Quality Control of Food Packaging by Acceptance Quality Level Methods

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Abstract:- Quality control is one of the measures used to ensure that the product produced is in accordance with applicable standards and suitable for the market. However, adequate quality control measures have not been fully implemented at PT. XYZ. This results in an assumption of mistrust of the packaging used. It is supported by the discovery of several defects in the packaging used at PT. XYZ. Therefore, the acceptance quality level method can be done as a quality control measure that needs to be done at PT. XYZ. Acceptance quality level (AQL) is a quality control measure by inspecting the sample's characteristic attributes and being the parameters for acceptance and rejection of the number of samples inspected. This research was conducted on the Noodle Cup packaging used at PT. XYZ, there were 21250 pcs of arrival material. It means that 315 samples will be checked with General Inspection II. The results showed that the material for the arrival of the Noodle Cup could be accepted. This is based on the number of defects found, three pcs that are still within their acceptance tolerance.

Keywords:-AQL, Quality, Defects, Parameter, Packaging.

I. INTRODUCTION

Recently, competitive global business competition, especially in the food and beverages industry, requires manufacturing to respond to market dan customer effectively. Therefore, companies should produce a product that meets customer requirements. These requirements also include on-time delivery, without ignoring the quality of the products.

Quality is an important factor and becomes one of the keys to success in the business competition, which is shown in meeting customer requirements and satisfaction (Hoe & Mansori, 2018). However, on the other hand, productivity is as important as quality to meet customer demands. This means productivity and quality are correlated and interrelated. Productivity does not go collectively with the quality of the product, which can affect customers' attractiveness and loyalty to the products.

Therefore, to achieve high quality with high productivity, quality control is needed, which aims to monitor, control, and analyze the material used by ensuring the products are of quality in accordance with specified standards (Ahyari, 2002). However, an inspection of all incoming products is not possible due to lower efficiency level. Therefore, acceptance sampling method is used.

According (Sower, 2006) *Acceptance Quality Level* is an important part of quality control by inspecting several attributes characteristic of the test sample to confirm that the products meet the predetermined standard (H.K, 2005). Besides, *Acceptance Quality Level* also be a parameter in the acceptance and rejection of materials based on the specified attributes and the number of defective units found in the test sample (Deros, Peng, Ab Rahman, Ismail, & Solung, 2008).

One of the most common problems faced by companies is the high proportion of defects. With a high proportion of defects obtained by the manufacturing process, the production level decreases as well, which cause target deviation. Much rejection cause of increasing the cost of reworking defective products and causing considerable losses to the company (Senaviratna, 2013). In fact, implementation of quality control, especially for the packaging used in PT.XYZ has not been appropriately implemented. Whereas, there were many defects found on the packaging used and potential to reduce consumer attractiveness to the products. Therefore, this research aims to implement quality control with acceptable quality levels on incoming materials for packaging used at PT. XYZ

II. METHODOLOGY

The steps taken in this research are as follows. Identification and formulation of problems are the initial stages in researching by conducting direct field observations and analyzing quality control that has been carried out at PT. XYZ. From the problems found at the observation stage, literature studies were conducted to compare data between actual data and theoretical data. It is necessary to apply quality control using the Acceptable Quality Level (AQL) method following applicable standards from the problems faced.

The method used in this research is the Acceptable Quality Level (AQL) with the following stages: determining the Acceptable Quality Level (AQL) parameters, incoming material size, type of sampling, determining the level of inspection, determining the inspection procedure, determining the sample size code, and perform analysis with Operating Characteristic curve.

In the research conducted, qualitative data or attributes are used in inspecting the packaging used. Attribute data is obtained by checking whether or not the test sample is good by looking at the sample's visual aspects.

III. RESULT AND DISCUSSION

A. Problem Identification

From the observations made on the packaging used by PT. XYZ, the problem occurs with the quality control method used for incoming material, both in primary and secondary packaging. The packages are often outside the specified specifications and standards, but the quality control that is carried out is not completely right according to the applicable standards. Thus, it raises doubtful assumptions about the packaging used.

The results of observations made at PT. XYZ, Noodle Cup is one of the primary packages most often found defects and is outside the applicable specifications. Defects that occur in cup noodles are generally caused by the injection molding process, which is the process of ordering plastic materials by offering high pressure to materials that are melted by heat (Kurt, Kamber, Kaynak, Atakok, & Girit, 2009). One of the defects often found in noodle cup packaging is scratching caused by excessive pressure applied to the injection molding process, causing the packaging material to rub against the mold wall.

In carrying out quality control using the Acceptance Quality Level method on the noodle cup packaging, there are several characteristic attributes that become the checklist, such as the shape, molding results, and color grading of the noodle cup.

B. Implementation of Acceptable Quality Level

The Acceptable Quality Level application for incoming material is carried out on one of the product packages used at PT. XYZ, it is Noodle Cup with a single sampling plan. The single sampling plan is a single random sampling plan in a lot of material arrival, where the decision to accept and reject it is based on an examination of one sampling. The decision to reject the test sample occurs when the number of defects found in the sample size (n) exceeds the number (c) of defects in the applicable standard. (Schilling, 1982).

According to (Gulia, Vandana, & B.S, 2014), Noodle Cup is the premier packaging made of polystyrene, polyethylene, or paper cups, which are watertight and used as a container for precooked instant noodle products and ready-to-eat seasonings.

In controlling the Noodle Cup packaging quality with 21250 pcs of incoming materials, Acceptance Quality Level (AQL) is applied with General Inspection II. In implementing the Acceptance Quality Level, the author and the company set a single sampling system with an inspection level of 1.5% critical defects, 4% major defects, and 10% minor defects. This shows that the number of product defects that have the potential to occur is not more than 1.5%, 4%, and 10% for critical defects, major defects, and minor defects respectively from the total material arrival (Fitriyani & Agus, 2011).

Thus, from the above provisions, the sample size code to be checked from each checking lot can be determined in accordance with **Figure 1.**

Lot or Batch Size	Special Inspection Levels				General Inspection Levels		
	S-1	S-2	S-3	S-4	I	II	III
2 to 8	A	A	A	A	A	A	B
9 to 15	A	A	A	A	A	B	C
16 to 25	A	A	B	B	B	C	D
26 to 50	A	B	B	C	C	D	E
51 to 90	B	B	C	C	C	E	F
91 to 150	B	B	C	D	D	F	G
151 to 280	B	C	D	E	E	G	H
281 to 500	B	C	D	E	F	H	J
501 to 1200	C	C	E	F	G	J	K
1201 to 3200	C	D	E	G	H	K	L
3201 to 10000	C	D	F	G	J	L	M
10001 to 35000	C	D	F	H	K	M	N
35001 to 150000	D	E	G	J	L	N	P
150001 to 500000	D	E	G	J	M	P	Q
500000 and over	D	E	H	K	N	Q	R

Fig 1: Sample Size Code Letters (Military Standard, 1989)

Based on Figure 1, it can be seen that the sample code from the tests carried out on 21250 pcs of arrival material, namely M. Thus, the number of samples carried out to check was 315 pcs.

In **Table 1.** It can be seen that out of 21250 pcs material arrivals can be accepted if the total number of defects that occur in the material is less than the rejection parameter which is 11 pcs critical defects, 22 pcs major defects, and 22 pcs minor defects. If a defect is found with an amount that is more than the rejection standard, then the material is rejected.

Incoming Material	Sample Code	Amount of Sample	Defect Type	Parameter		Total Defect	Decision
				Accept	Reject		
21250 pcs	M	315	Critical	10	11	3	Accept
			Major	21	22	-	
			Minor	21	22	-	

Table 1:- Noodle Cup Quality Control Inspection Results Data

From the research that has been done, it can be seen that the material for the arrival of the Noodle Cup of 21250 pcs can be received according to the Acceptance Quality Level. This is based on the total defects that occurred in the inspection which was carried out as many as three pcs on the critical defect. It means that the proportion of defects that occurred was 0.0095 which was obtained from the comparison between the number of defects found and the number of samples used (Dodge, 1977). The defect that occurs in the arrival material has met the acceptance rate in accordance with the predetermined acceptance parameters. To evaluate and analyze the performance of the sample, operating characteristic curves are used. The characteristic operating curve is a presentation of the probability of receiving lots of material arrival. The characteristic operating curve shows the probability of acceptance (Pa) of the non-conformity occurring (P) (Widiaswanti, 2014).
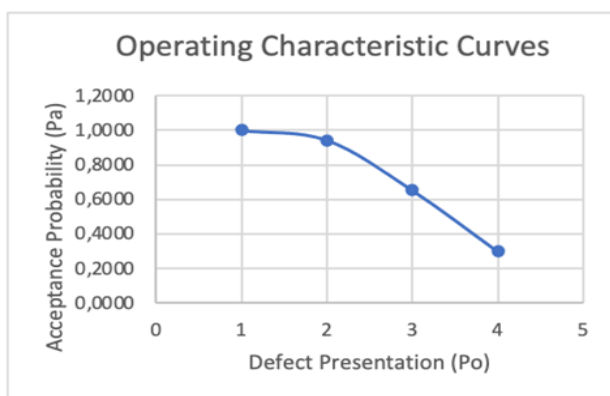

Fig 2: Characteristic Operatic Curves

From **Fig.2** shows that the smaller the value of the proportion of authenticity (Po), the greater the value of the confirmatory probability (Pa). The proportion of defects obtained in this research is 0.0095, so the probability value of acceptance is 0.9995. Thus, if there are 21250 pcs of material in one arrival lot, then the probability of receiving it is 21239 pcs of material.

IV. CONCLUSION

Thus, the application of Acceptance Quality Level can be applied to PT. XYZ to improve and maintain the quality of the products produced based on applicable standards and specifications so that it has the potential to increase consumer satisfaction with the products produced. In addition, applying the Acceptance Quality Level can also eliminate the assumption of distrust of the packaging used.

From the research that has been done, it can be concluded that the incoming material, especially the Noodle Cup at PT. XYZ can be received. This is based on the number of defects found within a predetermined tolerance limit.

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