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Analysis of 5S Method Application in SPMS Area at PT.Excelitas Technologies Batam

1st Andi Erna Mulyana
Business Management Dept.
Politeknik Negeri Batam
Batam, Indonesia
andierna@polibatam.ac.id

2nd Rizqi Tambayu
Business Management Dept.
Politeknik Negeri Batam
Batam, Indonesia
Tambayurizqi@gmail.com

***Abstract*—This research aims to analyze the implementation of *Seiri, Seiton, Seiso, Seiketsu* and *Shitsuke* (5S) and the effectiveness of its application in Spare Part Management System (SPMS) area of PT Excelitas Technologies Batam. This research used a descriptive method of qualitative analysis. Data collection techniques were observation methods, interviews and documentation. The results of the study showed the achievement of the 5S indicator in the SPMS area has been executed well. The implementation of the *Seiri* is effectively applied in the SPMS area as well as the *Seiton*'s application. Meanwhile for the implementation of *Seiso* has not been effective enough. The implementation needs more attention and commitment from SPMS and other related parties. While the application of *Seiketsu* and the overall the application of 5S in SPSM area goes pretty well.**

Keywords— 5S; Storage; material management.

I. INTRODUCTION

This research discusses the application of the 5S in the *Spare Part Management System* (SPMS) area at PT Excelitas Technologies Batam. SPMS is storage of spare parts used for the production process. Many devices are manufactured by PT Excelitas Technologies Batam, so the required spare parts are also varied. This becomes one of the high-factor inventory spare parts in SPMS. In addition, this spare part has different types, sizes and safety stock. Many of these variations cause the difficulty of regulating storage in spare part room in SPMS. The limited room causes raw material and spare part to store in one place. This makes the materials in the spare part room becomes untidy and potentially caused a work accident.

Storage of documents in the SPMS space is also still not managed properly. Document Delivery Order, Withdrawal, Inventory, Attendance and others are still stacked in one cabinet. Moreover, the items which are not supposed to be scattered on the desk, such as a used spare part. Besides it does not neat, it also makes the search process need more times. It is certainly a waste.

Waste is all activities that use or consume resources that do not provide value added for the product. Surely this is detrimental to the manufacturing company itself. Therefore, there is a need for improvement to eliminate waste. One method that can be used to improve work efficiency and eliminate waste is to implement the 5S working culture.

5S is a determination to conduct screening in the workplace; organizing, cleaning, maintaining steady conditions, and maintaining the habits necessary to perform a good job. The 5S's working culture originated in Japan, the 5S consisted of *Seiri* (Sort), *Seiton* (Set in Order), *Seiso* (Shine), *Seiketsu* (Standardize), and *Shitsuke* (Sustain) [1].

Management played a pioneer and took part in the application of 5S at PT Excelitas Technologies Batam. To support the creation of the 5S culture in the company, employees are given training and 5S certification. The company also provides a widest opportunity for employees to do a 5S improvement on the work area.

II. LITERATURE REVIEW

A. 5S

5S is derived from five Japanese words, Seiri, Seiton, Seiso, Seiketsu, and Shitsuke. The origin of the word 5S is a system made first in Japan to summarize a series of activities to eliminate waste that causes errors, defects and workplace accidents [1].

1) *Seiri* (Sort)

   Seiri is the sorting process of goods into 3 categories namely goods needed, hesitant, and items that are not needed. Seiri governs all things, sorting according to specific rules or principles [1]. All goods on the job site are simply items that are strictly needed for work activities [2].

2) Seiton (Set in Order)

   After removing the unnecessary items, the next step in the 5S activity is to determine how many items will be stored and where it should be stored. This called *Seiton* (Set in Order). Set in Order is about how to store items by focus on efficiency, quality, security and the optimization of the storage [1].

3) *Seiso* (Shine)

   Seiso is a method of cleaning items that were previously laid out neatly in order not to be dirty; it also covers the working environment and machinery. Be it a breakdown

machine or a machine in the framework of the Preventive Maintenance (PM) program [1]. The workplace is cultivated in such a way as to shine and clean like the exhibition space to be comfortable and healthy, thus minimizing the decline of motivation work due to messy and dirty environment.

4) *Seiketsu* (Standardize)

Seiketsu is a method of working environment to keep it clean and tidy, so it becomes the standard of work. The condition achieved by the *Seiri*, *Seiton*, and *Seiso* should have been standardized [1]. These standards are made in such a way that it is easily implemented and understood by all members of the organization, as well as could be checked periodically and regularly.

5) *Shitsuke* (Sustain)

It is a self-awareness of the work ethic. The entire 5S work procedure is ideally implemented and productive along with the improvement to achieve better results [1]. The main purpose of the concept is to ensure the successful of the 5S program as a discipline.

B. Waste

Waste is defined as loss of various resources, namely material, time (relating to manpower and equipment) and capital, resulting from activities that require direct or indirect cost but no added value to the final product for the user.

C. Effectiveness

Effectiveness is the ability to choose the right goal or the right equipment to achieve a predetermined goal [3]. Effectiveness is the relationship between outputs to the goal, the greater the contribution gained from the output to the achievement of the goal [4]. Thus the effectiveness has a reciprocal relationship between outputs and objectives. The greater the contribution of output, the more effective the activity.

The effectiveness rate can be measured by comparing between predefined plans and results. The standard used to measure effectiveness in an organization is the extent to which the Organization can conduct programs or activities properly and implement the functions optimally so that the target is fulfilled, and its purpose.

III. RESEARCH METHOD

This research is a qualitative research with a descriptive approach. The notion of qualitative research with a descriptive approach is research whose objects are natural that look at terms of circumstances, whether conditions, situations, events, activities, because the researcher itself is referred to as the key instrument, data collection techniques using triangulation techniques are combined observation, interviews and documentation [5].

A. Informant

Informant includes PT Excelitas employees associated with the SPMS area. The informant in this study is the one who knows and have a sight of the problem, as well as directly involved with the research problem. This informant is required to know the conditions in accordance with the application of the 5S method in the Equipment Engineering Detection Department of PT Excelitas Technologies Batam in SPMS area.

The determination of the informant in this study using purposive sampling technique, which is the process of selecting the informant based on the criteria specified and established based on the research objectives [6]. An informant must have data and be willing to provide complete and accurate information. Here is a brief profile about the informant:

1. Suprianto (Head of Equipment Engineering Detection Departement)
2. Asrial Lafindo (Technician Detection Departement)
3. Vika Asmorowati (Custodian of SPMS)

B. Data Collection

Types and sources of data in this study are from primary data and secondary data.

1. Primary Data in this study collected through interviews, conducted to the informant and observation directly with the employee in the Equipment Engineering Detection Departement of PT Excelitas Technologies Batam in the SPMS area.
2. Secondary Data in this study are the company's profile data, 5S activity data and 5S audit data in the Equipment Engineering Detection Departement of PT Excelitas Technologies Batam in SPMS area

The data collection techniques in this study are:

1. Interview: in this research, researchers interviewed the informant involved in the Equipment Engineering Detection Departement of PT Excelitas Technologies Batam in the SPMS area to obtain the work system data and the application of the 5S method in daily activity.
2. Observation: researchers are involved with the daily activities of the person being observed or used as a data source [5]. This field of research was conducted to obtain the necessary data in the research,
3. Documentation: researchers use several documents such as writing, video, images and photographs as valid evidence in the collection of data on this research.

C. Data Processing

The method of data analysis used in qualitative research is a method of descriptive analysis. The method of descriptive analysis is to process the data that has been collected by analyzing it according to the conditions that occur in the field through data collection, reduction, display and conclusion.

1. Data reduction is a process of selection, attention-centered, and simplification of data, for the recognition and transformation of abusive data arising from interviews [6].

2. Presentation of data, in qualitative research, data presentation can be done in the form of brief descriptions, charts, relationships between categories, flowcharts, and the like [5].
3. Draw conclusions and verify, the conclusions gained in the research are verified and supported with valid and consistent evidence so that it becomes a credible research.

IV. Result And Discussion

A. *SPMS AREA*

SPMS in PT Excelitas manages the spare part from the purchase, storage and usage until its management after no use anymore (scrap). For the process of renewal (refurbishment) goods and machinery done by the vendor also follow up by SPMS. SPMS has a very important role to assist in the production process and all activities related to production machines.

Location of SPMS located on the 2nd floor of Lot 238 building, this room is divided into two parts namely administration and part of storage spare part. The Administration section on the first floor with an area of 9.6 m^2 and room spare part room on the second floor covering 21 m^2. Additional Information, the height of the room for 2nd floor spare part is 175 cm. For the size of the company's high manufacturing room less maximum, especially for male employees

Documents are neatly arranged in the filing cabinet and for frequent documents in access such as withdrawals and the gate pass placed on the tray at the desk to reduce wasting time in its use. Some information about room conditions such as floor plans, work procedures, 5S updates, inventory schedules, hygiene checklist and picket schedules are on the wall of the room, information or announcements on the board. Cleaning equipment is in the corner of the room, and then trolley located beside the document cabinet in the area and locked when not in use.

Spare part on the second floor consists of 16 spare parts cabinet ranging from cabinet A to P which stores more than 2000 kinds of spare parts. In addition, there is a common cabinet and table, the floor plan in the face paste. The condition of this room is wider than the first floor.

B. *Application of 5S in SPMS Area*

A method needed in spare part storage system to be more effective and efficient. One of the methods that can be treated to facilitate the storage process in SPMS is by the method 5S (*Seiri, Seiton, Seiso, Seiketsu and Shitsuke*).

1. Seiri

   The sorting standard in SPMS is that there is no equipment scattered over the work area and no goods are not in the work area. This sorting will throw away unnecessary items, so only the items that are really needed will be stored in the SPMS. The sorting steps applied in the SPMS area are dividing the goods into 3 categories i.e. necessary items, not required and new doubts. The result is a clean work desk, only the items that are in the SPMS space in the room. SPMS room looks wider than before.
2. Seiton

   This activity is carried out by custodian SPMS in charge of the area. Superior supervises and advises improvements. Activities of Seiton or arrangement obtained several activities conducted to meet the neat standard/SPMS room layout. Here is the Seiton implementation in the SPMS area:

TABLE 1. ACTIVITY FOR SET IN ORDER

ITEM	Activity	
SPMS Room 1st Floor	1	Gives a yellow line for the door movement area
	2	Give Yellow line in the temporary storage area
	3	Give Yellow line in hygiene tools area
	4	Gives Yellow line on the placement area of the trolley
	5	To give the chain in the trolley placement area
	6	Placing and storing items back according to their respective areas
Working Desk	7	Give a barrier line for goods that are on the table such as document tray, stationary, and telephone.
	8	Labeling document tray, stationary place
	9	Put stationary in place in accordance with the Lebel
	10	Put the document in place according to the label in the document Tray
SPMS Cabinet	11	Label the cabinet wall, for placement of goods
	12	Provide a list of cabinet contents
	13	Put items in the cabinet according to the label listed
Tray Document	14	Label the map
	15	Give a yellow line to the folder, so that the document doesn't misplace
	16	Hit document according to label and Yellow Line
2nd Floor Spare part room	17	Gives a yellow line on the floor, as a delimiter for each cabinet area
	18	Labeling code on each cabinet
	19	Label an identity for box spare part out system
	20	To put spare parts and goods according to their identity
	21	Provide safety day at the entrance of spare part space and some areas that are potentially workplace accidents

(Source: Data Processing, 2019)

3. Seiso

   Targets of *Seiso* in SPMS are clean and tidy work areas. To achieve these targets SPMS apply cleaning standards are:

   - Work Area free from garbage, dust, and other dirt
   - No excess items in the work area

   Seiso activity or cleaning applied in SPMS involves 2 parties, namely the hygiene of the company and the SPMS itself. Both parties are responsible in their respective portions in applying cleaning in SPMS.

   Cleaning activities by the company are done by ISS or cleaning service. The task is to sweep and mop the floor that is done every morning. After completing the

task, the ISS officer will sign the daily cleaning check list form. Further custodian SPMS will be to do and sign his.

While cleaning activities in SPMS are conducted by custodian covering daily activities and weekly activities. Daily activities performed at the beginning of the working shift and the end of the working shift. Here are the shine implementation activities in the SPMs area:

TABLE II. ACTIVITY OF SEISO

First shift activity:	
1	Turn on the first floor SPMS lights and 2nd Floor
2	Start PC Computer
3	Checking and cleaning the work desk and around the work area
4	Checking and cleaning the Whiteboard
5	Checking and ensuring the floor is clean
End Shift Activity	
1	Clean the Whiteboard
2	Cleaning work desks and working areas
3	Waste
4	Shut down PC
5	Turn off the first floor SPMS lights and second floor
Weekly activity:	
1	Check, clean and update the box P3K
2	Checking, cleaning and updating of APD and chemical
3	Checking, clearing and stationary updates
4	Checking, cleaning and updating of cabinet archives
5	Checking, cleaning and updating of the goods out system

(Source: Data Processing, 2019)

4. Seiketsu

Some things applied in *Seiketsu* activity is to create a floor plan and complete with the layout of existing goods in the room SPMS first floor and second floor. The plan is pasted on the wall. It aims as a guide when there are things that change not in accordance with the systems. Then, it can be adjusted back with current condition SPMS.

The other thing is to make the standard of SPMS room suitable with 3S that have been done in the previous stage. The standard of this room contains photographs and rules of the standard. Furthermore, this standard is hung on the wall as reference.

5. **S**hitsuke

After the application of Seiri, Seiton, Seiso and Seiketsu go well, of course, there must be further action to maximize the application of 5S with the stage of the habituation. The aim of the habituation stage in SPMS is to cultivate 5S in its daily work activities in the SPMS area. There are four things to do in the SPMS room, which are:

- Create a PIC (Person in Charge) in the SPMS space and attach it at the entrance of the room.
- Creating the PIC cabinet and pasting on the SPMS cabinet door.
- Sticking an invitation to move the 5S culture in SPMS environment
- Conducting training and 5S briefing to other co-workers.

Management took part in creating a 5S culture in the SPMS area. Management support is very helpful in the process of deploying and repairing 5S in SPMS. Management also monitors and assesses and provides feedback for better improvements to cultivate 5S. The audit process generates some positive findings and negative findings. Positive findings should be retained, while negative findings must be corrected according to the 5S standard.

C. Discussion

The application of Seiri, Seiton, Seiso, Seiketsu, (5S) in Equipment Engineering Detection Department in SPMS area is already running well. This can be seen from the resulting chart of increased audit assessments implemented in the SPMS. In addition, interviews from several speakers also gave positive feedback on the application of the 5S in SPMS.

In this section, it will explain the results of the research based on the data obtained and analyzed using a quality descriptive analysis.

1. Seiri

The activity 5S started by throwing everything that is unnecessary. This process requires assessment and stratification management. Stratification management includes deciding the importance of an item to reduce unnecessary inventory, while ensuring that the necessary items are stored in close proximity for easy and efficient [1].

There are 3 *Seiri* Achievement Indicator (sorting) that are the selection of goods that are necessary and not necessary, keep the necessary items and get rid of unnecessary items. These three things should be applied to get effective sorting predicate. If the *Seiri* (sorting) is executed well, then the next step will be easier to apply.

a. Sorting of goods
SPMS has determined the criteria of the goods required and not required. Then do the sorting of goods that are in the work area and divide into 3 categories (items required, hesitant and unnecessary).

b. Required items
The required items have been separated based on their usage frequency. For the frequently used items will be placed around the work desk, shelves and drawers. Further items whose frequencies are rarely used will be kept in the cabinet. For items stored is also set in the minimum stock and maximum storage.

c. Get rid of unnecessary items
Items entered into a hesitant category and were not required to be given a red tag, removed from SPMS area and collected into the TPS area (temporary storage place). Next is the management of stratification for goods entering the TPS area. These items become the authority of management to decide on the next steps.

Based on the results of the Seiri (sorting) implementation in SPMS is in accordance with the indicators set. In this case it should be underlined that the sorting process should be routine and controlled by the implementation. Unused goods are not mixed with the goods that are still used. It can be concluded that the constituent criteria of one of the indicators of this application of Seiri (sorting) is carried out well.

2. Seiton

Seiton is an absolute thing to be done in the work area, to facilitate the search of goods, documents and equipment; easy to find the needed items and also easy to save them back. The set Setup is a reference for discipline in building the 5S culture.

There are four things to note in the Seiton activity, i.e. classification of goods, storage place, layout and identity/identification of the goods [1]. The following are four indicators in the application of *Seiton* in SPMS.

a. Classification of goods
The items in the SPMS have been classified based on the frequency of their use. Furthermore, it is also classified functionally and dimensions.

b. Storage Place
Goods and documents are placed on the shelf and cabinet on the first floor. And a large volume of goods will be placed on the second floor. The frequently used Tooling is also placed in the area near the working desk, and the other in the cabinet. Examples such as giving a boundary line for items on the table such as document tray, stationary, and phone, so as not to shift placement. Another example that is applied by SPMS is the provision of yellow lines on some areas for the weaving of goods, it is easier to store.

c. Layout
The layout of goods applied in SPMS also pays attention to the ease of access factor, comfort, safety and occupational health. Provide safety day at the entrance of the room SPMs, spare parts and some areas that are potentially workplace accidents. Trolley to pick up the goods from the store is placed in the stand beside the document shelf on the first floor. Trolley area storage mechanism is given a yellow line and is given a chain of chains to keep the condition of trolley safety while not in use. Placement of this trolley considering the room condition and safety risk faced.

d. Labeling
The very important thing is the labelling of the goods that have been placed in the respective area. It is very important to minimize the error when laying the goods. SPMS has been terrorized the labelling standard for several groups of goods. For example, in the cabinet, each shelf is marked with an arrow and the name of the storage. On the outside the cabinet is also given a list of cabinet contents. Document labeling also has its own standard. Labeling the Cabinet spare part and labeling spare parts also have their respective standards.

Based on the results of the implementation of Seiton (Setup) performed in SPMS is in accordance with the indicators set. The things that have been applied in SPMS provide ease in the process of retrieval and repositioning. So it can be concluded that the criteria of the composition of one of the indicators of Seiton (Setup) is carried out well.

3. Seiso

The third step in the application of the 5s culture is shine or cleansing which is a problem prevention. Cleaning is also an effort to prevent problems. Cleaning is also an examination activity and eliminating the source of dirty causes; when carrying out hygiene activities means checking. In this case the long-term goal is to minimize the risks of small errors that can interfere with work activity.

The Shine (cleaning) Achievement indicator has 3 means of hygiene, initial cleaning operations and cleaning activities. If these three things are well implemented in SPMS area then it can be said the implementation of shine is running effectively.

a. Cleaning facilities
SPMS has provided cleaning equipment in the form of broom and dustpan that are placed in the corner of SPMs to facilitate cleaning activities.

b. Initial cleanup operation
In this section SPMS has not implemented in detail to determine the frequency of cleaning the area. It is necessary to check in depth to find out which areas need to be cleaned and how dirty the area is. This should be detected earlier for hygiene scheduling.

c. Cleaning activities
Cleaning activities have been run by SPMS and the ISS section. For floor cleaning is done by ISS every morning that is sweep and mops the floor, while the SPMS custodian cleared the

working desk area and around the working table and the beginning and end of the shift. Weekly activities that have been scheduled have been run by SPMS. But the implementation is still not disciplined. For daily hygiene activities is quite effective run every day by ISS and SPMS custodian. Weekly activities need to be further improved discipline. This is due to the negligence of the individual in charge.

Based on the results of *Seiso* (cleaning) implementation done in SPMS some things are well implemented. However, it is necessary to perform a more in-depth inspection of the initial cleaning operation to detect other areas that need cleaning and cleanliness. It will also provide the result of other hygiene tools needed for the cleanliness of the SPMS space. In addition, the weekly cleaning activities that have been set can't be executed effectively. There should be a warning for employees who served on the week to perform this activity. Overall can be said *Seiso* activity or cleaning applied in SPSM is less effective, it needs to be further improved application.

4. Seiketsu

The fourth stage is the *Seiketsu*. The determination is the repetition activity of the previous *Seiri*, *Seiton* and *Seiketsu* (sorting, structuring, and cleansing) as well as their continued awareness and activity to ensure that the state of 5S is maintained [1]. The 5S that is done in a disciplined and consistent manner can train skills and maintain visual control.

The indicator is the achievement of a visual management. 5S is easy if done just once. The thing that is hard is to do it repeatedly. With this constant repetition it is important and is the only alternative to the 5S culture to be carried out. Visual management is very important in case of abnormal and can repair and can store the goods properly.

SPMS has implemented visual management in the form of creating 5S standards. The 5S standard is a guide line for people working in the area. Some of the things used for guidance include the floor plan along with visual images of SPMS space and spare part space. Furthermore, the visual image of the placement and storage of goods in SPMS room and spare part.

5. Shitsuke

The last step is the *Shitsuke* or habituation. Habituation also means thinking about various problems that arise daily, deciding to do better in the day, through all sorts of obstacles to improve it, especially when it relates to quality, safety and occupational health.

Indicators of effectiveness in the application of Seiketsu are personal responsibility, formation of customs and the campaign is obedient to the regulations. When this type of thing can be done well, then the 5S culture in SPMS area is already running very well.

a. Personal responsibility
   Who is responsible for the activity in SPMS there is the custodian of SPMS itself. To create the 5S culture then in SPMS room and some areas in label PIC (Person in Charges). This PIC Label is in the paste in the SPMS space door and the document cabinet.

b. Habit forming
   That is sharing and training provided by PIC of the room to co-workers associated with SPMS. The use of this training can be a habit and the 5S is a good culture.

c. Regulatory campaign rules
   That is sticking to posters and some rules on 5S culture in SPMS area, to invite and remind co-workers of the importance of 5S.

Based on the results of the application of Shitsuke in SPMS area can be said that the application is running effectively. This is evidenced by the fulfilment of all three indicators.

a) Positioning Figures and Tables: Place figures and tables at the top and bottom of columns. Avoid placing them in the middle of columns. Large figures and tables may span across both columns. Figure captions should be below the figures; table heads should appear above the tables. Insert figures and tables after they are cited in the text. Use the abbreviation "Fig. 1", even at the beginning of a sentence.

V. CONCLUSION

1. The application of 5s in SPMS area is already referring to the sources and references used in this research. Seiri, Seiton, Seiso, Seiketsu and Shistsuke are already executed in accordance with spms standards.
   a. The application of *Seiri* in SPMS is by sorting the goods in SPMS and classifying into the category of goods required, hesitant and not required.
   b. The application of *Seiton* in the SPMS by determining the storage of all necessary goods and giving a clear identity to the goods, giving the boundary line on each area of the goods storage, giving a list of the contents of goods in the area of storage, and provide a warning sign in an area that is at risk of workplace accidents. For easy retrieval and storage. Performance becomes more efficient.
   c. The application of *seiso* in SPMS by creating a cleaning schedule in the SPMs area according to each

responsibility. Fill out the room cleanup form and verify the data.

d. The application of *Seiketsu* in SPMS by creating a standard 5S in SPMS room and spare part that is a reference for anyone who is in the room. This becomes a reference when there are abnormal things happened.

e. The application of the SPMS of Shitsuke by determining the PIC (person in charge) in the space, provides 5S training to co-workers and performs campaigns or invitations to implement the 5S culture.

2. The effectiveness of the application of Seiri, Seiton, Seiketsu and Shitsuke is already effective. But there is one implementation that has not been effective, that is Seiso. Cleaning activities have not been performed properly. It is necessary to check in depth to find out which areas need to be cleaned and how dirty the area is. In addition, the cleaning schedule that has been made has not been done to the fullest, in practice still some do not do shine activity in SPMS

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