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Study Experimentel the Quality of Tombstones by Utilizing Coconut Fiber Using Seven Tool

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ABSTRACT

Product quality in the production process is important, where consumer needs for the quality of the products produced will be better or better by going through existing processes and innovations in products that can make products that were originally good become better. The quality improvement on the tombstones at UMKM_SADAR Gresik has problems in terms of unstable quality and there are defects with thin cracks, small at the corners. there are several factors that need to be considered, namely in the fish bone diagram on human factors, methods, materials, the environment, namely the need for skills training/training for the process of making the tombstone and adding raw materials by utilizing the addition of coconut fiber to improve quality in the compression test and can reduce the potential for thin cracks, chipping at the corners of tombstones and monitoring worker evaluations

INTRODUCTION

The quality of the product in the production process is important, where the consumer's need for the quality of the product produced will be better or better by going through the processes and innovations that exist in the product that can make the product that was originally good to be better than its predecessor product in terms of quality. Quality control is a way to verify and carry out appropriate maintenance/maintenance of equipment, periodic inspections, and corrective actions when necessary (Sulaeman, 2014).

A tombstone is a product that is needed when a family member dies or the tombstone is damaged, consumers will buy the tombstone product. UMKM SADAR in Gresik City is one of the producers of tombstones which are made of concrete whose composition only uses coral, cement, sand with water as the supporting material, tombstone molds. The process of making UMKM tombstones in Kec. Manyar Kab. Gresik is simple, that is, it requires sand, cement, mixing is done and then the formation / pattern according to a predetermined design (Wajo & Inayah, 2017). These UMKM SABAR Gresik will get a lot of orders if in the fasting month of Ramadan approaching Eid al-Fitr in 1 day they can produce 40 to 45 orders of tombstones, in the production process this UMKM SABAR Gresik have problems in terms of finished products, namely Thin Cracked Tombstones, Corner of the chunk Tombstone. Tests carried out on a compression test concrete resulted in the greatest increase in concrete compressive strength occurring in concrete with the addition of 0.5% coconut coir fiber, which was an increase of 21% (272.14 kgf/cm2) against the design concrete (225 kgf/cm2). And there was a decrease in the addition of 0.25% fiber by 18% (184.33 kgf/cm2) (Sahrudin & Nadia, 2016a). Compressive strength testing with coconut fiber was carried out at the age of 28 days to determine the compressive strength, up to the addition of 1% of coir fiber showed an increase in compression and flexural strength increased with increasing percentage of coir fiber (Amirtharaj, 2019). Reinforced again by adding 0.2% coconut fiber, water-cement ratio of 0.43, and the results of the compressive strength test are the best (Yashwanth, 2021). The desire for the world's increasing demand for coconut fiber and the development of the number and diversity of industries in Indonesia that have the potential to use coconut fiber as raw materials or auxiliary materials, is a great potential for the development of the coconut fiber processing industry (Shiddieq, 2017). coconut fibers and banana fibers strengthen the concrete compression with proper and correct processing will produce quality products (Thanushan & Sathiparan, 2022).

To improve the quality of tombstone products at UMKM SADAR Gresik requires innovation which by utilizing coconut fibers with grade A fiber quality will have an impact on improving quality in terms of defects, thin cracked tombstones, cuil tombstone corners. With the addition of coconut fiber will produce a good compressive test and will get an increase in quality in terms of compressive strength test (Shiddieq, 2017). And pressure tests on tombstone products using the method seven tools.

RESEARCH METHOD

2.1 Quality Control

Control and supervision are: Activities carried out to ensure that production and operating activities are carried out in accordance with what was planned and if there is a deviation, the deviation can be corrected so that what is expected can be achieved (Assauri, 1998). Quality control is an activity (company management) to maintain and direct the quality of the company's products and services to be maintained as planned (Ahyari, 1983). Quality control is a verification and maintenance/maintenance of a desired level/degree of product or process quality by means of careful planning, use of appropriate equipment, continuous inspection, and corrective action when necessary (Wignjosoebroto, 2003). The definition of quality control is an activity carried out to monitor activities and ensure the actual performance carried out is in accordance with what was planned (Gaspers, 2002).

2.2 Quality Control Objectives

Quality control is an integrated activity within the company to maintain and mediate the quality of the products produced so that they can run well and results according to established standards (Ahyari, 1983).

Quality is to find out to what extent the processes and results of products (services) are made in accordance with the standards set by the company. The objectives of quality control in general (Prawirosentono, 2002), are as follows:

a) The final product has specifications in accordance with established quality standards or quality.
b) So that product design costs, inspection costs, and production process costs can run efficiently.
c) From the expert opinion, it can be concluded that the principles of quality control are efforts to achieve and improve the process carried out continuously for analysis in order to produce information that can be used to control or improve the process, so that the process can meet the desired product specifications. by consumer

2.3 Benefits of Quality Control

Quality control is said to be within the control limits if there are only errors caused by general causes. Based on this, it certainly provides important benefits (Gryna & Juran, 2001)namely:

a) The process has stability that will allow the organization to predict behavior at least in the short term.

b) The process has an identity in constructing a set of conditions that are important for making future predictions.

c) Processes that are in a state of “being within the limits of statistical control” operate with less variability than processes that have special causes, low variability is important to win the competition.

d) Processes that have special causes are unstable processes and have excessive errors that must be closed by making changes to achieve improvements.

2.4 Seven Tools Quality Control

Seven tools are useful tools for mapping the scope of the problem, compiling data in diagrams to make it easier to read and understand (Tannady, 2015). Seven tools consist of seven quality control tools that are used to identify and analyze quality problems that are being faced so that these problems can be controlled. The seven quality control tools (Tannady, 2015), include:

1. Flow Chart, flow chart or flow chart is one of the tools in the implementation of quality improvement methods that are oriented and mapped the process. Flow is a management tool used to map the process or stages of a process.
2. Check Sheet, is a tool to ensure quality in real time, meaning that the cheek sheet will provide an actual and up-to-date picture of the conditions in the field.
3. Histogram, is one of the tools in the quality improvement implementation method that serves to map the distribution of the amount of data. The word "histogram" comes from the Greek words "hitos" and "gramma".

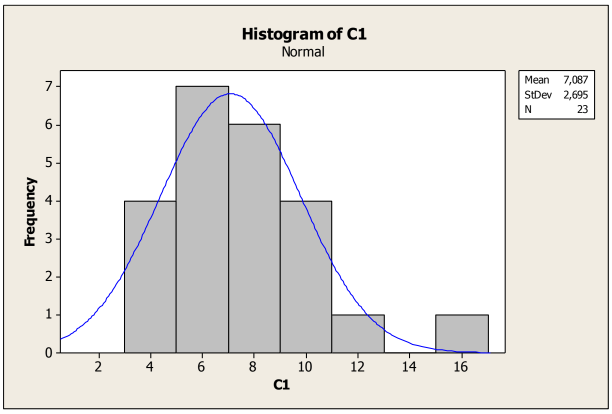

Figure 1. Histogram

4. Scatter Diagram, determine the correlation (relationship) of a continuous causal factor to other factors. In this case, the other factors are the characteristics of the quality of the work (Wignjosoebroto, 2006). In general, the distribution of this data will tend to follow 5 models according to the following, positive correlation The value of y will increase if the value of x also increases. If the value of x is controlled: (a) then the value of y will also be controlled, (b) There is a symptom of positive correlation. If x increases, then y tends to increase, but it can also be caused by factors other than x, (c) There is no visible correlation, (d) There is a symptom of a negative correlation. An increase in x will cause a downward trend in y, (e) Negative correlation An increase in x will cause a decrease in y, so that if x can be controlled, then y will also be controlled. The following is the formula for finding the Scater correlation value.

$$rxy2 = \frac{N\sum xy - \sum x \sum y}{\sqrt{N}\text{N} \sum(\text{x2}) - \sum(\text{x2})]\text{x}[\text{N} \sum(\text{y2})] - \sum(\text{y2})]} \quad (1)$$

Explanation : $rxy2$: Correlation coefficient between X and Y, ∑xY : The sum of the multiplications of X and Y, ∑x : Total X, ∑x2: The sum of the squares of X, ∑y: Total value of Y, ∑y2: The sum of the squares of Y, N : Amount of observation scatter diagram, we should consider the degree of correlation along with the types of correlations that have been concluded by statisticians as shown in the picture pattern (Straker, 2010).

5. Pareto diagram, are made to find the cause or problem which is the key in adjusting the problem and comparing it to the whole. The steps for making a Pareto diagram are as follows:

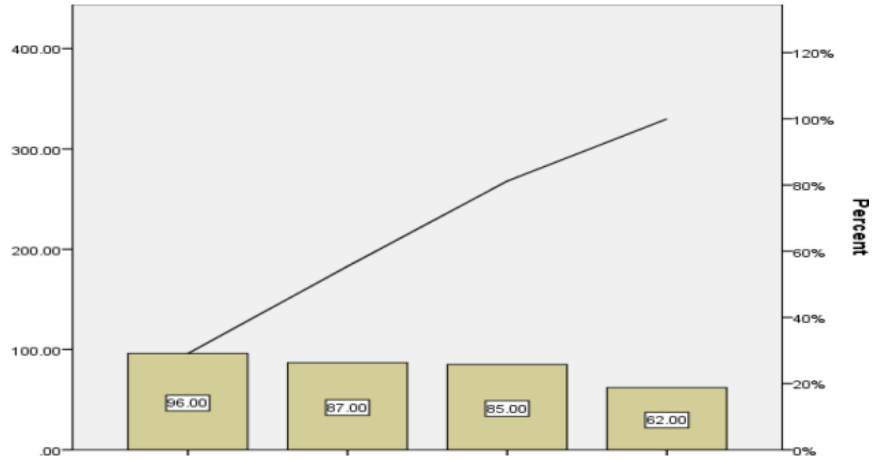

Figure 2. Pareto Diagr

6. Control chart, is a map that is used to find out whether a process is within the control limits or whether the capabilities of a process are within the expected limits and criteria. Each data type has its own control chart type (Neyestani, 2017). Meanwhile, the components that make up the control chart consist of, (a) UCL = Upper Central Line, (b) CL = Central Line, (c) LCL = Lower Central Line, (d) Distribution of observation values.

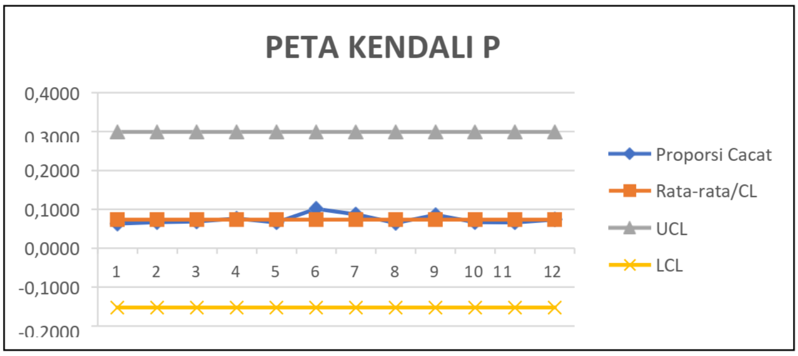

Figure 3. Control chart

control chart, we can draw conclusions about whether process variations are consistent (within control limits) or cannot be predicted beyond control limits because they are influenced by special causes of variation. The following is the formula for the P control chart diagram:

a) Calculating the Percentage of Damage P=X/N (2)

Description : P : the proportion of errors in each sample, X : the number of incorrect products in each sample, N : the number of samples taken in each sample

b) Calculate the center line/Central Line (CL), the center line is the average product damage

$$(p\ ),\ L = P = \frac{\sum X}{\sum N} \quad (3)$$

Description: X:total number of damaged, N:total number checked

c) Calculating the Upper Control Limit (UCL) To calculate the upper control limit or UCL, the formula is:

$$UCL = p + 3\frac{\sqrt{p-(1-p)}}{n} \quad (4)$$

Description : p : the average non-conformance of the product, and : the amount of production

d) Calculating the lower control limit or Lower Control Limit (LCL), To calculate the lower control limit or LCL is done by the formula:

$$UCL = p - 3\frac{\sqrt{p-(1-p)}}{n} \quad (5)$$

Description : p : the average non-conformance of the product, and : the amount of productionhj

7. A cause effect diagram is a graphic depiction that displays data on the causal factors of failure or non-conformance, to analyze to the deepest sub of the factors causing the problem (Tannady, 2015). Which consists of 4M and 1L (Machines, Mans, Methods, Materials and Environment) to find out the cause and effect of defects.

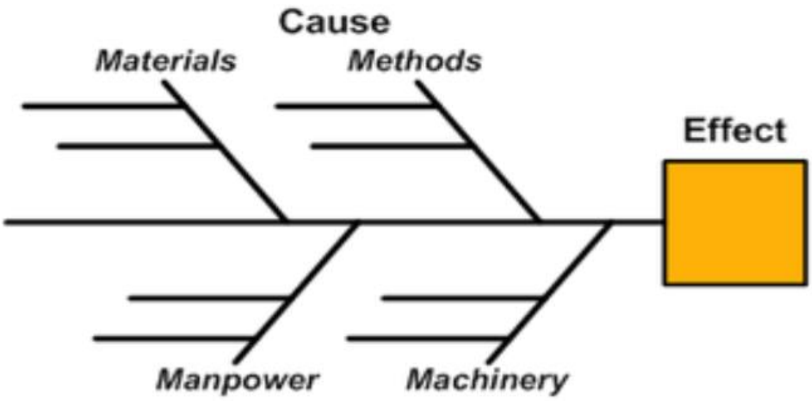

Figure 4. Fishbone diagram

2.5 Coconut Coir and Compressive Strength Test

Coconut fiber is a fibrous material with a thickness of about 5 cm, which is the outermost part of the coconut fruit. The extracted fibers were 40% hairy fibers and 60% mattress fibers. From 100 grams of fiber abstracted, 70 parts of husk were obtained, 18 parts of mattress fiber, and 12 parts of hairy fiber (Sahrudin & Nadia, 2016b). Brown coconut fiber: This type of fiber is strong, thick and has high abrasion resistance(Syafwan & Hayu, 2020).

For testing the compressive strength of a concrete cube measuring 150mm × 150mm × 100mm prepared and tested on a compression test machine with an age of 28 days, the cube strength is expressed in N/mm2 (Sharma, 2017). Compressive strength can be calculated using the formula (Syed et al., 2020);

Compressive strength=P/A

P= Load when the test object collapses in Newton

A = Surface area of the test object in mm2

2.6 Repair 5W+1H

To get a solution to the problem, the research objective is to determine corrective actions to reduce the level of defects by using causal diagram analysis and the 5W + 1H method and to find solutions to prevent defects from occurring. 5W+1H to investigate the causal factors in depth by developing questions based on the 5W+1H method, namely What, Where, When, Why, Who and How so as to determine the source of the main cause (Casban & Dewi, 2019).

RESULTS AND DISCUSSION

The use of the seven tools method on tombstones at UMKM SADAR Gresik, with the tools used to improve quality, namely:

3.1 Flow chart, from the results in the field for UMKM SABAR Gresik on the tombstone will be shown in Figure 5:

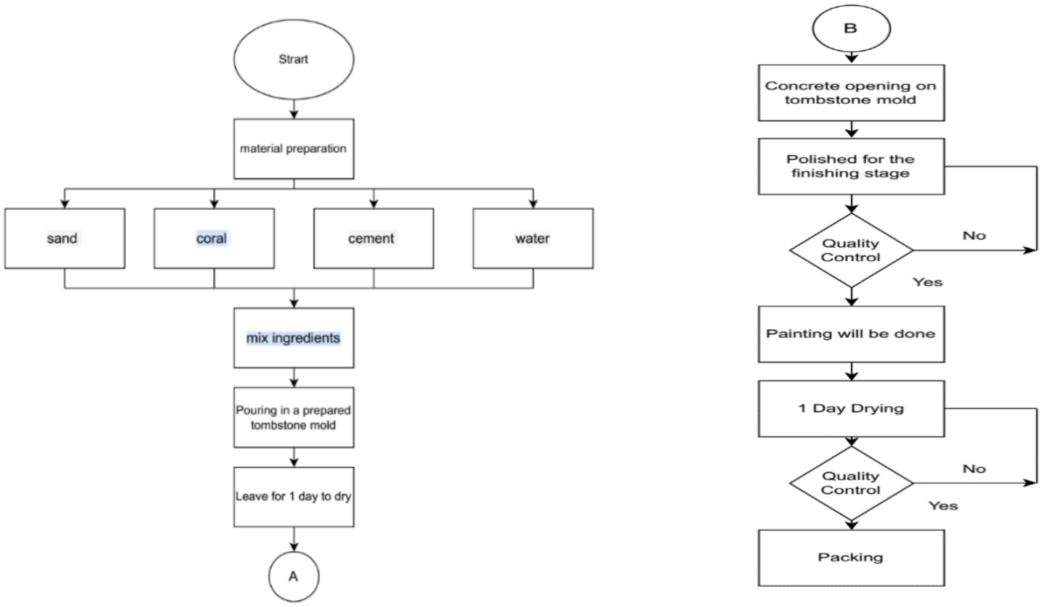

Figure 5. Tombstone production process flow

3.2 Check sheet, from the results of direct observations with documentation at UMKM-SABAR Gresik and summarized using observation sheets, get the following results table1:

Table 1. Check sheet

NO	Date	Production Quantity	Type of defect		Total Product Defect	Defect percentage
			Thin Cracked Tombstone	Tombstone Corner Chunk		
1	02-Apr-22	40	3	3	6	15,0%
2	03-Apr-22	40	6	0	6	15,0%
3	04-Apr-22	40	7	3	10	25,0%
4	05-Apr-22	40	6	8	14	35,0%
5	06-Apr-22	40	6	0	6	15,0%
6	07-Apr-22	40	8	8	16	40,0%
7	09-Apr-22	40	4	7	11	27,5%
8	10-Apr-22	45	10	6	16	35,6%
9	11-Apr-22	40	8	7	15	37,5%
10	12-Apr-22	40	4	6	10	25,0%
11	13-Apr-22	40	6	4	10	25,0%
12	14-Apr-22	40	11	7	18	45,0%
13	16-Apr-22	40	3	8	11	27,5%
14	17-Apr-22	40	4	8	12	30,0%
15	18-Apr-22	40	7	9	16	40,0%
16	19-Apr-22	43	9	1	10	23,3%
17	20-Apr-22	40	7	3	10	25,0%
18	21-Apr-22	40	6	2	8	20,0%
19	23-Apr-22	44	9	4	13	29,5%
20	24-Apr-22	40	15	4	19	47,5%
21	25-Apr-22	42	5	5	10	23,8%
22	26-Apr-22	40	5	6	11	27,5%
23	27-Apr-22	45	8	5	13	28,9%
24	28-Apr-22	40	9	4	13	32,5%
25	30-Apr-22	40	8	3	11	27,5%
TOTAL		1.019	174	121	295	723,6%
Average			6,2	4,8	11	28,9%

3.3 Hitogram, it can be seen in the histogram regarding the type and number of defects experienced in tombstones, the value that often occurs is 8-9 on figure 6.

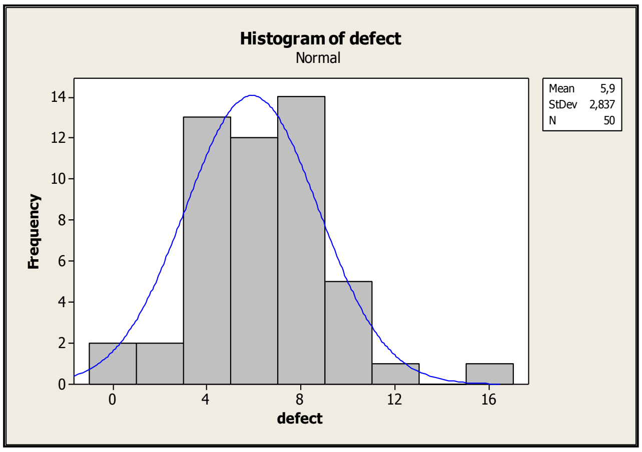

Figure 6. Hitogram

3.4 Scatter diagram, will show two types of variables, which variables have a correlation in figure 7.

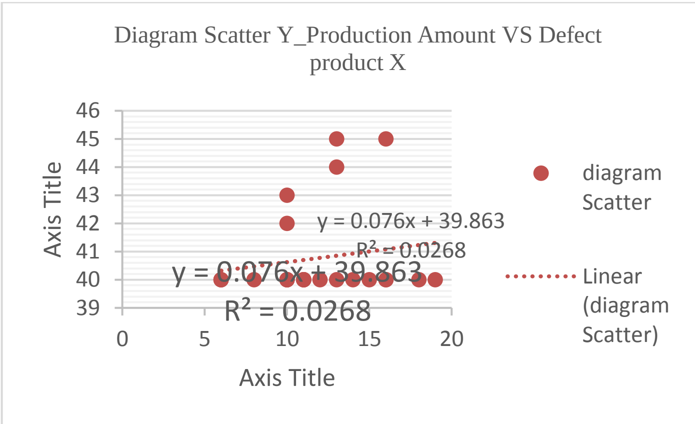

Figure 7. Diagram scatter

can be seen between variables Y and X the resulting correlation is less than 0.27 which can be interpreted as a very weak correlation (Suryoputro et al., 2017).

3.5 Pareto diagram, table 2 describes the number of tombstone defects and the cumulative percentage value that will be used for making pareto diagrams (Mizuno & Bodek, 2020).

Table 2. Pareto diagram

type of defect	Total cacat	Damage Percentage(%)	Cumulative Damage Percentage (%)
Thin Cracked Tombstone	174	59,0	59,0
Tombstone Corner Chunk	121	41,0	100,0
Jumlah	295		

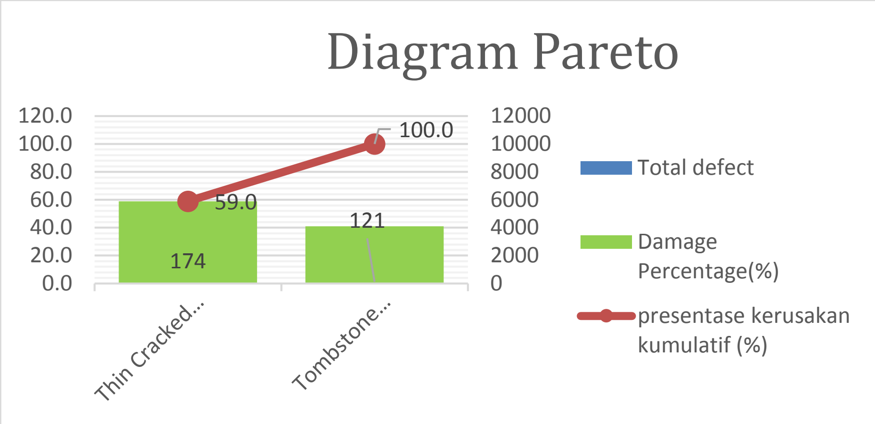

Figure 8. Pareto diagram

3.6 Control chart, to find out whether the tombstone product defect in UMKM_SADAR Gresik is still within the control control limits on the proportion of defects that occur, it is necessary to calculate which is already in the research method (Muhammad, 2015), it will be shown in table 3 and figure 9

Table 3. Control chart

NO	Date	Production Quantity	Average	Defect	Proporsi Defect	CL/P	UCL	LCL
1	02-Apr-22	40	41	6	0,1500	0,2895	0,5020	0,0770
2	03-Apr-22	40	41	6	0,1500	0,2895	0,5020	0,0770
3	04-Apr-22	40	41	10	0,2500	0,2895	0,5020	0,0770
4	05-Apr-22	40	41	14	0,3500	0,2895	0,5020	0,0770
5	06-Apr-22	40	41	6	0,1500	0,2895	0,5020	0,0770
6	07-Apr-22	40	41	16	0,4000	0,2895	0,5020	0,0770
7	09-Apr-22	40	41	11	0,2750	0,2895	0,5020	0,0770
8	10-Apr-22	45	41	16	0,3556	0,2895	0,5020	0,0770
9	11-Apr-22	40	41	15	0,3750	0,2895	0,5020	0,0770
10	12-Apr-22	40	41	10	0,2500	0,2895	0,5020	0,0770
11	13-Apr-22	40	41	10	0,2500	0,2895	0,5020	0,0770
12	14-Apr-22	40	41	18	0,4500	0,2895	0,5020	0,0770
13	16-Apr-22	40	41	11	0,2750	0,2895	0,5020	0,0770
14	17-Apr-22	40	41	12	0,3000	0,2895	0,5020	0,0770
15	18-Apr-22	40	41	16	0,4000	0,2895	0,5020	0,0770
16	19-Apr-22	43	41	10	0,2326	0,2895	0,5020	0,0770
17	20-Apr-22	40	41	10	0,2500	0,2895	0,5020	0,0770
18	21-Apr-22	40	41	8	0,2000	0,2895	0,5020	0,0770
19	23-Apr-22	44	41	13	0,2955	0,2895	0,5020	0,0770
20	24-Apr-22	40	41	19	0,4750	0,2895	0,5020	0,0770
21	25-Apr-22	42	41	10	0,2381	0,2895	0,5020	0,0770
22	26-Apr-22	40	41	11	0,2750	0,2895	0,5020	0,0770
23	27-Apr-22	45	41	13	0,2889	0,2895	0,5020	0,0770
24	28-Apr-22	40	41	13	0,3250	0,2895	0,5020	0,0770
25	30-Apr-22	40	41	11	0,2750	0,2895	0,5020	0,0770
TOTAL		1.019		295				

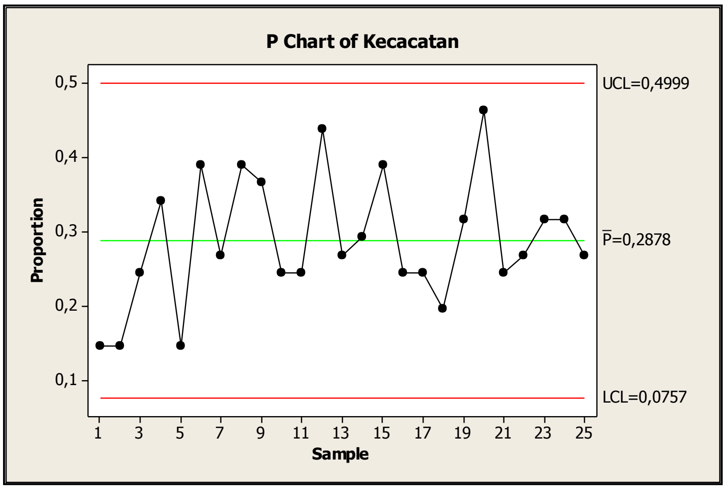

Figure 9. Control chart

it can be seen in Figure 9 for UCL and LCL there are no defects in the tombstones that come out of the predetermined line, the graph of defects will remain or the proportion of these defects goes up and down.

3.7 Fishbone diagram, in order to be able to see the type of defect in the tombstone product at UMKM_SADAR Gresik, the causes and consequences will be known, so that improvements can be made by knowing the cause on figure 10.

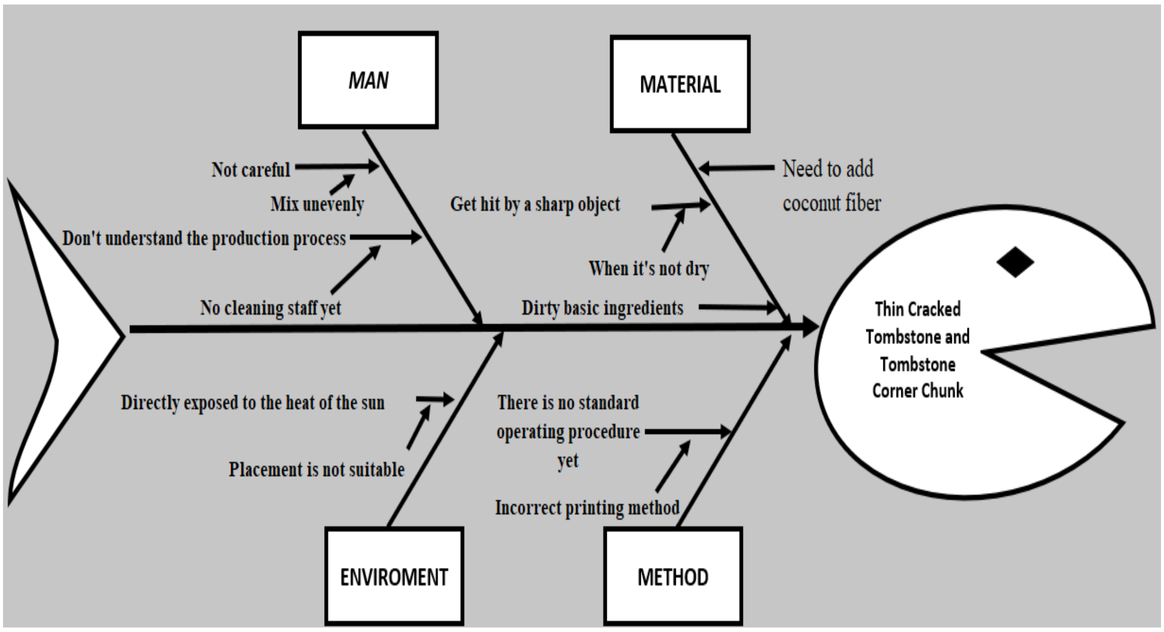

Figure 10. Fishbone diagram

3.8 Coconut Coir and Compressive Strength Test

The materials utilized are from Gresik and it's environmental factors, the materials utilized are rock, sand, concrete, water and coconut fiber. The level of coconut fiber utilized was 0%, 1%, 1.5% and 2% of the volume of cement. The length of coconut fiber with grade A quality utilized as a blend is 2 cm. The coconut fiber prior to being utilized as a combination is dried in the sun to diminish the water content, blend configuration is utilized to get the extent of the necessities of each total for substantial quality. the aftereffects of the compressive strength test can be shown in table 4

Table 4. Concrete Compressive Strength Test

% Coconut	No.	Age	Cube Size	Large	Weight of test object	Filling weight	**Crushed pressure**	crushing stress 28 day	Average
		day	(cm)	(cm2)	(gram)	(t/m3)	(KN)	(kg/cm2)	
0	1		15x15x10		5429	2,413	314	142,31	
	2	28	15x15x10	225	5729	2,546	349	158,17	328,67
	3		15x15x10		5524	2,455	323	146,39	
	1		15x15x10		5726	2,314	367	166,33	
1,0	2	28	15x15x10	225	5143	2,078	323	146,39	352,67
	3		15x15x10		5611	2,078	368	166,78	
	1		15x15x10		5511	2,449	360	163,16	
1,5	2	28	15x15x10	225	5529	2,457	334	151,37	336,00
	3		15x15x10		6448	2,204	314	142,31	
	1		15x15x10		5844	2,259	308	139,59	
2,0	2	28	15x15x10	225	5495	2,124	348	157,72	344,33
	3		15x15x10		5497	2,221	377	170,86	

Table 4 makes sense of the consequences of the pressure test with a few organizations going from 0% 1% 1.5% 2% to various outcomes, in the event that 0% the typical compressive test esteem is 328.67 KN and the most noteworthy worth is 1%, which is 352.67 KN. has a distinction somewhere in the range of 0% and 1% which is 24 KN, so one might say that involving the expansion of coconut strands in the substantial compressive test has an impact with a worth of 1% utilized, should be visible in the bar graph Figure 11.

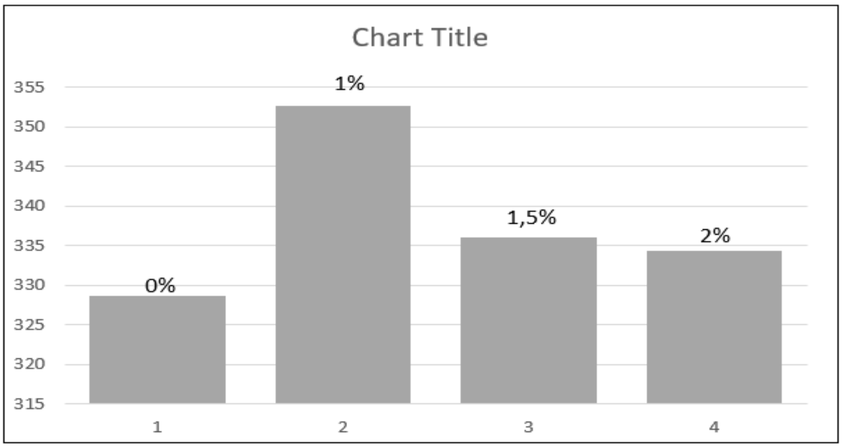

Figure 11. Average Pressure Test on Tombstones

3.9 5W+1H, to get recommendations for improvment, it should be fixed to come by results that are in accordance with assumptions, to be specific to work on the nature of tombstone items at UMKM_SADAR Gresik so that defect don't happen during the creation cycle which will be displayed in table 5.

Table 5. 5W+1H

Type	5W+1H	Portrayal of the Tombstone Quality Control and Improvement Plan
The main purpose	What	Control and improve the quality of tombstones
Reason for Use	Why	In order to be able to control and increase the speed in accordance with the specifications / product standards that have been determined
Location	Where	The process of making tombstone products
Sequence	Who	Employees and owners who do this have a responsibility

Method	How	The need for training/skill training for the process of making these tombstones and making additions to raw materials by utilizing the addition of coconut fiber to improve quality in compressive tests and can reduce the potential for thin cracks, chipping at the corners of the tombstones and monitoring evaluation of the workers

CONCLUSION

This experimental study found that in order to improve product quality on tombstones, it was necessary to add the production process using coconut fiber with a good percentage of 1%. and in terms of humans and methods, there needs to be training so that they know what standards must be done in the process of making tombstones, the environment so that there are no thin cracks on the tombstones needs to be shaded first and it is not recommended to be heated directly into the sun and pay attention to the material used. use it to clean it from dirt, including the cleanliness of the coral and also the sand used on the tombstones.

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