



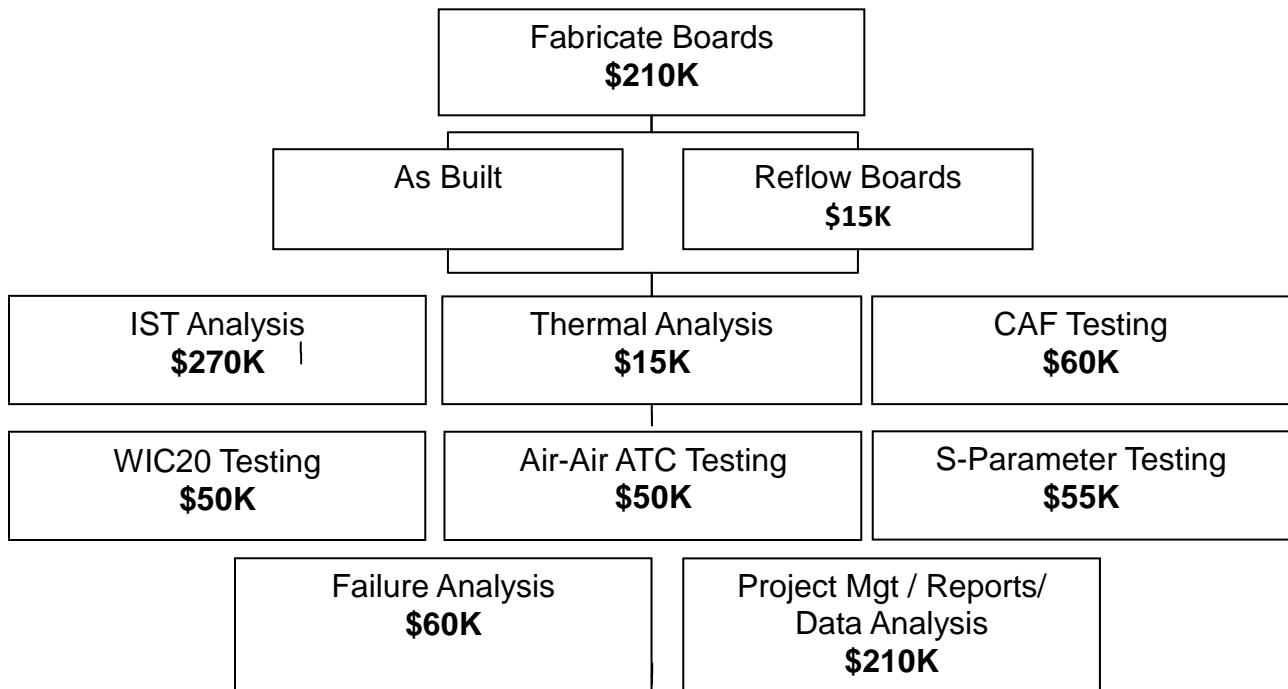
Leverage of HDP User Group Cooperative Research

HDP User Group operates on the concept that by bringing companies together to cooperate and share key resources and knowledge the cost to each project participant to undertake vital research work is a fraction of the cost of going it alone. This is accomplished by partitioning the research tasks among the Member Companies who volunteer internal resources to accomplish the task. The research work is done by the volunteer companies using the resources of their companies, as available, and sharing the results among the membership.

Below is an analysis of the actual cost of a recent HDP Project, "Reliability of Lead Free PCB Materials". The project evaluated the latest generation of Printed Circuit Board (PCB) Laminates to assess mechanical and electrical performance consistency before and after multiple lead free solder reflow process stages. 20 different materials were evaluated with 27 different board constructions. This is the kind of study every company that uses PCBs would typically undertake before selecting a board material for their Lead Free products.

"We've calculated the Return on Investment for HDP Membership at Oracle in order to justify our investment to Finance and our Management team. This calculation never falls below 800% per year, or an ROI of less than 2 months. This is on top of the intangible benefit of the informal atmosphere and willingness of the participants to discuss mutual problems and solutions"

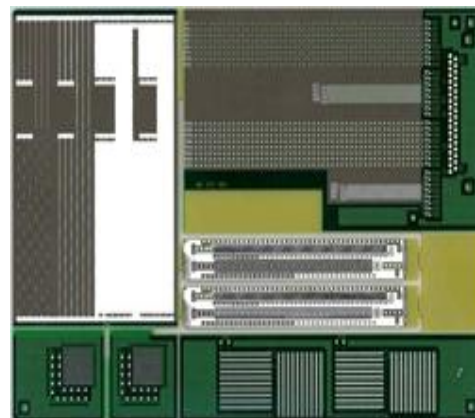
*~ Dave Love
Manager, Interconnect Technology and Materials
Oracle*



Total Project Cost: \$995K

It would cost a single company over \$995K to conduct this kind of analysis on their own, yet no participant of this HDP User Group project invested more than \$50K in materials and effort. That yields a **minimum leverage of 20:1**, with HDP members who were not direct contributors to the project realizing a **leverage of almost 60:1**.

In addition, by sharing the performance of their materials with the material suppliers, the project gave them direction and incentive to make the necessary improvements that will yield far better PCB materials in the future. Over 70 people from 24 different companies contributed materially to the project, and 6 papers were written and presented at APEX 2011 on the results of the project. Over 250MB of data generated by the project on testing, data and failure analysis is available to HDP User Group Members for their evaluation. The project took a little over 1 year from first meeting to completion of data analysis. The next round of the project with new improved materials from the suppliers is in progress, and other HDP User Group projects based on this model are underway to evaluate Halogen Free Cables, High Speed PCBs, Wafer Level Packaging Materials, as well as other important industry issues.



Project Test Vehicle

HDP User Group Collaborative Projects have proven themselves as an extremely cost effective way to conduct much of the R&D necessary to remain competitive in today's Electronics Industry.

“The High-Density Packaging User Group (HDPUG) has been at the forefront of evaluating environmentally-friendly technologies within the electronics industry. Member companies have the opportunity to share information and leverage resources to help enable technology transitions such as lead-free, halogen-free, etc to prepare for regulatory and/or market environmental trends. HDPUG is uniquely positioned to address member needs while producing meaningful results that benefit the overall industry.”

~ Scott O'Connell
Environmental Program Manager – Environmental Affairs