Research theme	Modeling of manufacturing processes
Research title	Modeling approach of printed circuit board bow in relation to manufacturing process based on laminate theory.
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Research period	From 12-03-2012 to 17-12-2012
Company	Thales Nederland B.V.
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Background

Thales Nederland is a manufacturer of professional electronics for defense and security systems such as radars and communication systems. Important parts of the supporting hardware are printed circuit boards (PCBs). Continuous development in radars requires continuous development of PCBs as well. Increasing the complexity of PCBs leads to problems during production. One of these problems is deformation of the board due to residual stresses in the material.

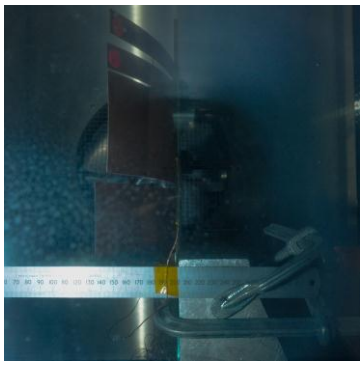
Assignment

In this assignment the classical lamination theory (CLT) is used to model the deformation of PCBs. Improvements to the model are made to model different production steps. Multiple press steps, patterned layers and metalizing steps are added to the model. A second target of the research was to gather experimental data to validate the results of the model. Multiple tests were carried out to determine the influence of layups, process temperatures and production processes.

Results

Normalized measurement data and model predictions were established. With the current model it is possible to accurately predict the results of producing bilayer samples and the results of multiple process steps. More research is needed to improve the accuracy for patterned layers and real production boards.

Measurement setup to measure bow in a temperature controlled environment



Actual measurement; visible are 4 samples that were tested for bow in 1 dimension

Personal experience

At first I did not know if I wanted to do a detailed simulation project. But I am happy I did it. What I really liked about this assignment was the combination of simulation and experiments. It is very nice to see experimental results fit your calculations. What really surprised me was the complexity of simplest experiment. Usually each experimental answer comes with three new questions.