



# Planning, DFM, and Inspection: Key to **High-reliability** Fab

Feature Interview by the I-Connect007 Editorial Team

At PCB West, Andy Shaughnessy and Kelly Dack spoke with Marc L'Hoste, VP of West and South Americas for ICAPE Group, a company that supplies and manufactures high-tech PCBs at locations around the world.

We asked Marc to share some advice regarding high-reliability fab. In this conversation, Marc is clear that planning, pre-work, and inspection are the key ingredients to high-reliability success.

*Kelly Dack: Marc, you fabricate quite a few high-reliability PCBs. How do you define high reliability and what is your perspective on what high reliability means in our industry?*

*Marc L'Hoste: IPC class 3 stands out for high-reliability printed circuit boards, but it also depends upon the type of industry and the type of customer. When we look at our own customers, about 20% of them are in the automotive industry, which has always been very complex to navigate. Automotive suppliers have very high standards to follow, such as the IATF ISO certification. For example, the quality levels are usually measured in parts per million (PPM) of manufactured parts. Over the past 15 years, we've been able to deliver fewer than 40 PPM for the automotive industry, which means less than 40 defective PCBs per million—significantly better than we see in stan-*



Marc L'Hoste

dard consumer production where we are usually talking about 250 PPM. The same applies to other critical industries, such as aerospace, with certifications like AS9100, and critical processes with sampling and DPPM (defective parts per million) controls.

**Dack:** *That's a pretty low defect rate. What are some of the most typical causes of failures you see in high-reliability fabrication?*

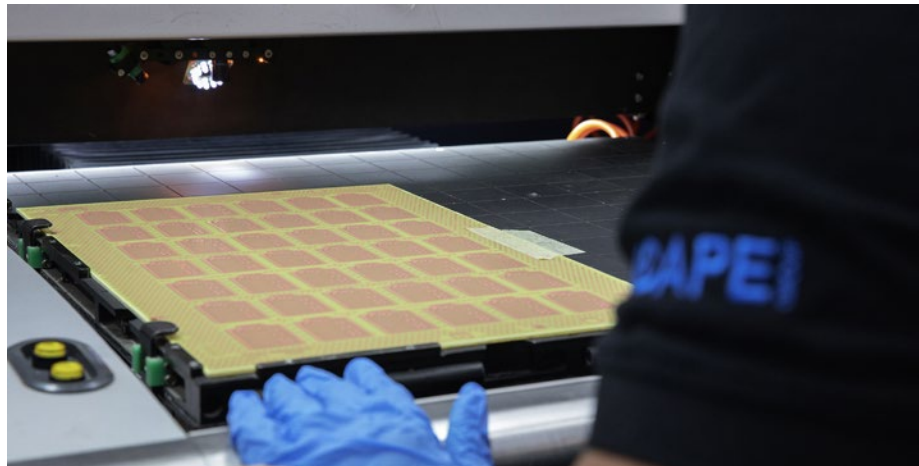
A lot of different points need to be checked. For me, it always starts with the design itself, and making sure that whoever designs the board follows the IPC guidance. We have spreadsheets and guidance sheets that we can share with our customers. Let's say Bob is tasked with selecting the right manufacturer for his boards. Bob must make sure that, if you build a flex or rigid-flex circuit board, you're not working with a factory that specializes only in rigid or metal PCBs. Selecting the right manufacturer usually means auditing them to make sure

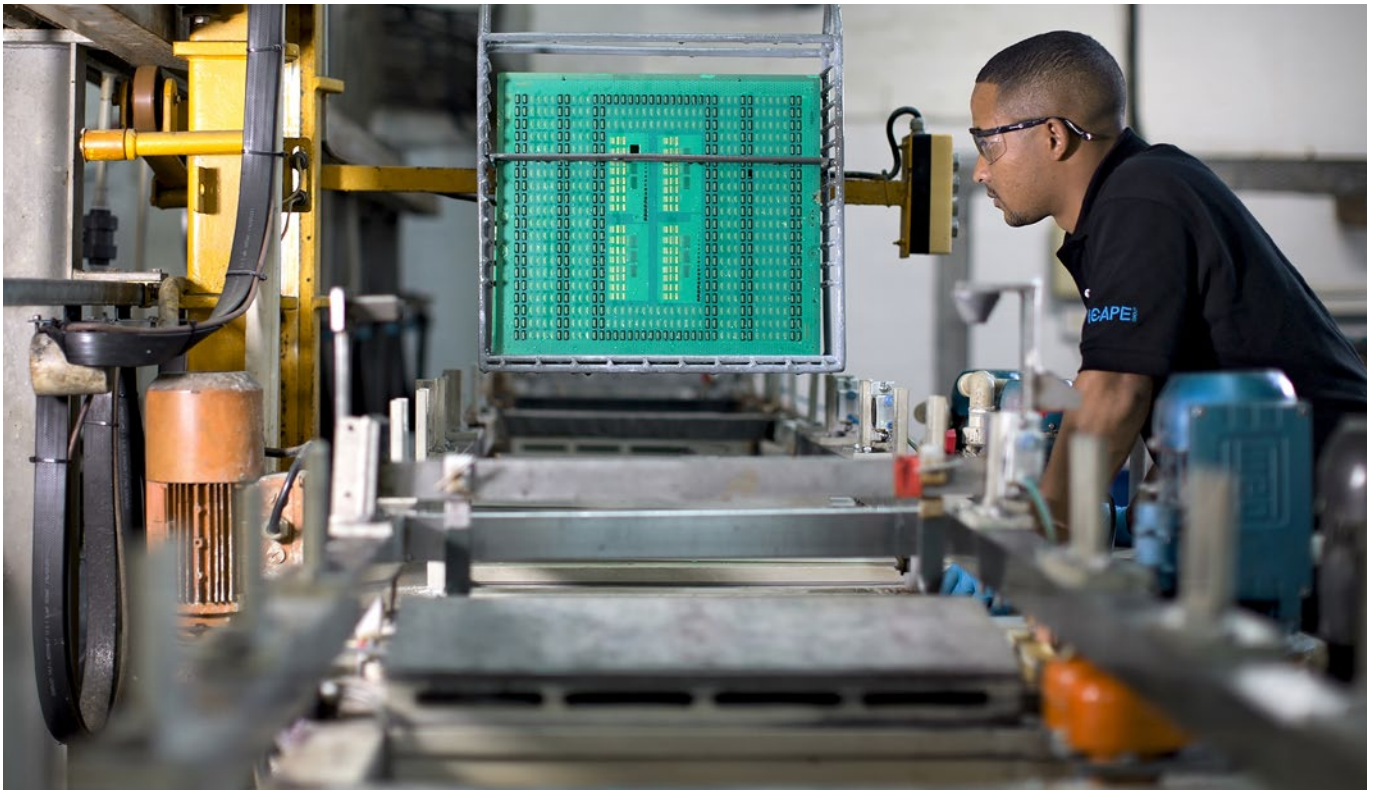
they have the right technical capabilities to build these boards. Choosing the right materials and finishes is also critical, and the finishes you select will depend upon the type of components on your boards. OSP (organic solderability preservative) is great, of course. It's very cost-effective, but if you have a BGA on your board, that might not necessarily be the right finish to choose.

Once you've nailed down all these different points, make sure that you do a good inspection on your board. A 100% test is always mandatory. Automatic visual inspection is very important, too. What we propose at ICAPE Group is a kind of double inspection. We have about 60 quality inspectors, and some of them are directly working with our engineering and manufacturing partners. Their job is to control the quality of our boards at these different locations. We have double points of inspection in the process: 100% inspection on our boards at the factory, and then inspection with our own quality people at our partners' locations before we ship.

**Dack:** *For our designers who are designing to IPC class 3 expectations, what are some things for PCB designers to think about? Because it's possible to design a board that can't be built.*

Before we even start a quotation, we do a software analysis of the Gerber files that the customers provide. In our case, we're using Ucamco software. This software makes sure





that all the basic points of the printed circuit board's dimensions, thicknesses, layers, type of solder mask, and so on, have been well defined in the Gerber files. If that's not the case—and it is often not the case—then we help our customers with guidances and give them options for different materials that they can use, depending on the application.

**Dack:** You offer a design review service for your customers to make sure all the technologies and materials will work together? That's a great idea.

Yes, that is the very first stage. Once we've done the quotation and receive an order from our customers, we have a secondary stage, which is technical questions—DFM. We just make sure that the board is manufacturable as it's been designed. Today, 60% of those technical questions are handled by our own engineering team of about 30–50 engineers in China, Mexico, the U.S., and Europe. Our job is to check the files, making sure we can manufacture, or preparing a list of technical questions, and always with options. We are not just telling

our customer, “Oh, this doesn't work.” We provide them with solutions. Then their job is simply to say, “We can accept this, but we cannot accept that.” The last stage is also sending Gerbers to our customers for them to review one last time before we manufacture the PCB.

**Dack:** It's really good to hear that one of your first steps is a design review, to make sure that everything will line up for an EMS provider. As an EMS provider, one of our frustrations with other fabrication suppliers is that design teams send Gerber data and a panelization detail specification for how it's to be panelized. We send that for quotation and receive the quotation. But it's not until we cut the PO to build the boards that we receive the engineering queries to tell us all the ways that they can't make the boards. When that happens, it's very frustrating, so it's good to hear that you address this in a more successful way.

We've heard the same story from many of our customers. Being an ISO company, we always



strive to improve ourselves. We've used this system for at least five years. Customers are extremely happy with it because we don't only deliver reports; we also deliver a quotation. At more than 30 pages, the reports are very comprehensive.

**Dack: Is your Ucamco system automated?**

Yes. It's a fairly simple process. It takes a few minutes, I believe, to generate a report. Our engineering team has a look at the report before we start working on the quotation, making sure everything is noted, and eventually having a technical description for the customer if there was a big issue.

It's a system that works great for us. We have partners in many different countries, and our customers need quotations within 24 hours; with this system, we make our own quotations internally. We don't rely on petitions from different board houses. We do our own quotes. Because we're often in the same time zone as our customers, we can get inquiries in the morning and have quotations ready for customers same day.

**Andy Shaughnessy: What advice would you give to fabricators who are having issues with reliability?**

It's fairly simple: Take your time and do the work. Perform design reviews, DFM checks, and inspections. As I said, we have a double inspection process. Select the right partner for you and your technologies. There are thousands of board houses around the globe specializing in specific technologies.

**Dack: Thanks so much, Marc. This has been great.**

Thank you. I enjoyed it. PCB007

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