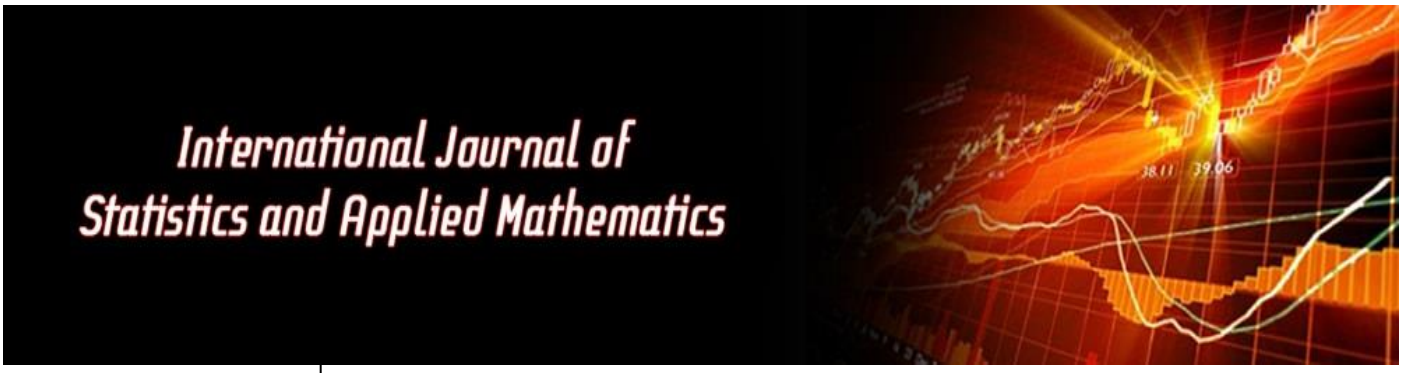
International Journal of Statistics and Applied Mathematics 2022; 7(3): 152-154



ISSN: 2456-1452
Maths 2022; 7(3): 152-154

www.mathsjournal.com
Received: 09-02-2022
Accepted: 11-03-2022

D Senthilkumar
Department of Statistics, PSG College of Arts & Science, Coimbatore, Tamil Nadu, India

P Sabarish
Research Scholar, Department of Statistics, PSG College of Arts & Science, Coimbatore, Tamil Nadu, India

Corresponding Author:
D Senthilkumar
Department of Statistics, PSG College of Arts & Science, Coimbatore, Tamil Nadu, India

Comparative study on double inspection single sampling plan with existing single sampling plan

D Senthilkumar and P Sabarish

DOI: https://doi.org/10.22271/maths.2022.v7.i3b.835

Abstract
Sampling inspection plans are playing a vital role in the production Industries. The professionals insist on the product very strict quality control measures should be adopted in order to avoid rejection and satisfying the need of the customer. In this article describes comparative study of Double Inspection Sampling Plan with Single Sampling Plan through operating characteristics curve and sample size. Also this article discussed the brief review of operating procedures, flow charts and operating characteristics functions of above plans.

Keywords: Single sampling plan, double sampling plan, double inspection sampling plan, and operating characteristics curves

Introduction
During the production process, due to various reasons defectives may occur. The professionals are inspecting all the observations in each sample with very strict quality control measures, to avoid rejection and satisfy the need of the customer. Single sampling plan is base of all sampling innovations. In single sampling plan the decision of accepting or rejecting the lot is made based on single sample only. It has three parameters N, n and c where N is the lot size, n is the sample size and c is the acceptance number. According to has also given a table which is an extension of the table given by Cameron's table is based on Poisson distribution and can be used to design single sampling plans for all the popular values of producer's risk and consumer's risk.

If single sampling plan not favour for the production situation, the inspection move to other sampling plans. In this study Double Inspection sampling plan was established only when needed. Focus on the bivariate situation where exactly two tests are performed on each unit. The Single Sampling Plan (SSP) is the basic, foremost and popularly used form of sampling plan for the industrial purposes. The SSP is used for count data in which only one sample is selected characterized by three parameters namely, the lot size (N), sample size (n) and acceptance number (c) but Double Inspection data in which only one sample is selected characterized by four parameters namely, the lot size (N), sample size (n), acceptance number (c_1) for first inspection and acceptance number (c_2) for second inspection. Senthilkumar and Sabarish (2020) [5] have developed the Construction and Selection of Double Inspection Single Sampling Plan [DISSP (0, 1)]. Senthilkumar and Sabarish (2021) [6] have developed Selection and Development of Double Inspection Single Sampling Plan. Senthilkumar and Sabarish (2021) [9] have developed Economic Design of Double Inspection Single Sampling Plan.

Operating procedure
Step 1: Draw a random sample of size 'n' units from the lot and test each unit for conformance to the specified attribute requirements.
Step 2: Count the number of defectives in the first inspection 'd_1' then go to next step. If $d_1 \leq c_1$ go to second inspection for the same sample of size 'n' otherwise ($d_1 > c_1$) reject the lot.
Step 3: Count the number of defectives in second inspection for the same sample, d_2 then go to next step.
Step 4: If $d_1 \leq c_1$ and $d_2 \leq c_2$ accept the lot otherwise ($d_1 > c_1$ and or $d_2 > c_2$) reject the lot.

Operating characteristics function

$$\text{Pa(p)} = \left(\sum_{k=0}^{c1} \frac{e^{-np} \quad np^k}{k!}\right) \left(\sum_{k=0}^{c2} \frac{e^{-np} \quad np^k}{k!}\right)$$

Comparison through sample size

Double Inspection Single Sampling Plan with existing Single Sampling Plan in two different inspections separately. For example, Double Inspection Sampling Plan (n: c_1=2, c_2=3) compared with two Single Sampling Plans [(n: c=2) (n, c=3)]. Here we observed that the proposed sampling plan gives the minimum sample size compare with other two single sampling plans. Plan determined by this method for smaller sample size provide the required information to accept or reject the lot for given c_1=2 and c_2= 3. It is advantageous to apply the bivariate attribute plan in industries for reducing the inspection cost and time.

Table 1: Values of sample size

p	SSP-1	SSP-2	DISSP
	c=2	c=3	c_1=2,c_2=3
0.001	818	1366	765
0.002	409	683	381
0.003	273	455	255
0.004	205	342	191
0.005	164	273	153
0.006	136	228	114
0.007	117	195	109
0.008	103	171	95
0.009	91	152	85
0.01	82	137	79

Table 2: Values of probability of acceptance

p	SSP-1	SSP-2	Pap
0.01	0.954004	0.991298	0.945703
0.02	0.788514	0.923919	0.728523
0.03	0.577566	0.784969	0.453372
0.04	0.388314	0.611435	0.237429
0.05	0.245522	0.443299	0.108839
0.06	0.148328	0.303434	0.045008
0.07	0.086540	0.198323	0.017163
0.08	0.049123	0.124851	0.006133
0.09	0.027273	0.076208	0.002078
0.1	0.014869	0.045334	0.000674

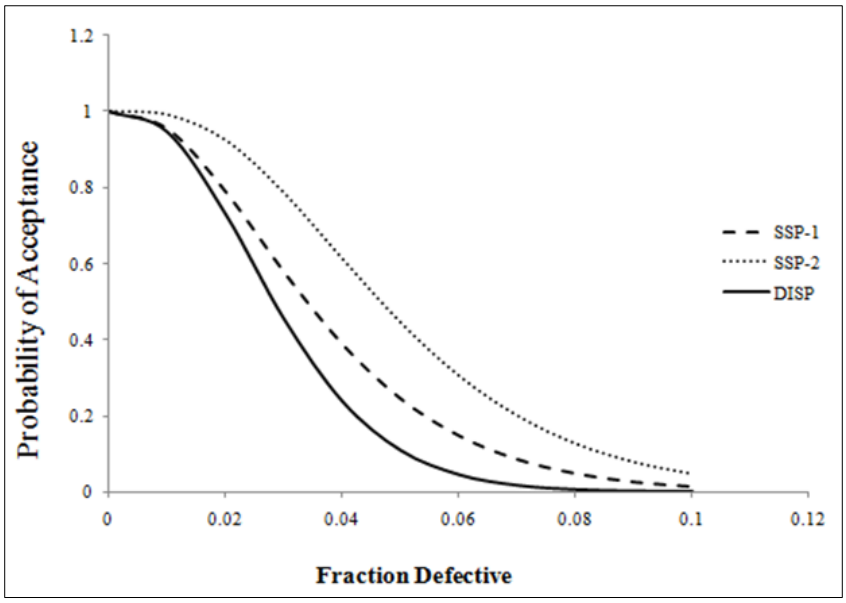


Fig 1: Comparison through OC Curve

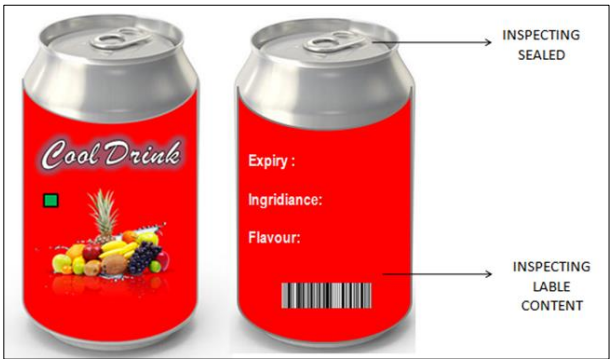
Description of tables

Table 1 gives the comparison of Double Inspection Single Sampling Plan with existing Single Sampling Plan through sample size.

Table 2 gives the probability of acceptance of first inspection for the sample of size n=79 and acceptance number c_1=2, the probability of acceptance of second inspection for the sample of size n=79, and the acceptance number c_2=3 and the probability of acceptance of Double Inspection Single Sampling Plan size n=79; c_1=2 and c_2=3 Double Inspection Single Sampling Plan.

Illustration

In Double Inspection Single Sampling plan two inspectors checking two different quality Characteristics of cool drink tins, c_1= Checking the sealed of the tin and c_2 = Checking the label of the tin, both the quality characteristics are independent Table 1 gives the probability of acceptance of first inspection for the sample of size n=79 and acceptance number c_1=2, the probability of acceptance of second inspection for the sample of size n=79, and the acceptance number c_2=3 and the probability of acceptance of double inspection single sampling plan size n=79; c_1=2 and c_2=3.



Umerical illustration

For example, Double Inspection Single Sampling plan (n: c_1=2, c_2=3) compared with two Single Sampling Plans [(n: c=2) (n, c=3)]. Here we observed that the proposed sampling plan gives the minimum sample size compare with other two single sampling plans. Plan determined by this method for smaller sample size provide the required information to accept or reject the lot for given c_1=2 and c_2= 3. It is advantageous to apply the bivariate attribute plan in industries for reducing the inspection cost and time. Figure 1 shows the OC curves of single sampling plan 1 (n=79, c=2), single sampling plan 2 (n=79, c=3) and Double inspection single sampling plan (n=79, c_1=2 and c_2=3) We can observe that the slope of the Double Inspection Single Sampling Plan Operating Characteristic curve becomes steeper than other two (SSP-1 and SSP-2) Operating Characteristics Curves.

Conclusion

In this study concluded compare to other sampling plans (SSP-1 and SSP-2) the sample size is very small in Double Inspection Single Sampling Plan. In other words Double Inspection Single Sampling Plan provides minimum of sample size with maximum of acceptance. In this plan we inspect two different and important quality characteristics of the same product, so that the product gets more quality. This finest plan was applicable for Mass and costliest product production industries like foods, smart phones and gold ornament so on where the human intervention is much involved and also it decreases the consumer risk.

References

1. Abraham Golub. Designing Single Sampling inspection plans when the sample size is fixed. Journal of the American Statistical Association. 1953 Jun 1;48(262):278-88.
2. Edward Shilling G, Neubauer V. Acceptance Sampling in Quality Control. 2nd Ed, Tylor & Francis; c2008.
3. Aydemir E, Olgun MO. An Application of Single and Double Acceptance Sampling Plans for a Manufacturing System. Journal of Engineering Science and Design. 2010 Sep 1;1(2):65-71.
4. Kazutomo Kawamura. The Structure of Bivariate Poisson distribution, KODAI Mathematical Seminar Reports. 1973;25(2):246-256.
5. Senthilkumar Sabarish. Construction and Selection of Double Inspection Single Sampling Plan by Attributes [DISSP (0,1)]. International Journal of Disaster Recovery and Business Continuity. 2020;11:3295-3304.
6. Senthilkumar Sabarish. Selection and Development of Double Inspection Single Sampling Plan. Bulletin Monumental. 2021;22:7-12.
7. Senthilkumar Sabarish. Economic Design of Double Inspection Single Sampling Plan. GIS Science Journal. 2021;8:568-583.
8. Senthilkumar Sabarish. Design of Double Inspection Quick Switching System [DIQSS (0,1)]. International Journal of Mechanical Engineering. 2022;7:421-424.