NEWSLETTER

Volume 20 • Issue 2 • December, 2022

www.stiusa.com

261 Palmer Road, Madison, AL 35758
Tel: (800) 767-4919 · Fax: (256) 461-9566


HAVE A
holly jolly
CHRISTMAS
sti
electronics

Contents

Volume 20, Issue 2 • December, 2022

features

STI Electronics, Inc.
261 Palmer Road
Madison, AL 35758
256.461.9191
www.stiusa.com
email: info@stiusa.com

Since 1982 40 Leading the Way In Electronics

Dave's World

December 2022

What happened in 1982? Michael Jackson's "Thriller" album was released. The movie "E.T." was released. Ronald Reagan was President. We were all nervous about taking tylenol, gas was $0.91 per gallon, the stock market closed at 1,046, and Soldering Technology International, Incorporated (now STI Electronics, Inc.) was formed.

You can read more about those other things but Soldering Technology International, Inc.'s 40 year journey is the one near and dear to my heart. We started with Jim Raby (Dad), Ellen Raby (Mom), and myself all working part time. Those first couple of years we did 6 to 8 seminars per year around the country teaching people how to efficiently build electronics using military standards. Dad would write the presentation, Mom & I would work on flyers promoting it, and Dad & I would take time off from our real jobs and spend a week or two on the road presenting a couple of times a year. Dad was the presenter and I was the logistics guy working with the hotels, registering attendees, and operating the slide projector. (On a side note, after hearing the presentation so many times, eventually I was able to fill in when needed.)

David Raby

President/CEO

On a typical trip we would fly to Boston on Wednesday, present the seminar on Thursday & Friday then fly to Orlando on Saturday and do the seminar on Monday & Tuesday. Next we would fly to Austin on Wednesday and present the seminar on Thursday and Friday. From there we would go back to our real jobs on Monday and then repeat the process 6 months later with different cities.

Our goal was to help people and companies be better at what they do. Dad had knowledge that could help and we wanted to share. We never imagined how the company would evolve, including becoming full time jobs, or still being around 40 years later. It has evolved and has been quite an adventure. Although, we haven't done a seminar in many years, we still share knowledge with our teaching, consulting, analytical lab and now, a contract manufacturer using some of the concepts from those 1980's seminars to build the best quality products for our customers.

Dad isn't with us physically any longer but his teachings and spirit still guide our decisions every day. Mom is enjoying retirement but still is happy to jump in whenever and however she can help (and she does).

Why have we made it this long when many others haven't? It is because of our staff, those who have worked at STI, friends & supporters of STI, and the Raby family. To the ones who have been or are currently customers of STI, you have made this whole journey possible and there is no way I can express my gratitude properly. Thank you!

Where are we going to be in 40 years? I'm as clear on that as I was at the beginning of our first 40 years. I'm fully expecting STI to continue to evolve and adapt as it has in the past. What will that look like? I have no idea. I hopefully won't be here as I plan on being a big winner in the World Pickleball Championships (100+ year old division).

Thank you again for all your support. We look forward to working with you as this journey continues.

David Raby

UP CLOSE and PERSONAL

Meet Meagen

Master Instructor

How long have you been part of STI Electronics, Inc.? **Since April, 2022**

What do you do for STI? **I educate people on various IPC standards.**

Just For Fun

Tell us about your family. **My parents have been married for 54 years and have been retired for a little over two years. I have an older brother and a sister-in-law who live in Madison County.**

Do you have a favorite place to visit? **Chattanooga or Pigeon Forge**

What's your favorite type of music/song/artist? **I like all kinds of music but I would have to say my favorite is music from the 80's.**

What is your favorite movie or TV show? **My all-time favorite tv show is Bewitched. I have all the episodes and watch them frequently. I love movies and I watch a lot of Netflix on the weekends.**

What's your favorite meal/food? **Cheese Pizza**

Tell us about any hobbies that you enjoy. **I enjoy cross stitching and going to antique/thrift stores.**

What is your favorite motto or quote that summarizes your approach to life?
"Tell me and I forget. Teach me and I remember. Involve me and I learn." – Benjamin Franklin

What's one fun thing to know about you? **I have always wanted to learn how to paint. I have taken a few classes and I really enjoy it.**

What's your favorite thing about working at STI? **The people I work with.**

What is your favorite non-profit to support and why? **My favorite non-profit is Lucky's Cat House in Petersburg, Tennessee. They are a small non-profit cat rescue that services the Lincoln, Marshall and Giles County areas. It is the first cat only shelter/rescue in that area of Tennessee. They provide care to homeless and abused cats and help them find their forever homes. All of the cats that are placed for adoption are fully vetted, vaccinated and fixed. They also provide education and resource programs to the public. Unlike a lot of other shelters/rescues, they offer a working cat program where they find safe environments for feral cats that need to be relocated.**

Anything else you'd like to share with your team members? **I'm delighted to be here and look forward to working with everyone.**

From all of the "behind the scenes" Operations Staff, we thank you for your business and another successful year! We wish you and your family a very Merry Christmas and a healthy, prosperous New Year! Please let us know how we can better serve you and we look forward to working with you in 2023!

Thanks,

Diana Bradford
Vice President,
Operations/Training Resources

Merry Christmas

Christy
Executive Assistant

Sheila
Corporate Secretary

Donna
Receptionist

Erick
Job Cost Analyst

Scott
Accounting Manager

Robbie
Marketing Coordinator

Roger
Facilities Manager

Jean
Facilities Maintenance

From all of us in Training Services, we thank you for your business and another successful year! We wish you and your family a very Merry Christmas and a healthy, prosperous New Year! We look forward to working with you in 2023!

Thanks,

Pat Scott

Training Services Manager


Frank
Lead Master Instructor
Michelle
Customer Service Manager
Julio
Training Ctr. Manager, TX
Robert
Master Instructor
Travis
Master Instructor
Meagen
Master Instructor
Melissa
Customer Service Rep.
Martin
Master Instructor

Engineering Services/Manufacturing

Mark
VP, Engineering Srvs./Manuf.

Chris
Manufacturing Manager

Troy
Systems Engineer

Caroline
Analytical Lab Mgr.

A.J.
Prod. Engineering Supvr.

James Nicholson
Customer Account Manager

During the second half of 2022 we have had several anniversaries to celebrate. We would like to congratulate each one on achieving this anniversary with us! They have all worked hard for this accomplishment and we truly appreciate their dedication. *Congratulations*

Diana • 25 Years

Mark • 22 Years

Chris • 7 Years

Caroline • 3 Years

Shawn • 4 Years

Katrena • 12 Years

Sharon • 5 Years

Joel • 5 Years

Julio • 10 Years

Robert • 1 Year

Yolanda • 3 Years

Pam • 16 Years

Edna • 13 Years

Robert • 4 Years

Kim • 3 Years

Donna • 23 Years

Jonnie • 18 Years

K.P. • 12 Years

Jeff • 9 Years

Troy • 5 Years

Robbie • 3 Years

Bobby • 14 Years

Jean • 3 Years

Lisa • 9 Years

Contact Information:
Mark McMeen
VP, Engineering Services/ Manufacturing
mmcmeen@stiusa.com

Contact Information:
Caroline Anthony, Phd.
Analytical Lab Manager
canthony@stiusa.com

Do you know the difference between Creep Corrosion vs. Electrochemical Migration (ECM) / Dendritic Growth?

By: Mark McMeen and Caroline Anthony, Phd.

Those in the electronics industry sometimes confuse these failures and failure modes. Creep corrosion and electrochemical migration are two completely different failure modes and their root causes are unique as well. The following analysis and pictures explain these two phenomena and their causes, and why one should not classify them as the same failure mode. As the world of electronics continues down its paths of miniaturization and smaller form factors, and the overall density of electronics increases, then these failure modes are becoming more prevalent. The world's environmental pollution increase has also influenced the growth in one of these failure modes, due to the release of sulfur dioxide from gasoline, to the burning of coal for energy and heat. Do you know which failure mode is influenced by sulfur dioxide? If not, you will soon, read more down below:

Creep Corrosion

Creep corrosion occurs when sulfur attacks exposed copper or silver leading to a migration of the corrosion, without the assistance of an electric field. This attack is caused by an active sulfur compound present in the environment / pollution, or its by product, that will lead to the attack on copper or silver, and the formation of copper sulfide (Cu_2S) and silver sulfide (Ag_2S), respectively. Humidity is required for this corrosion to occur (monolayers of water on the surface of the PCB assembly above 60 to 70% relative humidity), but there is no voltage requirement for creep corrosion, unlike ECM/dendritic growth or conductive anodic filament (CAF). The active sulfur compounds in the environment react with the humidity, or water, available on the surface to form a weak sulfuric acid (H_2SO_4). Sulfuric acid is then able to attack the copper or silver forming either copper or silver sulfide. Creep corrosion can be a slow process, taking anywhere from a couple of months to years to occur. Once creep corrosion has started the PCB can still function, and the PCB will only fail once the growth is large enough to cause a short or eat and dissolve the trace creating an open circuit. There are numerous steps that can be taken to mitigate the

potential for creep corrosion. These steps can include eliminating sulfur from the operating environment, plugging vias, making sure the finish is optimal for the sulfur induced environment, and / or covering all solderable areas completely with solder, conformal coat, and/or encapsulation. The challenge is the sulfuric acid has a unique ability to dissolve and corrode silver plating finishes and or copper traces, and the creep corrosion continues growing and expanding overtime in the presence of moisture/relative humidity.

Please note in the pictures below how the corrosion "creeps" or "blossoms out" from the exposed copper and/or copper plated immersion silver finished via. This corrosion continues to creep and grow outward and is very conductive and can create a short if there is an adjacent via, pad, or trace. Again, one should note that this slow growing corrosion can develop in months or even years based on the amount of sulfur dioxide that is present in the atmosphere and can react on the exposed metal surface of copper and/or immersion silver.

Note – it should be noted that silver plated components, or silver sputtered coated layers of the end caps of chip style components, can be impacted electrically by the corrosion, as well.

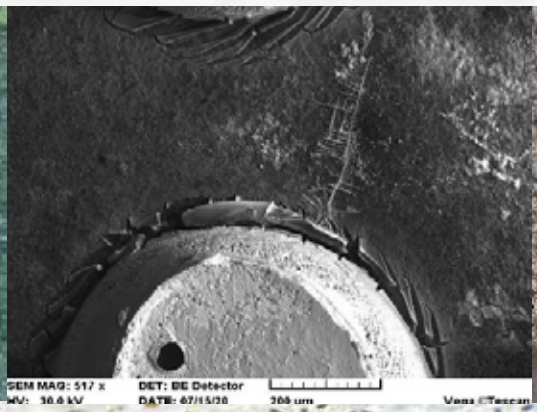
What do you need to create CREEP CORROSION:

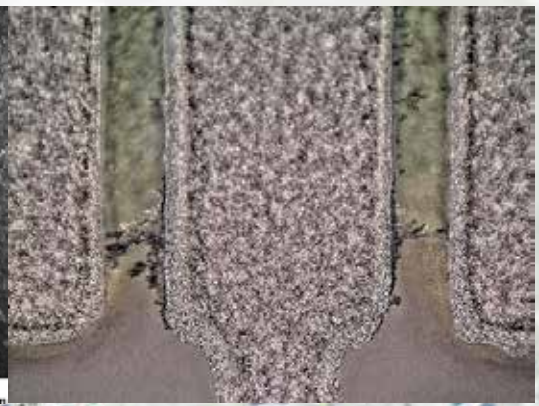
1. Sulfur rich environment
2. High enough relative humidity, 60 to 70% plus, to create monolayers of water on PCB surface
3. Exposed copper, silver plating boundary, or immersion silver plating
4. Accumulation points – unplugged or exposed vias, immersion silver finish, and/or exposed pads.
5. Silver plated boundary layer components are also vulnerable to creep corrosion
6. Not all encapsulations and conformal coats are good barriers of sulfur and actually act as a sponge holding the active sulfur compounds, which will produce sulfuric acid and actually attack and creep corrode underneath certain encapsulations and conformal coatings.

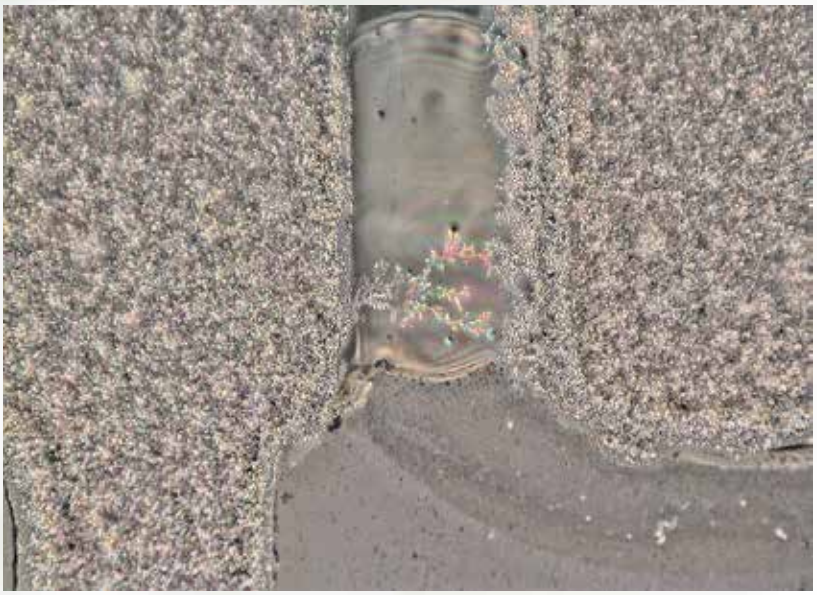
Electrochemical Migration (ECM)/ Dendritic Growth

Electrochemical migration (ECM)/ dendritic growth is another failure mode that is chemically different from creep corrosion but creates similar results, such as shorts and opens. Electrochemical migration (ECM)/ dendritic growth involves the dissolving of metal ions in the presence of electric potential. This allows for the growth of dendrites between the anode and the cathode. Creep corrosion does not require electric potential, which is necessary for ECM/dendrites. The growth of a dendrite can occur in a fraction of a second, but it takes multiple steps to grow a dendrite. These steps include water adsorption, metal dissolution, ion accumulation, ion migration, and finally dendritic growth. When a dendrite grows and connects adjacent conductors a short occurs. Before the dendrite fully shorts it can impact the surface insulation resistance (SIR) between the adjacent conductors. This phenomenon is called parasitic leakage and it can be measured with SIR test equipment. Please see picture of parasitic leakage where dendrites have formed, but have not yet caused a short.

The following pictures show dendritic growths or dendrites:







Dendritic growth between two pads – note the tree like structure and the dead short between the two pads.

What do you need to create ECM / DENDRITIC GROWTH

- Adsorption of water through condensation or high relative humidity on the surface between the contacts, pads, and/ or traces of opposite polarity
- Alkalization of the water due to the applied voltage potential difference which decreases the pH value in the water film initiating the corrosion and release of metal ions
- Normally this drop in pH of the water comes from ionic contamination, which in most cases is anions or weak organic acids left on the PCB from its processing or manufacturing (flux residues)
- Dissolution of the anode metal
- Metal ion migration to the cathode
- Reduction of the metal ions and deposition on the cathode with the formation of a dendrite – tree like structure
- Dendritic growth towards the anode
- Reduction of the resistance between the contacts until a permanent short occurs – Parasitic leakage until the dendritic tree creates a fully shorted dendrite between pins of opposite polarity

Now, one can see that failed electronics can have a shorted circuit, but the causes can come from two completely different failure modes and their root cause can be uniquely different as well. The next time you have a failure due to corrosion apply the analytical approach of studying and identifying the failure mode: Creep Corrosion or ECM / Dendrite

Please call Mark McMeen or Caroline Anthony with your failure mode analysis questions and let us help you with your analytical needs.
Mark: mmcmeen@stiusa.com
(256-705-5515)
Caroline Anthony: canthony@stiusa.com
(256-705-5531)

Training Services

Contact Information:
Pat Scott
Training Services Mgr.
pscott@stiusa.com

This past year has been outstanding for STI's Training Services Department. STI is fortunate to have a group of trainers that are hard-working, exceptional and committed to their job. The instructors have spent 2022 traveling/teaching on-site at customer locations throughout the United States as well as teaching classes at our locations in Madison, AL and Houston, TX. A special thank you goes to Frank Honyotski, Rob Fornefeld, Meagen Stone, Travis Wease, Julio Estrada and Martin Garcia for all their hard work and dedication.

In order to keep up with the increase training demand STI has added an additional Mastor Instructor.

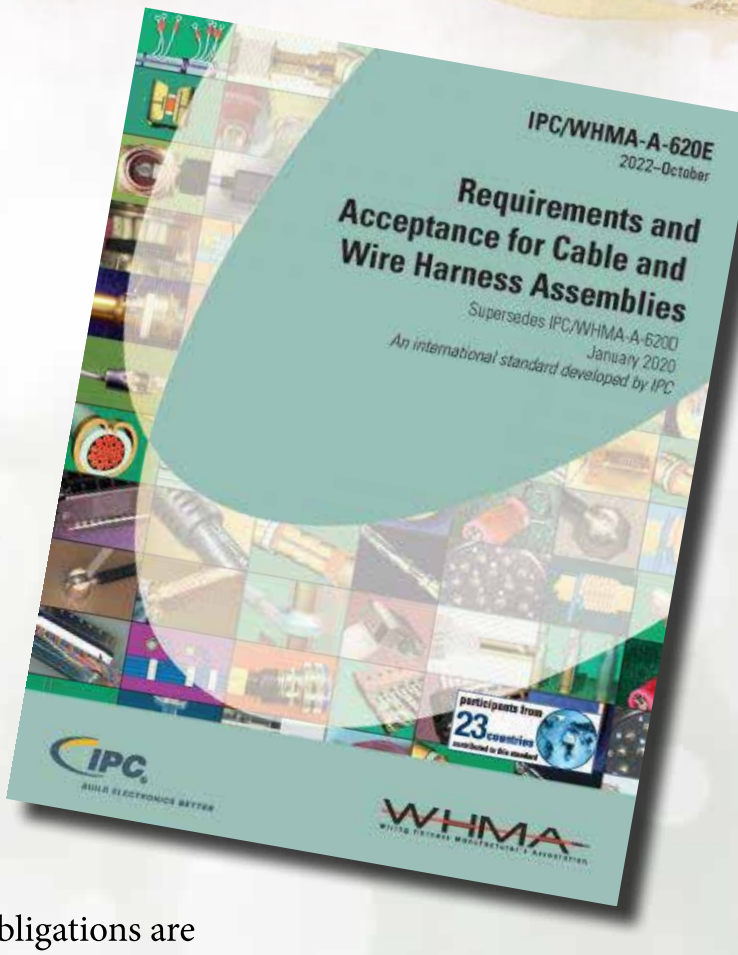
Meagen Stone joined the STI Training Team in July 2022. She has over 18 years of experience in Quality Assurance and Training. She is presently certified as a CIT for J-STD-001, J-STD-001 Space Addendum, IPC/WHMA-A-620, IPC-A-610, IPC-7711/7721 and IPC-A-600. Meagen is also currently qualified as a Master IPC Trainer (MIT) in J-STD-001, J-STD-001 Space and IPC-A-610. Meagen has hit the ground running and is a welcomed addition to the Training Team.

STI realizes that it's the customers that make it all possible. We thank you for your continued business and will continue to provide the best customer service/ training possible.

The 2023 Training Schedule is Online

https://stiusa.com/all-training-events/

IPC News



IPC/WHMA-A-620E Standard was released October 2022.

STI will be ready to teach the CIS and CIT IPC/WHMA-A-620E courses as soon as IPC completes development of the training programs. This typically takes approximately 4-6 months. When the training programs become available just check IPC Edge/Resources and you can start using the curriculum as soon as it's available. You do not have to purchase the training materials for the new 620E course as the cost is covered by your course testing fee when you certify or recertify as a CIT every 2 years. Your organization is not required to teach the latest revision of any IPC document so check with your organization to find out what your contractual obligations are before starting to teach a new revision.

IPC will be increasing pricing of all certification programs starting January 1, 2023. Additionally, IPC will be increasing pricing for all IPC standards and technical documents effective January 1, 2023. Due to these increases STI will slightly increase IPC course costs starting January 1, 2023.

While the training materials are available through IPC at no additional cost, the documents that the courses are based on must be purchased separately. If you need new documents, STI Electronics is a licensed IPC Distributor, so please contact our Customer Service group and request a quote today!

STI Celebrated 40 Years in 2022

STI Electronics, Inc. (STI) celebrated its 40th year in business in 2022. Our purpose from day one was to support the electronics manufacturing industry and to share our knowledge and expexpertise with our industry friends and customers. Our mission was to provide the best customer service through all of our products and services and to help ensure the success of our customers. STI will continue with this same purpose and mission as we look forward and prepare for the next 40 years.


Merry Christmas
sti
electronics
LET'S CELEBRATE
Hope the holidays bring you lots of reasons to smile.
Merry christmas & Happy new year
We will be closed Monday, December 26th & Monday, January 2nd.