

Management Proposal for Consumable Item Control in an Electronic Company Using Concept of Human Reliability and Quality Tools

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Abstract — This paper will bring a new proposal for the management and control of consumable items in an electronic company at Manaus Industrial Pole, using the concept of human reliability in order to reach a best efficiency of the activities carried out by the coating station operators and also the use of tools like control charts, Ishikawa diagram, 5W2H, and PDCA which when are combined result in the understanding of the problem and also a better management method in the current situation.

Key words — Consumable items, Production Planning, Raw Material Management.

I. INTRODUCTION

The analysis will come from a company that's part of an electronic manufacturer sector. In this organization, it's developed solutions of energetic efficiency in LED illumination, portable batteries and energy storage solutions. The focus of the industrial plant localized in Manaus city are the portable batteries of ion-lithium, used specially on cell phones and notebooks.

The market of this kind of sector is highly competitive. Therefore, there is a huge necessity to always enhance the development of new products or the ones that already exist, so the buying planning of inputs be the most assertive as possible, trying to avoid huge failures or raw material remains used in the production in large scale.

Within the manufacture of any product, there's always the input demand than previously was programmed to purchase from the data sent by the customer (product's project) The question is that can happen that not even all the items on the list own an exact measurement, for example, the fluid types. From this context, it is going to be developed a theoretical referential that can corroborate with the study to be proposed, taking into account applicable concepts of reliability and the usage of tools of quality in camp.

In the problematic itself, the many positive and negative effects are going to be approached, looking for every improvement opportunity.

II. LITERATURE REVIEW

A. Material Planning and Management

The materials management is applied to all the functioning spheres of manufacture companies and in the most part determines the quality, time, flexibility, and many other essential factors to the parametrization of the main processes. The collect specificity, storage and material allocation in individual spheres of functioning of these companies is a little different and each one of them have their critical points [1].

According to [2], storages are stacks of raw material, inputs, compounds, products in process and finished products that come up in numerous spots through all the logistical channels and from the company's production.

Following the argument, stacks are any quantities of physical goods that are conserved, in a non-productive way, for some time interval; they constitute the stack the finished products that keep the sale or dispatch and also raw-materials and compounds that wait for utilization in the production [3].

According to [4] he says that the classification of the stocks can be considered as auxiliary materials (those that don't incorporate to the final product, also called indirect or non-productive materials), raw-material (incorporated to the final product, including the packages), products in processes (materials that are in the fabrication process) and finished products (are the materials now under the form of final product, ready to be marketed or delivered).

The author sustains the materials that can be considered surplus (treating of an obsolete material that exists in superior quantity to the users' needs); obsolete material (that doesn't satisfy anymore the company's requirement, because they have been substituted by others); scraped material (which treats the deteriorated material over the time, without any other utilization, that doesn't present another value, or else the inherent of its composition; and the unserviceable material (which as a consequence of the time utilization, deteriorates, becoming useless for its technical recuperation, economically unfeasible).

In organizations, there is a clear need to have clear control over the entire flow of materials: their storage period, the quantity of items kept in each compartment, the frequency of replacement, among others. The areas responsible for

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managing the inputs need to critically analyze the use of each item in the final product and thus establish a type of planning for future replacement and correct storage, always paying attention to some key points such as expiration dates, supplier lead time and alike.

The PCP area is used to describe planning processes of capacity, materials need, planning shop floor control, orders' production liberation and purchases, within other activities [5]. The PCP that determines what, when, how, where and how many will be produced [6], that is to say, it's the responsible by the materials' stream regulation, from the compounds' acquisition, pieces and inputs until they are transformed in finished products, by the manufacturing process [7]. To assist the planning area, there are tools called MRP MRP (Material Requirement Planning) that uses registered information from BOM (Bill of Materials) of product with its respective use quality. The MRP solution comes from a simple premise: if we can design requirements, with knowledge from the initial stocktaking, we can forecast or calculate when the inputs' refilling point will happen. By knowing this, we must keep the storage low until a little before is needed to produce the next stock of some finished product [8].

The MRP allows the company knows which materials are going to be necessary and in which moment through the production master plan explosion using information's from materials' list, enables to verify the inputs forecast quantities and the quantities that will be delivered from each compound that are necessary to deliver the request, also analyze the stock to verify if already exist available materials ensuring that are purchased only the necessary to time's utilization [9].

B. Human Reliability Concept

According to [10], human reliability is defined as any method by which reliability on people is estimated. It's the probability of success of human activities which the failures can cause a significant impact in the general reliability of a system man-machine. A second author also affirms that the Human Reliability can be defined as a quality or state of who can be trusted, that is to say, it's the probability of someone succeed in accomplishing his own mission, in a certain period and suitable environmental conditions with the necessary resources available [11].

Some techniques have been developed over the time and can be utilized in the industrial mean. These techniques aim to determine the impact of human mistakes in a system. They are based on systems' engineering and behavioral science methods to understand and evaluate the human contribution to reliability and security of the system [12].

The methodology used can variate according to the system observed. Some of the main techniques are: THERP, SLIM-MAUD, the CREAM and the MERMOS.

The method THERP – Technique for Human Error Rate Prediction, is based on the results of a task analysis, which divides a task into many sub tasks. It has been developed to deliver representational modeling of human actions (trees of the event HRA) and the estimative of Human Error Probability (HEP) [13]. The method SLIM-MAUD, according to [14], is based on the supposition that the failure probability associated with the performance of the task comes from a combination of PSFs (Performance Shaping Factors)

that includes the individuals', environment, and task characteristics.

The CREAM - The Cognitive Reliability Error Analysis Method, consists basically of a number of groups the describe phenotypes (errors mode, manifestations) and genotypes of wrong actions, where the last refer to a fundamental distinction between a person genotypes, technology and organization related to this nature [14].

MERMOS – Méthode d'Évaluation de la Réalisation des Missions Opérateur la Sûreté, tries to identify the states by observing the teams in operation (answering to accidents in the simulator), considering the previous registers and the specialists' considerations. Because of that, it is aimed at the use of simulator information and data collected by observers denoting the team's action when they are answering a simulated accident [15].

C. Cause and Effect Diagram

According to [16], the traditional cause and effect diagram is a management qualitative tool. By using this tool, it is possible to show the relations between cause and effect and lastly do a critical analysis between them [17]. Normally, countless causes can be associated with a problem not classified as machines, methods, materials, measurements, people and environment and after classified by sub causes [18].

The analysis process is clear the relation between causes factors in the process and the effects such as quality, cost, productivity, etc., when enrolled in the control process. The process control tries to discover the cause factors that prevent the light functioning of processes. He searches that the technology can perform preventive control. Quality, cost and productivity are effects or results of this process control [19].

According to [20], there is a technique that enables the diagram mounting to find a relation of cause and effect:

1. Identify the problem.
2. Draw up the main factors involved.
3. Identify possible causes.
4. Lastly, analyze the diagram as a whole.

The causes are generally grouped in principal categories to identify these variation sources. The categories normally include:

- Labor: Any person involved in the process;
- Methods: Once the process has been done and the specific requirements to do it, such as politics, procedures, rules, regulations and laws;
- Machines: Any equipment, computer, tool etc. necessary to do the work;
- Material: Raw materials, pieces, pens, paper, etc., used to produce the final product;
- Measurements: Data generated by the process that are used to evaluate your quality;
- Environment: Conditions, such as localization, time, temperature and culture in which the process operates.

In the Fig. 1, we have the graphic functioning of the tool.

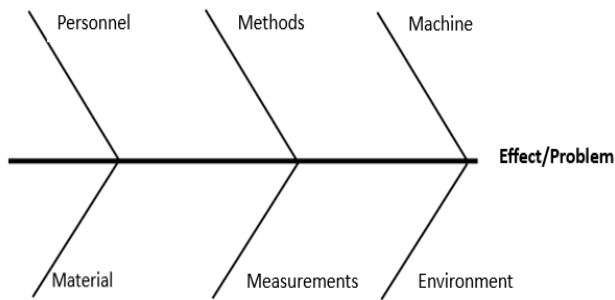


Fig. 1. Cause and Effect Diagram.

D. Control Charts

The graphic controls have been initially developed as a tool to monitor and control the fabrication processes [21], who proposed the concept that a graphic or card control shows the quality value characteristic of interest in function of the time or the sample number.

This graphic is constituted by a central line that represents the medium value of control processes of two horizontal lines, the superior limit control (SLC) and the inferior limit control (ILC) [22].

According to Fig. 2, around the line are going to be distributed the spots, in case it doesn't occur any variability in the process, once being the central line the nominal value or target that the quality features should assume.

The superior limits or inferior are going to be noticed when the sample averages or results transpose the control limits, alerting to the need of verification and corrective action of the process [23].

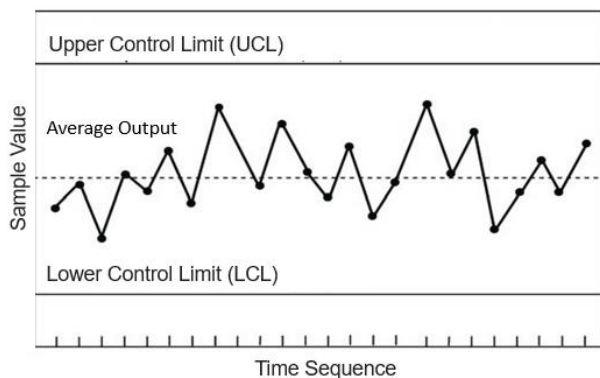


Fig. 2. Cause and Effect Diagram [24].

These control cards are distinguished between two sources of variation: variation of "common cause", which is intrinsic to any process and variation of "special cause", caused by a factor extrinsic to the process. A fundamental characteristic of this classification (variation of common cause vs special cause) is that the necessary actions to solve them are different. Reduce the variation of common cause, we need to change the process in some fundamental way and to variations of special causes, we need to find the extrinsic factor and after act over it [25].

Some preliminary concepts about the statistics have a huge importance for the development and understanding of this tool:

1) Central tendency measures

Average, median, mode indicate the center around which of the data are going to be normally distributed.

2) Dispersion measures

The measures of central tendency, though, do not reveal how many data are dispersed around the central value. For that, we need to measure the variability or dispersion of these data. Some measurements are used to measure the variability are the range, the variance and the standard deviation [26].

The range calculation is the fastest measure and most simple to measure the variability. It consists of the difference between the highest and the lowest value of a determined data group. The range is indicated by R where: range = maximum value - minimum [27].

Population variance (σ^2) is defined as the sum of the squares of the deviations divided by the number of data (n) [26]. Sample variance (s^2) is calculated by the sum of the squares of the deviations divided by the number of data minus 1 [27]. For the standard deviation (σ), it has calculated the square root of the variance; it is the most important measure of dispersion utilized in quantitative data [26].

E. PDCA

In many studies, it is observed a certain worry with the scientific method (not only qualitative but also quantitative) to be used. To [28], they constitute a tool of grouping results and obtain a better general comprehension about the phenome that has been analyzed.

The PDCA cycle (Fig. 3), also known as Deming Circle, has been proposed by W.E. Deming, a prominent American specialist in quality management. This cycle includes specially four steps: planning, implementation, inspection and action [29]. The PDCA method is used to manage internal processes in order to ensure the achievement of established objectives, based on information as a factor to guide decision-making. This work method is the basic quality management method and the general law of all the aspects of business management [30].

The real objective of PCDA is to enable the methods to be used in the problem solving be planned, executed, verified and patterned. According to [31], the PCDA cycle steps are:

a) Plan: this is the first cycle step, in this phase can be taken as base the information collected in the diagram 6M and is planned as an action that solves the identified causes.

b) Do: the second cycle step consists in executing the plan that has been elaborated.

c) Check: the third step is the action verification, in this phase is analyses the current situation, it is compared to the previous situation, and is verified if what has been planned was in fact done.

d) Action: the fourth step is the action to be taken against the obtained result. In case the effect has been negative and the problem persists, it is started another cycle, if the effect has been positive and the problem has been solved then it's evaluated the current situation and the changes that proportionate the outreach of the goals so that it can be done a standardization of the utilized system.

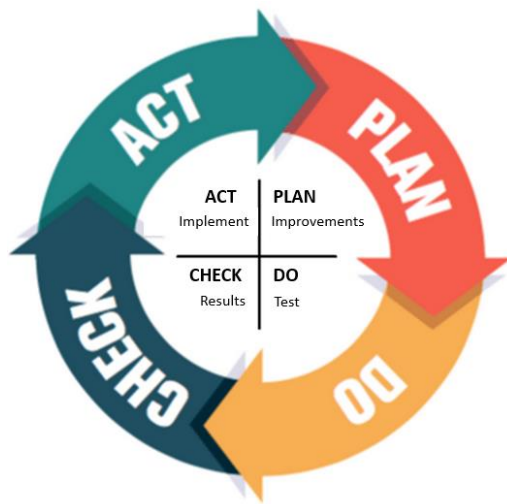


Fig.3. PDCA Cycle [32].

III. METHODOLOGY

The methodology applied offers a new proposal of management to consumable items based on information is collected through livingness in camp and official data provided by studies done by the Engineering of company product.

In the first phase of the study, we have a data survey and utilization of statistical tools to validate the quantitative data. In the second phase, we have the application of Ishikawa's diagram to find the causes and propose efficient actions to the problems identified, in the third phase it has been elaborated an action plan with assistance of the tool 5W2H, and lastly it has been concluded that with the PCDA method to be continuous enhance.

IV. FINDINGS AND DISCUSSIONS

A. Current Scenario

The mentioned company uses a MRP (Material Requirement Planning) system to plan and do the raw-material requests of its suppliers when it is necessary to supply the process. The most items to fabrication of their finished products are imported sources, with this, we have that Lead Time (time that the material takes to arrive in the factory, from the solicitation of the request) most of the suppliers is of long period time.

The planning area takes into account all the items found in BOM (Bill of Materials) to end its monthly production plan. This BOM composes the product structure within the system and has the materials classified as FP – Finished product; PP – product in process; RM – raw-material and PK – package.

Each item of RM and PK has a consumption value, for example: Product X takes the quantity of two resistors in the SMD production phase, or Product Y takes a quantity of 5cm of scotch tape in the final mounting phase. However not even all the items found in the list have an exact quantity of use, for example the inks, liquid adhesives, and weld in past.

In this article we are going to approach, specifically about the items classified as RM that don't have this exact measurement of how much is spent in the productive process of a final product.

To avoid that the planning have problems with the line stop (shortage) or raw-materials' due date in the stock (leftover), due to this impossibility of knowing in fact how much is spent in production lines, these meetings are been done with the ones involved in the MMT (Material Management), PCP (Planning Control Production), NPI (New Product Introduction) and Supply areas.

To manage this situation, there is a meeting minute (it does not have pattern periodicity established) where shows all the consumable utilized items in the factory and its respective current quantities in stock (indicating shortage or leftover). From the verified values and discussions, the actions are taken by the Production Engineering area that will be responsible for doing consumption studies to each item that represents exorbitant changes diagnosed in these meetings.

To the methodology survey presented in this article, we are going to take as an item of study only the liquid adhesives utilized in the SMD mounting.

B. Consumption Study and Data Survey

The adhesive in question (Fig. 4) is utilized to set the compounds on the signs during the welding process, that is to say, it is utilized to unite the compounds to the sign in a way that avoids the unwelcome displacement of the compounds during the automated welding process. This kind of adhesive does not modify the compounds' function neither the ones from the electronic circuit.



Fig. 4. Adhesive being applied in SMD PCB's.

In the organization are utilized four adhesives from different suppliers (asked according to the initial project). However, they have the same function as mentioned above.

The study has been carried out in order to estimate the use by sigh of "X" kg (unity used in the MRP system) of adhesive with assistance of a precision balance. There are two ways of doing it and both get to approximated results.

The first way is pass through a full tub a certain quantity of signs and collect the liquid value of the adhesive used:

$$\text{Quantity Utilized adhesive} = \text{Quantity full tube} - \text{Quantity after use} \quad (1)$$

Right after, divide the number found by the PCB's quantity that have been used:

$$\text{Consumption} = (\text{Quantity Utilized adhesive}) / (\text{Utilized PCB's}) \quad (2)$$

The second way is done by collecting a certain quantity of blanks containing the signs before the adhesive application

and collection of its weight after the application of the adhesive (this way allows us to have a sample quantity equivalent – normally 10 blanks containing 10 or 16) as shown in Table I.

TABLE I: CONSUMPTION BY BLANK (16 PCB'S) – MODEL "X"

BLANK	Before	After
Sample 1	14,232	14,396
Sample 2	14,563	14,733
Sample 3	14,263	14,433
Sample 4	14,296	14,463
Sample 5	14,308	14,445
Sample 6	14,472	14,604
Sample 7	14,439	14,573
Sample 8	14,560	14,695
Sample 9	14,420	14,554
Sample 10	14,429	14,561
Final weight	143,982	145,457

In the Table I, we have the value collected in camp. After this, we determine the consumption by blank:

$$\text{Total} = \text{Peso Final weight (After)} - \text{Final weight (Before)} \quad (3)$$

Once we have the total, we can obtain the consumption by blank:

$$\text{Consumption by Blank} = \text{Total} / 10 \quad (4)$$

Lastly, we can obtain the consumption value by PCB (in this case, each blank has 16 PCB's, study with total sample of 160 PCB's)

$$\text{Real consumption by PCB} = (\text{Consumption by blank}) / 16 \quad (5)$$

The consumption values found by this piece are kept in only one file with the aim of having an historic to posterior revision. From these data, a statistical study will be done with the assistance of the Control Cards so that can be defined the real size of the variation of the use of the item being studied.

The data collected to the development of this work refers to the consumption of 2019 to one of the adhesives used in a model "X" of SMD sign, remembering that all the studies in the current scenario don't use to follow a pattern periodicity: they are done only when there are divergences in the production plan and stock of these materials (according to the meeting minute).

We have a total of 5 consumption samples collected from July to November of 2019. In each month, it has been withdrawn the measurement to constitute the database (5 samples), that are presented with the average and amplitude calculation of each one of them (Table II).

From this, it is calculated:

TABLE II: SAMPLES (JULY – NOVEMBER).

Samples(n)	Measure July	Measure August	Measure September	Measure October	Measure November	Average (X-bar)	Amplitude (R)
Samples 1	0,0136276	0,0080093	0,0082992	0,0010081	0,00112154	0,006413148	0,0126195
Sample 2	0,0659123	0,0588816	0,0485845	0,0047753	0,07854664	0,051340068	0,07377134
Sample 3	0,0052025	0,0059632	0,0084716	0,0064846	0,00948525	0,00712143	0,00428275
Sample 4	0,0209538	0,0215706	0,0185647	0,0156548	0,01965546	0,019279872	0,0059158
Sample 5	0,0090886	0,0103325	0,0099851	0,0235464	0,02548167	0,015686854	0,01639307

General average (P): average of the averages (X-Bar) of each one of the samples:

$$P = 0,019968$$

Amplitude average (R-bar): average of the values found to amplitude (R) of each one of the samples.

$$R_bar = 0,022596$$

Standard deviation (σ): average of the amplitudes divided by the statistical constant d2 to each n value of sample (which n = 5, d2 = 2,326)

$$\sigma = R_bar / d2$$

$$\sigma = 0,009715$$

From this, we can calculate the superior, inferior and medium limits to X-bar e R-bar:

$$\text{LSC } X_bar = P + (3 * \sigma) / \sqrt{n}$$

$$\text{LM } X_bar = P$$

$$\text{LIC } X_bar = P - (3 * \sigma) / \sqrt{n}$$

$$\text{LSC } R = R_bar + 3 * d3 * \sigma$$

$$\text{LM } R = R_bar$$

$$\text{LIC } R = R_bar - 3 * d3 * \sigma$$

Which the statistical constant d3 = 0,8641, refers to the number of samples n = 5. In the Table III below, we have all the calculated values.

TABLE III: SUPERIORS, INFERIORS AND MEDIUM LIMITS

Model X	LSC Xbar	LM Xbar	LIC Xbar	LSC R	LM R	LIC R
Sample 1	0,0330	0,0199	0,0069	0,0477	0,0226	0
Sample 2	0,0330	0,0199	0,0069	0,0477	0,0226	0
Sample 3	0,0330	0,0199	0,0069	0,0477	0,0226	0
Sample 4	0,0330	0,0199	0,0069	0,0477	0,0226	0
Sample 5	0,0330	0,0199	0,0069	0,0477	0,0226	0

The results are shown in the following graphics (see Fig. 5 and Fig. 6).

Analyzing the Fig. 5, where we can visualize the variation from the calculated measures, we can clearly conclude that the consumption of this adhesive over the studied period has presented levels above the superior limit and doesn't have a constancy, such as in the Fig. 6 also, where we can verify variations from its amplitude. The consumption levels are totally out of statistical control.

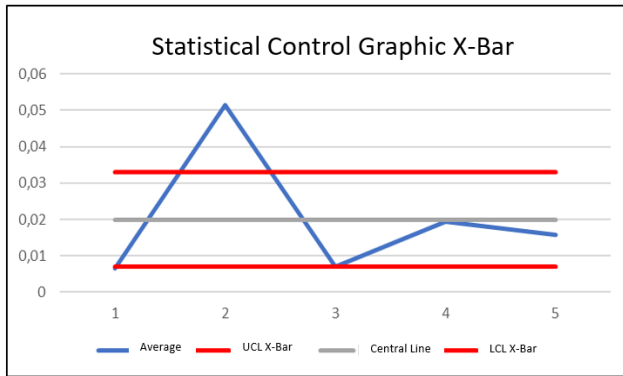


Fig. 5. Statistical Control Graphic X-Bar.

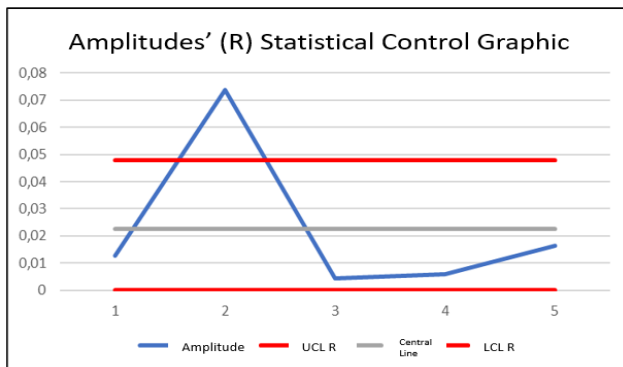


Fig.6. Amplitudes' (R) Statistical Control Graphic.

Noticing the divergence value, from its study, a discussion is opened between the members involved to know if the value of use in the MRP system must be adjusted to adjusting to the planning aiming to be the most assertive as possible.

With all the surveyed data, we can propose and enhance the study done in camp, the use of some quality tools that help with the management efficiency and control of this kind of input.

C. Results Analysis

As a proposal to create a management routine more efficient in these items control over the time, the PCDA model can be utilized. The aim is to understand in fact how the mentioned problem comes up, and how it must be solved, with the focus bigger on the cause than the consequences. From the identification of the opportunity of enhancement, are put into practice actions to promote the necessary change and achieve the awaited objectives, that in this case is try to avoid the failures in the maximum in the production planning.

In the phases previously mentioned in this article, applied to the studied case, we have:

- **Planning:** To develop a strategic map, it is necessary to find the root cause of the problem discussed. With this objective, it is going to utilize the tool known as Ishikawa's diagram.

To the application of the Cause and effect diagram (Ishikawa), there are going to be selected the main reasons that can cause variation in the consumption of the SMD adhesive within the process. This way, it's avoided to get to wrong conclusions, because the wrong survey of the causes can make the decision making inefficient or even harmful.

As explained before, this diagram has the 6M's (Method,

Machine, Man, Mother Nature, Measurement and Material):

- 1) **Method:** Wrong machine program of the adhesives' application spots in the SMD signs can take to a higher or lower consumption than the normal.

- 2) **Material:** Adhesives in conditions of next due dates or already overdue, can become hardened and change the normal consumption level; the supplier change can modify the chemical conditions of the adhesive, with this change also its consumption levels (personal of each supplier).

- 3) **Machine:** The right calibration in the pressure levels can change the item consumption; the maintenance on time of the adhesive application machines can also affect the process.

- 4) **Man:** The operator does not have adequate training to operate the machine correctly.

- 5) **Mother Nature:** It might have absence of instruction and manuals next to the workplace; the environment temperature can bring alterations (normally very low but must be considered) in the process.

- 6) **Measurements:** Incorrect reading of the project to establish the application spots (measures) necessary to be programmed; chance of project and lack of communication between the involved ones.

Still in the first phase, in parallel to Ishikawa's application and identification of actions to be taken, it must be used the called 5W2H (Table V), to plot the general planning aiming to help to make the execution become much clearer and more effective.

1. What (what is going to be done?) Establish a weekly periodicity to do the camp study of the consumable items. From Ishikawa's diagram, always search working in camp in the possible spotted cause by the tool. If the problem already has a high criticality level, search for damming your house (according to the indicated actions) right away in the process.

2. Why (why is it going to be done?) To avoid or even do not reach critical levels and out of the statistical curve control maintaining a higher database to posterior historic.

3. Where (where is it going to be done?) On the own factory floor.

4. When (is it going to be done?) Weekly.

5. Who (by whom is it going to be done?) Engineering teams with planning and materials assistance.

6. How (how is it going to be done?) Through the compliance of the actions in camp and discussions during meetings about the subject.

7. How much (how much is it going to cost?) Depending on the cause found by the 6M, zero costs. Except for supplier's failure and outsourced maintenance that are going to demand additional costs.

Giving continuation about the PCDA method, we have:

- **Execution:** Execute the plan according to what has been agreed in the first phase.

- **Verification:** Verify if the actions taken were, in fact, efficient to the problem in question.

- **Action:** Analyze the scenario after the realization of three previous steps, verifying its positive and negative spots, with the aim to implement enhancements to the next cycle.

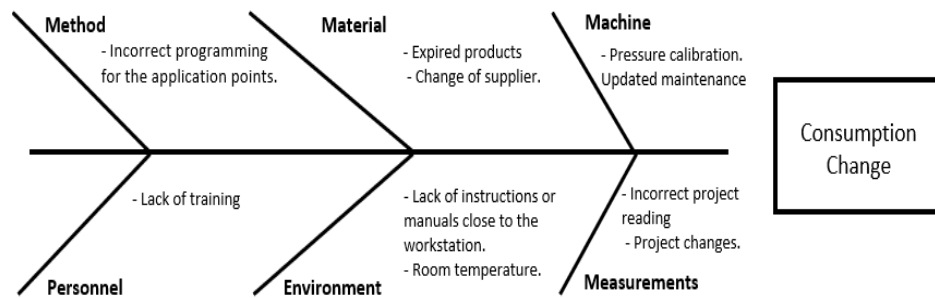


Fig.7. Ishikawa's Diagram of the Process.

TABLE IV: ACTION PLAN 5W2H

6M's	Cause	Action	Responsible team
Method	Incorrect programming of application points	Correct the programming, using the Gerber files	Product Engineering/SMT Engineering
Material	Adhesives expired / to expire	Initiate qualitative negotiations to verify whether the consistency of the products can still be used in the process or not	Quality Engineering
	Change of supplier	Check with the supplier the chemical specifications contained in the product before using it in Mass Production	Product Engineering/Quality Engineering
Machine	Correct pressure calibration	Check if the pressure calibration of the machine used is correct or if it needs some kind of adjustment	SMT Engineering
	Maintenance up to date	Check if the machine maintenance is up to date, applying corrective and preventive measures in accordance with the established plan	Maintenance Engineering
Manpower	Lack of training	Conduct efficient training of operators responsible for the adhesive application post work station	SMT Engineering/Occupational Safety Engineering
Mother Nature	Lack of instructions and manuals	Check if there are instructions and physical manuals at the workstations serving as an aid to the operator. Otherwise, request printing.	SMT Engineering/Occupational Safety Engineering
	Room temperature	Frequently check how the room temperature is regulated	SMT Engineering
Measurements	Incorrect design reading	Review the initial project file so that there are no errors when passing on the necessary information to the SMD area	Product Engineering
	Project changes	Communicate all involved team if there is any kind of change in the initial project, review all Gerber files	Product Engineering/SMT Engineering

TABLE V: ACTION PLAN 5W2H

Class	Phase	Activity
5W	What	Based on the Ishikawa diagram, always try to act in the field on the possible cause pointed out by the tool
	Why	To avoid or even not reach critical levels and outside the statistical control curve
	Where	Plant floor
	Who	Engineering teams and auxiliary areas
	When	After problem identification
2H	How	Field action, as indicated above on the 6M model
	How Much	Depending on the cause found by the 6M, cost zero. Except for outsourced supply and maintenance failures that will demand additional costs

V. CONCLUSION

Supplying the needs of a productive process in an efficient and assertive way is one of the hindrances that most of the factories face in their daily routine. It is necessary to search for alternatives that focus on processes well defined so that they can achieve in fact the continuous enhancement.

From the developed proposal in this article, it is clear that the good use of the quality tools available, assist having a management of raw-materials non-measurable (consumable items) within the production control and planning.

Following the PCDA method, we are going to have a wider

vision and a higher control over the actions to be taken related to each cause. Your application consists of creating a maintenance routine more efficient for these kinds of input.

Besides that, it has been presented in Ishikawa's Diagram of Cause and Effect that has focused on identifying the consumption root variation, once can exist more than one reason to take to an unbalanced statistical control. Once it is known the root cause, we can eliminate or avoid the same from happening in the future.

Once identified the man as the main cause of Ishikawa's Diagram, we notice also that the importance of the organization dominates the techniques that aim to the human

reliability, this is going to keep its process more efficient in the products' fabrication. In parallel, it has also used the tool 5W2H to mount a solid and defined action plan to be put into practice. The initial objective is to present an enhancement proposal to the management of the consumable items has been achieved. According to what has been explained, it has been shown in this article how to identify the problems, present actions and at last establish an enhancement routine to the company in question.

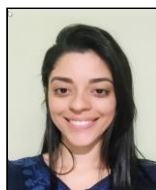
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