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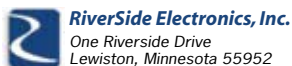
PROVING YOU CAN DO IT: One Company's **Lead Free** Journey



PROVING YOU CAN DO IT: One Company's Lead Free Journey

By Susan Filz, IPC

July 2007 marked the one-year anniversary of the European Union's (EU's) Restriction of Hazardous Substances (RoHS) Directive, otherwise known as lead free regulations. This is the story of one EMS company's experience in becoming lead free and how the drive to meet regulations has changed their organization.



RiverSide Electronics was facing a challenge in early 2004. Distributors had already begun discontinuing tin-lead components in anticipation of the RoHS Directive. For RiverSide, and for many companies in the EMS industry, this meant that it would be increasingly difficult to procure leaded components. They would have to become capable of producing lead free product.

"When RoHS regulations were announced, the first thing that I thought, and I think everybody thought at the time, was that it was a political ploy and another way of leveraging the trade wars," recalled **Gregg Reick**, general manager of the Lewiston, Minn. based company.

Politics aside, RiverSide's lead free journey actually began in 2002, soon after the EU announced its intent to implement RoHS. Triggered by what Reick describes as a curiosity and a desire to take a proactive approach, the company started an engineering program to determine how they were going to solder with lead free solder and components, experimenting with more than six solder formulations. They focused on the process. Could they solder with it? Could they create reliable solder joints? "We were not worried about traceability," Reick said. "We were not worried about the integrity of the components." However, the company cancelled the program after a year due to lack of customer demand for lead free product.

But reality, as it often does, was slowly sinking in by 2004. "We realized that our customers have to be compliant, and in order to be competitive and do business in this industry, and to keep our customers, we needed to be compliant," said **Kris Blanchard**, RiverSide's customer operations manager.

RiverSide went back to the drawing board. They attempted to learn everything they could about RoHS through webinars, tradeshows, seminars and information exchange with

other companies. "As we were educated about RoHS and what it actually means to be lead free, there was gradual realization that soldering, which RiverSide first tested in 2002, is the smallest piece of the puzzle," said Reick.

RiverSide, like all EMS companies, understood that it faced a Pandora's Box of issues.

How would they manage inventory? Would they need to run two lines — one tin-lead and one lead free? What other aspects of the manufacturing process would be impacted? How were they going to prove to their customers they knew how to produce a lead free product? For a small EMS company with only 320 employees, answering these questions could be an impossible challenge ... a challenge that RiverSide decided to meet head on.

Lead free: It's more than solder

The first thing RiverSide knew it had to do if it was going to become compliant was to determine how RoHS was going to impact each department. A failure mode and effect analysis (FMEA) was conducted, through which more than 300 process steps were examined. "We basically used the FMEA as a process mapping tool. We looked at every system in the company, from the point of when we first get a bill of materials (BOM) from the customer, to loading the BOM into the system, and from the purchasing side, to receiving the components," explained Reick. "We actually did a process map from the conception of the product line to the shipping of the product. As we went through the process, soldering became insignificant. Everything else was daunting."

The first "big shock" RiverSide received while conducting the FMEA was that they would need to invest in capital equipment to support RoHS. "We discovered that our reflow ovens were not capable at all," said Reick. "We needed ovens with better cool-down zones."

Incorrect component labeling was also encountered. RiverSide assumed their component distributors would devise a system so the industry could readily differentiate components. "All of the seminars we participated in told us we would need to track our components. But we didn't worry



(From left) Keith Crane, Deb Fenske, SMT machine operator, and Gregg Reick review a changeover checklist for the switch to lead free solder on a dual-use SMT line.



Dual-use SMT line set up to build lead free assemblies.

about it. We just thought our distributors would deal with it," said Reick. "Just for the fun of it, we brought in some XRF (X-ray florescence) analyzers and tested some of our lead free samples. There were all sorts of things on there that should not have been. It was a sudden realization that our component suppliers did not have a handle on it either."

In a particularly stunning example of component mismatch, Blanchard described one instance when the source of lead on the component was coming from the paint that was used to label the component. "From the materials side, it was like a train and we couldn't stop it. The parts were coming in," recalled **Sue Stull**, RiverSide's purchasing manager.

RiverSide realized they would need to solve the component labeling problem on their own. First, they purchased their own XRF machine and began testing 100 percent of their components. They also developed their own internal labeling system. Initially, they experimented with creating dual part numbers for every part in their system. "We went into this assuming that our customers were going to go gang busters on this," said Blanchard. "We got to a point where we realized that this was not going to happen. Creating unique RoHS part numbers was a lot of work. We decided to have mixed stock, and create a dual part number only when the customer's BOM necessitated it." In place of the dual code system, RiverSide developed an internal three-character "environmental code," which identifies the part's lead status, temperature rating and moisture sensitivity.

Space on the floor was another issue RiverSide needed to solve. There simply was not enough room to implement a dedicated lead free line. "Our main concern was avoiding

cross contamination," **Michael Bublitz**, process and maintenance leader, explained. To avoid a lead free mix up, special cleaning and preparation procedures were implemented. An area was dedicated for storage of only lead free materials, and equipment such as hand soldering irons and trays which were only to be used for lead free product were labeled accordingly. New soldering irons dedicated to lead free work were purchased and procedures were put in place to ensure that tips would not be interchangeable with the irons used for work on leaded products. "Basically, we made sure that all of the equipment we had could be used for lead free if we followed certain procedures," said Bublitz.

RiverSide also eliminated parts banks in the repair areas and ceased returning excess components from the floor on RoHS assemblies. A process to identify RoHS RMAs (return materials authorization) would also be set up.

However, there was one issue that was not covered on the FMEA that would prove to be one of the most difficult and important challenges of all. Once it was apparent that RoHS would be enacted, customers were concerned about the Directive and looked to RiverSide for answers. The company was put in the position of having to help their customers with compliance. This would prove to be no easy task. Riverside estimates that in 2004, nearly 90 percent of their customers assumed they would receive exemptions — a widely held misconception in the early days of RoHS.

"There was a sudden realization that we needed to prove to our customers that we knew what we were doing," Reick said. "In the EMS industry, you need to prove you know

what you are doing. Some customers don't necessarily want to be educated, they just want to know the bottom line — that their product will meet lead free requirements."

RiverSide knew they needed a neutral perspective. "It came down to the fact that we needed an outside 'professional opinion' or some type of baseline, not only to demonstrate our lead free ability to our customers but also to confirm our processes to ourselves," Reick said. In May 2006, the company registered for the IPC Certification for RoHS Lead Free Electronics Assembly Process Capability program.

Beginning the certification process

The unique IPC certification program involves a careful audit of a facility's processes and procedures to determine, if followed and applied precisely and consistently, the facility is capable of producing product to meet lead free requirements of the EU's RoHS Directive.

When a facility signs up for the program, the first step is to complete a 301-item questionnaire that covers the facility's operations, from training to materials declaration. IPC requests that the facility complete and return the questionnaire within 30 business days, at which time an independent auditor would be assigned to review the questionnaire and then work with the company before the audit. While the IPC Certification for RoHS Lead Free Electronics Assembly Process Capability program does not ensure that the facility will produce lead free product, it validates that the facility has the ability to produce lead free product.



(From left) Keith Crane and Scott Wilson evaluate components' RoHS compliance using a Niton XRF analyzer.

One Company's Lead Free Journey (continued)

The IPC certification program was launched last year after extensive development and review by a blue ribbon committee of OEMs, EMS companies and industry suppliers. Auditors, selected for the program, must meet stringent and significant industry experience and education.

"When I first heard about the program I thought that our prayers were answered. We would finally have an independent organization confirm what we were doing," said Reick. "When I saw the questionnaire, I was worried that we wouldn't be able to do it."

Once RiverSide overcame its initial shock at the extent of the questionnaire, they began to look at it not as a burden but as a learning opportunity that would help solidify their lead free processes. They divided into teams and began working on the questions. "As it turned out, the questionnaire was not as daunting as it first appeared," Reick said.

However, the RiverSide team struggled with the questionnaire. "It seemed to me that many of the questions on the audit form assumed a certain path should be taken," said **Keith Crane**, RiverSide's manufacturing engineer. "The questions seemed to imply that a facility should have a separate production area or a separate facility. In our case, we were using the same surface mount stations and production space. It made us stop and review our plan." Instead of changing their processes or abandoning the audit, RiverSide gathered the information they needed to prove that the methods they had established would work.

At the same time, completing the certification questionnaire also taught them a few things about lead free processes. "There were a few items on the questionnaire which opened my eyes and I realized that we needed to take action," said **Bublitz**. "Some of the questions, for example, helped justify our need to update equipment and change some operations."

As a direct result of completing the questionnaire, the RiverSide team realized they still had some work to do. A checklist was developed to verify that a line had been cleaned, inspected and ready to produce lead free product. Dedicated squeegees for the screen printers were purchased. They had to determine if they could use the same water to clean the boards and if they would be able to use the same stencil cleaner. Even though RiverSide had dedicated lead free areas, they would have to be more thorough in how the areas were segregated. They also realized that a formal training program would need to be implemented to ensure that employees understood the new procedures and the importance of following them.

RiverSide asked for and was granted two extensions on the 30-day questionnaire deadline while they worked on perfecting their processes. By September 2006, they were ready to be audited. **Don Saunders**, the auditor assigned to RiverSide, reviewed the company's documentation and set up the audit for November.

"When the day of the audit finally came, we were a little apprehensive," said **Scott Wilson**, Riverside's materials manager, "but it was tempered by the fact that Don had given us some feedback beforehand and indicated we were in pretty good shape."

For RiverSide, the audit was as surprising as the checklist, but this time it was a pleasant surprise. The day began with a kick-off meeting so Saunders and the RiverSide team could become acquainted. Then, Saunders toured the facility, which followed the manufacturing process. Saunders made observations and offered suggestions, such as using a different lead check kit and an alternate way to inspect solder tips. "It was more like an exchange of ideas rather than an audit," recalled **Bublitz**. "We talked about different concepts and different ways to keep solder segregated. They were not really questions but more of an open discussion."

"Some auditors are very adversarial and try to poke holes in what you are doing," added **Wilson**. "Don was not like that at all. He was on our side. He acknowledged what we were doing and he would make a suggestion if he thought it would be helpful. It was very constructive."

Saunders spent three days auditing RiverSide. A week later, he notified the company that they would need to address a few minor issues before they could be awarded certification, such as cleaning and testing of the work stations and cleaning squeegees. RiverSide spent a month addressing the issues, and officially received certification a month later after they verified the changes with Saunders through e-mail.

As they would learn, this was one certification that would go beyond a simple certificate in the lobby. "Becoming certified has allowed us to internalize what lead free means," said **Crane**. "It has given us more confidence to recommend solutions to our customers. Our customers have more confidence in us."

Preparing for the audit also compelled employees to work together as a team and learn a completely new way of doing things. "Everyone gained a fresh perspective from other departments," said **Crane**. "Coworkers learned what other departments went through. I think everyone gained a better understanding of how everything works together and, as a result, we are a stronger company."

RiverSide's achievements were held up as an example to other EMS businesses in the area when they were presented with the "Excellence in Technology/Innovation" award by the **Winona (Minn.) Area Chamber of Commerce** for receiving the IPC certification.

"It is something you can feel good about," said **Wilson**. "As a company, we feel good about not putting hazardous material in the environment."

For more information on becoming RoHS lead free certified, visit www.ipc.org/LFCert.