness with which these are made. For this reason, it is important that continuous improvement is an idea utterly internalized in the conduct of all members of the company, becoming a philosophy of work and life.

On the other hand, solve "small" problems, will cost much less and seeing objectives fulfilled easily encourage us to keep improving slowly. In this principle is based the methodology PDCA (Plan, Do, Check, Act), which is a cyclic methodology consisting of:

Plan

Is to identify a problem and plan the way it will be solved.

Do

Is to contrast the theories proposed in the P phase with the process, there where value is added, as causes of the analyzed problems.

Check

Is to measure the results of the actions taken using the appropriate metric and compare them with the established objectives in order to find differences.

Act

Is to analyze the causes of the found differences to create from each one, a new improvement project, implementing and consolidating each

one of the conclusions found from phase C. This involves standardizing and document the solution and extend learning to similar processes.

7. Presentation of the study case

7.1 Identification of areas for improvement

To perform this study, we'll build a VSM, step by step, until complete a Map where we can reflect its initial situation. In order to understand where we're adding value, and we're (kaizen lights or stars) we have problems to build this value.

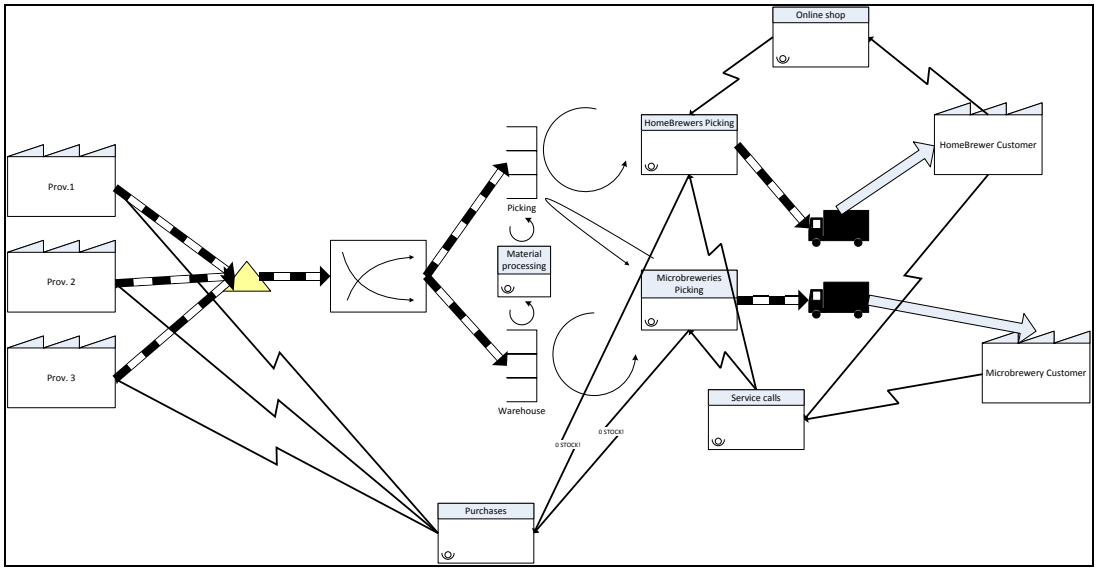


Figure 7.7 initial VSM

7.1.1 Customers demand

The Customers has the following demand:

Origin	Takt Time
Homebrewer	60'/c
Microbrewery	126'/c

Figure 7.8 Customers demand

These data should be the first to be included in the VSM initial situation. As Value is the first principle.

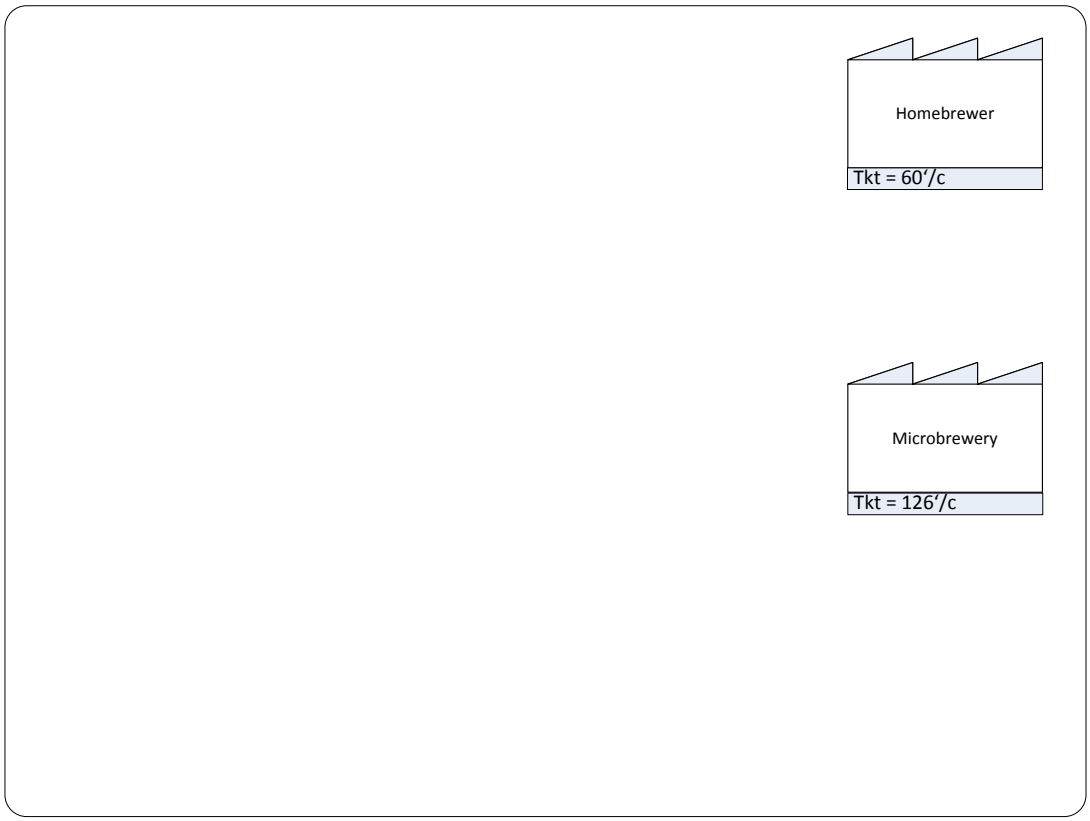


Figure 7.9 VSM Customers demand

7.1.2 Areas

The areas where we will focus on to improve are:

- Homebrewers (web purchases)
    - Service calls
    - Order reception
    - Storage
    - Picking
- Microbreweries (gross material)
    - Service calls
    - Order reception
    - Storage
    - Picking

- Direct shipping from provider

This allows us to set boundaries in the VSM that is seen in the written title.

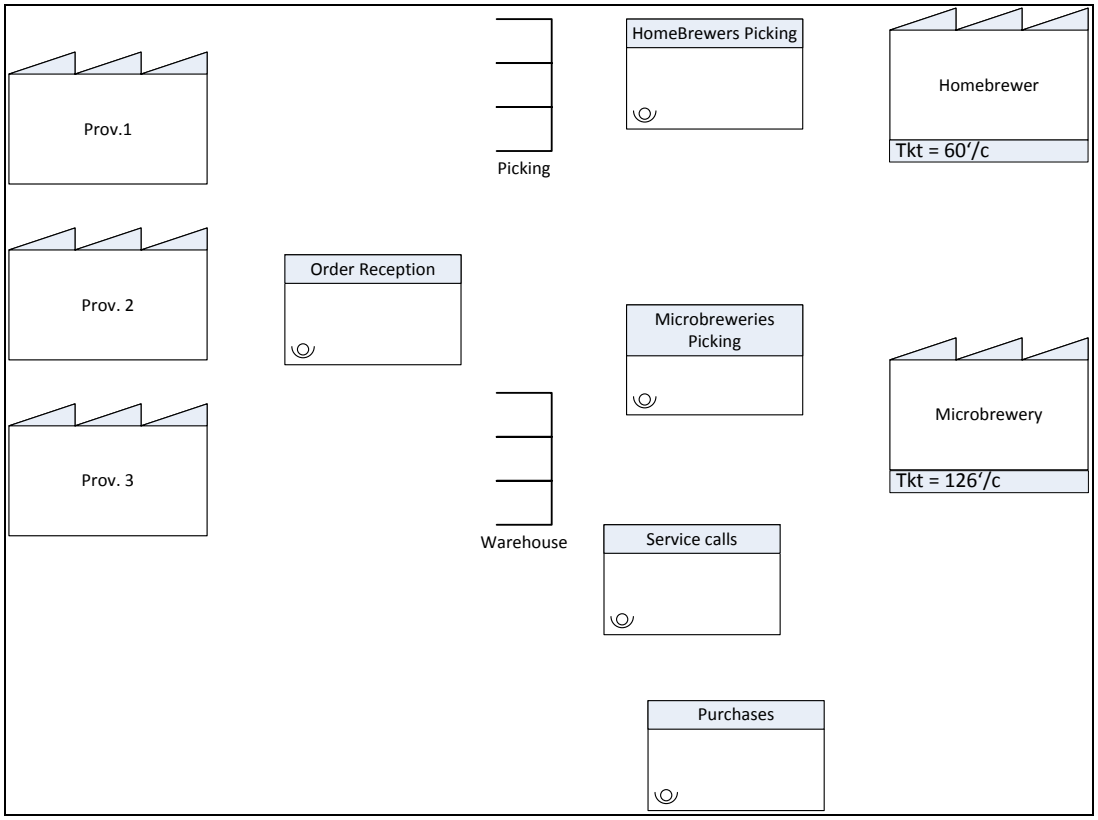


Figure 7.10 VSM servicing customers

This VSM occurs in the following layout:

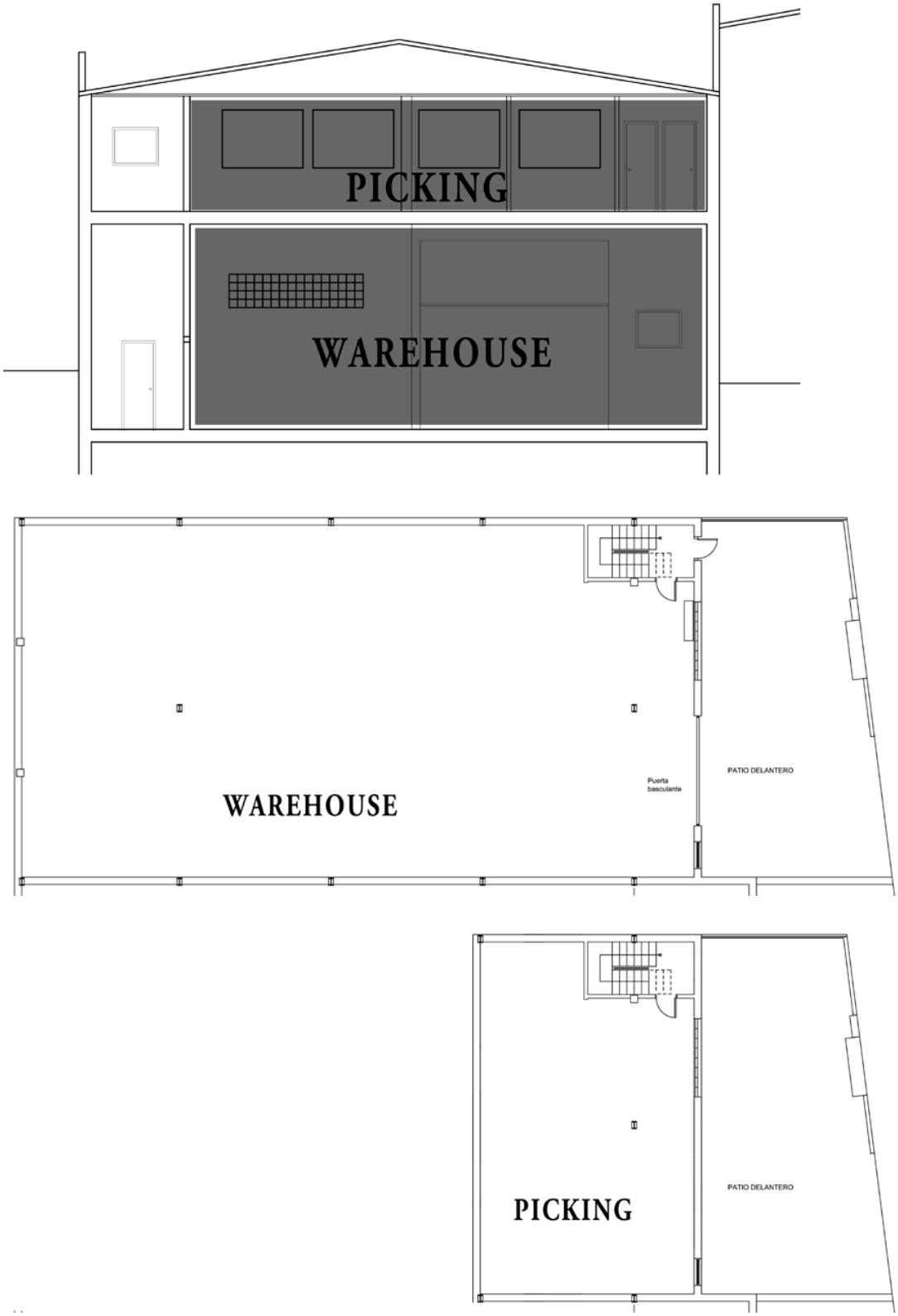


Figure 7.11 Warehouse and picking zone layout

As we can see, the picking zone and the warehouse are at different levels.

7.2 Description of the process object of improvement

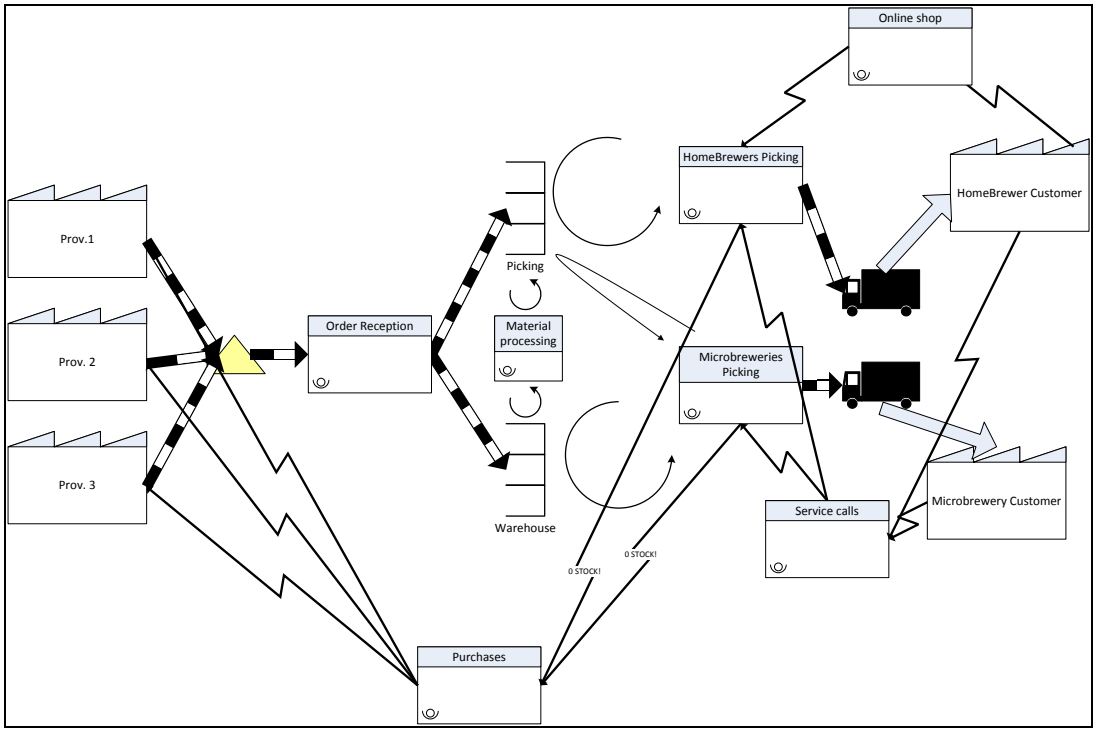


Figure 7.12 Initial VSM

7.2.1 Service Calls

Service calls and mails must be attended so the customer can transmit his needs and the company can offer him an answer. Workers must be able to locate any information that customers requires, customers can ask about:

- Product stocks
- New order
- State of an order
- Counseling (know how)
- Technical specification of products
- Raw material sanitary analysis
- Legal documentation to give to councils and public administration

- Old invoices or orders
- User manuals

7.2.2 Order Reception

The incoming purchases from provider are received into the reception area, there, the worker must see if there are any damages or missing material so we can claim it. Then it must be sent to the correct supermarket so next processes can pull from it. Depending on the product size and destination it will go to Picking room or warehouse.

The worker must know which orders and when will receive.

The order reception must receive purchasing orders from storage so he can complete them.

7.2.3 Storage

The Storage is composed by different tasks, including the stock control, order preparation and purchase management. The timetable is from 7:00 to 13:00 and from 15:00 to 17:00.

The stock control should be in the warehouse, considering not just the units sold, but also take into account the units used to with Kits, units that were broken or defective, etc.

It is also important to have a sales forecast to never run out of stock, taking into account the replenishment lead time and product demand.

To successfully perform these controls is essential to track sales and correctly identify products with a reference code (SKU), which allows us to refer to a product and order with no margin for error.

A correct product organization and stock control will also help other processes like picking, because the products will be easier to find out.

Another task is to verify the inventory in order to check that the stock is correct. Because the production processes there are losses and that can cause stock errors.

7.2.4 Picking

The order confirmations are received by e-mail (both microbreweries and home brewers) and are prepared with all the demanded products. This operation can be subdivided into the following processes:

- Preparation of bulk material: there are some products that because of their characteristics must be weighed and sealed again in a new wrapper.
    - The materials that must be manipulated so are the materials to be used for brewing, mainly malt (grain), hops (pellet) and caps. Each of these elements is in a different format, which are:
        - Malt: 25Kg bags
        - Hops: 5KG bags
        - Caps: Sacks of 10,000 units
    - Each one of this products is needed in different amounts in the brewing process, because of that, the required formats are different in each case, the offered formats are:
        - Malt: 1Kg, 5Kg and 25Kg
        - Hops: 100g, 250g, 1Kg and 5Kg
        - Caps: 100 unidades and 2.000 units
    - The steps to prepare each of that paquet are:
        - Cut a piece of plastic and seal to make a bag
        - Go to the place where the product sack is
        - Look for the good reference
        - Take that reference and go to the balance
        - Open the Sack (closed with a rope)
        - Take the correct amount and weight it
        - Go to the sealer/ vacuum machine
        - Seal it (with or without vacuum)
        - Go to the pc/labeler
        - Design and print a label
        - Put the label on the bag
        - Close the product sack
        - Go to the place it is stored to leave the product sack

- Bundle Preparation: there are some products that because of their specifications must be sold with other products, joining them physically ones with others, this production is done in the picking place and we can distinguish between 2 main bundles:
    - Ensambled bundles: Are that bundles that must be joint in a specific way, because of that they require a joining process and can't be sent separately.
    - Kits: are that bundles that are composed of different parts but this parts don't require to be joint. The parts can be sent separately and can be treated as individual products.
- Product Picking: When a new order arrives, normally is composed with different product references, a selection of the demanded products must be done and also a verification that the given products are the ordered ones (in number and reference).
- Packaging: Because of the transport can break some products it's important to protect them in the package so we avoid transport damages.
- Refiling of the products of the picking zones from the warehouse:
    - Because of there is no enough space in the picking zone, some articles must be stored in the warehouse. Is important to replace them with prevision, otherwise we will need to go to the warehouse many times per day

7.3 Processes Analysis.

In the next section all the processes of the value chain from Cerveza Artesana Homebrew will be analyzed for improvement.

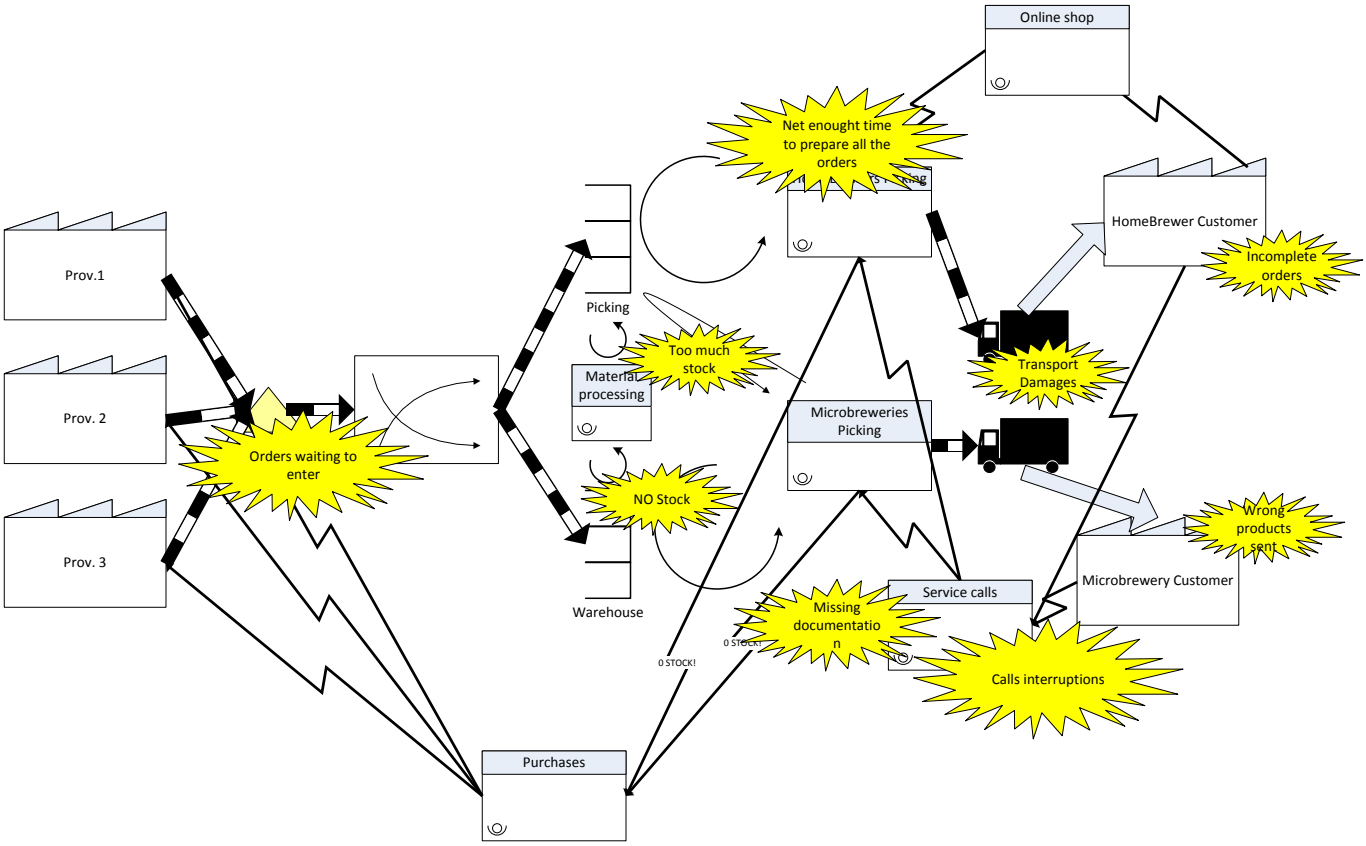


Figure 7.13 Actual VSM with detected problems

7.3.1 Service Calls

Calls Interruption:

Customer has different phone numbers to call, but each number doesn't have a specific function. There is no correspondence on a given phone number to a given function in the process. Just a bulk of numbers.

This makes a lot of interruptions to workers and it supposes a waste in time when the call must be redirected to the correct person.

As we can see in the photo, each worker has different multiple lines that can ting with an incoming call:

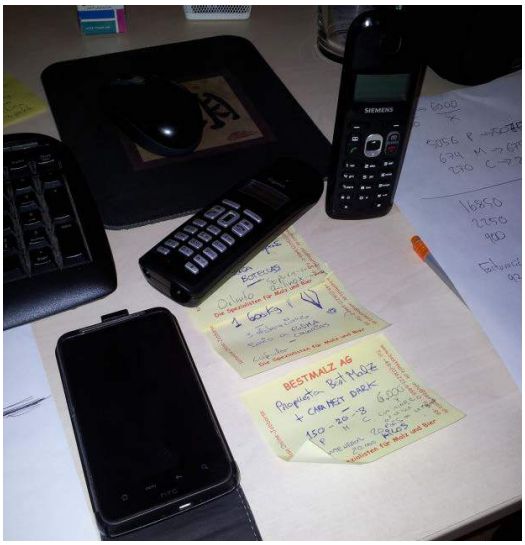


Figure 7.14 Telephone lines

Missing Documentation:

When a customer asks for information about some products or documentation that cerveza artesana must provide him, the worker many times is not able to give to the customer the information because he can't find it. There is a lack of standardization in the organization of the documents.

In the following photo we can see the lack or organization:

Figure 7.15 Documentation organization

Summarizing these problems result in a lack of cost as we can see in the following table, where it's shown the phase of lean implementation strategy, indicating with grey the areas those areas or processes which are better.

Management map			
Tools			
Operative System			
Visual management			
Flow			
Standardization			
	Quality	Volume	Cost

Figure 7.16 Phase Matrix – Service Calls Strategy Actual state

As we can see there is a lack of visual indicators as can be labels or sections, there has a lack also in Standardization because there is no specific place to put any documentation. Each person that wants to store a document stores there where he thinks it can go. We will focus on improve the standardization, flow and visual management.

7.3.2 Order Reception

Orders Waiting to enter:

The Order Reception has no control of when will receive a new Order or the size of it, so when some orders arrive there are a non-controlled situation because maybe there is no enough space or resources to manage it. Then it's possible that the order stays there for some days until it can be processed. The problem of not manage the order in 24h makes impossible to claim if there was something broken in the reception.

We can see in the following table, where it's shown the phase of lean implementation strategy, indicating with grey the areas those areas or processes which are better.

Management map			
Tools			
Operative System			
Visual management			
Flow			
Standardization			
	Quality	Volume	Cost

Figure 7.17 Phase Matrix – Order Reception Strategy Actual state

As we can see, the order reception is basically adapted to costs, mainly in his flow, as well as the operative system, but it has a very big leakage in quality parameters. There is where we will focus the improvement.

7.3.3 Storage

The storage is organized without any order, without references to identify the products or visual indicators that help to determine the stock there are.

Figure 7.18 Picking Storage

Figure 7.19 Warehouse Storage

As we can see, is very difficult to find products in the warehouse and in the picking zone, because of that, a lot of time is wasted in each order looking for products and it makes easier to have an error.

No Stock

This poor organization makes more difficult to have an stock control, because it can happens that there is a product in stock but we can't find it because is hidden so we think we've lost or have an error in stock.

There is not a genuine and reliable control stock. Stock control is always performed on theoretical numbers. This fact causes that often are not available in stock a product that the customer has already purchased, a fact that causes a long delay in delivering the product to the customer.

The lack of this control makes it much harder stock control traceability and purchasing management.

Purchases are made when someone realizes that one product is not in stock. Thinking, deducing it's made an estimation of which products to purchase using as a guideline the latest sales done.

The orders are picked when are ordered, without any demand estimation. A lot of time is wasted preparing some products that are not ready to pick them up.

Figure 7.20 Filling and weighting of a hops bag

With this situation, it's easy to see that there are a lot of limitations to prepare many orders daily and shows the importance of improving this process in order to eliminate errors and increase sales volume.

Management map			
Tools			
Operative System			
Visual management			
Flow			
Standardization			
	Quality	Volume	Cost

Figure 7.21 Phase Matrix – Storage Strategy Actual state

As we can see, because of no manager is used in the storage, there is no cost, but it has a leak in quality and volume managing. We see that the tools part is quite developed while the operative system is not yet implemented.

We can see opportunities in Flow and Standardizations Volume and Costs.

8. Actual State

Aquesta situació inicial es objectivada, per comprovar que efectivament els problemes descrits són certs I poder veure tanmateix la correlació dels mateixos.

8.1 Service Calls

8.1.1 Definition of the value: need of the customer

The needs of the customer in this service are:

- Fast answer in their questions

8.1.2 Actual metrics

Regarding the number of incoming mails: 1480 mails/account/month

Regarding the number of phone calls/month:

Total duration (incoming + out)	3382,12 + 1648,56 minutes
Time attended (incoming + out)	3196,07 + 1501,49 minutes
Total calls (incoming + out)	1047 + 628
Attended calls (incoming + out)	992 + 628
Non attended calls (incoming + out)	55 + 136
Forwarded calls (incoming)	532

Table 8.1 calls/month

As we can see there are a lot of incoming calls and the mean duration is 3 minutes and 24 seconds

8.1.3 Objectives

- Reduce the non-attended incoming calls

8.1.4 Analysis and diagnostic

As we can see here, the number of incoming calls and the duration of the calls make to lose a lot of time, if we analyze the content of the callings we will see that a lot of times the questions that the customers do are related to their orders, asking about the state, complaining about some missing articles or delay in the order delivery.

We can see that a lot of customers phone for a specific question to a specific person, but they don't have a direct number for them, so id another person answers the phone, that calling must be forwarded.

That forwarding is the main percentage of waste in service calls, which supposes a 54% of the total incoming phones

That confirms our problem of call interruption.

Another waste we can detect is that customers usually ask for documentation of technical specifications about products that worker must explain by phone because is impossible to locate. This is also translated in outgoing calls in order to give an answer to the customer after trying to look for the documentation and not having it.

This confirms the problem of missing documentation.

8.2 Order reception

8.2.1 Definition of the value: need of the customer

The needs of the customer in this service are:

- Good traceability control
- Good state of the products (without damages)
- Wait the minimum until the products can be served (enter and classifies in the warehouse)

8.2.2 Actual metrics

Regarding the actual arrival of orders:

- 3 orders per week

Regarding the actual waiting time of orders:

- 10 days maximum
- 2 days average

8.2.3 Objectives

According to the value that customer perceives, the service and the metrics presented above, to achieve improvement goals are:

- Reduce waiting time to less than 24h

8.2.4 Analysis and diagnostic

The initial state of the Orders reception is:

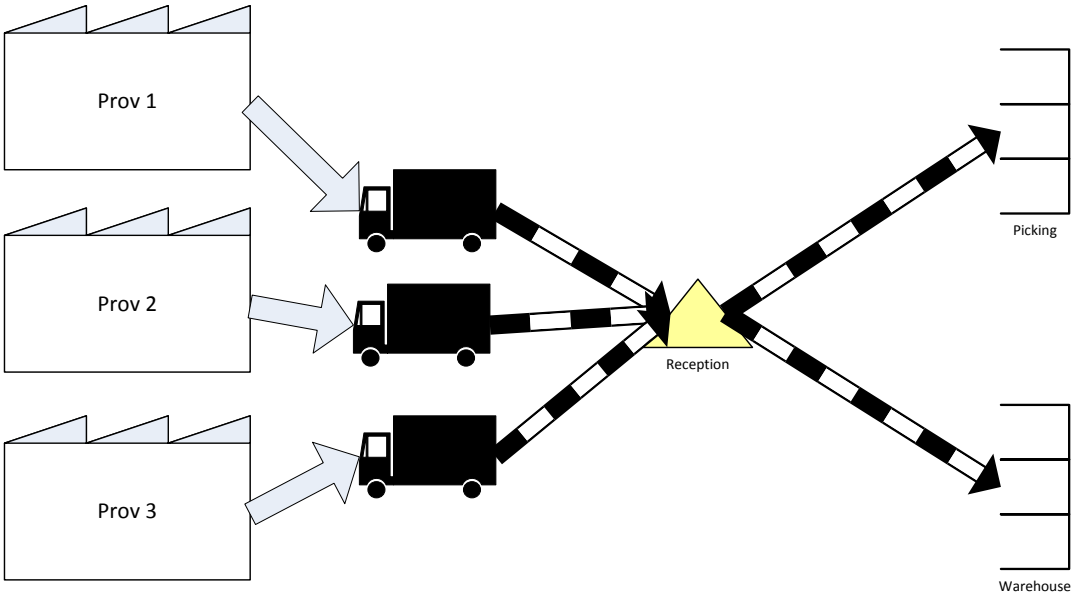


Figure 8.22 VSM Order Reception

As we can see, all the providers send by push all the purchases to the reception, there is no control of when the order will arrive.

5 Why

1. Why is the order waiting more than 24h without managing it?

- Because the worker is too busy preparing orders and had no notice of that arrival in his schedule.

2. Why had no notice of the arrival?

- Because the purchasing responsible has not told him

3. Why had not told him?

- Because there is no purchasing protocol

8.3 Storage

8.3.1 Definition of the value: need of the customer

The needs of the customer in this service are:

- Good state of the products
- Having all the products demanded
- Having the products as soon as possible
- Receive what they've ordered

8.3.2 Actual metrics

Regarding the stocks:

- Average stock time: (hauria de posar quants dies de stock tenim de cada prod?)
- Average lack of stock in homebrewer orders: 2.6 orders/day
- Average lack of stock in microbreweries orders 0,6 orders/day
-

8.3.3 Objectives

According to the value that customer perceives, the service and the metrics presented above, to achieve improvement goals are:

- Reduce the lead time of an order
- Ensure that we always have stock of all the products

8.3.4 Analysis and diagnostic

The stock control is realized theoretically, the selling program discount sold units from stock and adds units when a purchasing is completed. The purchasing amount is calculated in function of the last units sold. In general, providers don't have a minimum amount to order of the products.

The purchases are completed in providers from Italy, Germany, France, United Kingdom, Belgium, Austria and other countries that has a replenishment time of 2 weeks and the freight costs are an important cost to have in mind.

Wastes detected:

Waste in product loses:

Storage open sacks of hops or malts can become into a hops quality losing, so sometimes the open bags must be thrown away.

NO stock:

As we can see there is an important problem of stocks, every day there is some product with no stock. A lack of visual

A correct organization of the products and his stock control will also help with the picking process, because will be easier to locate the products with his reference. Either if the worker doesn't knows the product.

5 Why

1.Why the customer has not received all the products he ordered?

- Because there were some products out of stock

2.Why there were some products out of stock?

- Because there have not arrived or has not been purchased yet

3.Why have they no arrived yet?

- Because we didn't know that the stock was going to finish that fast

4. Why we didn't know that the stock was going to finish?

- Because there are no real stock and sells control

5. Why there is no control?

- Because there's no standardization

Too much Stock

Having too much stock means that the freight costs per unit will decrease, but the storage costs will increase, it will also have problems with the rotation of the materials because they will last too much time in our warehouse, another problem can be that the time between purchasing orders is too high, so the time you must wait until you can order new products is too big. This also means a lot of money in stock.

The average stock we have for microbreweries products is: 80 days

The average stock we have for homebrewer products is: 20 days

As we can see, here the main problem is the stock of microbreweries products, mainly malts, so we will focus on that part and not on homebrewer stock.

8.4 Picking

8.4.1 Definition of the value: need of the customer

The needs of the customer in this service are:

- Minimum lead time
- Good state of the products
- Having the exact amount they've ordered
- Having all the products they've ordered
- Knowledge of when will arrive the order

8.4.2 Actual metrics

Regarding the preparation of products:

- Average time producing a caps packet: 1' 34''
- Average time producing a hops packet: 4'13''
- Average time producing a malts packet: 2'54''

Regarding the Orders:

- Average number of homebrewer orders: 8 Orders/day
- Average time of homebrewer orders: 18' 52''
- Average number of microbrewery orders: 3,8 Orders/day
- Average time of microbrewery orders: 41' 45''

Regarding the errors:

- Problems in broken packets during transport: 3.25%

8.4.3 Objectives

According to the value that customer perceives, the service and the metrics presented above, to achieve improvement goals are:

- Reduce the time spent preparing products
- Reduce the lead time of an order

- Reduce the errors

8.4.4 Analysis and diagnostic

The orders are picked when are demanded, including the products that need a production. There is no sells prevision. A lot of time is wasted during the individual preparation of some products.

The initial state of the Orders reception is:

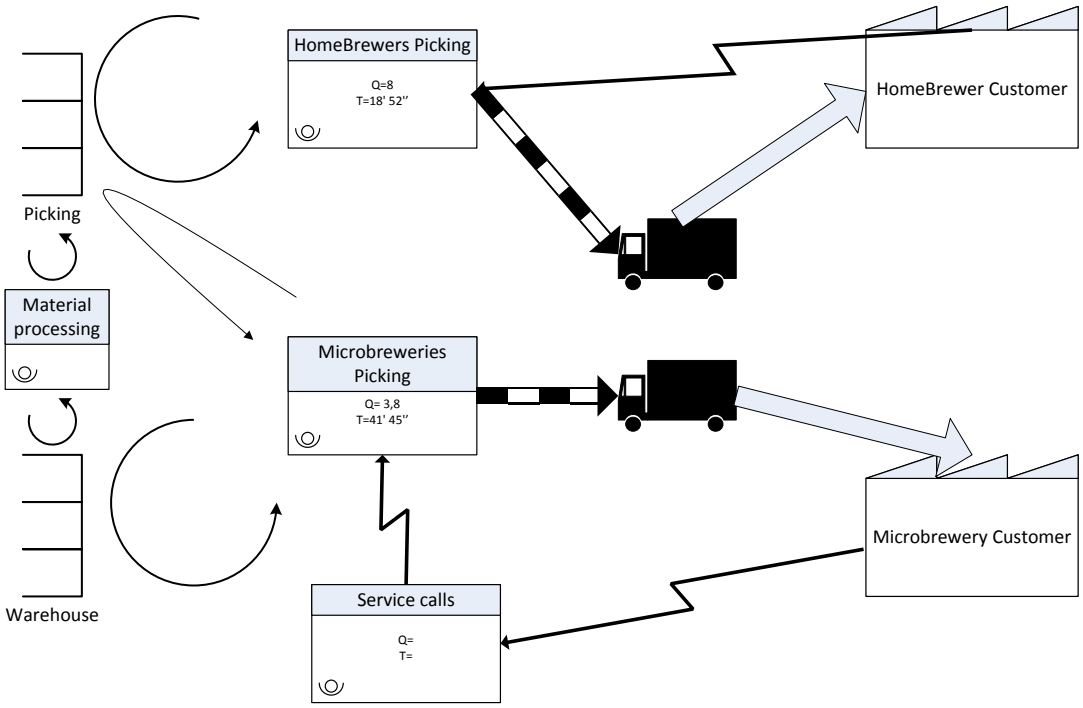


Figure 8.23 Initial State Orders Reception VSM

There are two main supermarkets:

The first one is the warehouse; there will be all the big pallets that must be moved with a lifter. This supermarket has all the microbreweries products but also has some stock to replace the picking supermarket. This material is always on pallets with more than 1 unit in each pallet.

The second supermarket is the picking; here we have all the small tools and materials for home brewers. This material is stored individually in shelves so the worker can pick it up easily.

Each time an order is received, the worker must do the following:

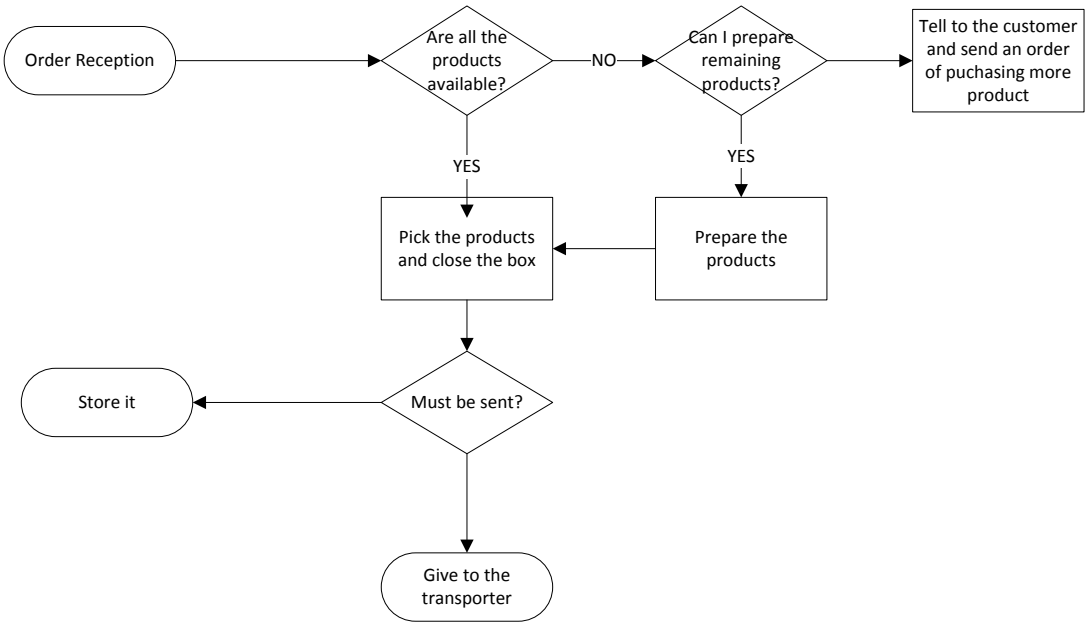


Figure 8.24 Order preparation Flow Chart

Some of the products requiere, as we've said, a production, we will analyze the timing for that kind of productsIn the following VSM:

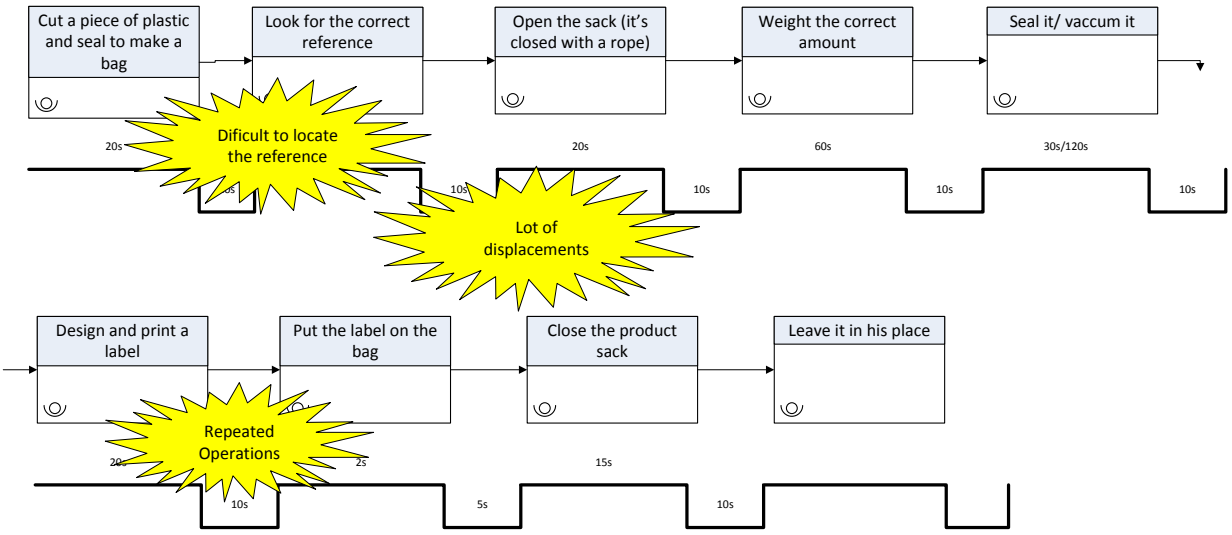


Figure 8.25 VSM of the preparation of a bulk packet

Wastes detected in VSM:

Repeated Operations:

We're looking for the product, moving it, opening, closing and returning to its place and print just 1 label each time this is much time wasted. There is also a waste in energy because opening the fridge that much causes energy lost. Those operations are the same always if the material are the same and can be done just once for a lot of units if we produce more than 1 unit at the same time.

Lots of displacements:

There is a lot of time that the worker spends going from one side to another side

Transport damages:

As we can see, the percentage of packets with damages during transports are very low (3,25%) so we won't focus on that problem.

Not enough time to prepare all the orders:

5 Why

1. Why there is no time to prepare all the orders?

    - Because each order takes a lot of time

2. Why each order takes a lot of time?

    - Because there are some of the products that require a process that spends a lot of time

3. Why there are some processes that spend a lot of time?

    - Because there are a lot of wastes in time

4. Why there are wastes in time?

    - Because the products are prepared 1 by 1

5. Why are prepared 1 by 1?

    - Because we have not a sales forecast of each product

9. Proposed designs of the future state

9.1 Service Calls

9.1.1 Improving proposals for the future state

Proposed countermeasure for Calls Interruption:

In order to offer to the customer the correct person to answer the phone and avoid forwarding incoming calls a PBX has been installed, allowing the automatic redirection of the incoming calls to the correct person.

Figure 9.26 Installed PBX

Another advantage of having the PBX with a virtual center is that allows the company to register the number of incoming calls, leave a message during holidays so the customer can be informed or allow the customers to leave a voice message that will be sent by mail to the recipient.

Proposed countermeasure for Missing Documentation:

All the documentation has been compiled, reviewed and reorganized in file cabinets, each file cabinet is identified so it's easy to find any documentation is required. The same process has been completed with virtual documentation.

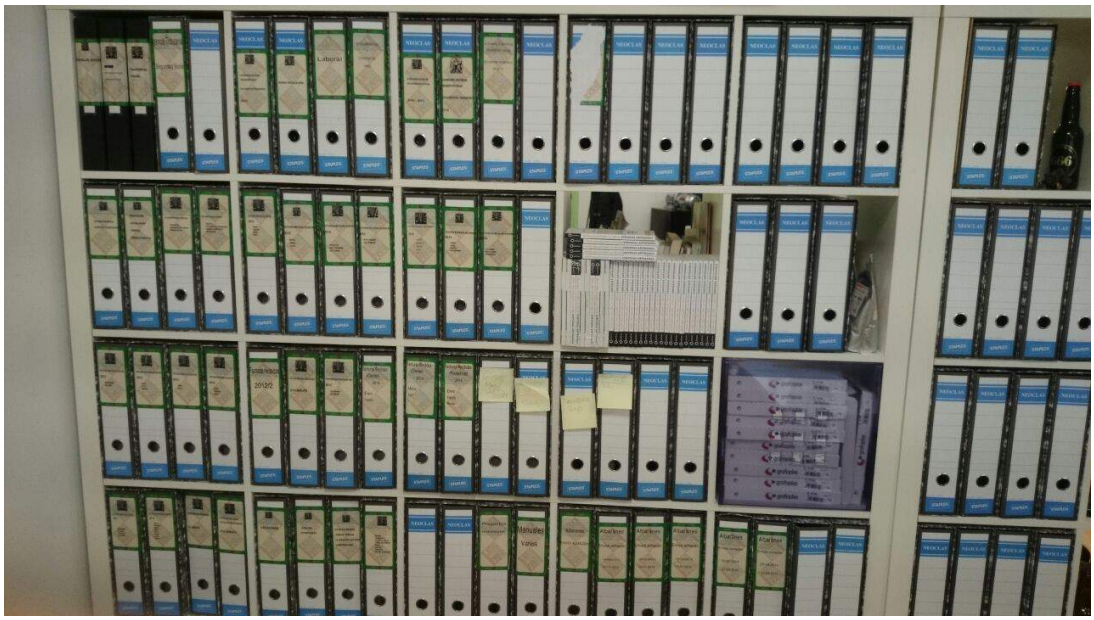


Figure 9.27 File cabinets full of documentation

9.1.2 Expected Benefits

- Reduce the non-attended calls

  With that solution the non-attended calls will be reduced to 0 because all the calls will be attended even if the destination is busy the customer will leave a message and the message will arrive directly to the recipient.

- Reduce the forwarded calls

  Workers won't have to lose more time in forwarding calls because when a customer calls knows where is calling. There will be some calls that must be forwarded, but just for that customers that don't really know where they must address.

- Reduce searching time when looking for documentation

  When a customer requires for documentation the worker can quickly find it or know if that documentation is available, that avoids waiting time for customers, outgoing calls and reduce the time dedicated to answer questions from customers.

9.2 Order Reception

9.2.1 Improving proposals for the future state

Countermeasure for Orders waiting to enter:

- Transfer the purchases control to the Order Reception

  The Kanban targets from picking will be collected when it's scheduled so this department can complete the purchasing and have an estimation of the delivery date.

  We've also applied the phases from point 6.2.1 to proposed so all the departments can help them and improve internal comunication.

9.2.2 Expected Benefits

The expected benefits are:

- Better Schedules in purchase arrival.
- Faster order entrance managing.

9.3 Storage

9.3.1 Improving proposals for the future state

Proposed countermeasure for NO stock:

- Security Stock

  Have a Security Stock with enough products to cover the refilling time. This security stock is calculated taking into account that during the refilling time the sales are higher than the average so we can cover the 84% of the cases.

  That security stock is clearly shown in each product shelves so when the products arrive to the minimum stock a visual element (Kanban target) is detected and therefore a purchasing order is completed.

- Kanban Targets

  Each product will have kanban targets that will contain the name, the ID, the number of units to order (lot) and the provider to order, so when the worker takes a product with a target, he can put the target into the gasket of the provider and have a correct purchase order when is scheduled or when a security stock target is used from the same provider.

Provider	Purchasing cycle
Provider 1	21 days
Provider 2	21 days
Provider 3	3 days

Figure 9.28 Purchasing Cycle

Proposed Countermeasure for Too much Stock:

We've done a graphic of the freight costs VS the Stock costs. Having too much stock means that the freight costs per unit will decrease, but the storage costs will increase, it will also have problems with the rotation of the materials because they will last too much time in our warehouse, another problem can be

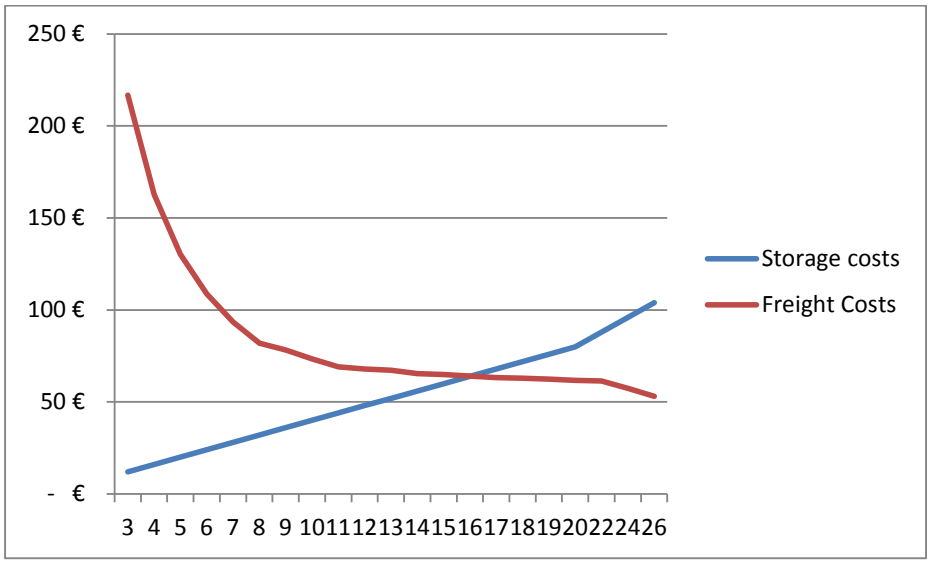


Figure 9.29 Storage Costs vs freight costs

As we can see here, the orders must be of 16 pallets, if each pallet has a capacity of 750Kg, which means 12.000Kg per order, which means 480 sacks of malt. In that case we will be an average of one month of Stock.

The security stock we've established is the stock that can cover us during the refilling time (which is 2 weeks) and can cover the 84% of the times. The result amount of that is 10814,5Kg of malt, quite near of the 12.000Kg we've calculated to purchase in each order.

In summary we can say that we will order to the raw material provider (for microbreweries) each 2-4 weeks

The Proposal for the future state of the process is represented with the following VSM:

9.3.2 Expected Benefits

The expected benefits are:

- More material Rotation
- Better Schedules in purchase arrival.
- Better stock control.
- Avoid resends due to stock problems.
- Avoid calls due to stock questions.

9.4 Picking

9.4.1 Improving proposals for the future state

Proposed countermeasure for

The Proposal for the future state of the process is represented with the following VSM:

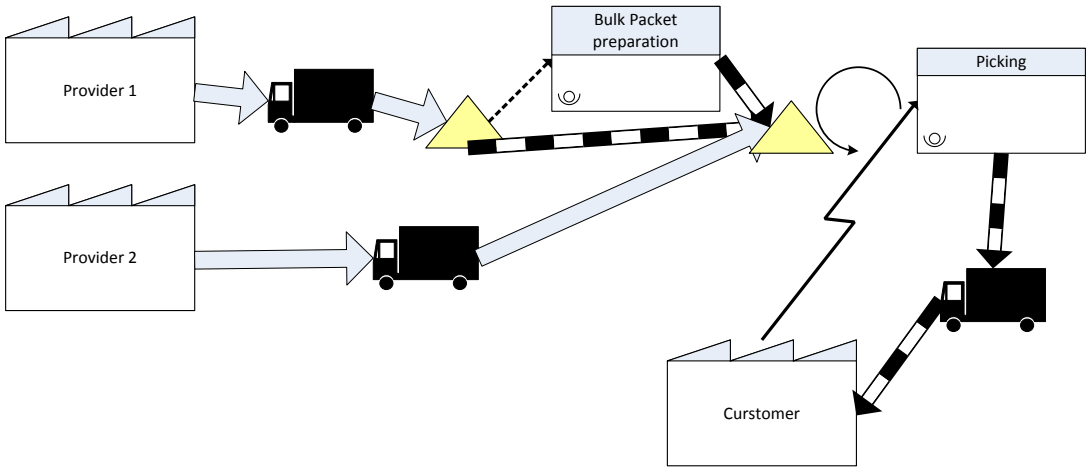


Figure 9.30 Proposed VSM for Picking

This new proposal is based on the creation of flow, deleting wastes, and promoting the Pull

Create flow and delete wastes when processing malt, hops and cap packets creating an estimation of the sells for each week, so the worker has all the packets ready when the customer orders them and he must not prepare them.

To do it we propose:

Schedule one day each week when the worker will process all the expected sells of each product, then the total time wasted for each product will decrease depending on the produced products at the same time with that formula:

$$Time\ per\ product = 150 * (N * 94 + T)$$

Where:

- N is the number of units done
- T is the type of paquet done
    - T=30 for malts and caps
    - T=120 for hops

9.4.2 Expected Benefits

This supposes a direct benefit of 150s per unit from the second produced unit. Which represents a:

- 54% less time for malts and caps packets
- 41% less time for hops packets

This benefits represented in time supposes:

- For caps packets
    - (116-4) packets/month* 150s/paquet= 280min/month
- For malt packets
    - (218-4) packets/month* 150s/paquet= 535min/month
- For hops packets
    - (150-4) packets/month* 150s/paquet= 365min/month

That makes a total benefit of:

280min/month + 535min/month + 365min/month = 19h 40min/month

11. Social and Environmental Impact

11.1 Social Impact

From the social perspective, we can speak of Lean as a tool for value creation in the social and economic net of a country. The introduction of this new management can become even an essential component for the progress of social, economic and knowledge capital of the whole sector as:

- Implementing Lean in a sector of a quality product as craft beer can provide the territory as a whole, greater competitiveness globally. It has an industry that allows development in agriculture, universities, archaeological excavations and a lot of cultural events, even with restaurants, bars or hotels etc. developing knowledge networks and highly qualified human capital to achieve a competitive position in the industry and their professionals.

- The innovative dimension and highly efficient operations, involving introduction of Lean sector can distinguish the target from the perspective excellence of local and regional product. This is a great opportunity for being recognized worldwide, not only for the quality of the service, but also for its operational excellence and its ability to maximize the craft beer sector.

- Lean Management involves a change of mindset in the concept of empowerment and involvement of the workforce. This new form of management approaches the decision taking to the worker through his skill development, teamwork and understanding of the concept of quality over quantity. This new way to direct prioritizes the development of leadership skills of the leaders and a highly skilled workforce.

11.2 Environmental impact

Regarding environmental impact, while not the direct object of study of the project, we can say that the introduction of Lean Tourism involves an improving on the environmental impact of the activities.

Eliminating waste in operations and resources are mostly associated with the reduction or elimination of energy waste. Leveraging our case study will list some examples that reinforce the above statements:

- The elimination of reshipping has a direct impact on the number of transports done, reducing the amount of CO2 produced during the transports independently if they are complete by truck, boat or plane.

- The reduction in reprocesses means an energy saving, in our case, some of the reprocesses were associated to fridges and other controlled temperature elements that waste a lot of energy when they interact.

In conclusion, we can say that both principles, strategies, and objectives of Lean management are fully aligned with the guidelines of the Environmental Management standards UNE-EN-ISO 14001: 2005 and the European Regulation EMAS, as these systems are designed to reduce those harmful activities that organizations can cause on the environment, so as to ensure minimal environmental impact of its processes and services.

12. Economic and financial analysis

12.1 Budget

In this chapter we will see the cost for the company of the following:

1. The dedicated total hours to complete this project (only the part that we've worked on the study case)

2. The required time for the implementation of the improvement proposed actions.

3. The equipment, materials or other costs required for the implementation of the project.

Obviously this assessment does not include the cost of the previous training of students in Lean Management as they are items that are not directly attributable to the investment made with the project.

The evaluation of the current state study of the company and the design of the future state included in the project has been divided into the following phases:

- Evaluation and initial meetings with management and those responsible for the company.

- Follow-up meetings and teamwork.

- Study of the current state

    - Identification of areas and processes to improve.

    - Definition of value and customer needs.

    - Actual Metrics.

    - Establishment of objectives.

    - Analysis and diagnosis.

- Design of the future state

    - Improving actions proposal

    - Estimated benefits.

The following table includes the cost of hours spent in each phase of project development, as well as spent hours and resources caused by displacement. A price/time of 95 Euros (according to the market price of Lean Consultants Juniors) has been considered.

Project Phase hours			
Project Phase	PVP	Hours	€
Evaluation and initial meetings	95 €	8	760 €
Monitoring team meetings	95 €	2	190 €
STUDI OF THE ACTUAL STATE			
Identification of the processes to improve	95 €	16	1.520 €
Definition of value and customer needs	95 €	4	380 €
Actual Metrics	95 €	40	3.800 €
Establishment of objectives	95 €	8	760 €
Analysis and diagnosis	95 €	25	2.375 €
DESIGN OF THE FUTURE STATE			
Improving actions proposal	95 €	40	3.800 €
Estimated benefits	95 €	15	1.425 €
Total hours per project		**158**	**15.010 €**

Kilometers Costs				
Destination	Km/travel	PVP	disp.	€
Offices	60	0,35 €	3	63 €
Warehouse	80	0,35 €	8	224 €
Total Km per process	**140,00**	**1 €**	**11**	**287 €**

Displacement time Costs				
Destination	h/travel	PVP	disp.	€
Offices	1	95,00 €	3	285 €
Warehouse	0,7	95,00 €	8	532 €
Total hours per process	**1,70**	**190 €**	**11**	**817 €**

meal allowance costs				
Destination	diets/disp.	PVP	disp.	€
Offices	1	15 €	3	45 €
Warehouse	1	15 €	8	120 €
Total meal allowances	**2,00**	**30 €**	**11**	**165 €**

SUMMARY	
Concept	**€**
Project Hours	15.010
Kilometers Costs	287
Displacement Hours	817
Meal Allowances	165
Total	**16.279,00**

The assessment of the physical implementation has been divided in the following phases:

- Definition of the main implementation plan.
- Training the managers and Staff of the company in Lean tools
- Support for the physical implementation of improvement plans.
- Monitoring of the achievement of the objectives and expected benefits.
- Constitution of the sustainability plan and improvement equipment.

The following table includes the estimated costs of the time to invest in the implementation phase, as well as spending hours and resources caused by displacement:

Project Phase hours			
Project Phase	PVP	Hours	€
Definition of the main implementation plan	95 €	16	1.520 €
Training in managing Lean tools	95 €	38	3.610 €
Presentation of the improvement plans	95 €	8	760 €
Support for the physical implementation	95 €	48	4.560 €
Monitoring of the achievement of the objectives	95 €	32	3.040 €
Constitution of the sustainability plan and improvement equipment	95 €	28	2.660 €
Total hours per project		**170**	**16.150 €**

Kilometers Costs				
Destination	Km/travel	PVP	disp.	€
Offices	60	0,35 €	7	147 €
Warehouse	80	0,35 €	2	56 €
Total Km per process	**140,00**	**1 €**	**9**	**203 €**

Displacement time Costs				
Destination	h/travel	PVP	disp.	€
Offices	1	95,00 €	7	665 €
Warehouse	0,7	95,00 €	2	133 €
Total hours per process	**1,70**	**190 €**	**9**	**798 €**

meal allowance costs				
Destination	diets/disp.	PVP	disp.	€
Offices	1	15 €	7	105 €
Warehouse	1	15 €	2	30 €
Total meal allowances	**2,00**	**30 €**	**9**	**135 €**

SUMMARY	
Concept	**€**
Project Hours	16.150 €
Kilometers Costs	203 €
Displacement Hours	798 €
Meal Allowances	135 €
Total	**17.286 €**

And finally, the assessment of the equipment costs, materials or other requirements for the project implementation.

Equipment, materials and requirements costs			
Concept	Units	€/unit	€
Offices			
File Cabinets	50	0,85 €	43 €
Furniture	1	600,00 €	600 €
PBX	9	104,00 €	936 €
Warehouse			
Tray	200	3,65 €	730 €
shelves	10	183,00 €	1.830 €
TOTAL			**4.138,50 €**

In summary, the total costs are:

SUMMARY	
Concept	**€**
Project Costs	16.279,00 €
Implementation Costs	17.286,00 €
Equipment, materials and requirements costs	4.138,50 €
Total	**37.703,50 €**

12.2 Estimated Cash-flows

This chapter calculates what are the annual cash flows generated by the project as a consequence of the benefits that arise to achieve.

These cash flows consider only the savings arising from the increased productivity in the process.

Please note that in order to propose a very conservative scenario, have not considered the possible positive cash flows arising from income growth. All improvements planned in the future state aimed at creating value for customers and this implies a direct effect on improving customer's opinion and as a consequence the increasing of customers that want to trust in the company, as well as the loyalty of the actual ones.

With the new service call and documentation system, we've reduced the incoming calls+ the outgoing calls a 33% in amount and a 20% in duration. Considering that in the office there are 5 employees, we can do the same work (even more) with one less worker, what supposes a benefit of one salary of a full-time auxiliary of administration (Level 08 / Group A Conveni col·lectiu de treball per a la Indústria Metal·logràfica de Catalunya).

With the new picking system was not necessary to increase the warehouse workers and was able to continue with 1 employee, that suposes a benefit of a full-time warehousemanv (Level 07 / Group A Conveni col·lectiu de treball per a la Indústria Metal·logràfica de Catalunya).

Then, the total cost of this workers for the company (applying a 30% in concept of Social Security and IRPF) is:

- One professional Level 08 / Group A:

  1x1,3x 16.197,33€/year = 21.056,53€/year

- One professional Level 07 / Group A:

  1x1,3x 15.545,00€/year = 20.208,5€/year

With the new system, we've reduced the resent order because of stock crush like the following:

- Homebrewer: 57,2 orders/month
- Microbreweries: 13,2 orders/month

That supposes a benefit of:

- Homebrewer Orders:

  57,2orders/month x 7€/order= 400,4€/month= 4.804,8€/year

- Microbrewer Orders:

  13,2orders/month x 40€/order= 528€/month = 6.336€/year

In consequence, the anual cash flows generated because of the benefits of the proposed project are:

21.056,53€/year + 20.208,5€/year + 4.804,8€/year + 6.336€/year = 52.405,83€/year

12.3 Financial analysis of investment

This chapter should determine the economic viability of this project.

To achieve this, we'll carry out financial analysis of investment considering the cost determined in section 12.1 and the cash flows are quantified in section 12.2.

The analysis is performed using dynamic methods of investment selection. These methods take into account the amount originally paid for the investment, the cash flows derivatives thereof, the period in which these flows are generated (according to the desired recovery term of investment) and return on the investment required.

Therefore,

- Investment Required: 37.703,50 €
- Annual cash flows: 52.405,83€
- Desired payback term: 2 years

With these data is calculated the internal rate of return, in other words, the profitability of the investment, at the discount rate, r, that makes his net worth is equal to zero. The goal is to know if it is feasible payback at a reasonable discount rate within two years.

$$-37.703{,}50 + \frac{52.405{,}83}{(1+\ r)} + \frac{52.405{,}83}{(1+\ r)^2} = 0 \rightarrow r = 106{,}35\%$$

The internal rate of return (TIR) obtained by return on investment in two years is spectacular, much higher that the discount rate may exert interest any bank credit to a business.

To reinforce the above statement, we calculate the net present value (VAN), which is the difference between its current value, which represents the equivalent of all current flows that generates the investment and their initial outlay. Is determined assuming that Cerveza Artesana Homebrew asks for a credit for the total value of the investment at an interest rate of the 8% and inflation during the next 2 years will be 3.5%.

In consequence:

The discount rate taking into account inflation remains:

$$k = 0.08 + 0.035 + 0.08 * 0.035 = 0.1178$$

And the VAN remains:

$$-37.703{,}50 + \frac{52.405{,}83}{(1 + \ 0.1178)} + \frac{52.405{,}83}{(1 + \ 0.1178)^2} = 114.416€$$

13. Conclusions

The proposed changes in the project has represented several notable changes to the company in both management and effective control of this vital and strategic area within the daily operations of the company:

In the beginning of the project, the sells and stocks were not controlled, thinking that the online shop was a waste and direction was thinking of closing that section because the results were deplorable.

At this stage, the effectiveness is increasing; Now it is perceived as an important branch of the company and workers feel involved in the company. The stocks are always controlled and the workers can do the same work with less time, so they can dedicate more time to other branches.

This allowed the company to be known in a sector with a high growth rate despite the crisis and due to the small size of the company at the beginning of the project, its evolution has been very important.

This project also means an increase of the company benefits, returning the initial inversion in less than 2 years.

These results show the effectiveness of lean methodology and will encourage microbrewery customers to use it too.

15. Glossary

15.1 Vocabulary

A3 Report

The A3 report it's a Lean tool to document the current state and the improvement opportunity of a determined problem or process. This report objective is to expose in one sheet (A3 sized) the whole lean methodology development in order to achieve the improvement of a process or a problem.

Value chain

Is the set of stages, steps, operations or activities that add value to a product or a service. In this way, the production of a service is usually linked to the production of another service through the value chain [Cuatrecasas, 2010, p.41-42].

Waste

Activity or resource avoidable that doesn't add value to the final service or product of the process [Instituto Lean Management, 2010, p.9].

A lean System considers eight kind of wastes:

- **Overproduction**: Process articles or services before or more than the customer needs. Is the cause of the most of other wastes
- **Wait**: Occurs when traders await for information or materials or when customers wait for information or some service.
- **Inventory**: Is the excessive storage of raw materials, products or services in process or product or service don't finished yet.
- **Over processing**: It carry out unnecessary activities to process goods or to provide services with the customers' required quality.
- **Reprocessing**: Is the repetition or correction of processes for defective products or services.
- **Transport**: Movement of the work in process from one side to another, even when distance is short.
- **Person's movement**: Any movement that an operator performs beyond of the movements that add value to the end product or service.
- **Waste of human talent**: Don't use the creativity and intelligence of the working force to eliminate waste.

Just in Time

Just in the right time. Production management system that integrates customer-supplier duality in terms of compliance with quality specifications, terms established and quantity of product or level of service similar conditions. Managing Just In Time allows for flexible work processes to adapt quickly to changes in tastes and ways, to socioeconomic opportunities or improvements, and reduces wastes due to stock, waiting, overproduction, reprocessings etc. [Cuatrecasas, 2005, p.59].

Kaizen

Continuous improvement. It is a strategy or philosophy that aims to improve a process by performing small progressive and continuous optimization.

Kanban

Signal.It's a Leana tool in the form with visual support that unites customers demand with production. These cards are used to give a signal output or refilling that indicates when and how much to produce or supply. [Cimorelli, 2006, P.14].

Lean Management

Waste elimination management. It is a philosophy that provides a way of thinking, a way to specify value, line up the value adding actions in accordance with the optimal sequence, conduct these activities without interruption whenever someone requests and make them more efficient way. In summary, Lean provides a method to make more with less and less human effort, less equipment, less time and less space while coming more and more to offer customers exactly what they want. [Womack and Jones, 2005, p.26].

Pull

Refers to the work mode "Pull" where a process is connected to the following process in pull mode (stretch), then is the next process that pulls the production, causing it to produce exactly the required amount and required time.

Push

Refers to the work mode "Push" which means that a process always produces a certain amount without worrying about the needs of the following process.

Spaghetti Flow

Flow movement chart. It's a Lean tool to represent movements of a person through all the phases and steps that passes for a specific process. This tool helps to identify opportunities of improvement visualizing unnecessary movement of operators, customers and materials.

Value Stream Mapping (VSM)

The VSM is a tool used to comprehensively analyze the value chain, beyond the analysis of a single process and collecting only certain general data of the various operations performed. The objective of mapping the value chain is to obtain an overview of the whole, not just individual processes, and improve everything, not just optimizing the parts. From the information gathered we should establish an objective situation in the future map of the value chain.

We must also establish an action plan, specifying the necessary changes to implement ant the responsible to complete them.

The objective may be to get a complete vision of the production flow "door to door" in a plant, including the arrival of the products or pieces from the provider, the orders from the customers and the product delivery to the customer.

The analysis focuses particularly on the relationship between the material flow and the information flow. Normally the study of the value chain focuses on optimizing the flow of materials throughout the entire production process. In lean production, the flow of information is considered as important as the material.

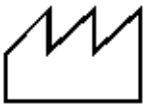
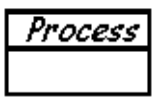
It has been supporting methods that are often used in Lean environments to analyze design flows at the system level (across multiple processes).

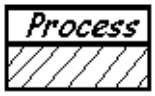
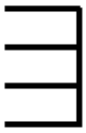
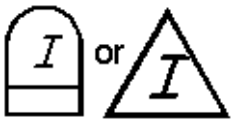
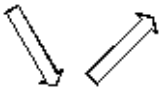
Although value stream mapping is often associated with manufacturing, it is also used in logistics, supply chain, service related industries, healthcare, software development, product development, and administrative and office processes.

15.2 Abbreviations and Acronyms

15.2.1 VSM Symbology

The VSM methodology is based in a graphical description of the value chain using standardized symbols, as we show in the following:

SYMBOL	REPRESENTS	OBSERVATIONS
	Customer/Supplier	Represents the customer when it's on the right part of the map and to the provider when it's on the left.
	Process Box	Can be a process, operation, machine or department through which there flows material

		continuously.
	Shared Process	
	Data Box	It's situated beyond a Process box and contains significant information or data to analyze the system.
	Supermarket	Represents a supermarket organized with kanbans. There is a shelf with a little stock of the product. When the customer withdraws it, the previous process refills it.
	Inventory	It represents inventory between two processes. It also represents raw material and final product inventory. Beyond the symbol the maximum amount that represents is written.
	Shipments	Represents the material movement between providers and warehouse or between warehouse and customer.
	Push Arrow	Represents the material movement between two processes in push mode
	Material Pull	Represent the connection between a process with the followings with pull mode
	Truck Shipment	External shipments from providers or to customers.

	Working cell	It represent some processes that has been integrated in once cell where exists a continuous flow
	Production Kanban	Represents what and which amount must be produced
	Withdraw Kanban	Represents what and which amount must be withdrawn by the next process
	Manual Information	Represents an information flow that are manually sent.
	Electronic information	Represents an information flow sent through internet, intranets or LANs

16. Acknowledgements

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ANNEXOS

TITLE: Lean Implementation at Cerveza Artesana Homebrew S.L

MASTER DEGREE: Master in Science in Telecommunication Engineering & Management

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ANNEX
THE PRODUCT

History

There exists the false notion of its origin, which is erroneously thought to be from north European countries such as England, Germany or Belgium. In actual fact when we speak of beer we are talking about one of the most important drinks of our civilization, a product that has accompanied man throughout history from our nomadic ancestors to our more sedentary lifestyles today.

Historically surplus cereals, which had been cultivated primarily for food, would be used in the production and enjoyment of this fermented drink, which has been one of the most consumed drinks of all time. We know of documents in cuneiform script over 4,000 years old recording of deliveries of spelt, barley and malt to breweries and activities that people engaged in, although there are no details of the processes of production or recipes. Furthermore, there is evidence that indicates that during the Egyptian dynasty (3315-3100BC) beer was already a popular drink as traces of beer have been found in vessels dating from this period. This indicates that the beverage was used by this advanced civilization. At the time it was believed that Osiris had been the inventor of beer. There is also the legend of the ferocious and bloodthirsty lion Hathor (Sekhmet) who sought to terminate humanity, but the sun god Ra, who with the intention of saving humanity, ordered that beer that had been colored red be given to the lion, which the lion duly drank believing it to be blood and was then converted into Hathor, the adored Egyptian god of music and dance and intoxication.

However, the oldest beers documented in Europe were found in a cave in Can Sadurni, Begues in the province of Barcelona. The investigations undertaken by Jordi Tresserras Juan and Juan Carlos Matamala Mellín in 2010 proved the identification of an artisanal brewery from the Neolithic age, more than 5,000 years ago. In the villages of the Mediterranean the consumption of beer called zythos was already appreciated by the Greeks, and Plinio spoke of Egypt, Gaul (now France) and Hispania (now Spain and Portugal) as the zones where the most well known beers were produced. In Hispania the beers were produced with barley and wheat as well as berries, reaching maturity thanks to the use of conservatives and flavourings such as Artemisia, thyme and rosemary sweetened with honey.

During the Middle Ages in the north of Europe the consumption and elaboration of beer flourished. During that time water was a transmitter of numerous illnesses and thanks to its fermentation it offered great hygienic/heath advantages. It was also a source of investment for the local government treasury, who quickly imposed substantial taxes on beer.

With respect to the techniques used for making beers, the first written recipe in Europe for ale appears in the 14th century in the city of Gante, Brussels. During this period, monasteries weren't the only centers of cultivation and distribution of beer, although they did create the first ale as they were who had knowledge of its manufacture. The commercialization of the product was carried out in places close to where it was made due to its poor capacity of conservation. It didn't take long for conflicts of interest to arise from the competitors that had entered the market, now not only the monastic processors were producing the

beverage but also laymen. Although it was the monks that enjoyed exemption of taxes and had the facilities to prepare the large quantities in favorable conditions while their competitors had to pay all sorts of taxes and had to purchase cereals at elevated prices. And here lies the historic distinction between the monks' breweries that produced a denser and more aromatic beer while the laity produced a beer that was more refreshing but not as nourishing.

The first addition of hops added before the fermentation process dates back to the VI century when the German Abbess of the monastery in Rupertsburg, Hildegarda of Bingen, introduced hops to the brewing process that would see the reappearance of herbs such as myrlte, rosemary, coriander and artemisia as the principle flavorings. Also, thanks to the preserving properties of the hops it was greatly improved in terms of storage capacity, which proved to be a milestone in the production of beer during this part of the medieval period. In spite of this it wasn't until 12th century that the use of aromatic plants and herbs in the artisanal production became the flavor associated with the best European cities of the 13th century.

On the 23rd April 1516, thanks to the growing popularity of beer, William IV of Bavaria introduced what is known as the purity laws in the regulation of beer brewed in that region. This law of purity limited the production of beer to only three ingredients: water, hops and barley malt. In contrast, the ales of the British Isles were beers where the yeast was fermented on the top of the brew and had a stronger flavour and tended to be bitterer than German beers.

At the beginning of the 15th century a new beer appeared from the German monasteries whereby the fermentation process was made with a cold-fermenting yeast that sank to the bottom of the tank. This new beer required cold conditions for fermentation and so was stored in caves and was consequently referred to as 'lagerbier' which is derived from the German verb 'cold storage' . Its new characteristics of a lighter flavor created an opposition to traditional ale, which as a result meant a rapid separation between the processes of beer in Europe. However, the British Isles opted to continue with the beer known as ale with its top fermentation process with a yeast called Saccharomyces cerevisiae with which its production was perfected. However, the greater part of central Europe adopted the new variant using the bottom fermentation process, using the yeast Saccharomyces pastorianus.

Charles V authorised the first beer factory in Madrid in 1537 and only five years later in 1542 Alonso de Herra applied for royal permission from Charles V to open a new commercial brewery in New Spain, now Mexico. Spanish and American convents also began to produce beer in portable artisanal workshops for the consumption of the monks, as in the case of the Monastery of Yuste where Charles V, the emperor himself retired along with his master beer maker Enrique van der Trehen. Or the brewery of the Convent of San Fransico de Quito founded by the Belgian friar Jodoco Ricke in 1566.

The royal court maintained the legal authority granted for the production of beer by means of the Royal Privilege Off-license or Liquor store state monopoly although people continued its production throughout the territory, a phenomena

that required a detailed investigation. In particular Santander stood out as an important brewing core in 1783 and particularly after this date, after obtaining licenses for the exportation to the Americas.

Jean Baptiste Henri Joseph Desmazieres was one of the first investigators who observed yeasts through a microscope. He published an article in 1827 in which he demonstrated through illustrations of yeasts, one in particular referred to Mycoderma cervisiae. This was the first time that yeast had been recognised as being a living organism although still it wasn't attributed to have the capacity of fermentation. It was Pasteur who at the end of the decade 1850, began to study the process of fermentation of sugars conducted by the yeasts. It was discovered that these yeasts nourished by sugar produced residual substances such as ethanol and carbon dioxide. The base of these elements were found to increase the storage capacity of beer and at the same time freed the manufacture of the meteorological restrictions and the characteristics of where the product was made.

Various enterprises took advantage of this discovery along with many other advances of technology such as the design of bottle caps that meant a revolution in terms of bottling beer and it soon became one of the first industrialised beverages. This process provoked a slow but progressive disappearance of the small producers of beers especially in Spain, from where it had been produced during the first decades of the 20th century.

Presently Spain's large breweries produce large quantities and varieties of beer that play a dominant role in the marketplace. Fortunately in recent years the artisanal beer is returning to life and its place on the market is growing with force and is already appreciated by the gourmet consumer who is more concerned with quality and sensitive to where the product is made. This guide will enable the beer lover to some of the best artisanal speciality beers around today and the best way to enjoy them. [Guía para descubrir las mejores cervezas artesanas, 2013,p.11-14]

Ingredients

To produce beer four basic ingredients are required: water, malt, hops and yeast.

Water

Like with many plants, organisms and drinks, water is the predominant element; more than 95% of a beer is water. With this in mind, it seems obvious that the choice of good quality water will enhance the essential performance it plays in the process of manufacture. If you've ever asked yourself why beers vary depending on the place where is brewed, why beers made in London or Dublin are famous for being smooth in flavour and dark in colour while those of Pilsner are light and golden in colour and those of Burotn, dark and bitter. The reason is simple: water. In each of these cities there is a totally different type of water, each beer is adapted during its production depending on the available kind of water.

The following graph summarizes the concentration of the different elements combined in water and the production in various cities expressed en ppm (parts per million).

City	**Burton**	**Dortmund**	**Dublin**	**Londres**	**Munich**	**Pilsen**
Beer Style	**Pale Ale**	**Pale Lager**	**Stout, Porter y mild ales**	**Stout, Porter y mild ales**	**Lagers oscuras**	**Pilsner**
Calcium	268	260	80	90	80	7
Magnesium	62	23	19	4	19	1
Bicarbonat	282	540	328	246	328	18
Sodium	30	69	1	24	1	3
Cloruro	36	106	1	18	1	5
Sulfat	638	283	5	58	5	6
Residual Alcalinity	0.1	4.9	4.0	2.7	4.0	0.2

Another aspect to take into account is the PH value, which will play an important role in the performance of brewing, depending on the sugars of the malt.

The PH value once made into a paste, that is the mix of the grain with water, should vary between 5.3, and 5.7, since this is the range where alfa-amylase and beta-amilasas (the enzymes charged with transforming the starch into sugars) works better. If the PH balance is not correct, there will be little activity from the alfa-amylasas and beta-amylasas which will render the process invalid so the performance of the brewing process is affected.

Hops.

Hops are a natural conservative with antiseptic and bacteriostatic properties which help the beer to maintain the best conditions with the least risk of contamination. The part of the hops used for the preparation of beer is the female flower of Humulus Lupulus, from the Cannabaceae family. It is possible to find wild hops in cold humid areas of Spain normally next to rivers. In the past, before the introduction of hops in the manufacture of beer, it was used in conjunction with preserving aromatic herbs that would differ depending on each herb: artemisia (wormwood, mugwood and sagebrush) thyme, rosemary.

Hops provide both aroma and flavour (or bitterness) depending on how it's used. There are different varieties, each one with it's own characteristics. At the moment of boiling, when the hops are added, isomerization in the wort produces its own particular attribute to the beer (bittering). To make it, resins (alpha acids) are required. These resins are found naturally in the hops and are different depending of the variety, it can have an inferior presence of between 3% and 20%.

In order to take advantage of the bitterness of these acids it is necessary to be able to dissolve the wort; for this, it necessary to dissolve by boiling for a minimum of 45 minutes and a maximum of 90. During the boiling the hops, the essential acids are detached, these responsible essences to give flavor and aroma to the beer. These acids are highly volatile and evaporate in a short time during the boiling. When hops are added during the final minutes of the boil, less of the aromatic oils are lost to evaporation and more of the hop aroma is retained.

The international unit to measure the bitterness of a beer is the IBU (International Bitterness Unit): the higher the index, the more bitter is the beer.

Malt

Malt is a processed cereal, which has been germinated and dried so the natural enzymes from the cereals are activated but they don't consume all the midons, so we can use them to produce beer.

Malt is divided into two main families: base malt and specialty malts. Base malt from which sugars are extracted which provide food for the yeast to make alcohol and for this reason they are used most in the brewing of beer.

Speciality malts are used to give flavour, aroma and colour to the character of the beer, although it is not advisable to use more than 20% of malt in a beer recipe. Depending on the degree to which the malt has been toasted, the malt will be dark or lighter. The unit most utilized to measure the colour is the European Brewery Convention which is a scale between 0 for the lightest beer to 80 for the darkest. In the graph below there are some of the examples of different beers.

Yeast

Yeasts are single cell fungi that reproduce by budding and are responsible for the transformation of sugars of the wort in CO2, alcohol and other subproducts.

There exist thousands of variants and strains of yeast although until relatively recently there were considered to be only two types of beer yeast; ale yeast or top fermenting yeast, Saccharomyces cerevisiae and lager yeast, the bottom-fermenting yeast, Saccharomyces pastorianus also known as Saccharomyces carlsbergensis. However, after reclassification of the species Saccharomyces it has been concluded that both larger and ale yeasts are Saccharomycres cerevisiae.

The top fermenting yeast works better at temperatures that vary between 18ºC and 25ºC. These yeasts dominate the top fermentation because they rise to the surface during the fermentation process, creating a thick yeast head. It produces a beer rich in esters, a distinctive characteristic of ale beers.

The bottom fermenting yeast in contrast, works better at lower temperatures from 7ºC to 15ºC. The lager yeasts work more slowly and produce less foam and tend to settle out to the bottom of the fermenter as the process nears completion. The resulting flavour depends largely on the strain of lager yeast and at which temperatures it was fermented.

Yeast can be bought in two distinct formats: freeze-dried or liquid. The dried yeast o freeze-dried is recommended to start for the beginner in the artisanal production of beer because it's cheap and resistant, and much easier to use than the liquid form, which although is of a better quality it has more requirements of conservation and utilization.

Apart from these two types, there is also spontaneous fermentation which is made/carried out by exposing the wort to the open air which literally infects the beer. One of the most typical yeasts of this type is the Brettanomyces Lambicus strain. This method of making beer has been practices for decades in the region of Flanders in Belgium.

The brewing process

If you feel curious about the world of artisanal beer making, and you wish to take your curiosity a step further, it is possible to make your own at home without complications. Depending on the time you have or wish to dedicate there exist two methods both practical and simple. The first, that requires the least amount of time, just an hour, is by using malt extract. This technique is used in countries such as the Czech Republic o England and it is possible to produce a very decent quality beer in this way. For this it is enough to buy the malt extract, which is the dehydrated wort of a specific type of beer such as pale ale, dissolve it in boiling water and add, if necessary, a little dextrose monohydrate (brewing sugar or ordinary sugar) that will increase/amplify the proof of the beer, Once the mix is cool, add the yeast so that the fermentation begins, then bottle and allow to mature for between 3 and 5 weeks.

The second method is called all grain brewing. This technique is more traditional and takes between 6 and 8 hours to make a homebrew batch. This procedure has many advantages, largely because you can control the profile of the beer that you are preparing. It also allows you to vary the percentage of malt and hops to your taste. Moreover, the whole process is more natural and from the first moment it work with the basic ingredients without chemical manipulation.

Designing the recipe.

The first step is design itself. You should consider the style of the beer that is desired and the ingredients that will help you to achieve to best result. One you have this first step established you will have to calculate the proportions. For this there exist a multitude of technical programs such as BeerSmith 2.

The main ingredient is water, this will make up 98% of the final product. The most practical to guarantee good quality is to purchase bottled mineral water although tap water can be used, it should have been previously boiled to remove the chlorine which is damaging to the flavor of the beer.

The next step is to determine the type of filling, or rather what will be the proportion of water to malt that you want to mix. It is usual to use between 2 to 4 liters of water to each kilo of malt. The variation of these quantities will determine the consistency of the beer:

- 2 liters per kilo for a dense mashing.
- liters per kilo for a medium mashing.
- liters per kilo for a light mashing.

The advantages of making a light mashing are that it is more efficient and that it provides a better retention of the heat. On one hand, a dense filling reduces the space necessary to make the beer so this makes it idea if you have smaller equipment and recipes with large quantities of grain. In this case, apart from

calculating the quantity of malt required, it is also necessary to take into account if the beer will have other ingredients and the malted cereal. To calculate the quantities of the hops and the time it takes to boil it is necessary to know the density the wort will have, how many sugars are extracted by the malt, and how many alpha acids in the hops you decide to use, and how long the whole process will take. One simple way to calculate the amount of hops that should be added is to consult the software mentioned earlier o some of the calculators of IBU that also can be found at www.Cervezaartesana.es. The best IBU will result in the best level of bitterness for the beer.

Finally, the yeast. The best considered yeasts between high and low fermentation but it is also important to know which yeast will add the desired amount of flavours to your beer or if you use a neutral yeast that it won't diminish the prominence of the other ingredients.

Wort creation

The stop before the process consists of grinding the malt which is done in a mill. There are a wide range of mills available on the market although it is the best to consult a specialised shop to get advised.

Another option is to buy the malt already ground although this means an important reduction in the final aromas. Grains are opened without breaking the husk, which serves as a filter. This permits the water from soaking to soften and dissolve the starch easily from the centre of the grain and the enzymes to propagate freely within the paste, breaking down the simple starch sugars. A good milled grain is one of the most important aspects of achieving a good beer, although in as much as milling the grain is harder than filtering it.

Mashing

Mashing is the process of combining a mix of malt and water and heating this mixture for at least 60 minutes. There are a countless types of recipients that can be used from a large saucepan on a stove to thermal tanks . The mashing produces sweet wort formed basically from the starches of the mat which are converted into sugars. . The majority of these will be consumed during the fermentation and are converted into alcohol and CO2 however, almost a quarter of these sugars are not fermentable so (se mantendrean) contributing to the taste, body and sweetness of the beer. At this point, one can decide how the final product will be.

The mashing produces into a level of temperature between 60 ºC and 72ºC, for a period of time between 60 and 90 minutes. Depending on the temperature, it's possible to obtain different results, already the enzymes react differently. In this way there exist basically five bands of temperature with which you can work:

Protecolytic breaks: which is a period of mashing when the protein molecules are broken down into small components. The proteolytic break is important for the clarification of the body, but especially for the stability of the foam and the capacity for absorption of the carbonic gas. The temperature is approximately

52 degrees centigrade, and following the formula is maintained between 5 and 20 minutes.

Mashing between 62ºC and 65ºC: has resulted in a relatively high proportion of fermentable sugars. This type of beer has a lighter and dryer body, and less sweetness. It is maintained at a temperature of between 66ºC and 69ºC and produces a normal proportion of fermentable sugars, maintained for between 60 and 90 minutes.

Mashing between 70ºC and 72ºC produces a relatively small amount of fermentable sugars. This type of beer has a lot of body and sweetness.

At the end of the mashing process, the temperature is always raised to 75ºC or 78ºC to finalize the activity of the enzymes and left to establish the recipe, which is maintained for 10 minutes.

The total time of mashing (without counting the Protecolytic breaks nor the rising of the temperatures to finalize the enzymes) shouldn't go above 90 minutes. In this way, it is possible to achieve the combination of the desired temperatures adjusting it to this maximum. An example of temperature for a recipe with malt Pilsner would be 10 minutes at 52ºC, 50 minutes at 63 ºC, 30 minutes at 72ºC and 10 minutes at 78ºC.

It is important to take into account the subtle change of the temperature, so it is careful control is recommended. Given that a drop of 5ºC can lead to a failure in the mashing process. An easy technique to avoid this problem is called the single infusion mash. With this method the mashing is done at a stable temperature and the paste is introduced from an isolated container that conserves the same temperature during the whole process. This allows testing the temperature every 20 mins correcting it with hot water.

In this way, the mash must be mixed in a vessel with the desired quantity of water with the malt and continue heating it until it obtains the desired temperature. If, doing the mash in a vessel that is possible to heat the mix in, a simple infusion must be done and hot water added at 68ºC and leave it to rest for an hour and a half, stirring it and verifying that the temperature is correct every 20 minutes.

Once the sugars have been extracted from the malt, it is necessary to remove the solid residues through a filter. This stage will be much easier and faster if it has been well mashed, given that it is used as a filter by the same cereal husks. The process of filtering consists of stirring the liquid through the husk pulp through a filter which will retain the flours which if not eliminated correctly provoke stringency. For this stage there are barrels of filters where the paste is introduced and stirred slowly up to three times taking out the wort from below and stirring from the top little by little so as not to stir it up too much. This is repeated until the work is clear of the flours and particles in suspension. This indicted that it is ready for the second stage of sparging.

Sparging

To be able the best yield and efficiency the grain should be washed as this retains the best quality of the sugars after filtering. For this it is necessary to add hot water at 78ºC, in a quantity of approximately a quarter of the total volume of wort that you are producing, and spraying the water of the top of the grain the same as was done during the filtering process. In order to determine the amount of the water added it should be tested with a densimeter in order to evaluate that the density of the wort demonstrating that all the sugars from the pulp have been obtained and in this case adding water can be cease. It is possible to correct after this process increasing time at boiling point, when the concentration of the wort increases thanks to evaporation. It is also advisable to taste the wort before and after the sparing in order to test the change in sweetness and the quantity of sugar.

Boiling.

Boiling is done in a container over an electric or gas stove. At this stage the hops are added to give bitterness to the taste and the aroma; it's important to take into account during this process that up to 5 to 10% of the wort will evaporate. Before starting the boil it is important to know that there are no chaffs/husks of the cereal in the wort as it will cause it be astringent, a bitterness that is not desired in this beer.

As the wort is brought to boiling point, and a film will form on the top which should be carefully removed using a strainer if this is not done it will hinder the work of the yeast during the stage of fermentation.

Once it starts to boil it is necessary to be ready for the foam that will occur rapidly on the top, and may overflow. It is necessary to adjust the temperature at this stage to allow the wort to boil at a consistent temperature, keeping the container semi-covered.

During the boiling, the determined amount of hops are added and watched carefully so it is not boiled for longer than necessary, as it will make the beer bitterer. The approximate time to achieve the different characteristics of the hops are:

- 60 minutes of boiling: bitter
- 15-20 minutes: flavor
- 0-5 minuets: aroma

For the cooling it is possible to use a heat exchanger. It is necessary to leave it boiling for a few minutes before starting the process of cooling to avoid contamination. Remember to leave it covered to avoid any contact of the wort with the outside of the vessel as it is now vulnerable to contamination.

To cool the wort is it necessary to stir in cold water through a wort chiller to a temperture of approximately 25 C. At this temperature it is possible to transfer the fermentor and inoculate the yeasts without harming them. Another method

used in Australia is based on transferring the boiled wort to the fermentor to sterilize itself.

It is then left a full day in an airtight container in a cool dark place so it cools.

Beer Fermentation

This process is carried out in fermenters ; these should be conical are made of stainless steel to purge the dead yeasts. However, there also exist fermenters made of plastic, which are more economical, and like glass models they are transparent which can cause problems as light is able to permeate and therefore contaminate. The fermentation should done in a dark place in order to avoid this problem.

During the fermentation process the cells in the yeast transform the fermented sugars in the wort and are converted into alcohol and CO2; depending on the quantity of sugars that are metabolized, the graduation of the beer will vary. To calculate the alcoholic volume of the fermented beer it is necessary to know the initial and the final density (these are the indicators of the quantity of the sugars present in the liquid). For this, before starting the fermentation it is necessary to take a sample of the density, test it and take note of the result.

Once the wort is placed in the fermenter with the inoculated yeast it should be left in a cool dark place for a approximately a week. The ideal temperature for the ale yeast is between 16ºC and 22ºC (lager beers should be between 7ºC and 15ºC). Then the airlock is filled with alcohol in order that it expulses the CO2. It is important to make sure that between the exterior air there is won't be any sterilized products that will be allow bacteria and therefore provoke contamination.

After 12 and 24 hours there should appear visible signs that the fermentation has begun. A large quantity of foam will appear at this stage and it will generate a lot of CO2. One should take in account that some yeast strains are more rapid than others, therefore one should not despair if it takes longer than thought in starting to ferment.

In general, the fermentation process will take between 4 and 15 days, but it can also depend on the type of recipe, the yeast and the temperature. There are no exact data from when fermentation should end, each beer has distinct conditionals and some recipes ferment more quickly than others. In the beginning, the fermentation is complete when no more activity is observed for 48 hours; in order to determine this, it should take tests of the density: if they don't vary it is a sign that there is no longer any activity.

Once fermentation has finished it is possible to calculate the volume of alcohol with density tests. The formula to calculate the alcohol is (density from the start – the density at the end) / 7,4= *%.

The majority of beers can benefit from a second fermentation, something which is normally done with ale. However, the term 'second fermentation is quite deceitful in that rather than a fermentation it about maturing and clarification

(there is hardly any fermentation compared to the first). In case of preparing a conical fermenter it can be done without moving it as the cone permits emptying the yeast sludge.

There should be no residues of air in the recipient where there will be the second fermentation or maturing as the oxygen can contaminate the beer. Although oxygen is necessary before the fermentation, after it is removed it will spoil the beer quickly and provoke oxidation of the alcohol producing an unpleasant, somewhat metallic taste. This will not occur during the first fermentation as already most of the CO2 is produced fills all of the interior of the fermenter, expulsing the oxygen outside.

For a less murky beer, another option is the clarification process. This stage can be done in many ways the two most advisable are:

Irish Moss: this product is a natural clearing agent, a seaweed, that is added during the last 15 to 20 minutes of boiling and doesn't alter the taste of the beer.

Decantation in fold: the proteins and yeasts are suspended and can be decanted without adding sugar products to the recipe by means of cold decantation. To do this it is necessary to leave the beer green (before bottling) at a temperature of between 2ºC and 4ºC during 3 days.

Bottling the beer

Before the process of bottling it is necessary to prime the beer, so that the yeast continues to work once it has been bottled. Thus the CO2 in the bottle will overflow on opening or even explode. On the other hand if the amount is less it is necessary, the beer won't have gas or probably foam.

To add sugar at this part of the process there are many choices. The most usual in homebrew bottling is the dextrose monohydrate o glucose. To be certain of not adding too much it is necessary to verify that the first fermentation has ended and that there are no more fermentable sugars in the beer (this is done by using verifications of density already discussed). Once tested, add 6 grams of dextrose o glucose per liter of beer. This quantity will make the yeast metabolize the right amount of CO2 that is required.

Once the beer has been bottled it is necessary to leave it until the second fermentation and maturation in a cool dark place between 15ºC and 20ºC for about a month, always depending on the recipe. As a general rule, beers with more alcohol graduation will need longer. Once this has been done, it only remains to chill the beer in the fridge, which should be done in a vertical position, given that it facilitates the activity of the yeast.

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ANNEX
PURCHASES COSTS

pallets	Peso	Almacen/mes	Almacen/kg	Envío Best Malz	Envío/kg	SUMA	SUMA por Kg
3	2250	12 €	0,00533 €	650	216,6667	662 €	216,67200 €
4	3000	16 €	0,00533 €	651	162,7500	667 €	162,75533 €
5	3750	20 €	0,00533 €	652	130,4000	672 €	130,40533 €
6	4500	24 €	0,00533 €	653	108,8333	677 €	108,83867 €
7	5250	28 €	0,00533 €	654	93,4286	682 €	93,43390 €
8	6000	32 €	0,00533 €	655	81,8750	687 €	81,88033 €
9	6750	36 €	0,00533 €	705	78,3333	741 €	78,33867 €
10	7500	40 €	0,00533 €	735	73,5000	775 €	73,50533 €
11	8250	44 €	0,00533 €	760	69,0909	804 €	69,09624 €
12	9000	48 €	0,00533 €	815	67,9167	863 €	67,92200 €
13	9750	52 €	0,00533 €	875	67,3077	927 €	67,31303 €
14	10500	56 €	0,00533 €	915	65,3571	971 €	65,36248 €
15	11250	60 €	0,00533 €	975	65,0000	1.035 €	65,00533 €
16	12000	64 €	0,00533 €	1025	64,0625	1.089 €	64,06783 €
17	12750	68 €	0,00533 €	1075	63,2353	1.143 €	63,24063 €
18	13500	72 €	0,00533 €	1133	62,9444	1.205 €	62,94978 €
19	14250	76 €	0,00533 €	1185	62,3684	1.261 €	62,37375 €
20	15000	80 €	0,00533 €	1235	61,7500	1.315 €	61,75533 €
22	16500	88 €	0,00533 €	1350	61,3636	1.438 €	61,36897 €
24	18000	96 €	0,00533 €	1380	57,5000	1.476 €	57,50533 €
26	19500	104 €	0,00533 €	1380	53,0769	1.484 €	53,08226 €

Peso por pallet
750

Escola d'Enginyeria de Telecomunicació i Aeroespacial de Castelldefels
UNIVERSITAT POLITÈCNICA DE CATALUNYA

ANNEX
SELLS HOMEBREWER

COMANDES CADA... 3 3

Suma de Cantidad pedida — periode

Nombre del producto	13829	13830	13831	13832	13833	13834	13835	13837	13838	13839	13840	13841	13842	13843	13844	13845	13846	13847	13848	13849	13850	13851	13852	13853	13854	13855	13856	13857	13858	13859	13860	13861	13862	13863	13864	Total general									
Chapas 26 mm. AMARILLO Pack 100 Unid.	1	1	2	3	1					1	5								1	1	1	1					1	1		3	2	3		1		29		1,7	1,2	2,9	5,0	3,1	5,9	9,0	15,0
Chapas 26 mm. AZUL Pack 100 Unid.																	1	4	4	4	1	2	1	2	5	1	2		1	2	1	2		4		37		2,3	1,4	3,7	6,0	4,2	7,7	11,8	19,5
Chapas 26 mm. DORADO Pack 100 Unid.	1	2	1	2	3			1	1	7	3	1	6		3		1	4			3	1			3		2		2		1	6	1		4	59		2,6	1,8	4,4	7,0	4,8	10,8	15,6	26,4
Chapas 26 mm. NARANJA Pack 100 Unid.	1	3									1								1	2		1			1							3		1		14		1,6	0,9	2,4	4,0	2,6	3,4	6,1	9,5
Chapas 26 mm. NEGRO MATE Pack 100 Unid.											1		2		2		1	4		2	3	2	1	2	5		5			2		2		2	1	37		2,3	1,3	3,6	5,0	4,1	7,7	11,8	19,4
Chapas 26 mm. PLATA METALIZADO Pack 100 Unid.	1		2				1						2		1					2	1		1	1		2	2		3		1	4	1			25		1,7	0,9	2,6	4,0	3,0	5,3	8,2	13,5
Chapas 26 mm. ROJO MATE Pack 100 Unid.	2																1		1						1		1				1	2		1		10		1,3	0,5	1,7	3,0	2,0	2,5	4,5	7,0
Chapas 26 mm. ROJO METALIZADO Pack 100 Unid.			2				1	2			1		5	2				2		4		2	1		5			1			1	3	1	2		35	1	2,2	1,4	3,6	5,0	3,8	7,1	10,9	18,0
Chapas 26 mm. VERDE OSCURO Pack 100 Unid.			1	4		2							2							5	1	3	3	1			2	2	1		1	3		4		35	0,2	2,3	1,3	3,6	5,0	3,9	7,3	11,2	18,4
Chapas CORONA azul diam 26 mm (100 und)			2		1										1																					4	0,5	1,3	0,6	1,9	3,0	1,7	1,2	2,9	4,0
Chapas CORONA blancas diam 26 mm (100 und)									1																											1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Chapas CORONA negro diam 26 mm (100 und)	1	1								1	1																									4		1,0	0,0	1,0	1,0	1,2	1,1	2,3	3,4
Copos de ARROZ 1Kg																		1									1									2		1,0	0,0	1,0	1,0	1,0	0,6	1,6	2,2
Copos de ARROZ 5Kg																				1																1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Copos de AVENA 1kg																		1		2							2	1	3		2					11		1,8	0,8	2,6	4,0	2,8	2,9	5,7	8,6
Copos de AVENA 5 kg																						1					1	1								3		1,0	0,0	1,0	1,0	1,1	0,8	2,0	2,8
Copos de avena 500g				1																		2														3		1,5	0,7	2,2	3,0	1,9	0,9	2,8	3,7
Copos de cebada 1Kg			1							1	3							2						2					1			3				13		1,9	0,9	2,8	4,0	3,0	3,3	6,3	9,6
Copos de CEBADA 500g																										1										1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Copos de CEBADA 5Kg																												1								1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Copos de CENTENO 1Kg																														1	2		2			5		1,7	0,6	2,2	3,0	2,2	1,4	3,5	4,9
Copos de TRIGO 500g																											2	1								3		1,5	0,7	2,2	3,0	1,9	0,9	2,8	3,7
Copos de TRIGO 5kg																												1							1	2		1,0	0,0	1,0	1,0	1,0	0,6	1,6	2,2
Irish Moss 100 gr																		1		3	1	2	1	1	4		2	2		1	1	8		2		29		2,2	2,0	4,2	7,0	4,1	6,5	10,6	17,2
Irish Moss 100g	2		1																																	3		1,5	0,7	2,2	3,0	1,9	0,9	2,8	3,7
Irish Moss 1kg												1																				1				2		1,0	0,0	1,0	1,0	1,0	0,6	1,6	2,2
Kit Blanche																				3	1											3				7		2,3	1,2	3,5	5,0	3,2	2,0	5,2	7,2
Kit Brown Ale																				1	1											1	1			4		1,0	0,0	1,0	1,0	1,2	1,1	2,3	3,4
Kit de Fermentación Doble DeLuxe											1									1		1					1			1						5		1,0	0,0	1,0	1,0	1,3	1,3	2,6	4,0
Kit de Fermentación Doble Superior				1				1						2		1	1	1	1					2		1						1		1	1	14		1,2	0,4	1,6	2,0	1,9	3,1	5,1	8,2
Kit de fermentación Economic	2	1	2		1					4	3		2	1	2	2		1	4	3	2	1			1	1	3	1					1	1		39		1,9	1,0	2,9	4,0	3,4	7,3	10,7	18,1
Kit de Inicio DeLuxe, Hacer Cerveza Todo Grano																1											2									3		1,5	0,7	2,2	3,0	1,9	0,9	2,8	3,7
Kit de Inicio, Hacer Cerveza Todo Grano				1																												1			1	3		1,0	0,0	1,0	1,0	1,1	0,8	2,0	2,8
Kit dispensador De Luxe				1																																1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Kit English Pale Ale																												2				2				4		2,0	0,0	2,0	2,0	2,0	1,2	3,2	4,3
Kit Helles															1																					1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Kit Pale Ale					1									1			1															2				5		1,3	0,5	1,8	3,0	1,8	1,4	3,2	4,6
Kit Receta HELLES 20 Litros.																				4												2				6		3,0	1,4	4,4	6,0	3,8	1,8	5,6	7,5
Kit Rubia					1						2																					3		1		7		1,8	1,0	2,7	4,0	2,6	1,9	4,6	6,5
Lúpulo AHTANUM pellet 100g								1				1	1					1	1											1						6		1,0	0,0	1,0	1,0	1,4	1,6	2,9	4,5
Lúpulo AHTANUM pellet 250g											1																									1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Lúpulo AMARILLO pellet 1 Kg													1																							1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Lúpulo AMARILLO pellet 100g								1										1										1	1					1		5		1,0	0,0	1,0	1,0	1,3	1,3	2,6	4,0
Lúpulo AMARILLO pellet 250g											2		1		1			1				2					1							2		10		1,4	0,5	2,0	3,0	2,2	2,5	4,8	7,3
Lúpulo Cascade 100g conos																												5								5		5,0	0,0	5,0	5,0	4,2	2,0	6,2	8,2
Lúpulo Cascade 250g pellet	1																																			1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Lúpulo CASCADE pellet 1 Kg																							1							1						2		1,0	0,0	1,0	1,0	1,0	0,6	1,6	2,2
Lúpulo CASCADE pellet 100g					3			2						1						5	1	1			2		1		2		1	3		1		23		1,9	1,2	3,2	5,0	3,4	5,2	8,6	13,8
Lúpulo CASCADE pellet 250g			1								2								1						2		3				1			3		13		1,9	0,9	2,8	4,0	3,0	3,3	6,3	9,6
Lúpulo Centennial 250g pellet																																		1		1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Lúpulo CHALLENGER pellet 1 Kg													2				1																			3		1,5	0,7	2,2	3,0	1,9	0,9	2,8	3,7
Lúpulo CHALLENGER pellet 100g														1											1		1									3		1,0	0,0	1,0	1,0	1,1	0,8	2,0	2,8
Lúpulo CHALLENGER pellet 250g																																		1		1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Lúpulo CHINOOK pellet 100g								1				1	1								1				2				1							7		1,2	0,4	1,6	2,0	1,7	1,8	3,5	5,4
Lúpulo CHINOOK pellet 250g																		1				1												1		3		1,0	0,0	1,0	1,0	1,1	0,8	2,0	2,8
Lúpulo Columbus 100g pellet	1																																			1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Lúpulo COLUMBUS pellet 100g								1														1	1							2	2	3				10		1,7	0,8	2,5	4,0	2,6	2,6	5,3	7,9
Lúpulo COLUMBUS pellet 250g																		1																1		2		1,0	0,0	1,0	1,0	1,0	0,6	1,6	2,2
Lúpulo E K Golding 100g pellet		1																																		1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Lúpulo EXTRA STYRIAN DANA pellet 100g																			1			1														2		1,0	0,0	1,0	1,0	1,0	0,6	1,6	2,2
Lúpulo EXTRA STYRIAN DANA pellet 250g																							1	1								1				3		1,0	0,0	1,0	1,0	1,1	0,8	2,0	2,8
Lúpulo FRANCE STRISSELSPLAT pellet 100g																		1																		1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Lúpulo FUGGLE pellet 1 Kg												1																								1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Lúpulo FUGGLE pellet 100g																	1		1						1		2							1		6		1,2	0,4	1,6	3,0	1,8	1,6	3,5	5,1
Lúpulo FUGGLE pellet 250g																		1	1										1							3		1,0	0,0	1,0	1,0	1,1	0,8	2,0	2,8
Lúpulo Fuggles 100g conos											1																									1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Lúpulo HALL. MITTELFRUH pellet 100g																		1		2					1							3				7		1,8	1,0	2,7	4,0	2,6	1,9	4,6	6,5
Lúpulo HALL. MITTELFRUH pellet 250g																							1													1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Lúpulo HALL. SAPHIR pellet 100g															1																					1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Lúpulo HALL. SAPHIR pellet 250g																1							1		1											3		1,0	0,0	1,0	1,0	1,1	0,8	2,0	2,8
Lúpulo HALL. TRADITION pellet 100g																			1													2				3		1,5	0,7	2,2	3,0	1,9	0,9	2,8	3,7
Lúpulo HALL. TRADITION pellet 250g										1								1					1													3		1,0	0,0	1,0	1,0	1,1	0,8	2,0	2,8
Lúpulo Hallertauer Herkules 100g pellet		1																																		1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Lúpulo Hallertauer Hersbrucker 100g conos			1				1				1																5					6				14		2,8	2,5	5,3	8,0	4,7	4,1	8,7	12,8
Lúpulo HALLERTAUER HERSBRUCKER pellet 1 Kg																													1							1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Lúpulo HALLERTAUER HERSBRUCKER pellet 250g				1							1					1		1					1				1		1							7		1,0	0,0	1,0	1,0	1,4	1,8	3,2	5,0
Lúpulo Hallertauer Mittelfrueh 100g pellet		1																																		1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Lúpulo Hallertauer Mittelfrueh 250 g pellet			1																																	1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Lúpulo MAGNUM pellet 100g													1					1	1					1					2					1		7		1,2	0,4	1,6	2,0	1,7	1,8	3,5	5,4
Lúpulo MAGNUM pellet 250g										2				2				1					1										1			7		1,4	0,5	1,9	3,0	2,1	1,9	4,0	5,8
Lúpulo NORTHERN BREWER pellet 250g											1	1																								2		1,0	0,0	1,0	1,0	1,0	0,6	1,6	2,2
Lúpulo Northern Brewer 100g pellet	1																																			1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Lúpulo NORTHERN BREWER pellet 1 Kg																													1							1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Lúpulo NORTHERN BREWER pellet 100g			1						1					1							1			2	3									5		14		2,0	1,5	3,5	6,0	3,4	3,7	7,1	10,9
Lúpulo PALISADE pellet 250g											1																									1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Lúpulo Perle 100g pellet		1																																		1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Lúpulo PERLE pellet 1 Kg																																		1		1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Lúpulo PERLE pellet 100g															1										1							1				3		1,0	0,0	1,0	1,0	1,1	0,8	2,0	2,8
Lúpulo PERLE pellet 250g										2			1										2	1								1				7		1,4	0,5	1,9	3,0	2,1	1,9	4,0	5,8
Lúpulo PILGRIM pellet 100g																		1				3														4		2,0	1,4	3,4	5,0	2,8	1,4	4,3	5,7
Lúpulo PILGRIM pellet 250g															1																					1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Lúpulo Saaz 250g pellet		2																																		2		2,0	0,0	2,0	2,0	1,7	0,8	2,5	3,3
Lúpulo SORACHI ACE pellet 100g									1						3																					4		2,0	1,4	3,4	5,0	2,8	1,4	4,3	5,7
Lúpulo SORACHI ACE pellet 250g																		1																		1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Lúpulo STYRIAN GOLDING pellet 1 Kg																													1							1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Lúpulo STYRIAN GOLDING pellet 100g																			1	6							1					2		1		11		2,2	2,2	4,4	7,0	3,8	3,3	7,1	10,4
Lúpulo STYRIAN GOLDING pellet 250g																		1										1								2		1,0	0,0	1,0	1,0	1,0	0,6	1,6	2,2
Lúpulo SUPER STYRIAN (AURORA) pellet 100g																									1											1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Lúpulo SUPER STYRIAN (AURORA) pellet 250g																1													1							2		1,0	0,0	1,0	1,0	1,0	0,6	1,6	2,2
Lúpulo T90 BREWERS GOLD 100g															1		1	1				2				1										6		1,2	0,4	1,6	3,0	1,8	1,6	3,5	5,1
Lúpulo T90 BREWERS GOLD 250g												1																								1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Lúpulo T90 CALYPSO 250g																							1													1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Lúpulo T90 CALYPSO 100g																				1																1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Lúpulo T90 CITRA Y 100g											1		1					1		3							1					4		1		12		1,7	1,3	3,0	5,0	2,9	3,2	6,1	9,3
Lúpulo T90 CITRA Y 250g											2				1								2		1									1		7		1,4	0,5	1,9	3,0	2,1	1,9	4,0	5,8
Lúpulo T90 CITRA Y 1 Kg																		1																		1		1,0	0,0	1,0	1,0	0,8	0,4	1,2	1,6
Lúpulo T90 EAST KENT GOLDING F 1 Kg												1	1																	1						3		1,0	0,0	1,0	1,0	1,1	0,8	2,0	2,8
Lúpulo T90 EAST KENT GOLDING F pellet 100g					1				1		1				2				1			3		1	2											12		1,5	0,8	2,3	4,0	2,5	3,0	5,5	8,5
Lúpulo T90 EAST KENT GOLDING F pellet 250g					1					2				1	1			5																		10		2,0	1,7	3,7	6,0	3,3	2,9	6,3	9,2
Lúpulo T90 HALLERTAUER HERKULES pellet 250g															1								1		1											3		1,0	0,0	1,0	1,0	1,1	0,8	2,0	2,8
Lúpulo T90 HALLERTAUER HERSBRUCKER pellet 100g																	1	1	2					1	1	1			3			3				13		1,6	0,9	2,5	4,0	2,7	3,3	6,0	9,2

| | | |

COMANDES CADA...	21

Suma de Cantidad pedida	periode										Lot
Nombre del producto	1975	1976	1977	1978	1979	1980	Total general				
Serpentín refrigerador con manguera y conector					3		3	3,0	0,0	3,0	3,0
Aceite aromático Citrus 5ml					1		1	1,0	0,0	1,0	1,0
Aceite aromático Herbal 5ml				1		1	2	1,0	0,0	1,0	1,0
Aceite aromático Hoppy 5 ml	1						1	1,0	0,0	1,0	1,0
Aceite aromático Hoppy 5ml				1			1	1,0	0,0	1,0	1,0
Ácido láctico 80% 1 Litro					3		3	3,0	0,0	3,0	3,0
Ácido láctico 80% 100 ml					2		2	2,0	0,0	2,0	2,0
Ácido láctico 80% 250 ml				2			2	2,0	0,0	2,0	2,0
Aireador de cerámica.						1	1	1,0	0,0	1,0	1,0
AIRLOCK para fermentador (Trampa de Aire)	6	1	12	9	11	2	41	6,8	4,6	11,5	16,1
AIRLOCK Duplex para fermentadores 60-150 l					2		2	2,0	0,0	2,0	2,0
Azúcar BREWING (Dextrosa) 1 Kg		1	11	13	21	17	63	12,6	7,5	20,1	27,7
Azucar Brewing (Dextrosa) 1 kg.	7	26					33	16,5	13,4	29,9	43,4
Azúcar clara (Candy Sugar) caramelizada 500g				2			2	2,0	0,0	2,0	2,0
Azúcar roja (Candy Sugar) caramelizada 500g				11	8	1	20	6,7	5,1	11,8	16,9
Azúcar roja (Candy Sugar) caramelizada 5kg					1		1	1,0	0,0	1,0	1,0
Balanza digital 3 Kg / 1g					1	1	2	1,0	0,0	1,0	1,0
Barril 5 Litros a presión						1	1	1,0	0,0	1,0	1,0
Barril 5 litros con grifo.				2			2	2,0	0,0	2,0	2,0
Barril ECOFASS negro 30l.					1		1	1,0	0,0	1,0	1,0
Botella de Cerveza 500 ml Moby Dick		10	140	54	20	40	264	52,8	51,7	104,5	156,1
BRAUMEISTER 20 Litros Kit Completo						3	3	3,0	0,0	3,0	3,0
Cabezal dispensador Tipo "A" DSI						3	3	3,0	0,0	3,0	3,0
Cabezal dispensador Tipo "S" MM						1	1	1,0	0,0	1,0	1,0
Cartuchos CO2 - 10 Unidades (16 gramos)						1	1	1,0	0,0	1,0	1,0
Cerveza: Calidad, Higiene y Características Nutricionales	1		1				2	1,0	0,0	1,0	1,0
Chapadora a martillo	1		1	1	1	1	5	1,0	0,0	1,0	1,0
Chapadora a Palanca 26mm	4	2	6	3	2		17	3,4	1,7	5,1	6,7
Chapadora Columna con boca de Ø26 y Ø29			4	7	10	2	23	5,8	3,5	9,3	12,8
Chapas CORONA, negro 29 mm (100uds.)			1				1	1,0	0,0	1,0	1,0
Chapas CORONA, verde 29 mm (100uds.)			3				3	3,0	0,0	3,0	3,0
Chapas NEGRO 29 mm Pack 100 Unid.					1	21	22	11,0	14,1	25,1	39,3
Chapas ROJO 29 mm Pack 100 Unid.				2	1	1	4	1,3	0,6	1,9	2,5
Chapas VERDE 29 mm Pack 100 Unid.				1	3		4	2,0	1,4	3,4	4,8
Chemipro® Acid 1L				1	2		3	1,5	0,7	2,2	2,9
Chemipro® Acid 250ml			1		2		3	1,5	0,7	2,2	2,9
Chemipro® Caustic 1,5kg					4		4	4,0	0,0	4,0	4,0
Chemipro® Caustic 400g			1	1	1		3	1,0	0,0	1,0	1,0
Chemipro® OXI 1 Kg	4	8	9	16	16	9	62	10,3	4,8	15,1	19,9
Chemipro® OXI 100g	7	3	4	4	10	12	40	6,7	3,7	10,3	14,0
Cilantro en semilla 100g				2	2	1	5	1,7	0,6	2,2	2,8
Cilantro en Semilla 1Kg				2	2		4	2,0	0,0	2,0	2,0
Cilindro test para densímetro de precisión	1						1	1,0	0,0	1,0	1,0
Cilindro Test para densímetro estándar		1	3	3	2	9	18	3,6	3,1	6,7	9,9
Cinturón calefactor 10º - 24º C					5		5	5,0	0,0	5,0	5,0
Cinturón Calefactor Mr. Malt®						4	4	4,0	0,0	4,0	4,0
Clarificante Biersol 100mL			3				3	3,0	0,0	3,0	3,0
Clarificante Klarvit	1						1	1,0	0,0	1,0	1,0
Cloruro de calcio 33% 100ml	1				2	3	6	2,0	1,0	3,0	4,0
Conector JOHN GUEST F5/8x 9.5mm					2		2	2,0	0,0	2,0	2,0
Conjunto desechable 30 litros tipo S.					2		2	2,0	0,0	2,0	2,0
Copos de MAIZ 1Kg				2	2		4	2,0	0,0	2,0	2,0
Copos de MAIZ 500g				2			2	2,0	0,0	2,0	2,0

Copos de MAIZ 5Kg				1			1	1,0	0,0	1,0	1,0
Curso de Elaboración de Cerveza Profesional 16 de Septiembre		3	4				7	3,5	0,7	4,2	4,9
Curso de Elaboración de Cerveza Profesional 25 de Noviembre						6	6	6,0	0,0	6,0	6,0
Densímetro con termometro						1	1	1,0	0,0	1,0	1,0
Densímetro estándar	2	1	9	2	8	9	31	5,2	3,9	9,0	12,9
Dispensador Beer King 2000 para barril de 5 Litros						1	1	1,0	0,0	1,0	1,0
Dosificador de azúcar 3 recip.	1	1	2	3	14		21	4,2	5,5	9,7	15,3
Elaboración Casera de Cerveza			1				1	1,0	0,0	1,0	1,0
Equipo completo para oxigenar el mosto						1	1	1,0	0,0	1,0	1,0
Escurrebotellas de plástico 81 puestos			2	5	12	5	24	6,0	4,2	10,2	14,5
Esterilizador para botellas manual.	3	6	4	5	17	2	37	6,2	5,5	11,7	17,2
Extracto de malta con dextrosa Muntons 1 Kg				1	3		4	2,0	1,4	3,4	4,8
Extracto de malta con dextrosa Muntons 1Kg	1	3					4	2,0	1,4	3,4	4,8
Extracto de malta líquido AMBER 1,5Kg		2		1	1	1	5	1,3	0,5	1,8	2,3
Extracto de malta líquido EXTRA LIGHT 1,5Kg			1	1	6		8	2,7	2,9	5,6	8,4
Extracto de malta líquido WHEAT (Trigo) 1,5 Kg				3		1	4	2,0	1,4	3,4	4,8
Extracto de Malta MUNTONS Dark 1,5 Kg		2					2	2,0	0,0	2,0	2,0
Extracto de malta seco Ambar 1kg			1	4	2		7	2,3	1,5	3,9	5,4
Extracto de malta seco Ambar 500g				1			1	1,0	0,0	1,0	1,0
Extracto de malta seco Black 500g						2	2	2,0	0,0	2,0	2,0
Extracto de malta seco Light 1kg			1	4	5		10	3,3	2,1	5,4	7,5
Extracto de malta seco Light 500g				1	4	4	9	3,0	1,7	4,7	6,5
Extracto de malta seco Trigo 1kg				1		1	2	1,0	0,0	1,0	1,0
Fermentador 30l de plástico			13	8	16	13	50	12,5	3,3	15,8	19,1
Fermentador 30l.	2	4					6	3,0	1,4	4,4	5,8
Fermentador 60 litros con airlock y grifo			2				2	2,0	0,0	2,0	2,0
Fermentador 60L Speidel			2				2	2,0	0,0	2,0	2,0
Fermentador Cilindro-Cónico simple 50 Litros			1				1	1,0	0,0	1,0	1,0
Fermentador de plástico 60 litros Cubitank con airlock y grifo					1		1	1,0	0,0	1,0	1,0
Fermentador plastico Mr Malt 50 L				2			2	2,0	0,0	2,0	2,0
Filtros de ebullición del lúpulo (10 unidades)		1					1	1,0	0,0	1,0	1,0
Filtros de ebullición para lúpulo (10 unidades)			6	11	5	14	36	9,0	4,2	13,2	17,5
Goma recambio tapón ceramica 100uds.					3	2	5	2,5	0,7	3,2	3,9
Goma ajuste airlock	7		4		28	3	42	10,5	11,8	22,3	34,1
Goma ajuste Airlock (diam.31/38)			1				1	1,0	0,0	1,0	1,0
Goma ajuste Airlock 17/22 mm.						1	1	1,0	0,0	1,0	1,0
Goma ajuste Airlock 21/27 mm.					1		1	1,0	0,0	1,0	1,0
Goma ajuste Airlock 26/32 mm.					1		1	1,0	0,0	1,0	1,0
Goma ajuste fermentador 28L	2				1		3	1,5	0,7	2,2	2,9
Grifo con tubo de trasvase	1						1	1,0	0,0	1,0	1,0
Grifo fermentador 50/100 L Mr Malt	3						3	3,0	0,0	3,0	3,0
Grifo para fermentador de 28/30 litros.	2		4	6	4	2	18	3,6	1,7	5,3	6,9
Guía para descubrir las mejores CERVEZAS ARTESANAS				1	5	1	7	2,3	2,3	4,6	7,0
Intercambiador a placas						1	1	1,0	0,0	1,0	1,0
Irish Moss 25g		1		1	4	1	7	1,8	1,5	3,3	4,8
Isinglass 100 ml.	1						1	1,0	0,0	1,0	1,0
Isinglass 100ml				1	1	1	3	1,0	0,0	1,0	1,0
Kit de Fermentación TOP	2	1	2	5	5		15	3,0	1,9	4,9	6,7
Lactol 100ml al 80%		1					1	1,0	0,0	1,0	1,0
Lavabotellas Blast					2		2	2,0	0,0	2,0	2,0
Lavabotellas rotativo Doble Efecto			2	5		3	10	3,3	1,5	4,9	6,4
Levadura Brewferm BLANCHE 12g				4	4	1	9	3,0	1,7	4,7	6,5
Levadura Brewferm LAGER 12g			7		8		15	7,5	0,7	8,2	8,9
Levadura Brewferm TOP 500g					1		1	1,0	0,0	1,0	1,0
Levadura Brewferm TOP 6g			1	4	8		13	4,3	3,5	7,8	11,4
Levadura DANSTAR BELLE SAISON 11 grs.		7					7	7,0	0,0	7,0	7,0
Levadura Danstar BELLE SAISON 11g			7	4	13	1	25	6,3	5,1	11,4	16,5

Levadura Danstar BELLE SAISON 500g			2			4	6	3,0	1,4	4,4	5,8
Levadura DANSTAR BRY-97 11 grs.	3	10					13	6,5	4,9	11,4	16,4
Levadura Danstar BRY-97 11g			6	15	12	14	47	11,8	4,0	15,8	19,8
Levadura Danstar BRY-97 500g			2	6	3	1	12	3,0	2,2	5,2	7,3
Levadura DANSTAR MUNICH 11 grs.	1	10					11	5,5	6,4	11,9	18,2
Levadura Danstar MUNICH 11g			1	9	11	4	25	6,3	4,6	10,8	15,4
Levadura Danstar MUNICH 500g			2				2	2,0	0,0	2,0	2,0
Levadura DANSTAR NOTTINGHAM 11 grs.	5	10					15	7,5	3,5	11,0	14,6
Levadura Danstar NOTTINGHAM 11g			6	12	4	3	25	6,3	4,0	10,3	14,3
Levadura Danstar NOTTINGHAM 500 g			2	1	1	4	8	2,0	1,4	3,4	4,8
Levadura DANSTAR WINDSOR 11 grs.	12	15					27	13,5	2,1	15,6	17,7
Levadura Danstar WINDSOR 11g			7	17	15		39	13,0	5,3	18,3	23,6
Levadura Danstar WINDSOR 500g			2	5		5	12	4,0	1,7	5,7	7,5
Levadura MAURIBREW ALE 514 500g			1			1	2	1,0	0,0	1,0	1,0
Levadura MAURIBREW LAGER 497 12,5g				2	8		10	5,0	4,2	9,2	13,5
Levadura SAFALE S-04 11,5g	2	25	26	39	44	29	165	27,5	14,6	42,1	56,7
Levadura SAFALE S-04 500g			1	1	4	3	9	2,3	1,5	3,8	5,3
Levadura SAFALE US-05 Paq.500g					1		1	1,0	0,0	1,0	1,0
Levadura SAFALE US-05 11,5 g	8	9					17	8,5	0,7	9,2	9,9
Levadura SAFALE US-05 11,5g		8	28	33	25	17	111	22,2	9,8	32,0	41,9
Levadura SAFALE WB-06 500g					1		1	1,0	0,0	1,0	1,0
Levadura SAFBREW F-2 20g				3	3	1	7	2,3	1,2	3,5	4,6
Levadura SAFBREW S-33 11,5g	4	27	37	48	30	21	167	27,8	14,9	42,7	57,6
Levadura SAFBREW T-58 11,5g	1	9	7	14	8	6	45	7,5	4,2	11,7	16,0
Levadura SAFBREW T-58 500g	1						1	1,0	0,0	1,0	1,0
Levadura SAFBREW WB-06 11,5g	1	4	11	9	8	11	44	7,3	4,0	11,4	15,4
Levadura SAFLAGER S-23 11,5g	1		5	7	3	8	24	4,8	2,9	7,7	10,5
Levadura SAFLAGER W-34/70 11,5g	2			2	10	1	15	3,8	4,2	7,9	12,1
Levadura seca BREWFERM LAGER 12g	1	1					2	1,0	0,0	1,0	1,0
Levadura seca BREWFERM TOP 6g	1						1	1,0	0,0	1,0	1,0
Libro Elaboración Casera de Cerveza				1		1	2	1,0	0,0	1,0	1,0
Limpia botellas doble efecto			1				1	1,0	0,0	1,0	1,0
Malta BEST MALZ Caramel Pils 25Kg					1		1	1,0	0,0	1,0	1,0
Malta BEST MALZ Heidelberger (2.8 EBC) 25Kg			3				3	3,0	0,0	3,0	3,0
Malta BEST MALZ Pale Ale 25Kg	3	1	2	5	4	2	17	2,8	1,5	4,3	5,8
Malta BEST MALZ Pilsen 25Kg	2		2		2		6	2,0	0,0	2,0	2,0
Malta BEST MALZ Red X 25Kg				1	1		2	1,0	0,0	1,0	1,0
Malta BEST MALZ Wheat (Trigo) 25Kg				2			2	2,0	0,0	2,0	2,0
Malta BLACK ROCK Bitter 1,7 Kg		1					1	1,0	0,0	1,0	1,0
Malta BLACK ROCK Bock 1,7 Kg	3	1					4	2,0	1,4	3,4	4,8
Malta Black Rock BOCK 1,7Kg				8			8	8,0	0,0	8,0	8,0
Malta Black Rock COLONIAL LAGER			1		1		2	1,0	0,0	1,0	1,0
Malta BLACK ROCK DRY LAGER 1,7Kg			2				2	2,0	0,0	2,0	2,0
Malta Black Rock EXPORT PILSNER 1,7Kg					2	1	3	1,5	0,7	2,2	2,9
Malta Black Rock INDIA PALE ALE 1,7Kg				3		1	4	2,0	1,4	3,4	4,8
Malta BLACK ROCK Lager 1,5Kg			3	1		1	5	1,7	1,2	2,8	4,0
Malta Black Rock MINER'S STOUT 1,7Kg				1		1	2	1,0	0,0	1,0	1,0
Malta Black Rock NEW ZELAND DRAUGHT				1	1		2	1,0	0,0	1,0	1,0
Malta Black Rock NUT BROWN 1,7 Kg					2		2	2,0	0,0	2,0	2,0
Malta BREWFERM Abdijbier 9L	4	9					13	6,5	3,5	10,0	13,6
Malta Brewferm AMBIORIX 1.5 Kg			2	4			6	3,0	1,4	4,4	5,8
Malta Brewferm BIERE BLANCHE (TARWEBIER) 1,5 Kg			4		1		5	2,5	2,1	4,6	6,7
Malta BREWFERM Bierre Blanche (Tarwebier) 15 L.		1					1	1,0	0,0	1,0	1,0
Malta Brewferm CHRISTMAS 1,5 Kg			3		2	4	9	3,0	1,0	4,0	5,0
Malta Brewferm FRAMBOISE 1,5 Kg						2	2	2,0	0,0	2,0	2,0
Malta BREWFERM Framboise 12 L	1	2					3	1,5	0,7	2,2	2,9
Malta BREWFERM Gallia 12 L	2						2	2,0	0,0	2,0	2,0

Malta Brewferm GOLD 1,5 Kg			2	4		3	9	3,0	1,0	4,0	5,0
Malta Brewferm GRAN CRU 1,5 Kg		1	1		2	1	5	1,3	0,5	1,8	2,3
Malta BREWFERM Gran Cru 9 L.		1					1	1,0	0,0	1,0	1,0
Malta Brewferm KRIEK 1,5 Kg				1	1		2	1,0	0,0	1,0	1,0
Malta BREWFERM Old Flemish Brown 12 L		4					4	4,0	0,0	4,0	4,0
Malta Brewferm OLD FLEMISH BROWN 1,5 Kg			1	2	2	2	7	1,8	0,5	2,3	2,8
Malta Brewferm PILS 1,5 Kg				1			1	1,0	0,0	1,0	1,0
Malta BREWFERM Pils 20 L	2	1					3	1,5	0,7	2,2	2,9
Malta BREWFERM Triple 9 litros	1						1	1,0	0,0	1,0	1,0
Malta Brewferm TRIPPEL 1,5 Kg			1				1	1,0	0,0	1,0	1,0
Malta BREWMAKER BB Yorkshire 3 kg					1		1	1,0	0,0	1,0	1,0
Malta Brewmaker BofB INDIAN PALE ALE 3 Kg				1			1	1,0	0,0	1,0	1,0
Malta Brewmaker Premium IRISH VELVET STOUT 1,8kg				2		6	8	4,0	2,8	6,8	9,7
Malta Brewmaker Premium LAGER 1,8kg					3		3	3,0	0,0	3,0	3,0
Malta Brewmaker Premium PILSNER LAGER 1,8kg					1		1	1,0	0,0	1,0	1,0
Malta Brewmaker Premium SCOTTISH HEAVY 1,8kg						1	1	1,0	0,0	1,0	1,0
Malta Brewmaker Premium YORKSHIRE 1,8kg					1	1	2	1,0	0,0	1,0	1,0
Malta BREWMAKER STRONG EXPORT ALE BITTER 1,8 Kg			1	3	1	1	6	1,5	1,0	2,5	3,5
Malta COOPER Australian Pale Ale 1,7 Kg	1	1					2	1,0	0,0	1,0	1,0
Malta COOPER Heritage Lager 1,7 Kg		1					1	1,0	0,0	1,0	1,0
Malta COOPERS Australian Pale Ale 1,7Kg			2	12	1		15	5,0	6,1	11,1	17,2
Malta COOPERS DARK ALE 1,7Kg		1					1	1,0	0,0	1,0	1,0
Malta COOPERS ENGLISH BITTER 1,7Kg					1	1	2	1,0	0,0	1,0	1,0
Malta COOPERS EUROPEAN LAGER 1,7Kg						1	1	1,0	0,0	1,0	1,0
Malta COOPERS HERITAGE LAGER 1,7Kg			2	1	1	1	5	1,3	0,5	1,8	2,3
Malta COOPERS INDIA PALE ALE 1,7Kg						1	1	1,0	0,0	1,0	1,0
Malta COOPERS LAGER 1.7Kg				1			1	1,0	0,0	1,0	1,0
Malta COOPERS MEXICAN 1,7Kg				2	1		3	1,5	0,7	2,2	2,9
Malta COOPERS PILSNER 1,7Kg			1				1	1,0	0,0	1,0	1,0
Malta COOPERS REAL ALE 1,7Kg				2			2	2,0	0,0	2,0	2,0
Malta COOPERS SPARKLING ALE 1,7Kg		1				1	2	1,0	0,0	1,0	1,0
Malta COOPERS STOUT 1,7Kg				1			1	1,0	0,0	1,0	1,0
Malta COOPERS WHEAT BEER 1,7Kg			2	4	1	3	10	2,5	1,3	3,8	5,1
Malta CRISP MALTING Extra Pale Maris Otter 25 Kg	1		1	6	2	2	12	2,4	2,1	4,5	6,5
Malta CRISP MALTING Finest Maris Otter 25 Kg			1	2		1	4	1,3	0,6	1,9	2,5
Malta Mr Malt Calidad BASE Pilsner		5					5	5,0	0,0	5,0	5,0
Malta Mr Malt Calidad ESPECIAL London Porter		1					1	1,0	0,0	1,0	1,0
Malta Mr. Malt® BASE YORKSHIRE BITTER 1,5Kg					2		2	2,0	0,0	2,0	2,0
Malta Mr. Malt® calidad BASE BITTER 1,5Kg			1	2	2		5	1,7	0,6	2,2	2,8
Malta Mr. Malt® calidad PREMIUM LAGER 1,8Kg			3	2	1		6	2,0	1,0	3,0	4,0
Malta Mr. Malt® calidad base MILD 1,5 Kg					3		3	3,0	0,0	3,0	3,0
Malta Mr. Malt® calidad base PILSNER L 1,5 Kg					2		2	2,0	0,0	2,0	2,0
Malta Mr. Malt® calidad Premium WEIZEN 1,8 Kg					2	1	3	1,5	0,7	2,2	2,9
Malta Mr. Malt® Premium Indian Pale Ale 1,8 Kg						2	2	2,0	0,0	2,0	2,0
Malta Mr. Malt® Premium MUNICH DUNKEL 1,8 Kg					2		2	2,0	0,0	2,0	2,0
Malta Mr. Malt® Premium TRADITIONAL BROWN ALE 1,8 Kg						1	1	1,0	0,0	1,0	1,0
Malta Mr. Malt® Special BARLEY WINE 1,8 Kg					4		4	4,0	0,0	4,0	4,0
Malta Mr. Malt® Special BOHEMIAN PILS 1,8 Kg					3		3	3,0	0,0	3,0	3,0
Malta Mr. Malt® Special IRISH STOUT 1,8 Kg					4		4	4,0	0,0	4,0	4,0
Malta Mr. Malt® Special STRONG ALE 1,8 Kg					4		4	4,0	0,0	4,0	4,0
Malta Mr.Malt® calidad BASE LAGER 1,5Kg	1	4	5		2		12	3,0	1,8	4,8	6,7
Malta MUNTONS CONNOISSEURS Bock 1.8kg		1					1	1,0	0,0	1,0	1,0
Malta MUNTONS CONNOISSEURS Bock Beer 1,8kg						1	1	1,0	0,0	1,0	1,0
Malta MUNTONS CONNOISSEURS CONTINENTAL LAGER 1,8kg			1				1	1,0	0,0	1,0	1,0
Malta MUNTONS CONNOISSEURS EXPORT PILSNER 1,8Kg				1	1		2	1,0	0,0	1,0	1,0
Malta MUNTONS CONNOISSEURS EXPORT STOUT 1,8Kg					2		2	2,0	0,0	2,0	2,0
Malta Muntons Connoisseurs IPA 1,8Kg						1	1	1,0	0,0	1,0	1,0

Malta MUNTONS CONNOISSEURS Pilsner 1.8kg	1						1	1,0	0,0	1,0	1,0
Malta MUNTONS CONNOISSEURS TRAD. BITTER 1,8Kg				4	1		5	2,5	2,1	4,6	6,7
Malta Muntons Connoisseurs WHEAT (TRIGO) 1,8kg					2	1	3	1,5	0,7	2,2	2,9
Malta Muntons Connoisseurs YORKSHIRE BITTER 1,8Kg						6	6	6,0	0,0	6,0	6,0
Malta Muntons Gold DOCKLANDS PORTER 3kg					1		1	1,0	0,0	1,0	1,0
Malta Muntons Gold INDIA PALE ALE 3Kg					1	1	2	1,0	0,0	1,0	1,0
Malta Muntons Gold OLD ENGLISH BITTER 3Kg					1	1	2	1,0	0,0	1,0	1,0
Maltas MOUTERIJ DINGEMANS Aromatic Amber 5 Kg				2			2	2,0	0,0	2,0	2,0
Mauribrew LAGER 497 12,5g	6						6	6,0	0,0	6,0	6,0
Molino de malta a rodillos 1kg/min					1		1	1,0	0,0	1,0	1,0
Molino de malta a rodillos MARGA				1	3	2	6	2,0	1,0	3,0	4,0
Molino de malta MARGA		1					1	1,0	0,0	1,0	1,0
Molino de malta METÁLICO			1	2	1	1	5	1,3	0,5	1,8	2,3
Molino Maltmill				1			1	1,0	0,0	1,0	1,0
MUNTONS GOLD imperial stout 3kg		1					1	1,0	0,0	1,0	1,0
Nutrientes para la levadura 42g				3	2		5	2,5	0,7	3,2	3,9
Olla de Elaboración Eléctrica 27 Litros (1800w)					2	1	3	1,5	0,7	2,2	2,9
Olla esmaltada 29 L		3					3	3,0	0,0	3,0	3,0
Pack 20 Botellas de Cerveza 330 ml.	1		10				11	5,5	6,4	11,9	18,2
Pack 20 botellas de Cerveza 500 ml adaptada para tapón mecánico		2	2	5	9	6	24	4,8	2,9	7,7	10,7
Pack 20 botellas de Cerveza 750 ml adaptada para tapón mecánico			1	3	2	6	12	3,0	2,2	5,2	7,3
Pala para remover el mosto 48 cm.	1		6	1	7	5	20	4,0	2,8	6,8	9,7
Piel de naranja amarga 100g		1	2		1	3	7	1,8	1,0	2,7	3,7
Piel de Naranja Amarga 1kg					1		1	1,0	0,0	1,0	1,0
Piel de naranja dulce 100 gr	1						1	1,0	0,0	1,0	1,0
Piel de Naranja Dulce 100g				1	8		9	4,5	4,9	9,4	14,4
Piel de Naranja Dulce 1kg						1	1	1,0	0,0	1,0	1,0
Potenciador de espuma 100g	1						1	1,0	0,0	1,0	1,0
Potenciador de espuma 100gr			4	2	4	5	15	3,8	1,3	5,0	6,3
Potenciador de espuma 1kg				1			1	1,0	0,0	1,0	1,0
Probeta de vidrio graduada 250 ml			1		1		2	1,0	0,0	1,0	1,0
Regaliz 100g			1			2	3	1,5	0,7	2,2	2,9
Saco filtrante para malta 30x30x35cm				5	7	5	17	5,7	1,2	6,8	8,0
Serpentin enfriador Inox para 25 litros		1		1		3	5	1,7	1,2	2,8	4,0
Serpentin enfriador Inox para 50 litros		1		1			2	1,0	0,0	1,0	1,0
Serpentín refrigerador con manguera y conector			1				1	1,0	0,0	1,0	1,0
Sifón automático con tubo de 1,5 metros (9/13mm)			3	7	5	1	16	4,0	2,6	6,6	9,2
Sifón com bomba de mano			1	4	8	5	18	4,5	2,9	7,4	10,3
Sifón telescopico con grifo pequeño			1				1	1,0	0,0	1,0	1,0
Sulfato de magnesio 100g	1	1					2	1,0	0,0	1,0	1,0
Sulfato de magnesio 100gr				1	1	1	3	1,0	0,0	1,0	1,0
Tapón Antisedimento	3	8	2	6	8	3	30	5,0	2,7	7,7	10,4
Tapón de plástico cierre clip para botellas		40					40	40,0	0,0	40,0	40,0
Tapón mecánico para botellas			85	145	230	191	651	162,8	62,4	225,1	287,5
Termómetro adhesivo 0-32ºC	1	1	2	2	4	6	16	2,7	2,0	4,6	6,6
Termómetro adhesivo 12-32ºC	1	1	10	6	15	11	44	7,3	5,7	13,0	18,7
Termómetro con jaula protectora 0/100ºC			1		3	1	5	1,7	1,2	2,8	4,0
Tiras para medir pH 3,8-5,5					1	1	2	1,0	0,0	1,0	1,0
Tiras para medir PH 5,2-6,8 (20 unid)						1	1	1,0	0,0	1,0	1,0
Virutas de roble americano con tostado fuerte 250g					2		2	2,0	0,0	2,0	2,0
Virutas de roble francés Heavy Toast (tostado fuerte) 250g					1	1	2	1,0	0,0	1,0	1,0
Virutas de roble francés Medium Toast (tostado medio) 250g				2	4	2	8	2,7	1,2	3,8	5,0
Virutas de roble Sherry Oloroso 250g				1		2	3	1,5	0,7	2,2	2,9
Virutas de roble Whisky 250g					1	2	3	1,5	0,7	2,2	2,9
Total general	**142**	**311**	**605**	**734**	**928**	**668**	**3388**	564,7	288,4	853,1	1141,5
								#¡DIV/0!	0,0	#¡DIV/0!	#¡DIV/0!
								#¡DIV/0!	0,0	#¡DIV/0!	#¡DIV/0!

	t bolsa chapas	t bolsa malta	t molturar	t bolsa lupulo	# pedidos online	t pedidos online	# pedidos mayoristas	t pedidos mayoristas	t clientes micros	t dudas online
	0:01:53	0:03:04	2:06:00	0:05:36	9,00	0:05:27	2,00	1:40:00	0:13:56	0:02
	0:01:27	0:03:58	2:20:00	0:04:45	9,00	0:32:36	2,00	0:05:00	0:07:59	0:02
	0:01:32	0:01:37	2:14:00	0:02:50	10,00	0:21:01	2,00	0:24:00	0:02:53	0:00
	0:01:25	0:01:45	2:40:00	0:04:32	6,00	0:15:47	2,00	0:18:00	0:08:17	0:08
		0:01:40		0:03:20	6,00	0:25:32	8,00	0:38:00	0:24:38	0:03
		0:01:10				0:21:55	3,00	0:43:00	1:05:24	
		0:07:53				0:19:53	5,00	0:50:00		
		0:02:01				0:27:09	4,00	0:36:00		
						0:23:11	6,00	0:32:00		
						0:12:26	4,00	0:58:00		
						0:02:35		0:42:00		
								0:55:00		
promitg	0:01:34	0:02:54	2:20:00	0:04:13	8,00	0:18:52	3,80	0:41:45	0:20:31	
desvest	0:00:13	0:02:13	0:14:31	0:01:07	1,87	0:09:07	2,04	0:23:53	0:23:12	
						8,00		3,80	0,03	
50% dies	0:00:00	0:00:00	0:00:00	0:00:00		2:30:56		2:38:39	0:00:36	
86% dies	0:00:00	0:00:00	0:00:00	0:00:00		3:43:52		4:09:24	0:01:16	

	Arribades comandes proveidor	Comandes amb problemes homebrewers	Comandes micros amb problemes
mon	1	2	0
tue	0	4	0
wed	3	3	1
thur	0	0	2
fri	0	1	0
mon	2	1	0
tue	1	2	0
wed	0	4	1
thur	0	6	1
fri	1	3	1
Total	8	26	6
Mitja diaria	0,8	2,6	0,6
Mitja semanal	4	13	3

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ANNEX
SELLS MICROBREWERIES

lot comanda	temps comanda	lot comanda	temps comanda		TOTAL	marzo	abril	mayo	junio	julio	agosto	septiembre	octubre	Noviembre	promitg mes	84% mes		min stock	max stock	dies stock mitg
				MALTAS																
				BEST MALZ																
		250	22		Acidulated	5	75	50	0	25	25	0	0	0	20	47	135%	47	297	189
		750	22		Aromatic	175	300	125	275	150	0	150	250	400	203	320	58%	320	1070	75
		250	22		Black	0	0	0	0	0	0	0	0	50	6	22	300%	22	272	583
		750	22		Caramel Dark	275	450	200	50	225	0	275	250	50	197	339	72%	339	1089	80
		750	22		Caramel Light	200	750	275	925	350	100	475	100	25	356	665	87%	665	1415	64
		750	22		Caramel Pils	0	1725	50	0	400	25	150	225	200	308	856	178%	856	1606	88
		750	22		Heidelberg	25	75	0	0	0	0	0	350	25	53	167	216%	167	917	226
		750	22		Melanoidin	25	150	25	350	25	0	500	275	225	175	351	101%	351	1101	91
		750	22		Munich	30	3600	350	450	200	225	0	1325	275	717	1867	160%	1867	2617	69
		750	22		Pale Ale	2275	8850	1375	4125	6200	0	3650	4175	2800	3717	6341	71%	6341	10058	49
		750	22		Pilsen	2000	9075	3875	10700	5400	500	1950	2250	2300	4228	7738	83%	7738	11966	51
		750	22		Red X				50	50	0	50	50	0	33	59	77%	59	809	287
		250	22		Smoked	25	100	50	75	25	0	0	0	0	31	68	121%	68	318	139
		750	22		Vienna	25	975	800	2250	900	25	100	75	200	594	1331	124%	1331	2081	63
		750	22		Wheat	275	600	275	1100	2500	75	400	525	225	664	1414	113%	1414	2164	59
		250	22		Wheat Dark		75	0	0	0	0	0	50	0	16	45	190%	45	295	240
															11317					
				CRISP MALT																
		1000	10		Maris Otter Finnest						750	150	1050	975	731	1139	56%	518	1518	31
		1000	10		Maris Otter Extra Pale					300	900	0	700	1700	720	1370	90%	623	1623	34
		325	10		Roasted Barley	15	0	0	0	200	0	0	25	25	29	94	220%	43	368	153
		325	10		Chocolate		1000	50	25	25	25	25	100	50	163	502	209%	228	553	53
		325	10		Crystal		1075	0	0	0	25	0	225	100	178	549	208%	250	575	51
				DINGERMAN																
		250	10		Special B	105	0	50	50	150	0	0	100	0	51	107	112%	49	299	76
		250	10		Aromatic	175	300	125	275	150	0	150	250	400	203	320	58%	145	395	29
		250	10		Biscuit		75	50	25	100	0	175	150	25	75	138	84%	63	313	55
		250	10		Cara-Red				50	0	0	0	0	0	8	29	245%	13	263	364
		250	10		Cara-Amber				50	0	0	0	0	0	8	29	245%	13	263	364
				AÑADIDOS																
		5	5		Azúcar Rojo	5	0	0	0	0	0	0	0	0	1	2	300%	1	6	119
		5	5		Azúcar Clara	5	0	5	5	10	0	5	5	50	9	25	164%	6	11	19
		5	5		Irish Moss	7,3	10	6	4	5	1	1	6	7	5	8	56%	2	7	18
		5	5		Naranja Amarga		4	0	1	0	0	0	1	0	1	2	185%	0	5	88
		5	5		Naranja Dulce		0	0	5	4	0	3	6	0	2	5	113%	1	6	35
		5	5		Dextrosa		10	0	34	10	15	20	0	10	12	23	89%	5	10	14
		5	5		Cilantro					1	3	1	1	0	1	2	91%	1	6	55
				COPOS																
		35	5		Avena					225	0	25	75	45	74	163	120%	37	72	16

35	5	Centeno					25	35	70	40	45	43	60	39%	14	49	16
35	5	Trigo							0	105	35	47	100	115%	23	58	19
		LUPULOS															
5	7	Ahtanum	0,25	10	5	5	12	5	0	0	0	4	9	110%	3	8	28
5	7	Amarillo	0,25	0	0	0	0	0	12	5	9	3	8	160%	2	7	37
5	7	Bramlin Cross		0	0	0	0	0	0	0	15	2	7	283%	2	7	56
5	7	Brewers Gold	10	0	0	21	0	0	10	5	0	5	12	144%	4	9	28
5	7	Calypso		0	0	0	0	0	0	0	0	0	0				
5	7	Cascade	3,5	16	30	21	43	8	6	28	37	21	36	66%	11	18	15
5	7	Centenial			0	0	1	0	0	0	0	0	1	265%	0	5	411
5	7	Challenger		0	0	0	0	0	0	5	1	1	3	234%	1	6	97
5	7	Chinook	1	0	8	5	2	0	5	5	6	4	6	81%	2	7	28
5	7	Citra	15,3	11	2	10	5	0	10	6	6	7	12	66%	4	9	19
5	7	Cluster		0	0	0	0	0	0	0	0	0	0				
5	7	Columbus	5	5	1	2	10	5	10	6	10	6	9	57%	3	8	20
5	7	EK Golding	5	33	11	20	15	2	0	26	10	14	25	82%	8	13	17
5	7	Estrissespalt	0	0		0	0	0	0	0	0	0	0				
5	7	First Gold		0	0	0	0	0	0	0	0	0	0				
5	7	Fuggle	7	30	5	12	0	0	3	15,5	3	8	18	115%	6	11	22
5	7	Hall. Herkules		0	0	5	1	10	0	1	0	2	6	170%	2	7	45
5	7	Hall. Hersbrucker	3,5	8	6	19	40	2	0	29,5	5	13	26	111%	8	13	19
5	7	Hall.Tradition	0	21	0	0	5	0	1	1	0	3	10	222%	3	8	40
5	7	Magnum	0	0	1	0	0	0	0	5	0	1	2	249%	1	6	107
5	7	Mittelfru	0	30	5	0	11	0	1	0	0	5	15	192%	5	10	31
5	7	Mosaic		0	0	0	0	5	0	5	0	1	4	185%	1	6	64
5	7	Northern Brewer	1	1	0	0	15	0	0	15	5	4	10	155%	3	8	31
5	7	Pacific	0	0	0	0	0	0	0	0	0	0	0				
5	7	Palisade	0	0	0	1	0	0	0	0	0	0	0	300%	0	5	523
5	7	Perle	0	0	0	0	5	0	0	5	10	2	6	163%	2	7	43
5	7	Pilgrim		0	0	0	0	0	0	0	0	0	0				
5	7	Premiant		0	0	0	0	0	0	0	0	0	0				
5	7	Saaz	5	17	1	6	14	26	15	16	16	13	21	59%	7	12	15
5	7	Saphir	5	1	16	15	5	15	0	11	15	9	16	70%	5	10	18
5	7	Simcoe	9	7	12	12	25	10	0	6	10	10	17	66%	5	10	17
5	7	Sorachi Ace		0	0	5	0	0	0	0	4	1	3	187%	1	6	69
5	7	Spalter Select	3	0	0	0	0	0	0	0	0	0	1	300%	0	5	193
5	7	Styrian Golding	1	0	0	0	0	0	0	5	10	2	5	196%	2	7	52
5	7	Summit	1	0	2	7	10	0	5	0	10	4	8	109%	3	8	29
5	7	Super Styrian Aurora		20	0	0	0	0	0	0	0	3	10	283%	3	8	49
5	7	Target		0	0	0	0	0	0	0	0	0	0				
5	7	Tett. Tettnanger	2	0	0	0	0	0	0	0	15	2	7	263%	2	7	55
5	7	Warrior		0	0	0	0	5	0	0	15	3	8	214%	2	7	44
5	7	Willamette	20	10	5	10	5	13	10	20	0	10	17	65%	5	10	17
		LEVADURAS															
1	3	S-04	7	0	4	5	8	2	0	4	16	5	10	97%	1	2	8
1	3	T-58	0	0	0	0	0	0	0	3	0	0	1	300%	0	1	45

1	3	WB-06	0	2	1	6	8	4	11	6	3	5	8	78%	1	2		8
1	3	K-97	0	6	9	1	3	0	0	0	0	2	5	156%	1	2		13
1	3	S-189	0	0	0	0	0	0	0	0	1	0	0	300%	0	1		111
1	3	S-23	0	0	0	0	0	0	0	0	1	0	0	300%	0	1		111
1	3	W34/70	0	0	0	2	7	0	0	5	0	2	4	170%	1	2		15
1	3	US-05	3	49	12	8	12	4	20	19	5	15	29	97%	4	6		7
1	3	S-33	0	3	0	5	1	0	0	2	1	1	3	130%	0	1		15
1	7	Mauribrew Ale			2	0	0	0	0	0	0	0	1	265%	0	1		64
1	8	Belle Saison			4	2	12	0	7	2	1	4	8	105%	3	4		20
1	8	BRY-97			2	8	8	9	6	7	18	8	13	59%	5	8		17
1	8	Munich	30	3600	350	450	200	225	0	1325	275	717	1867	160%	679	940		25
1	8	Notthingam					6	0	7	1	10	5	9	88%	3	5		19
1	8	WINDSOR				0	5	0	3	8	1	3	6	113%	2	3		21
1	7	Blanche								5	0	3	6	141%	2	3		21

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ANNEX
TRANSPORT

RATIO ABRIL CERVEZA ARTESANA

Cuenta de Tipo servicio				
Tipo servicio	TRANSITO	Desc. últ. incidencia	ESTADO	Total
14	14h	en hora	EN HORA	1
		Total en hora		1
	Total 14h			**1**
Total 14				**1**
24	24h	en hora	EN HORA	73
		Total en hora		73
	Total 24h			**73**
	mas 24h	Ausente CON NOTA	NO ATRIBUIBLE	10
		Total Ausente CON NOTA		10
		Ausente SIN NOTA (Indicar Motivo)	ATRIBUIBLE	3
		Total Ausente SIN NOTA (Indicar Motivo)		3
		Envío mal canalizado	NO ATRIBUIBLE	1
		Total Envío mal canalizado		1
		Pendiente recoger destinatario en delegación	NO ATRIBUIBLE	2
		Total Pendiente recoger destinatario en delegación		2
	Total mas 24h			**16**
Total 24				**89**
Total general				**90**

TOTALES

Envios realizados		**90**		
Entregados en Hora + no atribuibles			**87**	**96,67%**
Incidencias atribuibles		**3**		**3,33%**

RATIO MAYO CERVEZA ARTESANA

Cuenta de Tipo servicio				
Tipo servicio	TRANSITO	Desc. últ. incidencia	ESTADO	Total
24	24h	en hora	EN HORA	83
		Total en hora		83
	Total 24h			**83**
	mas 24h	Ausente CON NOTA	NO ATRIBUIBLE	8
		Total Ausente CON NOTA		8
		Ausente SIN NOTA (Indicar Motivo)	ATRIBUIBLE	1
		Total Ausente SIN NOTA (Indicar Motivo)		1
		Dirección incorrecta	NO ATRIBUIBLE	1
		Total Dirección incorrecta		1
		Pendiente recoger destinatario en delegación	NO ATRIBUIBLE	1
		Total Pendiente recoger destinatario en delegación		1
		Reparto al día siguiente (INDICAR MOTIVO)	ATRIBUIBLE	2
		Total Reparto al día siguiente (INDICAR MOTIVO)		2
	Total mas 24h			**13**
Total 24				**96**
Total general				**96**

TOTALES

Envios realizados		**96**		
Entregados en Hora + no atribuibles			**93**	**96,88%**
Incidencias atribuibles		**3**		**3,13%**

RATIO JUNIO CERVEZA ARTESANA

Cuenta de Tipo servicio				
Tipo servicio	TRANSITO	Desc. últ. incidencia	ESTADO	Total
24	24h	en hora	EN HORA	63
		Total en hora		63
	Total 24h			**63**
	mas 24h	Ausente CON NOTA	NO ATRIBUIBLE	14
		Total Ausente CON NOTA		14
		Ausente SIN NOTA (Indicar Motivo)	ATRIBUIBLE	2
		Total Ausente SIN NOTA (Indicar Motivo)		2
		Dirección incorrecta	NO ATRIBUIBLE	1
		Total Dirección incorrecta		1
		Envío mal canalizado	NO ATRIBUIBLE	1
		Total Envío mal canalizado		1
		Pendiente de llegada	ATRIBUIBLE	1
		Total Pendiente de llegada		1
	Total mas 24h			**19**
Total 24				**82**
Total general				**82**

TOTALES

Envios realizados		**82**		
Entregados en Hora + no atribuibles			**79**	**96,34%**
Incidencias atribuibles		**3**		**3,66%**

RATIO JULIO CERVEZA ARTESANA

Cuenta de Tipo servicio				
Tipo servicio	TRANSITO	Desc. últ. incidencia	ESTADO	Total
24	24h	en hora	EN HORA	81
		Total en hora		81
		Recibido en mal estado/roto	EN HORA	1
		Total Recibido en mal estado/roto		1
	Total 24h			**82**
	mas 24h	Ausente CON NOTA	NO ATRIBUIBLE	4
		Total Ausente CON NOTA		4
		Ausente SIN NOTA (Indicar Motivo)	ATRIBUIBLE	1
		Total Ausente SIN NOTA (Indicar Motivo)		1
		Dirección incorrecta	NO ATRIBUIBLE	1
		Total Dirección incorrecta		1
		Envío mal canalizado	NO ATRIBUIBLE	2
		Total Envío mal canalizado		2
		Pendiente recoger destinatario en delegación	NO ATRIBUIBLE	1
		Total Pendiente recoger destinatario en delegación		1
		Reparto al día siguiente (INDICAR MOTIVO)	ATRIBUIBLE	2
		Total Reparto al día siguiente (INDICAR MOTIVO)		2
	Total mas 24h			**11**
Total 24				**93**
Total general				**93**

TOTALES

Envios realizados		**93**	
Entregados en Hora + no atribuibles		**90**	**96,77%**
Incidencias atribuibles		**3**	**3,23%**

Escola d'Enginyeria de Telecomunicació i Aeroespacial de Castelldefels
UNIVERSITAT POLITÈCNICA DE CATALUNYA

ANNEX
A3

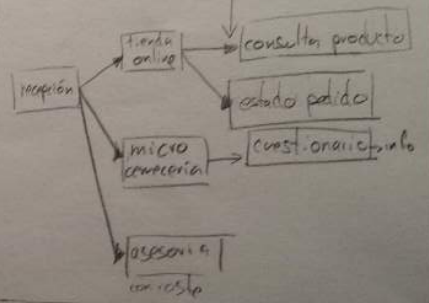
AB002 Gestión del tiempo y las tareas

Luis Castells
30-oct-2012

(1) OBJETIVOS Y ENTORNO
* Se pretende organizar el tiempo dedicado a cada tarea.
* Hay muchas tareas innecesarias que se realizan

(2) SITUACIÓN INICIAL
* Poco personal para atender tantas llamadas
* Muchas fuentes diferentes de llamadas, no se clasifican
* Llamadas a todas horas que interrumpen tareas.
* Llamadas muy largas sin beneficio.
* Sin orden ni preferencias en las tareas → todo se hace a la vez
* Contesta la llamada cada vez alguien diferente

(3) SITUACIÓN PROPUESTA
* Un horario de atención restringido
* Sistema DIVA para recogida y organización de llamadas por voz
* centralita que permita seleccionar llamadas.
* hoja de respuestas estandarizada
* fichas con detalles y caract. productos
* horario de tareas
* Identificar tareas innecesarias y eliminarlas



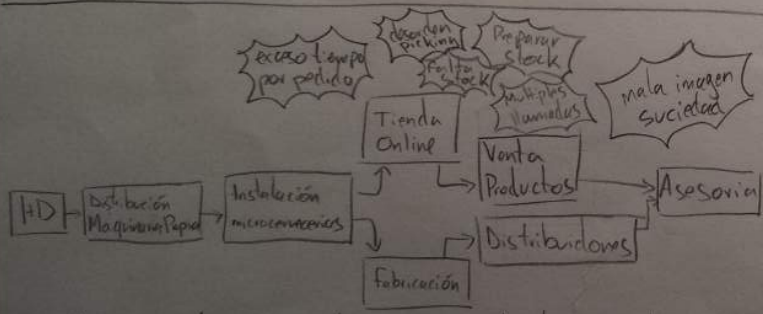
(4) ACCIONES
* Contratación centralita

A3. Crear una organización para cerveza Artesana SL

Iván Carballo 25 octubre

① Objetivos y Entorno

* Se inició en 2010 con una facturación de 150.000€ anuales y actualmente llega a 1.200.000€
  ↳ esto provoca una expansión organizativa y un cambio de modelo
* Es necesario definir el nuevo modelo de organización y estructura.
* Este nuevo modelo tiene que poder observer el crecimiento en número de líneas
* Identificar costes e ingresos por línea
* Identificar procesos externalizables
* 1 sede + 5 distribuidores → n sedes + m distribuidores
  (5 personas) (? personas)
* Venta solo a España actualmente, se requiere internacionalizar
* Puestos de trabajo y tareas no definidos



La oficina no está organizada, no se encuentra lo que se busca

② SITUACIÓN PROPUESTA

* Trabajo sin stock (stock mínimo) control de punto de pedido
* Tienda online autogestionada.
* Evitar interrupciones por llamadas
* Horario y tareas definidos por trabajador
* Buen seguimiento de clientes micro

④ ACCIONES

* Externalizar picking
* centralita con desvío llamadas y horario de atención
* Cálculo punto de pedido
* Aplicación 5s en la oficina

⑤ Indicadores

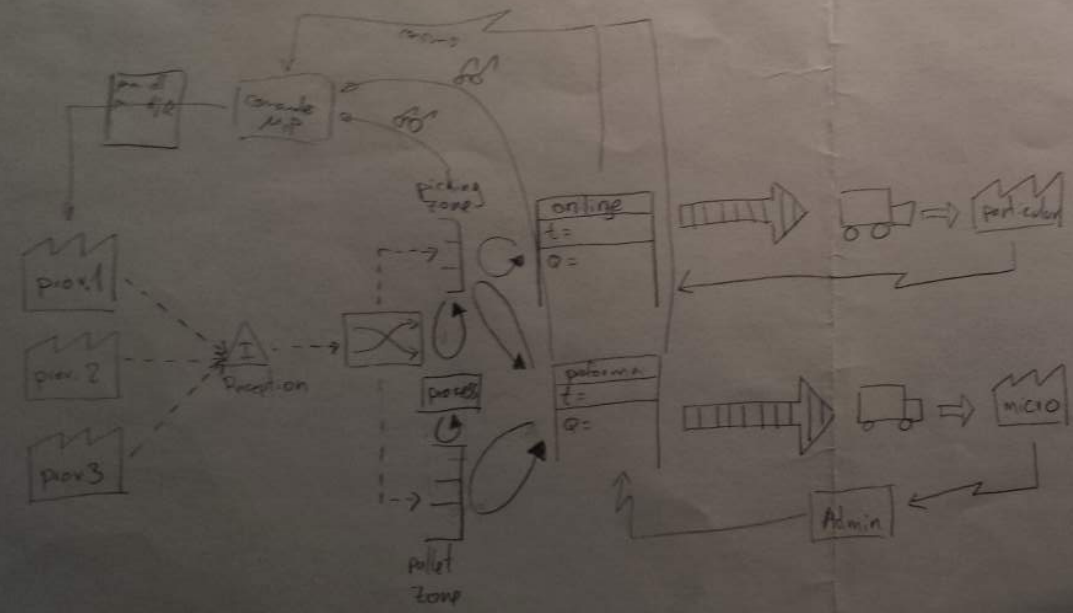
Indicadores	Inicial	Previsto	Real
- pedidos mensuales	100		
- productividad persona			
- LT servir producto			
- LT instalación micro			

Mapeo del Flujo de Valor ☒ Estado Actual ☐ Estado Futuro ☐ Estado Ideal

Proceso _____

Fecha _____

Nombre _____



Íconos de Mapeo

Íconos de Flujo de Material

Íconos de Flujo de Información

Íconos Generales

Lean Enterprise Institute
www.lean.org

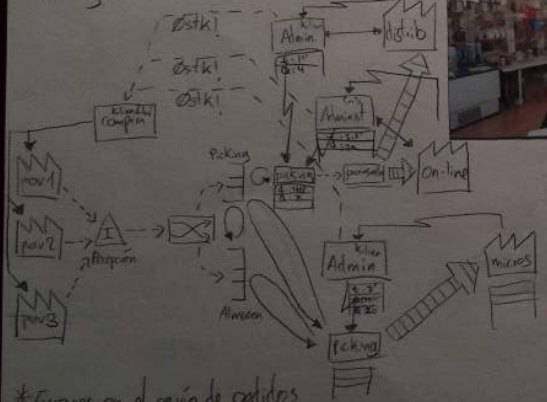
A3 001. Gestión de Productos hasta la venta

① OBJETIVOS ENTORNO

* Debido al gran crecimiento del volumen de ventas se ha multiplicado x5 en dos años el espacio y metodología se ha quedado limitando
* Se quiere trabajar con el mínimo stock, nunca quedarse sin, a pesar de los elevados tiempos de distribuidores (7-15 días)
* Posibilidad de expandirse con nuevos productos y nuevos distribuidores

② SITUACIÓN INICIAL

* Siempre hay problemas de stock
* Tiempo preparación pedido
* Creación de bundles
* Picking en oficina, desorden, sin espacio



* Errores en el envío de pedidos
* Retraso en la entrega de pedidos

③ SIT PROPUESTA

+ Productos ordenados por SKU para localización rapida
* Traspasar picking a un local específico fuera de la oficina

④ ACCIONES

* Organización con tarjetas Kanban

⑤ INDICADORES

	Actual	Propuesto	Real
Pedidos mensuales servidos			
Pedidos con retraso			
Pedidos erroneos			
Pedidos x persona			