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Identify Waste to Achieve Production Targets Using Value Stream Analysis Tool (VALSAT) Method

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ABSTRACT

An electronics company located in Bekasi, West Java, produces electronic components; one of its products is terminals. Based on data from the brazing department, the production target was not achieved because there was a difference or mismatch between the production target and daily production results, so it was necessary to improve the production line by identifying waste during the production process. The production target per shift is 2040 pcs, while the actual production output is 1927 pcs. An effective and efficient way to identify waste and its causes must be developed using Value Stream Mapping Analysis Tools (VALSAT). This research aims to find the causes of not achieving production targets and identify waste in the production process so that the production process is more efficient and effective using a brazing machine. By using VALSAT, it is hoped that it can describe problems and provide solutions. Value Stream Analysis Tools (VALSAT) is a tool that is used to map value streams in detail and focus on processes that have added value. VALSAT helps facilitate and understand existing value stream mapping and helps facilitate the resolution of identified waste. Detailed mapping from VALSAT can also be used to find the root causes of waste that frequently arise and occur so that the causes of not achieving production targets can be eliminated.

Key Words: Waste Identification, Production Target, Value Stream Maping Analysis Tools.

1. INTRODUCTION

The manufacturing industry is vital to keep the production process running smoothly. The company can meet production targets on time. Nowadays, many companies are trying hard to reduce operational costs. Companies use resources and production processes more economically, efficiently, and effectively. An electronics company in Bekasi that produces various electronic components, one of which is terminals and connectors. One of the departments/sections in the electronics company is Brazing, where in this department, the production activity is the brazing process, which experiences an increase in production every month. Initially, demand for terminal products was around 150,000 pieces per month, or around 1800 - 1900 lots. However, this demand continues to increase and peaked in July 2023 at 190,000 monthly pieces. Facing this increasing demand, the company optimized productivity in the Brazing Auto Series line by applying Lean Manufacturing principles. Customer demand continues to increase; the highest demand will be in July 2023. As in the picture, customer demand below.

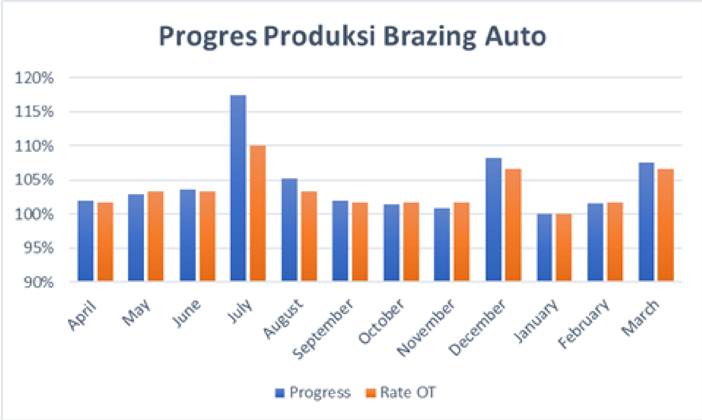

Figure1. Production in Auto Brazing machine

In the objective target that the company has every month, this series has a progress target of 100% of the planning made by logistics control. In total, the progress series always reaches the target of 100%. However, for this, relatively high overtime is required because the machine cannot reach the daily target during regular hours, while the overtime limit is 60 hours per month for the brazing department with the operator's work level due to several problems ranging from machine trouble, long cycle times, machines not supplying, c/o processes, pre-heating processes and other abnormal conditions that do not produce products or machines do not run productively and do not produce products. Then, the effort is to increase the overtime hours every day so that the target achievement is always achieved every day. Inverse proportional to the company's condition, reducing production costs from production to overtime. Employees must cut working hours that are too long or ineffective to produce the maximum quantity of product in the hope of achieving targets without working overtime. One way is to analyze processes in machines, people, and work methods that are felt to give rise to lead times that are too long.

Achieving production targets was accompanied by high overtime hours. One of the reasons for this is that the work process cannot meet daily targets during regular working hours, resulting in high overtime hours. The maximum overtime limit for the Brazing department, especially for operators, is 60 hours per month. For this reason, it is necessary to identify waste in the production process that has occurred so far, including long cycle times, delays in machine supply, replacement, and preheating processes, as well as abnormal conditions that hamper the production process. It is necessary to take an improvement approach through the concept of Lean Manufacturing theory. Analyzing waste that occurs in the production process by observing machine work processes, work methods, and labor efficiency in the Brazing department environment.

2. LITERATUR REVIEW

2.1 Lean Manufacturing

Waste is an element of production or service activities that does not have and does not provide added value. However, these activities add time, labor, capital costs, and other resources. The way we view waste must be from the customer's

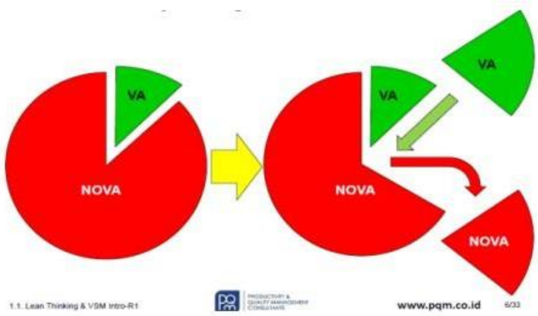

Figure 2. A Lean View of Waste

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point of view or perspective. The lean perspective on waste can be seen in Figure 2.

The Lean concept has five basic principles, namely:

1. Value defines the value of the product/service from the customer's perspective (seen from the perspective of results, not process).
2. Value Stream, identifying the value chain and eliminating existing waste.
3. Flow, creating a consistent process.
4. Pull, producing goods/services based on customer demand.
5. Perfection, always making continuous improvements.

2.2 Identify Activities in the Industry

In a process, identifying activities that provide added value (Value added activity) and activities that do not provide added value (Non-value added activity) is needed to increase productivity. The following are activities that often occur in the production process including (Nicholas, 2018):

1. Value-added activities, or activities that provide added value, are all activities that provide added value to consumer desires.
2. Non-value-added activity is any activity that does not add value to the product manufacturing process, categorized as waste. All efforts and actions in this activity become an additional burden, be it costs or resources, which are usually unrealized and need to be analyzed in depth. Therefore, NVA must be identified and eliminated as much as possible to increase profits and efficiency.
3. Necessary non-value-added activity is any activity that, when viewed from the consumer's perspective, does not provide additional value to the product manufacturing process but is needed. Eliminating this group of activities requires significant changes to the production concept and usually requires quite a long process and time.

2.3 Seven Waste

The Lean Manufacturing concept is intended to eliminate or at least reduce all wasteful production costs, human resources, energy sources, and useless activities. Waste is all activities in the production process that do not provide value from input to output throughout the value stream or process (Gasperz, 2007).

Taichi Ohno, in 1988, was one of the pioneers of TPS (Toyota et al.). Explaining and categorizing waste into seven waste groups. These waste groups include:

1. **Overproduction**, a waste that occurs when the products produced by a company exceed the required quantity target. It causes the money invested to stop or stop being used again as long as the excess product has not been sold. Overproduction can also cause higher production costs because it requires WIP or Work In Progress efforts to process the excess product. Overproduction can be caused by machines that have poor reliability, inconsistent processes, excessive machine capacity, and many others.
2. **Excessive Inventory:** All goods used are a cost burden on the company and cannot make money. These goods can be raw materials, products in process or WIP, and finished goods. All these items are considered waste if they are in the warehouse for too long because they cause burdens in the form of storage and material handling costs. Inventory can be caused by inconsistent suppliers, procurement of raw materials too early, minimum provisions for procurement of goods, production overtime, long cycle times, and poor line balancing.
3. **Product defects:** all types of defects in the product that make it impossible to sell the product to consumers. Potentials that can produce defective products include other things, such as a lack of training and training for members, unclear work procedures, machines that are not optimal, and machine part settings that need to be

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corrected. In this type of waste, the invested capital is wholly lost or reduced as a result of the product not being able to be sold or the need for a process with additional costs so that the product can still be sold.

4. **Over Processing**, waste of any process that is not needed in the product manufacturing process is carried out in that process as a result of using the wrong equipment, poor work methods, and the absence of precise specifications from consumers, which has a direct influence on the length of the production process, Damage to the quality of goods due to inappropriate treatment and increased production costs.
5. **Waiting and delay,** when the process stops due to the equipment needed to carry out the production process not being ready, waiting for materials to arrive from the warehouse, and follow-up information regarding specific actions. Things that have the potential to create delays and waiting times are inconsistencies in work procedures, long changes over time, bottlenecks due to unbalanced production lines, lack of maintenance on machines, and downtime due to machine repairs.
6. **Unnecessary Motion:** All forms of movement from the operator that are not needed in the production process are unnecessary motions. Movement: Additional movement that is not needed can occur due to poor workstation layout, inconsistent work methods, and lack of work standards, which can result in process lead times becoming longer.
7. **Transportation:** Transportation is categorized as waste because it does not impact adding product value. The large number of goods moving activities is due to the poor layout of work facilities, storage of raw materials and processes that are too far apart, process coordination that does not run smoothly, and other things that could potentially damage the product during the moving process and increase production costs.

3. RESEARCH METHODS

3.1 Type of Research

The type of research used in this study is quantitative research with a descriptive approach.

3.2 Data Collection Methods

The method or steps in conducting data collection can be seen as follows.

1. Observation, direct observation of the production process in the field to obtain valid data in supporting the making of this research.

2. Interviews, collecting information related to the causes of product defects through interviews by asking several questions directly to operators, supervisors and engineering.

3. Literature Study, studying reading sources that can provide information from various sources that have to do with the problem being studied.

4. Documentation and collection of data needed from the company's historical data in accordance with the research needs and problems studied.

3.3 Data Processing and Analysis Methods

Seven Waste Relationship (SWR) data was collected using interviews and direct discussions by connecting one waste and another. Distribute questionnaires to workers representing their respective fields. Then, the data is processed by weighting the questionnaire values and producing the most dominant waste.

- Waste Identification: Several types of waste are not utilized. Using the VALSAT method can help identify these areas in the process.
- Analysis and Evaluation: Once waste is identified, the next step is to analyze its causes and evaluate its impact on the overall process.

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4. RESULTS AND DISCUSSION

The auto-brazing machine is one of the unique processes in terminal production. The working process uses a pressurized flame in direct contact with the terminal material as the primary medium for the production process. Then, the terminal material will be heated to a specific temperature referring to production standards; after that, the hot material, the gaps will be flowed or filled with cops that comply with brazing production standards, and then the product will enter the OK product basket for the cooling process. There are several work processes involved in the auto brazing machine production process. As follows:

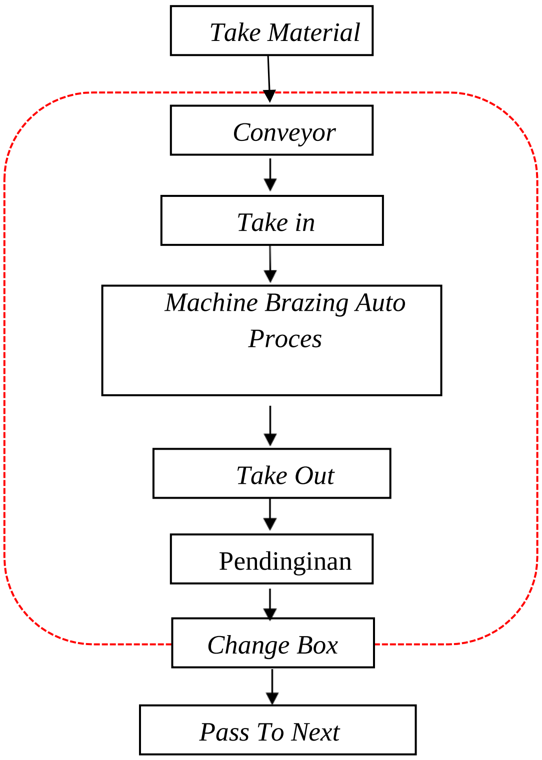

Figure 3. Auto Brazing Machine Production Process

Based on the picture above, the terminal production process on an auto-brazing machine is as follows :

1. Taking Material from the Material Area (Take Material), This process is carried out by material control, where material control will supply material according to the material and running plan on the auto brazing machines. This process is carried out manually by one person on every shift.
2. Conveyor, the machine operator pours the material into the hopper or material reservoir which will later be supplied automatically by the bowl feeder to be processed individually into the shooter and drum.
3. Take In Correction, This process is carried out automatically using the vibration of the bowl feeder and the shooter's movement, which uses a cylinder and drum rotation driven by an electric motor. In this process, there are several working steps for machine parts. Namely, the Stoper opens and closes, and the Guide Shooter opens and closes to stabilize the position of the material constantly and continuously so that the supply is stable. The product can be appropriately processed; the Correction movement rises and falls as a product stopper when supplied into the drum, so the product position is always at the same height. It does not move up and down, and Sensor detection detects material (Detecting the presence of material so that the sensor will give the servo motor command to send the wire after the heat treatment process).
4. Machine Brazing Auto Process, There are five processes carried out, namely Guide Chuck, Main-Heating PreHeating, Sending wire Spray Flux, Main Heating, and Air Cooling
5. Take Out Correction, After the heat treatment process is complete, the operator will carry out visual product selection in order to detect and separate any defective products produced by the machine, so that they do not pass to the following process.

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6. Cooling, this process is carried out so that the material does not get too hot so that when it is put into a plastic box, the material does not stick to the box. After selection, This process occurs when the material is spread out on the table and left for 5 minutes before being put into the box.
7. Change Box, This process involves changing the iron basket in the machine, then the basket filled with product is placed on the pallet to be exchanged back into a plastic box to wait for the product to cool first.
8. Pass To Next Process, Sending the product to the following process using several supporting facilities or equipment such as trolleys, hand jacks, and others in the picture above; the terminal production process on an auto-brazing machine is as follows.

Waste Measurement Based on Employee Analysis, Carried out by auto brazing machine operators, selectors, and operational and maintenance staff on duty on the machines and lines. In the brazing department, for each series or type of product, there is one operational staff, one maintenance, two operators, and one machine selector, or it could be interpreted that there are five employees in one series. They are given a questionnaire to provide data on what waste occurs on the machine while the production process is in progress.

They are measuring the production process time on the machine. Auto brazing machine process time data during production is based on calculations carried out directly.

5. CONCLUSION

After researching waste and other factors that cause waste on Brazing Auto machines in the Electronics Industry, it was found that the three most dominant wastes that occurred were Transportation, Waiting, and Overprocessing. This identification was carried out using the seven-waste relationship (SWR) method with a questionnaire filled out by several employees as respondents.

Improvements were made based on the results of VALSAT calculations by eliminating non-value-added activities, such as increasing operator competency and making material control the PIC for moving products. Additionally, necessary non-value-added activities, such as the water cooling process, were eliminated because they were deemed unnecessary. These improvements increased the efficiency of the Brazing Auto machine process from 5.3% to 50%, and production capacity increased from 1,927 pcs/shift to 2,448 pcs/shift. The results of implementing the Virtual Reality runway light application show that this application can run well on the VR device. This application utilizes VR technology to provide an immersive experience where users can interact directly with the 3D runway light model. Users can feel the sensation as if they are in a real airport environment, which helps improve their understanding of the function and workings of the runway light equipment. In addition, the app also comes with an interactive guide that assists users in every stage of equipment installation and disassembly.

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