

Implementation of Lean Methodologies in a Varnish Production Unit

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Abstract

In a globalised and competitive world, it is not enough for a company to present distinctive and customer-focused products. It is also necessary that its production process is efficient, guaranteeing delivery times in line with market needs and generating value for the company. To refer to Lean Thinking in an industry in constant change, and specifically in the company object of this project, with a wide range of products, generating great variability, is to build the foundations of a flexible and competitive process, through a culture of innovation that brings together all those involved. It is in this context that the project to implement Lean methodologies is developed, as a tool to consolidate continuous improvement.

The project consisted in the evaluation and mapping of the initial situation existing in the varnish unit of CIN - Corporação Industrial do Norte, S.A., in order to identify sources of waste, in the presentation of solutions aimed at eliminating or minimising this waste and in the implementation and evaluation of the effectiveness of the solutions presented. The work was based on the Lean Thinking paradigm, using, for such, the 5S, Visual Management, Work Standardisation, SMED methodologies and the evaluation of the efficiency of machines – OEE.

The implementation of the proposed improvements, despite the natural time constraints of the project, revealed measurable and promising results, allowing us to affirm its success. This is the case of the gains obtained by reducing operational changeover times, or by increasing the OEE of the line, by 41% compared to the average of the previous months, which clearly prove the effectiveness of the implemented measures. Regarding the reduction of operational changeover times, it was possible, in one of the cases covered in this project, to achieve a 50% reduction compared to the initial situation.

No less important was the involvement of all employees involved in the processes, which guarantees an improvement that is intended to be sustained. A continued commitment to this work will boost the results until now achieved.

Implementação de Metodologias *Lean* numa Unidade de Produção de Vernizes

Resumo

Num mundo globalizado e concorrencial, não basta que uma empresa apresente produtos distintivos e focados no cliente. É, igualmente, necessário que o seu processo produtivo seja eficiente, garantindo prazos de entrega consonantes com as necessidades do mercado e gerando valor para a empresa. Referir o Lean Thinking numa indústria em constante mudança, e concretamente na empresa objeto deste projeto, com uma vasta gama de produtos, geradora de grande variabilidade, é construir as bases de um processo flexível e competitivo, através de uma cultura de inovação que congregue todos os intervenientes. É neste contexto que se desenrola o projeto de implementação de metodologias Lean, como instrumento de consolidação da melhoria continua.

O projeto consistiu na avaliação e mapeamento da situação inicial existente na unidade de vernizes da CIN - Corporação Industrial do Norte, S.A, de forma a identificar as fontes de desperdício, na apresentação de soluções visando a eliminação ou minimização desse desperdício e na implementação e avaliação da eficácia das soluções apresentadas. O trabalho baseou-se no paradigma do Lean Thinking, recorrendo, para tal, às metodologias 5S, Gestão Visual, Normalização do Trabalho, SMED e à avaliação da eficiência de máquinas - OEE.

A implementação das melhorias propostas, apesar dos naturais constrangimentos de tempo do projeto, revelou resultados mensuráveis e promissores, permitindo afirmar o seu sucesso. É o caso dos ganhos obtidos por redução dos tempos de mudança operativa, ou por incremento do OEE da linha, de 41% face à média dos meses anteriores, que, de forma clara, comprovam a eficácia das medidas implementadas. Relativamente à redução dos tempos de mudanças operativas, foi possível, num dos casos abordados neste projeto, uma redução de 50% face à situação inicial.

Não menos importante, foi o envolvimento de todos os colaboradores intervenientes dos processos, garante de uma melhoria que se pretende sustentada. Uma aposta continuada neste trabalho potenciará os resultados até agora alcançados.

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Acronyms

FO: Filling Order

KPI: Key Performance Indicator

L: Litres

L/h.w: Litres per hour worker

OEE: Overall Equipment Effectiveness

PPE: Personal Protective Equipment

R&D: Research and Development

RMW: Raw Material Warehouse

ROI: Return on Investment

SMED: Single Minute Exchange of Die

SO: Shop Order

TPS: Toyota Production System

TQM: Total Quality Management

VSM: Value Stream Mapping

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1. Introduction

In the scope of the dissertation project of the Master in Mechanical Engineering of the Faculty of Engineering of the University of Porto, this project was developed in the company CIN - Corporação Industrial do Norte, S.A. with the theme Implementation of Lean Methodologies in a Varnish Production Unit. The project, developed in the CIN Varnish Production Plant and in the Operations Department, lasted for 4 months.

The main objective of this project is the increase of productivity in the C4 sector, through the implementation of Lean methodologies, with greater focus on the automatic filling machine, ME-37. This machine has the capacity to label and tag the containers, which proceed to filling and packaging.

In this chapter, in addition to a presentation of the company, the framework and the main objectives of this project are presented. Next, the methodology adopted and the structure of the dissertation are mentioned.

1.1. Company Presentation

The CIN group was founded in 1917, with the opening of its first paint and varnish factory, under the name Companhia Industrial do Norte. In 1926, it changed its name to Corporação Industrial do Norte, Lda. (Figure 1), a name that has remained to this day.



Figure 1- CIN - *Corporação Industrial do Norte* Headquarters

The group is present in several countries, with production units in Portugal, Spain, France, Angola and Mozambique. As mentioned, the group already has over 100 years of experience, has been sector leader since 1992 in Portugal and in 1995, with the integration of the Valentine brand, ensured Iberian leadership. It currently has over 1800 employees and a turnover in 2020 of 313 million euros.

1.1.1. Description

The company operates in three main sectors (Figure 2):

1. Decorative: paints and varnishes used in civil construction available to professionals and individuals, the segment that has the greatest weight in the company's sales, around 53%.
2. Anticorrosive Protection: the Protective Coatings range is designed to protect metal or concrete structures when exposed to an aggressive environment.

3. Industry: this segment is subdivided into two product types, solvent-based liquid paints for the metal, wood, plastic and glass industries and powder paints for the architectural, automotive components and metal furniture sectors. This segment accounted for 34% of the company's sales in 2020.



Figure 2- The different sectors in which the company operates

At the Portuguese headquarters, besides the manufacturing unit, there is also the R&D centre, with competencies for carrying out four types of studies: product study, colour study, product composition analysis and study of the behaviour and ageing of products, which are briefly presented in the following sub-chapter.

1.1.2 Main Products

The plant located in Maia, shown in Appendix A, is divided into seven distinct halls: The Central Hall (C1), responsible for the general line of products, Novaqua (C2) that produces water-based paint, the white paint production unit (C3) and the varnish production unit (C4), where this project was developed, the diluent production unit (C5), the industrial range production unit (C8) and, finally, the raw materials warehouse (C0), where the separation of products for the six production halls takes place.

Given the wide range of products it sells, CIN currently uses some Lean tools in the various areas of the company, such as the 5S and daily *Kaizen* meetings. However, it is very important to reinforce these tools and apply them in areas where there are greater sources of waste. Thus, the need for this project arises.

1.2 Project Background and Motivation

There is a constant need to improve adaptability and responsiveness to the constant changes faced by the industry on a daily basis, with a view to increasing productivity, placing competitive prices on the market, and innovation, all while still offering customers the products they demand.

At CIN, the focus on offering new products that meet customer needs is a priority, embodied in the existence of an R&D centre that works on this component on a daily basis.

This diversified offer to the customer cannot neglect the company's results and this requires an internal organisation of excellence that leads CIN to invest heavily in improvement projects.

The C4 sector was chosen as the intervention area of this project because it is possible to identify various sources of waste, for example because there is little standardisation of tasks. A wide range of products (varnishes and hardeners) are manufactured and packaged in this sector, whose layout is detailed in Appendix B, so there are many setups in product changes, which can be of product, container volume or image. Therefore, to increase the productivity of the sector, the use of 5S, Standard Work and SMED tools shows great potential in obtaining a more organised workspace and reducing product changeover times. Involving employees to implement these tools is crucial.

As previously mentioned, these skills offered by the R&D Centre allow CIN to develop not only new products, but also the customisation of existing ones and, therefore, customer loyalty. This attitude, while being an asset, also results in a greater variability of the production parameters and, consequently, a need for more accurate organisation and control, which is in line with the objectives of this project listed below.

1.3 Main Objectives of the Project

As a result of the aforementioned, there is a need to guarantee that the premise of a diversified response to the client does not prejudice the objective of achieving productivity that allows the company to obtain good results. To this end, three central objectives were established at the start of the project:

- Increasing the sector's productivity;
- Analyse and characterise the automatic labelling and filling process;
- Improve the OEE of the automatic labelling and filling machine.

To achieve these objectives, Lean tools were used, such as 5S, SMED and Task Standardisation.

1.4 Adopted Methodology

As the working method adopted is crucial to the achievement of the defined objectives, the following methodology was followed to carry out this project:

- Survey of the current situation, through the registration of the OEE indicator, analysis of daily indicators such as the productivity of the sector and setup times;
- Identification of improvement opportunities and mapping of the production process;
- Development of standards for less waste;
- Implementation of solutions and analysis of results.

Due to the short duration of the project, the focus of the work, and the biggest target when it came to implementing improvements, was the automatic labelling and filling machine, considered the "lung" of the production unit.

1.5 Structure of the Dissertation

This report is divided into five chapters.

The first chapter presents the initial framework of this project, a brief presentation of the company and the objectives and methodology for carrying it out.

The second chapter presents a theoretical contextualisation of the concepts on which the realisation of this project was based.

The third chapter describes the production process of the sector under analysis and characterises the initial situation, exposing the detected problems.

The fourth chapter presents the solutions proposed to solve the problems identified, their implementation and the results obtained.

In the fifth and last chapter, the final conclusions are drawn.

2. Literature Review

This chapter presents the main theoretical concepts that serve as a basis for the elaboration of the project.

Lean Thinking is contextualised, as well as its general principles, starting with the origin of this way of thinking that has revolutionised industry, and presenting the Toyota Production System. Afterwards, the various benefits and tools that compose this way of thinking are studied.

2.1 Toyota Production System

The industry paradigm has changed, from a time when everything was sold, to a context in which one is forced to dominate the production system, producing smaller quantities, more customised products and focused on customer needs. Toyota Production System (TPS), designed in Japan, started its implementation shortly after the second world war, at a time of great economic fragility in the industry, as, according to Ohno (1988), need is the mother of innovation.

However, TPS only began to attract major attention after the 1973 oil crisis, in which the economy was faced with a major stagnation scenario. It was during this period of emergency that Toyota stood out in a positive light for its relentless pursuit of waste elimination.

In 1950, Eiji Toyoda visited a facility in the United States that was operating under Henry Ford's system based on mass production. The key to this mass production was the simplification of in-line assembly, the reduction of tasks for each worker, which reduced cycle time, and the introduction of the moving assembly line. These innovations resulted in large cost reductions. However, this system has its limitations and does not allow the production of a wide range of products.

Back in Japan, Toyoda and Taiichi Ohno concluded with relative ease that this mass production system was incompatible with the specifications of the market Toyota was in. The Japanese market demanded greater product variety, in smaller quantities, something that the Ford Production System could not respond to. (Dennis 2007)

Ohno (1988) was of the opinion that mass production, characteristic of the Ford Production System, caused waste, inevitably increasing costs. In contrast, the Toyota Production System aimed to reduce these costs, to adapt to a new industry, with new social values, by abolishing the 'push' system and replacing it with a 'pull' system that takes into account customer needs and the quantities required - what, when and how much.

The production system developed by Toyota Motor Corporation aims at providing the best quality, the lowest cost and the shortest lead time by eliminating waste (Institute, Marchwinski, and Shook 2003), recognising that only a small fraction of the total time and effort for processing a given product adds value for the end customer. (Melton 2005)

As such, TPS is based on two pillars:

- *Just-in-time* - means that in a production flow, the parts required for assembly arrive at the assembly line only when needed and in the quantity required. A company that ensures this flow throughout the process can approach zero inventory, which from a cost and space management point of view is ideal. JIT increases efficiency and enables quick responses to possible changes. JIT reduces inventory and improves product quality by identifying and enabling real-time problem solving. JIT techniques include *Heijunka* (production smoothing - fine-tuning the quantities and mix of products to be made), *Kanban* and Value Stream Mapping (VSM). (Paladugu and Grau 2020)

- *Autonomation / Jidoka* – consists of the existence of machines that can prevent the production of defective parts by the action of a device that can distinguish normal from abnormal conditions. With the integration of this device, the machines can, when in normal conditions, work autonomously, without the intervention of the operator, who is only needed to solve the problems in the machine when they occur. This allows one worker to operate several machines, reducing the number of workers needed. (Ohno 1988)

This system is also called Lean Production and is the practical basis for Lean Thinking, whose pillars are presented in Figure 3.

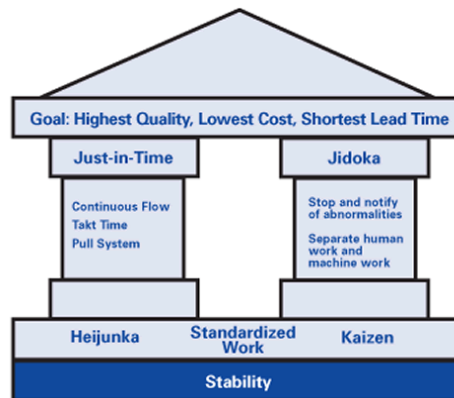


Figure 3- Toyota Production System Pillars (Source: Institute, Marchwinski, and Shook (2003))

This scheme represents the two pillars on which the Toyota Production System is based, Jidoka and Just-in-Time, as well as the basis for this production system, production levelling, standardised work and continuous improvement, as the supports that give stability to the system. (Institute, Marchwinski, and Shook 2003)

2.2 Lean Thinking

Lean philosophy is about improving processes by eliminating *Muda*, *Muri* and *Mura*, the three types of TPS wastes, meaning waste, overload and lack of uniformity, respectively. (Cifone et al. 2021) According to Ohno (1988) these wastes are the causes for the existence of losses in a productive flow and it is crucial that their identification is made at the *Gemba* (ground, where value is produced).

Lean can be considered a set of tools that help to identify and eliminate waste, elimination that must be constant, to increase quality and productivity and reduce costs and lead-time. This philosophy focuses on five principles: less material, less investment, reduced inventory, more space and minimisation of human resources. (Pinto et al. 2019) Thus, Lean Thinking provides a way to specify value, map value-added tasks into the best possible sequence and execute them more efficiently. (Womack and Jones 2010)

Wilson (2009) defines the Lean Manufacturing system in a fivefold manner, first point being its focus in quantity control to reduce costs by eliminating waste, then the fact that it is built in a strong foundation of process and product quality. It should also be fully integrated and continually evolving and, lastly, it should be perpetuated by a culture of conscious, continuous and consistent management.

The key areas for Lean Manufacturing are: flexibility, elimination of waste, optimisation, process monitoring and employee involvement (Oliveira, Sá, and Fernandes 2017) and for its implementation to be fruitful it is necessary that the proactive attitude inherent in Lean Thinking

extends to all the hierarchies of a company, far beyond the supply chain and operators, also including areas such as accounting and customer service. The more people feel involved in the implemented improvements, the more motivation is generated and the more successful the implementation of Lean methodologies is. (Gonzalez et al. 2019)

2.2.1 Lean Principles

Value

Value specification is the first step in Lean Thinking.

It can only be defined by the end customer, on a given product or service, at a given price. Thus, value represents what the end customer is willing to pay, which does not always correspond to what is needed to produce that given product or service. For this reason, for the producer, the term value does not have as clear a definition as for the customer. However, everything that does not meet the customer's requirements and its definition of value represents waste and should be eliminated. The most important step in the value specification is the definition of the target cost. The question to ask is "What is the muda-free cost of this product?" once the unnecessary tasks have been removed, which will inevitably make the cost lower than that achieved by a company's competitors.

Thus, a Lean enterprise has the following options: (Womack and Jones 2010)

- Reduce prices, which potentially increases sales volume;
- Add additional features to the product;
- Add value-added services;
- Expand the distribution and service network;
- Use the profit for new product development.

Having this said, by defining value and eliminating waste, more value can be created.

Value Stream

Set of tasks necessary for the production of a good or service. Identifying these tasks is the second step in Lean Thinking, and the one that reveals the biggest sources of waste in Gemba. When mapping the value chain, three types of tasks will be found:

- Tasks that create value;
- Tasks that do not create value but are not avoidable, the most common example being transportation;
- Tasks that do not create value and must be eliminated.

The objective identification of these tasks is crucial to enable the elimination of those that do not create value.

Flow

This third step consists in, after the definition of value, the value chain has been mapped and the non-value-adding tasks have been eliminated, making the tasks, identified as value-added, flow. This flow is contrary to the "batch and queue" method, which focuses on carrying out a task repeatedly, forming a batch that is then transferred to the next task. (Ohno 1988) One should fight against this way of thinking (in batches), because the different tasks can be carried out more

efficiently and accurately when the product is worked on from start to finish. (Womack and Jones 2010)

Henry Ford was the first to exploit the true potential of flow, reducing the effort required to produce a Ford Model T by 90%, by placing the machines in line in the correct and most productive sequence and establishing flow from raw materials to finished product. However, the way Ford achieved this feat only works in cases where production volumes are large enough to justify high speed assembly lines. The real challenge, according to Ohno (1988), was to be able to establish a continuous flow in a production facility producing volumes of tens or hundreds, not millions.

Ohno and his associates were able to achieve this continuous flow in low production plants by mastering rapid tool changes and correctly sizing machines to be placed adjacent to each other and form a continuous flow. The aim of continuous flow is for the product to move through the value chain without delays, stocks and waste. (Womack and Jones 2010)

Pull

The pull production system arises because it is impossible for manufacturers to continue following the system of planning production and consequently "pushing" their products onto the market. The dynamics of the industry change and, therefore, the customers, each with a different definition of value, place themselves at the forefront of the market and "pull" the goods they consider necessary, in the quantity required and when they need them. It is therefore considered that the production system only starts when the customer places an order, avoiding excess inventory and obsolete products. (Womack and Jones 2010)

Perfection

The idea of the fifth principle of Lean Thinking comes from the combination of the previous four:

- Specify the definition of value;
- Identify the value stream;
- Create a continuous flow with the value-added tasks;
- Enable consumers to pull value from the company.

These four principles interact with each other like a virtuous circle, as demonstrated in Figure 4, and through their exploration, and the notion that improvement must be continuous, induces the idea that perfection no longer seems unattainable.

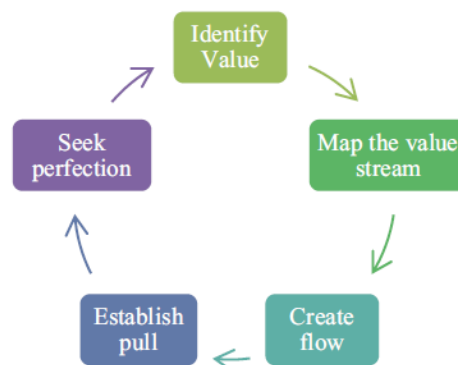


Figure 4- The five principles behind Lean Thinking (Source: Mathew Alexander and Saleeshya (2022))

One of the aspects of Lean Thinking that serves as the greatest incentive in the search for perfection is the transparency of the process and the fact that everyone involved, regardless of internal hierarchy, can better see the weaknesses of the production process and act on them. (Mathew Alexander and Saleeshya 2022)

2.2.2 Lean Thinking Benefits

After the explanation of the five basic principles of Lean Thinking, it is possible to understand the benefits, both short and medium/long term, that this type of mentality can bring to organisations and companies worldwide.

Successfully converting from a batch-and-queue production system to a continuous flow system with efficient pull will increase productivity, reduce non-conformities on arrival at the customer and work accidents, as well as the time-to-market of new products, making it possible to increase the range and complexity of products. These are just the initial benefits that come from implementing Lean in a production process, that is, the radical change in the value stream. This phenomenon is called *Kaikaku*, or Breakthrough *Kaizen*, which is followed by *Kaizen*, continuous improvement, the so-called route to perfection. (Womack and Jones 2010)

2.2.3 The Seven Big Wastes

With the premise of Lean defined - elimination of waste -, it is necessary to identify the types of waste that exist. To understand the definition of waste and the causes for its appearance, it is necessary to clarify the concept of "added value". A process consists of a sequence of activities, an activity being a manual operation or performed using machines or other devices. An activity is considered to have added value if it maximises the value recognised by the customer, at the lowest possible cost. Thus, waste is defined as any activity that results in increased costs without adding value for the customer.

There are three different ways of classifying waste, those being:

- The traditional Japanese method – 3 “MU”
- Japanese TQM Method – The 4 M
- The Seven Big Wastes – appropriation of the Japanese method by the United States.

The 3 UM

As mentioned earlier, the Japanese term "Muda" is generically used for waste, however, for the Japanese this term is more specific, resulting in the identification of three types of waste:

- ✓ *Muda* – more capacity than workload;
- ✓ *Mura* – variation in operation not caused by the end customer, causing overload periods and waiting times
- ✓ *Muri* – overload on equipment and people, which can result in defects and delays. (Chiarini 2013)

The 4 M

This form of classification is based on the Cause and Effect diagram or Ishikawa Diagram, having as inputs Material, Man, Machine and Method - 4M, as shown in Figure 5. The cause and effect diagrams are a visual tool that helps in the organisation of the causes of a certain problem.

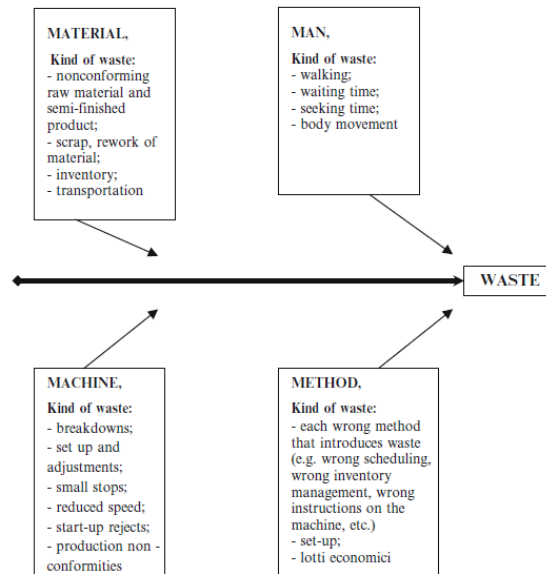


Figure 5- Cause and Effect Diagram example (Source: Chiarini (2013))

By analysing the cause and effect diagram above, it can clearly be appointed the reasons for the existence, in this specific case, of waste. (Chiarini 2013)

The Seven Big Wastes

The most common classification method, which divides Muda into 7 different types, was conceived by (Ohno 1988), these being represented in Figure 6.

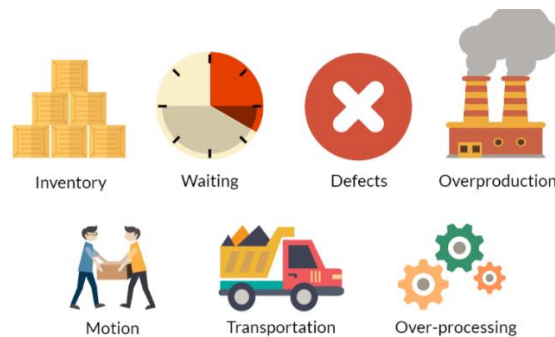


Figure 6- The seven big wastes (Source: Kanbanize)

Overproduction: production of goods or services before they are needed or production in quantities greater than necessary. (Paladugu and Grau 2020) The pull system aims to eliminate this type of waste, as do JIT and *Kanban* systems. (Deshmukh et al. 2022) It is also the cause of another type of waste, inventory, which may become obsolete.

Waiting: waiting times between activities, either due to lack of material, breakdowns or lines with poor load planning.

Transportation: unnecessary movement of materials and products between processes. The most common waste, caused for example by disorganised workspace, distant suppliers and complex material flows.

Overprocessing: performing operations beyond customer requirements and specifications, i.e. processing characteristics without value recognised by the customer.

Inventory: excessive amount of WIP (work in progress) materials and finished product resulting in higher costs, e.g. storage costs.

Motion: unnecessary movement of workers, which may include searching for tools or documents, caused by disorganisation of the workspace or lack of standardisation of tasks.

Defects: quality means getting it right first time, through prevention and planning. Defects can result in customer dissatisfaction, costs and recall time or the reworking of defective parts. (Chiarini 2013)

2.2.4 Lean Tools

Throughout this section some Lean tools will be presented that can be used in a production system to eliminate or minimise waste and that fit in the context of the project, namely the 5S Method, Visual Management, Standard Work, *Kanban*, Value Stream Mapping (VSM), Single-minute Exchange Die (SMED) and Overall Equipment Effectiveness (OEE).

5S Method

The 5S emerged as one of the Lean tools in the early 1980s, devised by Hiroyuki Hirano, who defined the five pillars of a visual workplace. The 5S's are a method of organising the workspace, simple to implement, useful in organising and cleaning, necessary on the factory floor for a good working environment. (Senthil Kumar et al. 2022)

The three motivations for implementing this method are: (Hirano 1995)

- A clean and tidy factory or office will be more productive, with the organisation of tools, for example, enabling more efficient changeovers and eliminating a major form of waste - time spent searching;
- A clean and tidy factory or office will produce fewer defects, as defects are more easily found in an organised space and clean equipment tends to operate with fewer faults;
- A clean and tidy factory or office will meet deadlines better as a result of the previous two points.

The name given to this tool comes from the Japanese words that summarise the five stages of implementation (Figure 7). (Jain et al. 2021)

1. *Seiri* means Sort
2. *Seiton* means Set in order/Straighten
3. *Sieso* means Shine
4. *Seiketsu* means Standardise
5. *Shitsuke* means Sustain



Figure 7- Five stages of 5S methodology (Source: leanproduction.com)

Sort

This is the first step in the implementation of 5S, consisting of separating what is necessary from what is unnecessary and keeping only what has been identified as necessary. Items of the same nature should be allocated to a single place, which reduces movement of people and material. (Gupta and Chandna 2020)

Straighten

After eliminating what is unnecessary, organise the items to create an efficient workflow. Everything should have a specific allocation, with proper identification, in order to avoid wasting time looking for work material.

Shine

Consists of cleaning the workspace with the aim of increasing quality, safety at work and minimising equipment failures.

Standardise

Defining standards to obtain an organised workspace and guarantee the three previous steps. It is thus defined as the state that is obtained when the first three pillars have been followed, and this becomes the reference to be maintained. It also serves to define the most efficient and/or safest way to perform a certain task. A standard is a clear picture of the desired state. (Dennis 2007)

Sustain

This step is continuous, linking all the previous ones, and consists of discipline, in order not to lose the progress made with the implementation of the previous steps, using audits for that purpose.

In short, an organised work area, besides increasing productivity, quality and safety and decreasing costs and waste, also promotes a good working environment, with motivated and responsible operators.

Standard Work

Standard Work is a Lean tool developed by Taiichi Ohno, defined as a set of rules and operating procedures that are formalised and executed, with clear instructions, with the aim of facilitating the work of operators and eliminating variability and inconsistency in the execution of a given task and in the results obtained. (Oliveira, Sá, and Fernandes 2017) The benefits of the implementation of this tool in the workplace are explored in Table 1.

Table 1 - Benefits gained from the use of standard work

Benefits	
Variability Reduction	By standardising the most efficient and safest way to carry out a given task, variations in the final product are eliminated, objective times are defined for carrying out each task, promoting correct line load planning and reducing waiting times.
Cost Reduction	As a consequence of eliminating waste, derived from inefficient procedures, the system becomes more cost effective.
Quality Improvement	If the same operation is performed differently depending on the person performing it, it may lead to defects.
Worker Involvement	Standardisation leads to transparency, with responsibility for errors being shifted from the person to the system, which makes workers more willing to highlight opportunities for improvement.
Continuous Improvement	Standardisation is essential for continuous improvement as it makes change easier, faster and more efficient.

Value Stream Mapping (VSM)

VSM as a tool allows company managers and directors to visualise the flow and sources of waste in the production process, as it includes all activities from raw material to finished product, thus facilitating the identification of opportunities for improvement. (Oliveira, Sá, and Fernandes 2017) The use of this tool makes it possible to visualise the combination of processes needed to obtain the final product, instead of the focus of optimisation being allocated to specific departments, without considering the process as a whole. (Dennis 2007)

It is also an easy way to record lead times, setup times, among others, in order to visualise the true performance of the system. (Oliveira, Sá, and Fernandes 2017)

Kanbans

Another of the Lean tools developed by Ohno (1988), the *Kanbans* emerged as a solution to overproduction, as a way to deliver what is needed only when needed, within the Just-in-Time principles. The idea came from supermarkets, a place that Taiichi Ohno describes as the place where the customer can get what he needs, when he needs it, in the quantity he needs. The *Kanban* is usually a card that signals the request to replenish material only when it is needed, usually when the defined minimum stock level is reached.

However, this tool, used improperly, can cause many problems, so it is necessary to understand how it works. Table 2 lists the functions of the *Kanbans* and the rules of operation.

Table 2- Functions of *Kanbans* (Ohno 1988)

Function of <i>kanban</i>	Rules
Provides pick-up or transport information	Later process picks up the number of items indicated by the <i>Kanban</i> at the earlier process.
Provides production information	Earlier process produces items in the quantity and sequence indicated by the <i>Kanban</i> .
Prevents overproduction and excessive transport	No items are made or transported without a <i>Kanban</i> .
Serves as a work order attached to goods	Always attach a <i>Kanban</i> to the goods.
Prevents defective products by identifying the process making the defectives	Defective products are not sent on to the subsequent process. The result is 100% defect-free goods.
Reveals existing problems and maintains inventory control	Reducing the number of <i>Kanban</i> increases their sensitivity.

Following these rules, the full potential of this tool can be unleashed.

Single-Minute Exchange of Die (SMED)

Referred to by its acronym, SMED, the Lean Thinking tool aims to reduce the time spent on product changes in order to minimise non-productive time.

In 1950, Shigeo Shingo realised on a visit to Mazda's Hiroshima plant that the operations included in a set-up fall into two types:

- Internal setup – tasks requiring machine downtime, such as tool changes and equipment calibrations;
- External setup – tasks that may be performed during machine operation, such as transporting new tools for the next changeover.

The SMED tool emerged then, in 1969, during a visit to Toyota Motor Company, where Shingo was challenged to reduce setup times to less than three minutes. Faced with this challenge, the idea occurred to him to transform internal tasks into external ones, reducing as much as possible the number of tasks that are done in non-productive time. The development of this tool took around 19 years, based on theory and years of experimental application, which gives results on any machine in any factory. (SHINGO and DILLON 1985) The creation of standards for change operations are also a crucial factor for the successful implementation of this tool. (Oliveira, Sá, and Fernandes 2017)

Spaghetti Diagram

The efficiency and effectiveness of a facility is influenced by the layout of the work area. Likewise, a poorly designed work process can lead to wasted movement that wastes time.

The Spaghetti Diagram is a tool that graphically represents the flow associated with a certain set of tasks that, by allowing the visualisation of the movement of people or materials, helps to identify

opportunities to improve this production flow, eliminating waste. (Senderská, Mareš, and Václav 2017)

Overall Equipment Efficiency (OEE)

The OEE is a Key Performance Indicator (KPI), developed by Seiichi Nakajima to measure the effectiveness of an equipment. This indicator includes the results of a machine presented in a clear and objective way, which allows the evaluation of the overall effectiveness of the equipment and tends to reveal hidden problems that affect the productivity of the machine. (Oliveira, Sá, and Fernandes 2017) The purpose of implementing OEE is to acquire and increase the efficiency of a given piece of equipment, eliminating all losses. (Singh, Khamba, and Singh 2021)

The OEE is the result of multiplying three factors (Bhade and Hegde 2020):

$$OEE (\%) = Availability(\%) \times Performance(\%) \times Quality(\%) \quad (1)$$

Availability – represents the comparison between the amount of time the machine is actually working and the time for which the machine is supposed to be working and is calculated in the following manner:

$$Availability(\%) = \frac{Time\ of\ actual\ operating\ of\ machine}{Time\ planned\ for\ operating\ the\ machine} \times 100\% \quad (2)$$

Performance – comparison between the operating speed rate and the net operating rate, calculated by:

$$Performance(\%) = \frac{Ideal\ Cycle\ Time \times Total\ quantity\ produced}{Actual\ Operating\ Time} \times 100\% \quad (3)$$

Quality – represents the proportion of defective production relative to the total production volume and can be determined by equation 4:

$$Quality(\%) = \frac{Total\ Quantity\ Produced - Total\ Defective\ Parts}{Total\ Quantity\ Produced} \times 100\% \quad (4)$$

Nakajima (1988) grouped the "Six Big Losses", which must be eliminated, into three factors, directly related to the three above mentioned, in order to make it easier to locate problems and rectify them.

Down time:

1. Equipment failure – from breakdowns;
2. Setup and adjustment – from exchange of die.

Speed losses:

3. Idling and minor stoppages – due to the abnormal operation of sensors, blockage of work on chutes and others;
4. Reduced speed – due to discrepancies between designed and actual speed of equipment.

Defect:

5. Process defects – due to scraps and quality defects to be repaired;
6. Reduced yield – from machine startup to stable production.

3. Problem Characterisation

Having presented the concepts that serve as a basis for this project, this chapter will present a contextualisation of the production process of the factory on which this project was focused, as well as an exposition of the problems detected and/or improvement opportunities identified.

3.1 Productive Process Description

The production process in the C4 sector is composed of two fundamental parts: manufacturing and filling. The swimlane of the process can be found in Appendix C.

The process starts in the raw materials warehouse, with the processing of the Shop Order (SO) so that the availability of the raw materials needed for manufacturing is verified and the subsequent separation of the raw materials to be sent to the sector. The liquid raw materials are sent in whole units, which can be barrels or cubes, both represented in Figure 8, unlike the solid raw materials, which are weighed in the S7 hall, intended only for this activity, for space management reasons in the manufacturing and filling halls.



Figure 8- Barrel and cube, respectively

Once the weighing of solids and separation of liquids for shipment is concluded, they are taken to the sector in the logistics train that follows the defined route, in order to pass through all the sectors. When the raw materials are received at C4, they are placed by the manufacturing operators in the intermediate area for raw materials.

Once the raw materials necessary for manufacturing are secured, the production process itself begins. The SO works like a recipe, explaining the raw materials and their respective quantities, as well as the operations to be performed and the execution times. The SO are in the possession of the manufacturing operator, who follows the instructions. Once the manufacturing process is finished, the operator takes a sample and sends it, along with the SO, to quality control.

After quality control, there are three options: (1) approved, the product is ready to be filled; (2) rejected, the product is not compliant and cannot be sold; (3) to be corrected, the product needs adjustments to be checked again. The samples and the respective SO return to the sector, brought by the provisioner, and the SO is placed in the tray of approved manufactures for when the filling of that product begins and the sample is reused, being the provisioner responsible for pouring the sample into the respective tank.

Whether it is an approved product or a product for correction, after the necessary corrections, the second part of this production process follows: filling.

In this case the filling operator has two sheets in his possession, the SO that came back from Quality Control and the Filling Order (FO). The FO identifies the product to be filled and the packaging material required, as well as the respective quantities associated with that filling and the units of material required. This packaging material consists of containers (cans and jars of different volumes), lids or nozzles, labels, boxes and pallets and is collected and placed in the filling machine by the provisioner.

There are three distinct filling lines: automatic filling (Figure 9), semi-automatic filling and manual filling. This project will focus on the automatic filling line, composed of a single machine, called ME-37, considered the "lung" of the sector and responsible for about 45% of the daily filled volume. ME-37 is an automatic machine in line with a labelling and tagging machine, called RO-11, which is also automatic. Thus, the filling operator is limited to stocking containers on the machine plate and removing the already filled containers from the line border to the pallet or to boxes.



Figure 9- Automatic Filling Line composed by RO-11 and ME-37

In the case of the semi-automatic filling line, there are two machines, ME-34 and ME-57. These machines only do the varnish dosing, and all other operations are the responsibility of the filling operator.

The manual filling line does not operate on a daily basis but when the programming determines it, either because of ruptures that require it or because of references that are appropriate for manual filling, and it is mobile. The allocation of the filling machine depends on the tank to which it is connected and whether it is mobile or fixed.

The full pallets of product are removed from the filling positions by the logistics operator, a role that will be explored in the following chapter, to the strapping zone. After strapping, they are sent to the dock, heading for the Distribution Center.

Productivity relates production to the resources used to obtain it, and in the company productivity is measured as follows:

$$Productivity \left(\frac{\text{litres}}{\text{hour} \times \text{worker}} \right) = \frac{\text{Filled Quantity}}{\text{Working Hours} \times \text{Operator}} \quad (5)$$

The numerator is the filled quantity, this represents the number of litres that have been given as closed, thus acting as a form of validation of those litres. Filled litres that, for various reasons, do

not serve their purpose and are not delivered to the customer do not count towards the productivity calculation, as do interrupted fillings, which will only count the next day.

The denominator is given by multiplying the number of hours worked by the number of workers who contributed to the daily filled quantity.

This is the most important indicator, discussed daily in *Kaizen* meetings.

Throughout the next chapters, some products will be mentioned in code, due to confidentiality reasons. Product references are composed by the combination of five digits that represent the type of product, followed by four more digits that relate to the colour and two last digits that represent the container volume.

3.2 Identification of problems and sources of waste

This sub-chapter is intended to describe the problems that were detected in the course of the production process previously described and responsible for the existing waste in the sector. These problems include different aspects, such as disorganisation of the workspace, unnecessary movements and general problems with the automatic filling machine in terms of availability and performance, which will be exposed below and whose proposals of improvement will be exposed in Chapter 4.

3.2.1 Workspace Disorganisation

Regarding the workspace, three critical areas that needed intervention were identified: the Dispersers Area, the Daily *Kaizen* Meeting Area and the Consumables Area.

Disperser and Agitators Area

The C4 manufacturing support area was identified as critical for a number of problems such as disorganised, unnecessary and damaged material, missing labels and the filter bags, used for filling, situated in a location that is difficult to access and vulnerable to dirt, as seen in Figure 10.



Figure 10- Initial situation in the disperser and agitators area

This area includes a tool board, mostly used by the manufacturing operator, the utensils needed to take samples from the tanks and to clean the area, the disperser and the agitators.

Daily *Kaizen* Meeting Area

The Daily *Kaizen* Meeting, where the indicators from the previous day are discussed, as well as the daily action plan of the facility, the *Kamishibai* (visual tool to perform audits, which helps to ensure the cleanliness, organisation and safety of the facility) and possible announcements, is held daily at 8:00 am. What triggered the need for reorganisation of this area was the fact that the sheets that must be filled out on a daily basis, such as the OEE, present in Appendix D, and metrological control sheets, as well as completed orders, Personal Protective Equipment (PPE) requisition sheets, malfunction records, etc., are located in trays (Figure 11) in the manager's office.



Figure 11- Initial location of the mandatory filling sheets and others

This location resulted in many unnecessary movements and sometimes even a queue in the office to deal with matters that could be solved without resorting to the supervisor.

The initial state of the area where the meeting is held is represented in Figure 12.



Figure 12- Initial situation in the Daily *Kaizen* Meeting Area

Finally, in this section where the levelling box is located, there was a need to reformulate its use and create a new sequencing methodology, whose function and measures taken will be explained in Chapter 4.

Consumables Area

This area (Figure 13) is used by all operators, but without assignment of responsibility to anyone, which has resulted in a disorganised, lacking material and dirty area.



Figure 13- Initial situation in the consumables area

The goal is to create a more accessible zone that meets the needs for high turnover and current use material.

3.2.2 Waste Barrel Management

In C4 there are 3 types of residues, that for confidentiality reasons will be referred to as RA, RB and contaminated diluent, all stored in barrels. The first two are treated as hardened paints that, due to their nature, need time to react inside the sector, unlike the contaminated diluent that, after having a full barrel, can be sent out to be treated and then reused. The reaction time for hardened paints is set for one week, however, in the case of RB, this time is not enough, and they end up staying in the sector waiting for the 4 barrels that make up a pallet to no longer be at risk of reaction.

The problem, which was found to be recurrent, consisted in the fact that the barrels, due to the quantity in use and the way they were organised, occupied a noble area and represented an overload on the space of the sector, as shown in Figure 14.



Figure 14- Disposition of the barrels

Besides this, the residue barrels are necessary for the product changes, in which the vat is purged by pouring the product and the cleaning agent into the residue barrel. Thus, as they are not easily

transportable to the filling machine, they were a constraint during the setups, as the filler purged into a can that would be poured into the barrel, forcing several movements.

3.2.3 Unnecessary Movements

Regarding the problem of unnecessary movements, two situations were identified.

The first situation concerns, in the course of the process, the cases where filling starts before the product is approved, i.e. the SO is in quality control and the operator has no access to it during filling. As mentioned before, the SO includes all the information about the product to be filled, including the micronage of the filter bag to be used for filling, while the filling slip contains the specification of the packaging material required. Thus, without the micronage information, the filling operators would go to quality control or to management in order to check the micronage to start filling. This leads to avoidable movements.

The second theme is related to the support operator's tasks, which in practice result in the accumulation of waste. It is this operator who performs a series of non-productive tasks that generate a lot of movement, so that others do not have to. The need arises to ensure that tasks are carried out in the most efficient and expeditious manner.

3.2.4 Problems regarding ME-37

As previously mentioned, the ME-37 is the focus of this project, being an automatic filling machine that presents a very low OEE, with an average value of 33% in the first three months of the year, with failures both in terms of availability and performance. The objective defined by the company for this indicator is 46%.

In terms of availability, the following problems were detected:

- Non-programmed stoppages, with the most recurrent being problems and breakdowns with RO-11 and Line Edge Full;
- Setups, being responsible for 33% of the non-productive time of the machine.

In terms of performance, the causes are not so easily attributable, but it was found that performance is very much affected by:

- Micro-stops (stops that range from 1 to 5 minutes), the most relevant being Problems in the Lid Labeller;
- Filling rate inferior to the theoretical rate, motivated by poor knowledge of optimal filling conditions, such as theoretical filling cadence (product/package combination) and the specification of filling variables (appropriate filling nozzle and conveyor speed).

3.2.4.1 Non-scheduled stops

There is a wide variety of non-programmed stops, each with its own code for recording in the OEE sheet. The distribution of unscheduled stoppages, from the beginning of the year to the end of April, is represented in the graph of Figure 15.

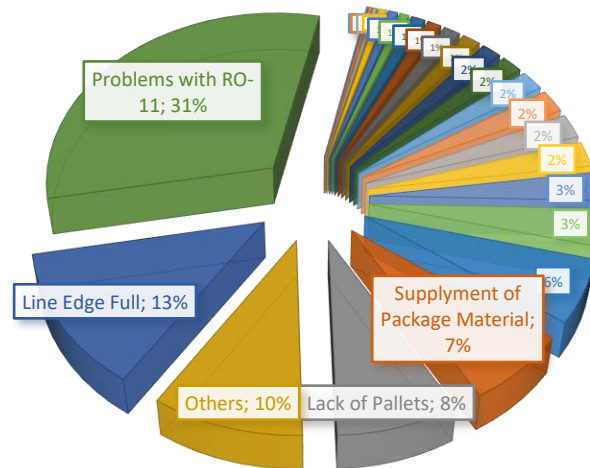


Figure 15- Pie-chart with the distribution of unscheduled stops

As can be seen in the graph, the two most significant stops are RO-11 problems (31%) and line edge full (13%). The smaller portions, other than the five most significant, relate to e.g. dripping nozzles, label correction, weight correction, inkjet problems, filter replacement, etc.

-Line Edge Full

This type of problem, evidenced in Figure 16, translates into both stoppages and micro stoppages. Considering the duration of micro-stops of 1 to 4 minutes, the hours of non-productive time of ME-37 due to a micro-stop by full line edge is 4h to 16h, in the time period of 58 days. The non-productive time due to marked stops is 8 hours. Thus, the sum corresponds to approximately 3 working days.



Figure 16- Line edge full

The full line edge represents the second most significant unscheduled stop and accounts for 3% of the total non-productive time of the machine.

It turns out that the sequence of tasks, represented in Figure 17, to be performed, as a kind of cycle, by the filler is enough to make the line edge fill up and force a stop on the machine to empty it. These tasks include:

- Supply of cans on the plate;
- Supply of lids/nozzles;

- Replacement of reels of labels, tags and lid tags;
- Weight verification and filling of the metrological control;
- Placing label/inkjet on the boxes;
- Placement of cans in the boxes;
- Palletizing.



Figure 17- Sequence of tasks during a 0,75L filling

This problem, with greater incidence in the 0.75L fillings, became more evident, and more critical, due to the fact that it was possible to increase the filling cadence, as will be explored in the Chapter 4.

- Problems with RO-11

The RO-11 was identified as the bottleneck from the start, due to the fact that its cadence limited the filling cadence causing the filling to stop, as it was lower than the cadence of ME-37. Some of the reasons identified were:

- Inadequate parameterization;
- Formats depending on operator - lack of standardisation;
- Poor knowledge of the parameters;
- Parameter tampering when troubleshooting, the first instinct was, whenever there was an RO-11 outage, to manipulate the format parameters;
- Micro-stops, because the cadences are similar, a micro-stop in RO-11 immediately translates into a stop in filling.

Besides the need to adjust the machine's parameterization to increase the cadence, intervention by the maintenance team was also necessary to solve problems, such as:

- Wear of station 3 rolls (tagger), resulting in torn tags;
- Faulty sensors, dispensing multiple labels/tags simultaneously;
- Broken RO-11 end roller, preventing cans from passing to the filling machine's connection belt;
- Opening of the broken cover forced a new parameterization of station 3.

The machine downtime, due to these mechanical problems that require maintenance, from the beginning of the year to the end of April, totaled approximately 22 hours, which corresponds to almost three full working days.

3.2.4.2 Micro-stops

It was found that the micro-stops are mostly caused by the operation of the cap labeler, one of the components of the automatic filling line, which places the proper identification on the different types of varnishes to be filled. In the filling of varnishes, there are three different types, which are:

- Colourless varnish, in 0.75L or 4L packages;
- Coloured varnish, usually following a colourless filling, in the same containers;
- Base, colourless varnish, but in which the filling volume is 0.713L and 3.8L because these cans go to the store, where dye is added (CIN's instant refining system) according to the colour desired by the customer.

Thus, since the base fillings do not yet have a defined colour, they do not carry a lid label. The two other types of fillings, on the other hand, require the usage of the lid labelling equipment. This labelling machine works by sucking the label, which is on a bobbin, and then placing it on top of the lid, already at the end of the line. However, the system did not work as intended resulting in fallen, shriveled and sometimes tangled labels.

These stops, for equipment adjustment, translate into micro-stops in the machine, which affects its performance. The week from May 16th to the 20th 2022, whose OEE can be seen in the graph in Figure 18, was a very important week to highlight the problem existing in these fillings.

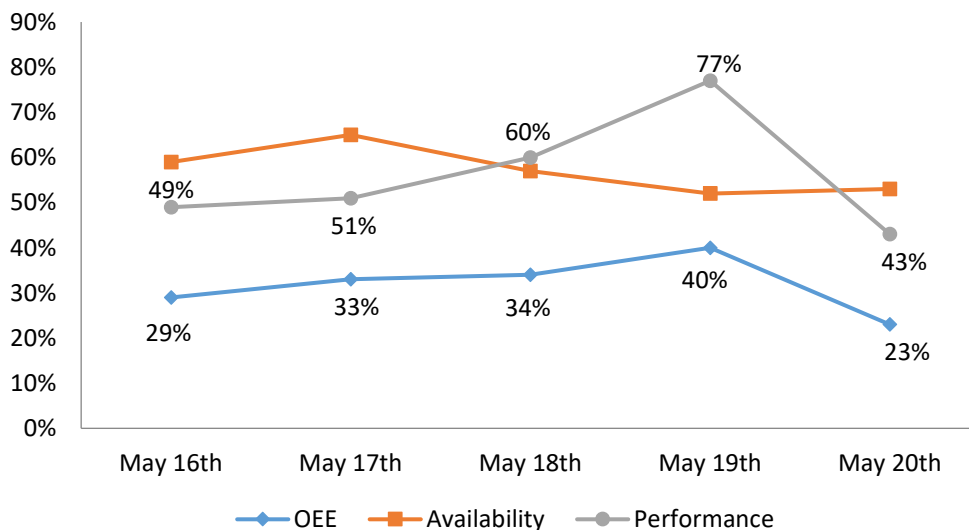


Figure 18- Graphic representation of the OEE indicator from the 16th to 20th of May 2022

On the 17th, 3 samples of 5 minutes were taken, knowing that the objective was, at the end of these 15 minutes, to have filled 285 cans of 0.75L, according to the theoretical cadence of the product, presented in Table 3. However, after 15 minutes of observing the machine, only 131 cans were filled, due to the micro stoppages caused by the problems in the lid labeler, thus the machine was working at only 46% of its potential.

Table 3- Fillings on the 17th of may and their respective performance and theoretical cadence

Date	Product Reference	Performance	Theoretical Cadence
17/05/2022	XXB01 YYIY Z7	59%	19
17/05/2022	XXB01 YYCY Z7	41%	19

On the next two days, the sequence of fillings allowed us to see the true impact of these micro-steps on performance. Table 4 shows the details of the fillings that took place on the 18th and 19th of May.

Table 4- Contrast between distinct types of fillings

Date	Product	Type	Performance	Label	Theoretical Cadence
18/05/2022	XXA02 YYIY Z7	Clear	44%	With lid label	19
18/05/2022	XXA02 YYBY Z7	Base	70%	Without lid label	19
19/05/2022	XXA02 YYBY Z7	Base	85%	Without lid label	19
19/05/2022	XXA02 YYBY Z7	Base	87%	Without lid label	19
19/05/2022	XXA02 YYCY Z4	Colour	64%	With lid label	10

It can be seen that for the fillings without a lid label, the performance was at least 70%, reaching 87% on the 19th. For the products with the lid label, the scenario is completely different, while filling the same product with the same filling conditions (nozzle, conveyor speed, etc), the performance was 44%, contrasting with the 70% achieved with the base. This impact is less noticeable in the 4 litre fillings, because the machine is less requested, the cadence being almost half, however, the performance did not exceed 64% in this case.

3.2.4.3 Filling Rate

The goal set for the productivity of the sector is 155 L/h·w, however the indicator is lacking. Two intermediate goals were defined, to enable the increase of the ME-37's productivity and consequently of the sector: the increase of the filling cadence and the increase of the machine performance.

The performance of the first three months of the year, which include the two months prior to the start of this project and the first month of the project where the initial situation was surveyed, is shown in the graph of Figure 19, with the average of 48%.

The reasons identified for the poor performance, in addition to the already explored micro-steps, were:

- Poor knowledge of the optimal filling conditions, such as the filling nozzle, which changes depending on product properties, and the conveyor speed that can be adjusted so as not to drip cans;

- Lack of regulators in the actuator that determines the time it takes for the next can to reach the mechanical sensor that enables the conveyor to move, which made it difficult to manipulate the parameter.

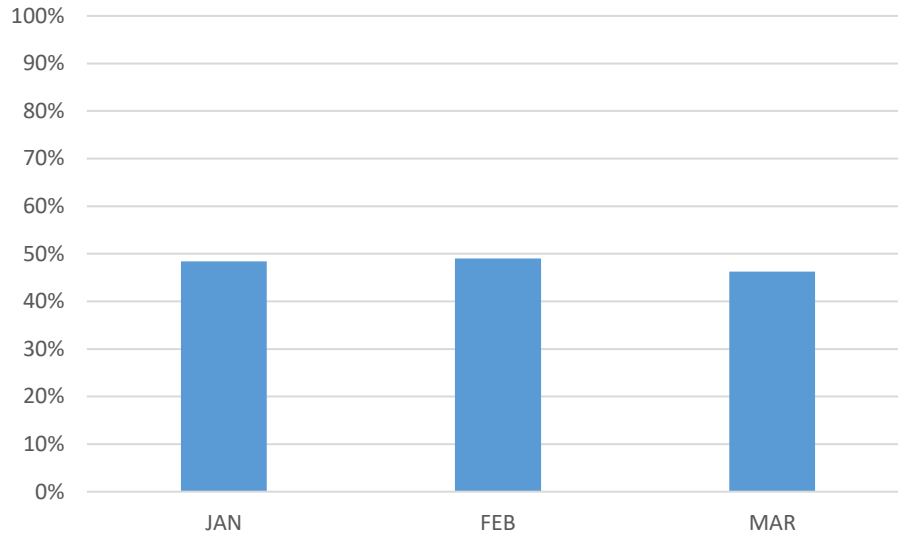


Figure 19- Average of performance from January to March 2022

With the combination of these problems, what the operator might consider a filling under normal conditions was in fact a filling far below the machine's potential.

It was therefore considered necessary to revise the cadences, which were measured without the proper study of the parameters and, therefore, below the machine's potential, and to implement measures to increase performance.

3.2.4.4 Setups

Three types of setup are defined in the company:

- Product, referred to as PI setup, occurs when there is a change in the product, whether this change is to a totally different product or the same product with a change in colour. This change requires washing and is the most time consuming;
- Container volume, which will be mentioned as E setup, happens when there is a change in the container to be filled, however, the product remains. The most common containers are 0.75L and 4L cans, and less frequently 0.25L cans and 1L and 5L jars;
- Image, named M setup, this change is the least time consuming and complex, keeping the product and the packaging, being able to change only the labels, that is, the packaging brand or the filling volume, having a different FO associated.

The target times for the three changes were defined, even though the PI changes may have some variability depending on whether it is a careful wash, a quick wash, or no wash, in the latter case, its is only necessary to bleed the tank and pull the next product, and are stated in Table 5.

Table 5- Setup target times

ME-37	Setup	Target Time (min)
	PI	34
	E	15
	M	9

As presented in the graph in Figure 20, setups are responsible for 33% of the non-productive machine time, second only to scheduled stops (43%) which are not an improvement point.

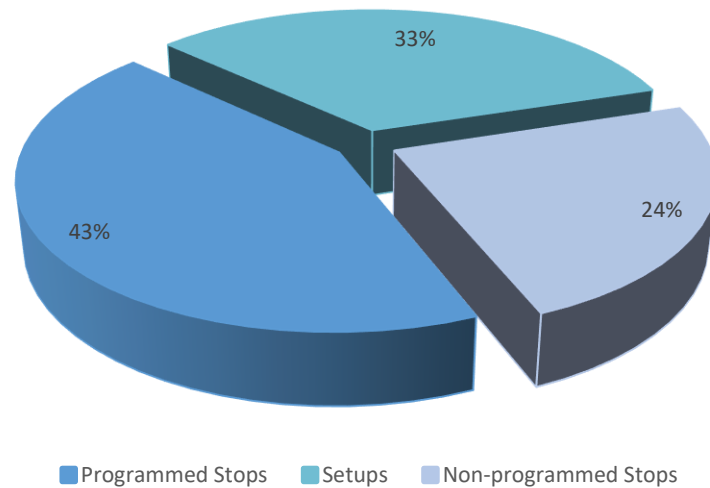


Figure 20- Impact of setups, programmed and unprogrammed stops in ME-37's non-productive time

Therefore, it is clear that the improvement of the changeover procedure has great potential for increasing the machine's productive time and, consequently, increasing OEE and productivity.

Analysing by type of change, the graph in Figure 21, shows the discrepancy between the duration of the setups and the goal set for each of the typologies, from the first week of March to the week before the start of implementation.

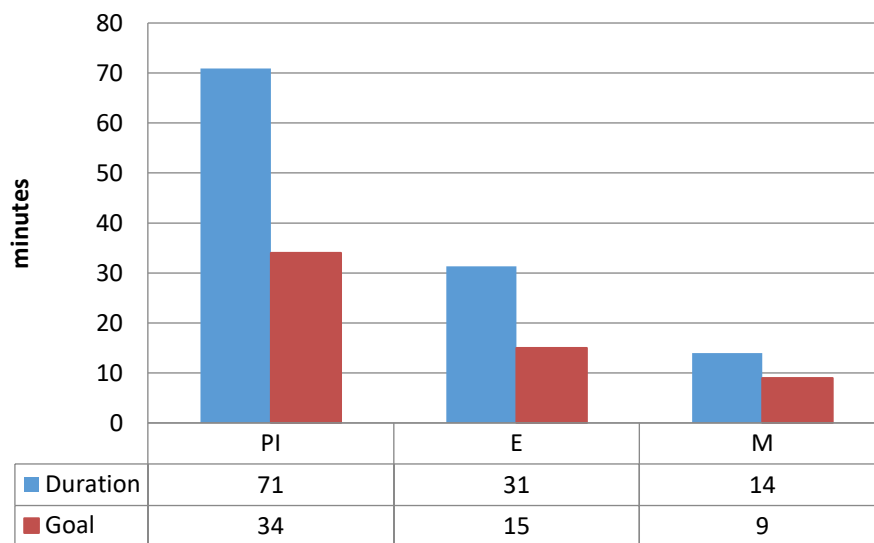


Figure 21- Comparison between average of durations of the three different types of setup and each target time

In the case of the PI and E setups, the duration was 209% higher than the goal, and in the case of the brand change, 156% higher than the goal of 9 minutes. Therefore, the potential for improvement, as expected, is very significant.

3.2.5 Pipe Allocation

The opportunity for improvement in the allocation of piping was triggered by the sequence of fixed tanks represented by the scheme in Figure 22. The initial situation consisted of piping 14 and 10 intended for solvent coloured products, piping 12 and 13 intended for solvent colourless and piping 11 for aqueous colours. In the case of the tanks, the TF-257 and TF-255 are for colourless products and the TF-256 and TF-258 for colour.

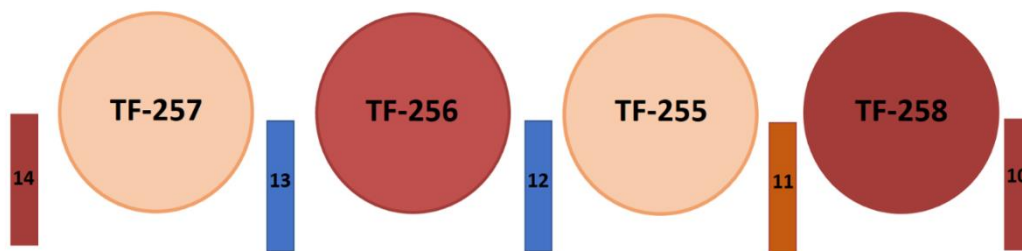


Figure 22- Visual representation of the initial tanks and pipes layout

As previously mentioned, when a SO is launched it has several FO associated to it, usually a colourless and/or base and one or more colours. The filling sequence, in the case of having several colours, is carried out from the colourless, followed by the lightest to the darkest colour, and, in this way, it is not necessary to wash the tank, being enough to purge the previous product and pull the next. However, with the arrangement of tanks and piping shown, the same does not apply to the piping. What happens is that when filling the first colour, for example in the TF-256, it would be necessary to connect the tank to the pump and the pump to pipe #14. After this filling, the operator or provisioner would have to wash the tubing to connect the tank with the darker colour, TF-258, to the pump that would make the connection with tubing #10, because the arrangement did not allow the TF-256 to connect to tubing #10 or the TF-258 to tubing #14.

3.2.6 Visual Management of Tank Conditions

The lack of knowledge of the status of the tanks led to the identification of another opportunity for improvement, that is, a method that could potentially facilitate the visualisation of which tanks are full, and with which product, or unwashed. The way this improvement opportunity was addressed will be explored in the next chapter.

4. Implementation of Improvements

This chapter presents the proposed improvements in view of the problems exposed in the previous chapter, their implementation, namely using methodologies such as SMED and 5S, and the results obtained.

4.1 Workspace Organisation

This subchapter will address the problems exposed in Subchapter 3.2.1, about the disorganisation of the workspace.

4.1.1 Implementation of the 5S methodology

Given the three critical areas identified in the previous chapter, it was necessary to implement the 5S.

The implementation plan consisted of:

- Survey of needs and establishment of objectives of the area where the intervention would take place and of the existing material in it;
- Reorganisation of the space according to the conclusions drawn;
- Cleaning of the areas;
- Standardisation, discussed in Subchapter 4.1.1.1, and awareness of the fifth step of the methodology, the Discipline.

The implementation was carried out with the full involvement of the operators, being they the agents of action in them, and the process was made to be as convenient as possible for them.

Disperser and Agitators Area

The implementation began with sorting, assessing what materials and tools were needed for the functions that this area was supposed to perform, and removing and possibly relocating any that were deemed unnecessary or damaged, as seen in Figure 23. A review was also made of the tool board.

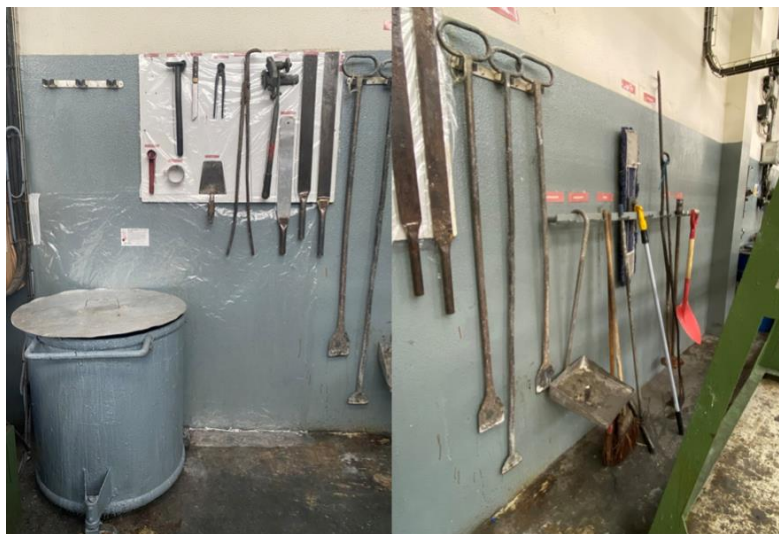


Figure 23- Disperser and agitators zone after 5S implementation

The second step consisted of defining a place for all the tools deemed necessary in the previous step and placing the appropriate labels. The third step, cleaning, occurred simultaneously with the second, because it was necessary, in order to relocate the tools, that the space was clean.

Consumables Area

The three initial steps were replicated in the consumables area, as seen in Figure 24.



Figure 24- Consumables area after 5S implementation

In this case, the arrangement of the racks and the consumables needed were reassessed, to prevent unnecessary material and unorganised shelves.

Daily Kaizen Meeting Area

Given the unnecessary movements mentioned in Subchapter 3.2.1, the idea arises to redefine the daily meeting area, the starting point for the beginning of each day, in order to be able to allocate these sheets more efficiently.

The implementation of 5S in the daily meeting area (Figure 25) was a little different. The material that was on the shelf was separated and consequently reorganised to allow the introduction of the trays, whose function was to centralise the daily and mandatory sheets. It was defined that, at the end of the day, the completed OEE sheets would be placed in the designated tray, and on Fridays the completed cleaning checklists would be placed in the same tray to be checked. Finally, there are trays for the placement of completed vouchers and the sheets for recording breakdowns and PPE requisition to be ordered by the supervisor.

Trays were also created for the approved fabrications (coming from quality control) and samples, to be reused later, and for the receipts that the provisioner forwards to the labelling sector, in cases where the labels are not enough for the entire filling.

The weekly manufacturing and filling plan was posted in this area, to make it easier to follow up on it and discuss reasons for non-compliance if applicable. This change was positive as it keeps the operators focused on the daily and weekly goals, and not only on the current filling.



Figure 25- Daily *Kaizen* Meeting Area after 5S implementation

The reorganisation of this area triggered the creation of a sequencing method, to assist in organising the tasks of the provisioner and consequently avoid delays in the preparation of fillings. A visual and organised system was deemed necessary to ensure that the provisioner prepared the necessary fills when needed. Thus emerged the levelling box (Figure 26).

The levelling box is divided into slots of every working half hour in the columns and the different filling machines in the rows. The sector manager is in charge of scheduling the preparation of the fills at the beginning of each day, with the possibility of making changes throughout this period if necessary, and the provisioner must follow the planning and perform the preparation of the filling according to the schedule. The operation is described in the standard present in Appendix E.



Figure 26- Levelling Box for the daily calendarisation of fillings

Regarding the new sequencing method, designed to facilitate communication between fillers and the provisioner regarding current and future fillings, trays have been placed for each filling machine, as shown in Figure 27, to place labels and FO of the filling programmed for the respective machine.



Figure 27- Trays for the new sequencing methodology

There are three possible scenarios for the state of each filling to be known, these are:

- Tray with labels only: Filling Order is scheduled in the levelling box, i.e. it is a filling to be provisioned;
- Tray with labels and FO: the filling is prepared and ready to be filled;
- Tray with only the FO: filling has been stopped, usually at the end of the working day. The filler must place it in the first tray of the respective machine, and it is picked up, also by the filler assigned to that machine, at the beginning of the next day. This is a filling in progress.

With the specification of the three different possible scenarios, its distinction becomes easier.

4.1.1.1 Standardisation and Discipline

In line with the fourth and fifth steps of the 5S methodology, so that the effort in organising the workspace would not be in vain, in addition to the revision of the sector's cleaning Checklists, present in Appendix F, the existing cleaning norm was updated, where rotating areas were added, such as the daily meeting area and the consumables area.

In this way, every week an operator is assigned to each rotating area, marked in purple in the common area cleaning standard, in order to keep the area in condition and everyone is responsible and elucidated of how that area should look. This standard is also present in Appendix F.

To ensure the last step of the 5S implementation, discipline, the realisation of *kamishibai* by the operators was also reinforced. A *kamishibai* consists of a card where situations that should be checked, regarding the organisation and cleanliness of the area to which the card refers, are described, with one side red and the other side green. If one or more of the mentioned issues does not conform, the card should mark the non-conformities and be placed on the board (Figure 28) with the red face visible. If everything is as intended, the green face will be visible.



Figure 28- Kamishibai board

Every week one operator of the sector is assigned the responsibility of performing this system of audits and the *kamishibai* performed are analysed and discussed in the daily meeting the following day.

4.1.1.2 Movement Reduction

In the case of the introduction of the trays (Figure 29) mentioned above, it was possible to reduce unnecessary movements at the beginning of the day, by relocating the sheets that the operators used daily.

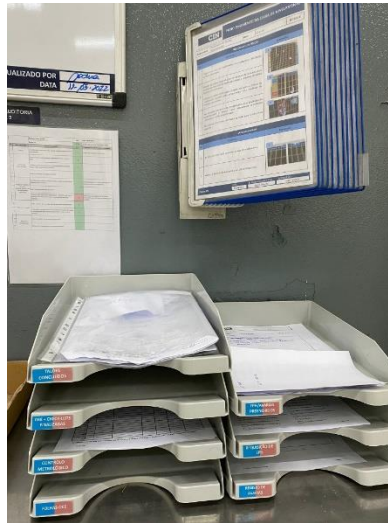


Figure 29- New allocation for mandatory filling sheets and others

The Spaghetti diagram in Figure 30 represents the movements that the filling operators and the provisioner (in blue) made daily. After the daily meeting, the filling operators went to the previous location, in the office of the sector's manager, and collected the metrological control record sheets and the OEE record sheets, and then went to the respective filling machine.

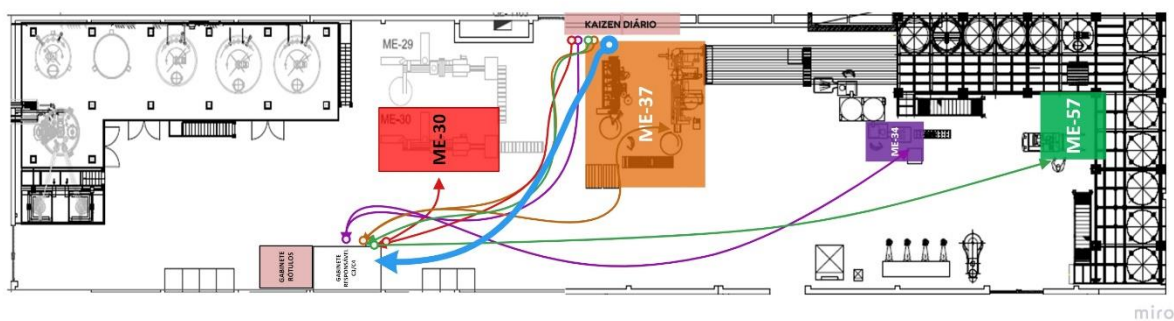


Figure 30- Spaghetti diagram before 5S methodology implementation

In the Spaghetti diagrams in Figure 31 the movements necessary are discriminated, after relocating these sheets to the daily meeting area.

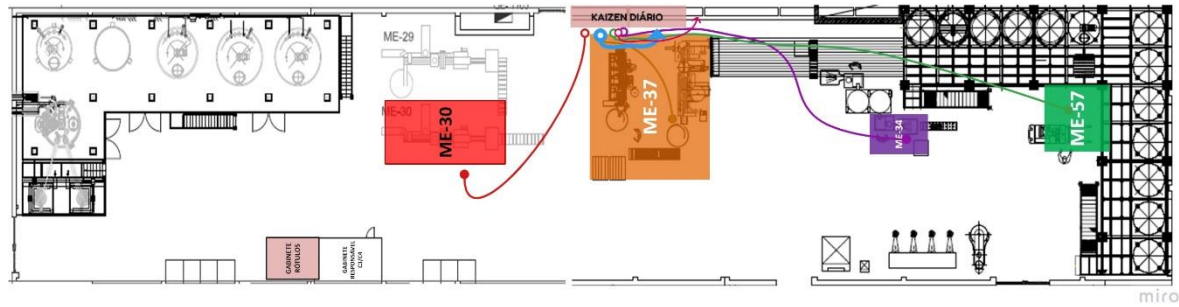


Figure 31- Spaghetti Diagram after 5S methodology implementation

The contrast between the two is clear, given that all trips to the supervisor's office were eliminated.

4.2 Waste Barrel Management

As explained in subchapter 3.2.2, the disposal of waste barrels is a constraint during setups and represents an overload in the sector's space. Therefore, the measures implemented to solve this set of problems were:

- The barrels in use were placed on wheeled monopallets (Figure 32) so that they can be transported as needed, for example to ME-37 when washing the vat, thus reducing movement and consequently setup time;
- It has been defined that at most one barrel is in use and one is placed in the second monopallet for when the first one is full;
- The manufacturing operator must put the barrels of RB and RA back on the monopallet, in case it is empty, because they are raw materials of common use on the sector.



Figure 32- Barrels of different types of residue in monopallets

After analysing the waste typology, it was found that RA did not react with humidity and therefore did not become hardened paint, regardless of the aging time. Therefore, it was defined that the RA barrels would be treated as contaminated diluent and taken to the washing area to be reused. This allowed space to be freed up in the sector, as the staging area would be assigned only to RB.

Regarding the staging area (Figure 33), it was defined that it would be in front of the gate, composed of two pallets of 4 barrels.



Figure 33- Staging Zone for RB barrels

In the case of RB, due to risk of reaction, they need a training time of at least a week, and for this reason, a sheet was placed where the date of placement of the fourth barrel on the pallet should be recorded. However, it rarely happens that this week is enough for all the barrels not to be at risk of reaction, thus justifying the second pallet.

4.3 Movement Reduction

This chapter will address the two themes introduced in Subchapter 3.2.3, about the micronage of the filling, from the point of view of the reduction of movements, one of the seven wastes.

In view of the issue presented in cases where filling occurs when the manufacturing sample is still being checked, a micronage table was added, placed next to the levelling box, to be filled in by the manufacturing operator and updated by the provisioner.

This table, shown in Figure 34, allows knowledge of the micronage of the filter to be used in the filling without having to go to quality control to verify this information in the SO.

PRODUCTO	SO	DATA	MICRAGEM	ADOTOP	DENSIDADE	TANQUE
12 330 0000	43139-1	31-5-22	150n.	NÃO	✓	TF 257
12 355 0505	53732	19-5-22	150n.	NÃO	✓	TF 260

Figure 34- Micronage Table

The manufacturing operator goes to the shelf in the daily meeting area to remove a sample bottle, which will be sent to quality control. In this process the operator transmits the information present in the SO to the micronage table so that the provisioner, when preparing the filling and taking the filter bag to the filter, has access to this information. The filter bags, as mentioned in Subchapter 3.2.1, needed to be relocated and are currently next to the micronage board. The existence of this board reduces waste in terms of time and movements.

The Spaghetti Diagrams in Figures 35 and 36 represent the impact in necessary motions that the addition of this frame provides.

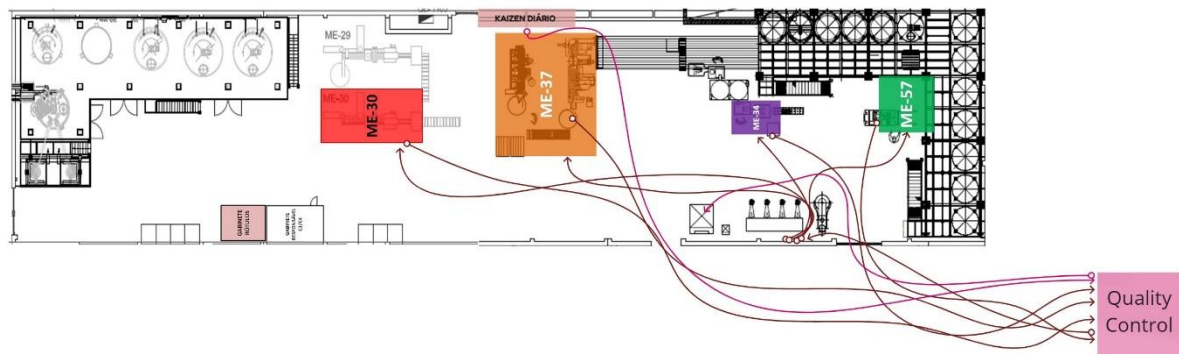


Figure 35- Spaghetti Diagram before the introduction of the Micronage table

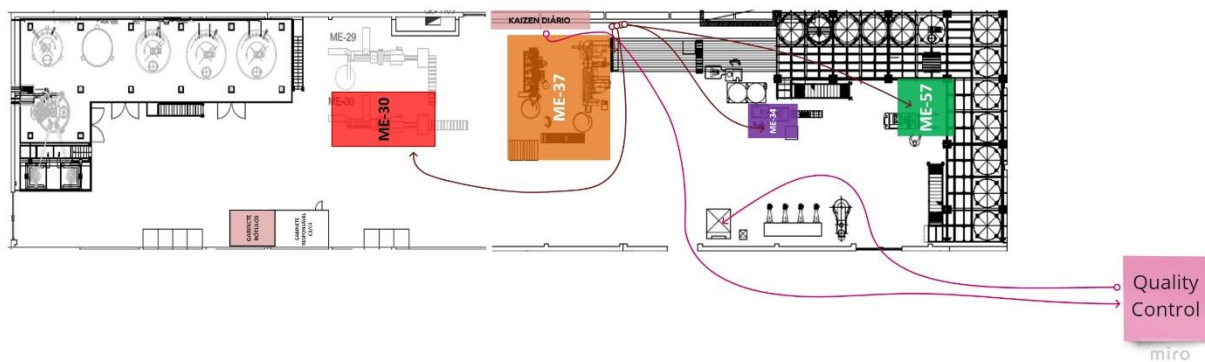


Figure 36- Spaghetti Diagram after the introduction of the Micronage table

Regarding the role of the support operator, the tasks to be carried out were listed, so that these tasks are not performed by people whose function counts directly for productivity. In order to elaborate the standard to which he should adhere, it was necessary to study the most efficient and safe order in which to carry them out, by monitoring and observing him performing them. The standard drawn up is presented in Appendix G. With this well-established function it is possible to eliminate unnecessary movement of the various operators while keeping the sectors tidy and organised.

4.4 ME-37

As previously stated, the contribution of the ME-37 line to the sector's overall productivity is determinant, reason why the focus on the resolution of the problems associated with it is of particular importance, being addressed from point 4.4.1 to point 4.4.4.

4.4.1 Stops and Micro-stops

With regard to the three main causes identified for machine downtime - cap labeler problems, line-edge full and RO-11 problems - described in Chapter 3, the problems have, for the most part, been alleviated or resolved.

Regarding the fact that the cap-labelling machine was identified as the cause of poor performance in the fills for which it was required, a request for intervention was made to maintenance. Table 6 shows the performance data, highlighting the data before and after the maintenance intervention.

Table 6- Contrast between the impact of the existence of lid labels before and after maintenance intervention

Date	Product Reference	Type	Performance	Label	Theoretical Cadence
Prior to Intervention					
18/05/2022	XXA02 YYIY Z7	Clear	44%	With lid label	19
18/05/2022	XXA02 YYBY Z7	Base	70%	Without lid label	19
19/05/2022	XXA02 YYBY Z7	Base	85%	Without lid label	19
19/05/2022	XXA02 YYBY Z7	Base	87%	Without lid label	19
19/05/2022	XXA02 YYCY Z4	Colour	64%	With lid label	10
After Intervention					
03/06/2022	XXB02 YYIY Z7	Clear	77%	With lid label	19
03/06/2022	XXB02 YYBY Z7	Base	62%	Without lid label	19
06/06/2022	XXB02 YYIY Z4	Clear	73%	With lid label	10
06/06/2022	XXB02 YYBY Z4	Base	89%	Without lid label	10
07/06/2022	XXB03 YYBY Z4	Base	87%	Without lid label	8
07/06/2022	XXB03 YYCY Z4	Colour	93%	With lid label	8

It is thus evident that after the resolution of the problem of the cap-labelling machine, the existence of a cap label on the filling is no longer a factor for lower performance of the same filling.

As for the full line, it has been an ongoing effort to instill the mentality of foreseeing stops and better organising the sequence of tasks, mentioned in Chapter 3, so that they are done more effectively. However, it is a difficult problem to solve, since in the 0.75L fillings (where it is more problematic), it is necessary to refill cans and caps approximately every 4 minutes, taking 1 minute to do these tasks. In one minute, based on the cadence, 19 cans enter the line border.

When the cadence of packaging was studied, it was concluded that it is very similar to the cadence of filling so it would take one person dedicated only to that task so that this stoppage could be eliminated.

However, by putting two people on the machine, although they increase the daily production, it does not double and therefore productivity does not increase. In this scenario, the decision will be to keep one person, investing in normalisation of tasks to best avoid the stops by full line board.

Efforts will continue to be made, such as the elimination of the metrological control filling step, with the upcoming introduction of new scales that register data automatically.

As for the RO-11 problems that required intervention by maintenance, they were also solved, and from the resolution of the problems there was a 16% reduction in non-productive minutes per day caused by RO-11 problems.

4.4.2 RO-11

As mentioned earlier, in the exposition of the problem associated with RO-11, the automatic labelling and tagging machine was identified as the bottleneck, a situation that worsened with the increase in the fill rate, a topic explored in Subchapter 4.3.3.

As one of the objectives of this project is to analyse and characterise the automatic labelling and filling process, a standard for the functioning of RO-11 was elaborated, that identifies the different components of the machine as well as how to parameterise it. Another standard was created and displayed next to station 3, regarding an efficient and quick method to parameterise it. Both these standards are shown in Appendix H.

The additional measures implemented to solve this problem were:

- The initial measurement of cadences to assess the potential for improvement;
- Study of editable parameters in the different RO-11 formats for cadence optimisation;
- Creation of a Checklist with the parameters for each format to avoid manipulation of the parameters defined as optimal.

With the implementation of these measures, very positive results were obtained, as can be seen in Table 7.

Table 7- Improvement in RO-11's cadence for 4L and 0,75L containers

Container Volume	Containers per minute				
	Initial Cadence	New Cadence	Gain	Filling Cadence	Safety Stock
4 Litres	11	17	54.55%	10	7
0,75 Litres	16	24	50%	19	5

In the 4 litre containers it was possible to increase the cadence from 11 to 17 cans per minute, which represents a gain close to 55%, and in the 0.75 litre containers it was possible to increase from 16 to 24. This increase already allows the creation of a safety stock on the conveyor connecting to the filling machine.

When optimising the parameterisation, the parameters were recorded for the creation of the above mentioned checklist. The goal is to make this checklist, present in Appendix I, available to employees by placing it in the RO-11 manual already present on the machine.

4.4.3 Filling Rate

In Subchapter 3.2.4.3, it was described that the filling rate was impaired by poor knowledge of the filling conditions. The theoretical cadences for each product and filling volume were recorded, so initially when measuring the cadences it was possible to see that most were undersized, due to the fact that the cadence was measured without much attention to the machine parameters.

There are several manipulable parameters in a filling operation, such as suction, nozzle used, actuator delay, and belt speed. These need to be understood in order to maximise the machine's cadence.

The measures implemented were:

- Identification of filling nozzles;
- Placing pressure regulators on the filling machine actuators to facilitate their adjustment;

- Analysing and recording the optimal filling nozzle and conveyor speed, depending on product and container;
- Adjusting the suction to make filling faster without dripping the can.

Appendix J contains the distinction between the different filling nozzles as well as the pressure regulators that were introduced.

In Table 8, the comparison between the documented cadence and the new achieved cadence is shown.

Table 8- Improvement in ME-37's filling rate

Product Line	Container	Containers per minute		
		Initial Cadence	New Cadence	Gain
XXA01	4 Litres	7	10	43%
	0,75 Litres	16	19	19%
XXA02	4 Litres	6	10	67%
	0,75 Litres	16	19	19%
XXB01	4 Litres	5	10	100%
	0,75 Litres	15	19	27%
XXB02	4 Litres	5	10	100%
	0,75 Litres	16	19	19%
XXB03	4 Litres	5	8	60%
	0,75 Litres	12	16	33%
XXC02	4 Litres	5	10	100%
	0,75 Litres	12	19	58%

Positive results were obtained, having managed to fix the cadence, for most products, in the 4 litre packages at 10 packages per minute and in the 0.75 litre packages at 19 cans per minute. The exception is the case of reference XXB03, due to its typology, for being a thinner product with a greater tendency to drip.

In the future, given the problem mentioned above regarding the filling operator not being able to be aware, during filling, that the machine is working below its potential resulting in low performance, after the record of optimal conditions for a particular filling is complete, the goal is to provide the filling operator with a sheet with the cadences of each product and the conditions necessary to obtain it, thus enhancing the increase in performance.

4.4.4 SMED Analysis

As explained in the previous chapter, excessively time-consuming setups are one of the biggest weaknesses when it comes to the productivity of ME-37.

As stated earlier, setups account for 26% of the machine's non-productive time, and the potential for improvement is identified as very promising. The measures implemented to reduce setup times were:

- Identification of the tasks inherent to each type of change and study of the ideal sequence;
- Redefinition and division of tasks between provisioner and filler operator;
- Identification of the tasks included in each type of change and tasks that do not require a stopped machine transformed into external tasks;
- Drafting of standards with the new sequence of tasks and respective responsible parties;
- Testing of the elaborated standards and necessary adjustments;

- Redefinition of space and floor markings.

Thus, for each type of change a survey was made of the tasks that needed to be performed, and the times of each task was recorded. These tasks were then divided between the provisioner and the filling operator, with the premise that the filling operator should not leave the respective machine, to minimise travel and so that they could work simultaneously. The tasks related to washing are the ones that originate most of the movements, while those related to machine adjustment and tool change are condensed in the space around ME-37.

The separation of internal and external tasks was made, with the external tasks being performed by the provisioner at the time defined by the schedule in the levelling box. In this way, the provisioner began the preparation of the setup about half an hour in advance.

After defining the operational flow and the separation of tasks was made, it came down to the elaboration of the standards that define the tasks to be performed, by whom and in what order, in order to eliminate the variability of the setups durations.

Six standards were hence developed regarding the tasks of the ME-37 operation changes, present in Appendix K, to be performed by the filling operator and the provisioner, those being:

- NT 32/15 – Preparação das Mudanças na Máquina ME-37;
- NT 43/15 – Tarefas de apoio nas Mudanças da ME-37;
- NT 28/15 – Mudanças de Produto Intermédio, Embalagem ou Marca;
- NT 25/15 – Lavagem da Cuba ME-37;
- NT 48/15 - Lavagem de Tanques Fixos C4.

Along with these standard documents, another checklist was added aimed to standardise and minimise the amount of diluent used in the washes required in PI setups. This checklist is present alongside the aforementioned standards in Appendix K.

Analysing in more detail the changes made to each setup typology, the details for each one are presented as follows.

M setup:

This setup typology is the least frequent and the one that consists of the largest percentage of necessarily internal tasks. It predominantly consists of label change, with the package dimensions and the product to be filled remaining the same. It was defined that the movements of the filling operator should be reduced and the premise that the operator should not leave the work area, therefore all tasks outside the machine should be performed by the provisioner.

The improvements implemented in this type of setup, to reduce the time spent and consequently increase the machine's production time, were then the elimination of the filling operator's trips to the label return and daily meeting area for the placement of the finished filling slip. It was also defined that the provisioner should make the necessary calculations and fill out the metrological control sheet before starting the setup, and this step was included in the norm for the provisioner - NT 32/15.

E setup:

The change of container volume is very similar to an image change, with the addition of having to adjust the guides and formats to the dimensions of the new container. To optimise this type of setup, it was necessary to review the floor markings and the way the machine's work area is organised, so that the replacement of packaging material could be made easily.

For such, a few measures were taken, like the removal of unnecessary material, as in the case of the table and scale in Figure 37.



Figure 37- Before and After ME-37's workspace organisation

Additionally, the decision was made to place floor markings with different colours:

- Red markings referring to any filling, in this case the allocation of the packaging material pallets, with space for two positions;
- Orange, for the allocations referring to 0.75L fillings, in this case it was necessary to define a position for Strapex, the equipment responsible for packaging the boxes (each one with six cans), and two positions for finished product pallets;
- Green, for all other fillings, with positions for three pallets.

With the floor markings, represented in Figures 38 and 39, the aim was to achieve a larger and more organised workspace. The red markings, which represent the allocations for packaging material, were placed in a vertical arrangement next to the supply plate of the RO-11 in order to allow the task of supplying material, which is the responsibility of the provisioner, to become an external task. In this way, even during filling, it is possible to have the packaging material for the current filling in one of the locations and the material for the next filling in the second, something that did not happen before because a filled location blocked access to the other.

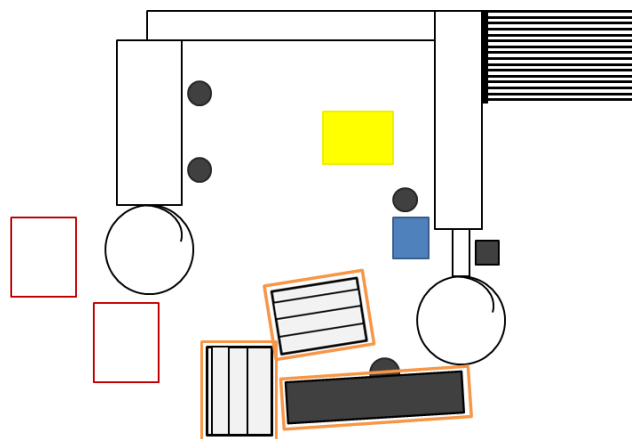


Figure 38- Floor markings for 0,75 fillings

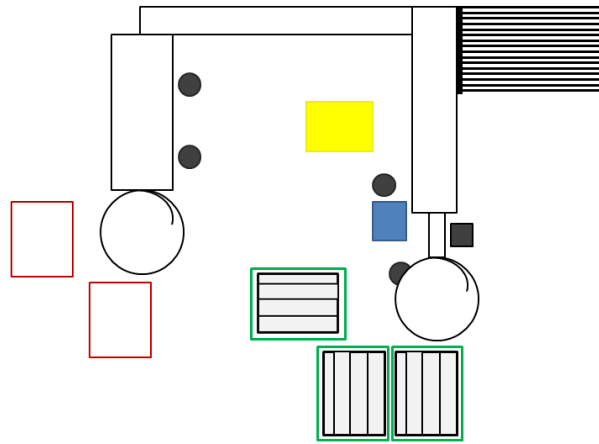


Figure 39- Floor markings for 4L fillings

In this way, as with the image change, the need for the filling operator to travel to the label return and daily meeting area for the placement of the completed packing slip was eliminated, as well as stipulating that it should be the provisioner who makes the necessary calculations and fills out the metrological control sheet. Furthermore, with the addition of one more position for packaging material, it is possible to supply the material before the packaging changeover begins, i.e. it is possible to transform it into an external task, including the placement of an empty pallet for the next filling. This transformation also applies to the placement and programming of Strapex, which is now carried out by the provisioner.

PI setup:

Product changes total 60% of the types of setups, as shown in the graph in Figure 40, so reducing the duration of these setups will have a large impact on increasing the machine's productive time. In addition, this type of change was identified as the one with the greatest potential for improvement, with the discrepancy between the target and average durations being the largest.

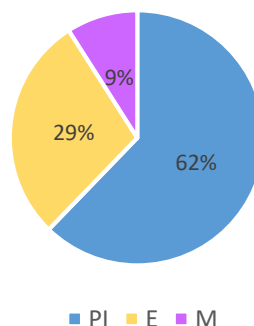


Figure 40- Pie-chart with the types of setup frequency distribution

This changeover was characterised by almost no intervention by the provisioner, thus resulting in an extensive and avoidable flow of movements. The washing, of the tank and of the tank in use, was carried out by the filling operator.

Put into context, a filling can be done through fixed tanks or mobile tanks (smaller). The tank is connected to a pump and the pump to a pipe. This piping starts in the tank area and ends at the back of the ME-37, thus connecting the piping to the filter that is connected to the tank of the machine. At the end of each fill, the tank is already empty and the product is only in the tank, and this moment is characterised by the sound of the pump pulling. Thus, the washing of the tank, whether fixed or mobile, is likely to be an external task, i.e., it can occur even while filling is taking

place. This was not the case, since this function was performed by the filling operator, who only performed this task after emptying the line edge.

In this way, the measure taken to reduce the duration of this type of changeover was the greater involvement of the provisioner, who is now performing all the washing operations, while the filling operator is limited to the adjustments of the filling machine.

The floor markings mentioned in the packaging changeover have also proved useful for this changeover in cases where the contents to be filled are also changed.

This way, the following tasks no longer have an impact on the time it takes for the filler to complete a change and start the next filling:

- Tank Washing;
- Transporting the Cleaning Agent Barrel/Cube;
- Washing the Vat;
- Storage of the labels and tags of the previous filling;
- Place the Strapex (box sealer equipment) and program it, in the fillings in which this equipment is necessary.

Therefore, with the measures being implemented, it was possible to decrease the average setup duration as presented in the graph in Figure 41, and the objectives were met.

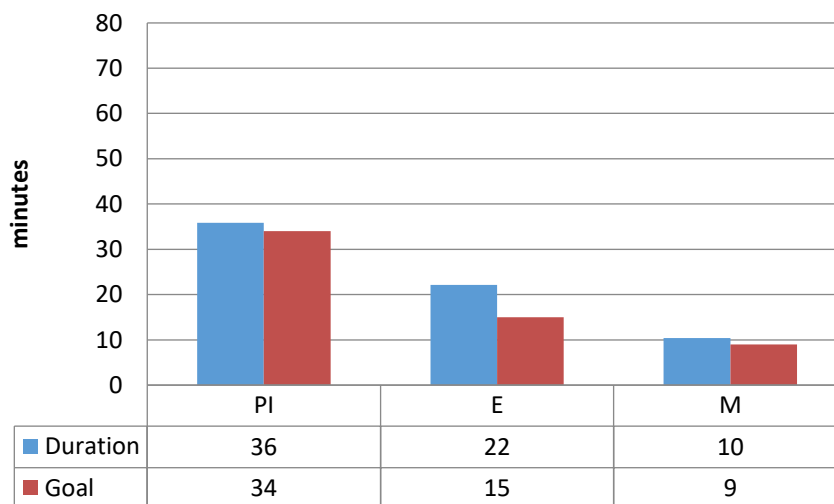


Figure 41- Comparison between duration and goal for the three types of setup after SMED implementation

The previous graph shows the average of the durations after implementation of this methodology, as of the twentieth week. As mentioned earlier, the duration of the PI and E setups was 209% higher than the target, and in the case of the M changeover 156% higher than the target. After the implementation of the SMED methodology, the PI changeover duration became only 105% higher than the target of 34 minutes, representing a 50% reduction over the initial situation. E changeover times were reduced by 29% and M changeover times by 26%.

4.5 Pipe Allocation

Given the problem described in Subchapter 3.2.5, the pipes were redefined. The following changes were made:

- Categorise the tanks by what products are fabricated in them;

- Rearrange the pipes taking into consideration the possible changeovers to reduce washes, economise and free up space and approximate the pipes to the tanks they would usually be linked to.

The scheme in Figure 42 represents the implemented changes, regarding the previous scheme showed in Chapter 3, and the current state of the tank arrangement. With the option to designate piping 12 for solvent colours, it makes it possible for both colour tanks to connect to this one, the same with piping 11 for aqueous colours.

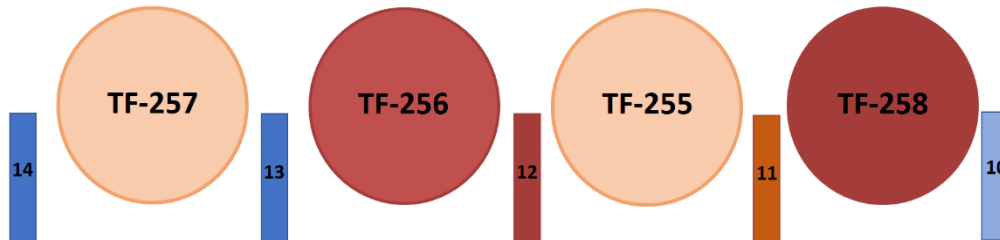


Figure 42- Visual representation of the pipes and tanks layout after changes were made

Thus, after filling the first colour it is possible to connect the tank with the second colour to the same piping used for the first filling. This represents one less wash per setup when it comes to mid-colour fillings in a colour sequence.

The elimination of the washes mentioned directly affects the time of the setups and the required moves, and it is expected that this change can have a positive impact on setup durations.

To estimate the impact that this change will have on the sector in terms of costs, breaks, and time saved, percentage of washes that could have been avoided since the beginning of the year was analysed. Colour sequence fills occur in the following list of products: XXA00; XXA02; XXA03; XXA04; XXB02; XXB03; XXC00; XXC01. These are varnishes with more than one colour. Thus, since the beginning of the year, 15% of pipe washings could have been avoided.

A pipe washing consists of the following steps:

1. Unhook the hose connecting the tubing to the tank;
2. Hitch it to the cart with the cleaning agent;
3. Pull the product into the vat, washing the tubing in the process;
4. Purge the vat.

This set of steps is equivalent to about 9 minutes, so by eliminating some of the washes that were previously thought necessary, it is possible to save time spent on intermediate product changes.

It was also possible to quantify the amount of diluent typically used in washing a colour pipe, this amount being 45 litres, and the purge totaled 57 litres, it can be estimated that the product breakage is around 12 litres.

Tables 9 and 10 present the data for each product regarding values such as price per litre of product and how much money can be saved by the avoidance of solely one wash.

Table 9- Conversion of price/kg to price/litre for different products

Material/Product	Price/kg	Density	Price/litre
Diluent	2,06 €	0,872	1,80 €
XXA02	2,43 €	1,028	2,50 €
XXB02	3,18 €	0,939	2,99 €
XXB03	2,63 €	0,856	2,25 €

Table 10- Amounts saved, volume wise and money wise, by the avoidance of one pipe wash

Material/Product	Price/litre	Saved volume per wash (L)	€ saved
Diluent	1,80 €	45	80,91 €
XXA02	2,50 €	12	29,99 €
XXB02	2,99 €	12	35,87 €
XXB03	2,25 €	12	26,99 €

By diminishing breaks of product, of approximately 12 litres as mentioned, it can also mean more filling quantity resulting in more revenue.

4.6 Visual Management of Tank Conditions

In point 3.2.6. it was described the lack of knowledge of the status of the tanks. In order to allow operators to have this information, boards were placed near the manufacturing area, specifically the scale, to have a more expeditious way to check the status of the tanks (Figure 43).

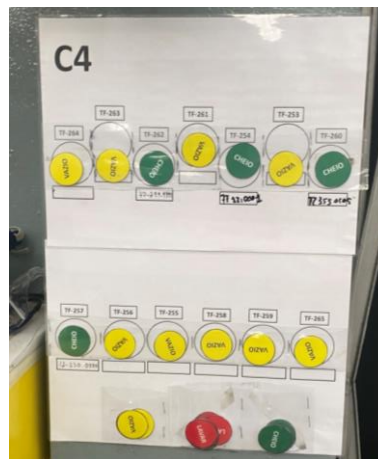


Figure 43- Tanks condition board for C4 sector

Thus, the manufacturing operator registers on the board the product he has just made, in the tank in which he made it and signals the status of full tank.

When the filling is complete, the manufacturing operator or the provisioner updates the status of the tank, to "unwashed" or "empty", if the fixed tank has already been washed. In this way, anyone involved in the process can have information about which tanks are empty and which products are being manufactured and filled.

4.7 Overall Results

Throughout the project the evolution of the sector's indicators was monitored and its progress was recorded, with greater emphasis on the two key indicators of this project - OEE and productivity. Another highly relevant data for this project is related to the evolution of the times of the different operational changes.

For the latter, the averages of each change after implementation of the improvements were presented in graph of Figure 41 in Subchapter 4.4.4. However, due to the high variability of records, the different nature of the products and the occurrence of possible anomalies, the average is not a precise indicator for the analysis of this evolution. Therefore, boxplot graphs were

prepared, shown in Figure 44 and 45, for the changes PI and E respectively, which allow us to analyse this evolution.

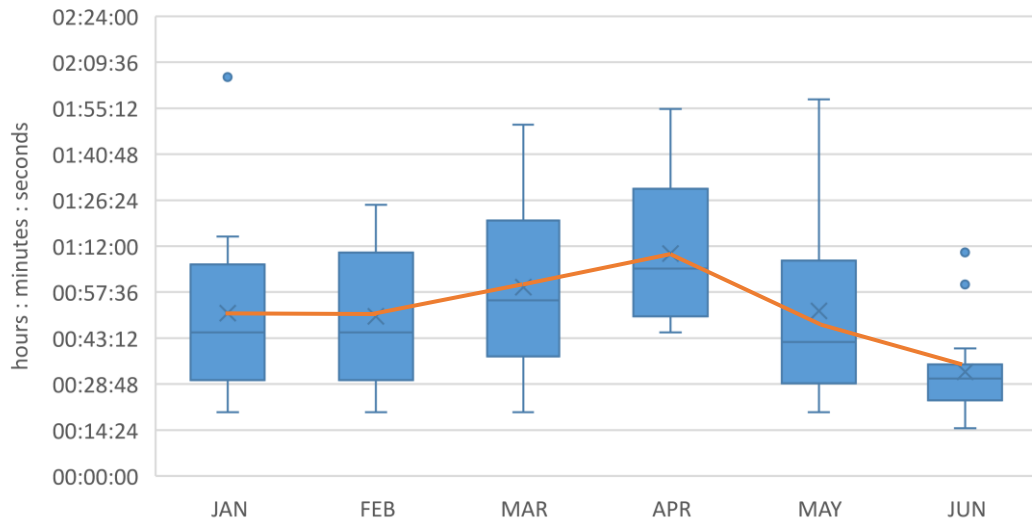


Figure 44- Boxplot chart with the evolution in PI setup durations

The analysis of the graph allows us to infer that, besides the obvious improvement in the median of PI changes, after the norms came into effect, the variability suffered a great reduction, in June, which is the month the standards were fully implemented.

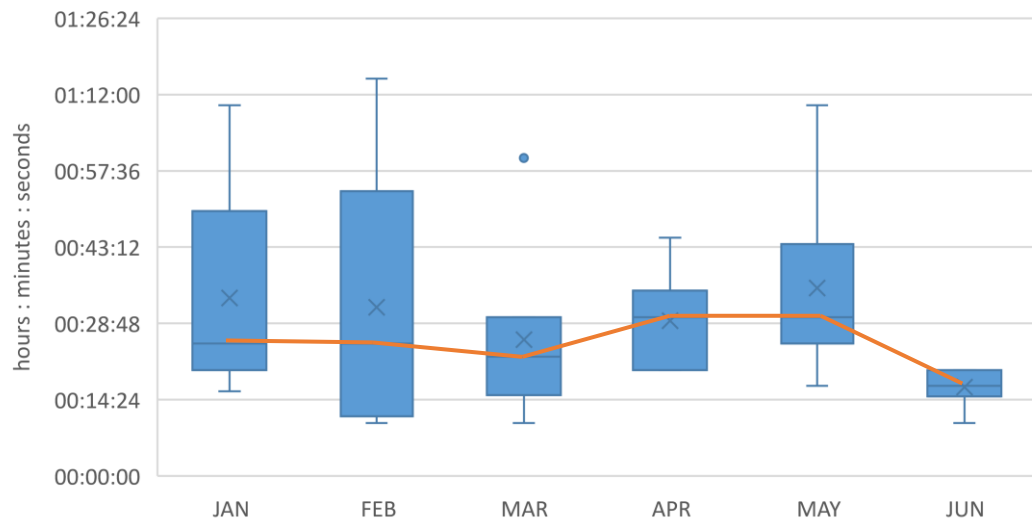


Figure 45- Boxplot chart with the evolution in E setup durations

The same is true for E setups, although the month of May did not show positive results. This is due to the fact that testing of the standards began in May, with greater focus on PI changes, as they were the most time consuming and involved more tasks in common with the other two (change of packaging and change of brand). Hence, an improvement is noted for PI changes in the month of May in terms of duration, the same not happening with E changes.

Regarding the OEE, and as previously assumed, this indicator was one of the focuses of this project. In March, when the project began, the value of the indicator was far from the goal of 46%, and the values of the month in which this project began (March) and the two previous months are shown in the graph of the Figure 46.

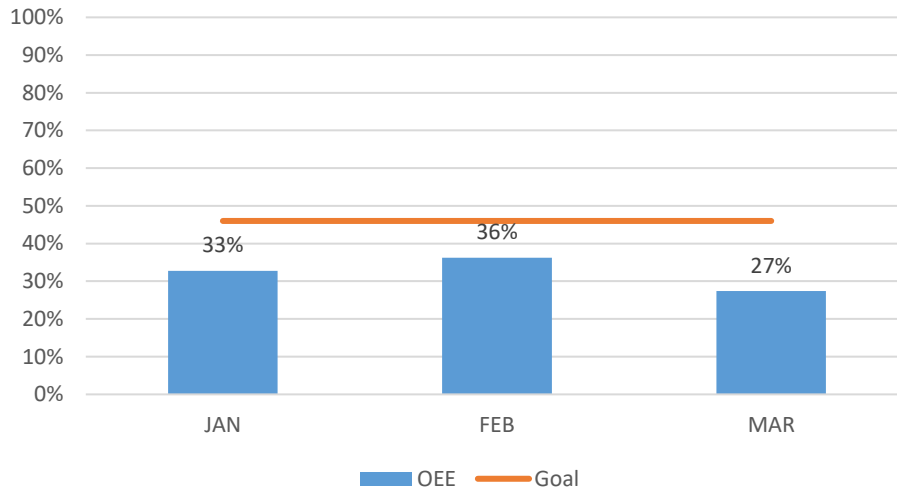


Figure 46- Average values of the OEE from January through March 2022

Given the results presented in the chart above, it is clear that the OEE is far from the goal. The improvements presented related to ME-37 aimed to improve two of the OEE aspects, availability and performance, considering quality as 100%.

In terms of availability, the only improvement explored in this project was the reduction of the setups duration, with positive results. However, due to problems of another nature, availability is still one of the machine's greatest weaknesses.

An important aspect that comes up when evaluating the way the availability evolved through the beginning of the year til June, which is shown in the bar chart in Figure 47, is how this indicator suffered a reduction in 19% from February to March and a further 17% reduction from March to April.

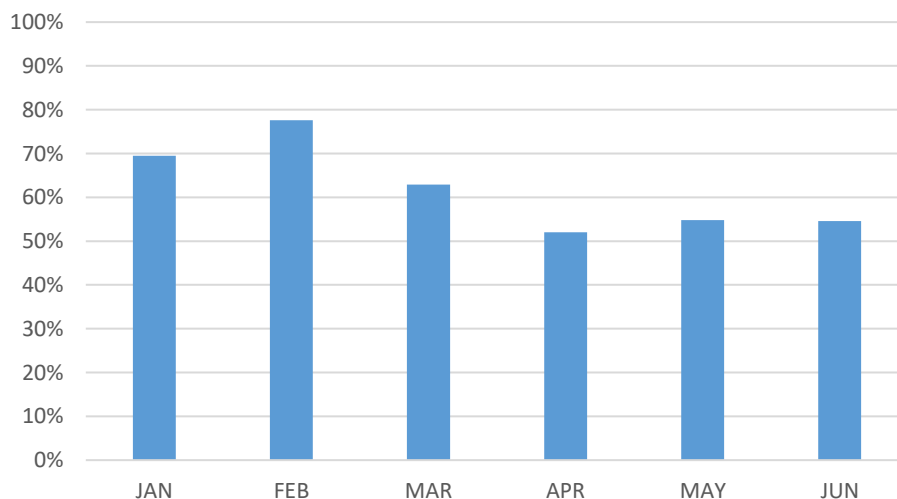


Figure 47- Evolution of the availability monthly average throughout six months

This decrease can be explained by the implementation of daily OEE meetings. Upon the start of this project and with the notion that the OEE was indeed far from target and that, in order to increase it, the registries on the OEE sheet had to be precise and faithful, it was decided that everyday an OEE reunion would be held to discuss the previous day.

This reunion showed clear improvements in that sense, and in the way the operators perceived OEE as an indicator that was meant to help them, which explains the reduction in the availability. Everyday it was discussed how the operators should go about their registries for them to be as

realistic as possible and everyday new scenarios were discussed. The problems in availability were present from the beginning but only from March were they clearly visible in the OEE records.

In terms of performance, through the solutions presented in Subchapters 4.4.2 and 4.4.3, it was possible to increase it. The values shown in the graph in Figure 48 allow us to understand the impact of these solutions.

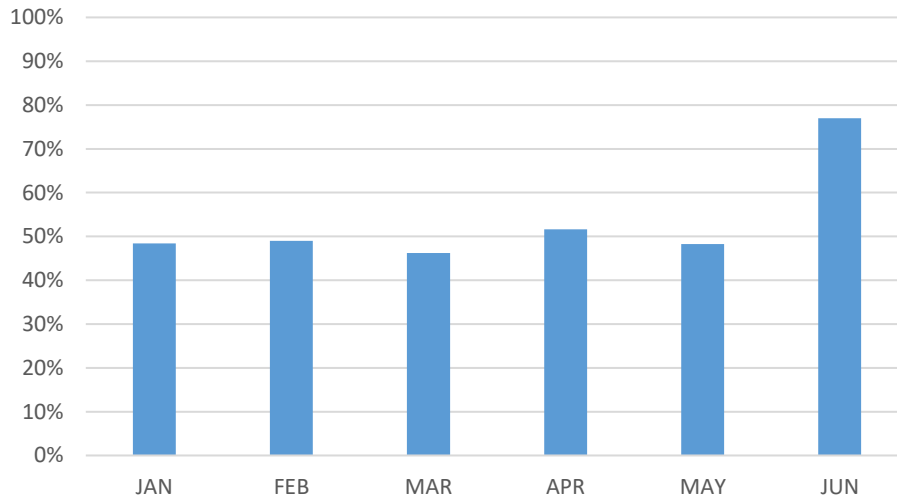


Figure 48- Evolution of the performance monthly average throughout six months

In the month of May, the performance was not positively impacted because, even though the implementation of the improvement actions was already in course, the increase of the theoretical cadence for each product was also occurring, enabling increased productivity. An interesting analysis regarding the increase in cadence of certain products consists of quantifying the gain in overall availability of the machine. From January to June, 147978 litres were produced, only of the products that underwent the increase in cadence, these being XXA01, XXA02, XXB0, XXB02, XXB03, XXC02.

Having registered the old and new cadences for each product and each filling volume, the difference between the time it would take to produce these 147978 litres of said products with its old cadences and the time the same amount would take with the new cadences was calculated. It can be affirmed that with the new cadences, the amount could be filled in 6.1 working days less, meaning that this time could have been used in more production if customer demand required so or in other activities the operator could attend to.

In addition to this, in the month of June, with the premise that the filling operator should have an understanding of what conditions are appropriate for the type of filling in hand, it was possible to increase performance, with an increase of 58% compared to the month of May, with this notion the filling operator is armed with what actions he should take so that the filling occurs with the desired cadence.

Therefore, with the increase in performance, the OEE followed. The graph in Figure 49 shows the evolution of the indicator.

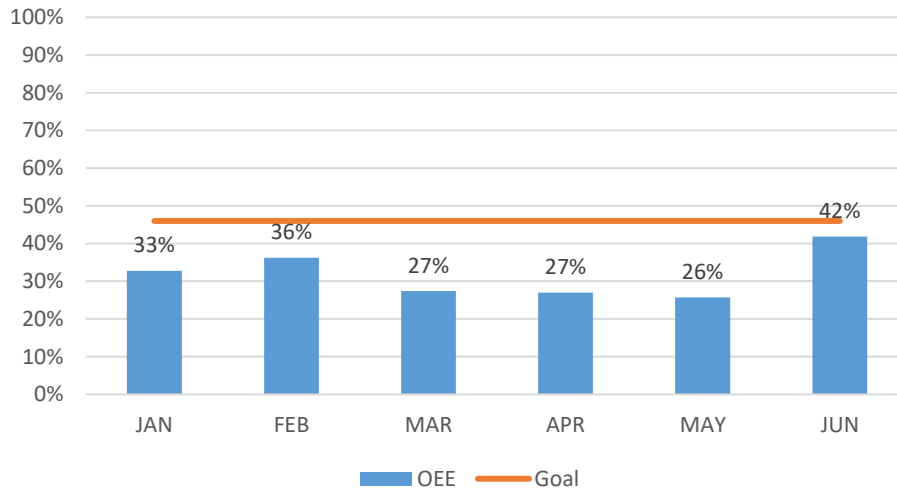


Figure 49- Monthly averages of the OEE indicator

The value shows clear improvements, but due to availability, whose evolution is displayed in the graph in Figure 50, it is not yet where it is intended to be.

Regarding productivity, this is an indicator that is extremely dependent on filled references. A day when you fill barrels (200L) cannot be compared with a day when you fill only small references, like 0.75L or even 0.25L. Given the heterogeneity of the indicator progress is not clear.

Therefore the productivity analysis refers only to the automatic filling machine, as mentioned responsible for almost 50% of the total production of the sector and with more homogeneous references, although with some variability, being the most common fillings of 0.75 and 4 litres.

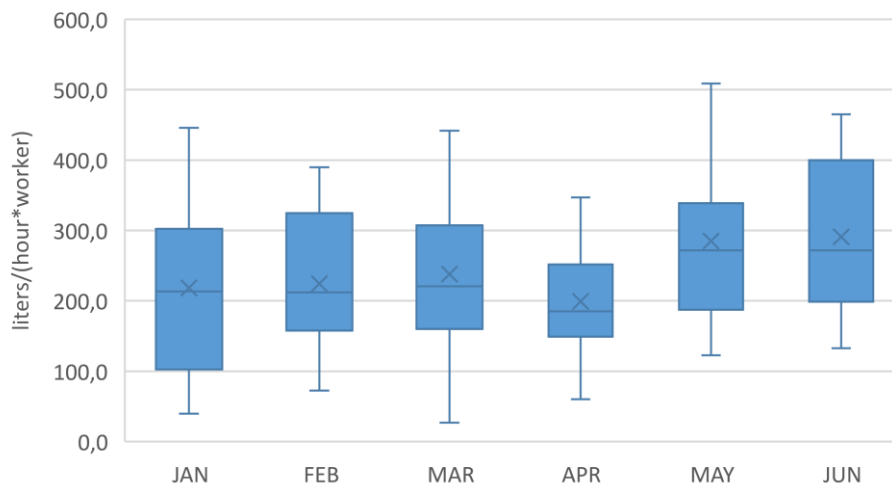


Figure 50- ME-37 productivity evolution

It was possible to fixate the median of the productivity of the machine in 271 litres/(worker*hour), due to all the effort put into the machine regarding the increase of the cadence, the reductions in setup times and the increase in the OEE indicator.

5. Conclusions

As stated in the chapter regarding the background and motivation of this project, there is a constant need to improve adaptability and responsiveness to the constant changes faced by the industry on a daily basis, with a view to increasing productivity, placing competitive prices on the market, and innovation, all while still offering customers the products they demand. As a general conclusion, it can be affirmed that the application of theoretical concepts to industrial practice, carried out within the scope of this project, allows sustained progress in the direction set out.

The present project can be subdivided into the three initial objectives and the procedures taken to achieve them: analysis and characterisation of RO-11 and ME-37, increase of OEE of ME-37 and increase of productivity.

The analysis and characterisation of RO-11 and ME-37 was a necessary objective to enable the increase of OEE. Being the only in-line labeller and labeller with filling machine in the company, a case study was necessary to understand the true weaknesses of the machine as a whole. With the elaboration of the RO-11 Operational Standard, as well as the creation of format sheets with the parameters considered optimal for each type of package to be labelled on the machine, it was possible to increase its potential and make it match the filling cadence, no longer being considered the bottleneck of the system.

Regarding the OEE increase, it was possibly the most challenging part of the project and the one that generated the most reluctance in the operators. The first step was the creation and filling of the OEE register sheet, where full quantities, stops and setups were registered, with the total monitoring of the machine to better understand the real situation and the biggest vulnerabilities and difficulties that the operator faced daily.

This initial study was very important for the better understanding of the machine, and it was from this point that the daily OEE meetings were implemented, i.e., every day the record sheet was collected, analysed and the results discussed the next day. This proved to be of great help in clarifying the operators' doubts on how to proceed with the registration, making the data more reliable. With the meetings and the sharing of ideas and involvement of the operators it was possible, to a large extent, to eliminate resistance to the real importance of the indicator and change the mentality towards a common goal.

With the measures implemented throughout the project and with the continuity of the improvements implemented so far, although the monthly average OEE has not yet reached the objective of 46%, it is expected that this value will not only be reached, but also surpassed.

Very positive results were obtained in the study of filling conditions, and in determining the parameters that allow the machine's potential to be maximised, with a 60% increase in performance in June compared with the previous month, reaching a monthly average of 77%. The involvement of the operator, as well as the awareness that a filling that appears to be normal may be below expectations and how to manipulate the machine's parameters in search of this maximisation of potential, was crucial at this stage.

Allied to this study was achieved the increase of the cadences of different products, whose impact can be estimated in 32% increase of machine availability, for the production of the products included in this study.

The SMED methodology was one of the sub-projects in ME-37 and the most challenging. The results presented did not achieve the desired degree of maturity, given the duration of the project. However, with the standardisation of the tasks and the better definition in their division by the provisioner and the filling operator, the results are encouraging, with the objective having been achieved in the case of the PI changes and being close to the objective in the case of the E and M

changes. It is expected that with the rooting of the standardised procedure and with the floor markings, already defined but not executed, the objective will be achieved.

Finally, in relation to the objective of increased productivity this was partially achieved. It is possible to verify an effective increase in the productivity of ME-37, as a result of the set of measures mentioned above, particularly the increase in cadences and performance. Regarding the sector's productivity it is not possible to verify an increase, even so the implementation of the 5S method is considered a success, as well as all the other improvements presented regarding the sector's space and the reduction of movements.

As a final conclusion, which was at the base of what can be considered a global result of great success, the openness of the company to the implementation of all the improvement solutions that were proposed, even without guarantee of efficacy, is to be highlighted. These solutions, often simple and taking advantage of the company's existing resources, revealed very positive results. The implementation of Lean and *Kaizen* methodologies proved to be effective, which also contributes to the motivation to continue implementing them.

As possibilities for future work, it would be interesting to:

- Investing in a universal point on labels, something that is already being studied, so that the camera does not need to be adjusted when there are changes in packaging, which could reduce the time spent on parameterising the camera of station 3 (tagging);
- Focusing the work on the semi-automatic filling line so that the progress seen on the automatic filling line would also be felt there;
- Assess the economic impact of the improvements implemented;
- To evaluate the ROI of the equipment to be acquired, once it has been put into operation.

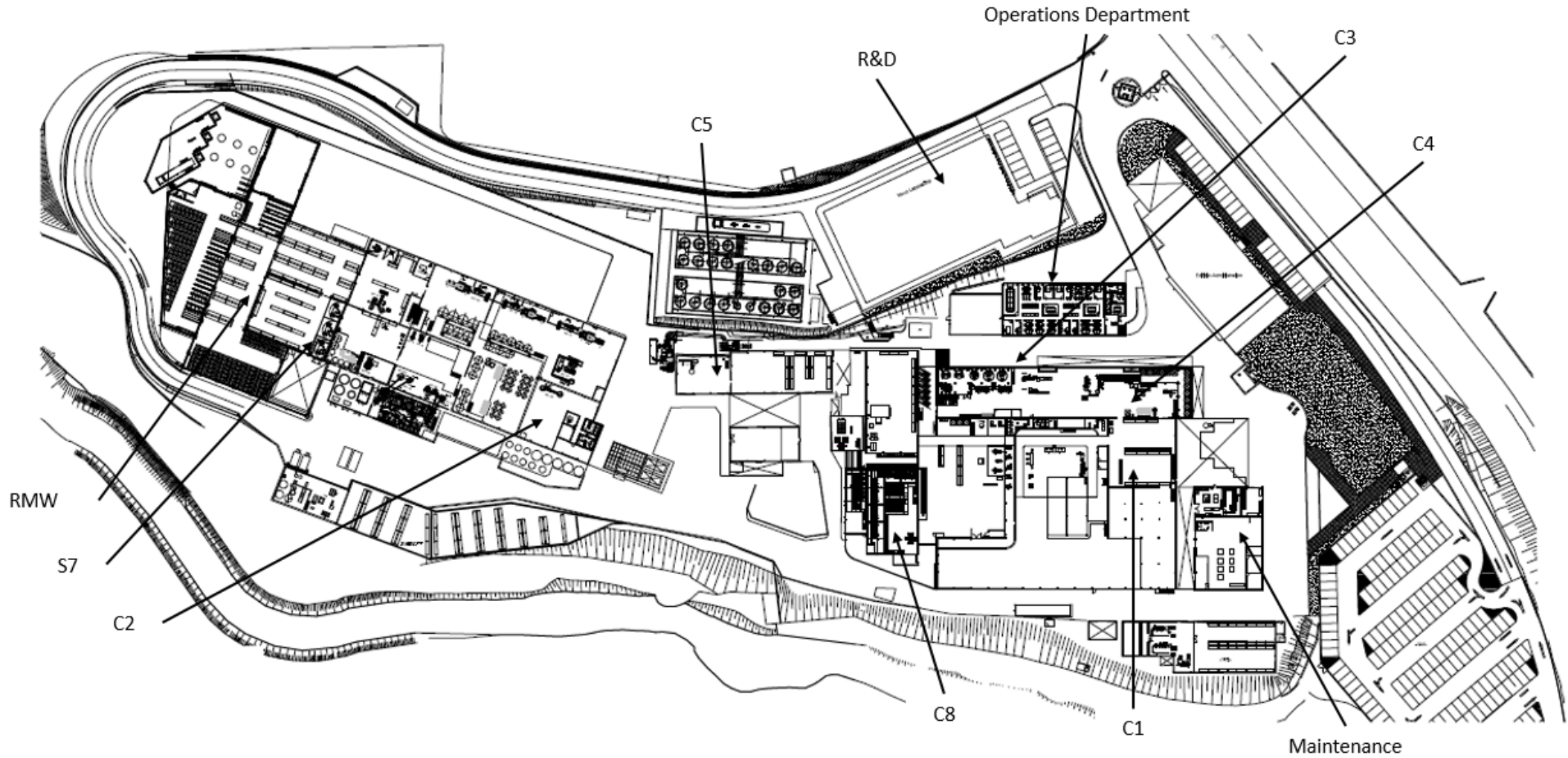
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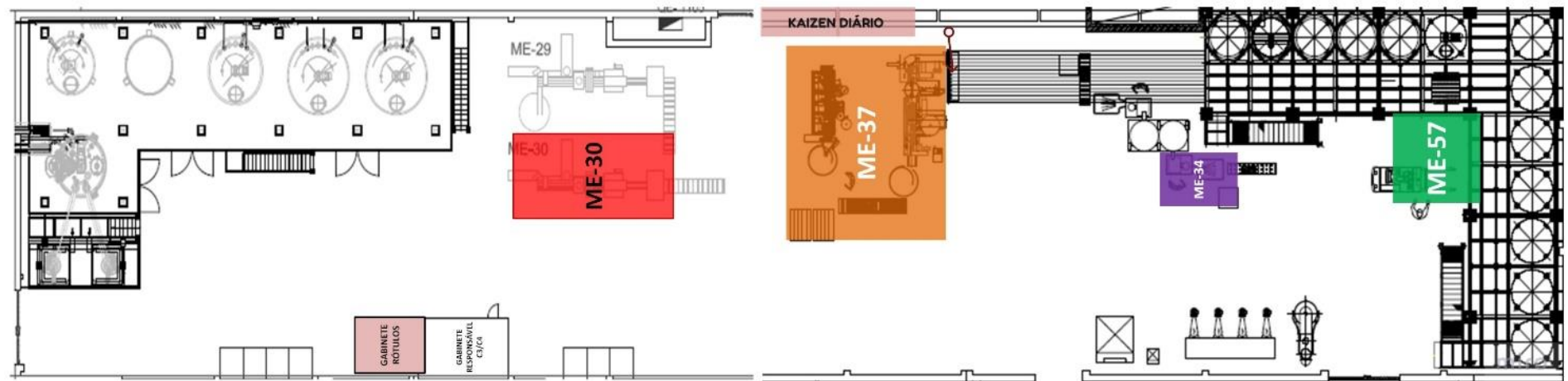
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APPENDIX

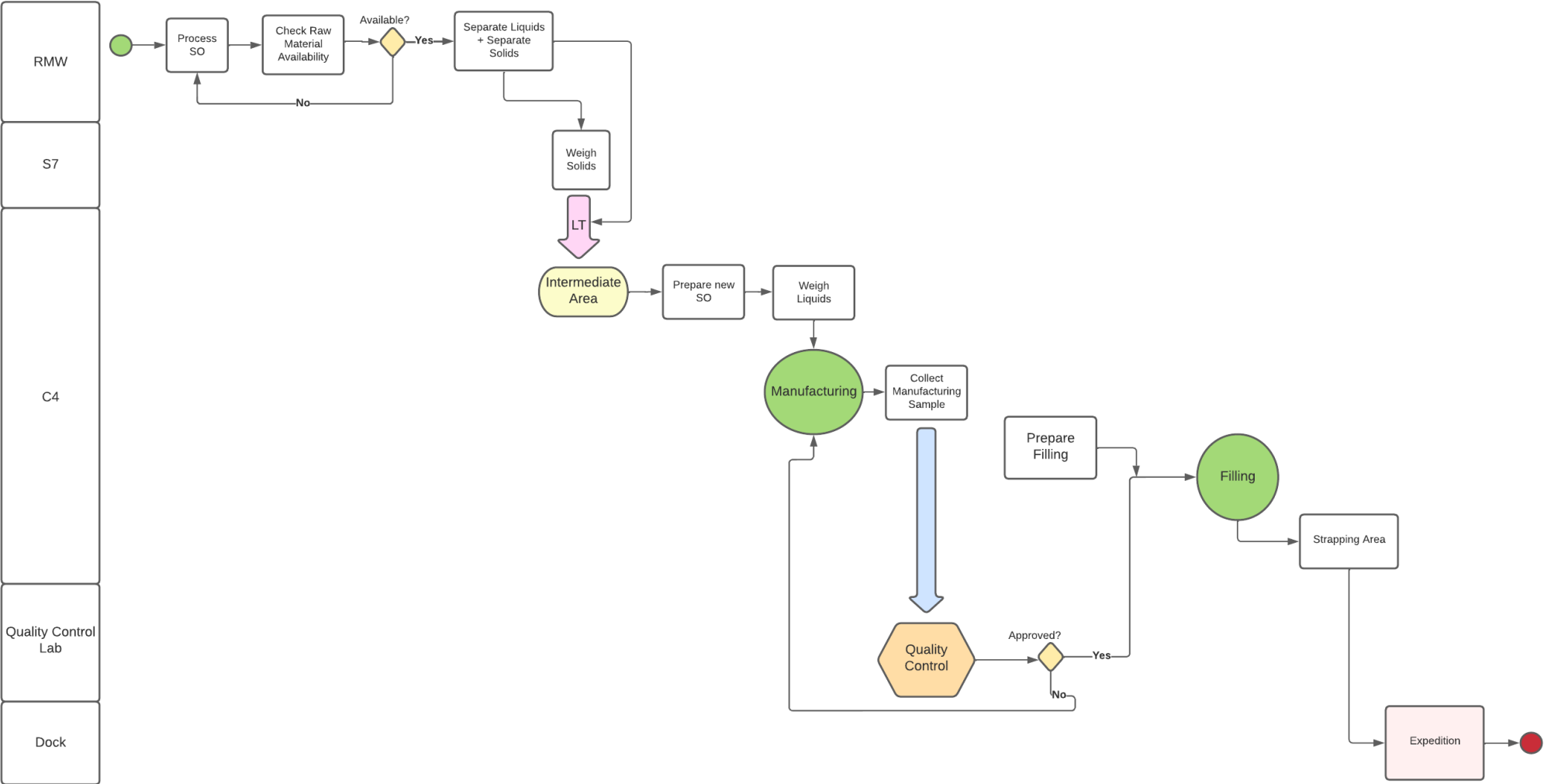
Appendix A – Plant Layout of the Company's Headquarters



Appendix B – Plant Layout of the C3 and C4 sectors



Appendix C – Swimlane of the Productive Process



Appendix D – OEE Registry Sheet

CIN

REGISTO DE DESEMPENHO DE EQUIPAMENTO

Máquina: _____

Data: _____ / _____ / _____

Hora de Abertura: _____ : _____

Hora de Fecho: _____ : _____

Microparagens

Nr Ocorrências

Qtd	Produto A	OE A	Produto B	OE B	Tipo	Hora início	Hora Fim	Setup Int.	Observações
_____	_____	_____	_____	_____	_____	_____ : _____	_____ : _____	☐	_____
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Appendix E – Procedure of the Levelling Box Standard

CIN FUNCIONAMENTO DA CAIXA DE NIVELAMENTO				
Responsável:	Responsável da Secção; Aprovisionador	Setor:	C3 e C4	NT 02/16
RESPONSÁVEL DA SECÇÃO				
Nº	Atividade	Fotografia		
1	Dirigir-se à caixa de nivelamento para programar atividades ou fazer alterações.			
2	Colocar as ordens de produção/enchimento 30 minutos antes da hora em que está programado iniciar a respetiva atividade (fabrico / enchimento). Colocar as folhas de lavagem juntamente com as Ordens de Enchimento quando está programada uma mudança de Produto Intermédio.			
3	Nas situações em que estão programadas duas atividades do aprovisionador à mesma hora, estabelecer prioridades colocando o cartão de prioridade. No caso de 3 ou mais atividades agendar para a meia hora seguinte.			
APROVISIONADOR				
Nº	Atividade	Fotografia		
1	De meia em meia hora consultar a caixa de nivelamento.			
2	Avançar a Barra do Tempo para a posição da hora atual.			

Página 1/2

DATA: 13/04/2022

ELABORADO/REVISTO: Joana Oliveira

APROVADO: João Teixeira

CIN FUNCIONAMENTO DA CAIXA DE NIVELAMENTO				
Responsável:	Responsável da Secção; Aprovisionador	Setor:	C3 e C4	NT 02/16
APROVISIONADOR				
Nº	Atividade	Fotografia		
3	Retirar e preparar/arrumar os talões colocados na hora atual ou em atraso, sendo que os talões em atraso têm prioridade sobre os colocados no momento atual. Aprovisionar em primeiro lugar o talão que se encontra mais atrasado no horário, a menos que esteja indicada prioridade. Caso não haja nenhum talão ou a preparação dos talões colocados no momento atual já tiver sido finalizada, avançar para o talão seguinte no horário.			
4	Atividades para máquinas diferentes à mesma hora: - Começar pela atividade identificada com o cartão "PRIORIDADE". Retirar o cartão "PRIORIDADE" quando retirar o talão e colocá-lo juntamente com os restantes cartões "PRIORIDADE".			

Página 2/2

DATA: 13/04/2022

ELABORADO/REVISTO: Joana Oliveira

APROVADO: João Teixeira

Appendix F– Cleaning Standards and Checklists

CIN ESCALA DE LIMPEZA C3/C4				CIN ESCALA DE LIMPEZA C3/C4																																																				
Responsável:	Operadores do C3 e C4	Setor:	C3 e C4	NT 04/16	Responsável:	Operadores do C3 e C4	Setor:	C3 e C4	NT 04/16																																															
ÁREAS DE LIMPEZA <table border="1"> <thead> <tr> <th>Nº</th> <th>ÁREAS</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Zona de enchimentos manuais e semiautomáticos C4</td> </tr> <tr> <td>2</td> <td>Zona de agitadores e dispersor C4 + Por cima da plataforma dos tanques fixos</td> </tr> <tr> <td>3</td> <td>Ecoponto C4</td> </tr> <tr> <td>4</td> <td>ME37</td> </tr> <tr> <td>5</td> <td>Zona de Reunião Diária</td> </tr> <tr> <td>6</td> <td>Ecoponto C3</td> </tr> <tr> <td>7</td> <td>Por Baixo da Plataforma – Tanques Acabamentos C3</td> </tr> <tr> <td>8</td> <td>Zona dos Moinhos + Em Cima da Plataforma DP21</td> </tr> <tr> <td>9</td> <td>ME30</td> </tr> <tr> <td>10</td> <td>Zona de placas separadoras e paletes CIN</td> </tr> <tr> <td>11</td> <td>Zona de consumíveis</td> </tr> <tr> <td>12</td> <td>Sala de Rótulos</td> </tr> </tbody> </table>					Nº	ÁREAS	1	Zona de enchimentos manuais e semiautomáticos C4	2	Zona de agitadores e dispersor C4 + Por cima da plataforma dos tanques fixos	3	Ecoponto C4	4	ME37	5	Zona de Reunião Diária	6	Ecoponto C3	7	Por Baixo da Plataforma – Tanques Acabamentos C3	8	Zona dos Moinhos + Em Cima da Plataforma DP21	9	ME30	10	Zona de placas separadoras e paletes CIN	11	Zona de consumíveis	12	Sala de Rótulos	<table border="1"> <thead> <tr> <th>Nº</th> <th>Atividade</th> <th>Fotografia</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Consultar a check-list CLK044 e verificar quais as zonas onde se deve realizar a limpeza durante a presente semana.</td> <td></td> </tr> <tr> <td>1</td> <td> Zona de enchimentos manuais e semiautomáticos C4: 1. Verificar se existem embalagens por baixo dos tanques e trocar se necessário; 2. Raspar o chão se existirem derrames; 3. Varrer a zona; 4. Colocar os resíduos no respetivo ecoponto. </td> <td> </td> </tr> <tr> <td>2</td> <td> Zona de agitadores e dispersor C4 + Por cima da plataforma dos tanques fixos: Consultar check-list CLK062. </td> <td></td> </tr> <tr> <td>3</td> <td> Ecoponto C3 e Ecoponto C4: 1. Limpar e raspar baldes do ecoponto; 2. Raspar o chão se existirem derrames; 3. Varrer a zona; 4. Colocar os resíduos no respetivo ecoponto; 5. Trocar plásticos de forrar os contentores, se necessário. </td> <td> </td> </tr> <tr> <td>4</td> <td> ME37: Consultar check-list CLK025. </td> <td></td> </tr> <tr> <td>5</td> <td> Zona de Reunião Diária 1. Varrer a zona. 2. Passar um pano nas estantes e no quadro. 3. Colocar os resíduos no respetivo ecoponto. </td> <td> </td> </tr> </tbody> </table>					Nº	Atividade	Fotografia	0	Consultar a check-list CLK044 e verificar quais as zonas onde se deve realizar a limpeza durante a presente semana.		1	Zona de enchimentos manuais e semiautomáticos C4: 1. Verificar se existem embalagens por baixo dos tanques e trocar se necessário; 2. Raspar o chão se existirem derrames; 3. Varrer a zona; 4. Colocar os resíduos no respetivo ecoponto.	 	2	Zona de agitadores e dispersor C4 + Por cima da plataforma dos tanques fixos: Consultar check-list CLK062.		3	Ecoponto C3 e Ecoponto C4: 1. Limpar e raspar baldes do ecoponto; 2. Raspar o chão se existirem derrames; 3. Varrer a zona; 4. Colocar os resíduos no respetivo ecoponto; 5. Trocar plásticos de forrar os contentores, se necessário.	 	4	ME37: Consultar check-list CLK025.		5	Zona de Reunião Diária 1. Varrer a zona. 2. Passar um pano nas estantes e no quadro. 3. Colocar os resíduos no respetivo ecoponto.	
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Página 1/3 DATA: 29-04-2022 ELABORADO/REVISTO: Joana Oliveira M. APROVADO: João Teixeira					Página 2/3 DATA: 29-04-2022 ELABORADO/REVISTO: Joana Oliveira M. APROVADO: João Teixeira																																																			

CIN		ESCALA DE LIMPEZA C3/C4		
Responsável:	Operadores do C3 e C4	Setor:	C3 e C4	NT 04/16
Nº	Atividade	Fotografia		
6	Zona de consumíveis: 1. Varrer a zona. 2. Passar um pano nas estantes. 3. Ver se todos os consumíveis estão corretamente abastecidos. 4. Colocar os resíduos no respetivo ecoponto.			
7	Por Baixo da Plataforma – Tanques Acabamentos C3: Consultar check-list CLK070.			
8	Zona dos Moinhos + Em Cima da Plataforma DP21: Consultar check-list CLK061.			
9	ME30: Consultar check-list CLK026 e NT 04/20 - Limpeza Filtro Russel.			
10	Zona de placas separadoras e paletes CIN: 1. Varrer a zona. 2. Colocar os materiais no local respetivo.			
11	Sala de Rótulos: 1. Varrer a zona. 2. Passar um pano nas estantes. 3. Ver se todos os consumíveis estão corretamente abastecidos. 4. Colocar os resíduos no respetivo ecoponto.			

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CIN		CHECK-LIST DE VALIDAÇÃO DE LIMPEZA C3/C4					CLK044 29-04-2022	
Nº	ÁREAS	Operador responsável	2ª	3ª	4ª	5ª	6ª	
1	Zona de enchimentos manuais e semiautomáticos C4							
2	Zona de agitadores e dispersor C4 + Por cima da plataforma dos tanques fixos		X	X	X	X	X	
3	Ecoponto C4							
4	ME37		X	X	X	X	X	
5	Zona da Reunião Diária							
6	Ecoponto C3							
7	Por baixo da plataforma – Tanques Acabamentos C3		X	X	X	X	X	
8	Zona dos Moinhos + Em Cima da plataforma DP21		X	X	X	X	X	
9	ME30		X	X	X	X	X	
10	Zona de placas separadoras e paletes CIN							
11	Zona de consumíveis							
12	Sala de Rótulos							

Nota: Deve ser preenchido o campo Operador Responsável e assinalar a periodicidade de limpeza das áreas 1, 3, 5, 6, 10, 11, 12.

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ELABORADO / REVISTO: Joana Oliveira M. APROVADO: João Teixeira

CIN		CHECK-LIST ME37/RO-012 (Início do Turno)					CLK025 31-03-2022	
Nº	TAREFA	VALIDAÇÃO						
		/	/	/	/	/		
1	Ligar o inkjet das embalagens. (Botão ON)	☐	☐	☐	☐	☐		
2	Ligar o interruptor principal da LSS (esperar que apareça o menu inicial antes de fazer qualquer intervenção no ecrã).	☐	☐	☐	☐	☐		
3	Ligar o ar comprimido da LSS.	☐	☐	☐	☐	☐		
4	Verificar se existem objetos estranhos no interior, nos dispensadores e nos transportadores da LSS.	☐	☐	☐	☐	☐		
5	Ligar ar geral + filtro.	☐	☐	☐	☐	☐		
6	Ligar a máquina e pressionar no botão "Arrancar" do quadro dispensador de bocais.	☐	☐	☐	☐	☐		
7	Se a máquina estiver com carga colocar a cuba em circulação.	☐	☐	☐	☐	☐		
8	Ligar o inkjet das embalagens. (Botão PLAY)	☐	☐	☐	☐	☐		
9	Abastecer Kit de Limpeza se necessário.	☐	☐	☐	☐	☐		
10	Trocar o agente de limpeza do recipiente do pincel de limpeza.	☐	☐	☐	☐	☐		
11	Limpar o dispensador das tampas e dispensador dos bocais.	☐	☐	☐	☐	☐		
12	Verificar o sistema de exaustão (estado e aspiração).	☐	☐	☐	☐	☐		
13	Verificar as manguelas do filtro e da bomba (kamelocks e condições).	☐	☐	☐	☐	☐		
14	Verificar se existem rótulos colados no rolo do dispensador de rótulos de tampas, retirando-os caso existam.	☐	☐	☐	☐	☐		
15	Verificar o Quadro de Ferramentas, mangueira de recirculação, raspadeira, manípulo e maço.	☐	☐	☐	☐	☐		
16	Colocar o bico de enchimento na máquina.	☐	☐	☐	☐	☐		
17	Abrir talão de enchimento no IFS.	☐	☐	☐	☐	☐		

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Colaborador: _____

CIN		CHECK-LIST ME37/RO-012 (Fim do Turno)					CLK025 31-03-2022	
Nº	TAREFA	VALIDAÇÃO						
		___/___/___	___/___/___	___/___/___	___/___/___	___/___/___		
1	Fechar o talão de enchimento no IFS.	☐	☐	☐	☐	☐		
2	Desligar o interruptor principal da LSS.	☐	☐	☐	☐	☐		
3	Desligar o ar comprimido da LSS.	☐	☐	☐	☐	☐		
4	Fechar todos os passadores e tubagens.	☐	☐	☐	☐	☐		
5	Desligar o ar da máquina, retirar o bico de enchimento, passar pano na rosca do bico e colocá-lo no recipiente do pincel de limpeza.	☐	☐	☐	☐	☐		
6	Limpar as aparadeiras do bico e da mangueira de recirculação.	☐	☐	☐	☐	☐		
7	Passar diluente no <i>inkjet</i> da <i>Strapex</i> . Voltar a colocar o frasco da tinta. Desligar a <i>Strapex</i> .	☐	☐	☐	☐	☐		
8	Limpar a área da balança e verificar se o símbolo de certificação está legível.	☐	☐	☐	☐	☐		
9	Parar o <i>inkjet</i> das embalagens. (Botão STOP)	☐	☐	☐	☐	☐		
10	Limpar as guias da máquina.	☐	☐	☐	☐	☐		
11	Limpar a aparadeira da máquina e o escorredor.	☐	☐	☐	☐	☐		
12	Levar latas estragadas para o ecoponto de metal.	☐	☐	☐	☐	☐		
13	Esvaziar os caixotes do lixo.	☐	☐	☐	☐	☐		
14	Retirar o bico de enchimento do recipiente, limpá-lo, passá-lo por ar comprimido e colocá-lo no Quadro de Ferramentas.	☐	☐	☐	☐	☐		
15	Desligar o <i>inkjet</i> das embalagens. (Botão OFF)	☐	☐	☐	☐	☐		

Página 2/3 Colaborador: _____

CIN		CHECK-LIST ME37/RO-012 (Fim do Turno – Sexta-Feira)					CLK025 31-03-2022	
Nº	TAREFA	VALIDAÇÃO						
		___/___/___	___/___/___	___/___/___	___/___/___	___/___/___		
1	Fazer tarefas diárias do fim de turno.	☐	☐	☐	☐	☐		
2	Limpar os dispensadores de rótulos da estação 2 e 3, utilizando um pano limpo e ☐ .	☐	☐	☐	☐	☐		
3	Limpar os rolos da estação 2 com ☐ .	☐	☐	☐	☐	☐		
4	Limpar os filtros do dispensador da estação 2 e da impressora utilizando ar comprimido.	☐	☐	☐	☐	☐		

Página 3/3 Colaborador: _____

CIN		CHECK-LIST DE LIMPEZA FABRICO C4 (INÍCIO e FIM DE TURNO)					CLK062
		VALIDAÇÃO					
N.º	TAREFA	--- / --- / ---	--- / --- / ---	--- / --- / ---	--- / --- / ---	--- / --- / ---	
Início Turno	1	Ligar sistema de extração da nave.	☐	☐	☐	☐	☐
	2	Colocar todos os tanques com produto a agitar durante 5 min e verificar se as etiquetas identificadoras estão corretas.	☐	☐	☐	☐	☐
	3	Trocar o diluente de lavagem das turbinas.					☐
Fim Turno	1	Recolher as embalagens sujas / estragadas e colocá-las no ecoponto de metal.	☐	☐	☐	☐	☐
	2	Colocar todas as ferramentas / utensílios devidamente limpos nos locais respetivos.	☐	☐	☐	☐	☐
	3	Limpar à volta dos agitadores, dispersor e da balança com ☐ e secar com panos.	☐	☐	☐	☐	☐
	4	Verificar estado de kamlocks dos tanques e limpar, se necessário.	☐	☐	☐	☐	☐
	5	Por cima da plataforma dos tanques fixos: • Recolher as embalagens sujas / estragadas e colocá-las no ecoponto de metal; • Limpar o chão com ☐ e secar com panos.	TF257, TF256, TF255	TF258, TF259, TF265	TF264, TF263	TF262 e TF261	TF254, TF253 e TF260
	6	Na zona de matérias-primas: • Verificar se a área está organizada e se não há derrames. • Recolher resíduos e colocá-los no respetivo ecoponto.	☐	☐	☐	☐	☐
Assinatura:							

Página 1/1	DATA: 12/05/2022	ELABORADO/REVISTO: Joana Oliveira M.	APROVADO: João Teixeira
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Appendix G – Logistics Operator Tasks Standard

CIN				TAREFAS DO OPERADOR DE APOIO C1, C3, C4 E C8			
Responsável:	Operador de Apoio	Setor:	C1, C3, C4, C8	NT 08/16			
		Máquina:	-				
RISCOS		EPIs					
ATENÇÃO - Sobre-esforços - Queda de carga em transporte - Queda de pessoas ao mesmo nível - Choque contra objetos e/ou pessoas - Derrames - Reação no interior dos tambores - Projecção de líquidos - Inalação de substâncias perigosas - Entalamento/ Esmagamento Para aceder a mais informação ver Portal > Aplicações > Sistema QAHS > Documentação > Análise e Avaliação de Riscos > CIN – Maia > Fab. Líquidas Industriais (C8)		Situação geral – transporte dos resíduos em porta-paletes/ empilhador ou situações em que não há presença que produtos / MP perigosos					
Para aceder a mais informação ver Portal > Aplicações > Sistema QAHS > Documentação > Análise e Avaliação de Riscos > Listagem de Equipamentos de Proteção Individual (EPIs) > CIN – Maia > Fábrica.		Situações de derrame ou manipulação de produtos/ MP perigosos					

CIN				TAREFAS DO OPERADOR DE APOIO C1, C3, C4 E C8			
Responsável:	Operador de Apoio	Setor:	C1, C3, C4, C8	NT 08/16			
		Máquina:	-				
Nº	Tarefa	Fotografia					
1	Verificar bolsas filtrantes e panos em C3/C4. Pedir, se necessário (quantidade mínima: 5 bolsas).	1					
2	Recolher carrinho de operador de apoio.	2					
3	Verificar a paleta com bolsas filtrantes em C1E e pedir, se necessário (quantidade mínima: 5 bolsas). Verificar se é necessária reposição do cubo	3					
4	Dirigir-se ao Armazém de Material Diverso com o carrinho e recolher os EPIs e outros materiais requisitados pelas secções C1, C3, C4 e C8. Simultaneamente, verificar o nível de água destilada na zona de carregamento dos porta-paletes. Se for necessário repor, proceder à reposição de no fabrico.	3					
5	Dirigir-se à secção C1E e colocar os EPIs na caixa para o efeito que se encontra na Reunião Diária. Colocar os restantes consumíveis nos locais respetivos (bolsas filtrantes, panos, pó verde, rolos de fita). Verificar necessidade de reposição de frascos em C1E. Se houver, colocar a caixa no carrinho de apoio.	3					
6	Dirigir-se à secção C1F e colocar os EPIs na caixa para o efeito que se encontra dentro do gabinete. Colocar os restantes consumíveis nos locais respetivos (panos, pó verde, rolos de fita, plásticos, sacos). Verificar necessidade de reposição de frascos em C1F. Se houver, colocar a caixa no carrinho de apoio.	5					
7	Verificar necessidade de reposição de frascos na secção dos moinhos, pesagens e pré-mistura. Se houver, colocar as caixas no carrinho de apoio.	6					
8	Dirigir-se à secção C8 e colocar os EPIs na caixa para o efeito que se encontra na Reunião Diária. Colocar restantes consumíveis numa paleta. Verificar necessidade de reposição de frascos em C8. Se houver, colocar a caixa no carrinho de apoio.	8					
9	Dirigir-se à zona da Reunião Diária de C3/C4 e colocar os EPIs de C3/C4 na caixa para o efeito. Verificar o stock de rótulos ADR e registar necessidades de reposição. Colocar os restantes consumíveis nos locais respetivos (bolsas filtrantes, panos, pó verde, rolos de fita). Verificar necessidade de reposição de frascos em C3/C4. Se houver, colocar a caixa no carrinho de apoio.	9					

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DATA: 23-06-2022

ELABORADO/REVISTO: C. Carneiro, J. O. Monteiro

APROVADO: A. Mendonça, J. Teixeira

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DATA: 23-06-2022

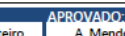
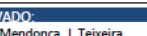
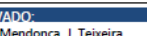
ELABORADO/REVISTO: C. Carneiro, J. O. Monteiro

APROVADO: A. Mendonça, J. Teixeira

CIN					CIN				
TAREFAS DO OPERADOR DE APOIO C1, C3, C4 E C8					TAREFAS DO OPERADOR DE APOIO C1, C3, C4 E C8				
Responsável:	Operador de Apoio	Setor:	C1, C3, C4, C8	NT 08/16	Responsável:	Operador de Apoio	Setor:	C1, C3, C4, C8	NT 08/16
		Máquina:	-				Máquina:	-	
Nº	Tarefa	Fotografia							
10	Se aplicável, recolher os frascos do Armazém I e entregar nas respetivas secções (pela mesma ordem de recolha das caixas). Estacionar carrinho de apoio.								
11	Colocar a Caixa de Rótulos C3/C4 – Etiquetagem no empilhador (caso se verifique necessário consoante o passo 12).								
12	Verificar se cubos de metal amassado junto à prensa de C1F estão cheios. Se sim, colocar no exterior e substituir por novo cubo. Verificar existência de rótulo LER 150110* (Metal Contaminado) e trazer da etiquetagem, se necessário.								
13	Entregar caixa de rótulos na Etiquetagem e recolher a presente lá.								
14	Entregar em C3/C4 a caixa de rótulos recolhida na Etiquetagem.								
15	Estacionar empilhador (se aplicável) e recolher o porta-paletes de carregamento de camião.								
16	Repor, caso seja necessário: 4: Encher cubo nos Brancos.								
17	Fazer Ecoponto de C4 (Efetuar Tarefas Nº 1 à 4 da NT 20/15).								
18	Fazer Ecoponto de C3 (Efetuar Tarefas Nº 1 à 4 da NT 27/15).								
19	Fazer Ecoponto do C1F e Lavagem e colocar resíduos no ponto de recolha exterior mais próximo. Verificar pó para recolha de derrames – pedir quando não existir nenhuma quantidade.								
20	Fazer Ecoponto da Zona de Pré mistura e colocar resíduos no ponto de recolha exterior mais próximo.								
21	Fazer Ecoponto da Afinação e Controlo de Processo e de C1E e colocar resíduos no ponto de recolha exterior mais próximo.								
22	Fazer Ecoponto do C8 e colocar resíduos no ponto de recolha exterior mais próximo.								
Nota: Em qualquer ponto de recolha (17-21), sempre que for necessário recolher sacos de Derrames e/ou Desperdícios, os mesmos devem ser colocados sobre uma paleta com um cartão para amparar possíveis derrames. No caso de ser necessária reposição de sacos avisar a chefia do setor em causa.									
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DATA: 23-06-2022					DATA: 23-06-2022				
ELABORADO/REVISTO: C. Carneiro, J. O. Monteiro					ELABORADO/REVISTO: C. Carneiro, J. O. Monteiro				
APROVADO: A. Mendonça, J. Teixeira					APROVADO: A. Mendonça, J. Teixeira				

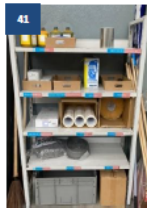
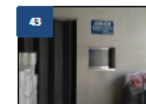
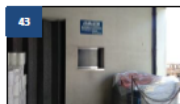
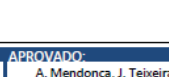
CIN

TAREFAS DO OPERADOR DE APOIO C1, C3, C4 E C8

Responsável:	Operador de Apoio	Setor:	C1, C3, C4, C8	NT 08/16
		Máquina:	-	
Nº	Tarefa	Fotografia		
29	Fazer gestão de resíduos em tambores de C3: Recolher tambores de resíduos nos Brancos (Ponto 6 da NT 27/15) e transferi-los para a Lavagem para a zona adequada. Colocar uma etiqueta corresponde ao dia atual em tambores com etiqueta LER 070304* - Diluente Sujo.			
30	Verificar necessidade de recolher cubo para água contaminada no C3. Substituir se necessário (Ponto 5 da NT 27/15).			
31	Fazer gestão de resíduos em tambores de C8: Caso existam tambores, colocá-los na zona de transição de tambores. Colocar uma etiqueta corresponde ao dia atual em tambores com etiqueta LER 070304* - Diluente Sujo.			
32	Verificar nível de solução aquosa. Se abaixo do nível, solicitar a chefia de Fabrico produção do mesmo.			
33	Verificar necessidade de trocar redes furadas presentes na máquina na Lavagem. Se sim, trocar na Manutenção e entregar no C1E.			
34	Auxiliar nas tarefas do operador de cintagem do C3/C4.			
35	13:00H Recolher empilhador de Reabastecimento do Armazém.			
36	Transportar Caixa Artigos CD – I&D para Área Técnica (NT 01/20 – pág. 1).			
37	Realizar Circuito de Amostras para Área Técnica (ver NT 07/19).			
38	Fazer gestão de resíduos em tambores dos Moinhos: Caso exista uma paleta de 4 tambores LER 070304* para recolher, colocá-la na zona da Lavagem e repor tambores vazios. Retirar todas as identificações do tambor e colocar o rótulo LER 070304* - Diluente Sujo. Colocar uma etiqueta corresponde ao dia atual em tambores com etiqueta LER 070304* - Diluente Sujo.			

CIN

TAREFAS DO OPERADOR DE APOIO C1, C3, C4 E C8

Responsável:	Operador de Apoio	Setor:	C1, C3, C4, C8	NT 08/16
		Máquina:	-	
Nº	Tarefa	Fotografia		
	Dirigir-se à Lavagem: Tambores com LER 070304* - Diluente Sujo: verificar nível de sedimentação dos tambores com a etiqueta corresponde ao dia atual (indicação de que já houve o repouso de uma semana). Esse processo deve ser realizado recorrendo à vareta de medição (quando não usada, deve estar numa lata a servir de aparadeira – caso esta não exista, repor). Caso visualmente se verifique um depósito de sedimento (cerca de 40 cm), trocar etiqueta LER 070304* - Diluente Sujo pela etiqueta LER 080111* - Resíduos de Tintas e Vernizes. Após a verificação, cintar os tambores e colocar em paletes de 4 no exterior. Nota: As paletes têm que ser cintadas com 4 tambores com o mesmo LER XXXXXX*. Caso não haja essa quantidade, aguardar que sejam transportados mais tambores para a Lavagem em circuitos seguintes.			
39				
40	Estacionar empilhador no Armazém A.			
41	Verificar stock de Fita Cola, Fita Strapex, Vedantes, Palha de Aço na zona de consumíveis C3/C4.			
42	Recolher carrinho de operador de apoio.			
43	Dirigir-se ao Armazém de Material Diverso com o carrinho e recolher os EPIs e outros materiais requisitados pelas secções C1, C3, C4 e C8.			
44	Dirigir-se à secção C1E e colocar os EPIs na caixa para o efeito que se encontra na Reunião Diária. Colocar os restantes consumíveis nos locais respetivos (bolsas filtrantes, panos, pó verde, rolos de fita).			
45	Dirigir-se à secção C1F e colocar os EPIs na caixa para o efeito que se encontra dentro do gabinete. Colocar os restantes consumíveis nos locais respetivos (panos, pó verde, rolos de fita, plásticos, sacos).			

Página 5/7

DATA: 23-06-2022

ELABORADO/REVISTO: C. Carneiro, J. O. Monteiro

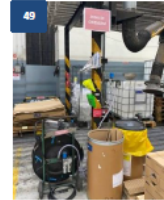
APROVADO: A. Mendonça, J. Teixeira

Página 6/7

DATA: 23-06-2022

ELABORADO/REVISTO: C. Carneiro, J. O. Monteiro

APROVADO: A. Mendonça, J. Teixeira

CIN		TAREFAS DO OPERADOR DE APOIO C1, C3, C4 E C8		
Responsável:	Operador de Apoio	Setor:	C1, C3, C4, C8	NT 08/16
		Máquina:	-	
Nº	Tarefa	Fotografia		
46	Dirigir-se à secção C8 e colocar os EPIs na caixa para o efeito que se encontra na Reunião Diária. Colocar restantes consumíveis numa paleta.			
47	Dirigir-se à zona da Reunião Diária de C3/C4 e colocar os EPIs de C3/C4 na caixa para o efeito. Colocar os restantes consumíveis nos locais respetivos (bolsas filtrantes, panos, pó verde, rolos de fita).			
48	Colocar a Caixa de Rótulos C3/C4 – Etiquetagem no carrinho de apoio/empilhador. Dirigir-se à Etiquetagem e trocar esta caixa pela presente na Etiquetagem. Transportá-la para C3/C4.			
49	Auxiliar nas tarefas do operador de cintagem do C3/C4.			
NOTA: Em todas as etapas anteriores de recolha de resíduos, ter em atenção as paletes que são usadas. Nunca devem ser utilizadas paletes COLEP, CIN ou partidas, mas sim paletes provenientes do AMP em bom estado. As mesmas encontram-se no exterior de C1/C8 ou no C3/C4 com a identificação "PALETES A DEVOLVER AO AMP". Caso nestas localizações não haja paletes, solicitar nas áreas de fabrico. Na gestão de resíduos, verificar também se na área exterior há resíduos sem identificação ou mal acondicionados. Em caso positivo, reportar à chefia.				
Página 7/7 DATA: 23-06-2022 ELABORADO/REVISTO: C. Carneiro, J. O. Monteiro APROVADO: A. Mendonça, J. Teixeira				

Appendix H – RO-11 Operations Standards

CIN			
Responsável:	Operador da Rotulagem Automática	Setor:	C1E, C4
		Máquina:	RO-011, RO-012
		NT 55/14	

FUNCIONAMENTO DA MÁQUINA DE ROTULAGEM AUTOMÁTICA LSS



CIN				NORMA DE FUNCIONAMENTO LSS			
Responsável:	Operador da Rotulagem Automática	Setor:	C1E, C4	Responsável:	Operador da Rotulagem Automática	Setor:	C1E, C4
		Máquina:	RO-011, RO-012			Máquina:	RO-011, RO-012
		NT 55/14				NT 55/14	

ELEMENTOS PRINCIPAIS

1

INTERRUPTOR PRINCIPAL

Posição ON



Posição OFF



2

LIGAÇÃO DE AR COMPRIMIDO

Posição ON



Posição OFF



3

PAINEL DE CONTROLO

Sensor da estação 1

Sensor da estação 2

Sensor da estação 3

Ecrã tátil

Botão para iniciar

Botão para parar

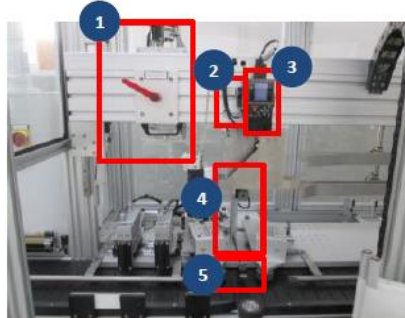
Botão de paragem de emergência

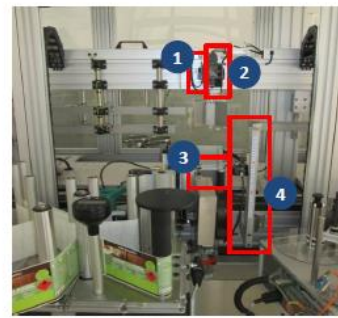
Botão para reativar



DATA:	ELABORADO/REVISTO:	APROVADO:
01-06-2022	Joana Oliveira M.	João Teixeira

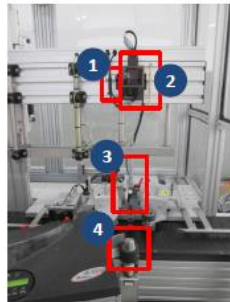
Página 1/18	DATA:	ELABORADO/REVISTO:	APROVADO:
	01-06-2022	Joana Oliveira M.	João Teixeira

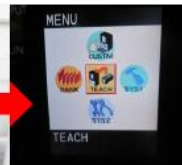
CIN		NORMA DE FUNCIONAMENTO LSS		
Responsável:	Operador da Rotulagem Automática	Setor:	C1E, C4	NT 55/14
		Máquina:	RO-011, RO-012	
4	ESTAÇÃO #1			
				
Posição de elevação da asa 1  Controlo do sensor da costura 2  Ajuste da imagem da câmara 3  Câmara 4  Contagem do sensor da costura 5 				

CIN		NORMA DE FUNCIONAMENTO LSS		
Responsável:	Operador da Rotulagem Automática	Setor:	C1E, C4	NT 55/14
		Máquina:	RO-011, RO-012	
5	ESTAÇÃO #2			
				
Controlo do sensor da costura 1  Ajuste da imagem da câmara 2  Rolos de Aplicação 3  Câmara 4 				

Página 2/18	DATA: 01-06-2022	ELABORADO/REVISTO: Joana Oliveira M.	APROVADO: João Teixeira
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Página 3/18	DATA: 01-06-2022	ELABORADO/REVISTO: Joana Oliveira M.	APROVADO: João Teixeira
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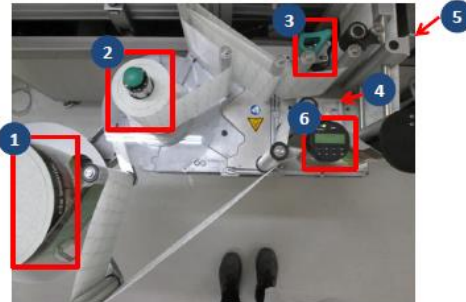
CIN		NORMA DE FUNCIONAMENTO LSS	
Responsável:	Operador da Rotulagem Automática	Setor:	C1E, C4
		Máquina:	RO-011, RO-012
			NT 55/14
6	ESTAÇÃO #3		
			
Controlo do sensor da costura 1 			
Ajuste da imagem da câmara 2 			
Câmara 3 			
Rolo de Aplicação 4 			

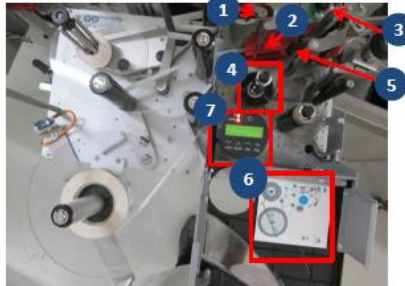
CIN		NORMA DE FUNCIONAMENTO LSS	
Responsável:	Operador da Rotulagem Automática	Setor:	C1E, C4
		Máquina:	RO-011, RO-012
			NT 55/14
7	AJUSTE DA IMAGEM DAS CÂMARAS		
Abrir tampa e deslocar o botão do centro para a posição do MENU. No ecrã aparece o MENU tal como mostra a figura.  			
Carregar no botão SET. No ecrã aparece a imagem que a câmara está a captar no momento (o que está delimitado pelo retângulo verde). Rodar a embalagem até a imagem pretendida aparecer no ecrã (pode ser necessário ajustar a altura da câmara, nesse caso consultar a altura definida para essa embalagem nas folhas de formato).  			
Caso seja necessário ajustar o tamanho do retângulo a verde: - Utilizar as setas de modo a ficar selecionado "3.SIZE"; - Carregar no botão SET; - Utilizar as setas para aumentar/diminuir o tamanho. - Quando tiver o tamanho pretendido carregar novamente na tecla SET.  			
 			

Página 4/18	DATA:	ELABORADO/REVISTO:	APROVADO:
	01-06-2022	Joana Oliveira M.	João Teixeira

Página 5/18	DATA:	ELABORADO/REVISTO:	APROVADO:
	01-06-2022	Joana Oliveira M.	João Teixeira

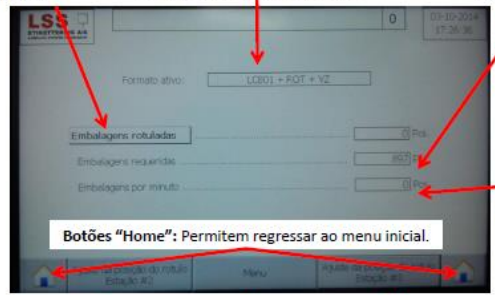
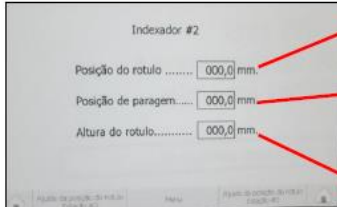
CIN				CIN			
NORMA DE FUNCIONAMENTO LSS				NORMA DE FUNCIONAMENTO LSS			
Responsável:		Operador da Rotulagem Automática		Responsável:		Operador da Rotulagem Automática	
		Setor: C1E, C4				Setor: C1E, C4	
		Máquina: RO-011, RO-012				Máquina: RO-011, RO-012	
		NT 55/14				NT 55/14	
7				7			
AJUSTE DA IMAGEM DAS CÂMARAS				AJUSTE DA IMAGEM DAS CÂMARAS			
Caso seja necessário ajustar a posição:				No final rodar a embalagem de modo a verificar que não existe mais nenhum ponto com uma classificação aceitável, ou seja, nenhum ponto onde a barra fique a verde.			
1. Utilizar as setas de modo a ficar selecionado "2. MOVE"; 2. Carregar no botão SET; 3. Utilizar as setas para deslocar o retângulo. 4. Quando estiver na posição pretendida carregar novamente na tecla SET.				Passar o botão do centro para a posição RUN.			
Quando os ajustes estiverem finalizados carregar na tecla laranja para tirar a fotografia.				A câmara está pronta a funcionar.			
Passar o botão do centro para a posição do meio (ADJ).							
Na ecrã aparece a classificação da imagem acabada de tirar (90 no caso do exemplo apresentado na imagem).							
O valor entre parênteses retos é a contagem do sensor da câmara e representa o valor mínimo para que a imagem seja classificada como aceitável. - Para ajustar este valor utilizar as setas para cima e para baixo.							
Neste caso a imagem é classificada como OK e por isso a barra está a verde. No caso da imagem não ser considerada aceitável a barra apresenta-se a vermelho, sendo necessário tirar uma nova fotografia.				Classificação da imagem			
		A verde – Imagem aceitável A vermelho – Imagem não aceitável		Contagem do sensor da câmara			
Página 6/18				Página 7/18			
DATA:		ELABORADO/REVISTO:		DATA:		ELABORADO/REVISTO:	
01-06-2022		Joana Oliveira M.		01-06-2022		Joana Oliveira M.	
		APROVADO:				APROVADO:	
		João Teixeira				João Teixeira	

CIN				NORMA DE FUNCIONAMENTO LSS			
Responsável:		Operador da Rotulagem Automática		Setor:		C1E, C4	
		Máquina:		RO-011, RO-012		NT 55/14	
8							
DISPENSADOR DE RÓTULOS							
							
							
Colocar o display em OFFLINE/ONLINE:							
1. Pressionar o 1º botão "+".							
<u>Nota:</u> O dispensador está pronto a funcionar quando o display apresenta a informação da imagem. Quando ocorre um erro/aviso a luz vermelha do status liga-se. Nestas situações corrigir o erro/aviso e em seguida pressionar o botão "+".							
 							
Puxar rótulos para a frente:							
1. Colocar o display em OFFLINE;							
2. Pressionar os botões "←" e "↑" em simultâneo.							
 							
Puxar rótulos para trás:							
1. Colocar o display em OFFLINE;							
2. Pressionar os botões "↓" e "←" em simultâneo.							
 							
Lançar rótulo:							
Pressionar o botão tal como mostra imagem.							
							
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Display							
Suporte para bobine dos rótulos:							
Para retirar o rolo rodar a peça verde. Não esquecer de voltar a apertar depois da colocação do novo rolo.							
Esquema:							
Apresenta a correta ligação dos rótulos no dispensador.							
Suporte para o papel:							
Para retirar o papel pressionar a peça verde.							
Sensor:							
Deteta a presença de rótulo. Garantir que o rótulo passa pela ranhura do sensor tal como é apresentado na figura.							
Posicionador:							
Certificar que se mantém a meia altura do papel de modo a posicioná-lo da posição correta. Para ajustar rodar para a esquerda							
Display							
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Display							
Suporte para bobine dos rótulos:							
Para retirar o rolo rodar a peça verde. Não esquecer de voltar a apertar depois da colocação do novo rolo.							
Esquema:							
Apresenta a correta ligação dos rótulos no dispensador.							
Suporte para o papel:							
Para retirar o papel pressionar a peça verde.							
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Deteta a presença de rótulo. Garantir que o rótulo passa pela ranhura do sensor tal como é apresentado na figura.							
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Certificar que se mantém a meia altura do papel de modo a posicioná-lo da posição correta. Para ajustar rodar para a esquerda							
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Suporte para bobine dos rótulos:							
Para retirar o rolo rodar a peça verde. Não esquecer de voltar a apertar depois da colocação do novo rolo.							
Esquema:							
Apresenta a correta ligação dos rótulos no dispensador.							
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Para retirar o papel pressionar a peça verde.							
Sensor:							
Deteta a presença de rótulo. Garantir que o rótulo passa pela ranhura do sensor tal como é apresentado na figura.							
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Certificar que se mantém a meia altura do papel de modo a posicioná-lo da posição correta. Para ajustar rodar para a esquerda							
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Suporte para bobine dos rótulos:							
Para retirar o rolo rodar a peça verde. Não esquecer de voltar a apertar depois da colocação do novo rolo.							
Esquema:							
Apresenta a correta ligação dos rótulos no dispensador.							
Suporte para o papel:							
Para retirar o papel pressionar a peça verde.							
Sensor:							
Deteta a presença de rótulo. Garantir que o rótulo passa pela ranhura do sensor tal como é apresentado na figura.							
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Certificar que se mantém a meia altura do papel de modo a posicioná-lo da posição correta. Para ajustar rodar para a esquerda							
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Suporte para bobine dos rótulos:							
Para retirar o rolo rodar a peça verde. Não esquecer de voltar a apertar depois da colocação do novo rolo.							
Esquema:							
Apresenta a correta ligação dos rótulos no dispensador.							
Suporte para o papel:							
Para retirar o papel pressionar a peça verde.							
Sensor:							
Deteta a presença de rótulo. Garantir que o rótulo passa pela ranhura do sensor tal como é apresentado na figura.							
Posicionador:							
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Suporte para bobine dos rótulos:							
Para retirar o rolo rodar a peça verde. Não esquecer de voltar a apertar depois da colocação do novo rolo.							
Esquema:							
Apresenta a correta ligação dos rótulos no dispensador.							
Suporte para o papel:							
Para retirar o papel pressionar a peça verde.							
Sensor:							
Deteta a presença de rótulo. Garantir que o rótulo passa pela ranhura do sensor tal como é apresentado na figura.							
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Certificar que se mantém a meia altura do papel de modo a posicioná-lo da posição correta. Para ajustar rodar para a esquerda							
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Suporte para bobine dos rótulos:							
Para retirar o rolo rodar a peça verde. Não esquecer de voltar a apertar depois da colocação do novo rolo.							
Esquema:							
Apresenta a correta ligação dos rótulos no dispensador.							
Suporte para o papel:							
Para retirar o papel pressionar a peça verde.							
Sensor:							
Deteta a presença de rótulo. Garantir que o rótulo passa pela ranhura do sensor tal como é apresentado na figura.							
Posicionador:							
Certificar que se mantém a meia altura do papel de modo a posicioná-lo da posição correta. Para ajustar rodar para a esquerda							
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Suporte para bobine dos rótulos:							
Para retirar o rolo rodar a peça verde. Não esquecer de voltar a apertar depois da colocação do novo rolo.							
Esquema:							
Apresenta a correta ligação dos rótulos no dispensador.							
Suporte para o papel:							
Para retirar o papel pressionar a peça verde.							
Sensor:							
Deteta a presença de rótulo. Garantir que o rótulo passa pela ranhura do sensor tal como é apresentado na figura.							
Posicionador:							
Certificar que se mantém a meia altura do papel de modo a posicioná-lo da posição correta. Para ajustar rodar para a esquerda							
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Display							
Suporte para bobine dos rótulos:							
Para retirar o rolo rodar a peça verde. Não esquecer de voltar a apertar depois da colocação do novo rolo.							
Esquema:							
Apresenta a correta ligação dos rótulos no dispensador.							
Suporte para o papel:							
Para retirar o papel pressionar a peça verde.							
Sensor:							
Deteta a presença de rótulo. Garantir que o rótulo passa pela ranhura do sensor tal como é apresentado na figura.							
Posicionador:							
Certificar que se mantém a meia altura do papel de modo a posicioná-lo da posição correta. Para ajustar rodar para a esquerda							
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Display							
Suporte para bobine dos rótulos:							
Para retirar o rolo rodar a peça verde. Não esquecer de voltar a apertar depois da colocação do novo rolo.							
Esquema:							
Apresenta a correta ligação dos rótulos no dispensador.							
Suporte para o papel:							
Para retirar o papel pressionar a peça verde.							
Sensor:							
Deteta a presença de rótulo. Garantir que o rótulo passa pela ranhura do sensor tal como é apresentado na figura.							
Posicionador:							
Certificar que se mantém a meia altura do papel de modo a posicioná-lo da posição correta. Para ajustar rodar para a esquerda							
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Responsável:	Operador da Rotulagem Automática	Setor:	C1E, C4
		Máquina:	RO-011, RO-012
			NT 55/14
9	IMPRESSORA/DISPENSADOR DE ETIQUETAS		
			
Rolo posicionador: 1. Garantir que se mantém nesta posição de modo a posicionar corretamente as etiquetas. Fita térmica: 4. Utiliza para a impressão de etiquetas. Posicionador: 2. As etiquetas devem encaixar na ranhura da parte de baixo e a parte de cima deve tocar nas etiquetas (sem colocar pressão sobre as mesmas). Para ajustar rodar a roda vermelha. Sensor: 5. Deteta a presença de etiquetas. Deve manter-se a meia altura da etiqueta. Para ajustar pressionar peça verde na parte superior. Sensor de espaço entre etiquetas: 3. Deteta o espaço entre etiquetas. O manual indica qual o valor do sensor para cada tipo de etiqueta. Esquema 6. Apresenta a correta ligação das etiquetas (a verde) e da fita térmica (a azul).			
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Responsável:	Operador da Rotulagem Automática	Setor:	C1E, C4
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			NT 55/14
9	IMPRESSORA/DISPENSADOR DE ETIQUETAS		
			
Ligar a impressora: Pressionar o botão da figura durante 2 segundos. 			
Selecionar formato: 1. Pressionar os 2 botões "ONLINE" e "ESC" em simultâneo; 2. Procurar o formato pretendido utilizando as setas para cima ("FEED") e para baixo ("APPLY"); 3. Após encontrar o formato pretendido pressionar o botão "ONLINE" 3 vezes. 4. O formato está selecionado. Sair do menu pressionando novamente os botões "ONLINE" e "ESC" em simultâneo. 			
Colocar o display em OFFLINE/ONLINE: 1. Pressionar botão "ONLINE". Nota: Quando se passa de OFFLINE para ONLINE é necessário pressionar "FEED" e lançar uma etiqueta para a impressora ficar pronta a funcionar. Só quando o display apresenta a informação da segunda imagem é que está pronta a funcionar. 			
Puxar etiquetas para a frente: 1. Colocar o display em OFFLINE; 2. Pressionar os botões "ONLINE" e "FEED". 			
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Responsável:		Operador da Rotulagem Automática		Setor:		C1E, C4	
		Máquina:		RO-011, RO-012		NT 55/14	
9				IMPRESSORA/DISPENSADOR DE ETIQUETAS			
				Display: 			
Puxar etiquetas para trás:							
1. Colocar o display em OFFLINE;							
2. Pressionar os botões "ONLINE" e "APPLY";							
Alterar o parâmetro do dispensador:							
1. Colocar o display em OFFLINE;							
2. Pressionar o botão "ESC";							
3. Carregar no botão "APPLY" até encontrar o menu "DISPENSER PARA";							
4. Pressionar o botão "ONLINE" 2x;							
5. Ajustar o valor para o pretendido utilizando as setas para cima e para baixo;							
6. Depois de introduzir o valor correto pressionar "ONLINE";							
7. Pressionar "ESC" até o display ficar como mostra a figura.							
Apagar o formato atual da impressora:							
1. Pressionar os botões "APPLY", "ONLINE" e "FEED" em simultâneo;							
2. Esperar até no display aparecer a informação da figura.							

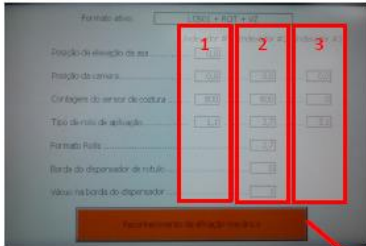
CIN				NORMA DE FUNCIONAMENTO LSS			
Responsável:		Operador da Rotulagem Automática		Setor:		C1E, C4	
		Máquina:		RO-011, RO-012		NT 55/14	
3				PAINEL DE CONTROLO			
				Menu Inicial Nº de embalagens já rotuladas. Para restaurar, ou seja colocar a zero, pressionar o retângulo "Embalagens rotuladas" durante 2 segundos. Código do formato em execução Nº de embalagens que se pretendem rotular. Para alterar ir ao Menu Principal.  Formato ativo: LORO + ROT + VZ Embalagens rotuladas: 0 Embalagens requeridas: 1000 Embalagens por minuto: 10 Botões "Home": Permitem regressar ao menu inicial. Cadência da máquina (embalagens/minuto) Ir para o menu de ajuste da colocação do rótulo na estação #2 Ir para o Menu Principal Ir para o menu de ajuste da colocação de etiquetas na estação #3			
				Ajuste da posição do rótulo Estação #2 Utilizado para fazer pequenos ajustes na colocação do rótulo na estação 2  Indexador #2 Posição do rótulo 000,0 mm. Posição de paragem 000,0 mm. Altura do rótulo 000,0 mm. Posição relativamente ao ponto de referência (costura ou imagem) onde se inicia a aplicação do rótulo na embalagem. Posição onde a embalagem para de rodar depois de se iniciar a aplicação do rótulo (sempre que se aumenta/diminui a posição do rótulo deve-se ajustar este parâmetro na mesma escala): Posição de paragem = Posição do rótulo + comprimento do rótulo + margem Altura de aplicação do rótulo na embalagem. O ponto de referência é o fundo da embalagem.			

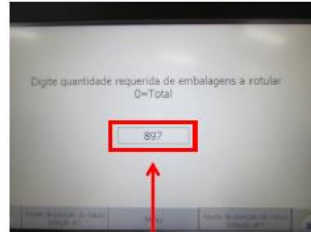
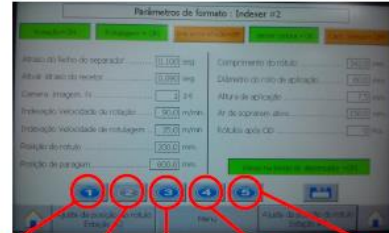
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CIN		NORMA DE FUNCIONAMENTO LSS	
Responsável:	Operador da Rotulagem Automática	Sector:	C1E, C4
		Máquina:	RO-011, RO-012
		NT 55/14	
3	PAINEL DE CONTROLO		
Ajuste da posição do rótulo Estação #3 Utilizado para fazer pequenos ajustes na colocação da etiqueta na estação 3 Indexador #3 Posição do rótulo 000,0 mm Posição de paragem 000,0 mm Altura do rótulo 000,0 mm Posição relativamente ao ponto de referência (costura ou imagem) onde se inicia a aplicação da etiqueta na embalagem. Posição onde a embalagem para de rodar depois de se iniciar a aplicação da etiqueta (sempre que se aumenta/diminui a posição do rótulo deve-se ajustar este parâmetro na mesma escala): <i>Posição de paragem = Posição do rótulo + comprimento do rótulo + margem</i> Altura de aplicação do rótulo na embalagem. A referência é o fundo da embalagem (coordenadas positivas fazem subir o rótulo).			
Menu Principal Para consultar as afinações mecânicas da máquina que o formato atual requer. 1 Para selecionar um novo formato (sempre que se altera a embalagem). 2 Configurações gerais do equipamento. Só é utilizado em intervenções de manutenção e por pessoas autorizadas (possui palavra-passe). 3 4 Para introduzir o nº de embalagens que se pretendem rotular. 5 Para alterar as configurações do formato selecionado. Só é utilizado para a criação de novos formatos e para ativar/desativar estações. 6 Para testar o funcionamento dos sensores das três estações.			
Página 14/18	DATA: 01-06-2022	ELABORADO/REVISTO: Joana Oliveira M.	APROVADO: João Teixeira

CIN		NORMA DE FUNCIONAMENTO LSS	
Responsável:	Operador da Rotulagem Automática	Sector:	C1E, C4
		Máquina:	RO-011, RO-012
		NT 55/14	
3	PAINEL DE CONTROLO		
1 Afinações mecânicas 1 – Afinações na estação 1 2 – Afinações na estação 2 3 – Afinações na estação 3 Voltar ao menu principal			
2 Lançar formato A denominação dos formatos é composta por 3 partes: I. Código da embalagem II. + ROT (se for colocado rótulo na estação #2) III. + ETIQ (se for colocado etiqueta pastilha na estação #3) Lançar Formato Product 3 1.0L C-thane primer Product 3 1.0L Full LPB01 WA LAB01 PIC LPB01 WA test EPL01 + ROT VZ LPB01 + ETIQ CH LCB01 + ROT + VZ AFL01 + ROT VZ TMT01 + ROT VZ Lançar 1. Procurar o formato pretendido utilizando as setas: Avançar de 1 em 1. Avançar de 10 em 10. 2. Pressionar a tecla "Lançar".			
Página 15/18	DATA: 01-06-2022	ELABORADO/REVISTO: Joana Oliveira M.	APROVADO: João Teixeira

CIN		NORMA DE FUNCIONAMENTO LSS	
Responsável:	Operador da Rotulagem Automática	Setor:	C1E, C4
		Máquina:	RO-011, RO-012
		NT 55/14	
3	PAINEL DE CONTROLO		
2 Lançar formato  3. Fazer as afinações mecânicas em cada estação de acordo com os parâmetros indicados no ecrã (o valor zero significa que não é necessário fazer ajustes, uma vez que não irá ser utilizado). 1 – Ajustes da estação 1 2 – Ajustes da estação 2 3 – Ajustes da estação 3 4. Pressionar o botão Laranja para informar o sistema que as afinações foram efetuadas. 5. O ecrã passa para o menu inicial. Pressionar o botão "Restabelecer" para o equipamento se ajustar ao formato pretendido.  <u>Nota:</u> Se for necessário confirmar as afinações mecânicas ir ao Menu Principal e pressionar o botão "Afinações Mecânicas".			
Página 16/18		DATA: 01-06-2022	ELABORADO/REVISTO: Joana Oliveira M. APROVADO: João Teixeira

CIN		NORMA DE FUNCIONAMENTO LSS	
Responsável:	Operador da Rotulagem Automática	Setor:	C1E, C4
		Máquina:	RO-011, RO-012
		NT 55/14	
3	PAINEL DE CONTROLO		
4 Embalagens Requeridas  3.1. Pressionar o retângulo  3.2. Digitar o nº de embalagens requeridas e pressionar 3.3. Pressionar o botão "Home" para voltar ao menu inicial.			
5 Formato Setup Neste menu é possível visualizar e alterar os vários parâmetros de cada estação. Só deve ser utilizado para criar novos formatos (não existentes) ou para ativar/desativar estações.  Parâmetros da estação 1 Parâmetros da estação 2 Parâmetros da estação 3 Afinações mecânicas Parâmetros gerais (diâmetro, altura e velocidade do tapete)			
Página 17/18		DATA: 01-06-2022	ELABORADO/REVISTO: Joana Oliveira M. APROVADO: João Teixeira

CIN

NORMA DE FUNCIONAMENTO LSS

Responsável:	Operador da Rotulagem Automática	Setor:	C1E, C4	NT 55/14
		Máquina:	RO-011, RO-012	

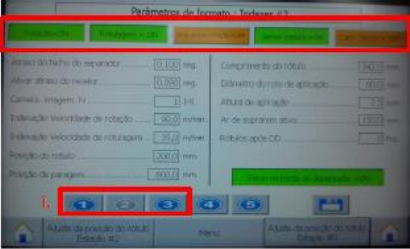
3

PAINEL DE CONTROLO

5

Formato Setup

ii.



Para desativar uma estação (isto é, colocar apenas rótulo ou etiqueta):

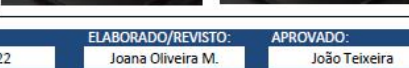
- Selecionar a estação que se pretende desativar;
- Pressionar todas as funções ativas da estação (as que se encontram a verde), de modo a ficarem com a cor laranja (=desativadas).

Página 18/18

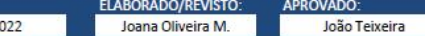
DATA:
01-06-2022

ELABORADO/REVISTO:
Joana Oliveira M.

APROVADO:
João Teixeira

CIN				PARAMETRIZAÇÃO DA ESTAÇÃO 3					
Responsável:		Operador de Enchimento		Setor:	C4	NT 19/19			
				Máquina:	ME-37				
Nº	Atividade	Fotografia							
1	Verificar se pen está inserida. Se estiver ok, avançar. Se não, falar com chefia.								
2	Clicar no botão ON.								
3	Clicar 1x em ONLINE.								
4	Clicar 1x em ESC.								
5	Clicar 4x em APPLY.								
6	Clicar 2x em ONLINE.								
7	Clicar em FEED para aumentar ou em APPLY para diminuir o valor até atingir o pretendido (29 ou 35 mm dependendo da etiqueta). Etiquetas grandes (80X20): 29mm Etiquetas pequenas (70X20): 35mm								
8	Clicar 1x em ONLINE.								

Página 1/2	DATA: 30-05-2022	ELABORADO/REVISTO: Joana Oliveira M.	APROVADO: João Teixeira
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CIN				PARAMETRIZAÇÃO DA ESTAÇÃO 3					
Responsável:		Operador de Enchimento		Setor:	C4	NT 19/19			
				Máquina:	ME-37				
Nº	Atividade	Fotografia							
9	Clicar simultaneamente em ONLINE e ESC.								
10	Selecionar o tipo de etiqueta (deve corresponder ao definido no ponto 7).								
11	Clicar 3x em ONLINE (surge um sinal sonoro).								
12	Clicar 1x em ONLINE e ESC simultaneamente.								
13	Clicar 2x em ESC.								
14	Clicar 1x em ONLINE.								
15	Clicar 1x em FEED.								
18	Repetir os passos 14 e 15 até ser dispensada uma etiqueta.								

Página 2/2	DATA: 30-05-2022	ELABORADO/REVISTO: Joana Oliveira M.	APROVADO: João Teixeira
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Appendix I – Checklist of the Editable Parameters per format in RO-11

CHECKLIST DE FORMATO - LSS

CIN

Embalagem: 4L

Embalagem: 4L

Estação 1

Atraso do fecho do separador	0,300 seg	
Ativar atraso do rolo de pressão	0,400 seg	
Camera. Imagem. N	4	
Indexação Velocidade de rotação	20 m/min	
Posição de paragem	150,0 mm	
Ativar atraso da paragem do rolo	0,560 seg	

Estação 2

Atraso do fecho do separador	0,600 seg	Comprimento do rótulo	563,0 mm
Ativar atraso do recetor	0,090 seg	Diâmetro do rolo de aplicação	59 mm
Camera. Imagem. N	4	Altura de aplicação	5 mm
Indexação Velocidade de rotação	32 m/min	Ar de sopragem ativo	10 mm
Indexação Velocidade de rotulagem	21 m/min	Rótulos após OD	0 Pcs
Posição do rótulo	100 mm		
Posição de paragem	896 mm		

Estação 3

Atraso do fecho do separador	0,250 seg	Comprimento do rótulo	70 mm
Ativar atraso do rolo de pressão	0,400 seg	Diâmetro do rolo de aplicação	60 mm
Camera. Imagem. N	4	Altura de aplicação	17 mm
Indexação Velocidade de rotação	30 m/min	Ativar atraso da paragem do rolo	0,500 seg
Indexação Velocidade de rotulagem	24 m/min	Rótulos após OD	0 Pcs
Posição do rótulo	490 mm		
Posição de paragem	800 mm		

CIN

Parâmetros de formato: gerais

Velocidade do transportador	4	Reposição	0 mm
Diâmetro embalagem	184 mm	Reposição	0 mm
Altura de guia da asa	210 mm	Reposição	0 mm
Reposição	0 mm	Reposição	0 mm
Reposição	0 mm	Reposição	0 mm
Reposição	0 mm	Reposição	0 mm
Reposição	0 mm	Reposição	0 mm

Parâmetros de formato: ajuste manual de posições mecânicas

	Indexador #1	Indexador #3	Indexador #3
Posição de elevação da asa	60		
Posição da camera	0,0	47	15,9
Contagem do sensor de costura	450	0	82
Tipo de rolo de aplicação	1,1	2,8	3,1
Formato Rolls		2,8	
Borda do dispensador de rótulo		0	
Vácuo na borda do dispensador		0	

CHECKLIST DE FORMATO - LSS

CIN

Embalagem: 0,75L

Estação 1

Atraso do fecho do separador	0,250 seg
Ativar atraso do rolo de pressão	0,250 seg
Camera. Imagem. N	1
Indexação Velocidade de rotação	90 m/min
Posição de paragem	2,0 mm
Ativar atraso da paragem do rolo	0,50 seg

Estação 2

Atraso do fecho do separador	0,200 seg	Comprimento do rótulo	327,4 mm
Ativar atraso do recetor	0,060 seg	Diâmetro do rolo de aplicação	60 mm
Camera. Imagem. N	1	Altura de aplicação	4 mm
Indexação Velocidade de rotação	35 m/min	Ar de sopragem ativo	50 mm
Indexação Velocidade de rotulagem	25 m/min	Rótulos após OD	0 Pcs
Posição do rótulo	35 mm		
Posição de paragem	450 mm		

Estação 3

Atraso do fecho do separador	0,200 seg	Comprimento do rótulo	30 mm
Ativar atraso do rolo de pressão	0,100 seg	Diâmetro do rolo de aplicação	60 mm
Camera. Imagem. N	2	Altura de aplicação	15 mm
Indexação Velocidade de rotação	30 m/min	Ativar atraso da paragem do rolo	0,400 seg
Indexação Velocidade de rotulagem	24 m/min	Rótulos após OD	0 Pcs
Posição do rótulo	205 mm		
Posição de paragem	500 mm		

Embalagem: 0,75L

CIN

Parâmetros de formato: gerais

Velocidade do transportador	4	Reposição	0 mm
Diâmetro embalagem	104 mm	Reposição	0 mm
Altura de guia da asa	300 mm	Reposição	0 mm
Reposição	0 mm	Reposição	0 mm
Reposição	0 mm	Reposição	0 mm
Reposição	0 mm	Reposição	0 mm
Reposição	0 mm	Reposição	0 mm

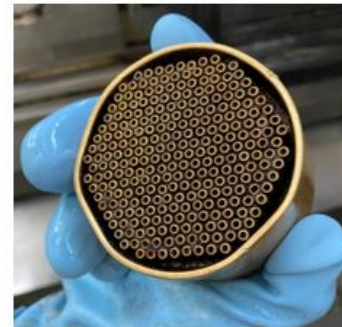
Parâmetros de formato: ajuste manual de posições mecânicas

	Indexador #1	Indexador #3	Indexador #3
Posição de elevação da asa	0,0		
Posição da camera	0,0	0,0	16,2
Contagem do sensor de costura	460	460	0
Tipo de rolo de aplicação	1,1	2,6	3,1
Formato Rolls		2,6	
Borda do dispensador de rótulo		0	
Vácuo na borda do dispensador		0	

Appendix J – Filling Nozzles and Pressure Regulators



Bico de Redes 1



Bico de enchimento 2



Bico de Redes 2



Bico de enchimento 3



Bico de enchimento 1



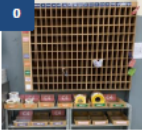
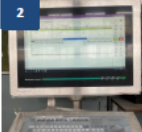
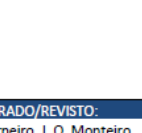
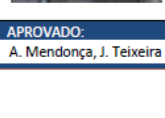
Bico de enchimento 4

CIN



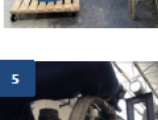
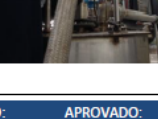
Appendix K – Elaborated Standards under SMED methodology

CIN		PREPARAÇÃO DAS MUDANÇAS DE PRODUTO INTERMÉDIO NA MÁQUINA ME37	
Responsável:	Aprovisionador	Setor:	C4
		Máquina:	ME37
NT 32/15			
RISCOS	EPIs		
ATENÇÃO  - Sobre-esforços - projecção de líquidos - Inalação, absorção, ingestão de substâncias perigosas - Entalamento - Surdez - Choque contra objectos e pessoas - Queda de carga em transporte - Queda de pessoas ao mesmo nível - Incêndio e/ou explosão Para aceder a mais informação ver Portal > Aplicações > Sistema QAHS > Documentação > Análise e Avaliação de Riscos > CIN – Maia > Vernizes	     Para aceder a mais informação ver Portal > Aplicações > Sistema QAHS > Documentação > Análise e Avaliação de Riscos > Listagem de Equipamentos de Protecção Individual (EPIs) > CIN – Maia > Fábrica.		
Página 1/3		DATA:	09/06/2022
		ELABORADO/REVISTO:	C. Carneiro, J. O. Monteiro
		APROVADO:	A. Mendonça, J. Teixeira

CIN		PREPARAÇÃO DAS MUDANÇAS DE PRODUTO INTERMÉDIO NA MÁQUINA ME37	
Responsável:	Aprovisionador	Setor:	C4
		Máquina:	ME37
NT 32/15			
Nº	Atividade	Fotografia	
0	Consultar caixa de nivelamento e recolher o trabalho colocado na hora atual (em caso de existirem talões em atraso estes têm prioridade). Verificar no quadro junto à caixa de nivelamento a micragem a utilizar.	 	
1	Recolher os rótulos pastilha respetivos e colocá-los na bancada na posição "SEGUINTE".	 	
2	Abrir a operação de preparação do posto de trabalho no IFS.	 	
3	Recolher os rótulos wraparound no armazém de rótulos (ver norma NT 11/17) e colocá-los na bancada na posição "SEGUINTE". <i>Nota:</i> se existirem rótulos na zona de retorno, transportar e arrumar os mesmos no armazém de rótulos antes de recolher os rótulos necessários.	 	
4	Caso os rótulos wraparound sejam para conteúdos de 0,25L ou 1L, dirigir-se à zona de rotulagem automática do C1 e recolher o rolo de aplicação respetivo (colocar o cartão "C4" no local do rolo no quadro de ferramentas).	 	
5	Ligar a pinça de ligação à terra e colocar o tanque em agitação.	 	
6	Recolher a bolsa filtrante e colocá-la junto ao filtro.		
7	Recolher o carrinho de apoio à lavagem e os agentes de limpeza definidos na Folha de Apoio à Lavagem e colocar junto à bomba de enchimento.		
8	Recolher as caixas e restante material necessário e colocá-lo junto à Strapex.		
9	Parar a agitação do tanque. Tanque móvel: Lavar a turbina e colocar a mesma no suporte. Transportar o tanque para a máquina.		
10	Arrumar espaço de trabalho. Remover material de embalagem que já não seja necessário, na zona de retorno ou na estante 1 no caso das embalagens com localização na mesma.		
Página 2/3		DATA:	09/06/2022
		ELABORADO/REVISTO:	C. Carneiro, J. O. Monteiro
		APROVADO:	A. Mendonça, J. Teixeira

CIN		PREPARAÇÃO DAS MUDANÇAS DE PRODUTO INTERMÉDIO NA MÁQUINA ME37	
Responsável:	Aprovisionador	Setor:	C4
		Máquina:	ME37
			NT 32/15
Nº	Atividade	Fotografia	
11	Recolher o material de embalagem: -Placas separadoras (se aplicável). -Embalagens de Supermercado (): a. Dirigir-se à estante 1 ou 7 (armazém A) e recolher as embalagens e as tampas (assinalar reposições se necessário). b. Se necessário recolher as caixas (caixas com localização no armazém A - Dirigir-se ao armazém e recolher a quantidade necessária; caixas sem localização no armazém A - Dirigir-se à estante de separação de caixas). -Outras embalagens: c. Dirigir-se à zona de separação.	 	
12	Preencher a folha de controlo metrológico de acordo com a norma NT 19/14 - Controlo Metrológico. Colocar os talões e a folha de controlo metrológico juntamente com os rótulos.		
13	Fechar a operação de preparação no IFS.		
Página 3/3		DATA: 09/06/2022	ELABORADO/REVISTO: C. Carneiro, J. O. Monteiro
		APROVADO: A. Mendonça, J. Teixeira	

CIN		TAREFAS DE APOIO NAS MUDANÇAS ME37	
Responsável:	Aprovisionador	Setor:	C4
		Máquina:	ME37
		NT 43/15	
RISCOS		EPIs	
ATENÇÃO  -Sobre-esforços - Queda de pessoas em altura - Queda de objectos em altura - Queda de carga em transporte - Enrolamento - Projecção de líquidos - Inalação, absorção, ingestão de substâncias perigosas - Entalamento - Incêndio e/ou explosão Para aceder a mais informação ver Portal > Aplicações > Sistema QAHS > Documentação > Análise e Avaliação de Riscos > CIN – Maia > Vernizes		     NOTA: Capacete obrigatório por baixo dos tanques fixos. Para aceder a mais informação ver Portal > Aplicações > Sistema QAHS > Documentação > Análise e Avaliação de Riscos > Listagem de Equipamentos de Proteção Individual (EPIs) > CIN – Maia > Fábrica.	
Página 1/4		DATA: 09/06/2022	ELABORADO/REVISTO: C. Carneiro, J. O. Monteiro
		APROVADO: A. Mendonça, J. Teixeira	

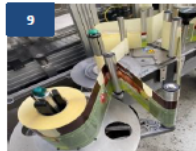
CIN		TAREFAS DE APOIO NAS MUDANÇAS ME37	
Responsável:	Aprovisionador	Setor:	C4
		Máquina:	ME37
		NT 43/15	
Nº	Atividade	Fotografia	
1	Abrir operação de preparação da ME37 no IFS.		
2	PI <u>Tanque móvel</u> - desengatar a bomba do tanque finalizado e engatá-la na panela do agente de limpeza (caso das mudanças com lavagem) ou no tanque seguinte (caso das mudanças sem lavagem). Se especificado na ordem de fabrico colocar o agitador portátil no tanque e iniciar a agitação. PI <u>Tanque fixo</u> – Colocar a quantidade referida na CLK095 - Folha de Apoio às Lavagens, do agente de limpeza respetivo, por cima do tanque. Desengatar a bomba do tanque finalizado e engatá-la na panela do agente de limpeza.	 	
3	PI Lavagem do tanque de acordo com a norma NT 48/15 – Lavagem de Tanque Fixo C4 ou transporte do tanque móvel para a zona de lavagem.		
4	PI Transportar o tambor de diluente contaminado / cubo de água contaminada para a frente da máquina.		
5	PI Lavagem da cuba de acordo com a norma NT 25/15 – Lavagem da Cuba ME-37. (Se necessário)		
6	PI 1. Certificar-se que o ar da bomba na máquina está desligado. 2. <u>Tanque fixo</u>: Deslocar a bomba para junto do tanque seguinte a ser cheio e fazer a ligação da bomba ao tanque, da bomba à tubagem e a ligação de ar comprimido. Abrir as válvulas da tubagem, da bomba e do tanque. Trocar a mangueira para a tubagem devida (na máquina). 3. <u>Tanque móvel</u>: Ligar a bomba ao tanque móvel e abrir as válvulas do tanque e da bomba.		
7	Arrumar o material de embalagem excedente na zona de retorno ou na estante 1 no caso das embalagens com localização na mesma.		
Página 2/4		DATA: 09/06/2022	ELABORADO/REVISTO: C. Carneiro, J. O. Monteiro
		APROVADO: A. Mendonça, J. Teixeira	

CIN

TAREFAS DE APOIO NAS MUDANÇAS ME37

CIN

TAREFAS DE APOIO NAS MUDANÇAS ME37

Responsável:	Aprovisionador	Setor:	C4	NT 43/15
		Máquina:	ME37	
Nº	Atividade	Fotografia		
7	Caso a localização do material seja no terceiro nível da estante 1, colocar uma etiqueta com a quantidade existente na paleta numa posição que seja visível ao nível do solo.			
8	E/M Lançar o formato pretendido na LSS e fazer os ajustes mecânicos necessários – consultar norma NT 55/14 – Norma de Funcionamento da LSS. (em elaboração) Mudança de embalagem conteúdo superior para conteúdo inferior: Antes de lançar formato mudar os rolos de aplicação da estação 2.			
9	E/M Colocar os rótulos no dispensador da estação 2.			
10	E/M Colocar as etiquetas no dispensador da estação 3 e fazer os ajustes necessários (altura, sensor de deteção da etiqueta, sensor de espaço entre etiquetas e parâmetro do dispensador – consultar manual de parametrização da estação 3).			
11	Colocar a Strapex na posição de enchimento, ajustar a mesma e programar o inkjet das caixas (se necessário).			
12	Embalagens com rotulagem manual: rotular as primeiras 20 embalagens e colocar no tapete.			
13	Colocar paleta vazia na posição de enchimento.			
14	Levar os rótulos finalizados para a sala de rótulos, as etiquetas para a caixa "Retorno de rótulos" e o talão de enchimento finalizado no tabuleiro "TALÕES CONCLUÍDOS".			
15	Verificar se existem embalagens danificadas e em caso positivo colocá-las no local respetivo (posição 2-5-1).			

Página 3/4

DATA:

09/06/2022

ELABORADO/REVISTO:

C. Carneiro, J. O. Monteiro

APROVADO:

A. Mendonça, J. Teixeira

Responsável:	Aprovisionador	Setor:	C4	NT 43/15
		Máquina:	ME37	
Nº	Atividade	Fotografia		
16	Caso existam paletes escuras colocadas de parte durante o enchimento, colocar as mesmas na localização em frente à serralharia.			
17	Caso se tenha finalizado a rotulagem de embalagens de 0,25L ou 1L, transportar o rolo para a zona de rotulagem automática no armazém L (colocar no suporte respetivo).			
18	Fechar a operação no IFS.			

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DATA:

09/06/2022

ELABORADO/REVISTO:

C. Carneiro, J. O. Monteiro

APROVADO:

A. Mendonça, J. Teixeira

CIN		MUDANÇAS PRODUTO INTERMÉDIO, EMBALAGEM OU MARCA	
Responsável:	Operador de Enchimento	Setor:	C4
		Máquina:	ME37
NT 28/15			
RISCOS		EPIs	
 -Sobre-esforços - Queda de pessoas em altura - Projecção de líquidos - Inalação, absorção, ingestão de substâncias perigosas - Entalamento Para aceder a mais informação ver Portal > Aplicações > Sistema QAHS > Documentação > Análise e Avaliação de Riscos > CIN – Maia > Vernizes		 Para aceder a mais informação ver Portal > Aplicações > Sistema QAHS > Documentação > Análise e Avaliação de Riscos > Listagem de Equipamentos de Proteção Individual (EPIs) > CIN – Maia > Fábrica.	
Página 1/4		DATA:	09/06/2022
		ELABORADO/REVISTO:	C. Carneiro, J. O. Monteiro
		APROVADO:	A. Mendonça, J. Teixeira

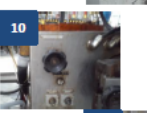
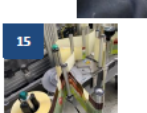
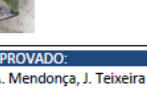
CIN		MUDANÇAS PRODUTO INTERMÉDIO, EMBALAGEM OU MARCA			
Responsável:	Operador de Enchimento	Setor:	C4		
		Máquina:	ME37		
NT 28/15					
Tempo objetivo – EMBALAGEM : 15 minutos/ MARCA: 9 minutos					
Nº	PI	E	M	Atividade	Fotografia
0	✓	✓	✓	Premir sinal sonoro, para avisar aprovisionador da mudança, quando se começar a encher a última paleta.	
1	✓	✓	✓	Esvaziar o bordo de linha caso tenha embalagens.	
2	✓	✓	✓	Fazer registo de início de setup e esvaziar a linha (colocar a aparadeira debaixo do bico de enchimento depois de encher a última lata).	
3	✓	✓	✓	Fazer o registo do controlo metrológico de acordo com a norma NT 19/14 – Controlo Metrológico e colocar as últimas embalagens na paleta.	
4	✓	✓	✓	Fazer o registo IFS do fim de enchimento e do início do enchimento seguinte.	
5	✓	✓	✓	Retirar os rótulos finalizados da etiquetadora das tampas e recolher os rótulos finalizados da LSS. Colocar os rótulos na mesa (para serem recolhidos pelo aprovisionador, juntamente com o talão de enchimento).	
6	PI (a lavagem)			Abrir bomba e puxar o produto para a cuba. Sangrar produto para recipiente e colocar o seu conteúdo de volta ao tanque.	
7	✓	✓		Ajustar a altura, o diâmetro e as guias laterais da máquina.	
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DATA:					
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ELABORADO/REVISTO:					
C. Carneiro, J. O. Monteiro					
APROVADO:					
A. Mendonça, J. Teixeira					

CIN

MUDANÇAS PRODUTO INTERMÉDIO,
EMBALAGEM OU MARCA

Responsável:	Operador de Enchimento	Setor:	C4	NT 28/15
		Máquina:	ME37	

Tempo objetivo – EMBALAGEM : 15 minutos/ MARCA: 9 minutos

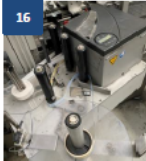
Nº	PI	E	M	Atividade	Fotografia
8	✓	✓		Ajustar o transportador.	
9	✓	✓		Ajustar as guias de ligação da LSS à máquina.	
10	✓	✓	✓	Ajustar o volume de enchimento.	
11	✓	✓		Retirar as tampas, trocar a ventosa, ajustar o dispensador de tampas e colocar tampas seguintes.	
12	✓	✓	✓	Colocar os rótulos na etiquetadora das tampas (se necessário).	
13	✓	✓	✓	Programar o inkjet das embalagens e imprimir a ordem de enchimento no talão de enchimento.	
14	✓			Lançar o formato pretendido na LSS e fazer os ajustes mecânicos necessários – consultar norma NT 55/14 – Norma de Funcionamento da LSS. (em elaboração) Mudança de embalagem conteúdo superior para conteúdo inferior: Antes de lançar formato mudar os rolos de aplicação da estação 2.	
15	✓			Colocar os rótulos no dispensador da estação 2.	

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DATA:
09/06/2022

ELABORADO/REVISTO:
C. Carneiro, J. O. Monteiro

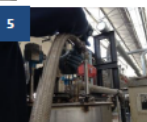
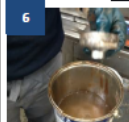
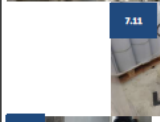
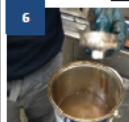
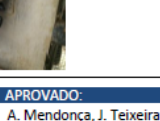
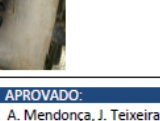
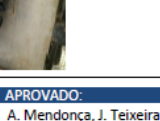
APROVADO:
A. Mendonça, J. Teixeira

CIN				MUDANÇAS PRODUTO INTERMÉDIO, EMBALAGEM OU MARCA		
Responsável:		Operador de Enchimento		Setor:	C4	NT 28/15
				Máquina:	ME37	
Tempo objetivo – EMBALAGEM : 15 minutos/ MARCA: 9 minutos						
Nº	PI	E	M	Atividade	Fotografia	
16	✓			Colocar as etiquetas no dispensador da estação 3 e fazer os ajustes necessários (altura, sensor de deteção da etiqueta, sensor de espaço entre etiquetas e parâmetro do dispensador – consultar manual de parametrização da estação 3).		
17	✓	✓	✓	Ligar o prato de abastecimento da LSS e o tapete de ligação entre a LSS e máquina de enchimento.		
18	✓	✓	✓	Iniciar o enchimento e fazer o registo do controlo metrológico de acordo com a norma NT 19/14.		
19	✓	✓	✓	Quando encher a 4ª embalagem, com peso apropriado, regista-se o fim do setup.		

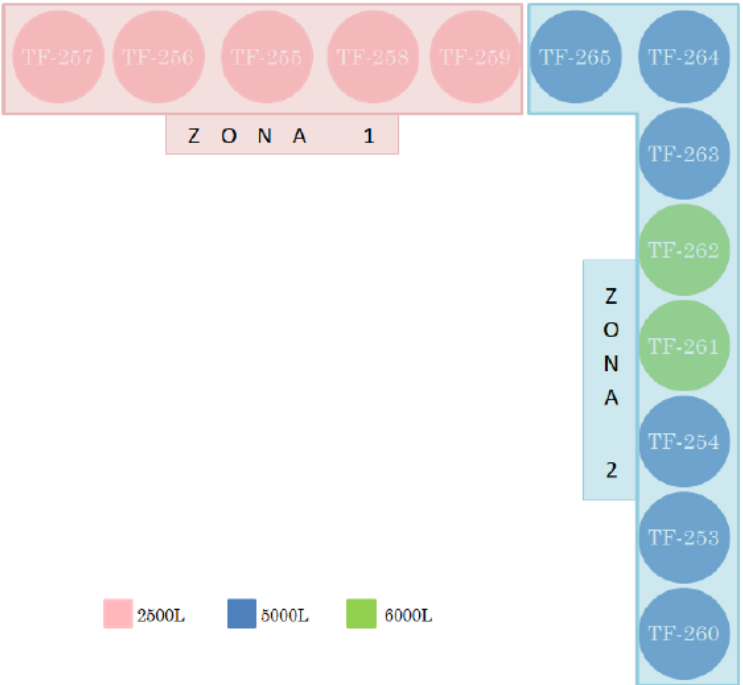
Página 4/4	DATA: 09/06/2022	ELABORADO/REVISTO: C. Carneiro, J. O. Monteiro	APROVADO: A. Mendonça, J. Teixeira
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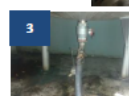
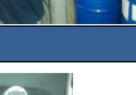
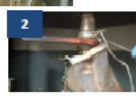
CIN		LAVAGEM DA CUBA ME37	
Responsável:	Aprovisionador, Operador de Enchimento	Setor:	C4
		Máquina:	ME37
		NT 25/15	
RISCOS		EPIs	
 - Sobre-esforços - Reação no interior dos tambores - Projecção de líquidos/ mangueira - Inalação, absorção, ingestão de substâncias perigosas - Entalamento - Surdez - Queda de pessoas em altura - Choque contra estruturas fixas Para aceder a mais informação ver Portal > Aplicações > Sistema QAHS > Documentação > Análise e Avaliação de Riscos > CIN – Maia > Vernizes		 NOTA: Capacete obrigatório por baixo dos tanques de fabrico. Para aceder a mais informação ver Portal > Aplicações > Sistema QAHS > Documentação > Análise e Avaliação de Riscos > Listagem de Equipamentos de Proteção Individual (EPIs) > CIN – Maia > Fábrica.	
Página 1/4		DATA: 08/06/2022	ELABORADO/REVISTO: C. Carneiro, J. O. Monteiro
		APROVADO: A. Mendonça, J. Teixeira	

CIN		LAVAGEM DA CUBA ME37	
Responsável:	Aprovisionador, Operador de Enchimento	Setor:	C4
		Máquina:	ME37
		NT 25/15	
LAVAGEM RÁPIDA			
Nº	Atividade	Fotografia	
1	Subir a máquina e retirar o bico de enchimento. Colocá-lo no recipiente 'bico de molho' respetivo.		
2	Engatar a mangueira de recirculação na parte de baixo da cuba. Abrir o ar da bomba e puxar o agente de limpeza para a cuba (quantidade registada na folha de apoio à lavagem).		
3	Fechar o ar da bomba. Purgar o diluente para o recipiente respetivo.		
4	Desengatar a mangueira e colocá-la no sítio respetivo. Limpar o bico de enchimento e colocá-lo na máquina.		
5	Deslocar-se ao filtro, proceder à sua limpeza e trocar a bolsa filtrante.		
6	Abrir o ar da bomba e puxar o produto seguinte para a cuba.		
7	Sangrar a cuba para o recipiente respetivo.		
8	Colocar o bico de enchimento.		
Página 2/4		DATA: 08/06/2022	ELABORADO/REVISTO: C. Carneiro, J. O. Monteiro
		APROVADO: A. Mendonça, J. Teixeira	

CIN					CIN				
LAVAGEM DA CUBA ME37					LAVAGEM DA CUBA ME37				
Responsável:	Aprovisionador, Operador de Enchimento	Sector:	C4	NT 25/15	Responsável:	Aprovisionador, Operador de Enchimento	Sector:	C4	NT 25/15
		Máquina:	ME37				Máquina:	ME37	
LAVAGEM CUIDADA									
Nº	Atividade	Fotografia			Nº	Atividade	Fotografia		
1	Subir a máquina e retirar o bico de enchimento (colocá-lo no recipiente "Bico de molho" respetivo).				7	6. Parar a recirculação e desengatar a mangueira da parte superior da cuba;			
2	Engatar a mangueira de recirculação na parte de baixo da cuba.					7. Purgar a cuba;			
3	Abrir o ar da bomba (válvula que se encontra na máquina) e puxar o agente de limpeza (quantidade registada na folha de apoio à lavagem). Fechar o ar da bomba e purgar a cuba para o recipiente respetivo.					8. Abrir o ar da bomba na máquina e puxar o 2º agente de limpeza para a cuba;			
4	Abrir o ar da bomba e puxar o resto do agente de limpeza para a cuba. Fechar o ar da bomba e lavar a cuba e as tampas com um pincel.					9. Fechar o ar da bomba e purgar a cuba;			
5	Engatar a outra extremidade da mangueira na parte superior da cuba e colocar a recircular.					10. Desengatar a mangueira da parte inferior da cuba e colocá-la no suporte por detrás do quadro de ferramentas;			
6	Limpar o bico de enchimento.				8	<u>Lavagem com 1 agente de limpeza:</u>			
7	<u>Lavagem com 2º agente de limpeza:</u>					1. Abrir o filtro, retirar a bolsa filtrante, limpá-lo e colocar a nova bolsa filtrante.			
	1. Certificar-se que o ar da bomba na máquina está desligado;					2. Parar a recirculação e desengatar a mangueira da parte superior da cuba;			
	2. No caso do enchimento ser por tubagem, deslocar a bomba para o tanque fixo seguinte, engatá-la na tubagem por onde irá ser feito o enchimento e fazer a ligação do ar comprimido.				3. Purgar a cuba para o recipiente respetivo;				
	3. Engatar a panela do 2º agente de limpeza à bomba;				4. Desengatar a mangueira da parte inferior da cuba e colocá-la no suporte por detrás do quadro de ferramentas.				
	4. Abrir as válvulas (da panela do agente de limpeza, bomba e tubagem se aplicável).				9	Abrir o ar da bomba e puxar o produto seguinte para a cuba.			
	5. Desligar o passador da tubagem junto à máquina, desengatar a mangueira da tubagem e engatar a mangueira do filtro à tubagem por onde se realizará o enchimento (se aplicável).				10	Sangrar a cuba para o recipiente respetivo.			
					11	Colocar o bico de enchimento.			
									
Página 3/4					Página 4/4				
DATA: 08/06/2022					DATA: 08/06/2022				
ELABORADO/REVISTO: C. Carneiro, J. O. Monteiro					ELABORADO/REVISTO: C. Carneiro, J. O. Monteiro				
APROVADO: A. Mendonça, J. Teixeira					APROVADO: A. Mendonça, J. Teixeira				

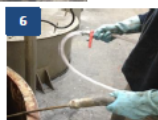
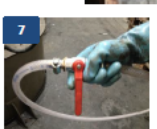
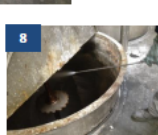
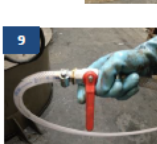
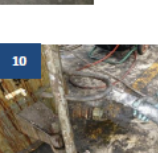
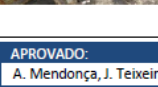
CIN		LAVAGEM TANQUE FIXO C4	
Responsável:	Aprovisionador, Operador de Fabrico	Sector:	C4
		Máquina:	Tanque Fixo
NT 48/15			
RISCOS		EPIs	
 - Sobre-esforços - projecção de líquidos - Inalação, absorção, ingestão de substâncias perigosas - Entalamento - Surdez - Choque contra objectos e pessoas - Queda de carga em transporte - Queda de pessoas ao mesmo nível - Incêndio e/ou explosão Para aceder a mais informação ver Portal > Aplicações > Sistema QAHS > Documentação > Análise e Avaliação de Riscos > CIN – Maia > Vernizes		 Para aceder a mais informação ver Portal > Aplicações > Sistema QAHS > Documentação > Análise e Avaliação de Riscos > Listagem de Equipamentos de Protecção Individual (EPIs) > CIN – Maia > Fábrica.	
Página 1/7 DATA: 01/07/2022		ELABORADO/REVISTO: C. Carneiro, J. O. Monteiro APROVADO: A. Mendonça, J. Teixeira	

CIN		LAVAGEM TANQUE FIXO C4	
Responsável:	Aprovisionador, Operador de Fabrico	Sector:	C4
		Máquina:	Tanque Fixo
NT 48/15			
Divisão de Tanques Por Zonas			
			
Página 2/7 DATA: 01/07/2022		ELABORADO/REVISTO: C. Carneiro, J. O. Monteiro APROVADO: A. Mendonça, J. Teixeira	

CIN		LAVAGEM TANQUE FIXO C4		
Responsável:	Aprovisionador, Operador de Fabrico	Sector:	C4	NT 48/15
		Máquina:	Tanque Fixo	
Nº	Atividade	Fotografia		
1	Verter quantidade de diluente mencionada na CLK095 – Folha de Apoio às Lavagens para dentro do tanque fixo e passar vassoura.			
2	Colocar recipiente debaixo do tanque fixo, no caso de não se proceder à lavagem da tubagem/cuba diretamente do tanque.			
3	Abrir válvula do tanque fixo.			
4	Retirar diluente para o recipiente.			
5	Verter diluente sujo no recipiente de borras adequado.			
Tanques Fixos da Zona 1				
1	Trazer tanque de diluente de lavagem.			
2	Colocar a bolsa filtrante no tanque fixo.			
3	Recolher bomba de lavagem e engatar a mesma à saída do tanque de lavagem.			
4	Ligar o ar comprimido da bomba de lavagem.			

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DATA: 01/07/2022 ELABORADO/REVISTO: C. Carneiro, J. O. Monteiro APROVADO: A. Mendonça, J. Teixeira

CIN		LAVAGEM TANQUE FIXO C4		
Responsável:	Aprovisionador, Operador de Fabrico	Sector:	C4	NT 48/15
		Máquina:	Tanque Fixo	
Nº	Atividade	Fotografia		
5	Abrir o passador do tanque fixo, do tanque de lavagem e da bomba de lavagem.			
6	Subir com a mangueira de lavagem e a extensão da mangueira do ar comprimido.			
7	Abrir válvula da extensão da mangueira do ar comprimido.			
8	Lavar tanque.			
9	Reduzir abertura da válvula da extensão de mangueira do ar comprimido. Prender mangueira de lavagem ao tanque e descer.			
10	Fechar a válvula do tanque de lavagem.			
11	Deixar escorrer o resto de diluente da bomba de lavagem para o tanque fixo.			

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DATA: 01/07/2022 ELABORADO/REVISTO: C. Carneiro, J. O. Monteiro APROVADO: A. Mendonça, J. Teixeira

CIN		LAVAGEM TANQUE FIXO C4			
Responsável:		Aprovisionador, Operador de Fabrico	Setor:	C4	NT 48/15
			Máquina:	Tanque Fixo	
Tanques Fixos da Zona 1					
Nº		Atividade	Fotografia		
12	COM BOMBA	Subir e fechar válvula da extensão da mangueira do ar comprimido. Descer com a extensão da mangueira do ar comprimido e com a mangueira de lavagem.			
13		Desengatar bomba de lavagem do tanque móvel. Enrolar mangueira à volta da bomba de lavagem e arrumá-la.			
14		Fechar válvula do tanque fixo.			
15		Retirar rótulos de identificação do tanque fixo.			
16		Colocar resíduos da bolsa filtrante no contentor de recolha de derrames (ecoponto).			
17		Arrumar tanque de lavagem no local respetivo.			
Tanques Fixos da Zona 2					
1	COM BOMBA	Trazer tanque de diluente de lavagem.			
2		Ir buscar bomba de lavagem e curva e engatá-la ao tanque de lavagem.			
Página 5/7		DATA: 01/07/2022	ELABORADO/REVISTO: C. Carneiro, J. O. Monteiro		APROVADO: A. Mendonça, J. Teixeira

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DATA:

01/07/2022

ELABORADO/REVISTO:

C. Carneiro, J. O. Monteiro

APROVADO:

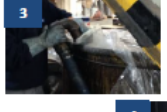
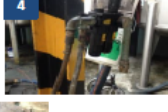
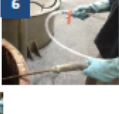
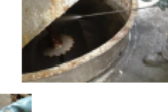
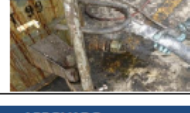
A. Mendonça, J. Teixeira

CIN

LAVAGEM TANQUE FIXO C4

Responsável:	Aprovisionador, Operador de Fabrico	Setor:	C4	NT 48/15
		Máquina:	Tanque Fixo	

Tanques Fixos da Zona 2

Nº	Atividade	Fotografia
3	Colocar curva na bolsa filtrante do tanque de lavagem.	
4	Ligar o ar comprimido da bomba de lavagem.	
5	Abrir o passador do tanque fixo, do tanque de lavagem e das duas bombas.	
6	Subir com a mangueira de lavagem e a extensão da mangueira do ar comprimido.	
7	Abrir válvula da extensão da mangueira do ar comprimido.	
8	Lavar tanque.	
9	Reduzir abertura da válvula da extensão de mangueira do ar comprimido. Prender mangueira de lavagem ao tanque e descer.	
10	Fechar a válvula do tanque de lavagem.	
11	Deixar escorrer o resto de diluente da bomba de lavagem para o tanque fixo.	

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DATA:

01/07/2022

ELABORADO/REVISTO:

C. Carneiro, J. O. Monteiro

APROVADO:

A. Mendonça, J. Teixeira

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DATA:

01/07/2022

ELABORADO/REVISTO:

C. Carneiro, J. O. Monteiro

APROVADO:

A. Mendonça, J. Teixeira

CIN		LAVAGEM TANQUE FIXO C4		
Responsável:	Aprovisionador, Operador de Fabrico	Setor:	C4	NT 48/15
		Máquina:	Tanque Fixo	
Tanques Fixos da Zona 2				
Nº	Atividade	Fotografia		
12	Subir e fechar válvula da extensão da mangueira do ar comprimido. Descer com a extensão da mangueira do ar comprimido e com a mangueira de lavagem.			
13	Fechar válvula da bomba de lavagem e desligar o ar comprimido			
14	Desengatar bomba de lavagem do Tanque móvel e enrolar mangueira à volta da bomba de lavagem e arrumar esta.			
15	Fechar válvula do tanque fixo e desligar o ar da bomba do tanque.			
16	Retirar rótulos de identificação do tanque fixo.			
17	Colocar resíduos da bolsa filtrante no contentor de recolha de derrames (ecoponto).			
18	Arrumar tanque de lavagem e curva nos locais respetivos			
COM BOMBA				
Página 7/7		DATA: 01/07/2022	ELABORADO/REVISTO: C. Carneiro, J. O. Monteiro	APROVADO: A. Mendonça, J. Teixeira

CIN		FOLHA DE APOIO ÀS LAVAGENS NA LINHA DE ENCHIMENTO AUTOMÁTICO		
Responsável:	Responsável dos Vernizes	Setor:	C4	CLK095
DATA: __/__/__				
ENCHIMENTO FINALIZADO Produto: _____		PRÓXIMO ENCHIMENTO Produto: _____ TANQUE: ☐ FIXO Nº Tanques Móveis a utilizar: _____ ☐ MÓVEL ☐ TUBAGEM		
TIPO DE LAVAGEM: ☐ RÁPIDA (MESMA FAMÍLIA E COR DIFERENTE) – 40L do Agente de Limpeza				
AGENTE DE LIMPEZA: ☐ _____ ☐ _____				
☐ CUIDADA (FAMÍLIA DIFERENTE OU PASSAGEM DE COR PARA INCOLOR): - 1º Agente de Limpeza - 60L → 30L circuito completo 30L só tubagem e cuba (ligar tubagem ao carrinho do agente de limpeza) - 2º Agente de Limpeza - 20L do Agente de Limpeza da natureza do enchimento seguinte				
AGENTES DE LIMPEZA: ☐ 1º Agente - _____ 2º Agente: _____ ☐ 1º Agente - _____ / 2º Agente: _____				
☐ SEM LAVAGEM				
Observações:				
SANGRAMENTO (Início de enchimento):				
☐ TAMBOR _____ ☐ TAMBOR DE DILUENTE SUJO ENDURECEDOR – LER 070304* ☐ CUBO ÁGUA CONTAMINADA – LER 161001* ☐ TAMBOR DE DILUENTE SUJO – LER 070304*				
Nº Baldes a sangrar (Caso Sem Lavagem): _____				
DATA:		ELABORADO/REVISTO:		APROVADO:
30-06-2022		Joana Oliveira M.		João Teixeira

CIN		FOLHA DE APOIO ÀS LAVAGENS DE TANQUES FIXOS		
Responsável:	Responsável dos Vernizes	Setor:	C4	CLK095
DATA: __/__/__				
TANQUE: TF- _____				
ENCHIMENTO FINALIZADO Produto: _____		PRÓXIMO FABRICO Produto: _____		
AGENTE DE LIMPEZA:		☐ 30 L de _____ - tanques de produtos aquosos ☐ 40 L de _____ - tanques de produtos solventes ou isocianatos ☐ 30 L do Agente de Limpeza de acordo com a natureza do produto anterior - tanques de produtos de natureza diferente		
		☐ _____ ☐ _____		
Observações:				
SANGRAMENTO:				
☐ TAMBOR _____ ☐ TAMBOR DE DILUENTE SUJO ENDURECEDOR – LER 070304* ☐ CUBO ÁGUA CONTAMINADA – LER 161001* ☐ TAMBOR DE DILUENTE SUJO – LER 070304*				
DATA:		ELABORADO/REVISTO:		APROVADO:
30-06-2022		Joana Oliveira M.		João Teixeira