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ARTICLES

REPETITIVE ACCEPTANCE SAMPLING PLAN FOR LIFETIMES FOLLOWING A SKEW-GENERALIZED INVERSE WEIBULL DISTRIBUTION

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ABSTRACT. In this paper, we consider a skew-generalized inverse Weibull probability distribution for repetitive acceptance sampling plans based on truncated life tests with known shape parameter. The design parameters such as sample size and acceptance numbers are evaluated by considering the median life time of the test units as a quality parameter under the constraint of two risks, known as the producer's risk and consumer's risk at a certain level. We explained the proposed method with the help of tables for different values of the known parameter. The skew-generalized inverse Weibull distribution fits better a real data set considered than the generalized inverse Weibull distribution. Comparison between the proposed plan and the single sampling plan is presented.

Keywords: consumer's risk, median life, producer's risk, repetitive acceptance sampling plan, skew-generalized inverse Weibull distribution.

1 INTRODUCTION

Statistical quality control methodologies contributes, on a huge scale, to the enhancement and quality control of the products in manufacturing processes. Statistical quality control means managing the production procedure so as to get an appropriate product for the reason which it has been structured. There are numerous plans like acceptance sampling plans, total quality control, control charts and production process control for product quality control. Control charts are statistical procedures that have been generally utilized in checking item quality during the production process. More insights regarding the usual control chart can be found in Costa and Machado (2007) and Claro et al. (2008). Schilling and Neubauer (2017) suggested that the reliability sampling plans are utilized to decide the adequacy of the item at some future point in its

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operational life. This generally includes some type of life testing. Examination of censored data can be made with changing levels of complexity. Efficient acceptance sampling plan include, the determination and utilization of explicit standards for lot examination. Reliability sampling plans are the fundamental apparatuses of acceptance control. Plans might be introduced in the area of accepting inspection and final investigation of a little amount of the finished item. Before an inspecting plan can be inferred, at least one assumed quality level should be set to characterize the protection which is managed by the plan. Acceptance sampling plan is a direction toward drawing a sample from a lot of finished items to achieve a conclusion about acceptance or rejection of the submitted lot of items. It is far better to change the procedure of production to control the quality of the product than to dismiss the lot which has recently been manufactured.

The single acceptance sampling plan structured for life time distribution is implemented by certain authors. In this plan, n items are arbitrarily chosen from a lot and put them on a life testing experiment for pre-defined time t_o. The lot is examined for t_o units of time and if the number of failed units is larger than the acceptance number a then the lot is rejected. Otherwise, the lot is accepted if aggregate observed failures are a or fewer before time t_o. It was presented by Epstein (1954) accepting a truncated life test in which life of the product follows exponential distribution. Tsai and Wu (2006) introduced the problem of an acceptance sampling plan for a truncated life test when the lifetime follows the generalized Rayleigh distribution. Balakrishnan et al. (2007) developed the single acceptance sampling plan from a truncated life test based on generalized Birnbaum–Saunders distribution and in general ensure a specified median life with a given confidence levels. The generalized Birnbaum–Saunders distribution results in reduced sample sizes than some other distributions. They also observed for a real data set that the generalized Birnbaum–Saunders distribution fits the data better than the classical Birnbaum–Saunders and inverse Rayleigh distributions. Aslam et al. (2010) provided the time truncated acceptance sampling plans for the generalized exponential distribution in which the shape parameter is known. They presented the tables for the minimum sample size required to guarantee a certain median life of the experimental units and also showed the operating characteristic function values associated with the producer's risks.

Al-Masri (2018) discussed the single acceptance sampling plan in which lifetime of the products are assumed to follow the Inverse Gamma distribution. Al-Omari (2018a) developed acceptance sampling plans based on life tests based on the transmuted generalized inverse Weibull distribution. Al-Nasser et al. (2018) introduced acceptance sampling plans for an Ishita distribution based on a truncated life test. Al-Omari (2018b) described acceptance sampling plans for Sushila distribution based on truncated life tests in which he reveals the smallest sample size needed to assure the mean life of the test items. Al-omari (2016) discussed the generalized inverse Weibull distribution and presented comparisons of generalized inverse Weibull distribution and skew-generalized inverse Weibull distribution. These distributions can be utilized in various fields, for example, quality control process, life testing experiments and acceptance sampling plans. Al-Nasser et al. (2020) proposed a new Shewhart control chart by utilizing ranked repetitive sampling plans. The implementation of the proposed control charts examined utilizing the unlimited average run length's criterion. The outcomes showed that utilizing repetitive inspecting plans enhance the execution of the control chart. Aslam and Jun (2013) proposed a two-point approach that can be applied to numerous distributions in which they considered the unknown scale parameter is represented by its mean or the mean ratio to the predetermined life. Al-Omari et al. (2016) discussed the reduction of producer's risk by studying the double acceptance sampling plan and assuming that the lifetime distribution is a new Weibull-Pareto distribution.

Skew-generalized inverse Weibull distribution is a skewed distribution. Gupta (1962) recommended that the median is a better-quality parameter than the mean. Though, for asymmetric distribution, the mean is preferably used as a quality parameter.

In this paper, we develop a Repetitive Acceptance Sampling Plan (RASP) based on the median lifetime of products for a Skew-Generalized Inverse Weibull (SGIW) distribution. Singh et al. (2019) discussed RASP in which the significant comparison study is done between RASP and some other existing sampling plan for generalized Pareto distribution. Sherman (1965) proposed the attribute repetitive group acceptance sampling plan for a normal distribution which gives an optimal sample size corresponding to the consumer's risk. Singh et al. (2018) discussed RASP in which optimal parameters and Average Sample Number (ASN) under the inverse Weibull distribution have been computed along with both consumer's risk and producer's risk are satisfied.

2 SKEW-GENERALIZED INVERSE WEIBULL (SGIW) DISTRIBUTION

Mahdy and Ahmed (2016) introduced SGIW distribution whose probability density function (pdf) and cumulative distribution function (cdf) are given by

$$h(t;\theta,\delta,\gamma,\lambda) = \delta\gamma\theta^{\delta}\left(1+\lambda^{-\delta}\right)t^{-(\delta+1)}e^{\left(-\gamma\left(\frac{\theta}{t}\right)^{\delta}\left(1+\lambda^{-\delta}\right)\right)} \text{ for } t>0 \tag{1}$$

and

$$H(t;\theta,\delta,\gamma,\lambda) = e^{\left(-\gamma\left(\frac{\theta}{t}\right)^{\delta}\left(1+\lambda^{-\delta}\right)\right)} \tag{2}$$

where $\theta,\delta,\gamma,\lambda$ all are positive reals in which θ is scale parameter, δ,γ and λ are shape parameters. When $\lim_{\lambda\to\infty} h(t;\theta,\delta,\gamma,\lambda)$ then skew-generalized inverse Weibull distribution becomes a special case of generalized inverse Weibull distribution and when $\lim_{\lambda\to\infty} h(t;\theta,\delta,\gamma,\lambda)$ along with $\gamma=1$ then the skew-generalized inverse Weibull distribution becomes the inverse Weibull distribution. The median of SGIW distribution is given by

$$m = \left(\frac{ln2}{\left(\gamma\theta^{\delta}\left(1+\lambda^{-\delta}\right)\right)}\right)^{\frac{-1}{\delta}} \tag{3}$$

In the acceptance sampling plans, the shape parameters are supposed to be known parameters. If the shape parameters are not known, it's hard to discover or structure the acceptance sampling plans or they may be estimated by going through the whole manufacturing history of the quality control of the products. The scale parameter and the quality parameter are equivalent terms for the above said distribution.

3 REPETITIVE ACCEPTANCE SAMPLING PLAN (RASP)

Repetitive acceptance sampling plan are here designed to be used when the life time of the product follows SGIW distribution. The manufacturer proposes a lot of items with m_o as the median life whereas will be used as the quality parameter for the test items. For suitability, put the test experiment time as some multiple of the specified median life time $(i.e. t_o = km_o)$, for some constant $k > 0$.

3.1 Operating procedure

The operating procedure of repetitive acceptance sampling plan (RASP) is described as follows:

Stage-I. Draw a random sample from a lot of size n and put on a life test, up to a specified test time t_o.

Stage-II. Submitted lot is accepted if $d \leq a_1$, where d is the number of failures items before the specified test time t_o and a_1 is called the first acceptance number. Stop the test and immediately reject the lot if $d > a_2$, where a_2 is called the second acceptance number and $a_2 \geq a_1$.

Stage-III. If $a_1 < d \leq a_2$, then turn to stage I and do again the above procedure of experiment.

In this proposed attribute plan, n, a_1, a_2 are three parameters. The suggested plan reduces to single sampling plan when $a_1 = a_2 = a$ (acceptance number).

3.2 Performance measures

The probability of lot acceptance is obtained by using the Operating Characteristic (OC) function:

$$P_A\{\text{Accepting the lot}\} = \frac{P_a\{\text{Accept lot at first sample stage}\}}{P_a\{\text{Accept lot at first sample stage}\} + P_r\{\text{Reject lot at first sample stage}\}}$$

where $P_a\{\text{Accept lot at first sample stage}\} = \sum_{i=0}^{a_1}(\binom{n}{i})p^i(1-p)^{n-i}$

and $P_r\{\text{Reject lot at first sample stage}\} = 1 - \sum_{i=0}^{a_2}\left(\binom{n}{i}\right)p^i(1-p)^{n-i}$; $0 < p < 1$.

Here p stands for the probability that a trial item collapses before the test termination time t_o. Using $t_o = km_o$ and equation (2), (3) we get

$$p = e^{\left(-\left(\frac{m}{km_o}\right)^{\delta} log2\right)} \tag{4}$$

The parameters n, a_1 and a_2 of RASP are calculated by solving the following inequalities simultaneously:

$$P_a\left(p_1 | \frac{m}{m_o} = r_1\right) \leq \beta \tag{5}$$

$$P_a\left(p_2|\frac{m}{m_o}=r_2\right)\geq 1-\alpha \tag{6}$$

where β is the consumer's risk, α is the producer's risk, p_1 is the failure probability before the termination time corresponding to the quality level $r_1 = 1$ and p_2 is the failure probability corresponding to the quality level $r_2 = 2,3,4,5,6$. Now more than one set of values for the design parameters will be obtained using equation (4), (5) and (6). We consider those particular values of the design parameters for which ASN is the least. For the proposed RASP the minimum ASN is required to make a decision to accept or reject the lot is given by:

$$ASN(p)=\frac{n}{P_a\left\{\text{Accept lot at first sample stage}\right\}+P_r\left\{\text{Reject lot at first sample stage}\right\}} \tag{7}$$

Therefore, to get the minimum sample size, the design parameters for our RASP will be achieved by solving the following optimization problem:

$$MinimizeASN\left(p\right)=\frac{n}{P_a\left\{\text{Accept lot at first sample stage}\right\}+P_r\left\{\text{Reject lot at first sample stage}\right\}}$$

Subject to

$P_a\left(p_1|\frac{m}{m_o}=r_1\right)\leq\beta$

$P_a\left(p_2|\frac{m}{m_o}=r_2\right)\geq 1-\alpha$, where $n\,\varepsilon\,Z$.

3.3 Optimum parameters

The design parameters of the plan satisfying the equation (5), (6), (7) are reported in Table 1 for $\delta = 0.75$. We are determining the parameters at three different levels of test termination ratio $k = 0.5, 0.75, 1.0$, four different levels of consumer's risk $\beta = 0.25, 0.10, 0.05, 0.01$ and for producer's risk α as 0.05. We consider the product quality level $r_1 = 1$ at consumer's risk, while product quality levels considered at the producer's risk as $r_2 = 2,3,4,5,6$. The average sample number (ASN) is also reported in both the Tables 1 and 2. Calculated values indicate that with increase in the median ratio r_2, the sample size and ASN decreases. As, when $r_2 = 2$, $\beta = 0.25$, $k = 0.5$ and $\delta = 0.75$, the sample size is 18 and ASN is 27.73 and, when $r_2 = 6, \beta = 0.25$, $k = 0.5$ and $\delta = 0.75$, the sample size decreased and become 4 and the same thing happened for ASN which is decreased and become 4.00 in Table 1. These kinds of changes in sample sizes and ASN are observed in all other levels of consumer's risk (β) and time termination multiplier $k = 0.75, 1.0$. Similar changes are also observed in Table 2 with $\delta = 1.0$. But, when we compare the ASN for both shape parameters, we find that the ASN increases when the time termination multiplier k increases from 0.5 to 0.75 for $r_2 = 2$. When δ increases from 0.75 to 1.0, the sample size and ASN decrease for $r_2 = 2$ and $k = 0.5, 0.75$.

4 INDUSTRIAL IMPLEMENTATION

4.1 Example

Suppose that a bulb manufacturer claims that the specified life time of testing items is 4000 hours. Assume that the life time of the items follows a skew-generalized inverse Weibull distribution with shape parameter $\delta = 0.75$. It is known that the true median life of the units is 4000 hours and 8000 hours at consumer's risk 10% and producer's risk 5% respectively. Now we are concerned about the plan parameters of the repetitive acceptance sampling plan when an experiment designer would like to progress the life test experiment for 2000 hours. Notice that in this case we have $\delta = 0.75, k = 0.5, \beta = 0.10, r_1 = 1, \alpha = 0.05$ and $r_2 = 2$. Subsequently, the design parameter sample size is $n = 22$ with ASN 36.18, in Table 1. The outcome of this study is for, a random sample of size 22 units from the purposed lot by the consumer and put to a life test for 2000 hours. During the experiment, if 3 or less unit fails then the lot will be accepted and if more than 6 units fail then the lot will not be accepted. If aggregate failed units are more than 3 and less than or equal to 6, then repeat the testing process. Therefore, on average 36.18 number of units are necessary in this plan to make a judgment about the acceptance or rejection of the

Table 1 – Minimum of average sample number with $\delta = 0.75$.

β	r_2	$k=0.5$				$k=0.75$				$k=1.0$			
		n	a_1	a_2	ASN	n	a_1	a_2	ASN	n	a_1	a_2	ASN
0.25	2	18	3	9	27.73	11	2	5	27.73	9	3	5	15.66
	3	12	2	3	12.00	9	2	3	11.75	7	2	3	8.73
	4	5	0	2	7.68	9	2	2	9.00	6	2	2	6.00
	5	5	0	1	7.68	4	0	1	5.92	3	0	1	4.24
	6	4	0	1	4.00	4	0	1	5.92	4	1	1	4.00
0.10	2	22	3	6	36.18	27	7	10	38.71	14	5	7	18.89
	3	9	0	2	14.93	9	1	3	14.32	6	1	3	10.40
	4	7	0	1	9.11	9	1	2	10.42	6	1	2	7.00
	5	7	0	1	9.11	5	0	1	6.53	3	0	1	4.24
	6	7	0	1	9.11	5	0	1	6.53	3	0	1	4.24
0.05	2	21	2	6	40.58	33	8	12	45.11	18	6	9	24.20
	3	15	1	3	19.61	12	1	4	18.77	9	2	4	12.01
	4	10	0	2	14.88	7	0	2	10.75	5	0	2	7.30
	5	9	0	1	10.48	7	0	2	10.75	5	0	2	7.30
	6	9	0	1	10.48	6	0	1	7.16	4	0	1	4.75
0.01	2	35	4	5	50.26	38	8	8	54.25	20	6	10	26.78
	3	15	0	2	20.27	17	2	2	21.17	12	2	5	14.36
	4	13	0	1	15.66	11	0	0	14.51	7	0	3	9.97
	5	13	0	1	13.62	9	0	0	11.02	6	0	2	7.33
	6	13	0	0	13.62	9	0	0	11.02	6	0	2	7.33

submitted lot. During the comparison of RASP with the traditional single acceptance plan, the design parameters of the single acceptance plan, obtained from Table 5, are $n = 51$ and $a = 11$. It makes a point that the random sample size $n = 51$ units should be required to an experiment about 2000 hours and if more than 11 units fail during the experiment then immediately the lot will be rejected; if not, it must be accepted.

Table 2 – Minimum of average sample number with $\delta = 1$.

β	r_2	$k = 0.5$				$k = 0.75$				$k = 1.0$			
		n	a_1	a_2	ASN	n	a_1	a_2	ASN	n	a_1	a_2	ASN
0.25	2	12	1	2	14.16	8	1	3	15.74	11	3	5	17.93
	3	7	0	1	9.11	6	1	1	6.00	7	2	2	7.00
	4	5	0	0	5.00	6	1	1	6.00	3	0	1	4.80
	5	5	0	0	5.00	3	0	0	3.00	3	0	1	4.80
	6	5	0	0	5.00	3	0	0	3.00	2	0	0	2.00
0.10	2	16	1	3	19.86	16	3	5	21.91	17	5	7	22.45
	3	9	0	1	10.48	9	1	2	10.77	5	0	2	9.41
	4	9	0	0	9.00	6	0	1	7.40	4	0	1	5.33
	5	9	0	0	9.00	5	0	0	5.00	4	0	1	5.33
	6	9	0	0	9.00	5	0	0	5.00	4	0	1	5.33
0.05	2	15	0	3	20.27	15	2	5	24.37	19	5	8	26.83
	3	11	0	1	11.98	8	0	2	11.50	9	1	3	11.75
	4	11	0	0	11.00	7	0	1	8.08	5	0	1	5.92
	5	11	0	0	11.00	7	0	1	8.08	5	0	1	5.92
	6	11	0	0	11.00	6	0	0	6.00	5	0	1	5.92
0.01	2	20	0	4	25.11	19	2	6	27.62	24	5	10	32.75
	3	17	0	1	17.23	10	0	2	11.99	8	0	3	12.48
	4	17	0	1	17.023	10	0	1	10.43	8	0	0	9.30
	5	17	0	0	17.00	10	0	1	10.43	7	0	1	7.40
	6	17	0	0	17.00	10	0	0	10.00	7	0	1	7.40

Similarly if the values of $k = 0.5, \beta = 0.10, r_1 = 1, \alpha = 0.05$ and $r_2 = 2$ remain the same and only $\delta = 1.0$ should change, then it is observed in Table 2 that the design parameter sample size n is 16 and ASN 19.86. The result of this inspection is: take an arbitrary sample of 16 units from the purposed lot by the customer and afterward put to a life test experiment for 2000 hours. During the examination, if 1 or less unit fails, the lot will be accepted and if more than 3 units fails then immediately stop the experiment and reject the lot; if the total of failure units is between 1 and 3, then repeat entire process. Hence, on average 19.86 units are required in the proposed plan to make a judgment about the acceptance or rejection of the submitted lot. Through the comparison of RASP with the existing single acceptance sampling plan, the plan parameters of the single acceptance sampling plan, acquired from Table 5 are $n = 30$ and $a = 4$. It is observed that an arbitrary sample size of $n = 30$ units should be needed to a test around 2000 hours and assuming that if an excess of 4 units fails during the investigation, promptly the lot will be dismissed; if not, it should be accepted.

4.2 Real life applications

In this section, the SGIW distribution fits a real data set better than the Generalized Inverse Weibull (GIW) distribution.

Data set: This data set is considered from Lee and Wang (2003), representing lessening times (in months) of a random sample of 128 patients of bladder cancer. The data are as follows:

0.08	2.09	3.48	4.87	6.94	8.66	13.11	23.63	0.2	2.23
9.02	13.29	0.4	2.26	3.57	5.06	7.09	9.22	13.8	25.74
5.09	7.26	9.47	14.24	25.82	0.51	2.54	3.7	5.17	7.28
0.81	2.62	3.82	5.32	7.32	10.06	14.77	32.15	2.64	3.88
14.83	34.26	0.9	2.69	4.18	5.34	7.59	10.66	15.96	36.66
5.41	7.62	10.75	16.62	43.01	1.19	2.75	4.26	5.41	7.63
2.83	4.33	5.49	7.66	11.25	17.14	79.05	1.35	2.87	5.62
1.4	3.02	4.34	5.71	7.93	11.79	18.1	1.46	4.4	5.85
1.76	3.25	4.5	6.25	8.37	12.02	2.02	3.31	4.51	6.54
3.52	4.98	6.97	0.5	2.46	3.64	9.74	14.76	26.31	5.32
7.39	10.34	1.05	2.69	4.23	17.12	46.12	1.26	7.87	11.64
2.02	3.36	6.76	12.07	21.73	2.07	3.36	6.93	8.65	12.63
17.36	8.26	11.98	19.13	8.53	12.03	20.28	22.69		

To compare the proposed SGIW distribution with the GIW distribution we study measures of the Kolmogorov-Smirnov test statistic, Akaike Information Criterion (AIC), Bayesian information criterion (BIC) and Consistent Akaike Information Criterion (CAIC). The superior distribution presents smaller K-S test, AIC, CAIC, BIC values. Estimated values of the parameters of both of these fitted distributions calculated by Mahdy and Ahmed (2016) are presented in Tables 3 and 4. Table 4 shows that the SGIW distribution gives better fit than the GIW distribution.

Table 3 – Estimation of parameters of the SGIW and GIW distributions.

Distribution	Estimated values of the parameters			
	$\widehat{\theta}$	$\widehat{\delta}$	$\widehat{\lambda}$	$\widehat{\gamma}$
SGIW	1.215	0.751	0.906	0.981
GIW	1.193	0.715	---	1.105

Table 4 – Goodness of fit.

Distribution	K-S	AIC	BIC	CAIC
SGIW	0.147	896.115	907.523	896.44
GIW	0.361	938.127	946.638	938.321

5 COMPARATIVE STUDY

5.1 Comparison of proposed plan with single acceptance sampling plan

From Table 5, it is noticed that the RASP is more reasonable and efficient than the single acceptance sampling plan, as the ASN is smaller than the sample size of single acceptance sampling plan. During the comparison of RASP with the traditional single acceptance plan, the design parameters of the single acceptance plan, obtained from Table 5, are $n = 55$ and $a = 18$, while, for RASP, ASN is 38.71 when $r_2 = 2, \beta = 0.10, k = 0.75$ and $\delta = 0.75$. This kind of difference is observed in Table 5 for almost every value of consumer's risks, median ratios, time termination ratios and for both shape parameters. But if there is zero failures observed then the proposed plan and single acceptance sampling plan have the same ASN. This represents a significant comparison of repetitive acceptance sampling plan and single sampling plan. In field work, to reduce the time and expenses of the life testing procedure of the products, smaller sample sizes are preferred. Table 5, clearly reveals that RASP gives smaller ASN than the single acceptance sampling plan for each level of consumer risk, time termination multipliers and shape parameters.

5.2 Comparison of GIW and SGIW in terms of their ASN

For the real life numerical examples of subsection 4.2, the performance of both distributions, GIW and SGIW, based on RASP in terms of their ASN and reduction percentage in ASN, for $\beta = 0.25, 0.10, 0.05, 0.01, k = 0.5, 0.75, 1.0, \alpha = 0.5$ and $r = 2, 3, 4, 5, 6$ is reported in Table 6. It can be observe in Table 6:

1. Almost all the values of the ASNs for the SGIW distribution are lower than the GIW distribution for all combinations determined by considering both the consumer risk (β) and producer (α).

2. For both distributions, the ASN values shows a decreasing pattern when β increases along with the fixed α for all combinations; reduction percentage in ASN also reveals the significant differences between GIW and SGIW distributions.

3. When time termination ratio k increases from 0.5 to 1.0, the values of ASNs also increase for $\beta = 0.25, 0.10, 0.05, 0.01$ and median ratio $r_2 = 2$.

Table 5 – Comparison between RASP and single acceptance sampling plan.

β	r_2	$\delta = 0.75$						$\delta = 1.0$					
		$k = 0.5$		$k = 0.75$		$k = 1.0$		$k = 0.5$		$k = 0.75$		$k = 1.0$	
		ASN	$n(a)$	ASN	$n(a)$	ASN	$n(a)$	ASN	$n(a)$	ASN	$n(a)$	ASN	$n(a)$
0.25	2	27.73	34(8)	27.73	35(12)	15.66	19(9)	14.16	20(3)	15.74	21(16)	17.93	23(9)
	3	12.00	12(2)	11.75	14(4)	8.73	10(4)	9.11	10(1)	6.00	6(1)	7.00	7(2)
	4	7.68	8(1)	9.00	9(2)	6.00	6(2)	5.00	5(0)	6.00	6(1)	4.80	5(1)
	5	7.68	8(1)	5.92	6(1)	4.24	6(2)	5.00	5(0)	3.00	3(0)	4.80	5(1)
	6	4.00	4(0)	5.92	6(1)	4.00	4(1)	5.00	5(0)	3.00	3(0)	2.00	3(0)
0.10	2	36.18	51(11)	38.71	55(18)	18.89	27(12)	19.86	30(4)	21.91	31(8)	22.45	33(12)
	3	14.93	20(3)	14.32	23(6)	10.40	14(5)	10.48	15(1)	10.77	12(2)	9.41	14(4)
	4	9.11	16(2)	10.42	14(3)	7.00	10(3)	9.00	9(0)	7.40	9(1)	5.33	9(2)
	5	9.11	11(1)	6.53	11(2)	4.24	8(2)	9.00	9(0)	5.00	5(0)	5.33	7(1)
	6	9.11	11(1)	6.53	8(1)	4.24	5(1)	9.00	9(0)	5.00	5(0)	5.33	7(1)
0.05	2	40.58	66(14)	45.11	69(22)	24.20	36(16)	20.27	40(5)	24.37	36(9)	26.83	42(15)
	3	19.61	27(4)	18.77	28(7)	12.01	17(6)	11.98	18(1)	11.50	17(3)	11.75	16(4)
	4	14.88	18(2)	10.75	16(3)	7.30	13(4)	11.00	11(0)	8.08	10(1)	5.92	11(2)
	5	10.48	14(1)	10.75	13(2)	7.30	11(3)	11.00	11(0)	8.08	10(1)	5.92	8(1)
	6	10.48	14(1)	7.16	13(2)	4.75	9(2)	11.00	11(0)	6.00	6(0)	5.92	8(1)
0.01	2	50.26	96(19)	54.25	99(30)	26.78	48(20)	25.11	60(7)	27.62	55(13)	32.75	59(20)
	3	20.27	38(5)	21.17	39(9)	14.36	24(8)	17.23	31(2)	11.99	22(3)	12.48	22(5)
	4	15.66	29(3)	14.51	27(5)	9.97	18(5)	17.023	24(1)	10.43	14(1)	9.30	17(3)
	5	13.62	24(2)	11.02	20(3)	7.33	13(3)	17.00	17(0)	10.43	14(1)	7.40	11(1)
	6	13.62	19(1)	11.02	17(2)	7.33	11(2)	17.00	17(0)	10.00	10(0)	7.40	11(1)

Table 6 – Comparison of GIW and SGIW in terms of their ASN and reduction percentage in ASN.

β	r_2	$k = 0.5$			$k = 0.75$			$k = 1.0$		
		GIW (ASN)	SGIW (ASN)	Reduction in ASN	GIW (ASN)	SGIW (ASN)	Reduction in ASN	GIW (ASN)	SGIW (ASN)	Reduction in ASN
	2	27.90	27.75	0.54%	32.24	28.15	12.68%	34.21	31.57	7.71%
	3	12.00	12.00	0.00%	11.71	11.71	0.00%	13.24	12.58	4.98%
0.25	4	7.69	7.69	0.00%	9.17	9.00	1.85%	10.24	7.83	23.53%
	5	7.69	7.69	0.00%	5.92	5.92	0.00%	4.80	4.80	0.00%
	6	7.69	4.00	0.00%	5.92	5.92	0.00%	4.80	4.80	0.00%
	2	39.22	36.23	7.62%	42.29	38.72	8.44%	45.16	42.10	6.77%
	3	14.96	14.94	0.13%	17.28	14.32	17.12%	19.85	17.20	13.35%
0.10	4	13.98	9.11	34.83%	10.43	10.43	0.00%	11.91	9.41	20.99%
	5	9.98	9.11	8.71%	9.76	6.53	33.09%	8.37	8.37	0.00%
	6	9.98	9.11	8.71%	6.56	6.53	0.45%	5.33	5.33	0.00%
	2	43.65	40.65	6.87%	48.97	45.93	6.20%	53.81	47.95	10.89%
	3	19.95	19.62	1.65%	19.61	18.78	4.23%	21.01	17.33	17.51%
0.05	4	14.90	14.90	0.00%	13.99	10.76	23.08%	13.79	11.75	14.79%
	5	11.35	10.48	7.62%	10.76	10.76	0.00%	8.93	8.93	0.00%
	6	11.35	10.48	7.62%	7.13	7.13	0.00%	8.93	8.93	0.00%
	2	56.17	50.34	10.37%	57.47	54.28	5.55%	63.02	58.43	7.28%
	3	24.19	20.29	16.12%	23.32	21.17	8.86%	24.58	23.58	4.06%
0.01	4	15.37	15.17	1.30%	14.51	14.51	0.00%	15.04	14.83	1.39%
	5	15.37	13.62	11.38%	11.00	11.00	0.00%	12.03	12.03	0.00%
	6	13.62	13.62	0.00%	11.00	11.00	0.00%	9.31	9.31	0.00%

6 CONCLUSION

In this paper, the RASP has been studied under the time truncated life test based on skew-generalized inverse Weibull distribution. The median life is considered as a quality attribute of the item. The desired parameters and ASN of the RASP under the skew-generalized inverse Weibull distribution have been obtained to such an extent that producer's risk and consumer's risk are fulfilled with the least values of ASN. The ASN of the proposed plan and the sample size of a single sampling plan have been compared. The proposed plan is progressively more cost-effective than the single acceptance sampling plan as it gives smaller sample size for conducting life test experiment. The goodness of fit of SGIW distribution for the real data set used for implementation of proposed plan is better than GIW distribution. Also the SGIW distribution gives smaller ASN than the GIW distribution for the proposed plan when applied to a real data set.

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