5S PROGRAM TO REDUCE CHANGE-OVER TIME ON FORMING DEPARTMENT (CASE STUDY ON CV PIRANTI WORKS TEMANGGUNG)

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Abstract. Productivity is one aspect that determines the success of a company in the competitive world of business. There are seven main types of activities that do not have value-added in manufacturing processes such as overproduction, waiting time, transportation, excess inventory, unnecessary motion and defects. The whole activity is a waste (waste) that can cause harm to the Company. Therefore, in production activities is important to pay attention so that the objectives of production productivity can be achieved. Problems experienced by CV Piranti Works is a production target is not achieved resulting in a lost sale raises the cost of which can cause harm to the Company. From the analysis conducted major known cause of the problem is the length of time required for changeover. This is supported by the high non-value added activity in the changeover activities. Lean Manufacturing is an approach to make system more efficient by reducing waste. This study refers to the book compiled by Takashi Osada (2004) and several other references. In this research used method 5S (Seiri, Seiton, Seiso, Seiketsu, and Shitsuke) for the of forming departement. The purpose of this research is to design a work environment using the 5S method (Seiri, Seiton, Seiso, Seiketsu, and Shitsuke) and make arrangement of equipment and working tool cabinet design with TRIZ methods. From these results, is expected to eliminate or reduce of non-value added activity and improved the changeover time so as to meet production targets completion of the company.

Keywords: Production target, 5S, changeover, non value added activity, Lost sale

1. Introduction

Productivity is one of the aspects that determine the success of a company in the competitive business world that increasingly stringent. According to Liker (2006) Toyota has identified seven major types of activities that do not have an value added in both business and the manufacturing process, such as overproduction, waiting time, transportation, excess inventory, unnecessary motion and defects. All of these activities is a waste which can result in losses to the Company. CV.PIRANTI WORKS is one of the companies that produce by order (job order). The products include: wooden radio, wooden toys and stationary / office stationery supplies. The final products should be maintained and even improved quality. To improve the quality of the product need a good working environment, clean and easy to reach equipment and raw materials in the production process. This company has five working groups in which each working group addressing a different job. Of the five working groups, Forming Department is a working group that has greatest percentage of the number and frequency of reject, compared with other working groups drawn from the radio product type Ikono data in July-December 2010, with percentage is 50.01% and the number of reject reject frequencies of 58.48%. So it can be said that the Forming Department is critically working group.

CV Piranti Works implement make to order system. During this time, most of the orders received from distributors abroad. This is because the company is more focused on Overseas markets. So far, CV Piranti Works often making shipping products delays to several major
distributors, because production quantities are not able to achieve the targets set. CV Piranti Works determined that the lead time to complete the order from the distributor is two months or 60 days (for the product with the type of radio). Based on the experience of the owners along that within one month of work to complete the radio product type "Ikono" by the number of 350 pieces. Ikono product is a product of the most booked for this. Here is an example case of delay problems faced by the Company, in which the order comes from the Main Distributor in Germany (Area ware.com) in 2010 order. During this time, in case of delays occurred, the distributor would receive compensation from the CV. Piranti Works. This case data shown in Table 1 below:

| No | Order Time | Quantity | Finished Target | Actual Quantity | Number of delays |
|----|------------|----------|----------------|----------------|-----------------|
| 1  | Maret      | 100      | Mei            | 100            | 0               |
| 2  | Mei        | 200      | July           | 185            | 15              |
| 3  | Agustus    | 104      | Oktober        | 90             | 14              |

(Source : Bagian Produksi CV. Piranti Works tahun 2010)

From the observations that have been made, the part-forming department is critical working group, so that the object of this study focused on this group. On this working group, identification of cause problems made by Fishbone diagram. Having obtained the issues that often comes up then did the analysis of the effect of the failure to determine the priority of solving the root causes using FMEA (Failure Mode and Effects Analysis). Robin E. McDermott (2009) say FMEA is a technique used to locate, identify, and eliminate potential failures, errors, and known issues of the system, design, process, or service before they reach the customer. FMEA Process in this research is to detect the risks identified during the process.

By identifying the effects, the causes of waste and control methods used can be calculated weighting value to see the waste. The cause of the greatest weight is the cause of the waste of potential waste of an opportunity that has the most impact on the system and the potential for reduced. From FMEA result of analysis obtained the main potential failure, that was very excessive lead time in machining process on part-forming department. This was because a redundant change-over time. The amount of changeover time is due to the too manye non-value added activities such as searching tools, excessive transportation necessary to get the equipment for placement anywhere. So to resolve the root cause of problems that occur, this study is focused to address the high change-over time. Figure 1 below illustrates the graph data summary results are expected to represent the activity changeover happens.

![Change Over Activity](Source : CV PIRANTI WORKS 12-16 September 2011)

Figure 1. Change-over Performance

The purpose of this research is designing a work environment using the 5S method in part-forming department (working group), constructing equipment and facilities arrangements and designing a Tool-Rack, to eliminate non-value added as tool searching time or other
equipment, and operators transportation, to reduce the limitations of the current system is the placement of the equipment.

2. RESEARCH METHODOLOGY
This study uses data collection using interview and direct observation in the field so after the design of the data obtained with the 5S method to do. The research methodology is shown in Figure 2.

Gambar 2. Research Metodology

3. LITERATURE STUDY
3.1. Lean manufacturing
Lean manufacturing is a concept that aims to eliminate waste in all areas of production including product design, supplier networks, and factory management relationship with the customer. This concept comes from Japan. With the implementation of lean manufacturing, is expected to produce a quality product by reducing waste there. Definition of waste here is all the activities and resources that do not create or provide added value in the process. While the process of adding value (value-adding activities) is the process of conversion / transformation of raw materials, changes in the shape or quality: changes in raw material into a particular part or product.
Here are some techniques that can be used to apply the concept of lean manufacturing: Kanban / Pull Production, SMED (single minute exchange of die), 5S, Heijunka (Production Smoothing), Takt Time, Flow and Cellular Production.

3.2. 5S Program as Implementation of Kaizen Philosophy

Five S (5S) are five simple steps that are used to improve the working conditions that are named based on the initial letters of the five steps in Japanese (Masaaki Imai, 2001).

- **Seiri**: According to Takashi Osada (2004:23) that Seiri means organizing everything, sorting according to certain rules or principles. 5S means necessary to distinguish between what is needed, take a firm decision, and implement management stratification is not required to dispose of them. The emphasis here is the stratification and management seek to eliminate the causes that are not needed and eliminate the cause of a problem before occurred.

- **Seiton**: According to Takashi Osada (2004:25) that Seiton means storing stuff in the right place or the right layout so that it can be used in a state of surprise. This is a way to eliminate the search process. The emphasis here is functional management and removal of the search process. If everything is kept in its place by the quality of security, it means you have a tidy workplace.

- **Seiso**: According to Takashi Osada (2004: 27) that Seiso means cleaning stuff so it becomes clean. In terms of 5S, means taking out the trash, dirt and foreign matter and clean up everything. Cleaning is one form of the examination. Here the preferred cleanup as checks and creates a workplace that does not have a blemish.

- **Seiketsu**: According to Takashi Osada (2004: 28), in terms of 5S, Seiketsu or stabilization means constantly and repeatedly maintain sorting, structuring, and cleansing. Thus, include personal and environmental hygiene. In this matter, especially the stabilization of 5S and visual management. Innovation and unified visual management used to achieve and maintain conditions that strengthened so as to always act quickly and appropriately.

- **Shitsuke**: According to Takashi Osada (2004: 29), Shitsuke means of training and ability to do what you want to do even though it is difficult to do. In 5S terms, this means that the implant (or have) the ability to do things the right way. In this case, the emphasis is to create a workplace with good habits and behavior. By teaching each one what to do and ordered everyone to do it, then the bad habits will be wasted and will form good habits. People practice to make and comply with regulations.

4. RESULTS AND DISCUSSION

4.1. 5S Designing

The design is divided into categories by each S.

- **SEIRI**
  
  Aiming to determine the items required and not required in Part-Forming Department Area.

- **Separate and determine the inter-goods groups.** In Table 2 below recapitulation sorting items in Part-Forming Department Area.

| No | Tools/Machine | Category |
|----|---------------|----------|
| 1  | Pallet komponen, gerinda, Dongkrak hidrolik, Tong sampah, Kardus alat kebersihan, Tempat duduk plastik, Isolasi, Mata Pahat, drill dan kertas amplas mesin amplas belt, Mistar, Jangka sorong, Penggaris siku, Kunci Inggris, Palu, kaca mata mesin, minyak pelomas dll, lem alteco, kertas amplas tangan, peralatan kerja pendukung, klem C. | Put in the shop floor area |
| 2  | *Table saw*, Ragum kecil, dan Lampu penerangan tambahan | Store in equipment and machinery warehouse |
b. **SEITON**
Aiming to save and put things in place and the proper layout.

- **Designing equipment lay-out**
  To design this made a bulletin board. Bulletin board here used to attach an explanation batch production running or to be run so as to eliminate idle activity and transport operators to find the head unit. The notice board is also used as a means of attachment to another announcement. The illustration shown in Figure 3 below.

![Figure 3. Position of Announcement Board](image)

- **Labeling of jig equipment**
  The labeling here is intended to provide a clear identification of the goods so as to facilitate the search. But the administration should ensure the name is obvious, not even confusing to workers who want to wear them. Here is an example of the label on the jig work equipment shown in Figure 4 below.

```
| Kode Produk | Kode Komponen | Nama komponen |
|-------------|---------------|---------------|
| WR01A-2B / 112 / Panel depan | 25 – 10 - 2011 |
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![Figure 4. Jig Labeling](image)

- **Production Area Marking**
  Making the boundary line location is only done on a production machine and some tools like the WIP storage racks. Figure 5 below will explain about giving part-forming Area boundary.
• **Work Equipment Rack with TRIZ methods**
  Here are the results for extra equipment rack design work. The equipment rack design results can be seen in Figure 6 below.

![Figure 6. Work-Equipment Rack.](image)

**c. SEISO**
Aimed at maintaining the cleanliness of work areas

• **Checklist design of equipment and machines work cleaning.**
  Checklist is used to directly monitor the performance of the application Seiso. Here is a sample checklist of cleaning equipment and machinery work. The results of the draft checklist for applications Seiso contained in Figure 7 below.

![Figure 7. Cleaning Checklist Form](image)

| Kategori | Keterangan |
|----------|------------|
| Lokasi   | Tidak ada bengkel (tescet) bersihkan |
| Meja     | Tidak terdapat serbuk / bubuk kayu |
| Alat kebersihan | Tergantung agar di tempat penyimpanan |
| Meja kerja | Bersih dari serbuk / bubuk kayu |
| Jig      | Tertata pada tempatnya |
| Peralatan | Mesin dengan bersihkan kerjaan |
| Rak      | Bersih dari serbuk / bubuk kayu |
| Peralatan | Tidak ada kerjaan |
| Keterangan | 

V: oke  
X: tidak oke
• **Making responsibilities lists of work area cleaning.**
  The initial step is to divide the area of production area into sections and allocating responsibility on the sub group. The division of the region can be seen in Figure 8 below.

![Figure 8. The Division of The Cleaning Region](image)

**d. SEIKETSU**
Aimed at maintaining the neatness and cleanliness in Part-Forming Area.

• **Determination of the discarded items place.**
  In this case, the supply box to be used as a garbage dump in the process. Garbage in this case is all the dirt including components derived from the rejects parts and non process. Non process the samples considered are not used anymore.

• **Announcement Board Example**
  It aims to make the room look neat with a bulletin board. Surely the correct way and neat attachment. So that the necessary procedures for the settlement procedures of the bulletin board. The way to do that is in the form of posters placed on one wall in the area of part-forming. The poster image can be seen in Figure 9 below.

![Figure 9. Anouncement Board Procedure](image)

• **Preparation of Work Procedures For Equipment Order.**
  This procedure is associated with a new rack design that uses tools card (cards work equipment). This procedure uses tools such as instruction card and instructions for lending equipment work. The instruction works can be seen in Figure 10 as follows:
e. **SHITSUKE**

Aims to keep the implementation Seiri, Seiton, Seiso, Seiketsu to run sustainable.

- **Daily checksheet for 5S implementation.**
  
  Daily Checksheet is intended for workers in the 5S program so easy working environment that includes the production area can be maintained. The purpose of making a checklist is to assist the operator in performing activities of cleanliness that no tool/machine that has not been cleaned. Another aim is that production managers can easily monitor the condition of the real from the production area. In Figure 11 there Checksheet containing containing disciplinary categories 5S implementation, Aims to keep the implementation Seiri, Seiton, Seiso, Seiketsu to run sustainable.

![Figure 10. Tools Card Procedure](image)

![Figure 11. Daily Checksheet For 5S Programs Implementation](image)

5. ANALYSIS

5.1. Analysis of 5S Designing

a. **SEIRI**: Designing Seiri begins by sampling the goods or equipment or machinery located in the production area and the area of the experiment. Of data items that are used to classify data obtained by function type of goods / equipment / machinery and the frequency of use of goods. From the classification of the data types of goods /
equipment / machinery is divided into types of items needed and unneeded items. For items that are necessary in the production area amounted to 30 kinds. As for the unnecessary items totaling 3 kinds of table saw, a small vise, and additional lighting lamps. Further action for 21 different types of work equipment / machine work after sorting placed determined in accordance with a predetermined (fixed establishment in the area) and for items not used as table saw, a small vise, and additional lighting lamps removed from the production area and warehouse equipment placed so that if necessary can be easily retrieved.

b. **SEITON**: Designing Seiton done in various stages: design placement of equipment on the part of the establishment, labeling the jig, the installation of the line marking in the production area as well as the design of work equipment rack. To design equipment laying on the formation is divided into two kinds of design for machine production and design a bulletin board. Based on the observations made for the placement of permanent production machine types are placed in its original position due to the limited extent of the area and did not interrupt the flow of material available today. The placement of a bulletin board attached explanation here is needed for batch production running or to be run so as to eliminate idle activity and transport operators to look for the head unit. And also that the paper work was not accumulate instructions on the production. Therefore given the notice board. In addition the bulletin board is a necessity for companies, because not all news can be disseminated orally, but some are in writing, hence why bulletin board is very important. Fitting a line to mark the placement of the goods made in all areas of production so that it can be seen that after the installation of the production area boundary markings look more presentable. This is because each area has had a limit so that production machinery can be more easily trimmed if at any time move. Jig labeling is intended to provide a clear identification of the goods so as to facilitate the search. But the administration should ensure the name is obvious, not even confusing to workers who want to wear them. The labeling here can be permanently affixed so stick to the jig. It may be easier to find the jig back if the need for this service which often turned to the R n D before using it and it will take work from the operator.

c. **SEISO**: As the concept of Seiso is how to maintain the cleanliness of the floor, machinery and equipment in the production area. The purpose of the design was to create a clean working area. And operators are expected to undertake regular cleaning in order goods or equipment or machinery used keep it clean and prevent damage to goods or equipment or machinery. Seiso is done in two steps, namely the design of list creation workspace cleanup responsibilities. The division here adapted to the working group that is no longer needed so that the grouping of cleanliness so that coordination can be directly done before. The second design are the checklist cleaning equipment and machinery work design. The checklist in this case is used as an observation when the application is run and the initial Seiso used only by the working group, designed Checklist is an example of the formation alone. At a later stage this checklist will be developed into a checksheet for use as a tool 5S monitor to keep running continuously.

d. **SEIKETSU**: The basic concept used in designing Seiketsu is how to maintain the production area is always in immaculate condition and clean. The design is done there are 3 stages, namely, the determination of the laying of the items to be discarded, making sample boards and manufacturing procedures to order/borrow equipment. Determination of placement of goods to be disposed done by providing a box that will be used as a garbage dump in the process. In the area of part-forming supplied two box placed at corners and edges of the wall so as not to interfere with the process of considering the labor of currently available work area is not too large. Making an example of bulletin boards are intended for some announcements
obtained from the owner or the Production Manager, this announcement contains not only the only production but appeals from owners. Preparation of work procedures for borrowing equipment relates to the design of new equipment rack where the presence of this equipment lending procedures be known who are the borrowers and equipment to facilitate the monitoring equipment.

e. **SHITSUKE**: Shitsuke is a discipline that must be implemented in order to carry out the procedure Seiri, Seiton, Seiso, Seiketsu can be sustainable. The design is done on the design concept is just Shitsuke daily checksheet for the implementation of 5S, checksheet contains all aspects of the assessment of 5S. Checksheet only examples used in the part-forming department/working group and used it as a tool to evaluate 5S Program.

### 6. CONCLUSION

The conclusion that can be drawn from this study are:

a. In Seiri, steps taken are: to separate and determine the inter-goods groups in the area of part-forming.

b. In Seiton, steps taken are: designing groundbreaking equipment on the part-forming department, equipment jig labeling, giving the line marking in the area of production and design of equipment racks working with TRIZ methods.

c. In Seiso, steps taken are: list-making responsibility for cleaning the work area, and a design checklist cleaning equipment and machinery work.

d. In Seiketsu, steps taken are: the determination of the place of the items to be removed, making the example boards, and manufacturing procedures to order/borrow equipment.

e. In Shitsuke, steps taken to design daily checksheet for the implementation of 5S.

### 7. RECOMMENDATION

The following recommendation can be given for the future practical program:

a. Development of a 5S program is not just done one particular workgroup, preferably applied in all production areas.

b. In a preferred design utilizing equipment that can be reused so that costs can be reduced.

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