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DESIGNING OF SINGLE SAMPLING PLAN IN PRODUCTION OF SELECTED CONFECTIONARY

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Abstract

Sampling Inspection is one of the key determinant of the level acceptance of any product whether by internal or external consumers. The study examines the use of sampling inspection in ensuring that output from sugar confectionaries companies benefit both the producers and the consumers of products using milkose sweet as a case study. The study utilized primary data collected basically by sampling and inspecting sachet of milkose sweet each containing 50pieces of the product. Single Sampling scheme was applied in determining the actual sample size n and number of defective (c) that would benefit both consumers and producers. The result shows that n=52, c=1 will level the gap between the parties.

Keywords ─ Acceptance Sampling Plans, Single Sampling Plan, Operating Characteristic Curve

INTRODUCTION

Nowadays, manufacturing is a quintessential component of a prosperous economy. Generally, modern manufacturers are associated with mass production. Technological advancements enable the mechanization of production processes, as well as improve overall efficiency and productivity of which the confectioneries are not left out. Since the production process is very complex based on organization structures, the application of quality control is needed to ensure that the desired result is met. Quality control techniques are a means of seeing that quality standards are maintained. A more specific definition of quality control, simply state by juran5, is that it is "the monitoring of production to

maintain process control and produce goods that are fit for the intended purpose" integral to a quality control/statistical process control system is the concept of designing quality into product, with monitoring to maintain control, and acceptance sampling as a final check.

Sampling is a structured process for the selection of specified items from a population to obtain information about the product and the process. Traditionally, quality departments sample for both monitoring and quality control purposes. Prybrutok, et al7 observed that the Japanese success with process control has led to acceptance sampling being relatively ignored in the literature, but acceptance sampling is a common tool in practice. A sampling plan gives management information on the production process after the process is completed and allows some regulation of the process.

Each plan contains a specific degree of certainty about the sampling results, as well as an average outgoing quality level (AOQL). Management is often presented with the dilemma of trying to understand the concepts of quality control and sampling, and of deciding which of these systems, or combination of systems, is appropriate for their production processes. The example discussed in this article illustrates that nonstandard procedures are at times more appropriate than accepted standard methods because of system constraints and competing objectives. Experience has shown that system constraints and competing objectives are common in practice. While process control and acceptance sampling are structured procedures in general, particular applications may require unstructured approaches.

METHODOLOGY

Data Sources

In order to meet the target of this study, data was collected through market survey by inspecting the randomly selected sachet of milkose sweet. Some of the local markets were visited, and samples of sachets were taken from the cartons. Base on the information on the Catton. Each pack of the milkos sweet contains 50 pieces. Sachets of these sweet were inspected to obtain the number of defectives in each of the of 50unit were inspected on each of the Company product (Milkose), A random sampling techniques is used for each unis for inspection of each lot. This ensures that every unit in the lot has an equal chance of being selected, the inspection and evaluation was done according to the predetermined criteria for quality control. This involve the Packaging, size and shape.

Method of Data Analysis

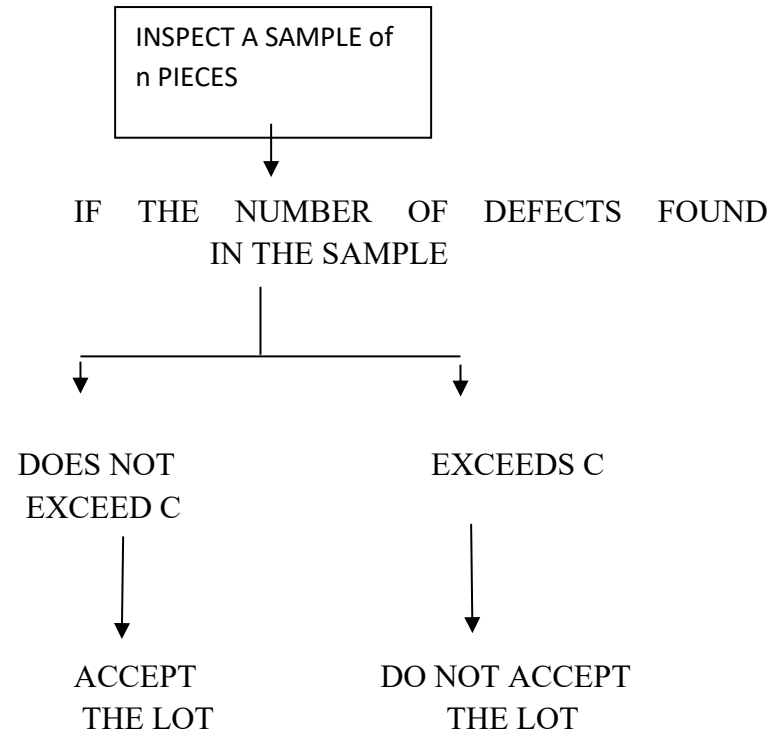
Acceptance sampling is a form of inspection that is applied to lots or barches of items either before of after a process. In the majority of cases, the lots represents incoming purchased item or final products to be supplied to customers. The purpose of acceptance sampling is to decide whether a lot satisfies predetermined standards i.e specification for important characteristics of the item. Lots that satisfies these standards are passed or accepted, those that do not are rejected. Acceptance sampling involves both producers and consumers. Consumers need acceptance sampling to limit the risk of rejecting good quality materials or accepting bad quality materials. Consequently, the consumers, sometimes in conjunction with the producers through contractual agreements, specifies the parameters of the plan.

There are several acceptance sampling methods for attributes and variables. The attribute sampling is a simple statistical method that utilizes representative samples to analyze traits of a large body of data and decides on the number of defectives in the lot. Variable sampling is design to predict the value of a given variable and to decide based on measurement values. thus, statistically valid sampling plan tells us the probability of accepting bad lots and the probability of rejecting good lots in the manufacturing system. The classifications are single, double, multiple and sequential sampling plans.

Single Sampling Plan

In this plan, one random sample is drawn from the lot, and every item in the samples is examined and classified as either good or defective. If the sample contains fewer than or equal to a specified number of defectives, C, the lot is accepted, otherwise if it contains more than c defectives the lot is rejected.

SINGLE ACCEPTANCE SAMPLING



RESULT AND DISCUSSION

The operating characteristics curve for single sampling plan using the following parameters n= 50, c=1, AQL=0.01, LTPD = 0.06 is given thus

Table. 1 Proportion defective Values of SSP

Prop. Def.	Np	Pa	
0.01	0.5	0.910	α= 1─0.910 =0.09
0.02	1	0.736	
0.03	1.5	0.558	
0.04	2.0	0.406	
0.05	2.5	0.287	
0.06	3.0	0.199	B=0.199
0.07	3.5	0.136	
0.08	4.0	0.092	
0.09	4.5	0.061	
0.1	5.0	0.04	

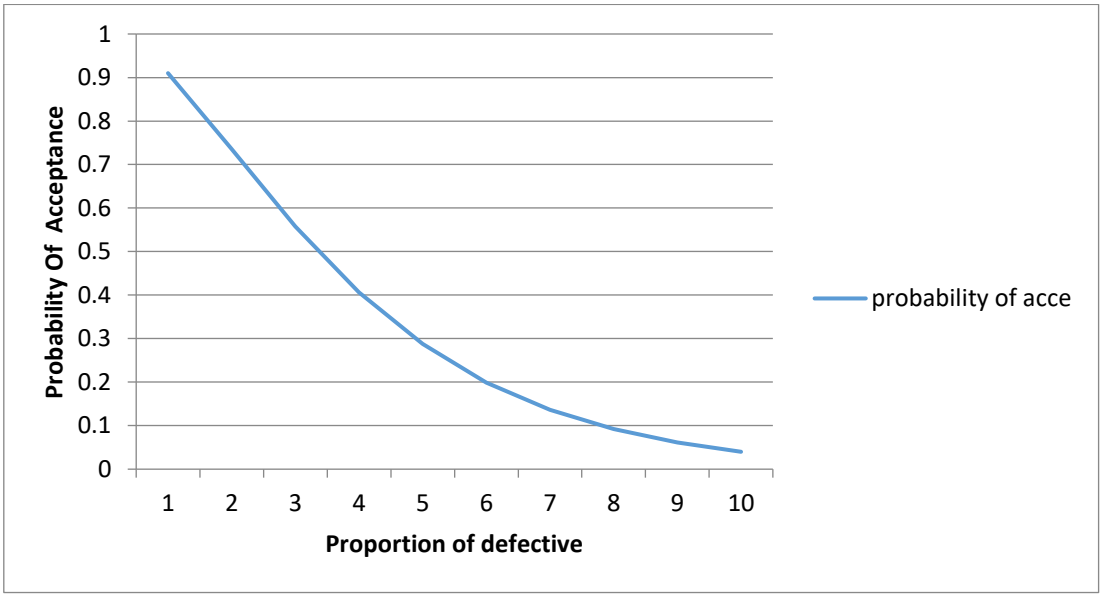


Figure 1 OCC for SSP

The plan provides a producers risk of 9% and the consumers risk of 19.9%, the risk can be adjusted by changing the sample size.

The single sampling plan consists of various plan parameters as n, c. in order to reduce the probability of rejecting good lots and accepting bad lots, we have to study how n and c affect the shape of the oc curve.
While holding c constant, the sample size Is increased. The probability of acceptance is given in the table below

Table 2. The proportion defective value for SSP for different sample size

Prop. Defective	Pa when= 70	Pa when= 90	Pa when= 110	Pa when= 130
0.01	0.844	0.772	0.699	0.627
0.02	0.572	0.463	0.345	0.267
0.03	0.381	0.249	0.159	0.099
0.04	0.231	0.126	0.066	0.035
0.05	0.137	0.061	0.027	0.011
0.06	0.078	0.029	0.01	0.004
0.07	0.044	0.014	0.004	0.001
0.08	0.024	0.006	0.001	0
0.09	0.013	0.003	0	0
0.1	0.007	0.001	0	0

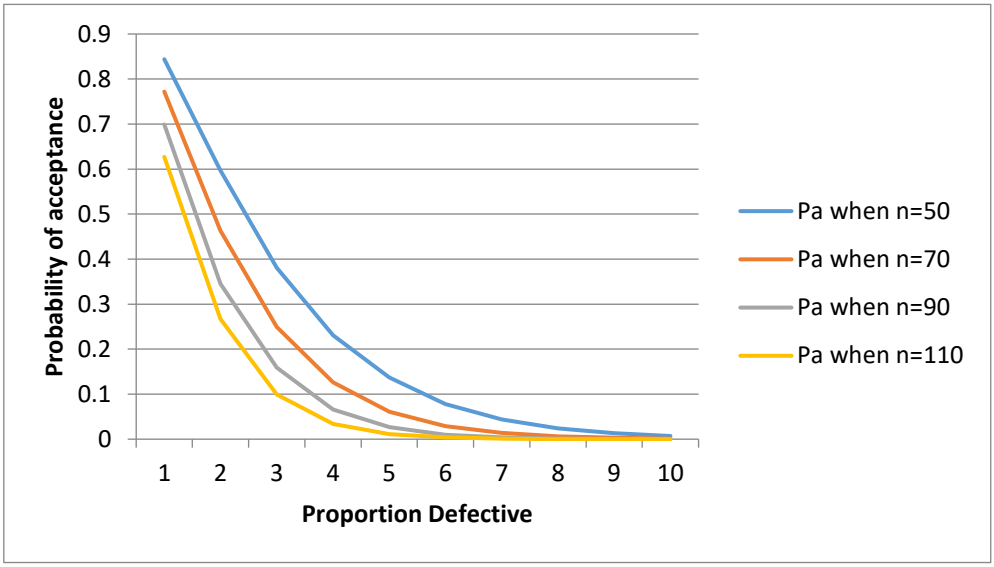


Figure 2.OCC of SSP for different sample size

Table 3. Producers and Consumers risk table for various sample size n

N	Producer risk	Consumer risk
50	0.09	0.199
70	0.156	0.078
90	0.228	0.029
110	0.301	0.01
130	0.373	0.004

Increasing the value of n while holding C constant shows that producers risk continue to increase and the consumers risks continue to reduce. This makes acceptance of the lot more difficult.

While holding n constant, the acceptance number Is increased. The probability of acceptance is given in the table below

Table 4. The proportion defective value for SSP for different Acceptance number

Prop. Def.	Pa when = C_1	Pa when = C_2	Pa when = C_3	Pa when = C_4
0.01	0.910	0.986	0.998	1
0.02	0.736	0.920	0.981	0.996
0.03	0.558	0.809	0.934	0.981
0.04	0.406	0.677	0.857	0.947
0.05	0.287	0.544	0.757	0.890
0.06	0.199	0.423	0.647	0.815
0.07	0.136	0.321	0.536	0.725

0.08	0.092	0.238	0.433	0.629
0.09	0.061	0.174	0.342	0.532
0.1	0.040	0.125	0.265	0.440

Table 3. Producers and Consumers risk table for various Acceptance number c

C	Producer risk	Consumer risk
1	0.09	0.199
2	0.014	0.423
3	0.003	0.647
4	0	0.815
5	0	0.916

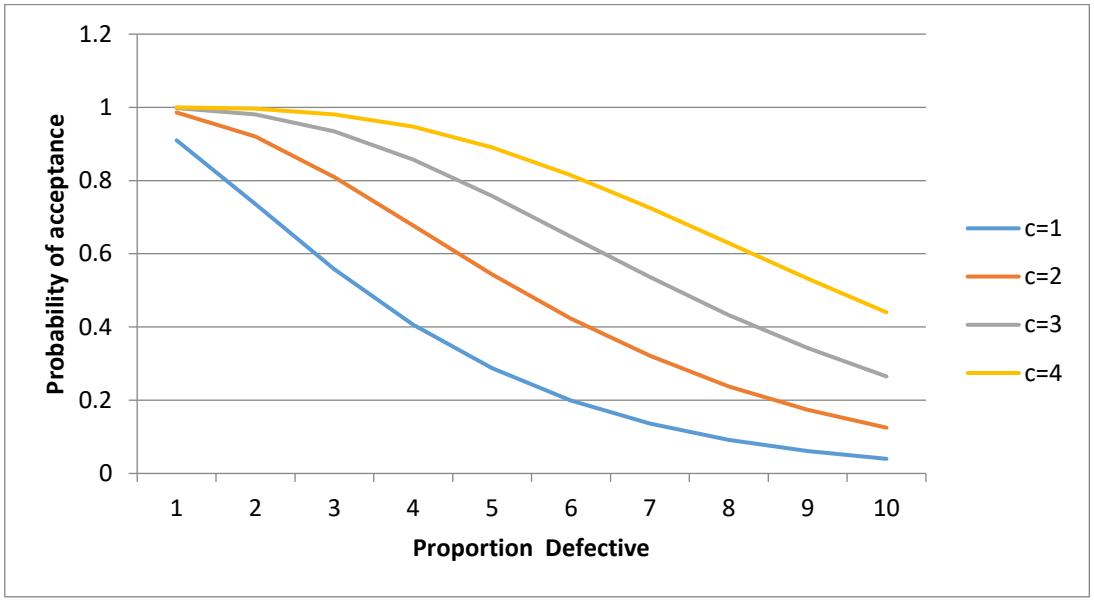


Figure 3. OCC of SSP for different acceptance number

Holding n constant, increasing in C makes producers risk to be decreasing and increasing in the consumer's risk. However, raising the acceptance number for a given sample size increases the risk of accepting a bad lot.

To improve Milkose single sampling acceptance plan, there should be increase in sample size n and increase in acceptance number c. These values will reduce the consumers risk and producers risk respectively. In order to determine the value c that marches n which will favour both producer and consumers, trial and error method and

Larson nomograph were used. The results shows that n = 52 and c = 1 would benefit both producer and consumers.

CONCLUSIONS

In this paper, we are focused on single acceptance sampling plans to evaluate output products of milkose sweet as one of the sweet confectionaries. Acceptance sampling produces acceptance number of defectives c and sample size n to decide whether or not the lot likely to be acceptable or not.

Further research can be carried out for selection of sampling plan and their cost effect by considering other sampling plan such as double, multiple and sequential plan of acceptance sampling method.

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