





FORMULA AND PARAMETER

1. L_{10} Expectancy : 70,000 hrs. minimum @ fan rated voltage and temperature of 40°C.

2. Formula : According to Weibull distribution, $MTTF \approx 7 \times L_{10} = 490000$ hours. Base on a safe coefficient---1.3 times, the target time of L_{10} is 91000 hours. And the target time of $MTTF$ is 637000 hours.

We depend on a zero failure Weibull test strategy and accelerated testing technique, to determinethe total test time (t) for verifying the above life estimation by the equation,

$$t = 1.036 \times MTTF \times [(B_{\gamma;c}) \div n]^{0.91} \div A_F, \text{ and } A_F = 2^{(T_s - T_u)/10}$$

where, $(B_{\gamma;c})$ is Poisson distribution factor with the failure number of γ equal to 0 and the decimal confidence level of c equal to 0.90 (90%).

Sample size (n) : 27 pcs.

Acceleration factor (A_F) : 16

Stress temperature (T_s) : 80 °C

Unstress temperature (T_u) : 40 °C

Poisson coefficient ($B_{\gamma;c}$) : 2.3026

We get required test time with zero failure (t) 4,390 hrs.

3. Parameter :
1. For current, the limit is less than spec. (max.).
 2. For speed, the acceptable decrease is no more than initial 15%.
 3. For noise, the limit is no more than spec. +15%.

4. Test Date :

1. Date of test start 2004/2/8 17:30
2. Date of test termination (Estimate) 2004/6/28 10:30
3. Date of test termination (Actual) : 2004/8/9 15:30

✘ If the actual test time exceed the required, it comes out that those fans' life expectancy and $MTTF$ are greater than warrant.

5. Test Equipments :

1. Thermostated container : GPO-090
2. DC power supply : GPC-6030D

RESULT

1. Current Test Status :

- ▶ Customer Request
- ▶ New Product
- ▶ Component Change
- ▶ Routine Test

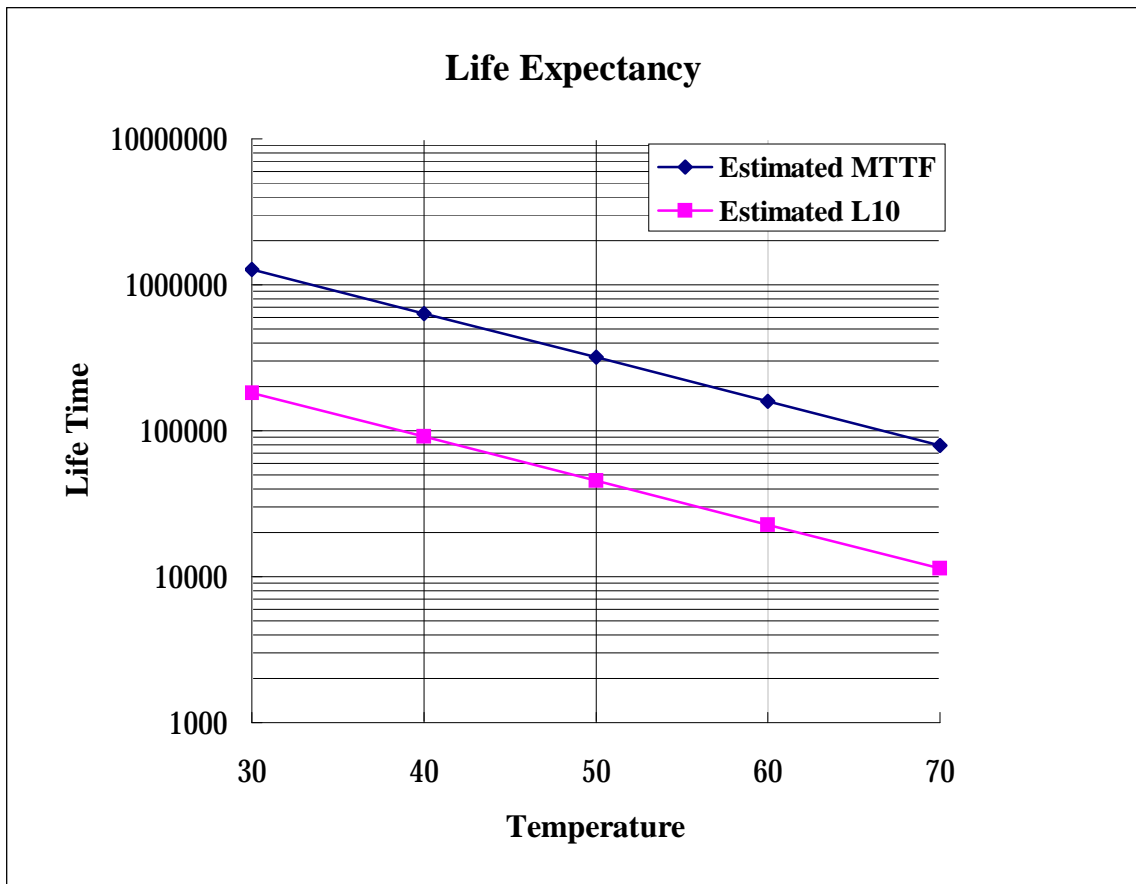
2. Actual Test Hours : 4,390 hrs.

3. Verified MTTF : 637,011 hrs.

4. Verified L₁₀ : 91,002 hrs.

5. Other Value Of MTTF and L₁₀

Temperature Value	25	30	40	50	60	70
A_F	45.25	32	16	8	4	2
Estimated MTTF	1801739	1274022	637011	318506	159253	79626
Estimated L ₁₀	257391	182003	91002	45501	22750	11375



TEST DATA

Sample No.	Current		Deviation	Speed		Deviation	Noise		Deviation
	0.2 Max.	0.2 Max.	%	6000 Ref.	5100 Min.	%	31 dBA	38 dBA	dBA
	Initial	Final		Initial	Final		Initial	Final	
1	0.07	0.02	-71.43	6454	6136	-4.93	31.1	34.5	3.4
2	0.07	0.02	-71.43	5703	6056	6.19	30.6	34.0	3.4
3	0.07	0.08	14.29	6103	6086	-0.28	28.3	34.9	6.6
4	0.08	0.07	-12.50	5526	5815	5.23	28.5	31.5	3.0
5	0.08	0.10	25.00	6068	6524	7.51	30.2	36.1	5.9
6	0.08	0.07	-12.50	6028	5718	-5.14	29.4	36.3	6.9
7	0.07	0.08	14.29	5879	6200	5.46	31.2	35.6	4.4
8	0.07	0.07	0.00	5931	5520	-6.93	29.0	33.0	4.0
9	0.07	0.06	-14.29	6036	5944	-1.52	28.3	31.9	3.6
10	0.08	0.09	12.50	5681	5784	1.81	30.0	34.8	4.8
11	0.08	0.09	12.50	6240	5803	-7.00	31.2	36.2	5.0
12	0.08	0.08	0.00	5744	5898	2.68	28.4	33.3	4.9
13	0.07	0.06	-14.29	6181	6098	-1.34	29.9	33.0	3.1
14	0.07	0.05	-28.57	5594	5594	0.00	31.2	34.9	3.7
15	0.07	0.06	-14.29	6079	6381	4.97	30.6	36.8	6.2
16	0.07	0.08	14.29	6289	6518	3.64	29.9	33.6	3.7
17	0.07	0.07	0.00	6036	5831	-3.40	31.2	35.3	4.1
18	0.07	0.09	28.57	6000	6438	7.30	31.1	35.4	4.3
19	0.07	0.05	-28.57	6319	5920	-6.31	29.4	33.7	4.3
20	0.07	0.09	28.57	6442	6441	-0.02	29.8	33.8	4.0
21	0.07	0.05	-28.57	5709	5905	3.43	29.8	33.0	3.2
22	0.07	0.06	-14.29	5964	6103	2.33	29.0	35.1	6.1
23	0.08	0.07	-12.50	5916	6218	5.10	30.1	35.8	5.7
24	0.07	0.06	-14.29	6315	6082	-3.69	29.5	34.1	4.6
25	0.07	0.06	-14.29	5817	6157	5.84	30.7	35.4	4.7
26	0.07	0.06	-14.29	6386	6637	3.93	31.2	34.9	3.7
27	0.08	0.07	-12.50	5746	5675	-1.24	29.5	34.5	5.0
-	-	-	-	-	-	-	-	-	-
Max.	0.08	0.10	28.57	6454	6637	7.51	31.2	36.8	6.9
Min.	0.07	0.02	-71.43	5526	5520	-7.00	28.3	31.5	3.0
\bar{x}	0.07	0.07	0.00	6006.9	6054.9	0.00	29.97	34.50	0.0
σ	0.005	0.019	0.000	263.40	299.00	0.00	0.980	1.340	0.0