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DAVE'S WORLD



CONTACT INFORMATION:
DAVE RABY
PRESIDENT/CEO
DRABY@STIELECTRONICSINC.COM

2012 SUMMER BY: DAVE RABY

I hope your summer was as much fun as mine.

Around the end of May, I was sitting at my desk and the phone rang. It was Mike Buetow, Editor-In-Chief of Circuits Assembly and Vice President, Editorial and Production for UP Media. Mike called to inform me that UP Media had started an Electronics Assembly Hall of Fame and not only was Jim (Dad!) the first inductee; they were naming it the Jim D. Raby Hall of Fame for Electronics Assembly. I'm not sure I've ever seen Dad so proud of any recognition in his life. Even then, he immediately began naming the names of others who he thought deserved the honor more. All I can say is my (very biased?) opinion is that he deserves it. I can't express enough my appreciation to Mike and all of the other fine folks at UP Media for the honor and recognition.

A couple of months ago I was escorting a visitor out and while we were chatting in the lobby, three kids came in. I call them kids because more and more people seem like kids to me but these guys were probably in their very early 20's. I was curious why they were at STI so we started talking and they told me they were UAHuntsville students and were working on a project and needed some supplies. I remembered my college projects and how they usually ended up involving a big dry cleaner's bill and a visit from the fire department. When I asked these guys what they were building, they said "A satellite. It will be launched next year." That got my attention. Then I started asking questions and they started answering in a fashion that made me realize quickly I was an ugly version of Penny talking with Sheldon & Leonard. However, their excitement was very contagious and I gave them a tour of STI and introduced them to some of our people who had "real world" experience and showed them manufacturing equipment and analytical equipment that might make their project easier. They do have a budget but it doesn't touch capital equipment. I was amused/extremely impressed that they had needed to make some type of test chamber which they had no money for so they bought a \$12 coffee maker and rearranged some parts and did their test. We discussed printing & stencils (they made their own from aluminum foil), pick & place (theirs is done by hand), reflow (toaster oven), cleaning (toothbrush), and inspection (20 year old eyes). Since that visit, they

have been back and asked a lot of questions and we've done some X-Rays for them. They have also visited some other local companies who are doing various types of work with them.

I tell that story for a few reasons. I'm excited about an education that includes a hands on project that gets students excited and involves thinking and building. Our industry and our country needs more young people growing up with the ability to do both. In trying to help in this regard, STI currently employs 3 UAH students that do a variety of science and engineering jobs. Starting this fall, we'll have our first high school intern from the nationally acclaimed Bob Jones High School Engineering Academy. I'm also always happy when a customer comes to STI for one reason (in this case, to buy a solder station and a sponge) and we are able to fulfill that need but also help in ways they hadn't thought of. This happens fairly regularly in all directions at STI.

We've added 12 people at STI since the beginning of the year and I'd like to tell you about all of them. All are important to us but there are two I want to make sure I mention which are the ones you are most likely to be dealing with. Julio Estrada has recently joined our world's best training staff. Julio is a very experienced instructor for IPC, NASA, and fiber optics. He will be based out of Houston, Texas. Cathy Cross has joined our staff in the sales department. Cathy brings a lot of experience in training, assembly, and government contracting. Cathy will be in outside sales covering Florida as well as southern Georgia and southern Alabama.

Thank you for your support and please let me know how we can serve you better.

You can follow us on Twitter ([daveraby](#)) or Facebook (STI Electronics) to keep up with our latest news.

David E. Raby

P.S. If you would like to learn more about the Jim Raby Electronics Assembly Hall of Fame, please visit <http://circuitsassembly.com/cms/news/12923-up-media-group-opens-jim-d-raby-hall-of-fame>

If you want to see more information on the satellite the UAH students are building, visit <https://sites.google.com/site/uahshc/projects/cubesat>

TRAINING NEWS

BY: PAT SCOTT

STI Electronics, Inc's Training Services Department, announces the appointment of Julio A. Estrada as its newest Instructor for the TX, OK, AR area.



Julio brings more than 15 years of experience in training classes in through-hole soldering, cable, harness and crimp assembly, fiber-optic termination, polymeric applications,

SMT fabrication and repair, as well as electrostatic discharge (ESD) avoidance for the

U.S. government. In total Julio has more than 28 years of experience in the aerospace industry.

He has trained personnel first on the NHB5300, then on the NASA-STD-8739 Workmanship Standards, and now on the IPC J-STD-001E, including the Space Addendum. Julio has devoted his entire career to helping others achieve their goals by becoming proficient in the work they perform for their employers. He has worked at respected companies including the Johnson Space Center in Houston, Texas and has experience developing course curriculums for premier companies such as NASA.

Julio has already instructed many courses in Texas, Oklahoma and Arkansas. So keep STI in mind when selecting your local training provider.

Did you know?

- STI will be offering IPC/WHMA-A-620A Space Addendum Hands-On Course December 17-21, 2012.
- The IPC/WHMA-A-620B will be published shortly followed by the development of the 620B CIT and CIS Certification/Recertification Courses. STI is fortunate to be working on this curriculum development project.
- The 2013 Course Schedule will be published soon. The schedule will include training in the following locations:
 - » Alabama
 - » Arizona
 - » California
 - » Florida
 - » Georgia
 - » Illinois
 - » Minnesota
 - » Nevada
 - » New Mexico
 - » New York
 - » Ohio
 - » Texas

- STI can conduct any IPC class on-site (J-STD-001, IPC-A-610, IPC/WHMA-A-620, IPC-A-600, IPC-7711/7721).
- STI develops customized on-line training courses.

As you can see we keep very busy with scheduled classes, customized training courses and curriculum development. STI continues to strive to provide the highest quality training at a competitive price. For additional information regarding our course schedule please visit our website at www.stielectronicsinc.com.

In an effort to offer training to our customers closer to home and reducing travel expenses STI's Training Services Department will also be conducting several IPC classes on the road. We are going to start with several classes in California which will be held at Hakko located in Valencia CA. These courses will be conducted in a traditional classroom environment. This is just a start. We plan on offering more of these courses throughout the US. For details visit our website at www.stielectronicsinc.com.

Regards,

Director of Training Services
256-705-5528 (Desk)
256-527-6758 (Cell)

TRAINING SERVICES



CONTACT INFORMATION:

PAT SCOTT

DIRECTOR OF TRAINING SERVICES

256-705-5528 [DESK]

256-527-6758 [CELL]

PSCOTT@STIELECTRONICSINC.COM

TRAINING SCHEDULE



TO REGISTER FOR A COURSE OR FOR
ADDITIONAL INFORMATION GO TO
WWW.STIELECTRONICSINC.COM
OR E-MAIL US AT
TRAINING@STIELECTRONICSINC.COM.

FALL 2012

MONTH	DATE	CLASS	LOCATION
OCT.	31	IPC J-STD-001 Certified IPC Trainer (CIT) Recertification Program	Madison, AL
NOV.	2	J-STD-001ES Update, Space Application Addendum to J-STD-001E	Madison, AL
	5	IPC/WHMA-A-620 Certified IPC Trainer (CIT) Recertification Program	Madison, AL
	7	IPC Rework/Repair and Modification Certified IPC Trainer (CIT) Recertification Program	Madison, AL
	7	IPC-A-600 Certified IPC Specialist (CIS) Training Program	Madison, AL
	12	MSFC/NASA 8739.1 Staking and Conformal Coating Certification Course	Madison, AL
	12	IPC-A-610 Certified IPC Trainer (CIT) Certification Program	Madison, AL
	19	IPC J-STD-001 Certified IPC Trainer (CIT) Recertification Program	Madison, AL
	19	IPC-A-610 Certified IPC Trainer (CIT) Recertification Program	Madison, AL
	26	IPC Rework/Repair and Modification Certified IPC Trainer (CIT) Certification Program	Madison, AL
DEC.	3	IPC-A-610 Certified IPC Trainer (CIT) Recertification Program	Madison, AL
	5	IPC J-STD-001 Certified IPC Trainer (CIT) Recertification Program	Madison, AL
	7	J-STD-001ES Update, Space Application Addendum to J-STD-001E	Madison, AL
	10	IPC J-STD-001 Certified IPC Trainer (CIT) Certification Program	Madison, AL
	10	IPC/WHMA-A-620 Certified IPC Trainer (CIT) Certification Program	Madison, AL
	17	IPC/WHMA-A-620AS Hands-On (CIT) Certification	Madison, AL



Metcal to Host Advanced Package Rework and Repair Workshop at STI Electronics, Inc. Alabama

When: Thursday, October 25, 2012

Where: STI Electronics, Inc.
261 Palmer Road, Madison, AL 35758

Also hosted by Mfg. Representative:
Tim Glasgow, Managing Partner,
REStronics Southeast
Phone: 770-634-4131
Email: smtpro@aol.com

Workshop Hours: 9:00 AM to 12:00 PM

Please join us for a continental breakfast at 8:30 AM / lunch at Noon

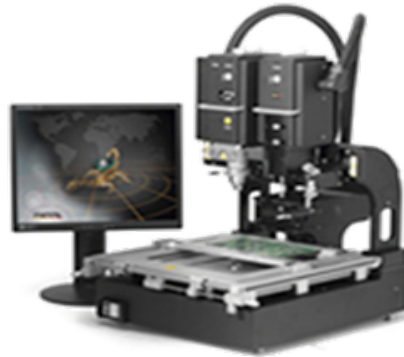
Spend the morning with the experts from Metcal to see the latest in rework and repair technology. At this workshop, you will learn the latest techniques to rework and repair BGAs, QFNs and Micro SMDs. See live rework demonstrations with real-life applications learned from global experiences. Be one of the first to see the new Metcal Scorpion Rework System in action.

Rework Workshop

The workshop will include a 30 minute multi-media presentation, 2 hours of hands-on demonstrations and instruction, and a Question and Answer session to conclude.

No charge to attend but you must register in advance as there is limited space available.

Go to <http://seminars.metcal.com/> to register or to see complete details for upcoming workshop.



Metcal Scorpion Rework System

Applications & Topics

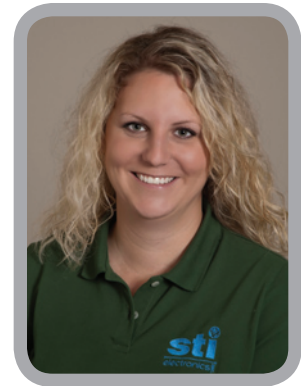
- Repair, Rework
- Low Volume Assembly
- Prototyping
- Screen Printing for Single Components
- Flux Gel Deposition for BGA/CSP Rework and Repair
- Temperature Profiling for Rework and Repair
- Rework and Repair Site Preparation

Who Should Attend

- Manufacturing Engineers
- Production Managers
- Production Supervisors
- SMT Process Engineers
- Quality Assurance Managers
- Production Engineers
- Repair Managers and Technicians
- R&D Managers

OKinternational

SALES



CONTACT INFORMATION:

KELLI KING

INSIDE SALES MANAGER

800-858-0604

SALES@STIELECTRONICSINC.COM



As Dottie transitions to Outside Sales covering AL, MS, TN, and GA, joining us in welcoming **Cortney Wright** as STI's new Inside Sales Representative!

MICROELECTRONICS LAB



CONTACT INFORMATION:

CASEY COOPER

ELECTRICAL ENGINEERING MANAGER

256-705-5511

CCOOPER@STIELECTRONICSINC.COM

MICROELECTRONICS LABORATORY CAPABILITIES

BY: CASEY COOPER

In the last newsletter, we discussed STI's capabilities to support the design and manufacturing of advanced microelectronic assemblies. This article will explore in greater detail the benefits of manufacturing and assembly of microelectronics within a cleanroom facility. Driven by the manufacturing precision and assembly cleanliness requirements of advanced microelectronic assemblies, nearly all microelectronic assemblies are manufactured in a clean environment meeting a minimum ISO Class 7 (Class 10,000) rating in order to produce high yield of these types of devices.

Because a cleanroom environment is critical when manufacturing and assembling high reliability electronic systems, STI installed an ISO Class 6 (Class 1,000) cleanroom environment in which to perform research and development (R&D) in the area of microelectronics in addition to supporting low-to-mid volume manufacturing of semiconductor packages/assemblies. STI's Microelectronics Laboratory is equipped for back-end processing of microelectronics, from component-level packaging to system-level assembly, within its tightly controlled cleanroom environment.

STI's Cleanroom Facility Construction Advantages

There are many factors to consider when selecting a cleanroom facility to manufacture and assemble high reliability electronic systems. The design and installation of the cleanroom facility ranks among the top. For microelectronics-grade cleanrooms, key factors include cleanliness (particle concentration and

- **Cleanliness** – The term “the cleaner, the better” couldn't apply more than to microelectronic/semiconductor manufacturing and assembly. However, “cleaner” comes with a pretty high price tag. To achieve “cleaner” requires the purchase and continuous use of a greater number of fan filter units (FFUs) within the cleanroom in order to meet the required air changes per hour to achieve particulate levels of the lower ISO Class requirements. STI designed and certified its cleanroom to ISO Class 6 requirements (less than 1000 particles of size 0.5um diameter and greater per cubic foot of air space). This low concentration of particulates within the assembly space dramatically reduces opportunity for process defects, typically seen during interconnect formation such as ultrasonic or thermosonic bonding.

- **Outgassing** – Particulates are not the only source of concern for air cleanliness within a cleanroom. Outgassing of construction materials can also contribute to contamination issues that lead to quality and yield defects. For instance, outgassing of sealants used to seal joints in the cleanroom structure (e.g. wall-to-floor and wall-to-ceiling joints) are prone to emitting volatile organic compounds (VOCs) that can deposit on assembly surfaces reducing bond strengths and leading to potential corrosion issues. STI utilized non-outgassing urethane-based sealant products throughout the cleanroom and carefully analyzed all wall, floor, ceiling, light fixture, FFU, and work station construction materials to eliminate gaseous contamination of die and substrate surfaces.

- **Facility Construction** – Unidirectional, or laminar, flow cleanrooms are required for the most stringent cleanliness requirements (Class 100 and lower) and require perforated floors to implement. These not only cost more to implement, but they also require special support structures for high accuracy assembly equipment in order to meet the equipment's rated accuracy specifications. STI implemented a mixed airflow design to meet ISO Class 6 requirements utilizing low wall returns and strategically placed HEPA FFUs to create airflow patterns that effectively remove particulates from the space.

- **Expansion and Upgrade** – There are many types of cleanrooms including modular soft wall and free-standing hard wall constructed spaces. STI's free-standing cleanroom was constructed of smooth cleanable aluminum composite wall panels which enable easy expansion for future growth to accommodate higher production volume and/or increased process capability. STI's smooth T-grid ceiling construction allows design flexibility in placement of FFUs, lights, and ceiling panels facilitating easy upgrade to higher cleanliness ratings through replacement of ceiling tiles with HEPA FFUs. While designed and certified to meet ISO Class 6 Operational Requirements, STI installed 50% additional FFUs than the average quantity required thus allowing STI to have much cleaner



outgassing requirements), facility layout (equipment requirements, airflow patterns, maintainability), manufacturing environment (operating temperature and humidity, personnel requirements), and more. Each factor can play a significant role in the quality and yield of the end-product microelectronic assembly.

MICROELECTRONICS LABORATORY CAPABILITIES (CONTINUED)

dedicated work areas for higher product quality and assembly yield.

- **HVAC** – Perhaps the most critical factor in cleanroom performance is the HVAC design and implementation. The HVAC system primary role is to supply airflow in sufficient volume and cleanliness level to meet the operational rating of the space, to condition air to meet temp and humidity requirements, and to provide conditioned make-up air to cover air losses and maintain positive pressure requirements. STI contracted an engineering firm to perform the sensible and latent loads presented by the surrounding environment, equipment operation, and personnel occupancy. The resulting load calculations drove equipment selections for the building controls, air handling units (AHUs), humidifiers, and reheat systems to ensure that temperature and humidity levels were met under standard operational conditions.

STI's Cleanroom Operational Procedures

While design and installation of a microelectronics-grade cleanroom is the first step, it is the daily operation and routine maintenance of a cleanroom facility that can have the greatest impact on quality and yield of the end-product microelectronic assembly. STI's cleanroom lab is certified in accordance with Nebb Procedural Standards per the requirements of ISO14644-1:1999 for ISO Class 6 (Class 1000) Manufacturing Cleanroom for Electronic Hardware in its Operational State. It meets the requirements to produce military, space, and medical devices that require cleanroom manufacturing standards and practices. STI's cleanroom lab is operated in accordance with ISO 9001:2008 requirements where quality control is implemented in the earliest phases of an assembly process beginning with particulate concentration monitoring, garment laundering, routine janitorial services, HVAC preventative maintenance and filter replacement, and rigorous operating procedures for gowning, facility usage, and equipment usage.

- **Pressure Differential** – Gowning procedures and effective cleaning of all equipment and/or assembly materials before entering an assembly area aids to minimize contamination of the cleanroom space. Room entrances have pressure differentials to ensure flow from cleanest space to least cleanest space and eliminate cross contamination. STI's intake of makeup air is set to create a minimum pressure differential between clean areas of 0.05 inches water column keeping the main assembly space at the highest pressure. Routine particle concentration monitoring is performed at assemble work surfaces to ensure compliance of ISO14644-1:1999 for ISO Class 6 (Class 1000) operation.

- **Garments** – Occupants of a cleanroom can have a significant impact on the operational cleanliness levels attained in a cleanroom facility. STI enforces the use of coveralls, gloves, foot covers and boots,

face masks, and head covers to minimize the release of particles into the cleanroom space. Ion-free, particulate-free gloves are used to handle materials and devices to ensure contaminate-free surfaces and prevent formation of corrosive elements on assembly surfaces.

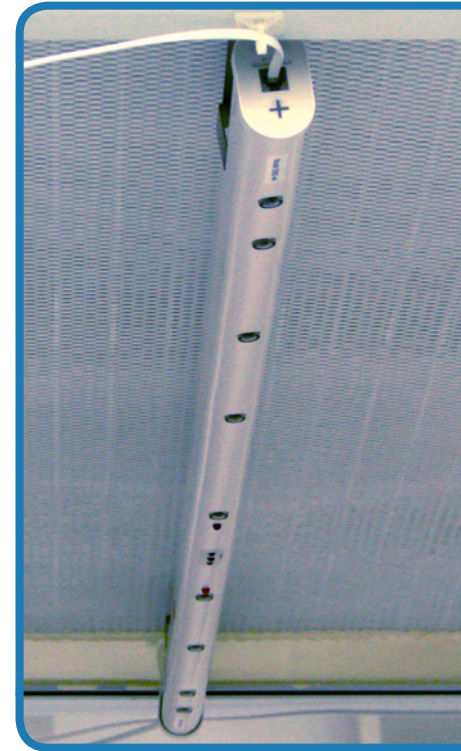
- **ESD** – With the use of static dissipative garments and dissipative sheet vinyl (non-outgassing) flooring, the risk of generating ESD during the manufacturing process is dramatically reduced. STI further combats ESD by the installation of pulsed-DC ionizers over all FFUs in order to discharge ESD generated by the high velocity airflow in order to meet the ISO Class 6 air change over requirements. Lastly, all workstations and assembly equipment in STI's cleanroom include ground straps for dissipation of static when in direct contact with devices and assemblies.

- **Temp/Humidity Control** – Temperature and humidity affect not only assembly material properties but also impact static control and comfort levels for the occupants as they manufacture the microelectronic assemblies. STI utilizes a building control system to modulate cleanroom space temperature to $70^{\circ} \pm 2^{\circ}\text{F}$ and relative humidity to $45\% \pm 5\%$ to ensure process control, maintain static-safe ESD levels, and a comfortable working environment when working in cleanroom garments.

- **Routine Maintenance** – The performance of a cleanroom facility will degrade over time if HVAC filters are not routinely replaced, if garments are not routinely laundered, and if the facility is not cleaned routinely (and cleaned with non-degrading, non-contaminating cleaning agents). STI uses lint-free wipes, neutral detergent (ESD-compliant), and filtered IPA and/or DI water for cleaning during and after assembly processes. STI utilizes differential pressure sensors across the filters to validate replacement schedules in order to maintain cleanliness levels. A particle counter is routinely used to validate cleanliness levels in a range of particle sizes to ensure continuous compliance with ISO14644-1:1999 Class 6 requirements.



MICROELECTRONICS LAB



ANALYTICAL LAB



CONTACT INFORMATION:
MARIETTA LEMIEUX
ANALYTICAL LAB MANAGER
256-705-5531
MLEMIEUX@STIELECTRONICSINC.COM

SEM/EDS BY: MARIETTA LEMIEUX

What are they?

SEM stands for Scanning Electron Microscopy and is an electron microscope in which the surface of a specimen is scanned by bombarding it with a beam of electrons that are reflected to form an image.

Some of the advantages that the scanning electron microscope has over traditional microscopes, are:

1. A large depth of field, which allows more of a specimen to be in focus at one time.
2. A much higher resolution, so closely spaced specimens can be magnified at much higher levels.
3. Strikingly clear images.

All this makes the scanning electron microscope a useful tool in the any failure or material analysis.

EDS stands for Energy Dispersive X-ray Spectroscopy and makes use of the x-ray spectrum emitted by a solid sample bombarded with a focused beam of electrons to obtain a localized chemical analysis.

A typical EDS spectrum is portrayed as a plot of x-ray counts vs. energy (in keV). Energy peaks correspond to the various elements in the sample. Generally they are narrow and readily resolved, but many elements yield multiple peaks. If elements are present in low abundance the x-ray peaks that may not be resolvable from the background radiation.

What do they do?

SEM

- Used for high magnification imaging - can get images up to several thousandX
- Can differentiate between different materials on sample via Backscatter Electron Imaging (grayscale variation)
- Topographical view via Secondary electron Imaging

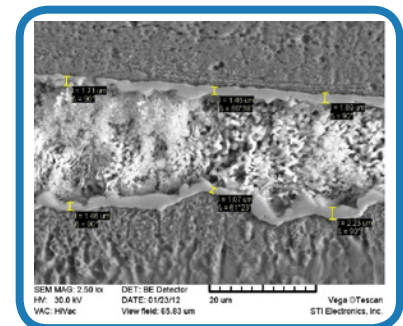
- Measurement in the micron level (e.g. IMC layer or thickness of plating)

EDS

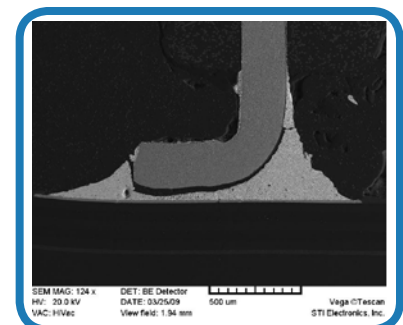
- Quantitative Elemental analysis
- Can identify individual elements starting with carbon on the periodic chart and heavier elements
- 5/10kV acceleration potential for surface analysis, 20/30kV acceleration potential for deeper sample penetration

Examples of SEM/EDS usage

- Solder joints; IMC formation - In order to have a good solder joint, one must form inter-metallic layers between the solder material and the base metal. Otherwise, the solder simply solidifies over the base metal without forming any bond.



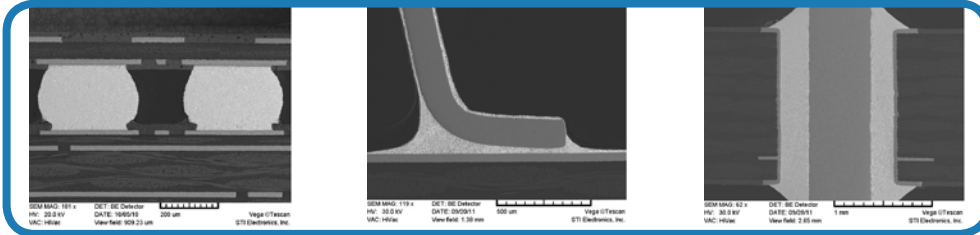
- Fractured solder connections



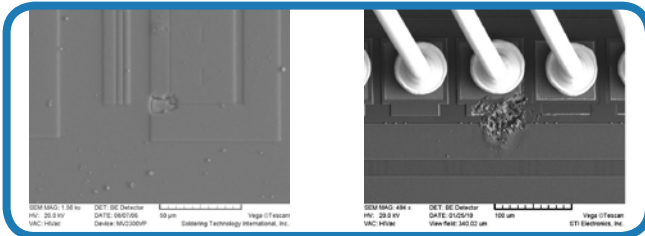
SEM/EDS

ANALYTICAL LAB

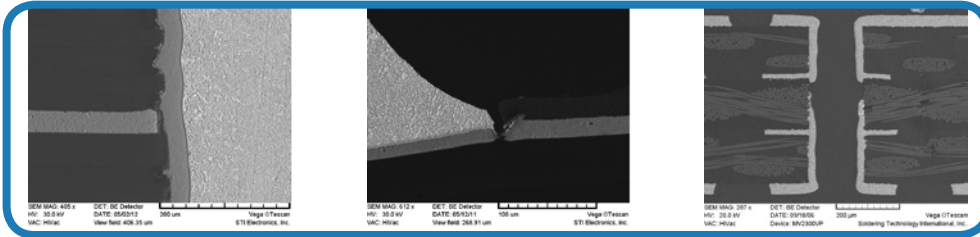
- Proper solder joint formation; Ball collapse, wetting angles, sufficient PTH hole fill



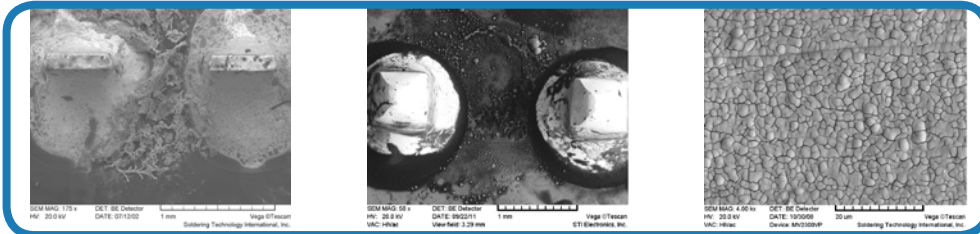
- Die evaluation, EOS or ESD damage



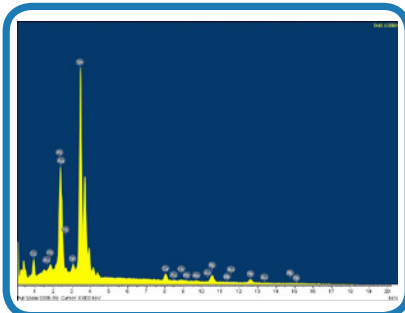
- PCB issues: Inner-layer separation, broken traces, PTH barrel fractures/plating issues



- Surface evaluation: Corrosion, PCB surface contamination, Plating issues



- EDS: Spectrum



Should you have any questions or would like a formal quote generated, please feel free to give us a call. Debi Bonkoski (256-705-5544) or myself, will be more than happy to be of assistance.

Marietta Lemieux (256-705-5531)

DIANA BRADFORD, VICE PRESIDENT, OPERATIONS/TRAINING RESOURCES

DIANA'S VIEW



CONTACT INFORMATION:

DIANA BRADFORD

**VICE PRESIDENT, OPERATIONS/
TRAINING RESOURCES**

DBRADFORD@STIELECTRONICSINC.COM

STI supports its customer base through one or a combination of all three divisions. Currently those divisions are: Engineering Services, Training Resources and Assembly/Solder Supplies.

In this newsletter article, I would like to spend a few moments introducing you to the products and services available to you through the Assembly/Solder Supplies group as well as the support personnel. STI is a stocking distributor of over 180 different product lines including OKI, PACE, Hakko, TechWear, MicroCare, Xcelta, 3M to name a few. In addition to the full line of products, this group consists of three inside sales representatives (Kelli King, mgr., Cortney Wright and Julia Adamczyk) as well as three outside sales representatives (Cathy Cross, Jack Harris

and Dottie Grantham). In addition to the sales staff, the warehouse staff, James Nicholson and Roger Hammonds, provide delivery and inventory support to local companies. STI offers engineered sales support as well as Vendor or Customer Managed inventory solutions. Inventory solutions can take multiple forms. Inventory can be managed as consignment with a scanner based set-up or vending system configurations. STI, through a solutions contract, can ensure that a company always has assembly and manufacturing critical supplies on hand. To get more information on how STI can support your inventory needs, please contact us today at sales@stielectronicsinc.com. We look forward to hearing from you!



KELLI KING



CORTNEY WRIGHT



JULIA ADAMCZYK



CATHY CROSS



JACK HARRIS



DOTTIE GRANTHAM



JAMES NICHOLSON



ROGER HAMMONDS