INDIAN JOURNAL OF SCIENCE AND TECHNOLOGY

Formation of Repetitive Group Sampling Plan for Life Tests Based on Percentiles using Odd Frechet Inverse Rayleigh Distribution

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Abstract

Objectives: This paper presents the idea of Repetitive Group Sampling Plans using Odd Frechet Inverse Rayleigh Distribution, when the life test is truncated at a pre-specified time. The main objective of the proposed sampling plan is to minimize the sample size because the analogous inspection time and inspection cost will be reduced. **Methods**: A truncated life test may be conducted to evaluate the smallest sample size to insure certain percentile lifetime of products. The minimum sample size and its ratio d_q for the specified lifetime percentile were derived for the producer's risk. The operating characteristic values are also obtained for the proposed sampling plan. The corresponding table values are obtained through Monto Carlo Simulation technique. **Findings**: The results from the sampling plan developed in this research can easily be adaptable in practical situation with small sample sizes and fewer experimental times and hence the plan yields a better result for reliability sampling plan. **Novelty**: The work designed and developed with the aim that sampling plan in this paper may be helpful for the engineers and statistical plan developers in the field of statistical quality control especially in attribute reliability sampling plan. The tables are generated which is useful for both producer and consumer. This plan can highly recommendable since the products are randomly sampled and also the procedure for sampling involves less experiment time and with minimum sample size.

Keywords: Odd Frechet Inverse Rayleigh Distribution; Percentiles; Repetitive Group Sampling Plan (RGS); Producer's risk

1 Introduction

A most commonly used technique in quality control is the Acceptance Sampling Plan. The acceptance sampling plans relates with the acceptance or rejection of a large-sized lot of products on the basis of quality of the products in a sample taken from the lot. The technological advancement, modern development and world competition increases the customer's expectation day by day. This competition makes the manufacturers to

produce high-quality products. Also, the customer expects that the purchased products should be safe and reliable. There are many definitions are given for quality, but general agreement that a high-quality product is reliable. So the sampling plan is adopted to examine the product over a designated period of time is termed to be Reliability Sampling Plan. This is the procedure that aids the consumer to examine whether the lot is reliable over a set time period t or not through trying out methods. This methodology does not improve the quality of the product instead helps the consumer to know how far the expected quality is reliable and to make decision over it.

The design parameters of a sampling plan depend on the underlying statistical distribution. Several studies have been done for designing sampling plans based on the truncated life tests under various statistical distributions. Acceptance Sampling based on the truncated life test was developed by Al-Omari and Al-Nasser[1] (2019) assuming the lifetime of the item follows the Rama Distribution. Farouk et.al[2] (2019) developed a time truncated life test approach on the new two-sided group chain sampling plan with log-logistic distribution. Goual and Yousof[3] (2019) construct a modified chi-squared goodness-of-fit test based on Burr XII inverse Rayleigh model. Jayalakshmi and Neena Krishn[4] (2021) has developed a Special Type Double Sampling Plan using percentiles based on Exponentiated Frechet distribution. Lee et.al[5] (2021) designed the acceptance sampling plan for based on the lifetime performance index under gamma distribution. Further Harsh Tripathi et.al[6] (2021) designed reliability Double and Group Acceptance Sampling Plan for truncated life tests based on the inverse log-logistic distribution. A study on extension of Double Acceptance Sampling Plans based on truncated life tests on the Inverse Rayleigh Distribution was done by Ibrahim et.al[7] (2021). For generalized exponential distribution a two-sided group chain sampling plans based on truncated life test was introduced by Aziz et.al[8] (2021). Rao et.al[9] (2021) developed Double-Acceptance Sampling Plan for truncated life tests based on Exponentiated Fréchet Distribution with Known Shape Parameters. Also, Jayalakshmi and Neena Krishna[10] (2022) has developed Double Sampling Plan using percentiles based on Kumaraswamy Exponentiated Rayleigh Distribution. Jayalakshmi and Vijilamery[11] (2022) developed Special Double Sampling Plan for truncated life tests based on percentile using Gompertz Frechet Distribution. Pradeepaveerakumari et.al[12] (2023) developed Skip lot sampling plan of type SKSP-R based on percentiles of Exponentiated Rayleigh Distribution. Nazrina Aziz et.al[13] (2023) established a time truncated new group chain sampling plan based on Log-Logistic Distribution.

Repetitive Group Sampling (RGS) is specified by three parameters namely the sample size, n, and the first and second acceptance numbers c_1 and c_2. The plan is applied under the conditions for application of attribute sampling inspection. Devaarul and Jothimani[14] (2020) design and developed relational repetitive group sampling plan - (RRGS - 1). Ambreen Shafqat et.al[15] (2021) designed X-bar control chart based on Inverse Rayleigh Distribution under repetitive group sampling plan. Haq and Elgarhy[16] (2018) proposed the Odd Frechet Generalized Family of Distributions. Later Elgarhy and SharifahAlrajhi[17] (2019) developed the Odd Frechet Inverse Rayleigh Distribution.

The main aim of this paper is designing of Repetitive Group Sampling Plan using truncated life tests under Odd Frechet Inverse Rayleigh Distribution. This distribution provides better fit than some other competitive models and it can attract wider application in applied areas such as lifetime analysis, reliability, hydrology and engineering. The beauty and importance of this distribution lies in accommodating several importance distributions as sub-models. Calculations are made for various quality levels to determine the minimum sample size, prescribed ratio, and operational characteristic values. A comparison is done for the proposed sampling plan with the ordinary sampling plan. The proposed sampling plan, which is appropriate for the manufacturing industries for the selection of samples, is also analyzed in terms of its parameters and metrics.

2 Methodology

2.1 Odd Frechet Inverse Rayleigh Distribution

The Cumulative Distribution Function (CDF) of Odd Frechet Inverse Rayleigh Distribution is given as follows:

$$F(t;\ \theta,\alpha) = e^{-\left[e^{\alpha/t^2-1}\right]},\ t,\alpha,\theta > 0 \tag{1}$$

Where θ and α represents the shape and scale parameters respectively. The corresponding Probability Density Function is given by

$$f(t;\theta,\alpha) = \frac{2\theta\alpha}{3} e^{\alpha/t^2} \left[e^{\alpha/t^2-1}\right]^{\beta-1} e^{-\left[e^{\alpha/t^{2-1}}\right]^{\theta}},\ t,\alpha,\theta > 0 \tag{2}$$

The percentile or the qth quantile of any distribution is given by,

$$p_r(T \le t_q) = q \tag{3}$$

$$t_q = \frac{\sqrt{\alpha}}{\sqrt{ln[1 + (ln(1/q))]/\theta}} \, . \tag{4}$$

t_q and q are directly proportional. Let

$$\eta_q = \sqrt{ln[1 + (ln(1/q))]}. \tag{5}$$

Replacing the parameter $\alpha = (t_q \eta_q)^2$, then we get the cumulative distribution function of the form

$$F(t) = e^{-[t_q^2 \eta q^2 / \delta q^{2-1}]^\theta} \quad t, \theta > 0 \tag{6}$$

Let $s_q = t/tq$

$$F(t, \delta) = e^{-\left[e^{\eta_q^2}/\delta q^{2-1}\right]^\theta} \tag{7}$$

Taking partial derivative with respect to δ, we have

$$\frac{\partial F}{\partial \delta} = \frac{2\theta \eta_q^2}{\delta q^3} e^{-\left[e^{\eta_q^2}/\delta q^{2-1}\right]^\theta} \quad e^{-\left[e^{\eta_q^2}/\delta q^{2-1}\right]^{\theta-1}} \quad e^{\eta_q^2}/\delta q^2 \tag{8}$$

Since $\frac{\partial F}{\partial \delta} > 0, F(t, \delta)$ is a non-decreasing function of δ.

2.2 Formation of Repetitive Group Sampling Plan

The Repetitive Group Sampling Plan is represented as $(n, C_1, C_2, t/t_q^0)$. Here, the sample size be denoted as $n, c_j, j = 1, 2$ represents the acceptance number. In life testing study, the test that will terminate at a pre-determined time t. The probability of rejecting a bad lot is P^* and the maximum number of allowable defectives are c_1 and c_2. The RGS plan for percentiles is considered to obtain the minimum sample size 'n' for the specified acceptance numbers c_1 and c_2 such that the consumer's risk (probability of accepting the bad lot) does not exceed $(1 - P^*)$.

A bad lot means that the true $100q^{th}$ percentile t_q is below the specified percentile t_q^0. Hence, the probability P^* is a minimum confidence level in the sense that lot of true average life below the specified life is rejected by the proposed sampling plan.

2.3 Operating Procedure

The operating procedure for the Repetitive Group Sampling Plan is characterized by $(n, C_1, C_2, t/t_q^0)$ as follows:

- From a lot, select a random sample of items and observe the number of nonconforming units, then put on the test for pre-assigned experimental time t_0.
- If $d \leq c_1$ then accept the lot, if $d > c_2$ then reject the lot.
- If $c_1 < d \leq c_2$, again select the random sample from the lot until the lot is either accepted or rejected.

2.4 Operating characteristic function

To determine the probability of acceptance of Repetitive Group Sampling Plan for truncated life test, the lots considered are sufficiently large and binomial distribution is applied when the success and failure of the item attained in the frequent mode. The Operating Characteristic function is one of the most useful tools in practical statistical applications to access the effectiveness of sampling plan. It gives the probability that the lot to be accepted. Then the probability of acceptance of Repetitive Group Sampling Plan is given by

$$L(p) = \frac{P_1(P)}{P_1(p) + P_2(p)} \tag{9}$$

Where $P_1(P) = \sum_{x=0}^{c_1} \binom{n}{x} p^x (1-p)^{n-x}$

$P_2(p) = 1 - \sum_{x=0}^{c_2} \binom{n}{x} p^x (1-p)^{n-x}$

Here p represents the failure probability before the time t, for the specified $100q^{th}$ percentile lifetime.

t_q^0, which is obtained by $p = F\left(t, \delta_q^0\right) = e^{-\left[e^{n_q^2 / \delta_q^{02-1}}\right]^{\theta}}$ through Equation (7), where $\delta_q^0 = \frac{t}{t_q^0}$ is the ratio of the pre-determined time t and the specified percentile t_q^0.

3 Result and Discussion

3.1 Numerical illustration

Suppose a quality engineer examines the lifetime of an electronic heater and the engineer works with the Repetitive Group Sampling Plan for the lifetime of the product. Assume that the lifetime of the product follows Odd Frechet Inverse Rayleigh Distribution with $\theta = 1$, $\alpha = 0.05$, $\beta = 0.10$. The engineer is interested to adopt the sampling plan to ensure 10th percentile that the lifetime is at least 1100 hours with the confidence level $P^* = 0.99$. The experimenter wants to break the experiment at t =1650 hours.

From Table 1, one can obtain the required sample size corresponding to the values of $P^* = 0.99, t/t_q^0 = 1.50$ and $c_1 = 0, c_2 = 2$ is $n = 8$. Thus, we have to put the test upto 8 units. The corresponding operating characteristic value $L(p)$ with a confidence level 0.99 for the Repetitive Group Sampling Plan ($n = 8, c_1 = 0, c_2 = 2, t/t_q^0 = 1.50$) under Odd Frechet Inverse Rayleigh Distribution from Table 2 is given as:

t_q/t_q^0	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75
L(P)	0.00688	0.14584	0.26665	0.91869	0.99971	1.00000	1.00000	1.00000

This shows that the true 10th percentile is equal to the required 10th percentile ($t_q/t_q^0 = 1.00$), the producer's risk is approximately 0.99312 (1-0.00688). The producer's risk is almost equal to 0.05 or less when the actual 10th percentile is greater than or approximately equal to 2.00 times the specified 10th percentile. Table 3 gives the values of $d_{0.10}$ for $c_1 = 0$ and $c_2 = 2$ and $t/t_{0.10} = 1.50$ in order to guarantee that the producer's risk is less than or equals 0.05. In this illustration, the corresponding value of $d_{0.10}$ is 1.53968 for $c_1 = 0, c_2 = 2, t/t_{0.10} = 1.50$ and 0.05. This means that the product can have a 10th percentile life of 1.53968 times the required 10th percentile lifetime under the above Repetitive Group Sampling Plan the product is accepted with probability of at least 0.95.
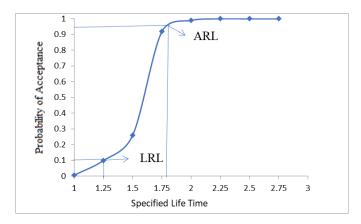
Fig 1. Operating Characteristic Curve of RGS Plan for 10th Percentile under Odd Frechet Inverse Rayleigh Distribution

Figure 1 represents the operating characteristic curve of RGS plan under Odd Frechet Inverse Rayleigh Distribution for the 10th percentile $\left(n = 8, c_1 = 0, c_2 = 2, t/t_q^0 = 1.50\right)$. From Figure 1, it is clear that the Repetitive Group Sampling Plan attains ARL when the actual 10th lifetime percentile is 1.75 times greater than required 10th percentile and attains LRL when the actual 10th lifetime percentile is 1.25 times greater than required 10th percentile.

3.2 Performance Comparison

The usual technique for comparing the ordinary plan with the proposed plan is by its probability of acceptance. Here ordinary sampling plan is compared with the proposed plan (RGS). Table 4 provides the probability of acceptance values of ordinary sampling plan and proposed sampling plan. Figure 2 represents the operating characteristic curve of Repetitive Group Sampling Plan and ordinary sampling plan under Odd Frechet Inverse Rayleigh Distribution. The curves display the probability of acceptance against the specified lime time percentile. It is observed from the figure that the probability of acceptance is high for Repetitive Group Sampling Plan. Also, from the figure it is clear that quality engineer can choose Repetitive Group Sampling Plan than the ordinary sampling plan to provide a high quality product.

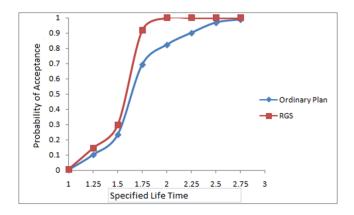**Fig 2. Operating Characteristic Curve of RGS Plan and ordinary plan under Odd Frechet Inverse Rayleigh Distribution**

3.3 Construction of table

- Step 1: Find the value of η_q for $\theta = 1$ and $q = 0.10$.
- Step 2: Set the evaluated $\eta_q = 1.09302, c_1, c_2, i$ and $t/t_q = 0.9, 0.95, 1, 1.25, 1.5, 1.75, 2, 2.25$.
- Step 3: Find the smallest value of n satisfying $L(P) \leq 1 - p^*$, where p^* is probability of rejecting the bad lots.
- Step 4: For the obtained value of n, find the ratio $d_{0.10}$ such that $L(P) \geq 1 - \alpha$, where $\alpha = 0.05$, $p = F\left(\frac{t}{t_q^0}, \frac{1}{d_q}\right)$ and $d_q = t_q/t_q^0$.

Table 1. Minimum Sample Size values of n for the 10th percentile of Repetitive Group Sampling Plan under the assumption of Odd Frechet Inverse Rayleigh Distribution

P^*	C_1	C_2	t/t_q^0							
			0.9	0.95	1	1.25	1.5	1.75	2	2.25
	0	1	136	74	47	15	7	5	4	4
	0	2	137	73	46	13	8	6	5	4
	0	3	141	76	47	14	8	6	5	4
	1	2	195	106	65	21	14	9	7	6
0.99	1	3	194	104	65	19	11	8	7	6
	1	4	197	106	66	19	11	8	7	6
	1	5	202	109	68	20	12	9	7	7
	2	3	246	133	85	26	16	10	9	7
	3	4	292	158	100	30	19	13	10	9
	0	1	95	52	34	11	5	4	3	3
	0	2	97	52	33	10	6	4	4	3
	0	3	108	59	39	15	6	5	4	4
	1	2	143	78	49	16	8	6	5	5
0.95	1	3	145	78	49	14	9	7	6	5
	1	4	152	82	52	15	9	7	6	5

Continued on next page

Table 1 continued

P^*										
	1	5	161	86	54	16	10	8	7	6
	2	3	188	102	66	22	14	8	7	6
	3	4	229	124	79	25	16	10	9	8
	0	1	76	41	28	9	4	3	3	2
	0	2	84	44	28	8	5	4	3	3
	0	3	91	49	31	10	6	5	4	4
0.90	1	2	120	65	42	14	7	5	5	4
	1	3	125	70	42	13	8	6	5	5
	1	4	134	72	45	14	8	7	6	5
	1	5	144	77	49	15	9	7	6	6
	2	3	161	87	57	18	10	7	6	6
	3	4	201	109	71	22	13	9	8	7
	0	1	53	29	19	6	3	3	2	2
	0	2	62	33	21	7	4	3	3	3
	0	3	73	39	25	8	5	4	4	4
0.75	1	2	90	63	33	10	6	4	4	3
	1	3	99	53	34	10	7	5	4	4
	1	4	110	59	38	12	7	6	5	5
	1	5	121	64	41	13	8	7	6	6
	2	3	126	69	45	16	8	6	5	5
	3	4	159	88	57	19	11	8	7	6

Table 2. Operating Characteristic value for the 10th percentile of Repetitive Group Sampling Plan under the assumption of Odd Frechet Inverse Rayleigh Distribution for $c_1 = 0, c_2 = 2$

P^*	n	t/t_q^0	t_q/t_q^0							
			1	1.25	1.5	1.75	2	2.25	2.5	2.75
	137	0.9	0.00722	0.41984	0.99999	0.99999	0.99999	1.00000	1.00000	1.00000
	73	0.95	0.00506	0.50973	0.99993	0.99999	1.00000	1.00000	1.00000	1.00000
	46	1	0.00814	0.45913	0.99878	0.99999	1.00000	1.00000	1.00000	1.00000
0.99	13	1.25	0.00478	0.30834	0.65498	0.99968	1.00000	1.00000	1.00000	1.00000
	8	1.5	0.00688	0.14584	0.26665	0.91869	0.99971	1.00000	1.00000	1.00000
	6	1.75	0.00687	0.00950	0.06055	0.53292	0.97103	0.99972	1.00000	1.00000
	5	2	0.00551	0.00279	0.02945	0.23513	0.78286	0.98571	0.99972	0.99998
	4	2.25	0.00248	0.00388	0.02978	0.17336	0.59708	0.92830	0.99439	0.99995
	97	0.9	0.00919	0.44908	0.85755	0.99999	1.00000	1.00000	1.00000	1.00000
	52	0.95	0.00899	0.35851	0.99997	0.99999	1.00000	1.00000	1.00000	1.00000
	33	1	0.00978	0.24509	0.99957	0.99999	1.00000	1.00000	1.00000	1.00000
0.95	10	1.25	0.01578	0.13271	0.83281	0.99986	1.00000	1.00000	1.00000	1.00000
	6	1.5	0.01355	0.02453	0.42950	0.97503	0.99989	1.00000	1.00000	1.00000
	4	1.75	0.02547	0.03898	0.32347	0.87077	0.99439	1.00000	1.00000	1.00000
	4	2	0.00700	0.01114	0.09299	0.47306	0.90645	0.99994	0.99989	0.99999
	3	2.25	0.01886	0.02757	0.15067	0.51112	0.87035	0.99439	0.99863	0.99996
	84	0.9	0.00646	0.49999	0.89755	1.00000	1.00000	1.00000	1.00000	1.00000
	44	0.95	0.01155	0.49464	0.99998	0.99999	1.00000	1.00000	1.00000	1.00000
	28	1	0.01616	0.38825	0.99974	0.99999	1.00000	1.00000	1.00000	1.00000
0.90	8	1.25	0.03845	0.28763	0.91869	0.99993	1.00000	1.00000	1.00000	1.00000
	5	1.5	0.03424	0.16170	0.60507	0.98571	0.99994	1.00000	1.00000	1.00000
	4	1.75	0.02392	0.03898	0.32347	0.87077	0.99439	0.99994	1.00000	1.00000
	3	2	0.05549	0.06930	0.34909	0.80581	0.97650	0.99863	0.99997	0.99999
	3	2.25	0.02986	0.03857	0.16067	0.53112	0.87235	0.98220	0.99963	0.99996
	62	0.9	0.02923	0.55156	0.99999	1.00000	1.00000	1.00000	1.00000	1.00000
	33	0.95	0.04528	0.54755	0.99999	1.00000	1.00000	1.00000	1.00000	1.00000
	21	1	0.07024	0.43733	0.99989	1.00000	1.00000	1.00000	1.00000	1.00000
0.75	7	1.25	0.08110	0.34991	0.94902	0.99996	1.00000	1.00000	1.00000	1.00000
	4	1.5	0.12579	0.17336	0.80812	0.99439	0.99998	1.00000	1.00000	1.00000

Table 2 continued

3	1.75	0.14642	0.18607	0.69475	0.96682	0.99863	0.99998	1.00000	1.00000
3	2	0.05549	0.06930	0.36909	0.80781	0.97850	0.99863	0.99997	0.99999
3	2.25	0.02986	0.03857	0.16067	0.53112	0.87235	0.98220	0.99963	0.99996

Table 3. The ratio $d_{0.10}$ for accepting the lot with the producer's risk of 0.05 when $\theta = 1$

P^*	C_1	C_2	t/t_q^0							
			0.9	0.95	1	1.25	1.5	1.75	2	2.25
	0	1	1.15607	1.19162	1.23009	1.43540	1.64343	1.85607	2.06640	2.32740
	0	2	1.12342	1.15215	1.18339	1.35126	1.53968	1.72764	1.91819	2.06657
	0	3	1.10179	1.12690	1.15208	1.29952	1.44486	1.59404	1.74093	1.81220
	1	2	1.13117	1.16196	1.19455	1.37710	1.56859	1.75981	1.97405	2.16352
0.99	1	3	1.10905	1.13518	1.16339	1.31792	1.47894	1.63492	1.81811	1.97183
	1	4	1.09298	1.11602	1.14000	1.27098	1.40470	1.52785	1.68089	1.79032
	1	5	1.08092	1.10164	1.12267	1.24052	1.36481	1.48207	1.54564	1.73835
	2	3	1.11592	1.14378	1.17407	1.33890	1.51218	1.67996	1.88407	2.00968
	3	4	1.10607	1.13167	1.15923	1.30836	1.47509	1.64659	1.78347	1.95139
	0	1	1.13959	1.17209	1.20595	1.39759	1.58936	1.80951	1.99142	2.24034
	0	2	1.10638	1.13198	1.16041	1.31555	1.48134	1.60588	1.83511	1.90561
	0	3	1.08619	1.10855	1.13142	1.26261	1.36695	1.52265	1.60937	1.81220
	1	2	1.11618	1.14373	1.17363	1.33949	1.50770	1.68387	1.85761	2.09037
0.95	1	3	1.09368	1.11708	1.14186	1.27329	1.43174	1.59058	1.75246	1.86393
	1	4	1.07875	1.09882	1.12082	1.23172	1.34821	1.47076	1.59179	1.63061
	1	5	1.06778	1.08463	1.10214	1.19895	1.3086	1.42617	1.54564	1.59341
	2	3	1.13369	1.12741	1.15387	1.29924	1.46123	1.61185	1.78622	1.92912
	3	4	1.09310	1.11608	1.14078	1.27942	1.42965	1.56036	1.73685	1.88725
	0	1	1.13009	1.16039	1.19460	1.36900	1.55174	1.74397	1.85165	2.89257
	0	2	1.09708	1.12130	1.14762	1.28417	1.43922	1.48144	1.69336	2.72994
	0	3	1.07810	1.09785	1.11920	1.24581	1.36695	1.40959	1.60937	2.58843
	1	2	1.10787	1.13346	1.16220	1.31830	1.47948	1.62555	1.76787	2.39103
0.90	1	3	1.08590	1.11001	1.12987	1.26155	1.40081	1.45125	1.65869	2.10278
	1	4	1.07145	1.08951	1.10773	1.21908	1.30861	1.39036	1.44932	1.79032
	1	5	1.06116	1.07634	1.09359	1.18567	1.27025	1.24028	1.41599	1.98722
	2	3	1.09454	1.11759	1.14335	1.28236	1.43920	1.49966	1.71449	1.61764
	3	4	1.08570	1.10735	1.12980	1.25665	1.38973	1.46964	1.60497	2.71090
	0	1	1.11239	1.13913	1.16872	1.32661	1.49340	1.49340	1.85165	2.08148
	0	2	1.08237	1.10197	1.12485	1.26211	1.37639	1.37639	1.69336	1.90561
	0	3	1.06491	1.08054	1.09972	1.20399	1.30679	1.30679	1.60937	1.81220
	1	2	1.09222	1.13049	1.14002	1.27624	1.44371	1.44371	1.76787	1.80126
0.75	1	3	1.07263	1.09012	1.11153	1.21406	1.36334	1.36334	1.50122	1.69101
	1	4	1.05959	1.07432	1.09251	1.18950	1.26106	1.26106	1.44932	1.63061
	1	5	1.05033	1.06155	1.07650	1.15584	1.22297	1.22297	1.41599	1.59341
	2	3	1.08050	1.10013	1.12338	1.24751	1.38129	1.38129	1.61360	1.81736
	3	4	1.07251	1.09082	1.11133	1.21749	1.33728	1.33728	1.60497	1.68235

Table 4. Probability of acceptance values of ordinary sampling plan and proposed sampling plan for $\theta = 1, c_1 = 0, c_2 = 2, t/t_{0.10} = 1.50$ and 0.05

t_q/t_q^0	Probability of acceptance $L(p)$	
	Ordinary Plan	Proposed Plan (RGS)
1.00	0.00258	0.00688
1.25	0.09875	0.14584
1.50	0.20568	0.26665
1.75	0.80257	0.91869
2.00	0.92875	0.99971

Table 4 continued			
2.25		0.97777	1.00000
2.50		0.98765	1.00000
2.75		0.99778	1.00000

4 Conclusion

This study establishes the designing of Repetitive Group Sampling Plan for the truncated life test when the lifetime of the product follows Odd Frechet Inverse Rayleigh Distribution. Engineers give more importance to the reliability sampling when the lifetime of the product is inspected and inference is made from it. The distribution used in this paper is a lifetime distribution which is widely applicable in the area of reliability studies and quality control. Percentiles give more information regarding a lifetime distributions than the mean lifetime. The main aim of this paper is to obtain the smallest sample size, so the inspection time and cost will be reduced. A smaller sample size can result in lower inspection operating costs and a lower risk of item damage due to mishandling. The probability of acceptance is high for RGS plan while comparing with the ordinary plan. The probability of acceptance increases sample size decreases. Therefore, the proposed plan is useful in minimizing the both the producer's and consumer' risk. The probability of acceptance and the specified percentile ratio for various quality levels are also calculated. Necessary tables and numerical illustrations are also provided for the proposed sampling plan. In future the proposed plan can be extended to other sampling plans and also can be extended to Bayesian Sampling Plan using other continuous distributions.

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