Sunonwealth Electric Machine Industry Co., Ltd

Fan MTTF / L10 Test Procedure And Calculation Method

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Definition

MTTF- Mean Time to Failure

MTBF- Mean Time between Failure

L10- Failed to 10% Times

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Failure criteria

- **Fan not function.**
- **Current over 15% of original.**
- **Speed under 15% of original.**
- **Noise over 3dB(A) of original.**

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MTTF Test Procedure and Calculation Method

1. Random sampling 50 units.
2. Perform function test in advance and set up temperature.
3. Function test once a week.
4. Test time for at least 3000 hrs.
5. Based on Total Test Hours(T) and Failure Quantity (r) and refer Chi-Square table with Confidential Level (CL) to get MTTF.

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MTTF Calculation Method

Formula: (Base on MIL-HDBK-781A)

$$MTTF=(2 \times T) \div (\chi^2 , \alpha , 2\gamma +2)$$

T : Total test time

χ^2: Chi- Square table

α : Producer's risk ; α =10% (CL:90%;CL=1-α)

γ : Failure Q'ty

υ =2γ +2; υ : Degrees of freedom

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Example:

Sample size : 50 units.

Test time : 3,000 hours.

Failure time : 2,400 hours * 1pc

2,736 hours * 1pc

Total test hours(T) = (2400 x 1) + (2736 x 1) + (3000 x 48)

= 149,136 hrs

Chi-Square table : 90% CL, 2 pcs failed, get a coefficient 10.6

MTTF = (2 x T) / 10.6 = (2 x 149,136) / 10.6 = 28,138 hrs.

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L10 Test Procedure and Calculation Method

1. Random sampling 50 units.
2. Perform function test in advance and temperature set up.
3. Function test once a week.
4. Continue test till 10% failure being found, then terminate.
5. Count total test hours (T) and failure quantity (r).

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Weibull Distribution

Formula:

$$L10 = \theta \times (0.10536)^{\frac{1}{\beta}}$$

θ: Characteristic Life

β: Shape Parameter

$$MTTF = \theta \times \Gamma\left(1 + \frac{1}{\beta}\right)$$

Γ: Gamma Table

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Example

Sampling 50 pcs/test for 27,384 hours.

1 Pc TTF at 9,912 hrs

1 Pc TTF at 15,624 hrs

1 Pc TTF at 20,160 hrs

1 Pc TTF at 23,856 hrs

1 Pc TTF at 27,384 hrs

Weibull distribution

β :Shape parameter = 1.9202

θ :Characteristic Life = 91,650

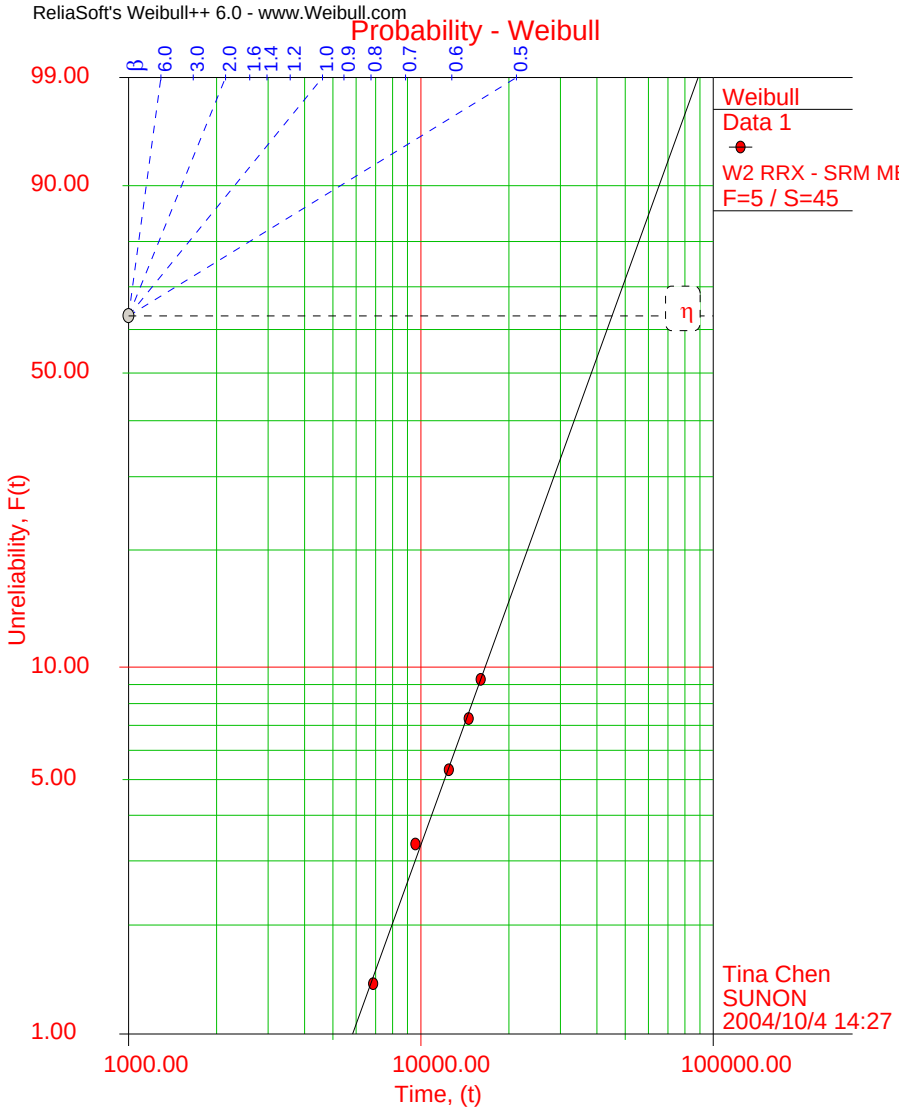
$$L10 = \theta \times (0.10536)^{\frac{1}{\beta}}$$

$$= 91{,}650 \times (0.10536)^{1/1.9202}$$

$$= 28{,}390 \text{ hrs}$$

$$\text{Mean Life} = \theta \times \Gamma\left(1 + \frac{1}{\beta}\right)$$

$$= 81{,}300 \text{ hrs}$$



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Thank You

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