

Technical Note 1

An Introduction to Environmental Testing

Introduction

The principal aim of Environmental Testing is to establish and take steps to improve the general quality and robustness of manufactured products. A defect or failure can trigger a wide range of actions such as recall, repair or replacement and can result in lost sales, lost time investigating and dealing with the problem as well as financial cost and reputational damage.

The integration of an environmental test programme during design, development and manufacturing processes will improve the quality, reliability, safety, and durability of products before they are brought to market. This applies to all types of manufactured products, materials, components, assemblies, devices and even their packaging. By understanding the environmental conditions and stresses that products will face during their lifetime, steps can be taken to ensure that they can withstand such conditions as well as uncover latent defects and design weaknesses.

Environments



A product can face many different environmental conditions during the manufacturing process and its operational life. For example, a commonly used object such as a mobile phone (and its constituent components) will experience vibrations during assembly, extremely high temperatures during soldering, vibration and shock and a range of temperature and humidity conditions whilst being transported and stored. This will all happen before it is sold to a consumer, who will subject it to more extremes of temperature, humidity, vibration, and shock as well as dusty, corrosive, and damp atmospheres. Environmental test equipment can simulate all these conditions in a defined space with accuracy and repeatability and this is extremely important when trying to eliminate design weaknesses and component defects. Here is a list of some of the environmental conditions that can and should be considered:

- Temperature
- Low pressure (altitude)
- Sunlight (full spectrum or UVA, UVB, UVC)
- Rain
- Mechanical Shock
- Humidity
- Vacuum (deep space)
- Dust
- Mechanical vibration
- Corrosive atmospheres

Sometimes, combined environments will be required for effective testing, for example, temperature and humidity (climatic), temperature and low pressure, sunlight and rain, vibration, and temperature (shake and bake). This, and more can all be achieved.



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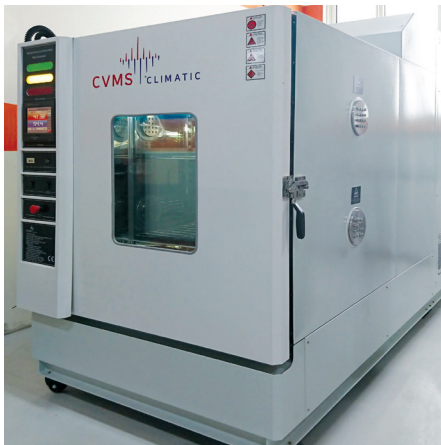
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Environmental testing will ensure that a safe and reliable product is introduced to market and its manufacturer will be able to define and specify operating conditions, expected duration of service and warranty period with a great degree of confidence. They will also be able to demonstrate compliance with any industry standards or other regulations that may be applicable.

So far, we have briefly considered different types of environmental simulation, where a product can be tested to ensure that it operates in the conditions where it will be active, with some degree of margin.

Environmental stimulation is another aspect of 'Environmental Testing' whereby employing techniques such as Stress Screening, Artificial Ageing and Accelerated Life Testing, hidden defects or design weaknesses can be uncovered and rectified. Products can be advanced to the middle and latter stages of their life cycle providing design and development engineers an insight into how their products will appear and perform after 5, 10 or more years in service, in just a few days or weeks. Another type of test called 'Burn-in' (although not widely used nowadays due to the relatively low screen strength and the length of time it takes to carry out a test) can be useful for eliminating 'early life failures', from electronic equipment or devices.

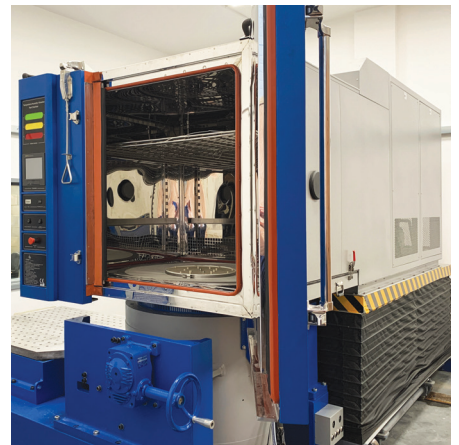
Examples of environmental test equipment



Environmental Stress Screening (ESS)



Air Treatment (ATU)



Combined Climatic - Vibration



Thermal Shock (3 zone)



Ingress Protection (IP xx) Rain



Corrosion Test (salt fog)

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