

Increase in Production Due to First Pass Yield Improvements

*José L. Rosario
Master of Engineering in Manufacturing Engineering
Carlos González Ph.D.
Industrial Engineering Department
Polytechnic University of Puerto Rico*

Abstract — *First Pass Yield (FPY) is a critical quality indicator at the electrical sector, dedicated to the manufacture of industrial breakers, and its improvement can have a significant impact on operational efficiency and customer satisfaction. In this project, the DMAIC (Define, Measure, Analyze, Improve, Control) methodology was used to address and reduce the quality problems found in the FPY analysis. The specific quality problems that affected the FPY were identified through exhaustive data and other relevant quality indicators on the breaker production line that were collected. Also, critical measurement points and variability evaluation in production were included. To identify the root causes of quality problems affecting FPY, manufacturing processes were examined in detail. Then, effective solutions like optimizing processes, improving staff training, updating equipment, and reviewing material specifications to ensure product quality were implemented. Finally measures were established to guarantee that the improvements implemented are sustainable in the long term; tracking and monitoring systems implemented to verify the effectiveness of the solutions; and corrective action plans developed to address deviations in the FPY.*

Key Terms — *Breakers, Cause and Effect, DMAIC, First Pass Yield (FPY), Root Causes.*

INTRODUCTION

The electrical breakers industry plays a fundamental role in ensuring safety and efficiency in the supply of electrical energy. These devices are essential for protecting electrical circuits and equipment against overloads and short circuits, making their quality of utmost importance.

However, despite the critical importance of electric breakers, companies operating in this sector face a series of challenges related to the quality of

their products. These quality problems can arise at different stages of the manufacturing process, from material selection to production and distribution.

In this article, we will explore the quality issues faced by electrical breaker companies and their impact on safety, reliability, and customer satisfaction. We will analyze the underlying causes of these issues and discuss effective strategies to address them, with a focus on improving First Pass Yield (FPY) and optimizing manufacturing processes [1].

By better understanding the quality challenges in the electrical breakers industry and implementing effective solutions, companies can strengthen their position in the market and meet increasing expectations for quality and security in electrical supply.

PROBLEM STATEMENT

A company dedicated to the manufacturing of breakers for the electrical sector is facing problems in meeting its customers delivery commitments. The decrease in daily production is affecting the completion of orders to be delivered to buyers. We have several hypotheses for this problem, but we must develop them to find the root cause of it.

RESEARCH DESCRIPTION

The investigation will be aimed at finding the root causes for the reduction in production. In this task we will be collecting daily data to be analyzed and reach our conclusions. At the moment we suspect that our biggest detractor in the process is the lack of quality. This analysis is of utmost importance to be able to define what is affecting our processes and therefore solve them.

RESEARCH OBJECTIVES

The objective of this research is to find our biggest detractor or significant detractors that are preventing us from achieving our production goals. I hope that with the data collected and the analysis of the root causes, we can develop a project to eradicate these detractors from the operation. As a starting point we will be using the First Pass Yield data in the unit testing area. In this data we can also distinguish what failure the unit had. Part of the strategy will be to work fully with the biggest offenders and analyze what caused the defect. When we have identified our flaws in the process, we will be improving it to ensure product quality, which will allow us to reduce the cost of rework and unnecessary consumption of parts.

RESEARCH CONTRIBUTIONS

With the development of this research, I hope to achieve the necessary production to satisfy the demand of our clients. Furthermore, with the result obtained from it, we can provide an improved and sustainable process to avoid variations in it. With this in mind, we aim to improve First Pass Yield by 10% as it is currently around 85%, which suggests this is the main reason why we are not meeting our commitments.

LITERATURE REVIEW

In this literature review we will be dedicating ourselves to presenting and defining the methodologies and parameters that we will use for the development of this project. This review will help us understand why we use these techniques in the theoretical and historical framework. We will begin by describing the DMAIC methodology, since this will be the format that we will be using to conduct our project.

The DMAIC methodology is a structured approach used in Six Sigma to improve processes and solve problems. The letters DMAIC represent the five phases of the process:

- Define: In this stage, the problem or improvement opportunity is clearly identified, the project objectives are established, and the scope is defined. Customers and their requirements are also identified.
- Measure: In this phase, relevant data is collected to understand and quantify the problem. Key performance indicators (KPIs) are established, and a detailed evaluation of the current process is carried out to identify areas for improvement.
- Analyze: During this stage, the root causes of the problem are investigated using data analysis techniques. Relationships between variables are sought and the factors that most impact the process are identified.
- Improve: Based on the findings of the analysis phase, solutions are developed and implemented to address the identified root causes. Pilot tests are carried out and solutions are adjusted as necessary.
- Control: In the final phase, controls and measures are established to ensure that the improvements implemented are maintained over time. Monitoring systems are implemented, and response plans are developed to handle any deviations from the improved process.

We will be using this tool since our main problem is the decrease in the output of the operation and we need to define which of the problems we have is our biggest detractor. When we identify this detractor, we will begin to capture data to measure what is causing the two production shifts in our company to not reach the daily goal of 40 units.

In the Analyze phase we will be using the First Pass Yield and Pareto Chart tools to analyze the data that we will be extracting from the Tableau Software. According to this analysis we will be finding the root cause of the problem, to prepare what the plan will be to eradicate that problem from the process.

The purpose of this plan will be to implement in the Improve phase the solutions required to eliminate the waste identified in the previous phase. As part of

this stage, we will be fully entering the process to improve all standard works, training and even the equipment and machinery used in the workstations.

Already in the Control phase, we will be documenting and validating that the new production standards are followed to ensure that all the improvement processes carried out are permanent and that they add long-term value to our company.

The DMAIC methodology is a valuable tool for continuous improvement and process optimization in organizations and is applied iteratively to achieve sustainable results.

SQL Server Reporting Services (SSRS)

SQL Server Reporting Services (SSRS) is a Microsoft platform that enables organizations to create, manage, and distribute reports in an efficient and scalable manner. Here is a summary of its main features:

- **Report Creation:** SSRS provides a development and design environment for creating a wide variety of reports, from simple tables to complex, visually appealing reports that include charts, maps, and interactive elements.
- **Data Connection:** Allows you to connect to a variety of data sources, including relational databases such as SQL Server, Oracle, MySQL, as well as non-relational data sources and flat files.
- **Report Scheduling:** Provides scheduling capabilities to automatically generate reports and schedule their distribution at specific times.
- **Security:** SSRS provides advanced security options to control access to reports and the data they contain, including role- and permission-based authentication.
- **Report distribution:** Allows you to distribute reports through different channels, such as email, web portals, printing and export to formats such as PDF, Excel and Word.
- **Integration:** Easily integrates with other Microsoft technologies, such as SQL Server Database Engine, SharePoint, and Power BI, enabling a richer, seamless reporting experience.

In short, SQL Server Reporting Services is a robust platform for creating, managing, and distributing reports in a variety of formats and channels, helping organizations make informed, data-driven decisions.

First Pass Yield (FPY)

First Pass Yield (FPY) is a metric used to measure the efficiency of a production process by calculating the proportion of products or units that meet the required specifications from the beginning, without the need for rework or additional corrections [1].

In simpler terms, First Pass Yield is obtained by dividing the number of good products produced without defects by the total number of products manufactured, multiplied by 100 to express the result as a percentage (Figure 1).

$$\text{First pass yield} = \frac{\text{Good Parts}}{\text{Total Parts}} \times 100$$

Figure 1
First Pass Yield Formula

First Pass Yield Benefits:

- **Process Efficiency:** The FPY provides a direct measure of the efficiency of a process, as it reflects the system's ability to produce compliant products from the beginning, without additional rework or corrections [2].
- **Cost Reduction:** By improving FPY, the number of defective products that require rework or scrap is reduced. This leads to a decrease in costs associated with the additional labor, materials and time required to correct defects.
- **Quality Improvement:** A high FPY indicates that the process is generating quality products from the first try, contributing to greater customer satisfaction and a positive brand reputation.
- **Problem Identification:** By monitoring FPY, organizations can quickly identify problem areas in the production process and take corrective action before problems escalate.

- **Increased Productivity:** By minimizing the need for rework and corrections, FPY contributes to a more efficient production flow, increasing the overall productivity of the operation.
- **Informed Decision Making:** The FPY provides concrete data that managers and leaders can use to make informed decisions about process improvements and resource allocation.

In summary, First Pass Yield is a valuable metric for evaluating and improving the efficiency of production processes, leading to significant benefits in terms of quality, costs and customer satisfaction [2].

Pareto Chart

The Pareto Chart, also known as a Pareto Diagram, is a visualization tool that combines bars and a line to show the distribution of a set of data. Its main objective is to identify and prioritize the problems or elements that contribute most significantly to a specific result. This graph is based on the Pareto principle, which suggests that approximately 80% of the effects come from 20% of the causes [3].

The Pareto Chart has two main components:

- **Bars:** Represent the frequency or magnitude of each category in descending order. The categories are placed on the horizontal axis, and the height of the bars indicates relative importance.
- **Line:** Shows the percentage accumulation of the total. This line is usually plotted on the secondary axis and helps visualize the cumulative contribution of each category to the total.

Benefits of Pareto Chart:

Identification of Priority Problems: Allows you to quickly identify the categories or problems that have the greatest impact on the overall result, helping to focus efforts on critical areas.

- **Root Cause Focus:** Facilitates the identification of the most important root causes contributing to a problem, allowing you to address the root

sources rather than treating superficial symptoms.

- **Informed Decision Making:** Provides decision makers with a clear, visual overview of areas requiring immediate attention, helping to allocate resources and efforts more effectively.
- **Improved Efficiency:** By focusing on the few root causes, efficiency is maximized by directly addressing the elements that have the greatest impact on the outcome.
- **Effective Communication:** The Pareto Chart is an effective communication tool that facilitates the understanding of problems and their priorities, both for internal teams and external stakeholders.
- **Monitoring Improvements:** After implementing changes or improvements, the Pareto Chart can be used again to evaluate how these actions affect the distribution and to ensure that the most relevant causes are being addressed.

In summary, the Pareto Chart is a valuable tool for analysis and decision making, as it provides a clear visual representation of the distribution of data and helps prioritize efforts for significant improvements [3].

In summary, the SQL Server Reporting Services (SSRS) is the tool that we are going to be using to obtain the First Pass Yield data of the units. In our case, this information comes from the unit testing area. At the company we perform a final test on each unit to verify that it is turning on and off in the appropriate way, if it reaches the temperatures in the required time, in addition to testing the electronic and mechanical components. Tableau is responsible for collecting data from our test equipment and provides us with information on whether the unit passed the test or failed, which is where our First Pass Yield metric is created. It also provides us with the alarm because the unit did not pass the test. In our project the alarm information is very important because with it we will make our Pareto Charts and we will define which is our biggest offender. The combined use of these tools described and reviewed will be an integral part in defining the problem and

its measurement. With this data collected and analyzed, it will help us to conduct the following phases of improvement and maintenance, to ensure that the implementation of our project results in the necessary increase in output that our company is requesting.

METHODOLOGY

In this project, the DMAIC (Define, Measure, Analyze, Improve, Control) methodology was used to address and reduce the quality problems found in the FPY analysis.

Define

In the first phase of Define we begin by creating a Project Charter to describe the current situation of the company and what is the problem why they are not able to achieve their objectives.

A Project Charter is a formal document that officially authorizes the start of a project. It serves as a statement of the project's objectives, scope, resources, roles and responsibilities, establishing the basis for its management and control (Figure 2).

Preliminary Objectives:	
<ul style="list-style-type: none"> - Process Improvements through team walk observations aligned to MV manufacturing capacity - Achieve and maintain a shipment to our customers of 40 MV units, including 6 38KV breakers. This would help us to reduce an backlog of 2,190 Medium Voltage Breakers approximately (\$ 19,923,726 of sales) - Improve OTP from 47.19% average to 95% - Improve FPY from 85% to 90% at end of May. 	
Production Requirements (Takt Time):	
480min -20 min(break)-15 min (5's)-10 min (Tier1) = 435min available time for production	
TAKT = effective time/demand	
Actual Daily demand = 21.6	TAKT Actual = 40.28 min/unit
Required Daily demand =40 units	TAKT Required = 21.75 min/unit
Process Information:	
<p>The MV breakers production line consists of a main line conveyor divided into 14 work stations and other 3 side laterals work cell areas (38KV, Minivac, MGT). All except 38KV, joining at the Main conveyor flow from test to pack. MV line is line with bulky parts, an average of 52 Management Load Line Families summarized on 19 Families. The MV production line works 2 shifts and has a manufacturing area of 17,105 SQFT for the Main area. Line has 41 employees on 1st shift and 48 on 2nd shift.</p>	

Figure 2
Project Charter

In this case, our client needs to achieve and maintain a shipment to our customers of 40 MV units, including 6 38KV breakers. This would help us to reduce a backlog of 2,190 Medium Voltage breakers approximately \$19,923,726 in sales.

The SIPOC (Supplier, Input, Process, Output, Customer) is a tool used in process management to visualize and understand the key elements of a process (Figure 3). Provides a simple but effective structure to identify and communicate the following aspects:

- **Supplier:** Suppliers are the sources of entry to the process.
- **Input:** Inputs are the materials, data or resources that are used in the process.
- **Process:** The process describes the activities or steps performed to transform inputs into outputs.
- **Output:** Outputs are the results or products generated by the process.
- **Customer:** Customers are those who receive the outputs of the process. They can be external customers who buy products or services, or internal customers who use the outputs as inputs for other processes.

The SIPOC is a valuable tool for understanding the overall structure of a process and the interactions between its key elements. It helps identify areas for improvement, clarify roles and responsibilities, and establish a foundation for effective process management.

For the purposes of this project, we will be using this SIPOC diagram to have a clearer perspective of where our inputs come from, how the process is developed and how it is delivered to our clients.

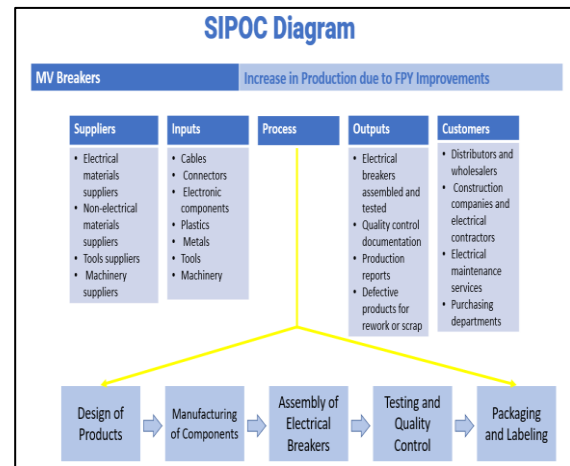


Figure 3
SIPOC Diagram

Measure

In this phase of Measure, as a team we decided to start carrying out several Gemba Walks along the production line to look for anomalies in the process. As part of these walks we were able to identify several variables which appeared as possible detractors when it came to affecting the daily output of MV breakers. During these tours we interviewed several employees, especially the unit testers, and we realized that they pointed out repetitive defects that were associated with each other. For that reason we focused on creating a Fishbone Diagram that could help us in the organization of the information received.

The Fishbone Diagram, also known as the Ishikawa Diagram or Cause and Effect Diagram, is a tool used to identify and visualize the possible causes of a specific problem. It takes its name from its shape, which resembles the bone structure of a fish (Figure 4).

In a Fishbone Diagram, the problem or effect being investigated is placed on the right side of the diagram, and a line is drawn to it from the "tail" end of the fish. Next, several "spines" or lines are drawn that represent different categories of possible causes

that could contribute to the problem. These categories can vary depending on the context of the problem, but commonly include people, processes, machines, materials, environment, and methods [4].

Each of these spines acts as a main category, and specific subcategories or factors are added within each of them. The participation of a multidisciplinary team is encouraged to identify all possible causes and contributions to the problem.

The goal of the Fishbone Diagram is to help teams systematically visualize the multiple potential causes that could be contributing to a problem, making it easier to identify key areas for analysis and improvement. It is an effective tool for structured thinking and team problem solving [4].

After analyzing the information collected in the Fishbone Diagram, the team came to the conclusion that we should do a deep dive investigation regarding the data obtained in the testing area since it was where product defects were detected. To understand a little better the behavior of the historical data provided by SQL Server Reporting Services (SSRS), we did an analysis of First Pass Yield from last year and the 4 months of this current year (Figure 5).

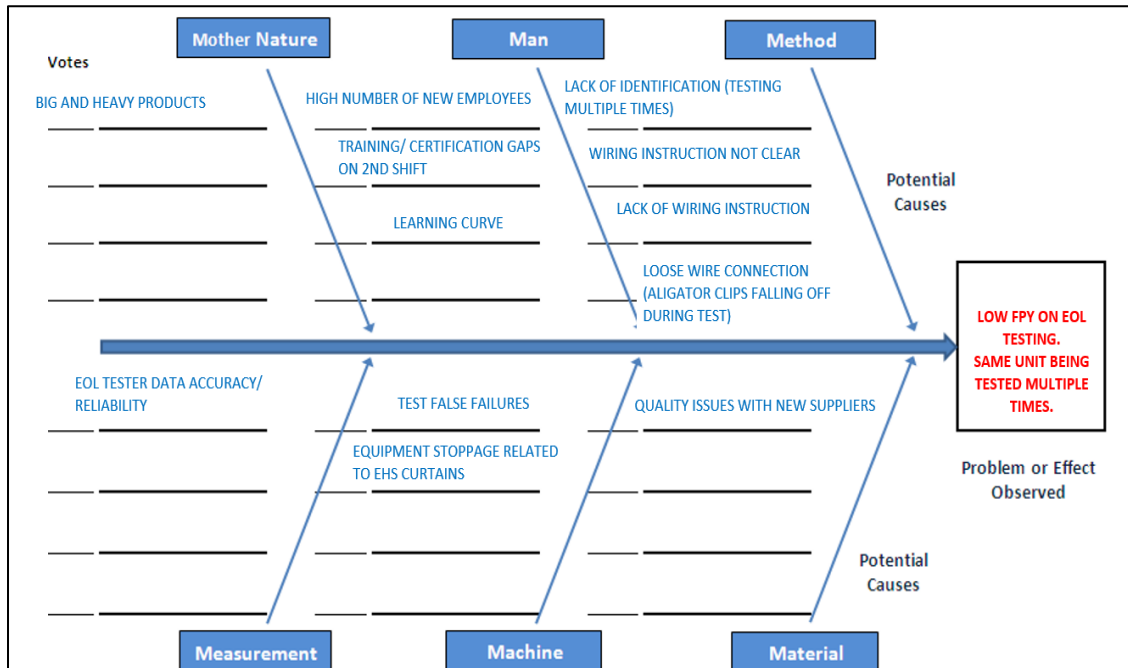


Figure 4
Fishbone Diagram

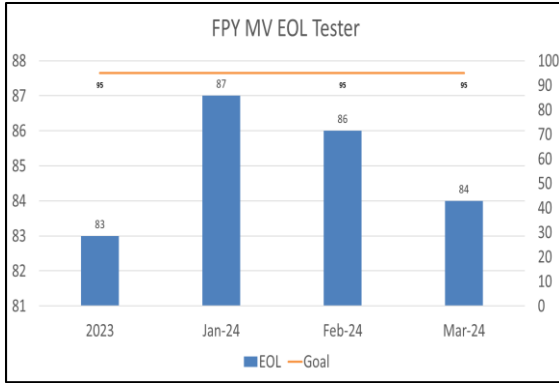


Figure 5
First Pass Yield Chart

This chart shows us that there is no consistency month after month and it behaves like a graph of peaks and valleys. It even shows us that the month of March was one of the most affected by failures in operational tests with a 84% of FPY when the goal is 95%.

Analyze

When we enter the Analyze phase and we have the data that in the testing area the units are failing for different reasons, we decided to make two Pareto's for defects. The first was for the entire year 2023 and the second for the year to date.

This data was exported from our SQL and gave us the most common defects why our breakers do not pass their respective functional tests.

Top offenders 2023 (Figure 6):

- Micro – Ohm Pole 1 (692/5825)
- Opening Time Pole 1 (670/5813)
- Fall Open Test (579/5340)
- Wiring Check Terminals (6-19) (420/4706)
- Micro – Ohm Pole 2 (393/5818)

Top offenders Year to Date (Figure 7):

- Fall Open Test (181/2098)
- Opening Time Pole 1 (178/2266)
- Micro – Ohm Pole 1 (159/2273)
- Micro – Ohm Pole 2 (137/2269)
- Micro – Ohm Pole 3 (118/2269)

After analyzing the data provided in the two Pareto's by our SSR system, we selected to work with the Micro – Ohm Pole 1, 2, 3 and Wiring Check

Terminals faults (6-19). Although Opening Time Pole 1 and Fall Open Test were among our top offenders, when we began to search for their root causes we realized that they are failures related to the testing system that must be corrected by the engineering team, especially those in charge of the testing area. . Even so, we raise the flag, we bring the information and fortunately they are working with those variables.

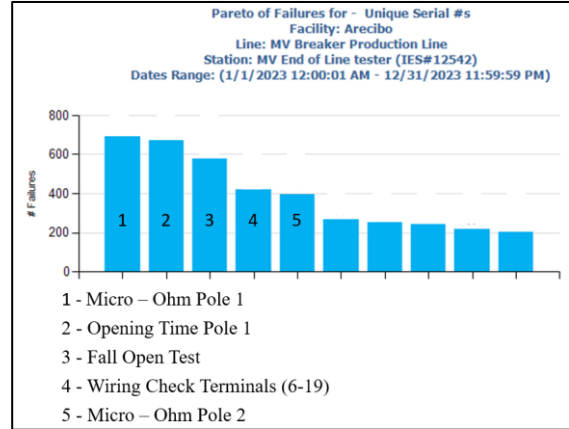


Figure 6
Pareto of Failures 2023

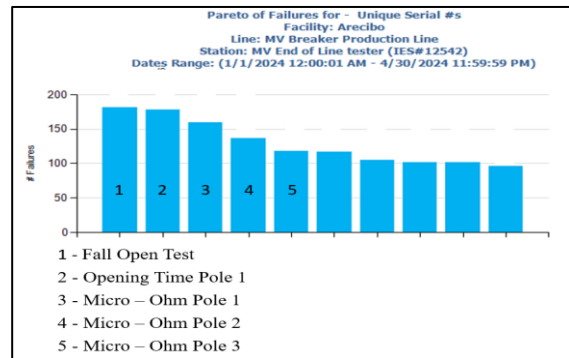


Figure 7
Pareto of Failures Year to Date

Improve

The Kaizen methodology, originally from Japan, focuses on continuous improvement through small incremental changes in processes, products or services. Its objective is to optimize efficiency, quality and customer satisfaction. Some key points of the Kaizen methodology include:

- Focus on small changes: Focuses on implementing gradual, manageable

improvements rather than drastic changes, which reduces resistance to change and makes implementation easier.

- Clear standards and procedures: Establish clear standards and procedures to ensure consistency and efficiency in operations.

In summary, the Kaizen methodology promotes a culture of continuous improvement, where employees are constantly looking for ways to optimize processes and deliver greater value to the customer [5].

To improve the two selected defects as quickly and effectively as possible, we decided to address them through two individual Kaizens.

The Wiring Check Terminals alarm (6-19) was one of the most frequent in our analysis and it implies that the cables that correspond to terminals 6 and 19 were reversed by the employees working at the LV station. This failure is due to employees not correctly following work instructions.

To solve this workmanship problem we were updating the work instructions, clarifying the order of operations, helping with the identification of the cables and adding visual aids so that employees can distinguish where the connector of each cable goes (Figure 8). Employees indicated that their doubts were clarified and that the visual aid allows them to better identify the cables.

On the other hand, the Micro – Ohm Pole 1, 2 and 3 alarms are identical, but they are generated in the different poles. For this failure we were able to identify its root cause and it is related to the test equipment. In this case related to the alligator clamps that are installed on the poles to inject current into the unit, we were able to observe that they become loose from the breakers due to the constant vibration that is generated when the product is being tested. This failure turns out to be the biggest detractor in the testing area if we take into consideration that it occurs constantly in 3 different locations.

<h1>KAIZEN REPORT</h1>			
Área: Medium Voltage		Fecha Comienzo: 3/25/2024	
Estación: Assembly - General		Fecha Terminado: 3/26/2024	
Descripción del Problema:			
<p>La alarma Wiring Check Terminals (6-19) fue de las mas frecuentes en nuestro analisis y la misma implica que los cables que corresponden a los terminales 6 y 19 fueron invertidos por los empleados que trabajan en la estacion LV. Esta falla se debe a que los empleados no estaban siguiendo correctamente las instrucciones de trabajo.</p>			
Nivel de Kaizen:	Responsable:	Número de MOC:	
2	José Rosario		
Miembros del Equipo Kaizen:			
Robert Rodriguez, José Rosario			
Herramientas Impactadas de Eaton Lean Six Sigma (ELSS) :			
VSM	5S+	SW	TPM SUR PS LMF SS
Métricos Impactados (High 5 Metrics) :			
Safety	Quality	Delivery	Inventory Productivity
Otros Impactos Importantes:			
Resultados Inmediatos:			
<p>Estuvimos actualizando las instrucciones de trabajo, acalarando el orden de las operaciones, ayudando con la identificación de la cableria y añadiendo ayudas visuales para que los empleados puedan distinguir donde va el conector de cada cable. Los empleados indicaron que sus dudas fueron aclaradas y que la ayuda visual les permite identificar mejor los cables.</p>			
Ahorros:	N/A	Mensual	Annual

Foto de Antes	
MEDIUM VOLTAGE CHECKLIST – ENSAMBLAJE DEL ALAMBRADO (LV)	
<p>Fecha del Alambrado: _____ Revisado (/) Fecha: _____</p> <p>SI NO N/A TURNO</p> <p>1. Terminal Block 12 Point T3M6UG17M (cantidad 2) son los correctos, están en buenas condiciones? <input type="checkbox"/> SI <input type="checkbox"/> NO <input type="checkbox"/> N/A <input type="checkbox"/> TURNO</p> <p>2. Terminal Block 6 Point T3M6UG17M (cantidad 1) es el correcto, está en buenas condiciones? <input type="checkbox"/> SI <input type="checkbox"/> NO <input type="checkbox"/> N/A <input type="checkbox"/> TURNO</p> <p>3. STB 1 y STB 2 tienen la secuencia de números correcta? <input type="checkbox"/> SI <input type="checkbox"/> NO <input type="checkbox"/> N/A <input type="checkbox"/> TURNO</p> <p>4. El "Position Switch" y "Motor Cut Off Switch" contienen la página requerida en el punto? <input type="checkbox"/> SI <input type="checkbox"/> NO <input type="checkbox"/> N/A <input type="checkbox"/> TURNO</p> <p>5. ¿La instalación del alambrado está en buenas condiciones, sin presencia de defectos? <input type="checkbox"/> SI <input type="checkbox"/> NO <input type="checkbox"/> N/A <input type="checkbox"/> TURNO</p> <p>6. "Secondary Disconnect" está ensamblado de manera correcta? <input type="checkbox"/> SI <input type="checkbox"/> NO <input type="checkbox"/> N/A <input type="checkbox"/> TURNO (Referirse a Ayuda Visual: AA.MV.26.01.0038.E000, AA.MV.26.01.0039.E000, AA.MV.26.01.0040.E000)</p> <p>7. ¿El Conector de los terminales no tiene alambros por fuera del bus? <input type="checkbox"/> SI <input type="checkbox"/> NO <input type="checkbox"/> N/A <input type="checkbox"/> TURNO (Referirse a Ayuda Visual: AA.MV.26.01.0115.E000)</p> <p>8. ¿Se usaron empalmes los pines machos del "secondary disconnect" con la herramienta suministrada para tal fin para verificar que están bien colocados? NAVY 2 Y UNIDADES QUE APLIQUE ESTE REQUISITO. <input type="checkbox"/> SI <input type="checkbox"/> NO <input type="checkbox"/> N/A <input type="checkbox"/> TURNO</p> <p>Quien comienza el ensamblaje: _____ Quien termina el ensamblaje: _____ Nombre: _____ Nombre: _____ Número ID: _____ Número ID: _____</p>	
Foto de Después	
MEDIUM VOLTAGE CHECKLIST – ENSAMBLAJE DEL ALAMBRADO (LV)	
<p>Fecha del Alambrado: _____ Revisado (/) Fecha: _____</p> <p>SI NO N/A TURNO</p> <p>1. Terminal Block 12 Point T3M6UG17M (cantidad 2) son los correctos, están en buenas condiciones? <input type="checkbox"/> SI <input type="checkbox"/> NO <input type="checkbox"/> N/A <input type="checkbox"/> TURNO</p> <p>2. Terminal Block 6 Point T3M6UG17M (cantidad 1) es el correcto, está en buenas condiciones? <input type="checkbox"/> SI <input type="checkbox"/> NO <input type="checkbox"/> N/A <input type="checkbox"/> TURNO</p> <p>3. STB 1 y STB 2 tienen la secuencia de números correcta? <input type="checkbox"/> SI <input type="checkbox"/> NO <input type="checkbox"/> N/A <input type="checkbox"/> TURNO</p> <p>4. El "Position Switch" y "Motor Cut Off Switch" contienen la página requerida en el punto? <input type="checkbox"/> SI <input type="checkbox"/> NO <input type="checkbox"/> N/A <input type="checkbox"/> TURNO</p> <p>5. ¿La instalación del alambrado está en buenas condiciones, sin presencia de defectos? <input type="checkbox"/> SI <input type="checkbox"/> NO <input type="checkbox"/> N/A <input type="checkbox"/> TURNO</p> <p>6. "Secondary Disconnect" está ensamblado de manera correcta? <input type="checkbox"/> SI <input type="checkbox"/> NO <input type="checkbox"/> N/A <input type="checkbox"/> TURNO (Referirse a Ayuda Visual: AA.MV.26.01.0038.E000, AA.MV.26.01.0039.E000, AA.MV.26.01.0040.E000)</p> <p>7. ¿El Conector de los terminales no tiene alambros por fuera del bus? <input type="checkbox"/> SI <input type="checkbox"/> NO <input type="checkbox"/> N/A <input type="checkbox"/> TURNO (Referirse a Ayuda Visual: AA.MV.26.01.0115.E000)</p> <p>8. ¿Se usaron empalmes los pines machos del "secondary disconnect" con la herramienta suministrada para tal fin para verificar que están bien colocados? NAVY 2 Y UNIDADES QUE APLIQUE ESTE REQUISITO. <input type="checkbox"/> SI <input type="checkbox"/> NO <input type="checkbox"/> N/A <input type="checkbox"/> TURNO</p> <p>9. ¿Motor Cut Off Switch SLS12000 está el conector 18 00' están instalados en sus posiciones? <input type="checkbox"/> SI <input type="checkbox"/> NO <input type="checkbox"/> N/A <input type="checkbox"/> TURNO (Referirse a Ayuda Visual: AA.MV.15.C.0004.001)</p> <p>10. IMPORTANTE: Marque con sus iniciales que la prueba de continuidad fue completada y satisfactoria. INICIALES _____</p> <p>11. PRESENCIA DE CONTINUIDAD BUENA DEBE GENERAR UN SONIDO <input type="checkbox"/> SI <input type="checkbox"/> NO <input type="checkbox"/> N/A <input type="checkbox"/> TURNO</p> <p>Quien comienza el ensamblaje: _____ Quien termina el ensamblaje: _____ Nombre: _____ Nombre: _____ Número ID: _____ Número ID: _____</p>	

Figure 8
Kaizen Wiring Check Terminals faults (6-19)

When we conducted the analysis to improve this situation, we realized that the equipment is in good condition but we had the opportunity to look for some alligator clamps that provide a better grip on the pole and we got them.

We have already started changing the equipment and the clamps are not coming off (Figure 9).

Control

As part of the control phase we decided to review again all the Work Instructions of the stations that require the installation of cables. This arises because as we explained previously, we found several opportunities in the wiring processes of the units.

We are also training 2 employees with extensive experience in these stations to become Subject Matter Experts (SME), so that they will be in charge of conducting more robust and specialized training in both shifts.

Regarding the Testing area, we were able to identify that our equipment needs better preventive maintenance, since the situation with the Alligator Clamps was causing us one of our biggest detractors in the operation with the failure of Micro – Ohm Pole 1, 2, 3. To eradicate this problem and be able to detect other possible events related to the failure of our equipment, we implement a Total Productive Maintenance (TPM) program on all our test equipment (Figure 10).

<h1>KAIZEN REPORT</h1>							
Área: Medium Voltage			Fecha Comienzo: 3/25/2024				
Estación: Assembly - General			Fecha Terminado: 3/26/2024				
Descripción del Problema:							
<p>Los clamps que se instalan en los polos para inyectar corriente a la unidad, pudimos observar que se aflojan de los disyuntores debido a la vibración constante que se genera cuando se prueba el producto. Esta falla resulta ser el mayor detractor en el área de pruebas si tomamos en consideración que ocurre constantemente en 3 ubicaciones diferentes.</p>							
Nivel de Kaizen:		Responsable:		Número de MOC:			
2		José Rosario					
Miembros del Equipo Kaizen:							
Robert Rodriguez, José Rosario							
Herramientas Impactadas de Eaton Lean Six Sigma (ELSS):							
VSM	5S+	SW	TPM	SUR	PS	LMF	SS
Métricos Impactados (High 5 Metrics):							
Safety	Quality	Delivery	Inventory	Productivity			
Otros Impactos Importantes:							
Resultados Inmediatos:							
<p>Tuvimos la oportunidad de buscar unos clamps que brinden un mejor agarre al poste y las conseguimos. Ya hemos empezado a cambiar el equipo y las abrazaderas no se salen.</p>							
Ahorros:		N/A				Mensual I Anual	

Foto de Antes




Foto de Después




Figure 9
Kaizen Micro – Ohm Pole 1, 2, 3

Mantenimiento Autónomo Estándar Visual y Lista de Cotejo Diario		Número de Serie		
Departamento: Producción	Área: Moldeo	Número de máquina: IM23	Fecha: 4/9/2024	
No.	Tarea	Frecuencia	Resp.	Tiempo
1	Verificar funcionamiento de parada de emergencia (Emergency Stop).	Mensual	Operador	30 seg.
2	Verificar si la máquina funciona con la puerta abierta.	Cada Turno	Operador	30 seg.
3	Verificar si el molde está sujeción correctamente (clampeado).	Cada Turno	Operador	30 seg.
4	Revisar que las rabizas de los moldes estén bien conectadas a la máquina.	Cada Turno	Operador	30 seg.
5	Verificar que las puertas de los paneles electricos esten cerrados.	Cada Turno	Operador	30 seg.
6	Verificar que todas las guardas identificadas estén cerradas.	Cada Turno	Operador	1 min
7	Verificar movimientos y ruidos inusuales en la máquina.	Cada Turno	Operador	30 seg.
8	Verificar si hay fugas de aire. (Debes escucharlo)	Cada Turno	Operador	30 seg.
9	Verificar si hay cables sueltos, expuestos o rotos. (máquina, balanza, abanico, etc.)	Cada Turno	Operador	30 seg.
10	Verificar derrames o liquesos de aceite y/o agua en el área de la máquina.	Cada Turno	Operador	30 seg.
11	Verificar documentos de LOTO, WRA, MIL y Standard Work estén en la estación / máquina.	Cada Turno	Operador	30 seg.
12	Verificar que los Gage esten en el rango adecuado.	Cada Turno	Operador	30 seg.
13	Verificar que nivel aceite en el gage sea adecuado.	Cada Turno	Operador	30 seg.
Aprobado por: Jose Piosario				Hoja 1 de 1

Figure 10
Total Productive Maintenance Checklist

CONCLUSION

After developing all the phases of the DMAIC methodology, we were able to find the root causes that were affecting the operation. All of this was possible because we did a structured analysis using the right tools to measure where we were, analyze that data collected and implement sustainable improvements.

In conclusion, our First Pass Yield this past April increased to 91%, exceeding by 6% the average obtained between last year and so far this year.

The final goal is to reach 95%, but just one month after the event, having improved that percentage was an achievement because it shows that the improvements made gave results and are maturing with the effectiveness that was sought. We can see how the FPY of the Medium Voltage line was behaving previously and the results for the month of April after the implementations (Figure 11).

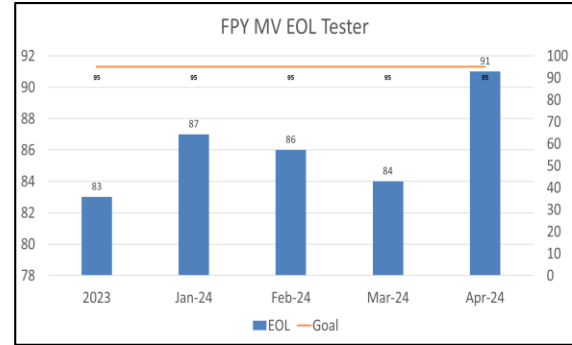


Figure 11
First Pass Yield Chart After Improvements

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