5

Designing Chain Sampling Plan for Truncated Life Tests Using Minimum Angle Method

5.1 Introduction

The concept of Chain sampling inspection plans was proposed by Dodge (1955), The ChSP – 1 plans are applicable for both smaller and larger samples. The Chain Sampling Plan (ChSP-1) proposed by Dodge (1955), making use of cumulative results of several sampling helps to overcome the shortcoming of the Single sampling plan. It avoids rejection of a lot on the basis of a single nonconforming unit and improves the poor discrimination between good and bad quality that occurs with the c = 0 plan. Chain sampling method is applied to cases where there is continuous production under the same essential conditions, and where the lots or batches of product to be sampled are offered for acceptance substantially in order of their production.

In this chapter a new approach of designing Chain sampling plans for truncated life test using minimum angle method, is proposed when the life time of the items follows different distributions. The distributions considered in this chapter are Rayleigh distributions, Generalized Exponential distribution, Weibull distribution and Gamma distribution. The test termination time, mean ratio time and number of preceding sample i = 2 are specified. The design parameter is obtained such that it satisfies both the producer's risk and consumer's risk simultaneously and also at the same time the it minimizes the sum of risks. The tables of the design parameter are provided for easy selection of the plan parameter. The results are analysed with the help of tables and examples.

5.2 Condition for Application of Chsp – 1

The cost of destructiveness of testing is such that a relatively small sample size is necessary, although other factors make a large sample desirable.

1) The product to be inspected comprises a series of successive lots produced by a continuing process.
2) Normally lots are expected to be of essentially the same quality.
3) The consumer has faith in the integrity of the producer.

5.3 Operating Procedure of Chain Sampling Plan for Life Tests

The plan is implemented in the following way :

1) For each lot, select a sample of n units and test each unit for conformance to the specified requirements during the time t_0.
2) Accept the lot if d (the observed number of defectives) is zero in the sample of n unit, and reject if d >1.
3) Accept the lot if d is equal to 1 and if no defectives are found in the immediately preceding i samples of size n.

Thus a lot is accepted if no defects are found in its sample of n units. A lot is rejected if two or more defects are found in this sample. But if one defect is found the lot is still be accepted if the last defect found was far enough back in history as determined by the choice of i.

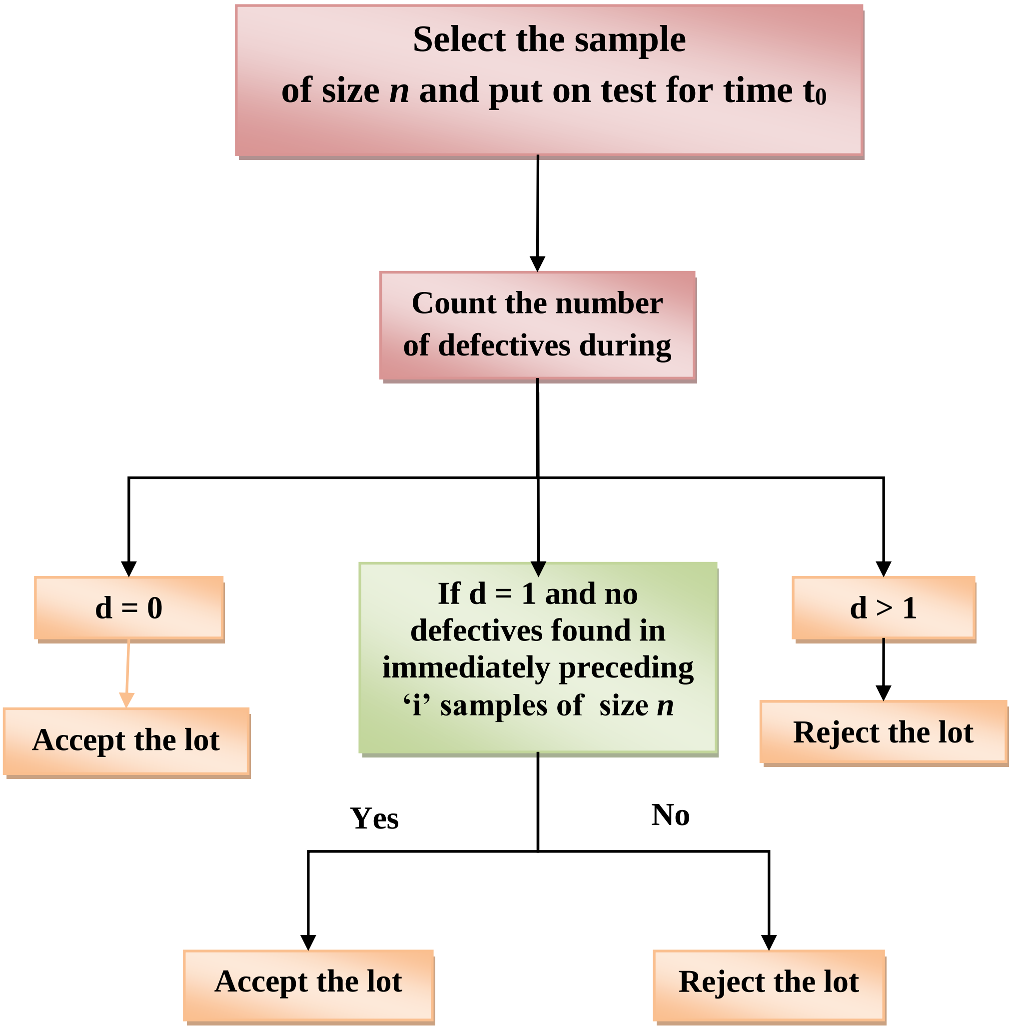
Dodge (1955), has given the operating characteristic function of ChSP-1 as $\mathbf{P_a (p) = P_o + P_1 (P_o)^i}$ **,** where P_a = the probability of acceptance,

P_o = probability of finding no defects in a sample of n units from product of quality p.

P_1 = probability of finding one defect in such a sample.

i = Number of preceding samples.

Flow - Chart



Select the sample
of size n and put on test for time t0
Count the number
of defectives during
d = 0
Accept the lot
If d = 1 and no
defectives found in
immediately preceding
'i' samples of size n
d > 1
Reject the lot
Yes
No
Accept the lot
Reject the lot

5.4 Distributions

The following are the life time distributions used in this chapter.

5.4.1 Rayleigh distribution

In this chapter we have considered Chain sampling plan for i = 2, the cumulative distribution function (cdf) of the Rayleigh distribution is given by,

$$F(t,\lambda) = 1 - e^{-\frac{1}{2}\left(\frac{t}{\lambda}\right)^2}, \quad t>0, \lambda>0 \qquad (5.1)$$

where λ is the scale parameter

5.4.2 Generalized Exponential distribution

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

$$F(t,\lambda) = \left(1 - e^{-\frac{t}{\lambda}}\right)^{\alpha}, \quad t>0, \lambda>0 \qquad (5.2)$$

where λ is the scale parameter and α is the shape parameter and it is fixed as 2

5.4.3 Weibull distribution

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

$$F(t,\lambda) = 1 - e^{-\left(\frac{t}{\lambda}\right)^m}, \quad t>0, \lambda>0 \qquad (5.3)$$

where λ is the scale parameter and m is the shape parameter and it is fixed as 2

5.4.4 Gamma distribution

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

$$F(t,\lambda) = 1 - e^{-\frac{t}{\lambda}} \sum_{j=0}^{\gamma-1} \left(\frac{t}{\lambda}\right)^j / j!, \quad t>0, \lambda>0 \qquad (5.4)$$

where λ is the scale parameter and $\gamma > 0$ is the shape parameter and it is fixed as 2

5.5 Construction of Tables

It is assumed that the lot size is large enough to use the binomial distribution to find the probability of lot acceptance. According to Dodge (1955), the probability of acceptance P_a (p) for the Chain sampling plan is calculated using the following equation

$$P_a(p) = (1-p)^n + np(1-p)^{n-1}(1-p)^{ni} \quad (5.5)$$

where p is the failure probability.

The Tables are constructed using OC function for Chain sampling plans under various distributions. The test termination ratio **t**/λ_0 values are fixed as 0.628, 0.912, 1.257, 1.571, 2.356, 3.141, 3.927 and 4.712, and the mean ratio λ/λ_0 values are fixed as 4,6,8,10,12. For various time ratios t/λ_0 and mean ratios $\boldsymbol{\lambda}/\lambda_0$, the parameter values n satisfying $L(p_1) \geq 0.95$ and $L(p_2) \leq 0.10$ are determined for various distribution and are provided in Table 5.1 to Table 5.5. The value θ and tanθ values are also provided in each table. The parameters can be selected corresponding to the minimum value of θ.

Table – 5.1 The sample size and probability of acceptance for Minimum angle method Chain sampling plan when the life time of the items follows Rayleigh distribution (i=2)

t/λ_0	λ/λ_0	n	L (P_1)	L (P_2)	tanθ	θ
0.628	6	15	0.985512	0.052387	0.185939	10.53324
	6	13	0.988937	0.07833	0.190537	10.78767
	8	12	0.996844	0.095987	0.195248	11.04791
	8	13	0.996311	0.07833	0.191606	10.84675
	8	15	0.99513	0.052387	0.186573	10.56835
	8	17	0.993801	0.035164	0.18348	10.39699
	10	14	0.998208	0.06402	0.189466	10.72844
	10	12	0.998678	0.095987	0.196077	11.09366
	12	13	0.999355	0.06402	0.189877	10.75117
	12	12	0.999355	0.095987	0.196596	11.12229
0.942	6	7	0.984356	0.045141	0.36848	20.22782
	6	6	0.988322	0.070942	0.37725	20.66898
	8	9	0.991436	0.018473	0.361188	19.85909
	8	6	0.996101	0.070942	0.37985	20.79929
	10	11	0.994618	0.007596	0.358557	19.72564
	10	7	0.997777	0.045141	0.371499	20.37999
	10	5	0.998862	0.102376	0.399221	21.76291
	12	8	0.99858	0.028846	0.366342	20.11991
	12	7	0.998911	0.045141	0.372474	20.42904
	12	6	0.999199	0.070942	0.382711	20.94238
1.257	8	4	0.994665	0.042789	0.56089	29.28765
	8	7	0.98431	0.003966	0.544603	28.57284
	10	5	0.996495	0.019295	0.550857	28.84848
	10	7	0.993233	0.003966	0.544137	28.55227
	12	6	0.997522	0.008742	0.54683	28.67118
1.571	8	4	0.987562	0.007186	0.703591	35.12988
	8	5	0.980989	0.002091	0.704653	35.17057
	10	7	0.984319	0.000177	0.707841	35.29243
	10	3	0.996991	0.024782	0.716529	35.62271
	12	3	0.998522	0.024782	0.719235	35.725
2.356	8	2	0.985256	0.003886	0.91223	42.37202
	10	3	0.985877	0.000242	0.923568	42.72459
	10	2	0.993656	0.003886	0.91971	42.60507
	12	2	0.996857	0.003886	0.925087	42.77152

t/λ_0	λ/λ_0	n	L (P_1)	L (P_2)	tanθ	θ
	12	3	0.992903	0.000242	0.925376	42.78042
3.141	10	2	0.981275	0.00005	0.96274	43.91244
	12	3	0.979147	0.00003	0.979545	44.40799
	12	2	0.990532	0.00005	0.968337	44.07841
3.927	10	1	0.989395	0.000448	0.935686	43.09701
	12	2	0.978225	0.00002	0.968503	44.08332
4.712	10	1	0.979079	0.00005	0.914047	42.42879

Table – 5.2 The sample size and probability of acceptance for Minimum angle method Chain sampling plan when the life time of the items follows Generalized Exponential distribution (i=2)

t/λ_0	λ/λ_0	n	$L(p_1)$	$L(p_2)$	tanθ	θ
0.628	6	11	0.97565	0.068307	0.228799	12.8874
	6	13	0.967004	0.041509	0.224312	12.64284
	8	11	0.991276	0.068307	0.22945	12.92282
	8	13	0.988014	0.041509	0.223744	12.61186
	8	15	0.984315	0.02533	0.220832	12.45289
	8	17	0.980206	0.015487	0.21952	12.38116
	10	14	0.993908	0.032414	0.222331	12.53474
	10	12	0.995478	0.053209	0.226867	12.78216
	10	10	0.996831	0.08787	0.23518	13.23435
	12	14	0.996924	0.032414	0.222782	12.55934
	12	11	0.998083	0.068307	0.231104	13.01283
0.942	6	7	0.957704	0.038635	0.382099	20.9118
	6	6	0.967965	0.061989	0.387621	21.18738
	8	9	0.974688	0.015149	0.375125	20.56233
	8	6	0.988159	0.061989	0.38864	21.23814
	10	11	0.983176	0.005963	0.372697	20.44029
	10	7	0.992878	0.038635	0.381668	20.89027
	10	5	0.996308	0.100201	0.406429	22.11826
	12	8	0.995282	0.024171	0.377492	20.6811
	12	7	0.996365	0.038635	0.382766	20.94513
	12	6	0.997317	0.061989	0.391934	21.40188
1.257	8	4	0.98493	0.057511	0.529199	27.88777
	8	7	0.957594	0.006599	0.51608	27.29737
	10	5	0.989462	0.027807	0.517835	27.3767
	10	7	0.980068	0.006599	0.511551	27.09207
	12	6	0.992222	0.013533	0.512973	27.15658
	12	3	0.998025	0.101209	0.572573	29.79428
1.571	8	5	0.951961	0.007173	0.630546	32.23333
	10	7	0.957616	0.000995	0.633883	32.36993
	10	3	0.99137	0.052375	0.645782	32.85365
	12	6	0.982794	0.002671	0.624885	32.00065
	12	3	0.995514	0.052375	0.64939	32.99928

t/ λ_0	λ/λ_0	n	$L(p_1)$	$L(p_2)$	tanθ	θ
2.356	8	2	0.967053	0.032935	0.807517	38.92146
	10	3	0.965734	0.005894	0.807771	38.93026
	10	2	0.984166	0.032935	0.815081	39.18282
	12	2	0.991534	0.032935	0.821629	39.40751
	12	3	0.981293	0.005894	0.807477	38.92008
3.141	10	2	0.95962	0.007167	0.884801	41.50242
	12	3	0.952067	0.000606	0.906347	42.18749
	12	2	0.977514	0.007167	0.888707	41.62771
3.927	10	1	0.978924	0.04048	0.911625	42.35307
	12	2	0.954136	0.001523	0.927016	42.83101
4.712	10	1	0.962947	0.018207	0.890108	41.67255

Table – 5.3 The sample size and probability of acceptance for Minimum angle method Chain sampling plan when the life time of the items follows Weibull distribution (i=2)

t/λ_0	λ/λ_0	n	$L(p_1)$	$L(p_2)$	tanθ	θ
0.628	4	6	0.958601	0.096223	0.349681	19.27376
	6	11	0.97088	0.013072	0.328886	18.2053
	6	6	0.990647	0.096223	0.352193	19.40189
	6	7	0.987442	0.064105	0.341164	18.8378
	6	9	0.979862	0.028844	0.331234	18.32662
	8	12	0.988139	0.008807	0.32651	18.08239
	8	6	0.996895	0.096223	0.355025	19.54615
	8	8	0.994549	0.042935	0.33602	18.57338
	8	10	0.991617	0.019409	0.328902	18.20615
	10	11	0.995709	0.013072	0.327658	18.14179
	10	6	0.9987	0.096223	0.356761	19.63443
	10	7	0.998233	0.064105	0.344673	19.01768
	10	11	0.995709	0.013072	0.327658	18.14179
	12	6	0.999365	0.096223	0.357828	19.68864
	12	7	0.999136	0.064105	0.345625	19.06641
	12	8	0.998873	0.042935	0.338066	18.67864
	12	9	0.998576	0.028844	0.333257	18.431
0.942	4	3	0.950579	0.07126	0.607641	31.28457
	4	3	0.950579	0.07126	0.607641	31.28457
	6	3	0.988692	0.07126	0.614664	31.57756
	6	6	0.958601	0.004873	0.591272	30.59465
	6	4	0.98037	0.028876	0.59266	30.65353
	6	5	0.970257	0.011845	0.588382	30.4718
	8	5	0.989723	0.011845	0.587487	30.4337
	8	7	0.980549	0.002006	0.587088	30.41669
	8	3	0.996229	0.07126	0.621092	31.84408
	8	6	0.985444	0.004873	0.585874	30.36493
	10	4	0.997179	0.028876	0.598393	30.89601
	10	5	0.995613	0.011845	0.588986	30.49751
	10	3	0.998417	0.07126	0.624949	32.00327
	10	7	0.991559	0.002006	0.585543	30.35082
	12	3	0.999226	0.07126	0.627304	32.1002
	12	4	0.998615	0.028876	0.600282	30.97564

t/λ_0	λ/λ_0	n	$L(p_1)$	$L(p_2)$	tanθ	θ
	12	5	0.997836	0.011845	0.590388	30.55709
	12	7	0.995798	0.002006	0.585753	30.35979
1.257	6	3	0.967308	0.008745	0.783563	38.08092
	6	2	0.984922	0.04301	0.797415	38.56937
	8	4	0.980313	0.0018	0.78655	38.18681
	8	5	0.970172	0.000371	0.793615	38.43605
	8	6	0.958485	0.000012	0.803049	38.76618
	8	7	0.945474	0.000001	0.814048	39.14725
	10	4	0.991455	0.0018	0.786495	38.18486
	10	5	0.986864	0.000371	0.789015	38.27398
	10	6	0.981454	0.00001	0.793129	38.41894
	10	7	0.975296	0.00001	0.798087	38.59293
	12	4	0.995746	0.0018	0.787892	38.23428
	12	5	0.993408	0.000371	0.788613	38.25977
	12	6	0.990619	0.00012	0.7906	38.32989
	12	8	0.983791	0.00001	0.796028	38.52077
1.571	6	2	0.965932	0.007191	0.885525	41.5257
	6	1	0.99151	0.091325	0.943128	43.32352
	8	3	0.974113	0.000609	0.901301	42.02836
	8	4	0.956061	0.000001	0.917794	42.54554
	8	2	0.988163	0.007191	0.894439	41.8107
	8	1	0.997192	0.091325	0.968597	44.08609
	10	4	0.980324	0.000012	0.908799	42.26454
	10	3	0.988665	0.000609	0.90164	42.03909
	10	2	0.994934	0.007191	0.901926	42.04811
	10	5	0.970189	0.000012	0.918249	42.55967
	12	2	0.997498	0.007191	0.907048	42.20955
	12	4	0.990034	0.00001	0.907346	42.2189
	12	3	0.994329	0.000609	0.903932	42.11144
	12	5	0.984713	0.000012	0.912205	42.37122
2.356	6	1	0.962083	0.0039	0.890463	41.68388
	8	1	0.98677	0.0039	0.928952	42.89062
	10	1	0.994327	0.0039	0.951227	43.56812
	10	2	0.976744	0.000012	0.964567	43.96673
	10	3	0.950506	0.00012	0.991178	44.74616
	12	1	0.997194	0.0039	0.964771	43.97278
	12	2	0.988173	0.000012	0.969787	44.12125
	12	3	0.974133	0.000012	0.983749	44.53063

t/λ_0	λ/λ_0	n	$L(p_1)$	$L(p_2)$	tanθ	θ
3.141	8	1	0.962098	0.00001	0.890901	41.69789
	10	1	0.983177	0.000012	0.921551	42.66216
	12	2	0.965971	0.000012	0.966623	44.02767
3.972	10	1	0.960505	0.00012	0.960505	42.45571
	12	1	0.97958	0.000012	0.91491	42.4557
4.712	12	1	0.962083	0.000012	0.890891	41.69757

Table - 5.4 The sample size and probability of acceptance for Minimum angle method Chain sampling plan when the life time of the items follows Gamma distribution (i=2)

t/λ_0	λ/λ_0	n	$L(p_1)$	$L(p_2)$	$\tan\theta$	θ
0.628	6	17	0.983832	0.093506	0.141628	8.061057
	8	17	0.994374	0.093506	0.142396	8.104222
	10	17	0.997578	0.093506	0.143034	8.140056
	12	17	0.998797	0.093506	0.14347	8.164519
0.942	6	9	0.979132	0.083289	0.258761	14.50768
	8	9	0.992571	0.083289	0.260101	14.57961
	10	9	0.996759	0.083289	0.261364	14.64742
	12	9	0.998376	0.083289	0.262261	14.69551
1.257	6	6	0.973281	0.071256	0.375556	20.58399
	8	6	0.99027	0.071256	0.377301	20.67155
	10	6	0.995698	0.071256	0.379257	20.76956
	12	6	0.997825	0.071256	0.380707	20.84218
1.571	6	4	0.973138	0.083416	0.490947	26.14861
	8	4	0.9901	0.083416	0.494899	26.33075
	10	4	0.995588	0.083416	0.498294	26.4868
	12	4	0.997756	0.083416	0.500681	26.59628
2.356	8	3	0.976725	0.032416	0.68424	34.3815
	10	3	0.989209	0.032416	0.687818	34.52088
	12	3	0.994372	0.032416	0.691226	34.65322
3.141	8	2	0.972033	0.032363	0.810242	39.01583
	10	2	0.986754	0.032363	0.818139	39.28793
	12	2	0.992987	0.032363	0.824587	39.50857
3.927	8	2	0.953429	0.009439	0.873109	41.12451
	10	2	0.972015	0.009439	0.876107	41.22183
	12	2	0.984761	0.009439	0.881498	41.3961
4.712	8	1	0.973669	0.053832	0.902742	42.07388
	10	1	0.987226	0.053832	0.928941	42.89027
	12	1	0.993108	0.053832	0.946549	43.4271

5.6 Example

Assume that an experimenter wants to establish that the lifetime of the electrical devices produced in the factory ensures the true unknown mean life as at least 1000 hours when the ratio of the unknown average life is $\lambda/\lambda_0 = 8$. and if no defects are found in the immediately preceding i samples. Following are the results obtained when the lifetime of the test items follows Rayleigh distribution, Generalized Exponential distribution, Weibull distribution and Gamma distribution respectively.

5.6.1 Rayleigh distribution

Suppose that the life time of a product follows the Rayleigh distribution. For the above example from Table 5.1, the sample size required is obtained as n = 17 and one can observe that the minimum angle is $\theta = 10.39699°$ and also $\alpha = 0.0062$, and $\beta = 0.0351$ which is very much less than the specified risk. The lot is accepted if in a sample of size 17 during 628 hours no failures are observed or if there is one failure, there is no failure is observed in the immediately preceding i = 2 samples. The sample size satisfies the condition of producer's risk and consumer's risk $\alpha \leq 0.05$, $\beta \leq 0.10$. Thus the required Chain sampling plan has parameters (17,2). For the same conditions when the time of experiment is 2356 hours, the probability of acceptance is 0.9852, the producer's risk is 0.0148 and consumer's risk is 0.0038. The sample size is 2 which is very much less. Thus it is clear that as the time of experiment increases, the sample size decreases. When the ratio of unknown average life to specified life is 12, there is slight change in the sample size but there is increase in the probability of acceptance. The probability of acceptance is 0.9993 which is almost equal to 1 and consumer's risk is 0.064 which shows that there is a reduction in consumer's risk.

5.6.2 Generalized Exponential distribution

Suppose that the life time of a product follows the Generalized Exponential distribution. For the above example from Table 5.2, the sample size required is obtained as n = 17 and one can observe that the minimum angle is is $\theta = 12.3811°$ and also $\alpha = 0.0198$, and $\beta = 0.0154$ which is very much less than the specified risk.

The lot is accepted if in a sample of size 17 during 628 hours no failures are observed or if there is one failure, there is no failure is observed in the immediately preceding i = 2 samples. The sample size satisfies the condition of producer's risk and consumer's risk $\alpha \leq 0.05$, $\beta \leq 0.10$. Thus the required Chain sampling plan has parameters (17,2). For the same conditions when the time of experiment is 2356 hours, the probability of acceptance is 0.9670, the producer's risk is 0.033 and consumer's risk is 0.0329. The sample size is 2 which is very much less. Thus it is clear that as the time of experiment increases the sample size decreases. When the ratio of unknown average life to specified life is 12, there is slight change in the sample size but there is increase in the probability of acceptance. The probability of acceptance is 0.9969 which is almost equal to 1 and consumer's risk is 0.0324 which shows that there is a reduction in consumer's risk.

5.6.3 Weibull distribution

Suppose that the life time of a product follows the Weibull distribution. For the above example from Table 5.3, the sample size required is obtained as n = 12 and one can observe that the minimum angle is $\theta = 18.0824°$ and also $\alpha = 0.0019$, and $\beta = 0.0088$ which is very much less than the specified risk The lot is accepted if in a sample of size 17 during 628 hours no failures are observed or if there is one failure, there is no failure is observed in the immediately preceding i = 2 samples. The sample size satisfies the condition of the producer's risk and consumer's risk $\alpha \leq 0.05$, $\beta \leq 0.10$. Thus the required Chain sampling plan has parameters (12,2). For the same conditions when the time of experiment is 2356 hours, the probability of acceptance is 0.9867, the producer's risk is 0.0132 and consumer's risk is 0.0039. The sample size is 1 which is very much less. Thus it is clear that as the time of experiment increases , the sample size decreases. When the ratio of unknown average life to specified life is 12, there is slight change in the sample size but there is increase in the probability of acceptance. The probability of acceptance is 0.9985 which is almost equal to 1 and consumer's risk is 0.0288 which shows that there is a reduction in consumer's risk.

5.6.4 Gamma distribution

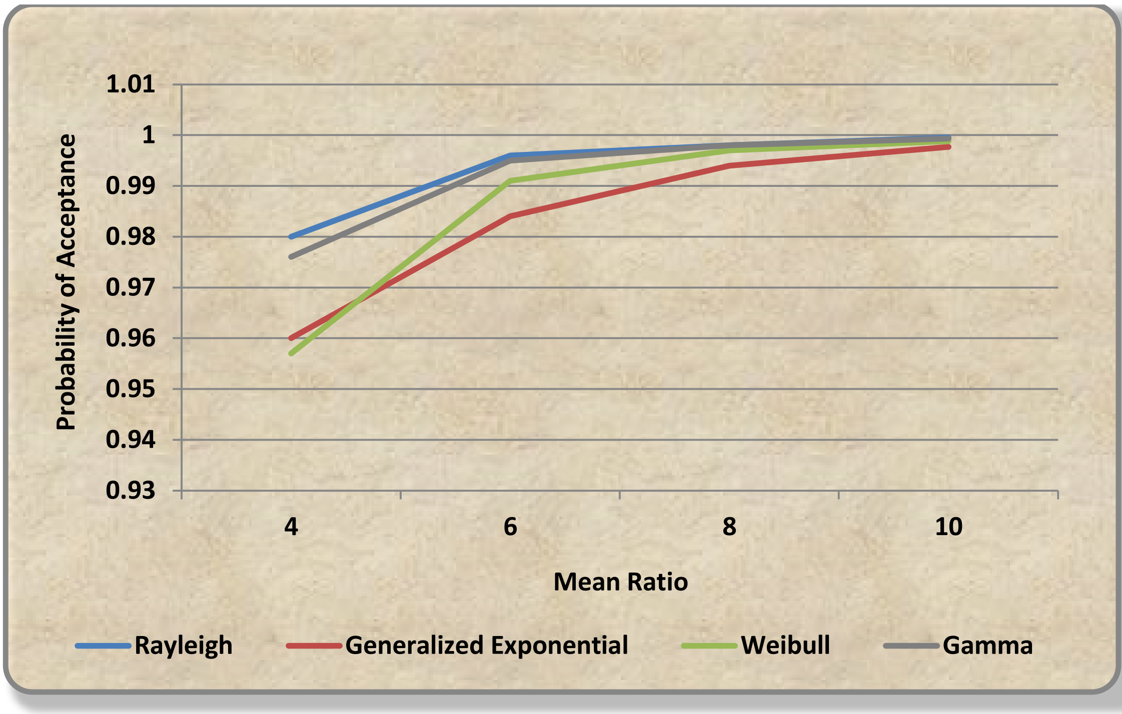
Suppose that the life time of a product follows the Gamma distribution. For the above example from Table 5.4, the sample size required is obtained as n = 17 and one can observe that the minimum angle is $\theta = 8.1042°$ and also $\alpha = 0.0057$, and $\beta = 0.0935$ which is very much less than the specified risk. The lot is accepted if in a sample of size 17 during 628 hours no failures are observed or if there is one failure, there is no failure is observed in the immediately preceding i = 2 samples. The sample size satisfies the condition of producer's risk and consumer's risk $\alpha \leq 0.05$, $\beta \leq 0.10$. Thus the required Chain sampling plan has parameters (17,2). For the same conditions when the time of experiment is 2356 hours, the probability of acceptance is 0.9767, the producer's risk is 0.0233 and consumer's risk is 0.0324. The sample size is 3 which is very much less. Thus it is clear that as the time of experiment increases, the sample size decreases. When the ratio of unknown average life to specified life is 12, there is no change in the sample size but there is increase in the probability of acceptance. The probability of acceptance is 0.9987 which is almost equal to 1 and consumer's risk is 0.0935 which shows that there is a reduction in consumer's risk.

Comparison of results of Producer's risk, Consumer's risk and sample size for Chain sampling plan when the life time of the items follows different distributions provided in table 5.5.

Table – 5.5 Comparison of results of Producer's risk, Consumer's risk and sample size for Chain sampling plan when the life time of the items follows different distributions (t/λ_0=0.628, i=2)

S.No.	λ/λ_0	Distribution	Producer's risk	Consumer's risk	n
1	6	Rayleigh	0.0145	0.0523	15
		Generalized Exponential	0.0330	0.0415	13
		Weibull	0.0291	0.0130	11
		Gamma	0.0162	0.0935	17
2	8	Rayliegh	0.0062	0.0351	17
		Generalized Exponential	0.0198	0.0154	17
		Weibull	0.0118	0.0088	12
		Gamma	0.0057	0.0935	17
3	10	Rayleigh	0.0018	0.0640	14
		Generalized Exponential	0.0061	0.0324	14
		Weibull	0.0043	0.0130	11
		Gamma	0.0025	0.0935	17
4	12	Rayleigh	0.0006	0.0640	13
		Generalized Exponential	0.0031	0.0324	14
		Weibull	0.0015	0.0288	9
		Gamma	0.0013	0.0935	17

Figure - 5.1 OC curve of Chain sampling plan when the life time of the items follows different distributions with (t/λ_0=0.628, i=2)



From Table 5.5 one can conclude that when the Weibull distribution is followed, the sample size is very much less than the sample size of all other distributions. And at the same time the producer's risk and consumer's risk are also less and the sum of the risks is also very much less for Weibull distribution. Figure 5.1 shows the OC curves of all four distributions. From the figure, one can observe that probability of acceptance is more for Rayleigh distribution than any other distributions. It can be seen that by applying the minimum angle method one can get the parameters which minimizes simultaneously the consumer's risk and producer's risk. This minimum angle method plan provides better discrimination of accepting good lots.