



BUILT FOR

Environmental and highly accelerated life testing create an accelerated pathway to improved product quality and reliability

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In an industry as competitive as consumer electronics, the details matter. With intense competition, short product cycles, and constant innovation required, each small advantage manufacturers can earn adds up. Environmental testing and highly accelerated life testing (HALT) are ways to earn some of those advantages.

WHY TEST?

The need for environmental testing begins early in the product development process and continues until a finished product is ready for the final consumer. As the manufacturing process advances, performing environmental tests helps to determine the strength of a product. With many performance failures occurring due to environmental stresses such as temperature and vibration, running failure analysis tests on anything from outsourced components and circuit boards to a functional prototype allows teams to determine both the capabilities and limitations of a product early on.

As testing continues, there are opportunities to improve the quality and reliability of the product. By pushing the limits early in the development process, areas for improvement are observed, allowing for timely alterations to be made to shore up any potential deficiencies.

However, testing is not just about fixing problems. Existing strengths can be confirmed and solidified, and can become key features, marketing boosts, and the foundation for future performance standards and innovations. With an industry as competitive as consumer electronics, small advantages in durability, reliability, and performance can make all the difference in a consumer's purchasing decisions.

Environmental testing also ensures products meet and exceed product requirements, specifications and regulations. Whether they are specifications put forth by the Consumer Electronics Association or the Electronic Components, Assemblies, and Materials Association, or regulated under the Consumer Product Safety Act, there are guidelines that

must be followed before taking a product to market. These guidelines include requirements surrounding product durability, safety and performance in certain conditions – all factors that can be validated through the environmental testing process.

Rigorous testing ensures new products aren't rejected or required to undergo an overhaul because they don't meet industry standards.

Each motivation for testing has its own validity and merits, but where they all come together is the impact on the bottom line. Investing the necessary resources – time, knowledge, finances – into the proper testing equipment, procedures and analysis can provide an excellent return on investment in the long term by lowering organizational costs and increasing revenues.

While every effort should be made to avoid isolated performance and durability issues, they often only have small effects and impact a few specific consumers. However, testing lapses may miss large-scale design or manufacturing flaws

“IN ORDER TO BEST UTILIZE HALT, IT'S FIRST IMPORTANT TO UNDERSTAND THE PRODUCT AND WHICH STRESSES OR COMBINATION OF STRESSES COULD LEAD TO SPECIFIC DEFECTS”



Thermotron's patented Universal Port is compatible with a HALT module that transforms a standard environmental test chamber into one capable of HALT failure analysis

and lead to considerably more wide-spread issues, including excessive warranty claims or even product recalls, which could have a catastrophic impact on an organization.

HOW HALT CAN HELP

Highly accelerated life testing (HALT) is a form of stimulation testing which ideally stresses a product to the point of failure by utilizing environmental stresses to uncover a product's weaknesses and limits. HALT combines aggressive temperature cycling with multi-axis repetitive shock vibration to quickly induce fatigue and failure, most often exposing a product to stresses beyond what it would face in its standard use environment. By applying higher stresses, the idea of HALT is to accelerate the rate at which relevant failures appear in a product's lifecycle, identifying potential issues prior to the production stage.

Within an industry that requires the constant innovation and shorter product cycles associated with consumer electronics, HALT is a valuable tool. Accurate failure detection and accelerated testing timelines save organizations critical time and money throughout the development process and provide opportunities



to maximize the lifecycle of a given technology. In order to best utilize HALT, it's first important to understand the product and which stresses or combination of stresses could lead to specific defects. Failures caused by stimulation testing are very often relevant to the failures that could be caused by the actual use environment a product would experience.

HALT chambers utilize environmental stresses such as temperature and vibration to conduct accelerated failure analysis testing

As each product is unique, there is no one specific machine or test that will display all the relevant failures for every product. Without a well-planned and informed product development and testing plan, or without the requisite knowledge of stimulation testing, HALT can produce incomplete conclusions and cost an organization its valuable resources. Post-HALT failure analysis is often considered the most critical part of the test.

For the most accurate and relevant results, work with a HALT chamber manufacturer that can provide highly customized equipment and in-depth knowledge of stimulation testing. With customizable features for the test chamber, vibration table, and controller, ensure you are working with an industry leader to meet your specific needs. **CET&D**