

Assessment on 5S System of Rules in a Cosmetics Manufacturing's Central Weighing Area, Processing and Packaging Area for Creams, Liquids and Lotions (CLL)

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Abstract — *A Cosmetics Company started implementing 5S housekeeping practice as quality assurance for the manufacture of their beauty products. This study focused only on the section where creams, liquids and lotions (CLL) are being manufactured. The raw materials passed through the central weighing area first before being transported to the CLL Processing Department. Along the line, wastes components such as boxes and plastic bottles are being generated. Since the company is involved in providing beauty and wellness products, the 5S housekeeping rules would enable them to prevent contamination of goods that could harm the consumers. This study was done to assess the capability and readiness of the CLL manufacturing department to achieve the 3S level of 5S Systems of Rules.*

Keywords – Lean Manufacturing, Sx Sigma

I. INTRODUCTION

The Cosmetics Manufacturing Company that was considered for this study is producing premium quality cosmetic, fragrance and toiletry (CFT) products, which are distributed in the Philippines and other Asian countries like Malaysia, Thailand and Vietnam. The company had lived up with its mission of providing women a means of livelihood with beauty products that addresses their basic needs in beautification and wellness.

The Cosmetics Company has three departments - Creams, Liquid and Lotion (CLL), Hot Melts and Mascara (HMM), and Powder and Hydro-Alcohol (PHA). Each of these departments is subdivided into two areas: Processing and Packaging. The processes involved are weighing and mixing of raw materials, moulding, and packaging. Among the three departments, the CLL is involve with large volume of production. The processes start with the weighing of raw materials to be used. Measurements need to be accurate and spills has to be avoided to minimize if not totally eradicate wastes in this area. The right consistency and formulation of each product produced should be observed to maximize the raw materials used. The Packaging Department uses different kinds of materials for its finished products such as plastics and glass bottles, rollers, head caps, pouches, labels and boxes.

The company started implementing 5S system of rules in year 2009. 5S' stands for five Japanese words with: Seiri (Sort) is the eradication of unnecessary items in the working area, Seiton (Set) refers to the

arrangement, storage and proper tagging of items to make the items easily accessible when needed in the process. Seiso (Shine) is regarding the maintenance of the machine and the tidiness of the area. Seiketsu. (Standardization) is focused on providing signs to remind people to keep the cleanliness and orderliness of their working environment, and Shitsuke (Sustain) is the involvement of the people in the full implementation of the 5S' system of rules, Henderson (2004).

There are 5 levels of 5S implementation shown in Table 1 that has been the basis for the assessment of depth of 5S housekeeping.

Table 1. 5 Levels of 5S Implementation (Parvin (2004)).

	SORT	STRAIGHTEN	SHINE	STANDARDIZE	SUSTAIN
LEVEL 1 Start	Criteria for disposal of not-needed items have been established	Decide and organize where to keep necessary items	Clean work area	Established work groups to develop and document standardized work methods	Area inspections are random and completed by work groups and/or department heads
LEVEL 2 Focus on Basics	Tag and identify not-needed items	Decide and organize how to keep necessary items	Develop cleaning assignments and checklist	Work methods established for S's one through three	5S level is established and posted in the area
LEVEL 3 Make It Visual	Establish a safe and secure holding area for not-needed items	Make it easy	Inspection during cleaning	Documented and standardized control for S's one through three	Work area 5S is maintained
LEVEL 4 Focus on Repeatability	Evaluate and remove unnecessary items for the site	Make it obvious	Cleaning is an everyday part of the job	Develop standardized work procedures for all work areas	Internal inspection process is standard
LEVEL 5 Continuous Improvement	Identify problem areas and document prevention actions	Identify problem areas and document prevention actions	Identify problem areas and document prevention actions	Share best practices with internal and external work groups	Root cause problem solving process in place

Using the above rubric, the Central weighing area falls on the 1.8S level, which indicates that slight efforts were exerted by the department. The CLL Processing falls on the 2.3S level based from the 2nd quarter audit, which implies that moderate effort is exerted by the department and consistency with their action plans enable them to achieve the minimum acceptable level. The findings of the 3rd quarter audit showed that the CLL Packaging area is on the 1S level after 3rd quarterly audit. As a whole, the level of 5S implementation in the company is at 2S which also indicates that the department has exerted moderate efforts.

The department intends to reach the 3S level in the Central weighing area, CLL Processing and Packaging areas by the 4th quarter audit. This was a result of the review of the 5S implementation procedure practiced in the company. Specifically, the company aims to reach the standard 5S methodology and at the same time ensure that the team has not overlooked any aspect in 5S.

The study aimed to improve the productivity of the line by determining the factors that contribute to the input and by determining the factors that affect the efficiency of the line and the causes of delays and downtime.

II. REVIEW OF RELATED LITERATURE

A. Continuous Improvement

Continuous improvement is an integral part of an industry's operations; it is a belief that any aspect in the process can be further improved. Kaizen is the Japanese term for continuous improvement which can be achieved through the application of: PDCA (Plan, Do, Check, and Act), Six Sigma, Just-in-Time, Employee Empowerment,

Benchmarking, 5S' system of rules, Total Productive Maintenance (TPM), (Dulhai 2008). PDCA cycle is an aspect involved in continuous improvement designed by Walter Shewhart.

Continuous Improvement can be achieved in many ways and implementation of the 5S housekeeping can bring about great improvement in an organization

B. 5S Housekeeping Rules

“5S' system of rules” is the housekeeping approach in lean manufacturing. 5S' stands for five Japanese words with: Seiri (Sort), Seiton (Set), Seiso (Shine), Seiketsu (Standardization) and Shitsuke (Sustain).

Henderson (2004), the Seiri aspect of 5S' system of rules addresses the following problems:

The time spent searching is a waste (or in Japanese speak a muda) and if we only held the items needed regularly in a prominent position we would save time.

Quality issues when gauged are not calibrated on time because too many are held.

Safety issues when people fall over things.

Lockers and racking cluttering the workplace making it hard to move around or to see each other and communicate.

Seiton (Set) is next to Seiri (Sort) for this step puts the necessary items in order. Seiton and Seiri aspect of 5S' can lead to facility layout that will lead to better space utilization.

The success of the 5S system is not assured by knowing the technical definition of Seriri, Seiton, Seiso, Seiketsu and Shitsuke, instead it can be achieved by clarifying the misconceptions in implementing them as an approach as well.

Chen (2008) has enumerated the following misconceptions in implementing 5S:

1. Lack of Leader's emphasis
 - The company head's participation is very important in the success of the 5S implementation for he/she dictates the target of 5S.
2. Lack of all employee's involvement
 - The mind-set that only the people in the production lines are responsible in carrying out 5S hinders the full attainment of the said system. For instance, if the finished goods are not delivered right away to the customers, these goods would pile up in the storage area and this would make the place untidy.
3. 5S is merely clean up
 - 5S and clean up are too different in terms of procedure and goal. 5S is a belief and a manner of arranging and supervising the work area and process flow that aims to increase efficiency through eradication of wastes, improve method and avoid delays.
4. Too busy to implement 5S
 - The employees have a notion that implementing 5S is time consuming and unnecessary, without them realizing that the goal of 5S is to identify causes and possible solutions to problems to avoid unexpected delays in performing their tasks.

Although achieving 5S level is not an easy process, some companies such as Metaldyne Corporation have come up with best practices in this housekeeping system and has brought large improvement in their operations.

C. Best Practice: Metaldyne's 5S Showcase

Carter's article (2003) illustrated the successful implementation of 5S at Metaldyne facility at Niles.

Metaldyne is a manufacturer of automatic-transmission valves and other die-cast products. Metaldyne facility in Niles has been described by its manager Tom Fisher and others as a dungeon. At present, the Nile facility is not a dungeon anymore and that was made possible by the implementation of 5S.

The transformation began in July 2002 when the company consulted Enrique Mora, who was an expert in 5S, Kaizen, Total Productive Maintenance and other improvement procedures. The first step was the formation of 5S teams. The 5S teams were comprised of the best staff from the different departments. The chosen members have undergone lectures and actual practice sessions with Mora. By the Spring of 2003, 64% of the employees of Niles facility have been trained.

“What's happened with the 5S program is that it cuts across all levels of management and across the bureaucracy..... Through 5S, the Metaldyne Corporation is trying to communicate to the working people that they have a lot more control over their own destiny than they think, that they are really the people who make the difference as to whether the parts are good or bad or a plant is safe or not safe, and whether we get jobs or not.”

– Tom Dolack, Director of Engineering-

Tom Fisher, the general manager says, "The first step in 5S is to clean out your garbage. So, floor space we didn't think we had prior to 5S, all of a sudden, Wow! We have room to grow."

The specific steps that Metaldyne Corporation has taken can be used by organizations that are still in the initial implementation of 5S practice in order to achieve the first three levels of 5S (Sort, Set and Shine). The Standardization level is more difficult to achieve but Mahalik (2010) has enumerated specific actions that will make Standardization easier to attain.

D. Actions to achieve Standardization aspect of 5S

Mahalik (2010) reported the actions considered in achieving the Standardize aspect of 5S:

1. Take "before" photographs.
- To have a documentation of the present situation of the area/s.
2. Check that the first three S's are implemented properly.
- The first three S's are the core of the 5S system.
3. All team activity documents/check lists should be publicly displayed on a 5S board.
- This step would create awareness to each individual in the organization on the progress in the implementation of 5S.
4. Establish the routines and standard practices for regularly and systematically repeating the first three S's.
-This would enable the achievement of the 4S which is Standardization.
5. Create procedures and forms for regularly evaluating the status of the first three S's.
-This would make monitoring of the system easier.
6. Standardize red tag procedures and holding area rules
7. Standardize procedures for creating shadow boards, position lines, and labeling of all items
8. Standardize cleaning schedules using the "5S Owner Check Sheets".
9. Standardize "single-point lessons" for documenting and communicating 5S procedures and improvements in workplace and equipment.
10. Create a maintenance system for housekeeping. Make a schedule for cleaning of the workplace. A common approach is to ask a cross-functional team to do it.

11. Sustain and enhance interest in 5S by encouraging inter-departmental competition
12. Assign responsibility to individuals for a work area and machinery.
13. Continue regular inspection/audit by special team (including senior management persons).
14. Instead of criticizing poor cases, praise and commend good practices or good performers.
15. Take "after" photographs and post them on the 5S board(s).
16. Complete evaluation using 5S levels of implementation with the facility manager or the authorized persons in the organization.

III. METHODOLOGY

A. Study Area

The researcher conducted the study at the Creams, Liquids and Lotions (CLL) Packaging Department, where different lines of packaging stations of different product variant can be found. There are 10 lines that operate within the area. Each line is named *JIT* with their corresponding numbers.

This study aimed to assess the level of implementation of 5S system in its Central Weighing Area, CLL Processing and Packaging Area. Data were obtained through observations and documentation. The information gathered was translated using the 5S checklist. The total rating for the 5S implementation on the said area is 1.9 which indicates that slight efforts are undertaken by the department and actions done are short term only. However, the average rating of the implementation in the CLL Processing department is 2.2. This indicates that the 5S implementation is at the minimum acceptable level. Specifically, the 5S implementation at CLL Packaging area is 1.48 which means that the department exerts only slight effort and about 1-2 persons participate in the implementation.

B. Descriptive method and Quantitative Method

Preliminary observations were done by the researcher to be familiar with the process and activities in each department. Results from the previous audit were obtained and review of the findings from the mentioned audit has been made for aspects that may have been overlooked by the auditor. Part of the documentation of the observations collected by the researcher was taking photographs of each area during the operations and break time and attending the 5S team meeting. Data obtained from the observations and documentation was translated using the 5S Audit Checklist. The data was analysed using the rubrics in Table 2. Conclusions were drawn based on the scores that each area obtained in the 5S audit Checklist and recommendations were then derived. The researcher has presented the final results and analysis to the top management of the company.

C. Instrumentation

Table 2 shows the summarized observations conducted on the four – month period of the study. This is the descriptive documentation of the activities in the three areas that served as the subject of study. This set of data was translated into the 5S Audit checklist to assess the level of 5S implementation in the Central Weighing Area, CLL Processing and Packaging Area. The tabular matrix is established to identify the contributing factors for the successful implementation of each 5S level such as: 1) Worker, 2) Management, 3) Machine, 4) Cleaning department, and 5) Logistics.

Table 2. Summary of the daily observations for four-month period of the study

	Actual	Standard	Measure	Remarks
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Central Weighing Area	Cleaning materials not placed on designated area	Shine	Worker	Good
	Materials are scattered	Set in order	Worker	Bad
	Cleaning the area	Shine	Worker	Good
	Tissue on station	Sort	Worker	Bad
CLL processing	Wet floor	Shine	Worker/Machine	Bad
	Cleaning materials properly stored	Shine	Worker	Good
	Papers are scattered	Shine	Worker	Bad
	Wet floor (ok)	Shine	Worker	Good
	Tool tray not labelled	Set in order	Management	Bad
	Broom and pan not stored properly	Shine	Worker	Bad
	Mop placed at components staging area	Shine	Worker	Bad
	Floor area (dry)	Shine	Worker	Bad
	Signage under container moist sink (140)	Set in order	Worker	Bad
		Shine	Worker	Bad
CLL Packaging	Cleaning line area after shift	Shine	Worker	Good
	Tagging laser printer and fountain for repair	Sort	Worker	Good
	Plastic was used to wipe the floor	Shine	Worker	Bad
	Gloves on the floor	Shine	Worker	Bad
	Rag below the conveyor	Shine	Worker	Bad
	Bottle of energy drink under the bottle loader	Sort	Worker	Bad
	Laser printer for repair (not yet picked up since Sept.28)	Sort	Eng'g dept.	Bad
	Improper waste segregation	Standardize	Worker	Bad

D. Data Analysis

The researcher translated the observations to the 5S audit checklist and used 0 -5 rubrics to quantify the level of 5S practice in the company as shown in Table 3. This rubric serves as guidelines in translating data obtained from the observations into numerical value corresponding to the level of implementation and points of implementation is specified by its corresponding description. The obtained scores from the audit checklist is presented thru 5S radar chart to visually show which level of 5S needs the most improvement.

Table 3. Rubric for 5S Audit checklist

SCORE	CATEGORY	DESCRIPTION
0	Zero Effort	There has been no 5S activity in this work area related to this criterion.
1	Slight Effort	Any 5S effort is probably the work of 1-2 people. There is no organized effort and plenty of opportunity for improvement.
2	Moderate Effort	Some attempts have been made to implement 5S, but efforts are temporary and/or superficial.
3	Minimum Acceptable Level	The entire team is working on improving their 5S implementation. Previous improvements are becoming standardized.
4	Above Average Results	The level of 5S in the work area is excellent. Although there is still room for improvement, the workplace is becoming world-class.
5	Outstanding Results	The level of 5S in the work area is world-class, a showcase for the industry. 5S is fully institutionalized in the workplace.

IV. RESULTS

The 5S implementation at the Central Weighing Area, CLL Processing and Packaging Department were evaluated.

The Central Weighing Area is where the raw ingredients are weighed before it is transferred to the Processing Area. The Processing area is where the raw ingredients are turned into intermediate goods that will be staged as finished goods at the Packaging area. The company focused on assuring that no microorganism will contaminate their products, in this endeavour, 5S is a great help to the company.

The CLL department is composed of varieties of lotions and creams that involve large volume of production. Too many quantity of materials such as cartons and plastics entail more wastes and more space needed for storage.

The Central weighing area was assessed at the 1.8S level and the CLL Processing is at the 2.3S level. Packaging area was at the 1S level after 3rd quarterly audit. As a whole, the level of 5S implementation in the company is at 2S. The 2S level indicates that moderate effort is exerted, the red-tagging system is observed in most of the departments and assignment of cleaning is established. However, these actions were only superficial

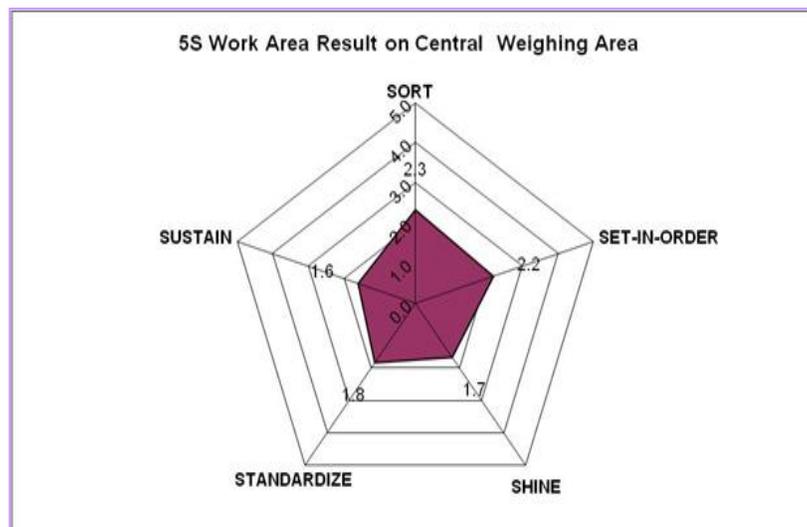


Fig. 1 Result of 5S Central Weighing

Audit in Area

Figure 1 presents the outcome of the 5S audit at the Central Weighing Area from the first to fourth period of the study. The total rating for the 5S implementation on the said area is 1.9. As from the rubrics,

slight efforts are undertaken by the department and actions done are short term only. This implies that 5S is not yet part of the system and there are more areas that need to be improved. This rating is contributed by 2.3, 2.2, 1.7, 1.8, and 1.6 as rating for Sort, Set in Order, Shine, Standardize and Sustain, respectively. The aspect that has the lowest rating is Sustain because not all the employees were engaging themselves into the 5S implementation

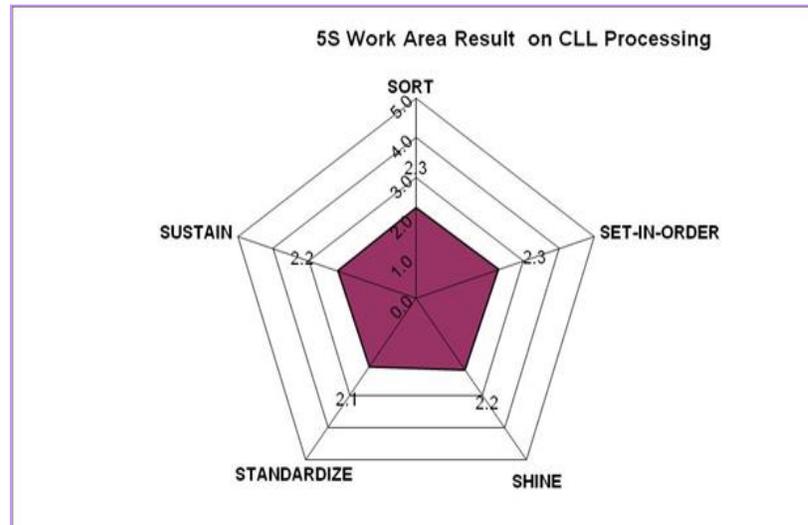


Fig. 2 Result of 5S Audit in CLL Processing Area

Figure 2 depicts the current status of 5S implementation at the CLL Processing Area. The average rating of the implementation in this department is 2.2. This indicates that the 5S implementation is going to the minimum acceptable level. All the aspects (Sort, Set-in-Order, Shine, Standardization and Sustain) of 5S have the average rating that falls within the range of 2.1 to 2.3.

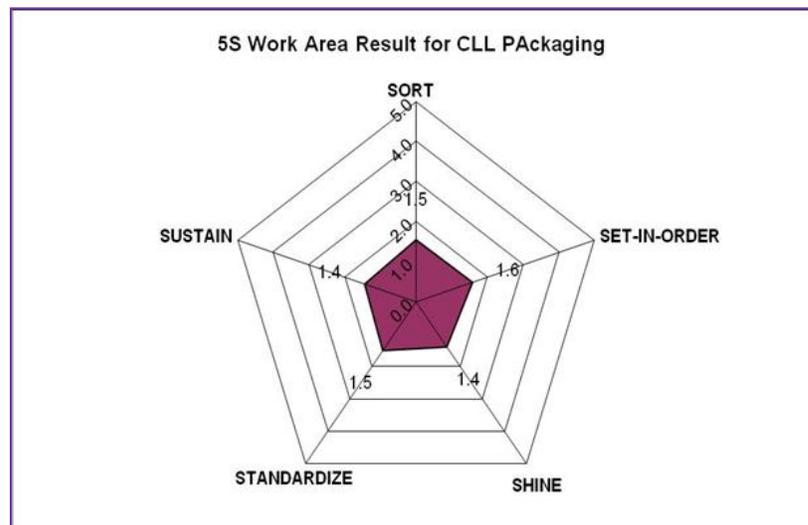


Fig. 3 Result of 5S Audit in Central Weighing Area

Figure 3 shows the summary of the 5S audit on Creams, Liquids and Lotions (CLL) Packaging department. The rating for the Sort aspect is 1.5, Set is 1.6, Shine is 1.4, Standardize is 1.5, and Sustain is 1.4. As a whole, the 5S implementation at CLL Packaging area is 1.48, which means that the department exerts only slight effort and about 1-2 persons participate in the implementation.

Analysis and Interpretation

Plan of action for the problems encountered in the production line

Problem 1: Workers do not fully participate on the 5S implementation and do not observe proper waste segregation (Sustain)

- Plastic, adhesive tapes, etc., were placed at the biodegradable trash bins instead on non-biodegradable bin. Workers are aware of the proper waste segregation but do not observe it.

Action Plan:

- Give incentive to the department that would be part of the Honor Roll for two consecutive periods to encourage workers full participation with the 5S implementation.
- Label the trash bins to easily track the person responsible for it. The label of the trash bin can be categorized according to the line where they belong to, also termed as JIT.
- Establish a 5S policy that people should follow and emphasize the personal benefits to employees if they will engage themselves in the 5S implementation or the consequences if they will not observe the activities involve in the 5S housekeeping rules.

Problem 2: Trash bins full most of the time and the amount of trash of each type is imbalanced (Shine)

- The biodegradable trash bins are full most of the time. This may be accounted to the frequency of collection of trash in a shift. There is an imbalance in the amount of biodegradable and non-biodegradable trash because of the amount of each type of material used in the process. For instance, material such as: caps, plastic bottles, tapes are in large amount in the CLL Packaging department. Chemical Waste or contaminated waste is the major type of trash identified in the CLL Processing department while tissue is found in minimal amount in the said area. For both scenarios, one trash bin is provided for biodegradable and another trash bin is for non-biodegradable/contaminated waste. With this 1:1 ratio of the trash bin, there will be no bin for the excess waste that is generated in the CLL Packaging if the trash is not yet picked up by the housekeeping team.

Action Plan:

- Closely monitor the content of the trash bin and follow up the schedule of picking of trash to ensure that the wastes will not overflow from the bins.
- Identify which type of waste is being mostly produced by each department and allot more bins for it.

Problem 3: Cleaning materials are not properly stored in CLL Packaging and CWA (Shine)

- There is no storage of cleaning materials in the CLL Packaging and CWA. This may be due to lack of budget. Another reason may be the inability to designate areas for storage cabinet due to lack of adequate space in the said areas.

Action Plan:

- Buy cabinets for storage of cleaning materials so that they will not clutter on the floor or be placed under the machine.

Problem 4: Floor is wet in the CLL processing staging area (Shine)

- The floor area of the Processing staging area is left wet due to spills form the machine. There is a signage that the floor is wet but sometimes, this is not put immediately. Not wiping-off the spill or not giving warning immediately exposes the employees to risk of slipping that may lead to injuries.

Action Plan:

- Align the spill containers with the tube of the machine where the spillage comes out.
 - The floor in the stated staging area is observed wet three occasions of the observation by the researcher due to spills coming from the machine. Spill container is placed below the machine to catch the spills coming from the machine but if the spill container is not properly aligned, the spill will spread on the floor and may cause the floor to be wet.
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Problem 5: The 5S audit is situational. The auditor can observe the areas on an instance when it is very untidy or it is very organized. (Sustain)

Action Plan:

- The audit should be conducted more than once to balance the possibility that the area can be messy or very tidy during an audit.

I. CONCLUSION AND RECOMMENDATION

Conclusion

After keen observations on the practice of 5S by Central Weighing Area, CLL Processing and Packaging Area, five (5) problems have been identified that hindered the departments to reach 3S level of 5S.

From the results, it was found that the workers are the main factor for the non-attainment of the 3S level at the CLL and Packaging Area. Their lack of participation and discipline when it comes to maintaining the cleanliness and orderliness on the area of responsibility was identified.

Recommendation

It is recommended to give incentive programs to encourage the workers' participation. For the attainment of 3S level, the following are recommended to be done:

- Since there are more biodegradable than non-biodegradable wastes and proper segregation is not observed properly, the type of trash that is largely produced by CLL must be identified in order to allocate more trash bins for it.
- As for the lack of storage for cleaning materials for CLL Packaging and Central Weighing Area, it is recommended that cabinets be bought for storage.
- The floor on the CLL staging area is caused by spills from the tank at the upper Processing area. This keeps the floor wet which can be a cause of mishaps. In order to avoid possible mishaps, the container must be aligned with the tube where the spillage comes out to ensure that it would catch the spill instead of spreading on the floor.
- Audit is recommended to be done more than once to balance out the possibility of seeing the area messy or organized during the checking.
- The level of 5S implementation in Central Weighing Area is 1.9. This indicates that 5S is not yet part of CWA department's system. The CLL Processing Area is at the 2.2 level of 5S implementation and implementation is at the minimum acceptable level. The level of 5S implementation at CLL Packaging Area is at 1.48 level which indicates that the activities implemented as practice of 5S are only temporary.

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BIOGRAPHY

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