

Case Study 2

Thermal Stress Screening



StressMaster thermal stress system

Westinghouse Signals Limited has over a century's experience of developing advanced signalling solutions for the world's transportation systems. The company's first surface mount facility was commissioned in 1995, to produce high quality, reliable subsystems for the Jubilee Line Extension project.

We spoke to Brian Samuel, surface mount manager at Westinghouse Signals, who explained how he specified and set up a facility which would serve his company's requirements in both the immediate and long term.



Adopting automated manufacturing for advanced signalling applications

“Westinghouse has won a large contract to supply its new TBS Transmission Based Signalling technology for London Underground’s Jubilee Line Extension project (JLE). Phase 2 of the project will upgrade the signalling on the existing line with the same TBS technology. We had a tight development schedule, and had to be up and running within a few months.”

TBS employs state of the art semiconductor technology, frequently only available in surface mount packages. This was the signal for Westinghouse to move to SMT.

“I set out to buy the most suitable machines to serve the company in the longer term, bearing in mind its requirements were usually based on relatively small production volumes with a high number of changeovers.”

At the front end of the line, solder paste deposition is performed by DEK’s 260 screen printer. Next in line is the pick and place machine, courtesy of Mydata. The TP-18 was ordered “fully loaded” with conveyors, machine vision and the component verification feature. “We needed a line which could support development work, and which was also easy to set up for short production runs”

Loaded boards emerging from the TP-18 are conveyed into the Conceptronic reflow oven, installed at the same time as the rest of the line.

Interestingly, functional testing of the TBS boards is carried out during an environmental stress screening (ESS) process, designed to provoke the manifestation of latent faults. Obviously, the JLE application is extremely safety sensitive: it is imperative that dry or unreliable solder joints, intermittent faults, tiny cracks in components and joints or any slight damage which could induce failure in the field is located and eliminated before the board leaves Westinghouse Signals.

For some time, Westinghouse has operated temperature testing rooms supplied by Sharetree Systems Ltd, of Stonehouse, Gloucestershire. These rooms are used for testing complete systems and subassemblies. For the JLE project, the company provided a liquid Nitrogen cooled StressMaster environmental stress screening chamber, which allows ESS to be carried out at PCB level.

Customised product carrier shelves within the chamber allow the unit under test to be connected to external test apparatus via a connector and interface plate, and also allow the chamber to be reconfigured to accommodate a number of different boards. While electrical testing takes place, the board is subjected to continuous thermal cycling between -40°C and +80°C, at a rate of 30°C per minute. This is designed to create mechanical stress which will expose weak points by inducing electrical failure. According to Sharetree Systems, many customers find that latent defects often occur within the warranty period of the product, and it is the need to reduce these failures which is one of the key factors driving them to adopt ESS. But at Westinghouse Signals Ltd, the overriding justification comes from a higher motivation - ensuring reliability for the passengers and operators of the London Underground network.

Looking beyond the JLE application, TBS has the potential to address new markets and applications around the world, such as mainline rail networks and driverless transportation systems. The SMT facility is an important tool to allow Westinghouse to enter these markets with confidence. It provides the flexibility to incorporate the latest semiconductor technology quickly and enables the company to move rapidly through development into full production. Having installed a fully-featured SMT line and established valuable partnerships, Westinghouse can now exploit this strategic resource as it works toward the future.

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