SCITECH
RESEARCH ORGANISATION|

Volume 2, Issue 2
March 7, 2015|

Journal of Progressive Research in Mathematics
www.scitecresearch.com

A Conditional Repetitive Group Sampling Plan for Truncated Life Tests Using Log – Logistic, Exponentiated Log – Logistic, Rayleigh and Inverse Rayleigh Distributions

Priyah Anburajan[1], Dr. A. R. Sudamani Ramaswamy[2]
[1] Research Scholar, Department of Mathematics, Avinashilingam University, Coimbatore, Tamil Nadu, India,
Email : priyahanburajan@gmail.com
[2] Associate Professor, Department of Mathematics, Avinashilingam University, Coimbatore, Tamil Nadu, India,
Email: arsudamani@hotmail.com

Abstract

In this paper, a conditional repetitive group acceptance sampling plan is developed for a truncated life test when the lifetime of an item follows different lifetime distributions. Sample sizes required for the acceptance numbers are determined when the consumer’s risk and the test termination time are specified. The operating characteristic values according to various quality levels are obtained. The results are explained with examples.

Keywords Log - Logistic; exponentiated log – logistic; Rayleigh and the inverse Rayleigh distribution; repetitive group sampling plan; consumer’s risk; Operating characteristics; Producer’s risk; Truncated life test.

1. Introduction

The quality control is one of the most important tools to differentiate between the competitive enterprises in a global business market. Acceptance sampling is plan is an essential tool in the statistical quality control and is necessary to limit the cost of inspection and is the only available method to appraise the quality in destructive testing. Acceptance sampling plans are widely used for automotive products, pharmaceutical products and so on in the areas of compliance testing and quality assurance.

Sherman in 1965 was the one who introduced the repetitive group sampling plan. According to him the attribute repetitive group plan is more efficient than the single sampling plan even its operation is similar to sequential sampling. Later in 1984 and 1986 Soundarajan and Ramasamy tabulated values for the selection of repetitive group sampling plan indexed through (AQL, AOQL); (p0, h0) and (p*, h*). The study was followed by Govindaraju who established OC functions for the repetitive group sampling plans in 1987. Shankar, G. & Mohapatra B.N. in 1993 presented GERT analysis of conditional repetitive group sampling plan. In 2004, Moon, Jun, Balamurali and Lee worked on the variable repetitive group sampling plan for minimizing average sample. It was Balamurali and Jun again joined hands to determine the repetitive group sampling procedure for variables inspection in the year 2006. This repetitive group sampling plans is used to determine the number of groups by Aslam, Niaki, Rasool and Fallahnezhad in the year 2012.

Kantam R.R. L., Rosaiah K. and Srinivasa Rao G. (2001) discussed acceptance sampling based on life tests with Log-logistic models. Rosaiah K. et. Al., in 2007 studied exponentiated Log – Logistic distribution. In 2005, Rosaiah, K. et. Al., presented acceptance sampling based on the inverse Rayleigh distribution. Muhammad Aslam in 2007, presented double acceptance sampling based on truncated life tests in Rayleigh distribution.

We here use the conditional repetitive group sampling to determine the sample size instead of determining the group. One can find that this method is far better than the other single sampling procedures due to its reduced sample sizes.

2. Lifetime Distributions

Log – Logistic distribution

The cumulative distribution function (cdf) of the Log – Logistic distribution is given by

$$F(t,\sigma)=\frac{\left(\frac{t}{\sigma}\right)^{\lambda}}{1+\left(\frac{t}{\sigma}\right)^{\lambda}}$$, t > 0 (1)

where σ is a scale parameter and λ is the shape parameter and it is fixed as 2.

Exponentiated Log – Logistic Distribution

The cumulative distribution function (cdf) of the exponentiated Log – Logistic distribution is given by

$$F(t,\sigma)=\left(\frac{t/\sigma}{1+t/\sigma}\right)^{\lambda}$$, t > 0 (2)

where σ is a scale parameter and λ is the shape parameter and it is fixed as 2.

Rayleigh distribution

The cumulative distribution function (cdf) of the Rayleigh distribution is given by

$$F(t/\sigma)=1-e^{-\frac{1}{2}\left(\frac{t}{\sigma}\right)^{2}}$$, t > 0 (3)

where σ is a scale parameter.

Inverse Rayleigh Distribution

The cumulative distribution function (cdf) of the Inverse Rayleigh distribution is given by

$$F(t)=e^{-\frac{\sigma^{2}}{t^{2}}}$$, t > 0 (4)

where σ is a scale parameter.

If some other parameters are involved, then they are assumed to be known, for an example, if shape parameter of a distribution is unknown it is very difficult to design the acceptance sampling plan. In quality control analysis, the scale parameter is often called the quality parameter or characteristics parameter. Therefore it is assumed that the distribution function depends on time only through the ratio of t/ σ.

3 Design of the proposed sampling plan

Conditions for the application of CRGS

1. Production is steady, so that results of past, present and future lots are broadly indicative of a continuing process.
2. Lots submitted may be isolated or series.
3. Inspection is by attributes, when the lot quality is defined as the proportion defective.
4. Variation in the lot quality may exist.
5. Lot has at least one defective unit.
6. Lots submitted for inspection may be of low quality.

Operating procedure of CRGS plan for truncated life test

The following is the operating procedure of the CRGS plan for truncated life tests.

1. From each of the submitted lots, select a sample of size n and observe the number of non-conformities, 'd' for the pre assigned time t_0.
2. Accept the current lot if $d \leq c_1$, reject the lot, if $d > c_2$.
3. If $c_1 < d \leq c_2$, utilize the information of the next proceeding lot (i.e.) the current lot is accepted if the proceeding lot result shows $d \leq c_1$ in the sample, in case the proceeding lot result also shows $c_1 < d \leq c_2$, then utilize next proceeding lot and checkup whether $d \leq c_1$ or $d > c_2$ continue utilizing the proceeding lot results till satisfying $d \leq c_1$ or $d > c_2$.

The following is the operating characteristics function for the conditional repetitive group sampling plan.

$$L(p) = \frac{p_1}{1 - p_1 p_3} \tag{5}$$

We have used binomial models to determine the number of samples.
In case of binomial distribution, the equation (5) becomes

$$L(p) = \frac{\sum_{i=0}^{c_1} \binom{n}{i} p^i (1-p)^{n-i}}{1 - \left[\sum_{i=0}^{c_1} \binom{n}{i} p^i (1-p)^{n-i} \right] \left[\sum_{i=0}^{c_2} \binom{n}{i} p^i (1-p)^{n-i} - \sum_{i=0}^{c_1} \binom{n}{i} p^i (1-p)^{n-i} \right]} \tag{6}$$

Here in equation 5,

$$p_1 = \sum_{i=0}^{c_1} \binom{n}{i} p^i (1-p)^{n-i}$$

$$p_2 = \sum_{i=0}^{c_2} \binom{n}{i} p^i (1-p)^{n-i}$$

$$p_3 = 1 - p_1 - p_2$$

where '*p*' is the failure probability. These failure probabilities are the cumulative distribution function of the life time distributions. The following are the life time distributions used in this chapter to determine the sample size with the help of repetitive group sampling plan.

By fixing the time termination ratios t/σ_0 as 0.628, 0.912, 1.257, 1.571, 2.356, 3.141, 3.927 and 4.712, the consumer's risk β as 0.25, 0.10, 0.05, and 0.01 and the mean ratios σ/σ_0 = 2, 4, 6, 8, 10 and 12, one can find the size of the first sample size n by substituting the failure probability p in the equations (5) and (6) and using the following inequality.

$$L(p) \leq \beta$$

The sample size generated using repetitive group sampling plan for the log – logistic distribution, exponentiated log - logistic distribution, inverse Rayleigh distribution, generalized Rayleigh distribution, are presented in the Tables 1 – 4 respectively and their corresponding operating characteristic values are presented in the Tables 5 – 8 respectively.

4 Operation Characteristic Functions

The probability of acceptance can be regarded as a function of the deviation of the specified value μ_0 of the median from its true value μ. This function is called Operating Characteristic (OC) function of the sampling plan. Once the minimum sample size is obtained, one may be interested to find the probability of acceptance of a lot when the quality (or reliability) of the product is sufficiently good. As mentioned earlier, the product is considered to be good if $\mu \geq \mu_0$. Te probabilities of acceptance are displayed in Table 3 and 4 for various values of the median ratios μ/μ_0, producer's risks β and time multiplier a.

5 Notations

g	-	Number of groups
r	-	Number of items in a group
n	-	Sample size
c	-	Acceptance number
t_0	-	Termination time
a	-	Test termination time multiplier
γ	-	Shape parameter
σ	-	Scale parameter
α	-	Producer's risk
β	-	Consumer's risk
p	-	Failure probability
L(p)	-	Probability of acceptance
μ	-	Mean life
μ_0	-	Specified life

6 Description of tables and examples

6.1 Example 1

Assume that an experimenter wants to establish that the lifetime of the AC adapter produced in the factory ensures that the true unknown mean life is at least 1000 hours. It is desired to stop the experiment at 628 hours. It is assumed that c_1 = 0, c_2 = 2 and β = 0.25. Based on consumer's risk values and the time termination ratio, the minimum sample size is determined using the conditional repetitive group acceptance sampling plan for truncated life test. Following are the results obtained when the lifetime of the test items follows the log – logistic, exponentiated log – logistic, Rayleigh and inverse Rayleigh respectively.

Minimum sample size and the probability of acceptance for different lifetime distributions when c_1 = 0, c_2 = 2 and β = 0.25

Lifetime distribution	***n***	***L(p)***
Log – Logistic	5	0.812052
Exponentiated Log – Logistic	19	0.976451
Rayleigh	8	0.860025
Inverse Rayleigh	19	0.999999

From all the above distributions one can see that Rayleigh distribution is comparatively better than the other life time distribution in case of sample sizes and the probability of acceptance (n = 8 and $L(p)$ = 0.860025) when the conditional repetitive group sampling plan is used (from Tables 1 to 4).

Table 1: Minimum sample size n for CRGS plan when the lifetime of the items follows the log - logistic distribution

β	**c_1**	**c_2**	**t/σ_0**							
			0.628	**0.942**	**1.257**	**1.571**	**2.356**	**3.141**	**3.927**	**4.712**
0.25	**0**	**1**	5	3	2	2	1	1	1	1
	0	**2**	5	3	2	2	2	2	2	2
	0	**3**	5	3	3	3	3	3	3	3
	0	**4**	5	4	4	4	4	4	4	4
0.10	**0**	**1**	8	4	3	2	2	2	1	1
	0	**2**	8	4	3	2	2	2	2	2
	0	**3**	8	4	3	3	3	3	3	3
	0	**4**	8	4	4	4	4	4	4	4
0.05	**0**	**1**	10	5	4	3	2	2	2	2
	0	**2**	10	5	4	3	2	2	2	2
	0	**3**	10	5	4	3	3	3	3	3
	0	**4**	10	5	4	4	4	4	4	4
0.01	**0**	**1**	14	8	5	4	3	2	2	2
	0	**2**	14	8	5	4	3	2	2	2
	0	**3**	14	8	5	4	3	3	3	3
	0	**4**	14	8	5	4	4	4	4	4

Table 2: Minimum sample size *n* for CRGS plan when the lifetime of the items follows the exponentiated log - logistic distribution

β	**c_1**	**c_2**	**t/σ_0**							
			0.628	**0.942**	**1.257**	**1.571**	**2.356**	**3.141**	**3.927**	**4.712**
0.25	**0**	**1**	18	6	4	3	2	1	1	1
	0	**2**	19	7	4	3	2	2	2	2
	0	**3**	19	7	4	3	3	3	3	3
	0	**4**	19	7	4	4	4	4	4	4
0.10	**0**	**1**	28	10	5	4	2	2	2	1
	0	**2**	29	10	6	4	2	2	2	2
	0	**3**	29	10	6	4	3	3	3	3
	0	**4**	29	10	6	4	4	4	4	4
0.05	**0**	**1**	37	13	7	5	3	2	2	2
	0	**2**	37	13	7	5	3	2	2	2
	0	**3**	37	13	7	5	3	3	3	3
	0	**4**	37	13	7	5	4	4	4	4
0.01	**0**	**1**	56	19	10	7	4	3	3	2
	0	**2**	56	19	10	7	4	3	3	2
	0	**3**	56	19	10	7	4	3	3	3
	0	**4**	56	19	10	7	4	4	4	4

Table 3: Minimum sample size *n* for CRGS plan when the lifetime of the items follows the Rayleigh distribution

β	c_1	c_2	t/σ_0							
			0.628	**0.942**	**1.257**	**1.571**	**2.356**	**3.141**	**3.927**	**4.712**
0.25	**0**	**1**	8	4	2	2	1	1	1	1
	0	**2**	8	4	2	2	2	2	2	2
	0	**3**	8	4	3	3	3	3	3	3
	0	**4**	8	4	4	4	4	4	4	4
0.10	**0**	**1**	12	6	3	2	1	1	1	1
	0	**2**	12	6	4	2	2	2	2	2
	0	**3**	13	6	4	3	3	3	3	3
	0	**4**	13	6	4	4	4	4	4	4
0.05	**0**	**1**	16	7	4	3	2	1	1	1
	0	**2**	16	7	4	3	2	2	2	2
	0	**3**	16	7	4	3	3	3	3	3
	0	**4**	16	7	4	4	4	4	4	4
0.01	**0**	**1**	24	11	6	4	2	1	1	1
	0	**2**	24	11	6	4	2	2	2	2
	0	**3**	24	11	6	4	3	3	3	3
	0	**4**	24	11	6	4	4	4	4	4

Table 4: Minimum sample size *n* for CRGS plan when the lifetime of the items follows the inverse Rayleigh distribution

β	c_1	c_2	t/σ_0							
			0.628	**0.942**	**1.257**	**1.571**	**2.356**	**3.141**	**3.927**	**4.712**
0.25	**0**	**1**	18	4	2	2	1	1	1	1
	0	**2**	19	4	3	2	2	2	2	2
	0	**3**	19	4	3	3	3	3	3	3
	0	**4**	19	4	4	4	4	4	4	4
0.10	**0**	**1**	29	6	4	3	2	2	1	1
	0	**2**	29	7	4	3	2	2	2	2
	0	**3**	29	7	5	3	3	3	3	3
	0	**4**	29	7	5	4	4	4	4	4
0.05	**0**	**1**	37	8	4	3	2	2	2	1
	0	**2**	37	8	4	3	2	2	2	2
	0	**3**	37	8	5	3	3	3	3	3
	0	**4**	37	8	5	4	4	4	4	4
0.01	**0**	**1**	56	12	7	5	3	2	2	2
	0	**2**	56	12	7	5	3	2	2	2
	0	**3**	56	12	7	5	3	3	3	3
	0	**4**	56	12	7	5	4	4	4	4

Table 5: Probability of acceptance for CRGS plans with c_1=0 and c_2 = 2 when the lifetime of the items follows the log - logistic distribution

β	**t/σ_0**	**n**	**σ/σ_0**					
			2	**4**	**6**	**8**	**10**	**12**
0.25	**0.628**	**5**	0.812052	0.985465	0.997028	0.999055	0.999612	0.999813
	0.912	**3**	0.725538	0.975152	0.994676	0.998294	0.999297	0.99966
	1.257	**2**	0.68497	0.967824	0.992669	0.997626	0.999018	0.999524
	1.571	**2**	0.500708	0.930691	0.982692	0.994303	0.997627	0.998846
	2.356	**2**	0.205068	0.777096	0.923519	0.973013	0.98845	0.994308
	3.141	**2**	0.090093	0.604981	0.806925	0.923547	0.965702	0.982713
	3.927	**2**	0.044215	0.471622	0.653433	0.840804	0.923496	0.960112
	4.712	**2**	0.023846	0.381287	0.500889	0.732384	0.859854	0.923519
0.10	**0.628**	**8**	0.616611	0.963224	0.992388	0.997577	0.999006	0.99952
	0.912	**4**	0.588893	0.956331	0.990541	0.996965	0.99875	0.999396
	1.257	**3**	0.474871	0.929527	0.983571	0.994659	0.997789	0.998928
	1.571	**2**	0.500708	0.930691	0.982692	0.994303	0.997627	0.998846
	2.356	**2**	0.205068	0.777096	0.923519	0.973013	0.98845	0.994308
	3.141	**2**	0.090093	0.604981	0.806925	0.923547	0.965702	0.982713
	3.927	**2**	0.044215	0.471622	0.653433	0.840804	0.923496	0.960112
	4.712	**2**	0.023846	0.381287	0.500889	0.732384	0.859854	0.923519
0.05	**0.628**	**10**	0.498757	0.943318	0.988116	0.996212	0.998446	0.99925
	0.912	**5**	0.468358	0.932914	0.985245	0.995255	0.998046	0.999055
	1.257	**4**	0.320233	0.879837	0.970985	0.990512	0.996067	0.998093
	1.571	**3**	0.284082	0.854063	0.961569	0.987215	0.994662	0.997402
	2.356	**2**	0.205068	0.777096	0.923519	0.973013	0.98845	0.994308
	3.141	**2**	0.090093	0.604981	0.806925	0.923547	0.965702	0.982713
	3.927	**2**	0.044215	0.471622	0.653433	0.840804	0.923496	0.960112
	4.712	**2**	0.023846	0.381287	0.500889	0.732384	0.859854	0.923519
0.01	**0.628**	**14**	0.320205	0.893291	0.976814	0.992574	0.996951	0.998529
	0.912	**8**	0.23081	0.841474	0.962668	0.987866	0.994991	0.997577
	1.257	**5**	0.216735	0.822226	0.955108	0.985199	0.993854	0.997018
	1.571	**4**	0.162822	0.763498	0.933037	0.977373	0.990518	0.99538
	2.356	**3**	0.077627	0.598464	0.840111	0.940652	0.974215	0.987226
	3.141	**2**	0.090093	0.604981	0.806925	0.923547	0.965702	0.982713
	3.927	**2**	0.044215	0.471622	0.653433	0.840804	0.923496	0.960112
	4.712	**2**	0.023846	0.381287	0.500889	0.732384	0.859854	0.923519

Table 6: Probability of acceptance for CRGS plans with c_1=0 and c_2 = 2 when the lifetime of the items follows the exponentiated log - logistic distribution

β	t/σ_0	n	σ/σ_0					
			2	4	6	8	10	12
0.25	0.628	19	0.976451	0.999879	0.999995	0.999999	1	1
	0.912	7	0.94657	0.999625	0.999984	0.999998	1	1
	1.257	4	0.897066	0.998951	0.99995	0.999995	0.999999	1
	1.571	3	0.812941	0.997112	0.999847	0.999983	0.999997	0.999999
	2.356	2	0.581793	0.982335	0.998704	0.999837	0.999969	0.999992
	3.141	2	0.298872	0.918638	0.991096	0.998705	0.999738	0.999932
	3.927	2	0.154776	0.800223	0.965592	0.994124	0.998704	0.999647
	4.712	2	0.085809	0.664353	0.909299	0.981473	0.995511	0.998704
0.10	0.628	29	0.946174	0.999718	0.999988	0.999999	1	1
	0.912	10	0.895231	0.999235	0.999966	0.999997	0.999999	1
	1.257	6	0.790299	0.997638	0.999887	0.999988	0.999998	1
	1.571	4	0.704017	0.994864	0.999728	0.99997	0.999995	0.999999
	2.356	2	0.581793	0.982335	0.998704	0.999837	0.999969	0.999992
	3.141	2	0.298872	0.918638	0.991096	0.998705	0.999738	0.999932
	3.927	2	0.154776	0.800223	0.965592	0.994124	0.998704	0.999647
	4.712	2	0.085809	0.664353	0.909299	0.981473	0.995511	0.998704
0.05	0.628	37	0.914482	0.99954	0.999981	0.999998	1	1
	0.912	13	0.832701	0.998706	0.999943	0.999994	0.999999	1
	1.257	7	0.731932	0.996783	0.999846	0.999983	0.999997	0.999999
	1.571	5	0.596613	0.991975	0.999574	0.999952	0.999992	0.999998
	2.356	3	0.360709	0.960732	0.997084	0.999632	0.999931	0.999983
	3.141	2	0.298872	0.918638	0.991096	0.998705	0.999738	0.999932
	3.927	2	0.154776	0.800223	0.965592	0.994124	0.998704	0.999647
	4.712	2	0.085809	0.664353	0.909299	0.981473	0.995511	0.998704
0.01	0.628	56	0.820227	0.998945	0.999957	0.999996	0.999999	1
	0.912	19	0.693044	0.997232	0.999879	0.999987	0.999998	0.999999
	1.257	10	0.561659	0.993432	0.999686	0.999966	0.999994	0.999999
	1.571	7	0.415033	0.984305	0.999165	0.999907	0.999983	0.999996
	2.356	4	0.221872	0.931631	0.994814	0.999346	0.999877	0.99997
	3.141	3	0.132302	0.830868	0.980074	0.997086	0.99941	0.999847
	3.927	3	0.052291	0.632004	0.924897	0.986815	0.997082	0.999204
	4.712	2	0.085809	0.664353	0.909299	0.981473	0.995511	0.998704

Table 7: Probability of acceptance for CRGS plans with c_1=0 and c_2 = 2 when the lifetime of the items follows the Rayleigh distribution

β	**t/σ₀**	**n**	**σ/σ₀**					
			2	**4**	**6**	**8**	**10**	**12**
0.25	**0.628**	**8**	0.860025	0.990339	0.998074	0.999391	0.999751	0.99988
	0.912	**4**	0.83031	0.987966	0.997568	0.99923	0.999685	0.999848
	1.257	**2**	0.863503	0.990658	0.998077	0.999391	0.99975	0.99988
	1.571	**2**	0.717909	0.977931	0.99532	0.998515	0.999391	0.999706
	2.356	**2**	0.307199	0.903709	0.976733	0.992529	0.996928	0.998516
	3.141	**2**	0.092033	0.766257	0.929735	0.976743	0.990353	0.995326
	3.927	**2**	0.021614	0.603685	0.84294	0.944874	0.976726	0.988651
	4.712	**2**	0.0039	0.461207	0.718086	0.89161	0.952835	0.976733
0.10	**0.628**	**12**	0.725721	0.97836	0.995662	0.998628	0.999439	0.999729
	0.912	**6**	0.676756	0.973104	0.994524	0.998266	0.99929	0.999658
	1.257	**4**	0.596226	0.963127	0.992309	0.99756	0.999	0.999518
	1.571	**2**	0.717909	0.977931	0.99532	0.998515	0.999391	0.999706
	2.356	**2**	0.307199	0.903709	0.976733	0.992529	0.996928	0.998516
	3.141	**2**	0.092033	0.766257	0.929735	0.976743	0.990353	0.995326
	3.927	**2**	0.021614	0.603685	0.84294	0.944874	0.976726	0.988651
	4.712	**2**	0.0039	0.461207	0.718086	0.89161	0.952835	0.976733
0.05	**0.628**	**16**	0.590306	0.961894	0.992288	0.997559	0.999001	0.999519
	0.912	**7**	0.601312	0.963598	0.992547	0.997639	0.999033	0.999534
	1.257	**4**	0.596226	0.963127	0.992309	0.99756	0.999	0.999518
	1.571	**3**	0.515942	0.951157	0.989489	0.996657	0.998629	0.999339
	2.356	**2**	0.307199	0.903709	0.976733	0.992529	0.996928	0.998516
	3.141	**2**	0.092033	0.766257	0.929735	0.976743	0.990353	0.995326
	3.927	**2**	0.021614	0.603685	0.84294	0.944874	0.976726	0.988651
	4.712	**2**	0.0039	0.461207	0.718086	0.89161	0.952835	0.976733
0.01	**0.628**	**24**	0.373516	0.917056	0.982695	0.994504	0.99775	0.998916
	0.912	**11**	0.359287	0.913394	0.981654	0.994164	0.997609	0.998848
	1.257	**6**	0.377134	0.919635	0.982746	0.994506	0.997748	0.998914
	1.571	**4**	0.35893	0.915498	0.981375	0.994057	0.997562	0.998824
	2.356	**2**	0.307199	0.903709	0.976733	0.992529	0.996928	0.998516
	3.141	**2**	0.092033	0.766257	0.929735	0.976743	0.990353	0.995326
	3.927	**2**	0.021614	0.603685	0.84294	0.944874	0.976726	0.988651
	4.712	**2**	0.0039	0.461207	0.718086	0.89161	0.952835	0.976733

Table 8: Probability of acceptance for CRGS plans with c_1=0 and c_2 = 2 when the lifetime of the items follows the inverse Rayleigh distribution

β	t/σ$_0$	n	σ/σ$_0$					
			2	4	6	8	10	12
0.25	0.628	19	0.999999	1	1	1	1	1
	0.912	4	0.998032	1	1	1	1	1
	1.257	3	0.941055	1	1	1	1	1
	1.571	2	0.835165	0.999991	1	1	1	1
	2.356	2	0.327288	0.987391	0.999991	1	1	1
	3.141	2	0.123273	0.857768	0.997227	0.999991	1	1
	3.927	2	0.054916	0.641528	0.960001	0.998991	0.999991	1
	4.712	2	0.027917	0.476425	0.83538	0.986878	0.999505	0.999991
0.10	0.628	29	0.999999	1	1	1	1	1
	0.912	7	0.993968	1	1	1	1	1
	1.257	4	0.898637	1	1	1	1	1
	1.571	3	0.684538	0.999979	1	1	1	1
	2.356	2	0.327288	0.987391	0.999991	1	1	1
	3.141	2	0.123273	0.857768	0.997227	0.999991	1	1
	3.927	2	0.054916	0.641528	0.960001	0.998991	0.999991	1
	4.712	2	0.027917	0.476425	0.83538	0.986878	0.999505	0.999991
0.05	0.628	37	0.999998	1	1	1	1	1
	0.912	8	0.992122	1	1	1	1	1
	1.257	4	0.898637	1	1	1	1	1
	1.571	3	0.684538	0.999979	1	1	1	1
	2.356	2	0.327288	0.987391	0.999991	1	1	1
	3.141	2	0.123273	0.857768	0.997227	0.999991	1	1
	3.927	2	0.054916	0.641528	0.960001	0.998991	0.999991	1
	4.712	2	0.027917	0.476425	0.83538	0.986878	0.999505	0.999991
0.01	0.628	56	0.999995	1	1	1	1	1
	0.912	12	0.982325	1	1	1	1	1
	1.257	7	0.735356	1	1	1	1	1
	1.571	5	0.417043	0.999941	1	1	1	1
	2.356	3	0.150743	0.971834	0.999979	1	1	1
	3.141	2	0.123273	0.857768	0.997227	0.999991	1	1
	3.927	2	0.054916	0.641528	0.960001	0.998991	0.999991	1
	4.712	2	0.027917	0.476425	0.83538	0.986878	0.999505	0.999991

7. Conclusion

It is observed that the sample size decreases as the time termination ratio increases. Moreover the operating characteristic values increases when the quality improves. This sampling plan can be suggested for the industrial purposes to save time and cost of the life test experiments.

References

[1] Sherman R.E. (1965). Design and evaluation of repetitive group sampling plan, Technometrics, Vol. 7, pp. 11-21.
[2] Soudararajan V. and Ramasamy M. M. (1984). Designing repetitive group sampling (RGS) plan indexed by AQL and LQL: ZAPQR Transactions, Vol. 9(1), 9-14.
[3] Govindaraju, K. (1987), An interesting observations in Acceptance Sampling. Economic Quality Control Journal, 2(4), pp.89-92.
[4] Shankar, G. & Mohapatra B.N. (1993), GERT analysis of conditional repetitive group sampling plan. ZJQRM, Vol.10(2), 50-62.
[5] Kantam, R.R. L., Rosaiah, K. and Srinivasa Rao, G. (2001): Acceptance sampling based on life tests: Log-logistic models. *Journal of Applied Statistics* 28, 121-128.
[6] Park H., Moon Y., Jun C.H., Balamurali S., Lee J. (2004). A variables repetitive group sampling plan for minimizing average sample number. Journal of the Korean Institute of Industrial Engineers 30 (3), 205–212.
[7] Rosaiah, K. and Kantam, R.R.L. (2005): Acceptance sampling based on the inverse Rayleigh distribution. *EQC* 20, 277-286.
[8] Rosaiah K., Kantam R.R.L., Santosh Kumar (2007). Exponentiated Log – Logistic distribution – An economic reliability test plan. *Pak. J. Statist*., Vol. 23(2) pp 147 – 156.
[9] Muhammad Aslam (2007). Double acceptance sampling based on truncated life tests in Rayleigh distribution, European Journal of Scientific Reasearch, Vol. 17 No. 4, pp. 605 – 610.
[10] Muhammad Aslam, S. T. A. Niaki, M. Rasool and M. S. Fallahnezhad (2012). Decision rule of repetitive acceptance sampling plans assuring percentile life, Scientia Iranica, Transaction E: Industrial Engineering.