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DESIGN OF FINISHED GOODS INSPECTION ACCELERATION WITH QCC METHOD AND SEVEN TOOLS TO INCREASE PRODUCTIVITY

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ABSTRACT

The manufacturing industry in the current era of globalization is very strict. Speed to produce products is important now, not only in terms of process. Developing a new product at PT. Surya Toto Indonesia has been running well, only in the process there are still found the exceeded of time or schedule of work plans that have been made. The preparation process for carrying out this test will take more time. Because the test aids have not been prepared or have not been grouped according to the type of finished goods or according to the series. It is necessary to analyze using the seven tool method and assisted by factor analysis to find the dominant cause and corrective action. It was found the old problem in the inspection process was the dress-up process or preparation for the test. Because the test kits are incomplete and not permanent, also the test kits do not have a storage area and lack of employee's ability to process them. Employee education, complete equipment components, and also need to make permanent test kits and according to the specifications of finished goods. Storage area for the test kits so that it is not scattered and messy.

Keywords: design; finished goods; seven tools; productivity.

1. INTRODUCTION

The competition in the manufacturing industry in the current era of globalization is very tight [1]. Competition today is not only in terms of processes and products produced. But also the speed in the process of developing new products as well as developing existing products for the better (improvement)[2]. The speed of this process consists of several factors, including the speed of construction design, the quality inspection process, and also the production process[3][4].

According to The Global Competitiveness Report published by the World Economic Forum, there are 12 pillars of 3 sub-indexes in determining the level of competitiveness of a country. Where productivity and competitiveness are included in the Efficiency subindex [5]. To produce a good product, a fast, effective and efficient process requires quality resources. The most important resources are 3 things, namely humans, tools/machines, and processes [6]. This is important for the smooth running of the production process. It also produces optimal product prices so that it can compete with competing products [7].

Of the 3 things above, one of the most important is the fast process. Because with a fast process, the goods will reach the consumer more quickly, with this also the costs incurred are cheaper [8]. PT. Surya Toto Indonesia is a company engaged in manufacturing sanitary ware and fittings products. Where in the business process

includes the process of production and assembly of bathroom necessities. The process of developing new goods at PT. Surya Toto Indonesia has been running well, only in the process, there are still many times that are found to exceed the time or schedule of work plans that have been made This, of course, will hurt competition with more and more similar companies. Not only is there more competition, but there are also many similar companies that have opened factories in the territory of Indonesia. This makes competition to make new products increasingly necessary and must be done quickly [9]. In the process of developing new products, the process is not only in terms of product design (construction) process design (manufacturing process) but also design checks (inspection of products both parts and finished goods or finished goods). on the check design, especially the inspection process or quality conformity test or product quality (Finished Good) against its specifications.

In the process of inspection of finished goods, of course, it is carried out in the test room in the New Product Development (NPD) section. But sometimes the preparation process to carry out this test takes time [11]. This is because test aids have not been prepared or have not been grouped according to the type of finished good or according to the series. So that when going to do the test, the person must first assemble the part (support) of the test equipment to become 1 unit of the tool. This causes the test preparation process to be longer than the implementation of the test itself. And it will have an impact on decreasing productivity [12].

2. METHODS

Based on the research conducted, the scope of the research is limited based on the place and object of research as follows:

a. Place and Time of Research
This research was conducted at PT. Surya Toto Indonesia, Tbk which is located at Jl. MH. Thamrin Km.7 Sepong, South Tangerang.
b. Research Time
The time of the study was carried out from January 2020 to December 2020.

2.1. Types of Research

In conducting the research, the method used is qualitative in the form of data on the length of time for the development of new goods, and a quantitative method, namely the results of interviews with employees processed using SPSS.

2.2. Data and Data Sources

To obtain data in this study, the authors made efforts to collect data. In this study, the types of data needed are:

a. Primary Data
Primary data is data obtained directly from the object of research. The primary data was obtained by conducting direct field observations, calculations, measurements, and direct interviews with competent parties.

b. Secondary Data
Secondary data is data obtained from company information and literature, namely:

c. Literature Study
Data were taken from various sources of articles, literature, books, and journals to get an understanding of the theories and analytical methods that underlie the research.

2.3. Data Collection Technique

In collecting the data needed in writing this research, the authors use several data collection methods as follows:

a. Observation
The observation method is a study that is carried out or systematically with its technical implementation, namely observing the actual objects that occur in the field so that they get a real or objective picture in the Final Inspection section that causes claims[13].

b. Interview
The interview method is a data collection technique through the direct submission of several questions.

2.4. Data Analysis Method

The stages of completing the data analysis method in this study are as follows:

a. Collecting data on external claims and data on types of external claims from January 2019 to December 2019

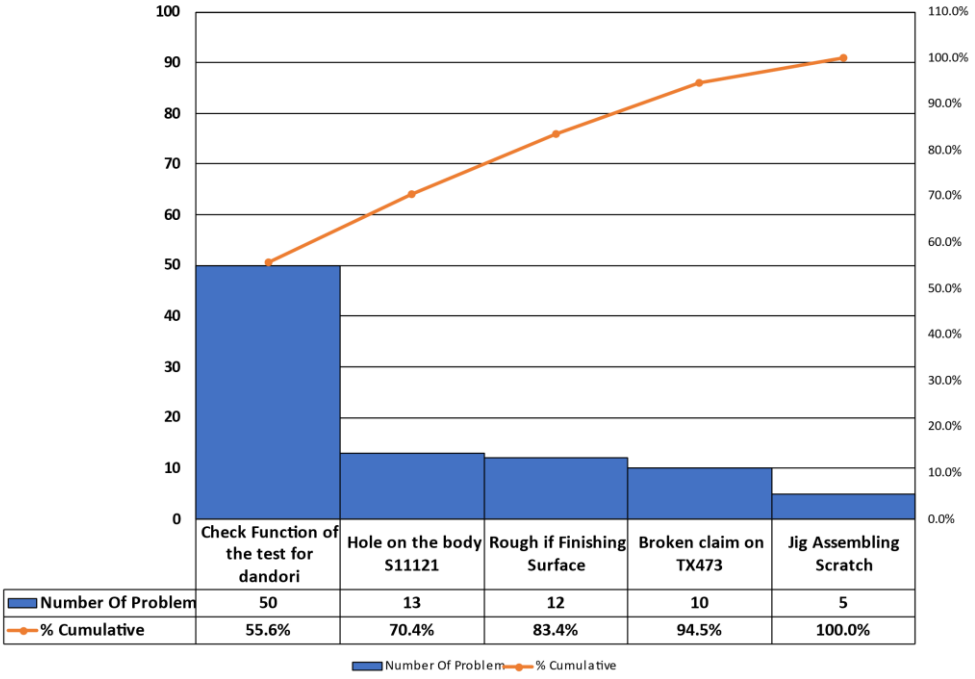
b. Data processing uses the seven tools method and factor analysis

c. To find out the dominant factor, factor analysis was carried out. By process order,

- Prepare a list of questions and distribute them to respondents according to the sampling technique used;
- Determine the variables to be analyzed;
- Testing the variables that have been determined using the KMO value, Barlett Test of Sphericity, and measurement of MSA (Measure of Sampling Adequacy);
- Interpretation of the factors that have been formed, which will become new variables derived from representatives of the previous variables [14]. Contains how data was collected, data sources, and data analysis methods, along with the research flow carried out.

3. RESULTS AND DISCUSSION

From the results of the recapitulation of existing problems, it is known that the most problems can be seen in figure 1.



	Check Function of the test for dandori	Hole on the body S11121	Rough if Finishing Surface	Broken claim on TX473	Jig Assembling Scratch
Number Of Problem	50	13	12	10	5
% Cumulative	55.6%	70.4%	83.4%	94.5%	100.0%

Figure 1. Pareto Diagram for Most Problems

From the graph above, it can be seen that the biggest problem in the quality inspection process is the length of the preparation process for checking the quality function of finished goods, which is the most common cause. Then to further refine what type has the longest time in the preparation process for the implementation of the function check. The results of direct measurements of the dandori process from all types of finished goods can be seen in figure 2.

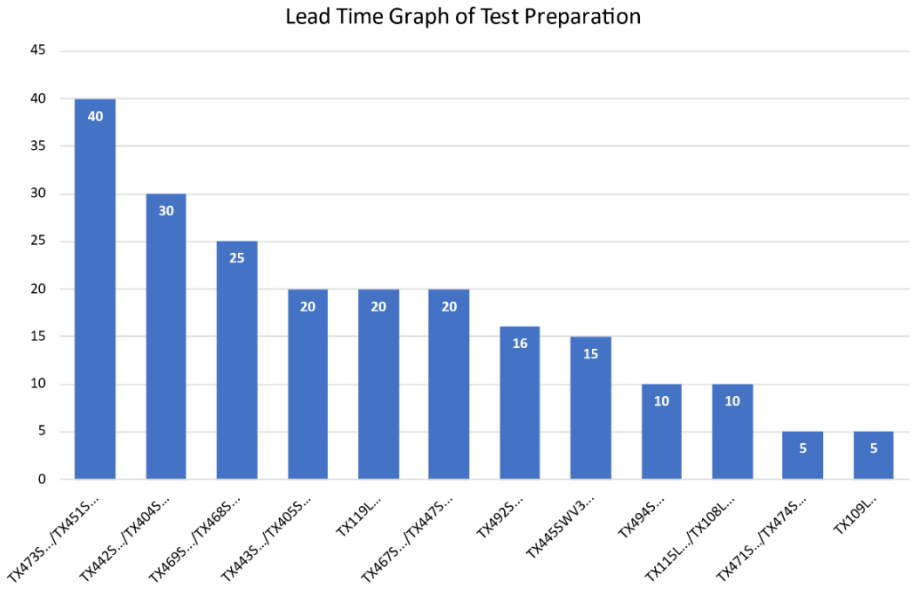


Figure 2. Histogram Diagram for the Oldest Type of Examination

In the graph above, the longest test preparation time is series concealed (finished goods embedded in the wall) for the TX442S…/TX404S…. Why is that, because the inspection process for this type of finished goods is quite complicated, and requires sufficient tools. complicated too.

Identification 4M+1L (Method, Machine, Material, Human, Environment)

In the process of identifying the problem using an Ishikawa diagram (fishbone diagram), the results can be seen in the figure 3.

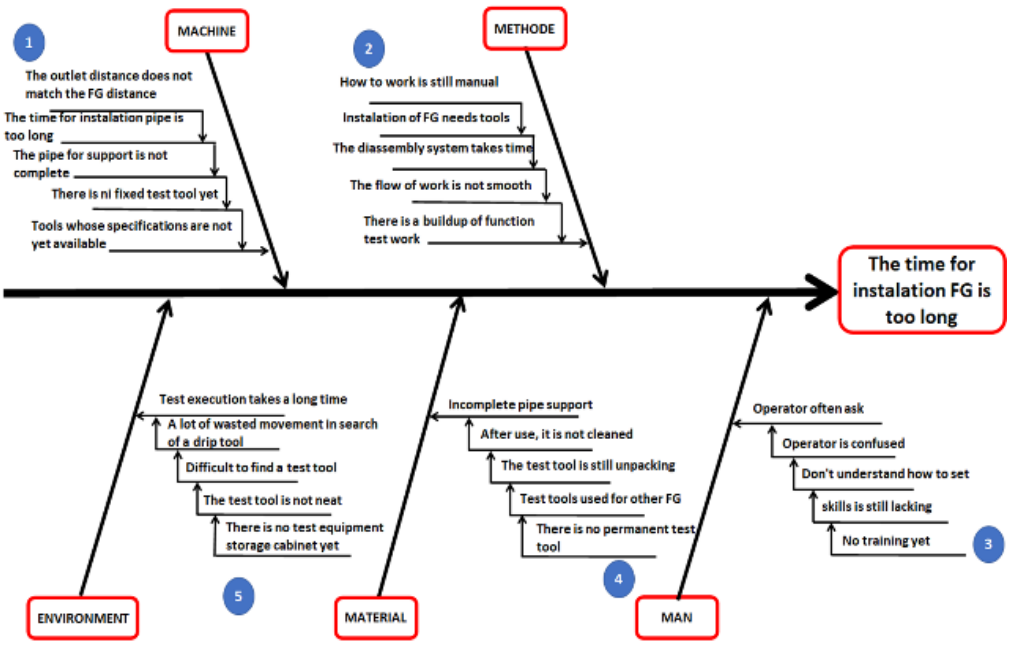


Figure 3. Fishbone Diagram for Problem Identification

The results of the identification of the cause of the problem, the length of the product inspection preparation process in the test room with 4M + 1L can be seen in table 1 below:

Table 1. Identification of 4M+1L

No	Variable	Indicator
1	MAN	Operators often ask
2		Operators Confused
3		don't understand how to set
4		skills is still lacking
5		No training yet
6	METHOD	How to work is still manual
7		Installation of FG needs tools
8		The disassembly system takes time
9		The flow of work is not smooth
10		There is a buildup of function test work
11	MACHINE	The outlet distance does not match the FG distance
12		The time for installation pipe is too long
13		The pipe for support is not complete
14	MATERIAL	There is no fixed test tool yet
15		Tools whose specifications are not yet available
16		Incomplete pipe support
17		After use, it is not cleaned
18		The test tool is still unpacking
19		Test tools used for other FG
20		There is no permanent test tool
21	ENVIRONMENT	Test execution takes a long time
22		A lot of wasted movement in search of a drip tool
23		Difficult to find a test tool
24		The test tool is not neat
25		There is no test equipment storage cabinet yet

Factor Analysis Assumption Test Results

The results of the stratification of the causes of the problems above are then carried out by a factor analysis test to determine the dominant factors that are the cause of the 25 causes of the length of the function inspection process. From the results of data processing using factor analysis, it was found that there were 4 variables where the KMO value > 0.5, namely the Human, Machine, Material, and Environmental variables, while the other variable, namely the Method, the value <0.5. Based on these results, we do not involve the method varies with the assumption that there is no dominant cause or influence on the problems that occur. The number of samples taken for data is 25 people. The results of the factor analysis test:

KMO Value > 0.5 = Human, Machine, Material and Environment
2.KMO value < 0.5 = Method[15]

From the results, there is no dominant cause for the method, and the dominant cause is on human, machine, material, and environmental variables. The results of the factor analysis of the incoming variables can be seen in table 2.

Table 2. Factor Analysis Results

Variable	Indicator	Factor Value
Man	Operators often ask	0.786
	Employee skills are still lacking	0.948
Machine	Long Pipe Setting Time	0.827
	Tools whose specifications are not yet available	0.848
	The outlet distance does not match the FG. distance	0.927
Material	Incomplete support pipe	0.811
	After use, it is not cleaned	0.832
	There is no permanent test kit	0.928
Environment	No test kit storage yet	0.931
	The placement of test equipment is not neat	0.961

Table 2 shows that for humans, the skill or ability of the operator is still lacking, for machines the distance between outlets is not suitable, and for materials, there is no permanent test kit and there is no place to store test kits for the environment.

After getting the data above, then the 5W1H analysis is carried out to make corrective actions and implementation plans. The results of the 5W1H analysis can be seen in table 3.

Table 3. 5W1H Analysis

How	Where	When	Who
Making training and education	Technical Dept	Every day during the morning meeting or once a week	Foreman Up
Create a test tool that is more suitable for each FG	Test Room or Order to Molding	until August 2020	Personel R&D
Completing and making test equipment components as spare parts	Technical Test Room	until August 2020	Personel R&D
Making storage racks for test equipment	Technical Test Room	until Sept 2020	Personel R&D

Variable	Problems	What	Why
Man	Operators often ask The ability of employees is still lacking	No education or training	To increase the ability of employees
Machine	Long Pipe Installation Time Tools whose specifications are not yet available The outlet distance does not match the FG. distance	The available tools are not complete and do not meet the specifications	So that the test equipment is by the specifications of the product being tested
Material	Incomplete support pipe After use, it is not cleaned There is no permanent test kit	The tool components are not incomplete and not permanent	So that the components of the test equipment are more sticky and permanent
Environment	There is no test tool storage yet The test tool is not neat	There is no storage area so the test tool is not neat	So that the test tools are stored neatly

There are several findings from the 5W1H analysis above that there is a need for training to improve the ability of employees in the product inspection process. It is also necessary to have permanent test kits and also need to make shelves or cabinets so that the test kits can be neater and not messy.

From the analysis and discussion above, the improvement plan can be made:

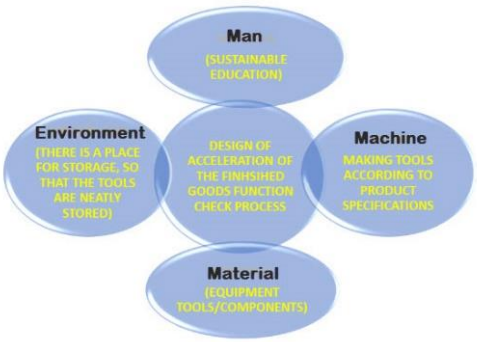


Figure 4. Design for Finished Goods Inspection Process Acceleration

4. CONCLUSION

The problem with the length of the inspection process for finished goods is the dandori process or the preparation of test equipment for each finished goods to be inspected. There is a 55.6% occurrence of the problem. The cause of the problem is that the ability of employees is still lacking due to the absence of continuous education, then from the machine, the test equipment is not by the specifications of the existing finished goods, then for the material problem, the components of the equipment are not complete and also not permanent. The problem environment is that there is no tool or place to store test equipment neatly. Actions that need to be taken are holding continuous employee education so that employee knowledge and abilities increase in terms of inspection and test equipment, it is necessary to make test equipment that is by the specifications of finished goods and is permanent, does not need to be dismantled and assembled, also completes its components, also so that the test equipment does not fall apart, it is necessary to make a shelf or storage cupboard containing conclusions. The conclusion contains answers to research questions. Written in essay form, not in numerical form.

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