International Journal of Statistics and Applied Mathematics

ISSN: 2456-1452
Maths 2022; 7(2): 105-107

www.mathsjournal.com
Received: 23-12-2021
Accepted: 25-01-2022

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

P Sabarish
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

Construction and selection of double inspection quick switching system

D Senthilkumar and P Sabarish

DOI: https://doi.org/10.22271/maths.2022.v7.i2b.802

Abstract
Acceptance sampling plan have been widely used in industry to determine whether the manufactured item satisfy the pre-specified quality levels or not. At this point, an industry must have to take a decision for accepting or rejecting the lots in accordance with randomly chosen units. In this article describes the quick switching system with the reference of double inspection single sampling plan. Tables are constructed for easy selection of sample size.

Keywords: Quick switching system, double inspection single sampling plan, operating characteristics function

Introduction

Dodge (1967) [1] has introduced new type of sampling system, which consists of pairs of normal and tightened plans, other sampling systems the inspection involving only normal and tightened inspection is usually referred as two-plan system. The system considers tightened inspection plans for the poor quality levels and normal plans involving smaller sample size for the good quality levels. Due to instantaneous switching between normal and tightened plan this system is referred as "Quick Switching System".

After many authors extended and applied Quick Switching Sampling System in various branches of statistical quality control. Romboski introduced QSS-1 $(n;c_N,c_T)$ which is a QSS-1 with single sampling plan as a reference plan $[(n,c_N), (n,c_T)$ respectively the normal and tightened single sampling plans with $c_T < c_N]$, Soundarrajan and Devaraj Arumai Nayagam (1990) [10] have developed Construction and Selection of Modified Quick Switching System. Govindaraju and Subramani (1990) [2] have developed Selection of Single-sampling Quick Switching System for given Acceptable and Limiting Quality Levels. Soundarrajan and Devaraj Arumai Nayagam (1992) [11] have developed Quick switching system for costly and destructive testing. Senthilkumar *et al*. (2012) [4] have developed Construction of quick switching variable sampling system indexed by cross over point. Senthilkumar *et al*. (2018) [5] developed Construction of modified quick switching variable sampling system indexed by crossover Point. Vennila and Devaraj Arumainayagam (2018) [12] have developed Quick Switching System with different reference plans. Senthilkumar and Sabarish (2020) [6] have developed the Construction and Selection of Double Inspection Single Sampling Plan [DISSP (0,1)]. Senthilkumar and Sabarish (2021) [7, 8] have developed Selection and Development of Double Inspection Single Sampling Plan. Senthilkumar and Sabarish (2021) [7, 8] have developed Economic Design of Double Inspection Single Sampling Plan. The work presented in this paper is Double Inspection Quick Switching System with acceptance number 0 for tightened level and 1 for normal level [DIQSS (0,1)] with reference to single sampling plan based on the poisson model. In double inspection, the first inspection does not depend on second inspection, the inspection process has to be continued until the lot is either accepted or rejected.

Operating Procedure

Select the random sample 'n' from the population 'N'

1. Select a random sample of size 'n' units from the lot and test each unit for conformance to the specified attribute requirements.

2. In first inspection find the number of defective d_{11} at normal level if $d_{11} \leq c_N$ move to second inspection otherwise shift to tighten level.
3. Count the number of defectives 'd_{12}' at the tighten level if $d_{12} \leq c_T$ move to second inspection otherwise reject the lot.
4. In second inspection find the number of defective d_{21} at normal level if $d_{21} \leq c_N$ move to second inspection otherwise shift to tighten level.
5. Count the number of defectives 'd_{22}' at the tighten level if $d_{22} \leq c_T$ accept the lot otherwise reject the lot.

Operating Characteristics Function

$$Pa(p) = \left[Pa1(p) = \frac{P_T}{P_T + (1-P_N)}\right]\left[Pa2(p) = \frac{P_T}{P_T + (1-P_N)}\right]$$

Average outgoing Quality

$$AOQ = p(P_a(p))$$

Illustration

In the digital world usage of the smart products (smart phone, smart watch, smart bag, smart glass...etc.) increase day by day. In DIQSS two inspectors checking two different quality Characteristics of the Smart ring with Normal and Tighten level, c_{11}= Checking quality of the display and c_{12} = Checking the performance of the Sensor, both the quality characteristics are independent (Normal). c_{21}= Checking quality of the display and c_{22} = Checking the performance of the Sensor, both the quality characteristics are independent (tighten).

p	DIQSS	AOQ
0.001	0.999978	0.001000
0.003	0.999430	0.002998
0.005	0.997494	0.004987
0.007	0.993444	0.006954
0.009	0.986684	0.008880
0.01	0.982133	0.009821
0.02	0.885310	0.017706
0.03	0.700305	0.021009
0.04	0.480036	0.019201
0.05	0.289699	0.014485
0.06	0.158932	0.009536
0.07	0.081952	0.005737
0.08	0.040771	0.003262
0.09	0.019912	0.001792
0.1	0.009643	0.000964

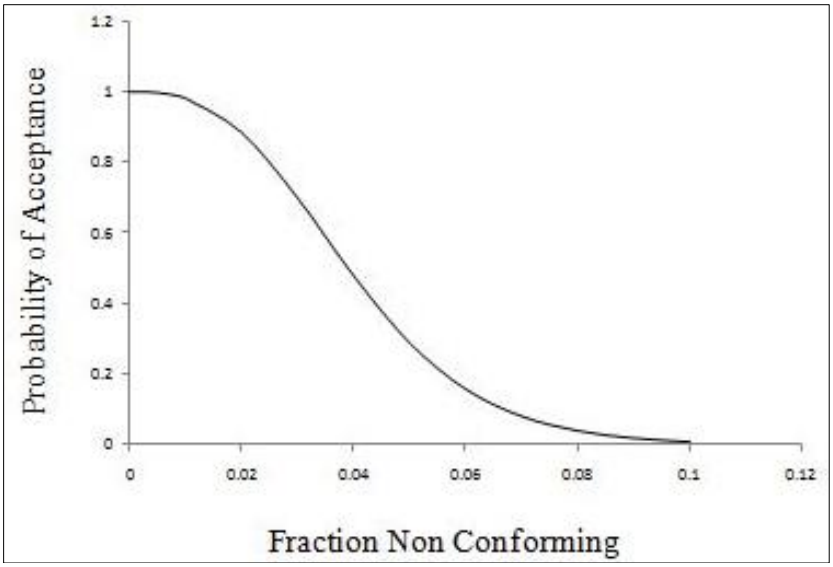

Fig 1: Operating characteristics curve

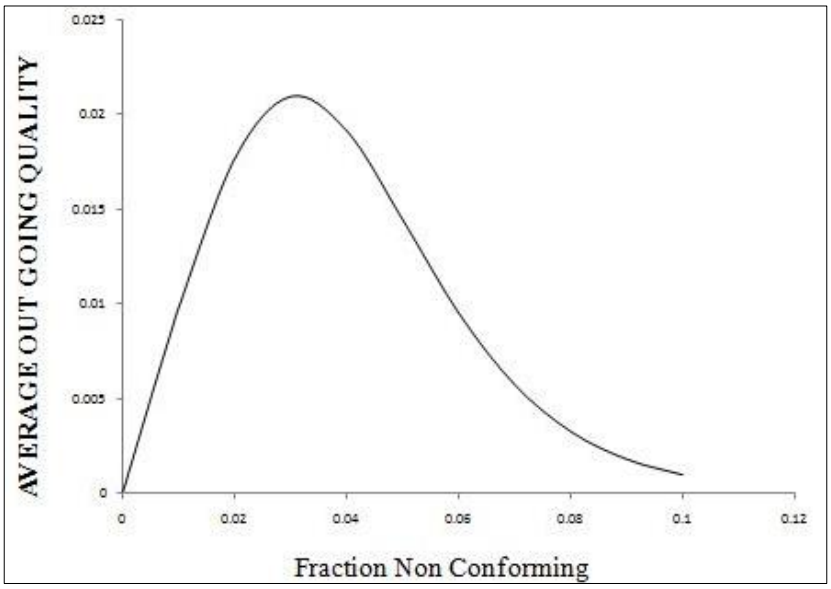

Fig 2: Average outgoing quality curve

Figure 1 reflects the operating characteristics curve of Double Inspection Quick Switching System and Figure 2 reflects the Average Outgoing Quality curve of Double Inspection Quick Switching System. These curves formed by the plan parameters n=41, c_N=2 and c_T=1 and points of the curves are shown in the Table 1.

Table 1: locates the values of sample size n, this sample size 'n' is indexed by the parameters p, c_T, c_N and Pa (p).

CT	CN	0.001			0.002			0.003			0.004			0.005		
		0.99	0.95	0.90	0.99	0.95	0.90	0.99	0.95	0.90	0.99	0.95	0.90	0.99	0.95	0.90
0	1	98	219	311	49	109	155	32	73	103	24	54	77	19	43	62
	2	303	514	649	173	257	324	101	171	216	75	128	162	60	102	129
	3	572	849	1011	286	424	505	190	283	337	143	212	252	114	169	202
	4	877	1202	1382	438	601	691	292	400	460	219	300	345	175	240	276
	5	1202	1564	1758	601	782	879	400	521	586	300	391	439	240	312	351
1	2	333	597	777	166	298	388	111	199	259	83	149	194	66	119	155
	3	645	1001	1219	322	500	609	215	333	406	161	250	304	129	200	243
	4	1002	1422	1662	501	711	831	334	474	554	250	355	415	200	284	332
	5	1382	1847	2101	691	923	1050	460	615	700	345	461	525	276	369	420
2	3	667	1069	1328	333	534	664	222	356	442	166	267	332	133	213	265
	4	1055	1544	1835	527	772	917	351	514	611	263	386	458	211	308	367
	5	1474	2023	2332	737	1011	1166	991	674	777	368	505	583	294	404	466
3	4	1073	1604	1935	536	802	967	357	534	645	268	401	483	214	320	387
	5	1516	2128	2486	758	1064	1243	505	709	828	379	532	621	303	425	497
4	5	1532	2183	2580	766	1091	1290	510	727	860	383	545	645	306	436	516

Table 1: Continued…..

CT	CN	0.006			0.007			0.008			0.009			0.01		
		0.99	0.95	0.9	0.99	0.95	0.9	0.99	0.95	0.9	0.99	0.95	0.9	0.99	0.95	0.9
0	1	16	36	51	14	31	44	12	27	38	10	24	34	9	21	31
	2	50	85	108	43	73	92	37	64	81	33	57	72	30	51	64
	3	95	141	168	81	121	144	71	106	126	63	94	112	57	84	101
	4	146	200	230	125	171	197	109	150	172	97	133	153	87	120	138
	5	200	260	293	171	223	251	150	195	219	133	173	195	120	156	175
1	2	55	99	129	47	85	111	41	74	97	37	66	86	33	59	77
	3	107	166	203	92	143	174	80	125	152	71	111	135	64	100	121
	4	167	237	277	143	203	237	125	177	207	111	158	184	100	142	166
	5	230	307	350	197	263	300	172	230	262	153	205	233	138	184	210
2	3	111	178	221	95	152	189	83	133	166	74	118	147	66	106	132
	4	175	257	305	150	220	262	131	194	229	117	171	203	105	154	183
	5	245	337	388	210	289	333	184	252	291	163	224	259	147	202	233
3	4	178	267	322	153	229	276	134	200	241	119	178	215	107	160	193
	5	252	354	414	216	304	355	189	266	310	168	236	276	151	212	248
4	5	255	363	430	218	311	368	191	272	322	170	242	286	153	218	258

Conclusion

The entries in Table 2 are the values of n. They are indexed by the parameters of c_T and c_N by Pa (p). In this paper, Double Inspection Quick Switching Sampling system that can help the consumer to get good quality products. Every sampling plan we are check single inspection for single quality characteristics of the product. In costliest and high volume production we need extra caution about the product because we need more quality. In that situation we use Double Inspection Plan which is applicable for costliest and mass Production.

References

1. Dodge. A New Dual System of Acceptance Sampling Technical report, No16 Statistics centre Rutgers: The State University, New Brunswick, New Jersey; c1967.
2. Govindaraju, Subramani. Selection of Single-sampling Quick Switching System for given Acceptable and Limiting Quality Levels International Journal of Quality and Reliability Management. 1990;8(2):45-51.
3. Romboski. An Investigation of Quick Switching Acceptance Sampling Systems Ph.D. Dissertation. Rutgers: The State University, New Brunswick, New Jersey; c1969.
4. Senthilkumar *et al*. Construction of Quick Switching Variable Sampling System Indexed by Cross over Point. International Journal of Engineering Science and Technology. 2012;4(2):420-430.
5. Senthilkumar *et al*. Construction of Modified Quick Switching Variable Sampling System Indexed by Crossover Point. International Journal of Latest Engineering and Management Research. 2018;3(2):10-18.
6. 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(1):3295-3304.
7. Senthilkumar, Sabarish. Selection and Development of Double Inspection Single Sampling Plan. Bulletin Monumental. 2021;22(5):7-12.
8. Senthilkumar, Sabarish. Economic Design of Double Inspection Single Sampling Plan. GIS Science Journal. 2021;8:568-583.
9. Senthilkumar, Sabarish. Design Of Double Inspection Quick Switching System [DIQSS (0,1)]. International Journal of Mechanical Engineering. 2022;7(1):421-424.
10. Soundarrajan, Devaraj Arumai Nayagam. Construction and Selection of Modified Quick Switching System Journal of Applied Statistics. 1990;17(1):83-114.
11. Soundarrajan, Devaraj Arumai Nayagam. Quick Switching System for Costly and Destructive Testing Sanakya: Indian Journal of Statistics. 1992;54(1):1-12.
12. Vennila, Devaraj Arumainayagam. Quick Switching System with Different Reference Plans American Journal of Applied Mathematics and Statistics. 2018;6(4):141-148.