IMPROVEMENT OF TRANSFORMATOR PRODUCTION SYSTEMS TO MINIMIZING WASTE

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ABSTRACT

PT. Bambang Djaja is a manufacturer company producing transformator to comply electricity needs, especially for PLN and other industries in private sector. The occurance of any non value added activities in production process inside a company will rising consumption of resources, as examples, the consumption of energy, cost, effort, and time are getting higher, and resulting inefficiency of production process. Researcher purpose is to make an efficiency effort by evaluating and eliminating non value added activities, known as waste, which occur in production department.. A particular method used to identify waste in a comprehensive integral manner is Value Stream Mapping Tools, where the selection of certain tools are made based on VALSAT method. Through this method, Process Activity Mapping, Supply Chain Response Matrix and Quality Filter Mapping were resulted as selected tools. Some improvement recommendations are given to minimize waste in production process, such as giving a proper training for operator to build awareness, improve work discipline, and giving an understanding about the importance of quality. In other hand, the number of defect product can be minimized by establish a standard in welding activity MIG.

Keywords*: Lean, Waste, Value Stream Mapping Tools, VALSAT.*

1. INTRODUCTION

1.1. Background

In order to improve quality and customer service in transformator production process transformator, company needs to give attention to every step in the production process itself, starting from the present of demand, production planning, to ordering raw material. In addition, company need to execute an evaluate to its production process continuously. According to the reason explained above, PT. Bambang Djaja seize a necessity to rise their company's performance by optimally improving work efficiency and effectivity.

Nowaday, company face a problem about terjadinya inefficiency of production process that caused by tremendous number of non value added activities, known as waste, and as the consequence will lead to a company losses, such as high number of product defect process. This indicating the lack of company's efficiency and poor performance. PT. Bambang Djaja identify its production efficiency based on consideration weight of rework caused by failure or inappropriate production.

1.2. Goal

The goal of the Research are:

1. Understanding the whole company's activity, in form information flow, physical flow, process time and equipments used in every process by using *Big Picture Mapping.*
2. Identify waste occur in production process and analize all possible factors that causing waste.
3. Understanding key activities (value added, non value added, dan necessary but not value added) that are influential in company's production systems.

4. Giving some improvement recommendations to the company in order to improve efficiency by minimizing waste.

1.3. Boundaries

Boundaries used in this Research are:

1. The Research focused on production department (departement whose responsible in producing inner and outer tranformator)
2. Waste observed are those 7 waste defined by Shigeo Shingo.
3. The data used for the Research are data 6 months period long, staring form January 2006 to June 2006.

With assumptions :

1. During the Research, production process runs in normal condition and stable.

1.4. Advantage

1. Company able to identify any possible waste that has not been detected.
2. Company able to identify root cause of every waste occur in the oproduction process.
3. Giving recommendations to the company related to series steps in minimizing waste to carry out repairment and improvement productivity continuously.

2. RESEARCH METHODOLOGY

2.1. Identification Stage

- **Problem Identification.**
  How to improve production systems in transformator production through reducing waste occur, in order to rise customer service level.
- **Setting Goal.**
  The goal set for the Research related to the problem identified in the first step so that it can bring a solution to the problem mentioned before.
- **Direct Observation.**
  Direct observation done to knowing and understanding real condition of the company.
- **Theoritical Reseach.**
  To understanding, theoriticaly, any possible method to used in the research to solve the problems.

2.1 Gathering and Processing Data Stage

- **Build Big Picture Mapping**
  Illustrate and giving understanding of the whole production systems along with Value Stream owned by the company.
- **Identify Waste and Tools Selection**
  In this step, resercher establish weight for every waste that often occur in Value Stream production, where it is done based on seven waste in Value Stream Mapping. Waste weight are establish through spreading questionnaire and discussion with every supervisor division whose involeved in production systems. From the weight established, afterwards, resercher conduct proper tools selection by using Value Stream Analysis Tool (VALSAT).
- **Build Detail Mapping**
  This step is processing data stage that carried out based on tools selected with VALSAT menthod proviously, the objective is to mapping waste that occur inside the value stream production systems.

2.2 Analysis and Evaluation Stage Based on Tools Selected

- **Analyzing Waste and Production Systems**
  Later, identification of factors causing waste in production process and factors influencing product quality characteristics are done using Cause Effect Diagram as tools.
- **Arrange Improvement Plan**
  In this step, resercher are formulate improvement recommendation to the production systems in order to minimize waste based on the result from previous analysis so that the company are able to continuously improve their customer service level.

2.3 Conslussion Deduction Stage

This stage is the final stage of the Research. Here, resercher are draw conclusion from the research performed and also giving some recommendations for the next research, so that the output obtained from this research might become guidance for a further research.

3. RESEARCH OUTPUT

3 output with the highest value obtained from the tools selection process according to VALSAT method are:

- Process Activity Mapping
- Supply Chain Response Matrix
- Quality Filter Mapping

a. Process Activity Mapping (PAM)

Based on time consideration used in PAM, obtained total time to produce 1 unit transformator with specification 3Ø 100 KVA 20 KV 400 V 50 Hz Yzn5 is 1220.33 minutes. From this total time, 1000.59 minutes or 81.9% were used for value adding activities. While non value adding activities spent 216.56 minutes or 17,8 % from total production time. The list of time allocation based on activity in transformator production process are given in Table 1.

Table 1. Time Allocation Based on Activity Type in Transformator Production Process

Activity	∑ Time (minutes)	Proportion (%)
Operasi	1000.59	81.99
Transportasi	35.45	2.90
Inspeksi	3.04	0.25
Storage	0.53	0.04
Delay	180.72	14.81

b. Supply Chain Response Matrix (SCRM)

The illustration are made using 2 axis, which are vertical axis and horizontal axis. The horizontal axis in SCRM represents cummulative lead time to planning and transfering product in supply chain. Whereas, the vertical axis represents cummulative inventory in every stage in supply chain.

Further, *supply chain response matrix* transformator production systems in PT. Bambang Djaja are shown in Figure 1 below:

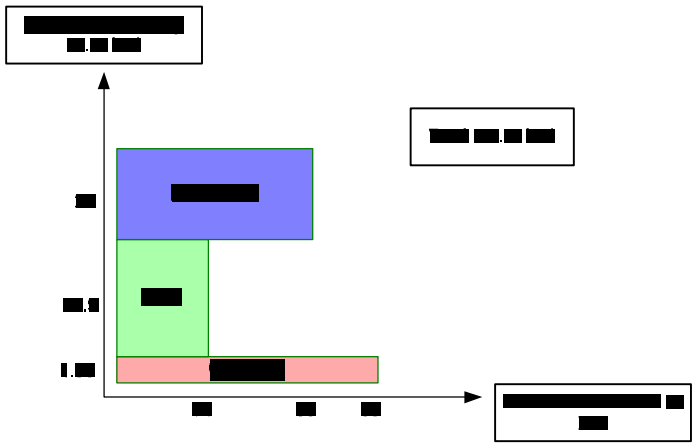

Figure 1. Supply Chain Response Matrix Transformator Production Systems

c. Quality Filter Mapping (QFM)

We can carry out an analysis for each form of defect determined according on production data periode Januari-May 2006. From Pareto Diagram composed by form of defect and its frequency, we obtain the most primary and critical defect, which can be seen further in Figure 2:

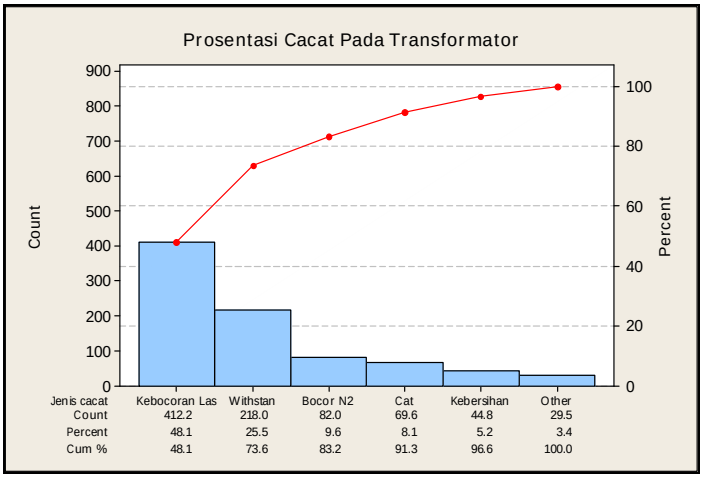

Figure 2. Defects Pareto Diagram

4. RECOMMENDATIONS

- Giving a proper training for operator to build awareness, improve work discipline, and giving an understanding about the importance of quality.
- Establish a standard in welding activity MIG to reduce defect process products.
- Reduce administration/ bureaucracy time by optimize the function of PPC department.
- Reduce delay time by adding space or working station for assembly process stck core and adding human resources.
- Carry out preventive action for all machinery and replacing spareparts periodically to maximize process capability and mnimizing defect products.
- Tighten prevail regulation and giving punishment for those who does not comply the standard process procedure.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclssions

a. Key activities that are influential in company's production systems identified form this research are:
   - Group of value adding activities are 63 operational activities with allocation time 1000.59 minutes.
   - Group of non value adding activities are transportation, storage, and delay activity with allocation time 216.70 minutes or 35 activities in total.
   - Group of necessary but non value added activities are inspection activity with allocation time 3.04 minutes or 3 activities in total.

b. According to Supply Chain Response Matrix, obtained that total time used to fulfill customer demand is 133 days

c. Result obtain using Quality Filter Mapping tool known that the defect with the highest number is defect in outer division.

5.2. Recommendations

1. Application of all stage and value stream mapping tool to measure value of company's supply chain as a whole.
2. Analizing waste in wider supply chain boundary, start from *supplier*, company and distributor.

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