STRESS SCREENING CHAMBER PERFORMANCE GUIDELINES

Purpose.

The purpose of this document is to identify the necessary performance and physical characteristics of an effective Thermal Stress Screening Chamber.

Scope.

The Stress Screening chamber and physical characteristics addressed take into consideration the broader scope of application of such chambers in relation to those reliability growth disciplines upon which best practice Stress Screening relies.

These reliability growth disciplines include: -

- product design robustness assessment
- product design stress screening to identify and eliminate potential for design related early life failures
- accelerated ageing to ensure fitness for purpose of product design and manufacturing process in relation to product whole life durability requirement
- manufacturing stress screening to identify and eliminate potential for manufacturing process * related early life failures

Also included is reference to the clear distinction that needs to be recognized between the relative impact of high and low volume manufacturing programmes on Stress Screening strategies and costs.

Essential Attributes.

In order to achieve maximum screen strength at minimum cost, any candidate Stress Screening chamber should be capable of demonstrating the following essential attributes: -

1. Temperature range of chamber air –100°C to +200°C.
2. Air velocity throughout working volume 5 to 8m/sec.
3. Convective heat transfer capable of moving 1lb. Aluminium specimen 0°C to 60°C and 60°C to 0°C at 15°C/min. *
4. Working volume capable of handling medium to high volume manufacture. **
5. Mechanical design of working volume capable of accommodating thermal screening fixtures.
6. Controller capable of monitoring and using product temperature to command temperature reversals.
7. Chamber able to be readily integrated into a safe handling area to provide full protection for static sensitive product.

Cable ports, door safety interlocks and oxygen depletion monitoring are assumed to be standard features.

* 1lb. Aluminium specimen to be a cube or a cylinder whose length is equal to its diameter.
** As a guide, taking an assembled Eurocard as a product example, medium volume would be

100 units per day and high volume would be 1000 units per day.

The effect of manufacturing volume on cost of screening.

The cost of Stress Screening per unit in manufacture decreases as numbers of units per screen increases. Experience indicates that screening of unit lots of less than 10 can increase unit cost by up to £5.00, whereas screening unit lots of 100 or more increases unit cost by as little as 20pence.

What is critical to cost effective screening at all levels of manufacturing volume is the ability to detect, root cause analyse and correct failures precipitated by the Screening process in the shortest possible time. Essential to meeting this requirement is the absolute need for controllable, measurable and repeatable Stress Screening chamber performance.

There is no valid statistical justification for sample screening. As one of the prime objectives of screening is to eliminate product defects arising from manufacturing process variations, the target must be to eliminate the need for screening altogether. Screening in manufacture must, therefore be either 100% or zero%.

It would be most unwise to use sample screening as a disguise for having inadequate screening capacity.

Other Reliability Growth disciplines.

Environmental Stress Screening is neither a “stand alone” nor a remedial process. Stress Screening contributes to the design qualification programme and has manufacturing as its final destination. With few exceptions, product wearout failures are due to cyclic stress reversals. Thermo-mechanical cyclic stress reversals account for some 80% of all field failures. It is therefore essential to the success of any acquisition programme that the durability of a design is demonstrated before transfer to manufacturing.

A well designed Stress Screening chamber can play a vital role in demonstrating product durability through well engineered Accelerated Ageing programmes

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