HALT & HASS

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Agenda

1. Introduce
2. Theory
3. Test process & method
4. Appendix

1. Introduce

HALT's target: Stimulation the failure, namely set the failure obvious.

HASS's target: Base on the HALT to create the HASS method, use HASS wipe out the manufacture failure and get high reliability quickly.

HALT mainly excellences :

A. Wipe out the design bugs, improve design reliability, insure we can get the reliability early .Then equipment will be higher reliability ;

B. Reduce the failure in verify test. After the HALT, the verify test are not important, that only a form ;

C. Reduce the cost of the life cycle ;

D. We can know the operating limit and destruct limit. That will support the stress level for HASS method。

HASS mainly excellences :

A. Can use the min cost and time to inspire the products hiding bugs ;
B. Can use min cost and time detect more bugs ;
C. Improve product reliability ;
D. Reduce products manufacture, screen, repair and assure total cost。

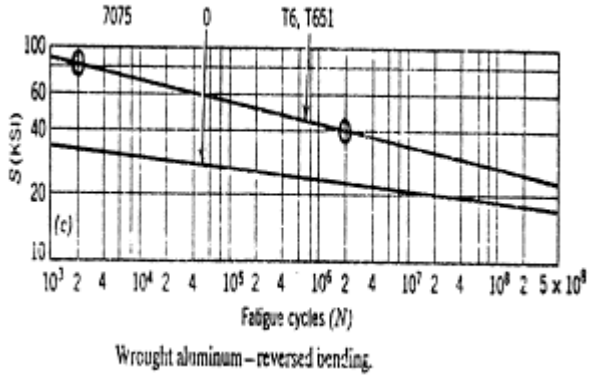
2. Theory

1、The relationship of destruct and stress

Formula of acceleration failure and mechanical stress:

$$D \approx n \sigma^{\beta} \qquad (1)$$

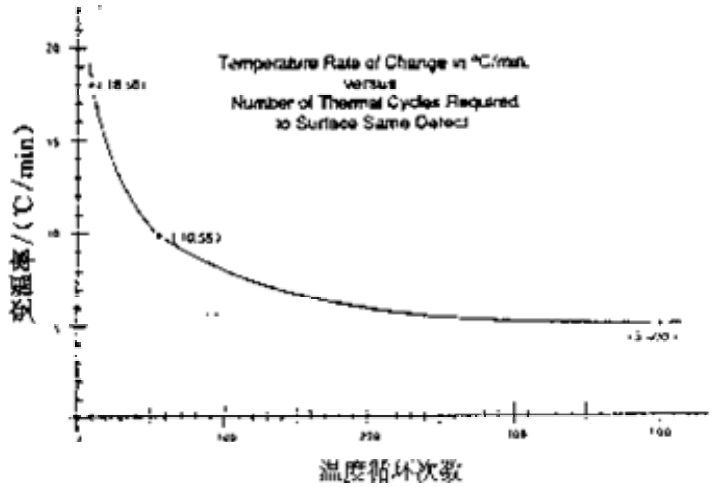
D cumulative tire destruct ;
n stress cycle time ;
σ mechanical stress (Bring by heat, static press, vibration or other stress) ;
β constant (range 8~12) 。



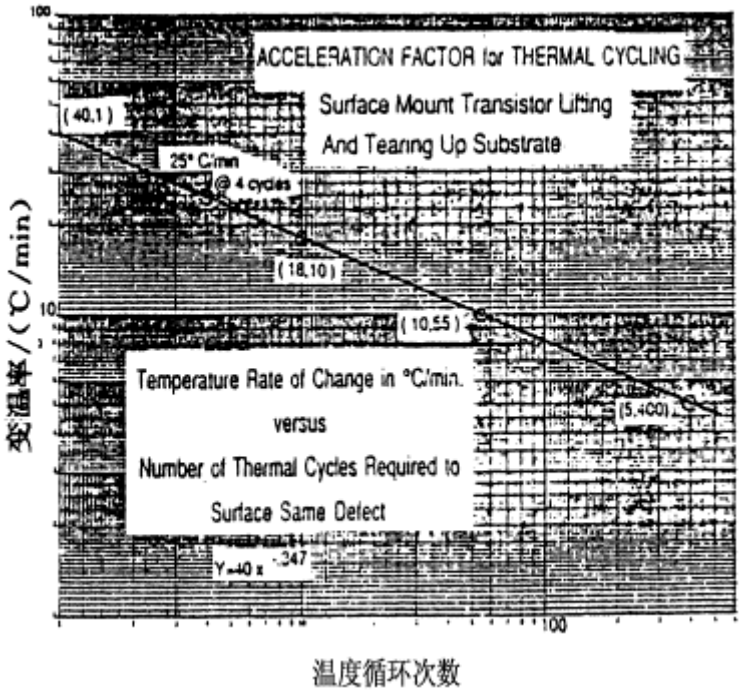
Wrought aluminum – reversed bending.

Al bending stress and failure cycle time relationship

2. Temperature transition rate and temperature cycle time of Stimulation bugs relationship



Temperature transition rate and the temperature cycle times of Stimulation failure relationship



Temperature transition rate and temperature cycle times

Temp transform rate (℃/min)	5	10	15	18	20	25	30	40
Cycle times	400	55	17	10	7	4	2.2	1
Min / Time	66	33	22	22	18.3	16.5	13.2	8
Screen times (h)	440	30	6	3.0	3.0	1.9	0.9	0.1

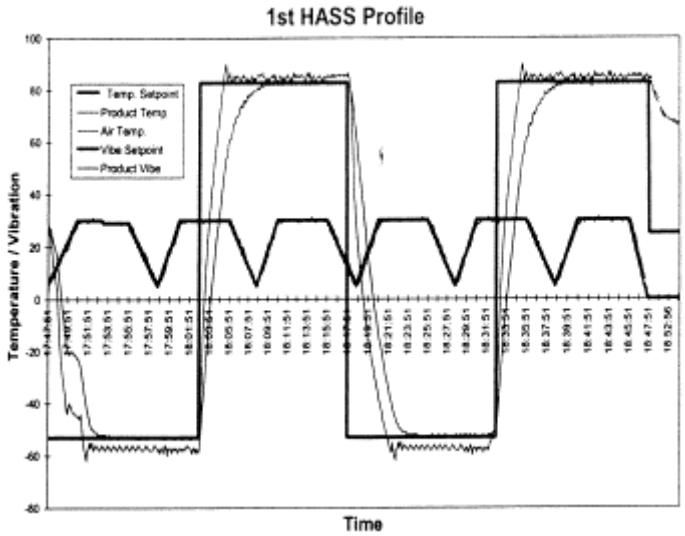
3. Test process and method

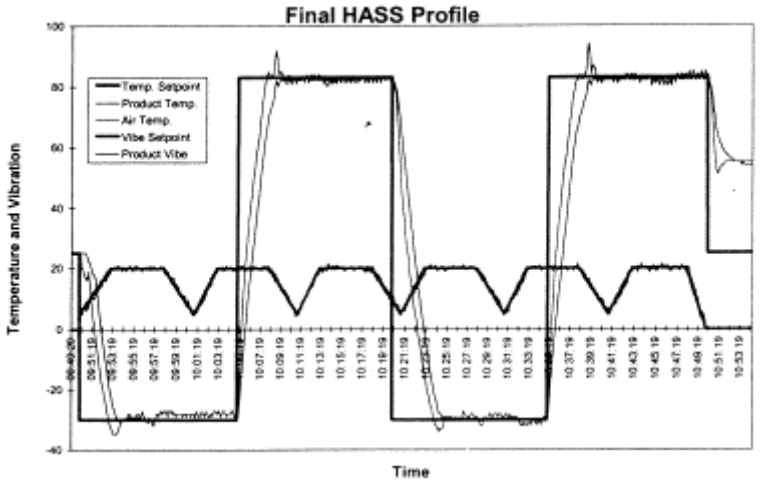
All failures in the HALT must do root cause analysis, continue do the test, analysis, verify and improve cycles. HALT is HASS precondition, HASS must do after the HALT and solve all bugs.Gregg K. Hobbs think we should get the operating limit and destruct for the HASS do screen.

HASS common include HASS tongs design manufacture and verify, section analysis and Proof-of-Screen.

Example

UPS HASS analysis first set 83℃, -53℃, average temperature transition 45℃/min. Vibration from 5 Grms to 30 Grms keep 60min. The final spec is 83℃, -30℃, average temperature transition 45℃/min. Vibration from 5 Grms to 20 Grms keep 60min.


1st HASS Profile
Temp. Setpoint
Product Temp
Air Temp.
Vibe Setpoint
Product Vibe
Temperature / Vibration
Time


Final HASS Profile
Temp. Setpoint
Product Temp.
Air Temp.
Vibe Setpoint
Product Vibe
Temperature and Vibration
Time

4. Appendix

- **To perform HALT in outside lab (ERSO).**
- **The test equipment used in ERSO specification is as below:**

1.Manufacture: THERMOTRON INDUSTRIES

2.Model No: AST-35/RS-28 S/N:29924

3.Temp Rang: -100°C ~ 200°C

4.Ramp Rate: 70°C/min (Max)

5.Table Size: 30” X 30”

6.Repetitive Shock: Up to 50Grms

7.Freq. Rang: 2Hz ~ 10kHz

8.FFT Channel: 8CH