

July 2017

12 **Defense Budget Analysis:  
Patience is a Virtue**

16 **Strategies for Compliance  
with DoD Regulations  
Including ITAR and DFARS**

30 **Mil/Aero Electronics  
Supply Chain Facing  
New Challenges**

**Much More!**

# the **pcb** magazine

MIL/AERO

SPECIAL COVERAGE  
IPC. IMPACT 2017



SAVE THE DATE!

# Geek-a-Palooza Dallas



November 14, 2017

It's a sure bet that this event will be a winner!

At this event,  
everyone's a  
winner! You can  
win cash, prizes  
and even new  
business!



LONE STAR PARK  
at Grand Prairie™

WIN

WIN

WIN

This ain't no  
hotel ballroom!  
We chose a  
venue that was  
filled with  
excitement  
and fun.



LONE STAR PARK  
at Grand Prairie™

PLACE PLACE PLACE

If you know only  
one thing about  
us, you know we  
know how to put  
on a good show!

SHOW

SHOW



More event info at [geek-a-palooza.com](http://geek-a-palooza.com)!

# Check out the latest titles in our micro eBook library!



Written by industry experts, these FREE micro eBooks each contain valuable information on relevant topics in an easy-to-read format.

[View eBook Library](#)

**100%  
Books**

# July 2017

## Featured Content

12



16



24



30



72



## Military/Aerospace

The present and future challenges of mil/aero electronics are covered from A to Zentech this month, including a special interview section on IMPACT, Washington D.C. 2017. From the DoD budget to the new cybersecurity regulations, and of course, reliability issues, it's all included.

### FEATURES:

#### 16 Strategies for Compliance with DoD Regulations Including ITAR and DFARS

*by Didrik Bech*

#### 30 Mil/Aero Electronics Supply Chain Facing New Challenges

*by Stephen Las Marias*

#### 72 Review of the 2017 IPC Reliability Forum

*by Steve Williams*

### FEATURE COLUMNS:

#### 12 Defense Budget Analysis: Patience is a Virtue

*by John Vaughan with Brian Friel*

#### 24 Time to Show our Hand?

*by Marc Ladle*

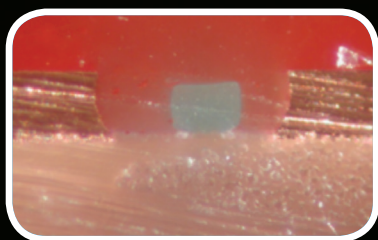
# LIQUID PHOTOIMAGEABLE SOLDER MASK



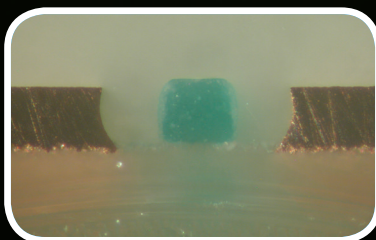
**DIRECT  
IMAGING**

PSR-4000 BW01DI, PSR-4000 BN HF DI & PSR-4000 GP01EU DI

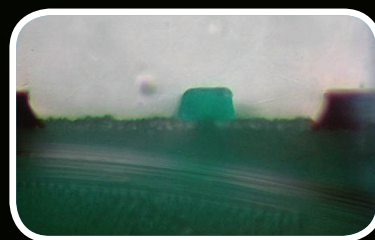
- Ⓢ DIRECT IMAGING
- Ⓢ GREEN GLOSSY FINISH
- Ⓢ FINE DAM RESOLUTION
- Ⓢ HALOGEN-FREE
- Ⓢ EXTREMELY FAST PHOTO SPEED, < 100 mJ
- Ⓢ WITHSTANDS ENIG & IMMERSION TIN
- Ⓢ COMPATIBLE WITH LEAD-FREE PROCESSING



PSR-4000 BW01 DI



PSR-4000 BN HF DI



PSR-4000 GP01EU DI

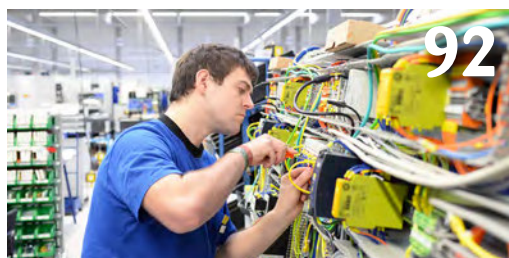
 **TAIYO  
AMERICA**  
Your Ultimate Solution

Phone [775] 885-9959 • [www.taiyo-america.com](http://www.taiyo-america.com) • [info@taiyo-america.com](mailto:info@taiyo-america.com)

in

## July 2017

### More Content



- 28** *HIGHLIGHTS*  
**Supply Lines**
- 38** **EIN & Market News**
- 84** **MilAero007**
- 112** **Top Ten PCB007**

#### DEPARTMENTS

- 102** **Career Opportunities**
- 114** **Events Calendar**
- 115** **Advertisers Index & Masthead**

- 39** *SPECIAL COVERAGE*  
**IPC's IMPACT Washington, D.C. 2017**

- 96** *ARTICLE*  
**Automotive Suppliers Must Manage Data for IMDS Compliance**  
*by Derrik Snider*

- 8** *COLUMNS*  
**What Happens in Washington Doesn't Stay in Washington—It Reaches All of Us**  
*by Patty Goldman*

- 86** **The Critical Importance of Rinsing, Part 1**  
*by Michael Carano*

- 92** **Three Ways to Close the Skills Gap in U.S. Manufacturing**  
*by John Mitchell*

- 15** *SHORTS*  
**X-ray Eyes in the Sky**

- 26** **Smart Quadcopters Find their Way without Human Help or GPS**

- 82** **Data I/O on Securing the Electronics Manufacturing Supply Chain**

- 90** **Drones that Drive**



Very Low Loss Laminate & Prepreg

# Astra<sup>®</sup> MT77

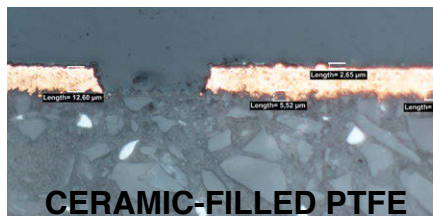
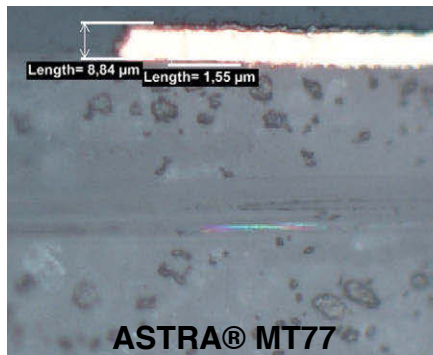
**Low Cost  
Teflon<sup>®</sup> Replacement for  
Radar Applications**

**RF/  
MICROWAVE**

## Astra<sup>®</sup> MT77

Astra<sup>®</sup> MT77 laminate materials exhibit exceptional electrical properties which are very stable over a broad frequency and temperature range.

© 2017 ISOLA GROUP. ALL RIGHTS RESERVED.



Tg: 200°C Td: 360°C

Ultra-low loss material with  
Dk: 3.00 and Df: 0.0017

Comparable high-frequency  
properties to Teflon<sup>®</sup> up to 100 GHz

Stable Dk over temperature range:  
-40 to 140°C and up to 125 GHz

Extremely simple PCB processing  
(short press cycle, standard drill  
route & no plasma, excellent  
prepreg flow, sequential lamination)

Complete design freedom for  
RF designers (any layer technology,  
HDI, microvia, buried via, blind via,  
buried resistor, sequential lamination)

UL RTI 130°C / UL 94 V-0

Best Price/performance Teflon<sup>®</sup>  
replacement material on the market

**RF/MICROWAVE • AEROSPACE & DEFENSE • AUTOMOTIVE & TRANSPORTATION**

# isola

FOR MORE INFORMATION, CONTACT YOUR LOCAL SALES REPRESENTATIVE.

**Isola Group**  
3100 West Ray Road  
Suite 301  
Chandler, AZ 85226  
Phone: 480-893-6527  
[info@isola-group.com](mailto:info@isola-group.com)

**Isola Asia Pacific (Hong Kong) Ltd.**  
Unit 3512 - 3522, 35/F  
No. 1 Hung To Road, Kwun Tong,  
Kowloon, Hong Kong  
Phone: 852-2418-1318  
[info.hkg@isola-group.com](mailto:info.hkg@isola-group.com)

**Isola GmbH**  
Isola Strasse 2  
D-52348 Düren, Germany  
Phone: 49-2421-8080  
[info-dur@isola-group.com](mailto:info-dur@isola-group.com)  
Website: [isola-group.com](http://isola-group.com)

# What Happens in Washington Doesn't Stay in Washington—It Reaches All of Us

by Patty Goldman

I-CONNECT007

I went to my second IMPACT Washington, D.C. event this year (May 1–3) and, as much as I applauded last year's event, this one far surpassed it—just ask anyone who was there. In this month's issue, a special section on IMPACT backs that claim.

The list of speakers from the departments of Education, Commerce and Defense, along with meetings with numerous congressmen and senators, plus the EPA and even the White House, was impressive. Across the board, the one request from all these departments was, “tell us what you need.” Manufacturing and business are indeed golden words in the Nation's Capital this year. You really had to be there to feel the vibes—we are the good guys now!

One of the first speakers we listened to was Dr. Robert Irie with the Office of the Undersec-

retary of Defense for Acquisition, Technology and Logistics (AT&L). His office deals with manufacturing and industrial base policy and their mission is to ensure a robust industrial base. His department conducts “agility and fragility” assessments, engages in industry outreach and performs acquisition oversight for microelectronics (among other things). He mentioned the need for data-driven decision-making and the need for innovation. Not a bad person to have met.

But wait, there's more!

We begin this month's issue with an analysis of the Defense Budget and what it means for your company. Zentech's John Vaughan, together with Brian Friel of Nation Analytics, give us a great overview and from this you can figure where the boards you make fit in.



Dr. Robert Irie (left) with Bhawnesh Mathur.

# Productive Fabrication Equipment



MDI-DT



WorkCell<sup>2</sup>



Hybrid CombiDrill UV/CO<sub>2</sub>



## MDI Micromirror-Digital-Imaging

- Cost-efficient & high-quality DDI
- High-power UV-LEDs & DMD-technology
- Operator-friendly concept w/compact footprint
- Modular machine concept & field upgradable
- Flexible number of heads and head distances for shortest exposure times
- Multiple wavelength concept

## Vacuum Lamination System

- Even pressure across the platen surface
- State-of-the-art heating system
- All-steel construction
- Modular machine concept & field upgradable
- User-friendly visualization system
- Affordable initial investment

## Laser Drilling/Cutting System

- Microvia drilling 50-300µm diameter
- Space saving compact design
- Best power/size ratio in market
- Pulse Stabilizer
- European technology center and USA support center

*Bürkle North America supplies a full complement of productive equipment for fabricating printed wiring boards. From imaging through metrology inspection, Bürkle North America's equipment offering sets the standard in the industry for Imaging, Registration, Lamination, Mechanical or Laser Drill/Routing and Feature Metrology Inspection.*

**BURKLE**  
NORTH AMERICA, INC.  
11105 Knott Ave., Cypress, CA 90630



Contact **Dave Howard**  
for more details.



Next, we have an article by Didrik Bech, Elmatica, on compliance strategies for supplying the DoD. He thoroughly discusses both ITAR and DFARS regulations, so get to reading if those acronyms are not familiar to you.

Viking Test's Marc Laddle gives us a general discussion on manufacturing products for the military industry and the importance of doing it right, not just for your own profitability but keeping in mind those who are out there with their lives on the line and counting on our electronics.

As is our custom, the I-Connect007 team put together a conference call with a few people to talk about the challenges associated with supplying to the military world. Freedom CAD's Scott Miller, Lenthor's Dave Moody and John Rolle, and Zentech's Matt Turpin and John Vaughan had plenty to say on the subject, especially about the new cybersecurity requirements that mean a whole different level of compliance. Dealing with lead-free requirements and reliability were additional subjects. All were expecting an uptick in business with the new administration in Washington, but perhaps it's best to refer back to Vaughan's column.

Speaking of reliability, Steve Williams (The Right Approach Consulting) attended IPC's recent Reliability Forum in Chicago, Illinois, and reports on it in detail. Topics included designing for reliability, use of embedded passives, reliability versus quality, and military reliability requirements. It should be noted that one of the reasons to attend such an event is the other attendees, as evidenced by the who's who of companies represented that Steve lists.

Mike Carano with RBP Chemical Technology takes us back to the nitty gritty of board manufacture with a discussion on the importance of rinsing. Any of you involved in the day to day of PCB building know that this most basic of steps is one of the most critical.



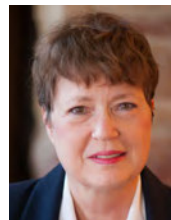
On to other subjects—and this one is uppermost in the minds of most management these days. I'm talking about the manufacturing skills gap as discussed by IPC's John Mitchell in his column this month. He doesn't just talk, but presents three ways to address it. Time to move beyond talk and into action, the sooner the better.

Lastly, we have Derik Snider of IMDS Data LLC to discuss supplying to the automotive industry

and managing the reporting aspect of it. Pay attention, as the separate markets we serve with PCBs are merging and this may be automotive-centric, but it seems to fit into military and other industries as well—as your car becomes a computer with extensive communication built in and reliability becomes ever more critical, perhaps even passing that for the military.

So there you have it. I am still thinking about IMPACT. In one of the interviews, I believe it is with Dave Raby, Kim Ford (Dept. of Education) mentions a website. Please look at that, as it contains a wealth of information, including ways to contact her and others to provide your input.

Next month we will be talking about streamlining your manufacturing process. Can you remove steps? Are there ways to automate that perhaps you haven't thought of? Check in and find out. You know the drill—[subscribe here](#) to get the magazine (and your choice of newsletters) delivered to your virtual door the moment it publishes. **PCB**



**Patricia Goldman** is managing editor of *The PCB Magazine*. To contact Goldman, [click here](#).



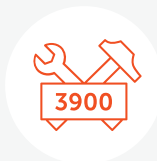
## Gardien's Integrate QA Solution

### WHAT IS INTEGRATE?

Integrate is a new approach to bare board PCB quality assurance. We address and are responsible for 100% of your tail end QA needs, whether it's AOI, testing, final inspection, or a combination of all three. We can provide the service in one of our service centers or fully integrate within your facility.

### WHAT MAKES IT DIFFERENT?

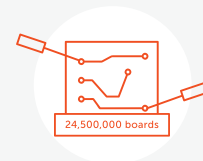
**Partnership pricing.** Payment is based on product that actually passes quality assurance, not on panels produced or tested. Our success is built entirely on how successful we can help you become.



3900 jobs tooled per month



18100 orders processed per month



24,500,000 boards processed per month

Find out if our Integrate solution is right for you!

[www.gardien.com/why-integrate](http://www.gardien.com/why-integrate)

# Defense Budget Analysis: Patience is a Virtue

by John Vaughan, ZENTECH MANUFACTURING,  
with Brian Friel, NATION ANALYTICS

Patience may be the most necessary watchword for proponents of significant growth in the budget for the U.S. military. The historic increases in defense spending promised by President Trump on the campaign trail won't come immediately, but it is likely that Congress will find ways to provide solid increases to the Pentagon's budget, particularly in 2019 and beyond.

Whenever I want to dig deep into the complexities of the Defense budget, my first call is always to Brian Friel of Nation Analytics. Prior to launching Nation Analytics, Brian was a senior contract analyst at Bloomberg Government, where he spearheaded IDIQ research and created the BGOV200<sup>[1]</sup> annual ranking of federal contractors. Brian lives and breathes defense budget analysis and is an invaluable resource.

As reflected in the following summary, Brian and I had the opportunity to get together recently and discuss the Defense budget status and the related funding mechanisms at length.

The administration has proposed a 7% year-over-year increase to the topline defense budget—that includes base, overseas contingency operations (OCO) and supplemental funding—for fiscal 2018, for a total of \$639.1 billion. That falls far short of many defense hawks' views of needed increases, but it nonetheless represents a turnaround from the tight budgets that Congress has enacted for Defense since 2013.

Tight spending caps under the 2011 Budget Control Act have governed defense spending since 2013, when sequestration allowed for only \$577.6 billion in topline budget authority for the Pentagon. That total was a dramatic drop from the prior five years. From 2008 to 2012, the Defense budget averaged \$671.1 billion and never dropped below \$645 billion.

The austere budget for 2013 has carried on since, reaching its low in fiscal 2015 at \$560.4 billion. The topline has crawled back up by a bit over 3% per year, to \$590.4 billion in enacted budget authority for fiscal 2017.



# ROG breaks FR-4 barrier!

Introducing  
**Kappa™ 438**  
Laminates



## Need Better RF Performance? FR-4 No More!

Demand for wireless data is growing exponentially, driving a need for substantially higher levels of mobile network capacity and performance. This demand will grow further in support of the upcoming 5G IoT ecosystem where

billions of devices will be communicating with each other, and connectivity is immediate and uninterrupted. FR-4 was historically a material choice for many less demanding RF applications, but changes in the wireless infrastructure related to growing performance requirements, especially in small cells and carrier-grade WiFi/Licensed Assisted Access (LAA), have resulted in instances where the properties of FR-4 are lacking, and RF performance and consistency is compromised. There's no longer a need to sacrifice your PCB performance.



Small Cell



V2X Communication

### — Now There's Kappa™ 438 Laminates.

Wireless circuit designers can enjoy a true breakthrough with Kappa 438 laminates because they feature the performance of "mid-tier" circuit materials and they shatter the performance limits of FR-4, but at affordable prices. Kappa 438 laminates have low loss, excellent Dk tolerance, and tight thickness control and are engineered for outstanding, repeatable wireless performance.

By having similar Dk to FR-4, your design transition to Kappa 438 laminates will be effortless! Visit [www.rogerscorp.com/kappa](http://www.rogerscorp.com/kappa) to learn more.

PROPERTY	TYPICAL VALUE
Dk*	4.38
Df	0.005

\*Design Dk; Differential Phase Length Method at 2.5 GHz



Advanced Connectivity Solutions

USA - AZ, tel. +1 480-961-1382 • EUROPE - BELGIUM, tel. +32 9 235 3611  
[www.rogerscorp.com/kappa](http://www.rogerscorp.com/kappa)

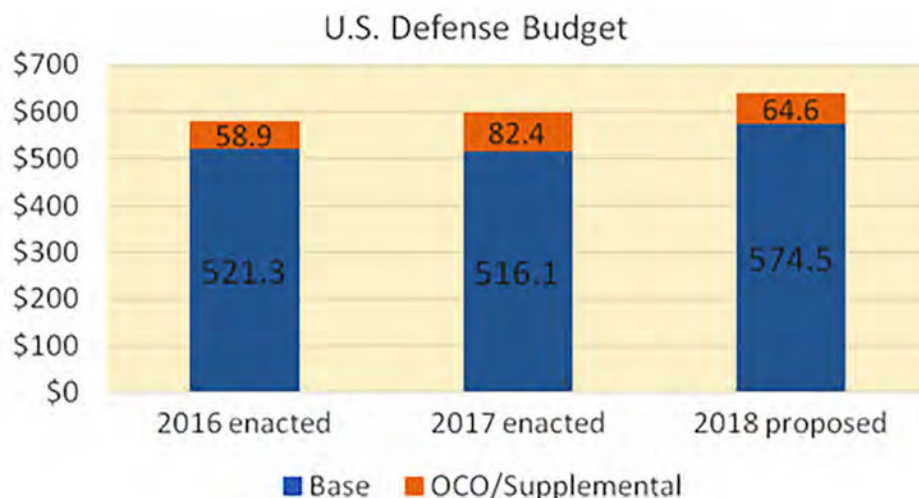


Figure 1: President Trump's proposed 7% increase in Defense budget authority. (Source: U.S. Department of Defense 2018 Budget Proposal, U.S. House of Representatives 2017 Defense Appropriations Summary)

Senate Armed Services Committee Chairman John McCain, R-Ariz., has argued for a \$700 billion defense budget for fiscal 2018, or about \$60 billion more than President Trump's request. That kind of truly dramatic, immediate increase in defense spending is unlikely given the political, budgetary and legal realities governing the appropriations process.

The base spending caps created by the 2011 Budget Control Act will continue through 2021 unless Congress acts to end or ease them. Budget hawks are unlikely to allow a complete end to the caps. Congress has eased the caps three times, appeasing budget hawks by cutting spending elsewhere in the vast federal budget to make way for defense increases.

Congress has also gotten around the defense cap by adding funds to the Pentagon's budget by using supplemental OCO funding.

OCO funding is money set aside in the federal budget for emergency expenses connected to overseas operations such as: crisis response, infrastructure and coalition support for operations in Iraq/Afghanistan, humanitarian assistance in the Middle East and North Africa, and embassy security, among other needs abroad.

A mix of supplemental and OCO funding increases and modest increases to the base spend-

ing caps are the most likely way that Congress will make good on President Trump's campaign promise. Growth at the rate proposed in the fiscal 2018 budget through 2021 would lead to spending at about the \$780 billion level that year that Senator McCain is seeking, just at a slower immediate rate of growth.

It's important to remember that the Trump administration has been in office for less than six months. Defense Secretary Jim Mattis has initiated a review called the National Defense Strategy, a

new strategic planning process that replaces the traditional Quadrennial Defense Review. Mattis and his team must work through that review before proposing any major new initiatives or programs.

The 2018 budget directs the largest funding increase to operations and maintenance accounts to shore up the readiness of the force as the National Defense Strategy looks at how best to make investments in procurement accounts starting in 2019.

With ongoing terrorism threats, coupled with rising threats from Russia and China, both on traditional military fronts as well as new cybersecurity and space fronts, the external justification for defense spending increases is clear. Through the National Defense Strategy, the Pentagon will describe the internal justifications for specific investments in new weapons and existing platforms. The political and budgetary realities facing Congress will temper the growth aspirations of defense hawks, but industry should be prepared to ramp up activity on behalf of the Defense Department now that the era of tough austerity is turning the corner.

Given the lack of new programs—and despite the slower-than-hoped-for near term budget increases—there are substantial business opportunities for the military primes (and the

sub-tiers such as printed circuit board fabricators and electronics contract manufacturers that support them) for upsides. The 2018 plus-up in the military budget will allow the services to shore up existing systems and foreign military sales (FMS) will continue to be robust.

Missile programs are a particular beneficiary. Modifications to missile systems will total \$898 million in fiscal 2018, \$267 million more than proposed last year and more than double the \$418 million allocated for missile system modifications in fiscal 2016.

Summarizing, it's time to patiently stay the course and let the budget processes unfold. Given all the actors on the world stage, it appears highly doubtful peace will be breaking out any time soon. Defense will soon be calling on industry to support our warfighters at accelerated levels and we need to be prepared to do our part in support of the many potential missions that are unfolding. **PCB**

## References

1. [BGOV200 Federal Industry Leaders 2016](#)



**John Vaughan** is vice president of sales and marketing at Zentech Manufacturing. To read past columns or to contact Vaughan, [click here](#).



**Brian Friel** is a leading federal contracts market analyst with two decades of experience analyzing the business of government. Prior to launching Nation Analytics, he was a senior contract analyst at Bloomberg Government, where he spearheaded IDIQ research and created the BGOV200 annual ranking of federal contractors.

## X-ray Eyes in the Sky

Researchers at UC Santa Barbara Professor Yasamin Mostofi's lab gave the first demonstration of 3D imaging of objects through walls using ordinary wireless signal. The technique, which involves two drones working in tandem, could

have a variety of applications, such as emergency search-and-rescue, archaeological discovery and structural monitoring.

"Our proposed approach has enabled unmanned aerial vehicles to image details through walls in 3D with only WiFi signals," said Mostofi, a professor of electrical and computer engineering. "This approach utilizes only WiFi RSSI measurements, does not require any prior measurements and does not need objects to move."

The proposed methodology and experimental results appeared in the Association for Computing Machinery/Institute of Electrical and Electronics Engineers International Conference on Informa-



tion Processing in Sensor Networks (IPSN).

In their experiment, two autonomous octocopters take off and fly outside an enclosed, four-sided brick house whose interior is unknown to the drones. While in flight, one cop-

ter continuously transmits a WiFi signal, the received power of which is measured by the other copter for 3D imaging.

After traversing a few proposed routes, the cop- ters utilize the imaging methodology developed by the researchers to reveal the area behind the walls and generate 3D high-resolution images of the objects inside. The 3D image closely matches the actual area.

"High-resolution 3D imaging through walls, such as brick walls or concrete walls, is very challenging, and the main motivation for the proposed approach," said Chitra R. Karanam, the lead Ph.D. student on the project.



## Strategies for Compliance with DoD Regulations Including ITAR and DFARS

by **Didrik Bech**  
ELMATICA

ITAR is usually the topic when compliance with DoD regulations is discussed. But what about DFARS? This article will examine strategies one can implement to ensure that one is compliant with all DoD regulations, by analysing internal and external factors in relation to procurement and compliance, and by asking the vital questions: what, how, where and to whom?

Governments regulate the import and export of defence-grade material and equipment, to ensure that their restrictions, laws and regulations are implemented and enforced. Governments and their domestic exporting companies are aware, educated, and receptive to ensuring that export compliance is implemented and documented in their compliance programs.

The challenge arises when the importing country has restrictions regarding compliance for the exporting country, and how the exporting companies in these countries can address these compliance demands in their local supply chain, consisting of domestic and foreign materials and components!

The largest actor on the global defence market is the United States Department of Defense (DoD). The DoD has imposed regulations regarding procurement, design, development and manufacturing. The most central regulations for DoD are described in the Federal Acquisition Regulations (FAR)<sup>[1]</sup>, Defense Federal Acquisition Regulations Supplement (DFARS)<sup>[2]</sup> and International Traffic in Arms Regulation (ITAR)<sup>[3]</sup>.

The logical deduction is that DoD regulations will affect most acquisitions and the question is hence, how does this affect your trade, when comparing DoD regulation with your national export regulation? A foreign state trading with DoD will in principle not be allowed any exemptions from these regulations except perhaps some elements regarding a country's privacy laws. Or putting it simply, if you do not abide by DoD regulations, then you will not be able to sell to or buy from the United States.

### Severe Consequences and No Excuses

A company supplying an article to a supply chain of a defence product, and particularly one purchased by the DoD, must be aware of the strict compliance DoD places on all exports

# A new set of rules for PCB production



Less process steps. CAM to etch in minutes instead of hours.  
Maximum yield. Minimal environmental impact. These are just a few  
of the PCB production rules that Lunaris has redefined.

We've put together a complete set of all the new rules  
made possible by Lunaris ...get yours today!

Download all the new rules:  
**The Official Lunaris Rulebook**

CLICK HERE TO DOWNLOAD



**mutracx**  
THE BETTER WAY

[www.mutracx.com](http://www.mutracx.com)



Figure 1: Defense regulations affect all, from product owners to end customers.

and imports. This irrespectively applies to all aspects of the trade, transaction and everybody is affected from the product owner, designer, sub-contractor by the compliance regulation of DoD as the end customer. The consequences can be severe; there are no excuses and one cannot simply claim that one did not know, as it is your responsibility to know.

Compliance management in the defence industry can be the defining factor between financial success and costly mistakes.

When procuring components, printed circuits or materials to the defence industry, there is no such thing as assuming or relying on questionable interpretations of rules and regulations. There is no option for shortcuts whether your supplier follows the regulations or not, and the costs of not properly examining what supply chain you are delivering to is far greater than the benefits of working faster.

As computer systems, XML files and purchasing entities are becoming more experienced and implementing stricter surveillance and control. One must assume that the frequency of non-compliant cases will increase and based on publicly available information, this seems to be the case.

## DoD Export and Import Regulations

If you are *buying from* the United States, ITAR export licensing regulates the control of export from the United States of certain military products, parts, components, materials and technology. The United States is presently selling to more than half the countries in the world and this affects many supply chains. There are also foreign companies who buy ITAR-regulated material for their own products and this will affect their domestic export control.

If you are selling to the United States, DFARS regulates all import to the United States of military goods and services. DFARS imposes requirements on U.S. government prime contractors and all lower tier subcontractors, regarding the

import of goods and services, profit margins, application of certain accounting principles, reporting requirements, terms of payment and provision of various representations and warranties.

## Why is everybody talking about ITAR, when we should be talking about DFARS?

DFARS Subpart 225.7 prohibits all procurement of PCBs from Mainland China. DFARS Subpart 225.10 and 225.003 states that foreign acquisition can only be conducted from NATO countries or allies of the United States. Any exemption from this regulation requires a deviation approval according to DFARS Subpart 201.4.

Why are we usually talking about ITAR when we should be talking more about DFARS? The first questions one should ask is, are you buying from or selling to the United States? In our experience, ITAR regulation is the most commonly known compliance regulation; however, a significant proportion of DoD foreign defence acquisitions is governed by DFARS regulation.

The question is then what strategy can one implement to ensure that one is compliant with

DoD regulations. A strategy of analysing internal and external factors in relation to procurement and compliance, can ensure that one is compliant. We shall examine this further in this article.

### Risk Analysis for Procurement and Sale Opportunities (Internal Factors)

When procurement issues a request for quotation (RFQ) for an article to the defence industry, there is a minimum of internal factors one should consider. These internal factors shall regulate and assist the purchaser, to determine the correct supplier of an article in relation to aspects such as compliance, reliability, future possibilities and costs.

Here are some examples of questions one could/should address when examining these factors in relation to your procurement and supply chain. The questions will differentiate depending on your supply chain, but the factors you should analyse are minimum the ones listed above:

#### Who is the product owner?

- If it is DoD and you are a foreign company, then you can be subject to ITAR or DFARS – Consequently, where are you allowed to purchase?
- If it is a company from a sanctioned country, then you need approval from the proper authorities before commencing

#### Who is the end customer?

- If it is DoD and you are a foreign company, then you can be subject to ITAR or DFARS – Consequently, where are you allowed to purchase?
- Where are you purchasing and what end user license does your foreign supplier request and is this a challenge?
- If it is a company from a sanctioned country, then you need approval from the proper authorities before commencing



## Risk Analysis for procurement



Figure 2: By asking what, how, where and to whom, one can ensure that the right regulations are followed.

#### Capabilities/Certifications Technology?

- How advanced is the article you wish to procure?
- How many suppliers can facilitate this technology?
- If few can and it is very advanced one should qualify several suppliers in prototype stage to minimize the risk of disruption to the supply chain, obsolete parts and potential future requalification costs

#### Regulations

- Is your supplier based in a country where one can expect a change or new regulations in the near future?
- How can this affect your supply chain and should you approve suppliers from different countries to minimize the risk?

#### Requalification Costs

- What is the general likelihood that one due to internal or external reasons will need to requalify?
- Has your development department already

ordered and approved prototypes, which will be difficult to find, expensive to buy or from countries not accepted by a potential End Customer?

- What is the cost of this requalification?
- Which measures can be put in place to reduce this risk?

### Expected Lifecycle

- What is the expected life cycle of this product?
- What is the future probability of obsolete materials to this product?
- What can you do to reduce your future risks in relation to a long life cycle?

### Documentation

- How have you stored information, drawings, agreements, manufacturing specification and compliance documents for the future?
- How can you document and trace all aspects of the commercial and manufacturing process in relation to ITAR, for example?

### Risk Analysis for Requalification of an Article (External Factors)

An external factor analysis will at minimum detect the following external factors one should consider when selecting a supplier for an article. Procurement should be aware of their external factors and how to minimize risk and costs for every article in their bill of material (BOM). It is essential to establish a strategy for selecting the right supplier and determine when and how one should address external risk. This is a prerequisite to minimize the chance of an unwanted situation where one must requalify an article at a high cost, with a disruption to your supply chain.

#### Supplier Bankruptcy

Examine the financial records, ownership structure and investment plans of your suppliers. This will decrease the risk of unwanted supplier closure.

#### New End Customer

The DFARS regulation is complex, applicable and important for all parts of the supply chain.

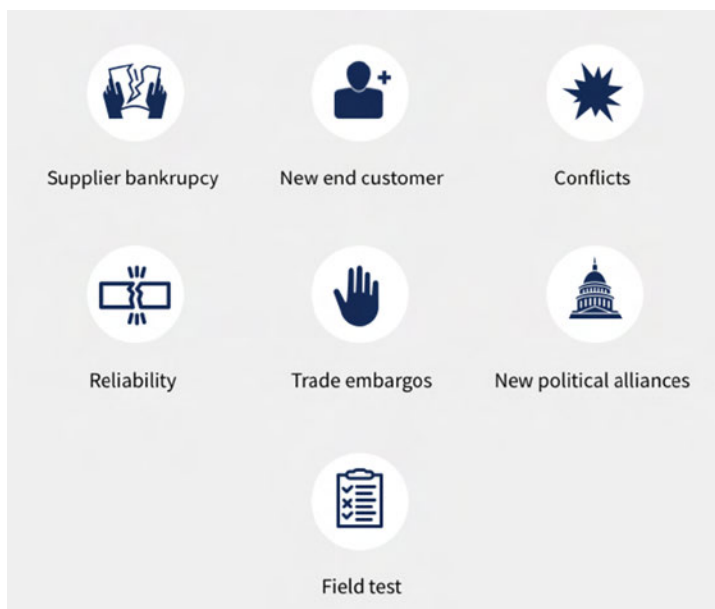


Figure 3: An external factor analysis will, at minimum, detect the following external factors one should consider when selecting a supplier for an article.

The product owner in a foreign state should consider who the end customers conceivably could be early in the development process of a new product, as this dictates requirements for the supply chain at a much later stage.

#### Conflicts

Select suppliers from NATO countries or countries with an defence alliance agreement with the U.S.

#### Reliability

Conduct onsite audits, both planned and unplanned, with competent and experienced personnel for the article you are procuring. Knowledge and experience of the manufacturing process and techniques is vital for determining the reliability you can expect from the supplier. One should not resort to “textbook standardized audits” as this will in most cases not detect a potential manufacturing challenge.

#### Trade Embargos

The U.S. government provides information regarding countries you cannot do trade with.



**PCB** systems  
**FORUM**

ACCELERATING SMART INNOVATION FOR PCB SYSTEMS DESIGN

# FIND A LOCATION NEAR YOU

INCREASING DESIGN COMPLEXITY. GROWING GLOBAL MARKET PRESSURES. GREATER DEMANDS FOR MORE DIFFERENTIATED, RELIABLE PRODUCTS. FOR CREATORS OF ELECTRONIC PRODUCTS, IT CAN BE CHALLENGING TO KEEP UP WITH CONSTANT INDUSTRY CHANGES. BUT WHY ADAPT WHEN YOU CAN BE THE DRIVER OF CHANGE?

THIS YEAR, MENTOR GRAPHICS HOSTS A GLOBAL PCB FORUM THAT EXPLORES HOW ORGANIZATIONS CAN ACCELERATE SMART INNOVATION, PUTTING THEMSELVES AHEAD OF THE CURVE IN PCB SYSTEMS DESIGN.

[WWW.MENTOR.COM/PCB-FORUM](http://WWW.MENTOR.COM/PCB-FORUM)

**Mentor**<sup>®</sup>  
A Siemens Business

### New Political Alliances

As defence projects can last over many decades, it is wise to consider the political landscape. Conducting business with NATO countries and U.S. allies is a sound strategy.

### Field Test

Some products such as missiles require extensive field tests. The more rigid testing a requalification of an article requires, the more careful one should be regarding selection of the supplier.

### Risks and Implications of Failing to Comply with DoD Regulations

DoD requires that a clause mandating strict compliance with U.S. export and import control laws and regulations is included in all DoD solicitations and contracts, including contracts between prime contractors and sub-contractors. This requirement highlights the importance of close communication with your manufacturers and sub-suppliers down to the tiniest part of your products to ensure compliance.

DFARS Subpart 225.7 prohibits all procurement from Mainland China. DFARS Subpart 225.10 and 225.003 states that foreign acquisition can only be conducted from NATO countries or allies of the United States. Any exemption from this regulation requires a deviation approval according to DFARS Subpart 201.4.

FAR, DFARS and ITAR specifically relate to defense programs of the U.S. government. The consequences of not following the regulations are severe. Violations of the U.S. export control laws may lead to civil and criminal penalties of up to \$1 million, or twice the value of a transaction, imprisonment, administrative penalties and suspension or debarment from U.S. government contracting.

### The What, How, Where and to Whom

What can you do to ensure compliance? Initiate all development projects by determining the internal and external factors and implementing a strategy regarding standardizing a compliance document for the project. The document should follow the product and the

BOM from development to mass production. Put simply, if you ensure compliance for all the articles entering your supply chain, then you will automatically have compliance for all the products leaving your supply chain. Ensure that all new products consist of components from DoD approved countries as this will significantly decrease your total cost, reduce administration and provide your sales force with access to the United States defence market.

Transparency, compliance methodology and clear communication with your partners, ensures that correct information regarding what, how, where and to whom articles are produced and delivered, are addressed. Identifying who the end customer can be will place restrictions on elements as country of origin for the parts necessary to build your product. As a general notice, one can state that buying from a NATO country is within all parameters. However, if your product consists of parts produced in China then you are subjecting the whole transaction to a variety of penalties from the United States.

You must know the country of origin down to the component, printed circuit or material level of your products and the BOM should encompass a country of origin for every article. Otherwise, you risk not only jeopardising your customer's business being banned from delivering to the U.S market, but substantial penalties to your own company. **PCB**

### References

1. [Federal Acquisition Regulations](#)
2. [Defense Federal Acquisition Regulations Supplement](#)
3. [International Traffic in Arms Regulation](#)



**Didrik Bech** is CEO of printed circuit broker Elmatica. He can be reached by clicking [here](#).



# Experience the **BENEFITS**

OF JOINING THE INDUSTRY'S PREMIER ASSOCIATION

**IPC membership will expand  
your resources and influence  
in the electronics industry**

- One single-user download of each new or revised IPC standard
- Significant savings on IPC standards, publications, and training materials
- Special registration rates for IPC conferences and educational events, including IPC APEX EXPO
- Access to participate in, and receive IPC market research studies
- 24/7 online access to members-only resources

**[www.ipc.org/membership](http://www.ipc.org/membership)**



# Time to Show our Hand?

by Marc Ladle  
VIKING TEST LTD.

It can be quite tough to satisfy the product requirements of the military and aviation industries, and rightly so. There are not many other parts that we manufacture that could result in a life-threatening situation should they fail when they are in use.

Once a product has been qualified, the process route may leave very little room for maneuver. The nature of many of these products is that they may have a long life-cycle so these restrictions can make process changes very difficult.

Some processes such as tin-lead solder have had to be maintained just for this type of application and there are no signs that the requirement is going to disappear soon.

For fabricators, this puts them in quite a difficult position. If they want to be able to compete for this type of work, they must maintain a process or multiple processes that may only

be called into action when there are military or aerospace boards in manufacture. Real estate inside the factory is expensive so this is a big ask for any company.

There is also a large time commitment to manufacturing these products. The maintenance of the approvals and the inspection and testing which relate to these circuits mean that many working hours are required, regardless of whether you make one batch of boards or one hundred. To make things worse, there is never any guarantee that you will get the contract. You can commit 100% to meeting the required standards and still fail to get a single order.

I have spent plenty of time working directly in bare board fabrication plants—enough time to know that the salesmen have a tough job to do. They have targets to meet and sales is a competitive sport. If your profit margins are too large you will never get the order! To some ex-



# Universal Direct Image Solder Mask

Established in production on a wide variety  
of direct image machines including:

- Chime Ball Technology
- Ledia
- Limata
- Miva
- Orbotech
- Diamond™, Nuvogo™ & Paragon™
- Schmol Maschinen

[www.electrapolymers.com](http://www.electrapolymers.com)



**ELECTRA**

## EMP110 DI

Liquid Photoimageable  
Soldermask for Direct  
Imaging.

"The exposure speed of the EMP110 DI coloured soldermask versus the fine feature capability was perfect for our production needs"

*Intec tiv, Slovenia - Schmol MDI*

"Electra EMP110 DI has been widely accepted by Amphenol Invotec's blue chip customer base and going forward Amphenol Invotec will look to EMP110 DI to be the soldermask of choice"

*Amphenol Invotec, UK - Ucamco Ledia SD-53*

"Electra's optimised soldermask exceeded expectation in quality, cosmetics and speed on the Nuvogo™ 800 DI system at Print Electronics."

*Print Electronics, Israel - Orbotech Nuvogo™*

"Electra EMP110 DI solder mask passed all requirements of our extensive testing process, including Cogra's fine line requirements and fast exposure speed to meet our quick turnaround production"

*Cogra Pro AB, Sweden – Miva 2605L Duo*

"The versatility and reliability of the EMP110 DI to run on our 3 direct imaging machines gives us the flexibility needed for our specialist PCB's"

*Stevenage Circuits Ltd, UK – Limata UV-R, Orbotech Nuvogo™ and Paragon™*

"Cipsa circuits extensively tested and approved Electra EMP110 Direct Image soldermask for use with the Nuvogo 780 system, thanks to its fast exposure and fine resolution capabilities."

*Cipsa Circuits, Spain - Orbotech Nuvogo™*

tent the same is true when manufacturing mil/aero products. When the salesman delivers the quote, it is critical that he understands the extra commitment and time which will be demanded to manufacture these products.

I am not directly involved in this process anymore so I feel reasonably comfortable suggesting that, as an industry, we need a more joint approach to the whole process. We are all in business to make a reasonable profit. I think all too often it is easy to lose sight of the actual costs of manufacturing occasional batches of special boards. You may be competing against a company who have not considered the whole picture when they have put forward their quote. Even worse, with the buyer dangling the carrot of future batches and related projects, loss leaders and special prices may hit the table. In the long term, it is impossible to compete against this type of approach—nobody wins. The buyer gets a very false impression of the true cost of their boards. It is simply not sustainable.

I would not usually be the person to suggest that extra red tape be added to the process, but in this case perhaps it could help. The manufacturing standards for these products are very detailed and each important process must be carried out in a way that is approved and assures the quality of the end product.

Why not have a detailed standard for the purchase cycle? An approved method for the calculation of process costs and inclusion of the detailed costs for the inspection and verification processes. Putting these prices forwards as an open book to the buyer. What would I propose in return? A reasonable specified profit margin which reflects the effort and commit-

ment put in by the fabricator. Only with this type of open policy is it possible for the buyer to understand if a pricing model is sustainable and correctly calculated. Then we can truly compete on a level playing field.

Particularly for the military applications, I feel quite strongly that we should be supportive as an industry to make sure they have access to products manufactured to the very best of our ability. The nature of conflicts around the world is changing and there is ever more reliance on specialised electronics to keep both military personnel and civilians safe.

My perspective has changed as I have gotten older. As a teenager, I had friends who joined the UK armed forces. Some of them joined the elite Royal Marines and Paratroop regiments. At the time, I respected the physical commitment they gave to their job. As my children have grown up and some of their friends joined the armed forces I feel I understand better the nature of the job they are doing for their country. Young men and women who are prepared to make huge sacrifices to protect the innocent. I may not agree with the politics involved but I absolutely support every member of our military who is prepared to offer their service and potentially their life for our benefit. If we can improve our service to them, we must! **PCB**



**Marc Ladle** is director at Viking Test Ltd. To contact him or to read past columns, [click here](#).

## Smart Quadcopters Find their Way without Human Help or GPS

Phase 1 of DARPA's Fast Lightweight Autonomy (FLA) program concluded recently following a series of obstacle-course flight tests in central Florida. Over four days, three teams of DARPA-supported researchers huddled in the sweltering Florida sun, fine-tuning their sensor-laden quadcopter unmanned



aerial vehicles (UAVs) during the intervals between increasingly difficult runs.

DARPA's FLA program is advancing technology to enable small unmanned quadcopters to fly autonomously through cluttered buildings and obstacle-strewn environments at speeds up to 45 mph, using onboard cameras and sensors as "eyes" and smart algorithms to navigate.

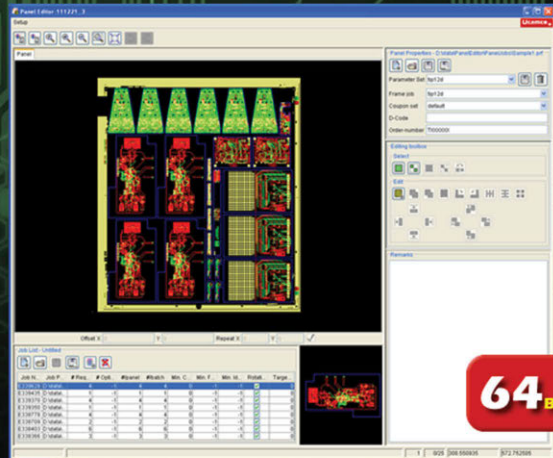
Software

# Multi Job Panelizer

High-yield multi-job panel generation made easy ...

- Combines different PCBs into a production panel
- Optimizes material utilization
- Reduces material costs
- Interactive or 24/7 automated operation
- Hotlinkable to ERP or Planning systems

[Read more](#) →



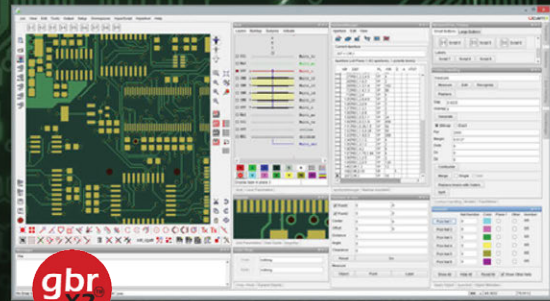
Software

# UcamX

New ground-breaking CAM Software

- For Rigid, Flex and HDI PCBs
- New Graphical User Interface with Workspaces
- Optimal performance using Parallel Processing
- Multi Job Processing via load balanced Sessions
- Support for Gerber version 2 (X2) format

[Read more](#) →



64 Bit

Multi Core

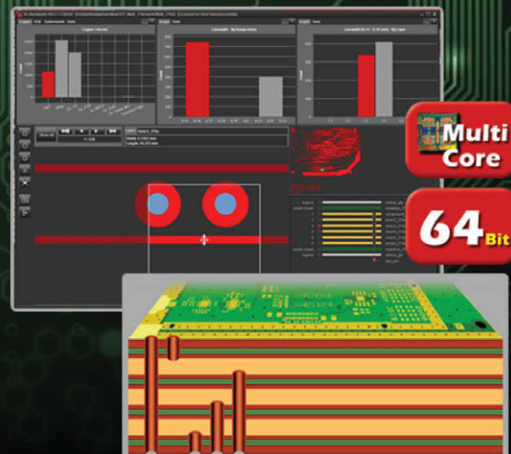
Software

# Integr8tor

Automated data entry and design analysis

- Ucamco's 9th Generation Sales & Engineering Tool
- Field proven with more than 250 installations in daily production
- Seamless integration into any environment

[Read more](#) →



## **Flying Probe Testing vs IPC-9252B**

Flying probe testing is extremely popular in today's manufacturing theatres. The main factor is cost reduction in contrast to dedicated fixtures and fixture testing. However, there are some limitations in flying probe testing when gauged against industry specifications—specifically, the use of indirect vs direct testing in Test Level C.

## **A Twist on Printed Electronics: Printing on 3D Shapes**

Barry Matties speaks with Optomec's Pascal Pierra about their LENS printer systems and aerosol jet technology, which allows manufacturers to print applications like sensors and antennas on 3D objects. The process is significantly faster and greener than competing technologies.

## **Intrinsiq Materials and NovaCentrix Unveil Ultra-Thin Printed Copper-Clad Polyimide using Photonic Sintering for HDI Applications**

Intrinsiq Materials has partnered with NovaCentrix to create a high-performance, low-cost, copper-clad polyimide without the use of adhesives or time-consuming sputtering. These thin layers cannot be produced by traditional lamination processes.

## **Amphenol Invotec Invests in Dynachem Lamination Technology**

Amphenol Invotec has installed a state-of-the-art Dynachem inner-layer dry film lamination line capable of handling 25 micron cores.

## **Meyer Burger Supplies CONx Microfab R&D and Pilot Production System at NextFlex**

Meyer Burger, in partnership with DuPont, Eastman Chemical and Intrinsiq Materials, is delivering a CONx Microfab cluster tool that includes two PiXDRO IP410 inkjet printing systems, a FLEXT PECVD deposition system, automation, and on-board metrology that will enable multilayer, multi-material additive depositions for complex FHE structures.

## **Rogers Launches HeatSORB Thermal Management Material**

Rogers Corporation is pleased to announce the introduction of HeatSORB, a proprietary phase change material that addresses thermal management challenges in portable electronics. HeatSORB is a unique material capable of consistently absorbing large amounts of heat within a very specific temperature window.

## **Uyemura Expands US Pacific Rim Service Capacity**

Jose Alonzo Garcia is Uyemura's new technical service engineer for a key territory that includes Northern California, Washington, and Oregon. The appointment was formalized May 8 by Uyemura Vice President Don Gudeczauskas.

## **Ventec International Expands UK Clean-Room Manufacturing Capacity**

Ventec International Group is upgrading the fabrication capability and capacity at its United Kingdom facility with an investment in a new state-of-the-art equipment for copper foil cutting in a Class 10,000 (ISO 7) clean-room environment.

## **Engineers Develop Innovative Direct Patterning Plating Technology**

This technology does not require a vacuum environment or photoresist, and can directly form low-resistance fine wires on a variety of materials using a low-temperature process that can be performed at or below 100°C.

## **Random Thoughts on Employment, from Both Sides of the Table...**

Many years ago, as I began my senior year of college, the reality of getting a job slapped me in the face! After three years of college studies, it dawned on me that without a job after graduation, all my hard work would have been for naught. Luckily, my university had a solid interview/job program that helped me and many of my fellow undergrads find gainful employment upon graduation the following spring.



# WET PROCESS LINE



***Etchers***



***Scrubbers***



***Developers***



***PTH***



***Oxide Replacement***

**THIN CORE HANDLING • PC CONTROL • RELIABLE • LOW COST**

**CLICK TO VIEW OUR UCE WET PROCESS LINE**



**The leading European PCB Equipment and Parts Supplier**

**www.vikingtest.com**  
**sales@vikingtest.com**





# Mil/Aero Electronics Supply Chain Facing New Challenges

**by Stephen Las Marias**  
I-CONNECT007

For this month's issue of our publications at I-Connect007, we invited a sampling of professionals whose experience centers on the electronics industry in the military and aerospace world, including experts from design, PCB manufacturing, and the assembly arena to sit down with us for a frank discussion. Joining us were Freedom CAD's COO Scott Miller; Lenthor Engineering VP of Sales/Engineering John Rolle and VP of Marketing Dave Moody; and Zentech's CEO and President Matt Turpin and VP John Vaughan.

Our discussion centered on the challenges associated with military work, including the new regulatory requirements for cybersecurity, dealing with leaded vs. lead-free components, and the differences and similarities with the commercial world.

The discussion started on the PCB design perspective, whether the challenges are more technical or more centered on the administrative side, such as on regulations.

"I can tell you from our perspective, this year and going forward, the rules of engagement have really begun to change because of cybersecurity, and that's having a huge impact on the engineering services community—how to comply with cybersecurity requirements that are now being mandated to us as external suppliers," explained Freedom CAD's Miller. "It's something we're spending a lot of time on. We've got work to do. We are ITAR-compliant, but cybersecurity compliance is a far deeper level of compliance than ITAR information management. That's huge. We're engaging with a consultant to help us understand how we can fulfill those requirements. And I think that's going to be a game changer for a lot of the smaller companies that currently participate in the mil/aerospace marketplace, because there are some serious costs associated with cybersecurity management.

"It's a year-end objective. They want to have a supply base compliant, or at least have identified where the holes are, the weaknesses are, as far as we can tell, but there's a huge impact. Assuming we overcome and address that, the

*Delivering the highest  
quality standard for  
aerospace & defense*  
**Fully certified  
AS9100 Rev C**



**ventec**  
INTERNATIONAL GROUP  
騰輝電子



Do you manufacture PCBs for the aviation, space and defense industries? With Ventec's AS9100 Rev C certification, you can rely on our fully accredited supply chain for high reliability laminates and pre-pregs.

From manufacture through fabrication and delivery, Ventec's high quality product portfolio of polyimides, high reliability FR4 and our latest 'tec-speed' range of high speed/low loss materials are all covered by the accreditation.

**Ventec - your strategic partner  
for safety critical supply chains**

**Ventec International Group**

179 Ward Hill Ave,  
Ward Hill, MA 01835,  
United States

**T:** 978-521-9700

**E:** [ordersCA@ventec-usa.com](mailto:ordersCA@ventec-usa.com)

**Follow @VentecLaminates**

[www.ventec laminates.com](http://www.ventec laminates.com)

other thing that has been kind of a mystery, and I'm sure everybody along the path sees this, is the defense budget, the DoD or Homeland Security, or whatever—any kind of government program—the defense budgets and understanding how the administrative change is going to slow down. Obviously, it looks like there's going to be more spending in that area, but it's not clear. Getting accurate forecast information or project information is difficult to do. We do our best to try to communicate with the customer and the subcontractor, etc., but they can only tell you so much because they only know so much.

Miller said that as the device types continue to get smaller and pin pitches get tighter, meeting traditional Class 3 requirements becomes increasingly difficult. "You can't meet Class 3 in certain applications, so you're consistently asking for a deviation or a waiver. Just because of the physics involved, you just can't physically meet Class 3 in some cases. And if it's a rigid requirement, then you have to work with the customer's engineers to fit the components that will allow you to meet that. From the standpoint of technology and architecture, we do things that are just as challenging in mil/aerospace, with fine lines and impedance matching, etc., that drive the consumer commercial world as well. From a technology standpoint, I don't think there's that big a gap in terms of what we're seeing as design requirements. It's been interesting to see how the government and the IRAD<sup>[1]</sup> product development drives a lot of new technology as the government subcontractors try to figure out how to do things to differentiate their capabilities, and that kind of flows into the consumer world eventually, and vice versa; the commercial consumer world is developing technologies that are now being adopted readily in the mil/aerospace."

Lenthor's Moody next explained the challenges from a PCB fabricator's viewpoint. "There are a couple, though John might have some different perspectives from an engineering standpoint. The requirements in the mil/aero defense industry are mirroring what is available everywhere else. The perception that there are cost advantages or margin advantages for fabricators to work in the military industry are going away



Scott Miller, Freedom CAD.

and have been disappearing for quite some time. There's a demand from a business standpoint on their end to buy more smartly—and better. So, the days where everybody thought, 'I'm going to participate in this military business because I can make more money at it' are kind of gone. There is a protection, to some degree, for the domestic fabricators because of ITAR content, so that remains as a competitive advantage on the business side for companies, domestically, who are trying to do business in this industry. But it is from the other aspects, such as design requirements, delivery requirements, etc."

Rolle added, "It's certainly challenging from a business perspective, because the expectation is to be competitive and then to continue to reduce that pricing. At the macro level, more dollars are being spent all the time. I'll build off what you were talking about earlier. Will it play down even to the fab level, where even if you're successfully participating in a contract with really good schedule performance and very low defects, the expectation is that costs will reduce if you want to entertain the next bid on the contract? I think in some cases those contracts are summarily rejected if you came back to the same price. So, I think that's the challenge. I don't know that it is different from other large programs in other industries. However, I just want to add on to what Dave was saying, that our experience has been a difficult one."

According to Rolle, another challenge when it comes to engineering and tooling perspective,

are the drawings with existing requirements.

"You're trying to comply with the drawing and you'll have situations, like you were mentioning. You have to get a waiver, to do something differently, or something's very cost-prohibitive due to an impact to yields. Getting changes through is always one of the supreme challenges. Even in cases where you provide a good service and your customer agrees to what you're requesting, often there's no funding in the program to pay for your engineering change. We've come across that recently where we all agree with this, it makes a lot of sense, and it's going to help you reduce costs, but nobody's going to pay you any money to fix that. Or cases where it does go through, but the length of time it takes to go through automatically puts the entire program on schedule jeopardy and puts immense pressure on the entire supply chain to perform to levels that maybe are unreasonable or difficult to come out looking good, when really you were just trying to do the right thing and build to print or reduce costs," he said. "Those are some challenges as well. I've seen many cases where jobs go on hold for three months, and then of course everyone needs it tomorrow. And I certainly understand that, no matter who that customer is. Everyone is making a product, and we're all feeding upwards towards some goal, and you can't recover that lost time. I'd say to Dave's point, there are certainly business challenges with that. I think change management, where it changes, and their impact on the overall schedule is also a challenge that's worth noting."

From an EMS standpoint, Zentech's Turpin also mentioned the need to comply with the new cybersecurity rules. "The NIST 800-171<sup>[2]</sup> guidelines are complex. It's night and day. ITAR is really nothing compared to the cyber rules. Complying with ITAR would be maybe a three, and to comply with the NIST 800-171 is more like an 83. It's orders of magnitude more complex and we've been working on it, and we already had a head start. We started about three years ago down this path, but the NIST 800-171 is formidable and it's being driven at us as flow-downs from all the military primes. Fortunately, it doesn't have to kick in now, but soon everybody is going to have to do it," he said. "To

the earlier point about the military being more commercial in terms of pricing, this NIST 800-171 is going to be an unbelievable barrier to entry. I don't know how a lot of people are going to have the infrastructure and the capability to comply with it. They're either going to have to close their eyes when they self-certify, or they're just going to be completely non-compliant and hope it will go away. NIST 800-171 is huge, and I'm surprised a lot of people aren't talking about it yet. That will be a big challenge. We're doing pretty good. We should be compliant before the end of this year."

Regarding how long it takes to go through that compliance process, Turpin said it depends on how mature the organization is. "For us, we currently have only two sites, and we're getting ready to add a third. If you are a multi-site organization, or you've got the challenge that Scott does in terms of kind of a virtual organization, it's unbelievably difficult because very specific hardware issues must be dealt with. I can't even begin to talk about it. I mean, I've got a whole team that's dealing just with this compliance."

But isn't this industry overregulated already? Absolutely not, according to Turpin. He said that there is such a disparity in terms of the due diligence the companies in the mil/aero-space undertake, and it's absolutely needed.



John Rolle, Lenthor Engineering.

“What a lot of companies do that I’ve seen, that we’ve audited, it’s almost criminal the lack of protections they have, relative to firewall, file security, data security, who they send files to, how they store stuff. It’s absolutely needed,” he stressed.

### Feedback System

Is there a feedback system in place between the suppliers, fabricators, assemblers, and customers in the mil/aero industry?

“From the Zentech side, 98% of everything we do is turnkey, build to print, complex assembly. We buy all the materials, we build it, we integrate it, we test it, we’ll ESS<sup>[3]</sup> it and then ship it off. We’re almost exclusively working with a design that somebody else has put together. Sometimes it’s ours, but 98% of the time it’s somebody else’s design,” Turpin answered.

For Freedom CAD, Miller said there’s not much process deviation between the commercial and the mil/aerospace world, in that they work closely with the board fabricators. “So much of what we design today is impedance-controlled or specialty materials. When we start the design process, we go and at least work with either the OEM themselves, who are the conduit to their fabricator, or with their fabricator to get a stack-up and make sure that it’s manu-

facturable from their perspective, and going to meet the impedance and current-carrying capability or requirements that are defined in the statement of work,” Miller explained. “From a process standpoint, we treat the process of design the same, whether it’s consumer or commercial product or a military product. We have pretty rigid processes for placement sign-off, critical routing sign-off, and then for final package sign-offs. As we go down the process, we’re trying to get as detailed a review from the customer as we can during the design process. And I know anybody that’s in the design community understands ‘as I can’ as a statement because you have companies that say they review it. And you get further down the design pipe and you’ve now got things connected, and they come back and say, ‘Oh, by the way, we need to move this component to the top of the board. We’ve got to change this or that.’ So, you think you have something that’s been signed off and approved, but in reality, until the product ships, it’s a moving target.”

### Lead-free Issues Remain

The electronics manufacturing industry may have transitioned to lead-free years ago, but the mil/aerospace industry is exempted from RoHS due to reliability issues. Electronics assembly providers working in such markets face the difficulty of sourcing advanced components in non-RoHS compliant configurations.

According to Turpin, the leaded requirements for technology have become a lot more difficult to design in for one part, and then have become a challenge because it’s harder to get the parts, it’s more expensive, and the lead times are different. “The military has tried to embrace some level of RoHS commercial-type products, but for the hardcore aerospace and space, it’s leaded,” he said.

Miller agrees. “That makes sense, and you guys have to deal with re-dipping or re-balling components that aren’t leaded to meet that requirement. We tend to try to follow what the customer wants to have happen, but we’ll point out to them if we see a problem—something that’s going to impact manufacturability downstream.”

“From the EMS perspective, there are really



Matt Turpin, Zentech.

two interrelated challenges and a lot of it does relate to lead. One is that all DoD stuff has embraced this concept of affordability and tried to drive affordability. I think some it's their own internal marketing to the government. But this concept of affordability falls down when you get to things like high reliability and leaded parts, where having new technology parts reballed, re-dipped, and re-tinned adds cost and lead time to everything. And then you overlay that with an environment that is really IDIQ-driven [indefinite delivery/indefinite quantity] to where, even though everybody knows that the government's going to buy 200–400 units over X number of years, they will only buy 20, 40, or maybe 50 at a time because of the way the IDIQs work and other things. It leads to something compressed more than they need to be, and pricing that's higher than it otherwise should be," explained Turpin. "The other thing was obsolete components. Generally, it takes so long to bring something to market, particularly in the aerospace side that by the time it really starts to get past the IDIQ level into MRL level 4<sup>[4]</sup>, a lot of the components are already becoming obsolete. That creates a whole new challenge in terms of building parts affordably, quickly, and in a way that the customer likes."

"I would completely agree with that," said Rolle. "One thing that we see happening as a result of that is you will have some products with multiple plating finishes on them because of the selections that are made upstream for all those reasons. And I sometimes see that drives complexity and makes manufacturing plans or parts more challenging if you're doing HASL, ENIG, or something like that. I've seen several instances where we really have to figure out if that's the way to make the part because of those types of decisions, or limits of those decisions that are made upstream as well."

### Business Expected to Increase

With the new administration in office, there's been talk of additional military spending. But has this translated to increase in business? Lenthor's Rolle said no, at least not yet. "I think you see election-year business cycles where in some cases the overall fear of spending, even for programs that are funded, gets people very tep-



John Vaughan, Zentech.

id, reticent to go ahead and spur that funding. They kind of wait and see where the chips lay. I think this was already mentioned, that the proposal was for a 10% increase in the defense budget, but really what that means to this segment of the market is not clear yet. There's a lot of business for hardware that goes on a soldier or person, whether that be homeland defense, etc. Our customer base in the military market is expanding to police force, Homeland Security or ICE, things like that, whereas before it was traditionally just the Army, Navy and Marines," he explained. "I don't know that we've seen that come through yet. It looks like things are moving again, but I don't know if that's just because the calendar turned over and things are starting to pick up like normal or it's post-election."

On the other hand, Zentech's Turpin said they have seen an uptick since the election. "Almost twice the amount, I would say, in terms of what's been coming in, and it's all segments. Other people in our niche, EMS companies, are seeing similar things. I'd say, no question it's picked up. Now, that's just in terms of quotes. Last month was a really good month from a booking standpoint. It's probably too early to tell if they're turning into orders in a sustainable way, but from a quote activity, yes."

Vaughan explained, "It has a lot to do with the business model you put in place. For four or five years, we've been, what I call, politically

agnostic and bi-partisan at the same time. The administration changes are going to be beneficial, but what's more important is to look behind the curtain at the programs and focus on pursuing and obtaining a seat at the table on programs that are funded. There are 40+ pro-

“The administration changes are going to be beneficial, but what's more important is to look behind the curtain at the programs and focus on pursuing and obtaining a seat at the table on programs that are funded.”

grams that we're active with for now, all funded through 2022. Regarding the changes in the administration, and you just kind of peel through it, it starts with Trump, the China issue, North Korea, and the stated objective to pivot to the Pacific and increase our naval assets. Then you've got the CIA with Mike Pompeo, the new director, and that's highly focused on signals intelligence, which translates into a lot of higher technology, RF circuit builds and data collection. And General Mattis, Secretary of Defense, is a former commander in Iraq and at some point, with increased troops on the ground, that drives the IED defeat-and-detect market. Commander Kelly is the former commander of SOCOM (Special Operations Command). The administration is pro-military through and through and that certainly bodes well for those of us focused on the mil/aero/defense segments of the market. Then you roll all that together, coupled with a request in the DoD budget to increase it by 10%. That would take us back pre-sequestration levels and the appropriations dialogue should be complete by the end of this month. We should have a pretty clear picture of where the dollars are flowing soon. Again, from our viewpoint, it's been proactive planning and striving to pick the programs and pick the tech-

nologies that are going to be required to support whatever effort the administration decides to lean toward.”

### Towards Successful Partnership

When it comes to key criteria that OEMs should consider when evaluating an EMS partner for their mil/aerospace project, here's what Zentech's Turpin has to say:

“First and foremost, many of the mil/aero companies lack the funding and the time, and sometimes the expertise to properly qualify EMS companies. They have commodity buyers, and certifications are important. In our world, on the EMS side, obviously, the IPC has recently rolled out what they call a Validation Services QML (qualified manufacturers list) trusted source, which helps companies really understand that, not only does a company have a good quality management system, but they're able to produce good products. Zentech is one of maybe 10 companies in the U.S. with a trusted source process. Additionally, if you're a mil/aero company, you must make sure that the EMS company you deal with is ISO 9100 certified. Most EMS companies are not.

“I would say, separately, NIST 800-171 is also important, and I think it's going to be increasingly more important with all the cyber sensitivities out there. I'd say that would be one. Companies tend to focus on equipment, but any idiot with a dollar can buy equipment. It takes more than money to produce good products. What kind of processes and procedures do you have to operate equipment, solve problems for the customer and get it right.” **PCB**

### References

1. IRAD: Independent Research and Development. Government subcontractors use this term to identify when they are spending their own money on a project vs. fulfilling a government contract.
2. “Protecting Controlled Unclassified Information in Nonfederal Systems and Organizations, [NIST Special Publication SP.800-171 Rev1.pdf](#).”
3. Environmental stress screening test.
4. MRL: [Manufacturing Readiness Level](#).

# Get the spark you need to tune up your sales team.

When an engine doesn't fire on all cylinders,  
performance is limited. The same goes  
for your sales team. We provide  
the spark to get your  
sales to the next level  
...and beyond.



We've helped dozens  
of companies big and small  
improve their bottom line.



Learn how we can help YOU

☎ 207-649-0879    ✉ [danbbeaulie@aol.com](mailto:danbbeaulie@aol.com)

# Electronics Industry News

## Market Highlights



### **Growth Ahead for Flexible Hybrid Electronics Industry**

According to Zion Research, “global demand for the flexible electronics market was valued at \$5.13B in 2015 and is expected to generate revenue of \$16.5B by 2021, growing at a CAGR of slightly above 21% between 2016 and 2021.” Key elements of the market, in the view of most analysts, include flex displays, sensors, batteries, and memory.

### **Flex and Flex-Rigid Printed Circuits Market Analysis**

In the last few years, North America and Europe have benefitted by the overflowing demand for flex and flex-rigid printed circuits. In these regions, aerospace and military have been the backbone of their production of flex and flex-rigid printed with maximum consumption.

### **Global PCB Market Expected to Reach an Estimated \$72.6 Billion by 2022**

The future of the PCB market looks promising with opportunities in the communication, computer/peripheral, and automotive industries. The major drivers of growth for this market are the strong demand for smart phones and tablets along with growing automation in industries, such as automotive and aerospace & defense.

### **Walt Custer's Market Report**

At the recent EIPC Conference, Walt Custer delivered his annual report detailing the trends he's been seeing in the electronics industry for 2016 and into the first quarter of 2017. Barry Matties sat down with Walt to discuss his findings, including his forecast for the upcoming year. Also discussed are Walt's prognosis for the market segments with the most promise and those that cause him concern.

### **Weiner's World—May 2017**

China's central bank is effectively anchoring the yuan to the dollar, a policy twist that has helped stabilize the currency in a year of political transition and market jitters about China's economic management.

### **EPTE Newsletter: Mixed Sales Data for Taiwanese Circuit Board Industry**

Taiwan is the production center for global consumer electronics, and the circuit board production in Taiwan is considered the barometer for the electronics industry. Performance for most of the major printed circuit manufacturers in Taiwan is mixed; there are some bright signs, and there are some areas that need improvement.

### **Flexible PCB Market Industry Trends and Developments**

Flexible printed circuit boards are widely used in an array of electronic devices that have complex circuitry. Besides efficient interconnectivity solutions, flexible PCBs offer another benefit viz. reduced system maintenance. Compact in size, flexible PCBs also reduce the entire costs of interconnectivity solutions.

### **DKN Research Newsletter: JPCA Show a Positive Sign for Industry**

I recently attended the JPCA Show, the largest trade show event for the printed circuit industry. The size of the show was almost the same as last year, but there were significant changes to product lines from material suppliers. It seemed to me there was an increase in attendance, and almost everyone was there to get a glimpse of some new technology trends.

### **Virtual Reality Market to be Worth \$48.5B by 2025**

The global virtual reality (VR) market is expected to reach \$48.5 billion by 2025, according to a new report conducted by Grand View Research, Inc. VR technology based Gesture Tracking Devices (GTD) devices find commercial applications in high-performance computers and VR gaming applications.

### **IPC Releases PCB Industry Results for April 2017**

IPC announced today the April 2017 findings from its monthly North American Printed Circuit Board Statistical Program. Although sales continued below last year's levels, orders were up and the PCB book-to-bill ratio continued to climb, reaching 1.09.

SPECIAL COVERAGE



# IMPACT 2017

**IPC** IMPACT Washington, D.C. – May 1 - 3



image: Martin Falbisoner - Wikimedia

# IMPACT Washington, D.C. 2017: You Had to Be There!

Introduction by Patty Goldman

At every opportunity, I made it a point to tell everyone I came across that this was the year to attend IPC's IMPACT event in Washington, D.C.—and I was right. This was the year, as you will learn while reading what your colleagues who attended had to say. Apparently, the new administration managed to very quickly spread the word throughout the many government departments that manufacturing is a good thing—and it's about time.

U.S. senators and representatives, along with their staffs, seem to be scheduled very tightly with lunch often skipped to squeeze in more meetings with constituents and time on the congressional floors. Ditto for the numerous government bureaucrats (the non-political appointees who run the myriad departments). Despite that, IPC's Washington contingent managed to put together an outstanding program of speakers and meetings with the most significant departments of greatest interest to our industry. These included the Departments of Education, Defense and Commerce; the EPA, the White House, and numerous senators and congressmen. While occasionally staffers were the ones we met, more often it was the actual official—like Scott Pruitt, the new head of the EPA. (What? Talking with people from electronics manufacturing, one of the most heavily regulated industries and yeah, once upon a time, polluters? That never happened before.)

All in all, it was a very uplifting, exciting 2+ days, as anyone who attended will tell you and as you will read in this special section. Every person who spoke to us and with us had the same message: Tell us what you need. Tell



us how we can help you. Business and manufacturing is now respected as more and more people (inside and outside the government) come to the realization that real jobs are not created by government but by businesses and especially small businesses just like yours. We are no longer the enemy and no longer looked down upon. Our thoughts, opinions, and needs are being recognized.

Sorry you didn't go? You should be—it was truly a golden opportunity. But there are still things you can do. You can talk with your congressional representatives, you can send in comments to IPC, you can ask IPC to help you schedule site visits by your representatives, and you can visit government websites and learn more. I know dealing with government officials is often distasteful, but now is the time to make the leap and do it.

Of course, I talked with as many of our group as I could while at IMPACT. But this time I was also able to interview Congressman Bill Johnson (R-OH) from Ohio, who spoke at the Monday night kick-off dinner. Congressman Johnson is a true champion of our industry, in fact IPC presented him with an award at last year's IMPACT meeting. This was a great way to kick things off, as his words were all encouraging. Washington is not like what you read in the papers or see on TV.

I have put all the interviews in order so you can feel the progression through the meetings and events. I was not able to speak and record Congressman Johnson until a few weeks after the event, so I have placed him last in the lineup, but his remarks were very similar to what we heard then. **PCB**

# IMPACT INTERVIEWS

## Brad Heath VirTex

Near the end of the first full day of meetings I got a chance to talk with Brad Heath, president and CEO of the EMS company VirTex.

**Patty Goldman:** Brad, I understand this is your first IMPACT event. At the end of our first full day, what are your impressions?

**Brad Heath:** It's like drinking from a fire hose. It's a full day, with full sessions. Just very comprehensive.

**Goldman:** What did you think of this morning's speakers?

**Heath:** I thought they were great. They addressed all the different areas that really impact what we're doing. We had discussions with the Department of Education, the Department of Commerce, and the Department of Defense. It was truly impactful.

**Goldman:** I was impressed because they all said, "We need to hear from you." Every one of them said, "We want to hear from you. Here's what we can do. Here's how you can contact us."

**Heath:** We heard the same thing up at the EPA, where they said, "We need to make stuff move faster." We tell them the problem and they say, "Why did we do that? We need to consider why we put this regulation in place." If it doesn't impact [the environment], if it doesn't change anything, but you spend

a lot of time and effort doing paperwork for it, that doesn't make sense. It should only be applied to the people who need to go do it. For one example, they took the reporting level from

25,000 pounds down to 100 pounds. All types of people must report now, who didn't before.

They're looking at, "How can we do it differently?" Again, I hadn't been here before, but I've been really surprised by how receptive people from the different departments were—wanting to hear what the industry has to say, and wanting to understand our concerns, our needs, and how they can make a difference to help us create more jobs.

**Goldman:** I can understand a little bit better this morning why they were working with us, but with the EPA there certainly has been an adversarial attitude in the past.

**Heath:** You bet. What I've been told is that since the new administration came in, the time to get a meeting, the willingness to take meetings, and the willingness to do things, listen and move stuff forward, is just remarkably different.

**Goldman:** You know, I told a lot of people, "This is the year to go to IMPACT." This is the best opportunity to get our message across, with everybody so willing to listen, and almost begging for information.

**Heath:** Right. They're saying, "Here's my email, if you have ideas send me this information. We don't know enough about this. You need to send us the information you have so we can look at what we can do about it."

**Goldman:** I wanted to ask the fellow from commerce, if it made a difference to hear from individuals versus, say, IPC representing everybody. IPC represents the whole industry, but does it make a difference to hear from individuals? My guess is yes. The more individuals they hear from, the more companies they hear from and the bigger the impact.

**Heath:** I would guess that's probably especially true if they start hearing the same patterns and the same trends over and over from different individuals. Even though most of us in



Brad Heath

## IMPACT Interviews



Scott Pruitt greets Shane Whiteside.

the industry are doing similar things—companies are different sizes, in different locations—but the headaches we're dealing with are pretty much the same, like workforce development, skills gap, over-regulation, taxes, healthcare, all those things.

**Goldman:** Hearing it from all over the country has got to make an impression.

**Heath:** Yes. My guess is it's not the first time they've heard any of these issues pop up. They probably would hear it as they talk to other industries as well.

IPC will be presenting two awards tonight to senators.

**Goldman:** Excellent. We'll have two people from the Senate hearing from us and we'll be hearing from them. It's really a two-way street. You pick up a lot from them and we learn their views and a little inside info on the workings on the Hill.

**Heath:** Then tomorrow we're going to head to the Hill. Go pound the message into the Senate, I guess. We'll have some group sessions and then I'll stay over tomorrow afternoon and I'll have some meetings with individuals from Texas and Wisconsin, which is where we have our facilities.

**Goldman:** You'll be able to speak with both. That's wonderful.

**Heath:** That's the hope. That's what they (IPC staff) are trying to get set up.

**Goldman:** You can imagine all the other industry groups that are also pulling at them, which has got to make it tough for scheduling. That's why we don't always get to speak to the senators and representatives themselves.

**Heath:** That's so true. But it's amazing when you get them out into your facilities. Over the last four or five months now, we've had the staffers from several of our Congressmen's office come through our Texas and Wisconsin facilities. We had Congressman Michael McCaul come through the Austin facility. That was great—we're getting in front of them. When they come through and look at it they're saying, "We had no idea this is what electronics manufacturing was like." They had no clue.

**Goldman:** It's possible they've never been in manufacturing facility at all. They think it's going to be dirty and smelly and rough; manufacturing is a dirty word to them, I suppose.

**Heath:** Well, they see the pictures of the facilities where people are putting stuff down by hand. That's what they think you're doing.



Alexander Gray, special assistant to the president.

## IMPACT Interviews

**Goldman:** It's nice to show them something different.

**Heath:** But in manufacturing there's a big cross-section. It's Anglo, it's Hispanics, it's Asians, it's African-Americans, it's Indians, you name it. There's probably no broader cross-section of a workforce than the manufacturing workforce. It's extremely diverse. It's diverse in terms of age. It's diverse in terms of gender. It's diverse in terms of ethnicity. You name it, it's there in manufacturing.

**Goldman:** That's true—and manufacturing is a very broad term itself. It's ranges from somebody doing the same thing repeatedly to people who push buttons and oversee things being built. Big things happen. Anything else come to mind here?

**Heath:** Looking forward to tonight and Day Two. For as busy as today was, I'd just as soon go to my bed tonight, but I'm going to the dinner.

**Goldman:** Oh, you definitely want to go to dinner because there will be two senators who will be worth listening to. You want to hear from more than just your own Congressmen.

**Heath:** A day like this will wear you out, but it's worth doing. Somebody has got to do it.

**Goldman:** It is definitely worth it. These people seem to run from one thing to the other, though. Apparently, they're very tightly scheduled. They've got no extra time.

**Heath:** They seem to run from one appointment to another—and they do this every day.

**Goldman:** No wonder it's difficult to get things scheduled. IPC did a fantastic job getting people from Education, Commerce and DOD this morning and then the top guy at EPA and staffers from Pence's office this afternoon.

**Heath:** They did. It's a great town here [Washington, D.C.].

**Goldman:** Thank you so much for your time, Brad.

**Heath:** You bet. Absolutely. **PCB**

---

### Mikel Williams Targus

After meetings all day Tuesday, there was an awards dinner that evening. IPC presented awards to two senators. Before we got started, I chatted a few minutes with Mikel Williams, president and CEO of Targus.

**Patty Goldman:** Mikel, we've listened to a lot of speakers today, and I understand you guys had great afternoon. Tell me about your impressions.

**Williams:** Yes, we did and I have several. First, it seems as though with every year, IPC's IMPACT days get better and better. We're generally known as a standards organization. We're now gaining footing in public affairs, coming to Washington and trying to weigh in on public policy. The early days were a little rough; now we're much better. The staff does a great job organizing it, and we get great meetings.

It's clear that the administration is still settling in, but in fact, I had a little side meeting with somebody from the foreign affairs committee between the dinner here and the last one with Vice President Pence's staff, and I said, "You know, for the first time in a number of years you go into these meetings and you're not being treated like a bad, guilty business guy com-



Mikel Williams

## IMPACT Interviews

ing in.” This trip, the people we met with know we care about environmental and labor issues and things like that, which of course we do, and they’re actually trying to help us also improve our country’s economy and our businesses.

**Goldman:** And they’re asking for help from us, and information.

**Williams:** Yes, they want to help do things that will be good for our economy and good for jobs and everything else, so it’s refreshing this year, in that regard, although still early in the new administration’s term. Hopefully, a year from now, we’ll have healthcare, tax reform, and a bunch of other things, if not done, well in hand.

**Goldman:** I guess the other thing you learn is that nothing happens very fast in Washington—fortunately and unfortunately.

**Williams:** That’s true. Sometimes, getting it done in a hurry is not getting it done right.

**Goldman:** Of the speakers this morning, is there anybody in particular that stood out to you?

**Williams:** I thought all of them were good. I enjoyed Congressman Bill Johnson (R-OH) at dinner last night.

**Goldman:** He’s great to listen to.



Earl Comstock (left), Office of Policy & Strategic Planning.

**Williams:** He’s funny and yet also insightful and committed to our country. I remember calling on him when he had just won his first term, and I’ll say, as with IPC developing its presence and skills over time, so has he. He has done a very good job, and he is a very good spokesman for many of our causes. I’m happy to have him involved with our program and support us by coming out like that.

**Goldman:** Yes, he’s really supporting us. Mikel, thank you for the quick chat.

**Williams:** Thank you. **PCB**

## Tony Revier Uyemura

One of the best parts of IMPACT for me is meeting and getting to know people in our industry that I haven’t met before. While hors d’oeuvres were coming around before the Tuesday evening awards dinner, I found a quiet corner to talk with Uyemura USA President and CEO Tony Revier.

**Patty Goldman:** We’re nearing the end of the first day at IMPACT, and I want to get your impression of today, Tony.

**Revier:** I think it’s been terrific. This is my third event. I didn’t get to come last year; I had some other customer issues, but of the three I’ve come to, this is by far the best. This is really a great meeting, and I’ve met a lot of folks. Last night was great, listening and talking with congressman Bill Johnson from Ohio.

**Goldman:** Yes, he’s the best, one of our industry’s champions.

**Revier:** I’ve been coming to the Hill for about 20 years, not just with IPC, but also on the metal finishing industry, with the National Associa-

## IMPACT Interviews

tion for Surface Finishing (NASF). We do a legislative day once a year too. In all the years that I've come, it's nice now that people here are talking about manufacturing.

**Goldman:** Do you feel that is new this year?

**Revier:** Well, it's been coming, but now of course they're embracing it big time. We saw that certainly with having a chance to meet with Scott Pruitt, the head of the EPA. He's somebody we can talk to now.

**Goldman:** He's asking you for feedback, right? That must be new.

**Revier:** Absolutely. Before that, I can tell you, we're in a specialty chemical industry, so we know those guys quite well. When you talked about chemicals with those people in the past, they were not on the favorable side of things. You can see from Scott's point of view, he's very open to working with manufacturing, with industry, and really understanding what it is that we're trying to do and accomplish. One of those things that are holding us back is regulation and over-regulation. The problem is that so many of the people out there, regulators, media, etc., have no clue what we do and that we know how to handle the chemicals we use.

**Goldman:** We already have good regulations, but they keep upping the game.

**Revier:** Right, and if you look at our industry as a whole, near and dear to our heart is chemical processing, whether it's the copper plating process, electroless copper plating, ENIG, EN-EPiG, and everything related to that; we're in the chemical processing business. We're highly regulated on many different fronts, not just by the EPA. We're now involved with the DEA because of the sodium hypophosphite issues, which just kind of drives us crazy. Mainly because what we're selling is a liquid containing the sodium hypo, and they're all about the hypo material itself. We're not selling the raw hypo.

We're selling a mixture. In their infinite wisdom, when I talk to senior level people at the DEA, they agree with us that we should not have been included in the 2011 revamp of the ruling, but then they laugh and say, "But you are. Live with it."



Tony Revier

**Goldman:** They don't quite understand the additional burden. That means nothing to them.

**Revier:** No, they have no idea. I have to register all my facilities. If I have a warehouse (which has the product containing hypo), and no matter where in the U.S., I have to register with the DEA, get permits, and pay an annual fee. Ah, it's always about the money, right? Then, of course, we have TSCA rules and we have OSHA regulations, but it seems to me now, though, we have an administration that is willing to really talk about these things and how to possibly change things. How can we relieve some of the unnecessary burden on industry?

**Goldman:** Hopefully how we can improve it, without compromising any of the important things.

**Revier:** We always say, "Look, our families live in these areas. We've got children. We've got grandchildren, and we want to be able to provide clean air or clean water." I mean, it's just absurd when they look at it and say, "Oh, you guys, you just want to roll things back and pollute." We've made such great progress, and a lot of the things that have happened on wastewater treatment and cleaning up the environment is because our industry has been very proactive in that stance.

**Goldman:** I was really impressed by Kim Ford this morning. She was so enthusiastic.

## IMPACT Interviews

**Revier:** I was interested in listening to the new EPA chief, Scott Pruitt, but I was certainly impressed at beginning of the meeting with Kim Ford. I didn't expect much, but the way she went around to meet everybody at the beginning of her presentation, was cool.

**Goldman:** She shook everybody's hand and introduced herself to everyone present. Such enthusiasm, too.

**Revier:** She said really positive things about trying to understand our skill needs. What do we need from an educational standpoint? How do we get people where they need to be? It was very refreshing. She seemed very genuine about what she was talking about.

**Goldman:** Yes, her focus was: "Tell us what you need; let us help you." The website she talked about, the Perkins Collaborative Resource Network (PCRN), is easily found on Google. It popped right up for me ([cte.ed.gov](http://cte.ed.gov)). There is a lot of useful information on it.

**Revier:** Yes, it seemed very interesting. You know, by and large our industry is all about technology. If you look at our company, we're a more international corporation, and I've been with UIC now for 29 years. The reason I came here in the very beginning was about technology. Our parent company is in Japan. We still have, even to this day, 70 people involved in research and development. We just invested about \$70 million in a brand new central research facility in Hirakata, Japan. We are totally committed to technology for the future. I mean, it's all about what we do.

**Goldman:** It's in your blood, so to speak.

**Revier:** And it's what sets us apart too. We're all about technology. Where's it going? What are the customer needs? How do we advance the industry? At the same time, back in 1997, we made the commitment to set up our own technical development center in Southern Connect-



Robert Irie (right), Office of Undersecretary of Defense, with John Mitchell.

icut. That's our UIC tech center, where we can support customers with failure analysis and ordinary samples. We do pilot plating there as well and some development work. We are excited that we just recently received our first UIC developed patent. Also, we do some very precise, small-scale production there. Then we have blending facilities in other areas of North America.

**Goldman:** What made you choose Connecticut?

**Revier:** In 1992, we took over the precious metal plating product line from a company called Degussa. At that time, we had not been in that area of the plating industry. We had not been in precious metals, but we had a long relationship on several different avenues with Degussa, which is now called Umicore. We took on that challenge in '92, and we picked up a number of great people and a facility in Connecticut.

Later, we decided that we really needed to do more than that. We decided to build our own facility in Southington. We built it from the ground up; it's a 45,000 square-foot facility where we can do everything we really need

HOW HAS **pluritec**  
CONTINUE TO STAND  
THE TEST OF TIME FOR  
MORE THAN 47 YEARS?

**WE MAKE TIME FOR OUR CUSTOMERS.**



### **PLURICUT AUTOMATES 8 PROCESS STEPS!**

X-ray measure Inner layers, Optimize Data/Scaling & drill tooling, Flash Rout, Bevel Edges & Corners, Panel thickness measurement, Image Barcode or Readable text and Statistical Data collection.

**⌚ 8 PROCESS STEPS UNATTENDED > 2-3 MINUTES PER PANEL. TICK-TOCK!**

### **MULTISTATION – EVO AUTOMATES**

Onboard barcode reader manages multiple job data with scaling, vision alignment, tool management (1680+) for up to 18 panels/jobs per load.



**⌚ HOURS OF UNATTENDED 2ND/3RD OVERNIGHT OPERATION. TICK-TOCK!**



### **ECOSPRAY AUTOMATES**

Double-sided Mask/Legend coating of 4 different panels/jobs with 4 different currently used materials, tack cure and ready for imaging in 25 minutes!

**⌚ CONVERTING HOURS OF WAITING TO MINUTES. TICK-TOCK!**

Interested in making  
time and money?  
Click here. Tick-tock!



[www.pluritec.com](http://www.pluritec.com) | [info@pluritec.com](mailto:info@pluritec.com)

## IMPACT Interviews

to do, and we can expand it too, if the business warrants it.

**Goldman:** Well, we're looking forward to a lovely evening here, I think. How was the afternoon? The EPA was great, but how about everything else?

**Revier:** The EPA was great. Then our other meeting was near the White House with some very strategic people that work for President Trump. It just kind of continued the excitement with people that are engaged in manufacturing and regulatory issues that affect what we're doing. It's very clear from meeting with those guys this afternoon that they're committed to listening to our issues and acting on them.

**Goldman:** We'll see how that action part works.

**Revier:** We'll see. I think the challenge obviously for President Trump; he said it was a swamp, but I think that he's finding out that it's not like running a business where you can get things done.

**Goldman:** Exactly. I mean, you're the boss, but you're not the boss.

**Revier:** But you got to navigate the way.

**Goldman:** Like they said this morning, nothing really happens that fast in Washington.

**Revier:** No, and I'm sure it's frustrating for him.

**Goldman:** Yes, because you're right. He's used to doing things fast.

**Revier:** At the same time, he's learning his way; the exciting part of it is he's putting together the right people to get the job done. I think Mike Pence as his VP was a perfect choice, and I think they're a good pair. They work together as a great team. They seem to be very symbiotic that way. I hope that continues.

**Goldman:** Well, thanks Tony. Maybe we'll get a chance to talk again. Right now, we're going to eat our hors d'oeuvres.

**Revier:** Absolutely. **PCB**

### Shane Whiteside Summit Interconnect

During Tuesday night's dinner I also had a chance to talk with Shane Whiteside, Summit Interconnect's president and CEO.

**Goldman:** Shane, it's good to see you. Is this your first time at IMPACT?

**Whiteside:** This is my first IMPACT. I've missed it in previous years, but I'm very pleased to be here.

**Goldman:** Tell me what you've learned in the past day and a half, since arriving.

**Whiteside:** I've been impressed with how IPC has organized a very effective event, and I think that's not only my impression, but other attendees as well. The people that we've met today reflect the influence that IPC has gained in this town, from EPA administrator Scott Pruitt to one of Vice President Pence's senior advisors, Darius Meeks. It's just an incredible lineup here today and I think what was really gratifying to me is understanding how much the new administration is aligned with a promoting a very positive industrial policy.

**Goldman:** It seems everybody is aligning with that, shall we say, and quickly.

**Whiteside:** There is a lot of enthusiasm with respect to the potential resurgence of U.S. manu-



Shane Whiteside

## IMPACT Interviews

facturing. I think that a lot of the people that we met today represent not only new faces, but a new approach as well. The tone is much different, from what I understand, from previous eras. And we're very much looking forward to the support and the commitments that were made here today to create positive change in our industry.

**Goldman:** I'm going to put you on the spot a little bit. This morning, a couple of people, including Kim Ford and Robert Irie from the Department of Defense said, "Get back to us with information—with your needs." Are you going to act on anything?

**Whiteside:** I think Kim Ford's challenge was to get back to her department with what sort of educational needs we can articulate to IPC and their membership can support, or she can support. I think IPC has increased their focus on members' training needs and is in the best position to respond to Ms. Ford, we will continue to work with IPC in this area. And with the DoD's request, they've spent a lot of time assessing the electronics supply chain in the U.S. and they have a very pragmatic assessment of where the risks are in the supply chain. Where I am concerned about the supply chain is in bare printed circuit board manufacturing, and unfortunately the government's assessment is still "TBD." This is due to a 2016 Department of Commerce study that will take until November 2017 to get the results for and allow anyone to really develop an opinion on how to go forward.

**Goldman:** They presented some preliminary information in February at IPC's Executive Forum.

**Whiteside:** Yes, I saw that at the IPC APEX EXPO Executive Forum, but it was very preliminary and nobody could really tell us, "What does this mean? What are you going to do with this?" My message that I was able to communicate to some of the people we met today was that some of the most advanced printed circuit board technology being produced in the world today is not



Shane Whiteside and Phil Titterton (TTM).

produced in the United States, whether from a circuit density HDI standpoint, or materials—a lot of the expertise that exists in the world to create the world's most advanced printed circuit boards resides in China. It doesn't reside in the U.S.

If the amount of technology that exists in today's smartphone needs to be immediately employed in the next generation of weapon systems, communication systems for defense, etc., you would need to take the most advanced pitch BGA device and pin that out on a circuit board in today's world, and build that circuit board in the United States. Currently, you can't build that here. We don't have the capital equipment set, we don't have the expertise, and we don't have the materials know-how, because for the past 15 years it's all been completely invested in outside of the United States. I've conveyed that message a few times here today, and I hope that that message has been received.

**Goldman:** Several people today said that things don't happen quickly. But as we know, in our industry things happen awfully fast. Much faster than they do in this town.

**Whiteside:** From my experience, that's usually due to changes in commercial business, whether some fall-down somewhere or something unanticipated happens. I don't know if anything is going to happen quickly inside the Defense Industrial Base that is part of the normal course

## IMPACT Interviews

of business, particularly in Washington, DC. I think it's just always going to be slow change. I'm hopeful that it can be faster than it has been, but even if everybody were to figure everything out in the next week with the budget—we're still in a stub-period with this—I don't know if it's a continuing resolution or whatever this thing is that we're at, but we don't have a full budget yet. Even if everything were to be figured out, by the time that funding and everything flows down to the component level in our supply chain, I don't look for anything to happen very soon.

**Goldman:** Quickly on another subject, I keep hearing about the shortage of copper; is that hitting you, and are you watching it?

**Whiteside:** The shortage of copper foil for PCB laminate is something that is affecting the industry globally, but much more so in Asia as I understand it. If it endures longer term I would look for the domestic impacts to become more severe.

**Goldman:** Thanks for your time, Shane.

**Whiteside:** Yes, thank you. I appreciate the opportunity to speak with you. **PCB**

---

### Dave Raby STI Electronics

After dinner concluded and we were returning to the hotel, I spoke with Dave Raby, president and CEO of STI Electronics.

**Patty Goldman:** Dave, it's good to see you again. How was your day at IMPACT?

**Dave Raby:** Today has been great. I didn't know what to expect, judging from the ongoing news coverage of how horrible things are in D.C. and all that. But we found a whole different attitude:

People were happy to see us! They wanted to know what they could do for us. They were receptive to ideas. They wanted input.

**Goldman:** And it wasn't a forced thing. They were genuinely interested, though of course nothing happens overnight, as they said.

**Raby:** That is true, and we'll see what the results are. Nothing we said today is going to change a law tomorrow, but I felt good about the people we visited and those who spoke with us.

**Goldman:** Me too. We started out with Congressman Bill Johnson (R-OH) last night, a champion for our industry. He makes you feel good about your country and that things are not so bad in Congress as we hear.

**Raby:** Yes. I like him.

**Goldman:** Does anyone in particular stand out for you today?

**Raby:** They were all impressive, they really were. It was great to meet with Scott Pruitt who is the administrator of the EPA and a member of President Trump's cabinet. We also met with Daris Meeks who is Deputy Assistant to the President and Director of Domestic Policy for Vice President Pence. It was hard not to be overwhelmed by those offices and all of the surroundings.

Personally, I was most impressed by Alexander Gray who is Special Assistant to the President and Director of the White House Domestic Policy. He had a true understanding of our industry and the issues we face and was committed to finding solutions. He understood how a supply chain and business works. I had not experienced that before or least not from someone who could articulate their understanding. He had an appreciation for every step along the way and was interested in how the government could help or



Dave Raby

## IMPACT Interviews

stay out of the way. He asked us to email him if we were facing a reduction in force due to a government regulation change. That impressed me.

**Goldman:** You've gone to more of these IMPACT events than I have, but it seems that we're seeing perhaps a higher level of people within the administrations.

**Raby:** We are and, continuing with the theme, they really did seem genuinely interested in what we had to say.

EPA Administrator Pruitt knew some of what we were talking about but would look to his deputy for help on other issues and ask IPC to send him more information on others. IPC has done a lot of work on environmental issues but this was our first time to get to meet with the Administrator and he seemed genuinely happy to see us and get our input. We were not treated like we were the enemy.

Mr. Meeks was also very welcoming. He was receptive to IPC's position and stressed his mandate to help us create jobs (everyone we talked with seemed to understand that government does not create jobs) and had a particular interest in high-tech and space which are both near and dear to my heart.

**Goldman:** I was impressed by Kim Ford, the deputy assistant secretary for Education, and her enthusiasm and interest in what we do and

how her department can help.

**Raby:** Yes, she was great. It was funny. John [Mitchell] was trying to get the meeting started and she was going around the room shaking hands with everybody and introducing herself. She was just bubbling and seemed so excited to be with us. She was in that job during the last administration, but she didn't come speak to us and we didn't see her. I may be wrong on this but my impression was she seemed to have been freed to do her job and was very excited at the prospect. She understood what was going on in our industry regarding skills gaps and was quick to say (even being from the U.S. Department of Education) that not everyone needs to go to college. She also recognized that some of that skills gap is a basic education of what is expected from an employee.

**Goldman:** And as she said, part of it is Johnny coming to work every day.

**Raby:** Yes. Well, that's the thing you know. "Do I really have to be there at 8:00 every morning?" "Yeah you do." I was impressed with everybody we met today. What really stands out in my mind though is their enthusiasm, willingness to listen and genuine interest in finding solutions for our industry.

**Goldman:** I wonder, the administration has been in office about a hundred days, as they keep telling us. Did these people and departments really change that quickly? Or was it like this before and it was just suppressed?

**Raby:** I don't know the answer to that. It would be guessing on my part, because we didn't meet with these people before. Everyone we met with today seemed to be committed to working with industry to solve the problems we have, and the status quo in many cases is the problem.

**Goldman:** And I'm sure we wouldn't have gotten to talk with the head of the EPA last year. I don't know, but my guess is no.



## IMPACT Interviews

**Raby:** There's a hundred reasons or more as to why you don't get to meet somebody because of all the schedules and the changes up here. I don't know how IPC put a schedule together but they do an amazing job.

**Goldman:** I don't either, and maintain it. It's amazing how everyone down here seems to run from one thing to the other. But they did make time to speak to us.

**Raby:** They did, and then personally, I always enjoy hanging out with all the other execs who are here. Some of them I know from previous years or from other places. Some of them I just met this morning or last night at dinner for the first time. But it's always nice to hang out with somebody in a similar position because you have the same issues all the time, and it's just always good to hear how they think of things. That helps me tremendously, whether I really get a solution from them or I just see somebody else survived it.

**Goldman:** There's a light at the end of the tunnel. Anything else you'd like to discuss?

**Raby:** I appreciate you being here, because this is good for our industry. It really is. The things that we're trying to accomplish are good for all of us, and you being here, your people supporting you being here, is supporting our industry.

**Goldman:** Well that's our motto, you know, "Good for the Industry." I believe everyone in our company is committed to this industry. It's our life. I guess a lot of people might be sorry that they aren't here; this was the opportunity this year. Then tomorrow, do you have more to come?

**Raby:** Tomorrow we're meeting with three senators in the morning and then I'm meeting with two representatives and a senator from my home state.

**Goldman:** That's a lot of congress people, all in one day.

**Raby:** The first three in the morning I don't know, but I'm sure I'm going to learn a lot. The three in the afternoon represent me, so I'm happy to get to talk with them and look forward to that.

**Goldman:** Do you invite them to your facility?

**Raby:** Yes, two of the three have been to our facility and both know us well. It's our representative and then the representative from the district just south of us where some of our workers live. The other one is a new senator that has only been in office since February. He is the replacement for Senator Sessions, who became the Attorney General. I have not had a chance to meet him, but I'm looking forward to that tomorrow.

**Goldman:** You can extend an invitation to visit your company.

**Raby:** I absolutely will.

**Goldman:** And IPC can help set that up. Dave, it's been great talking with you, as always.

**Raby:** Thank you. Thanks for all you do. **PCB**

---

### Suzy Sterner SAIC

While my discussion Wednesday morning with SAIC's VP of Government Affairs Suzy Sterner was brief, it was to the point and an excellent testimony to the success of this year's IMPACT event. Suzy has been in the defense industry for quite a while, making her comments particularly significant.

**Patty Goldman:** Suzy, you've been to IMPACT before. After this second full day, what is your impression of the speakers and meetings that were held yesterday?

## IMPACT Interviews



Suzy Sterner

**Suzy Sterner:** Yesterday was very impressive with the level of people from the administration that we had an opportunity to meet with, to the insights they shared with us.

**Goldman:** I understand you're quite involved in the defense industry. What are your thoughts on what Robert Irie (from the Office of the Undersecretary of Defense for Acquisition, Technology and Logistics) had to say?

**Sterner:** First, he was exactly the right person to be here because he handles all the electronics industrial base issues within DoD. He was very forthright on what he needs to help continue to support the Executive Agent for Printed Circuit Boards and Interconnection Technology sponsored by the Navy in Crane (Indiana). They want input from us and they want a dialogue.

**Goldman:** Is that a new thing, based on your previous experience here?

**Sterner:** This is my second IMPACT, but I've worked in Washington for more than 25 years. It's a little bit more open than it was in the previous Administration. We had the right people here, especially considering that not all the political positions have been filled. When political positions weren't available, we had very high senior-level civil servants who will be there when the new political person comes in, and they made it clear they will still be willing to work with us.

**Goldman:** That's great. I hear the meeting with the EPA was good yesterday.

**Sterner:** It was very good. It was a completely different—I was going to say environment, which sounds ironic to say about the EPA—but

it was a very different atmosphere than we've dealt with in the past. Administrator Pruitt was welcoming and interested in what we had to say; he took notes and he gave assignments for follow-up to his staff member assisting him. You can't ask for more than that.

**Goldman:** And there was a meeting at the White House also?

**Sterner:** Yes, we met with high-level staff from Vice President Pence's office. That was very worthwhile. In addition to defense, I cover space issues, and we got insights into what they're doing with the National Space Council. It's been a very productive day.

**Goldman:** Yes. Everyone seemed impressed with Kim Ford yesterday morning. She was very enthusiastic and welcoming as you said.

**Sterner:** Kim Ford was very impressive. They're really inviting industry to engage, and this was a great opportunity to do that.

**Goldman:** Yes. I think everybody was overjoyed about all of that.

**Sterner:** They should be. It was a highly productive day.

**Goldman:** Suzy, thanks so much for your input.

**Sterner:** Thank you. **PCB**



## IMPACT Interviews

---

### Mark Wolfe John Deere Electronic Solutions

An interesting participant at IMPACT was Mark Wolfe, director of supply management with John Deere Electronic Solutions. We spoke briefly Wednesday morning before things got started.

**Patty Goldman:** It's nice to meet you, Mark. We're starting the second full day of IMPACT, and I thought it would be good to get your perspective. First, you told me yesterday that the majority of your business is for John Deere, but you also assemble for other companies as well.

**Mark Wolfe:** Correct. Most of our business is for John Deere. We do have a component that's external and commercial with other OEMs with similar needs to John Deere, but are non-competing. They give us the opportunity to keep our competitiveness outside of being a captive supplier.

**Goldman:** So how did you feel about Monday night and yesterday? Has this been helpful to you?

**Wolfe:** It's been helpful. I've enjoyed it. I think it's been refreshing. I haven't been here the last few years, but certainly there was an undertone of largely positive change that was coming out of the different meetings and discussions we've had so far. There seemed to be less rhetoric. I guess time will tell if the actions follow through on things, but from the attitude of the people we met with, it was quite positive overall.

**Goldman:** The attitude was very positive. What did you hope to learn or gain from coming here?

**Wolfe:** I hoped to be a little more connected to where our new leadership for the country is headed, but at the same time I'm a long-stand-

ing IPC member and participant. So it's also as much as anything to support the efforts of IPC and all of the members.

**Goldman:** As far as you're concerned, that worked out this time.

**Wolfe:** Yes, I believe so.

**Goldman:** Good to hear. Thanks for your thoughts.

**Wolfe:** Thank you very much. **PCB**



Mark Wolfe

---

### Fern Abrams IPC

I wanted to get the inside story on the meeting with EPA that occurred Tuesday afternoon and who better to talk with than IPC's Fern Abrams. I was able to chat with her Wednesday morning.

**Patty Goldman:** Fern, as director of regulatory affairs for IPC, you are deeply involved with IMPACT, on the environmental end of things, especially. Tell me about yesterday.

**Fern Abrams:** We had a meeting with EPA Administrator Scott Pruitt, and his Deputy Chief of Staff for Policy, Byron Brown. I think I would speak accurately for everyone if I say it was an excellent meeting. I heard one of our attendees say that it was our best meeting of the day—but I'm biased.

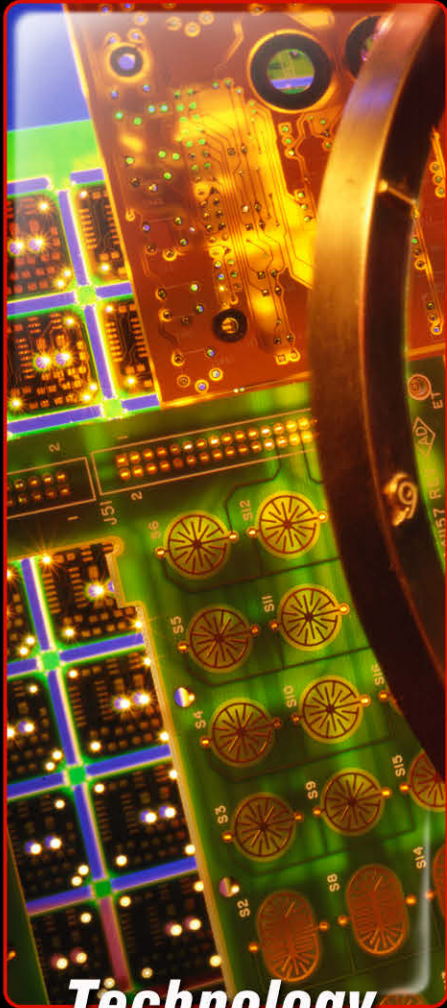
**Goldman:** Well, the fact that you spoke with the top person there says a whole lot.

**Abrams:** In a career of almost 20 years working in environmental policy, this is the third EPA

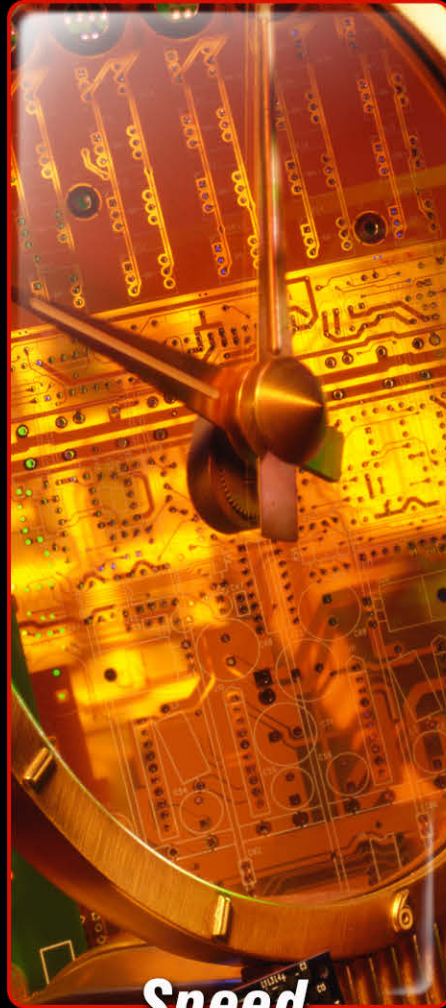
**We're Hiring!**

prototron.com

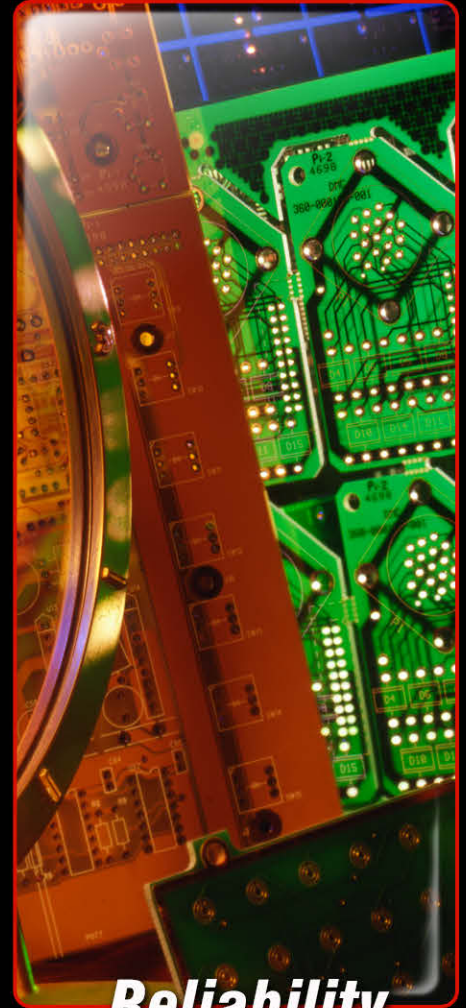
**We Take the Time to do it Right**  
*because you don't have the time to do it over.*



***Technology***



***Speed***



***Reliability***



# Prototron Circuits

High quality quick turn manufacturing, just another reason we are  
**America's Board Shop**

**Prototron is Hiring!** We are currently seeking candidates to fill positions for both a midwest sales professional and an experienced PCB process engineer. To apply, contact us at 425-823-7000 or email Russ Adams at [russa@prototron.com](mailto:russa@prototron.com) for sales or Kirk Willams at [kirkw@prototron.com](mailto:kirkw@prototron.com) for engineering.

## IMPACT Interviews

administrator I've had the privilege to meet, and I would say this was just a delightful meeting.

**Goldman:** Wonderful. What did he have to say?

**Abrams:** IPC's president, John Mitchell, kicked off the meeting by telling the administrator about IPC, what we do, the members we represent, and also letting the administrator know that we had a proud history of working with the EPA. He talked a little bit about our involvement in the Design for the Environment program and mentioned that one of our staff, David Bergman, had been recognized by the EPA for his work in helping the industry transition out of ozone-depleting chemicals, but that was a long time ago, quite frankly. We are looking forward to working with this administration on cooperative environmental protection that is based on science and is cost-effective.

**Goldman:** Are there any hot buttons right now?

**Abrams:** We talked about three. The first is the recycling of byproducts and what I would say is the unfair treatment of them under the Toxic Substances Control Act, where industry has worked very diligently to find beneficial reuses of byproducts. But now under TSCA they're treated as new chemicals and so companies that choose to recycle them have the burden of reporting and the liability of that complicated reporting if they don't get it just right. Whereas, if they'd chosen to simply dispose of it they would have neither the TSCA reporting nor the liability. This has been an issue for our members for some time. Since the mid-2000s we tried to work with EPA to address this and they've been rather intransigent. That's why we worked with Congress. You

heard Congressman Bill Johnson (R-OH) speak two nights ago about this issue and you heard it mentioned last night, both by Mr. Shimkus (R-IL) and Mr. Reed (R-NY), both of whom we worked with.

Under the legislation in the Lautenberg Chemical Safety Act that was signed last summer, the EPA is required to conduct a negotiated rule-making. That's where all parties involved sit down—EPA, industry, environmental groups, recyclers, all get a seat at the table—and we try to find common ground. The EPA will take that input and then, under the law, propose a rule in three years and finalize a rule in three-and-a-half years. We talked about that, and the process is already underway. The first public meeting will be next week and IPC will be represented by myself and Bret Bruhn. Bret is the environmental operations manager with TTM, in Oregon. He also chairs IPC's EHS committee.

We mentioned that to the administrator and said we were looking forward to working with him on that. The reason for bringing it up was to reinforce our hope that EPA will be a good faith participant in the negotiated rule-making. In the past, as I've mentioned, they've been somewhat intransigent on this issue. We had many meetings where they'd say they'd do something, agree with us and say it sounds reasonable...

**Goldman:** And then nothing happens.

**Abrams:** Exactly. So we're looking forward hopefully to a new attitude, new beginning with this administration. That was the first issue that was raised. The second one is the reporting of lead under the Toxic Release Inventory. It's part of the Emergency Planning and Community Right-To-Know Act. It's purely a reporting exercise. There's no actual environmental protection and as we pointed out to EPA, the reporting threshold is based on used, processed or stored. So a lot of our EMS members, in fact 32% of all companies that reported to TRI, reported zero pounds released. They spend, by EPA's estimate, about \$9,000 per facility. Bhawmesh Mathur,



Fern Abrams

## IMPACT Interviews

President of Creation Technologies and Chair of the IPC GR Committee, said he has six facilities that all filed that they had reported zero pounds and they must do that every year.

**Goldman:** That's a substantial cost.

**Abrams:** He said he thinks that cost is much higher, that it's underestimated. In any case, as the administrator said, "So every year you do this to tell us every year that you release no pounds?" We said, "Yes." He noted that 100 pounds was a pretty low threshold. We said it used to be 25,000 pounds until EPA lowered it, and he asked what the basis was for that.

**Goldman:** There was none.

**Abrams:** Well, I think I might have gotten the quote of the day when I said "junk science." More accurately, it was inappropriate or manipulated science, but junk science just makes a much better sound bite. He said he'd look into that. Then Phil Titterton of TTM raised a third issue, which is the RCRA Hazardous Waste Generators Rule. These are the requirements for companies that generate hazardous waste on their facility—often very small amounts. Most of our members are very small quantity generators or small generators. This was, I should say, a rule that was issued by EPA in November 2016 to consolidate 40 years of generator requirements that were here, there and everywhere in the regulations. Most of the rule we like. It brings clarity. It's much easier to read. But in that reorganization EPA took many of what used to be requirements and put them as conditions of exclusion. Meaning, exclusion from treatment as the most serious of hazardous waste facilities, a hazardous waste treatment storage and disposal facility (TSDF), which requires an operating permit. This is a very serious thing.



**Goldman:** That is serious.

**Abrams:** Well, these are the companies normally that take in waste, store it, and treat it.

**Goldman:** They're separate from generators, right?

**Abrams:** They should be. However, the way that this was organized, if you fail any of these conditions of exclusion, you've violated your conditions and EPA can enforce against you as

an illegal treatment, storage and disposal facility that's not meeting all these things and is unpermitted. It could be as simple as the label on a drum. Instead of saying "Hazardous waste June 2017," maybe you said, "Waste/Hazardous."

This is a very serious liability matter. We joined eight other trade associations in filing a suit against the EPA on this issue in January, but we would like very much not to litigate. We filed to preserve our legal options, but as we told the administrator yesterday, we would like very much to work with the EPA on a new rule that addresses just this small part of the rule.

Those were the three issues that we raised during the meeting. The administrator [Scott Pruitt] was responsive on all of them and talked for a bit.

**Goldman:** Others said he made assignments to staff?

**Abrams:** Just to look into it. That would be accurate. He talked a bit just about his perspective and added that you can have a business environment and still protect the environment. He talked a little bit about America's history and growth and how we've managed to grow and clean up the environment at the same time. It was just very refreshing.

**Goldman:** What's next on the environmental front?

## IMPACT Interviews



Everett Frank, Optimum Design Associates.

**Abrams:** Recently, as part of their implementation of Executive Order 13777, the EPA has had a series of listening sessions, at which I testified. The small business ombudsman had a meeting last week, April 22 and 23, for small businesses to talk about regulations they'd like to see addressed. Then on Monday [May 1], I spoke at the Office of Chemical Safety and Pollution Prevention. Next week someone else will be representing IPC at the Office of Land and Emergency Management, highlighting that same RCRA issue that we were just talking about. EPA is also taking formal comments, which we'll be submitting by the May 15<sup>th</sup> deadline.

We will also, of course, follow up with the administrator's staff on these issues. Then next week, we have the first meeting of the committee on the negotiated rule meeting on byproducts. Busy times.

**Goldman:** I know things don't happen fast. It seems everybody's very busy, and yet I know things take a while to actually happen.

**Abrams:** That is accurate. To talk about some of these rules on the byproducts issue, we've been working on this issue since 2006.

**Goldman:** That's more than ten years.

**Abrams:** Nothing happens overnight.

**Goldman:** Any other thoughts here today?

**Abrams:** Well, we've been talking about the administration. Obviously, we have an agenda on the Hill too and the members are meeting with some key legislators right now. You'll probably be interviewing other people on that, I presume.

**Goldman:** Yes, basically I get pretty general, but great feedback on those. To me, the attitude of the people that have been speaking to us seems so much more positive.

**Abrams:** I agree. You know, it's the beginning of an administration. Washington is where hopes come to die (laughs). No, that's not fair. Things take a while. Consensus is hard to reach. We have a democracy. It's set up to have debate and let everybody be heard and so nothing is done immediately. I think a new administration comes to town and they're fresh and they're excited, and that's exciting.

**Goldman:** Apparently, some amount of that has filtered out across the different departments.

**Abrams:** We've seen that in meetings we've had at the EPA and other agencies. We're excited, we're hopeful, and we're ready to work.

**Goldman:** Thanks so much for your time. Much appreciated.

**Abrams:** My pleasure. **PCB**

---

**Joe O'Neil**  
OAA Ventures

Around lunchtime on Wednesday, the second full day, I was able to sit with Joe O'Neil,

## IMPACT Interviews

OAA Ventures. As a veteran of many IMPACT meetings, his was a good perspective of the event.

**Patty Goldman:** Hi, Joe. It's good to see you. I understand you have a consulting firm now. Were you representing a particular company here at IMPACT?

**Joe O'Neil:** No, we had the entire IPC board of directors here for a board meeting on Monday. We have board members now from Europe, Asia—all over the world. They all came into town and then some of us stayed to support the IMPACT event and go out and kind of spread the word and build a foundation.

In prior years, we've been in different parts of the legislative cycle and had a specific set of bills or language where we could come here and have very definitive asks. I think we were successful then because in prior years it was much like what we're doing in this visit, which is foundational; we are getting our name in front of the freshman senators or congressmen. There are some things that are in play right now. Conflict minerals are in play. Healthcare is very much in play. Tax reform is maybe a little bit further out. But those are things that affect our membership and our voice needs to be in the mix.

**Goldman:** Might as well get in the beginning, right?

**O'Neil:** Yes. When there is something important that comes up, we were here supporting them, and now it's their time to support us when we call; they kind of know who we are. Through the year—I remember Capitol Hill Days 15 years ago or more—we've gone from circuit boards that no one could understand to bringing samples and giving them things that they looked at and touched. Now, with that education, I think they are beginning to understand the electronics industry. They understand that our membership ranges from major defense contractors and OEMs, the brand names throughout the world, to the electronic manufacturing services and print-

ed circuit board fabricators to the laminate and chemicals, and all the way through the supply chain.

They have recognition of that and they understand that those 4,000 member companies have a million employees just in the United States, and our training programs train hundreds of thousands of people a year. They see the value of that. For the most part, they are supportive, and hopefully that's going to be reflected in legislation that comes up.

**Goldman:** I suppose it helps that everything you use any more has electronics in it.

**O'Neil:** Absolutely. Including the listening devices throughout this town (laughs).

**Goldman:** So how did you find this morning's sessions? I know there were several meetings.

**O'Neil:** We had several senate meetings. In past years, we would have maybe one or two senate meetings and a lot over on the congressional side, since we have members in pretty much every district in the United States. The senate meetings were a little harder to get—a little higher level. This morning alone, I think we've had four or five senators and then we got to go over and meet with the rules-setting committee over on the congressional side. And that was very interesting to see how every bill that comes up goes through this small 12-person group.

It was very different to hear that bills come out of committee, but that little body can add or subtract anything they want before it goes to the floor. They had some interesting perspective in terms of how Washington is and how this is going to play itself out. It's a lot of change. It's still early. The talk of the town is still, you know, "the first hundred days" kind of references. We've heard everything from people who are giving the President an A+ to F- and below.



Joe O'Neil

## IMPACT Interviews



Joe O'Neil chats with Kim Ford, Deputy Asst. Secretary for Mgmt. and Planning, U.S. Dept. of Education.

**Goldman:** For the same things, I'm sure!

**O'Neil:** There's pressure, as I think it probably is with any transition that ever comes out of the gate running. And so the whole town seems to be running. The voice of business is being heard. People are taking meetings. People are actively engaged in conversations. I think that is very promising. And there's hope that the two political parties are going to find a way to work together on some things. One consistent thing is that it's not going to be easy. Both sides are saying that.

**Goldman:** Well, everybody that we talked with seemed to think that it's a good idea that they should all be talking to each other. And yet...

**O'Neil:** Yes, it's consistent that both sides are pointing to the other as the part that needs to be changed.

**Goldman:** "We'd like to work with them, but they don't want to work with us."

**O'Neil:** And I think that the interesting thing is that's just kind of the way the town works. Things do get done. Things get done every week. Things got done already this week. Things got done last week. And the sensationalism isn't

there when things actually get done. That stuff doesn't get really reported with the same vigor as the gridlock of the fight.

**Goldman:** You always hear the bad news more than the good news.

**O'Neil:** Absolutely. And we also had a meeting over at the EPA yesterday with the director, Scott Pruitt. The work the EPA does, they made a big impact over the last few decades on the environment, and I think in the last decade or so it has become more paperwork than advancement. But the new mentality seems to be "we're going to continue to safeguard the environment. We're going to look for every opportunity to do it in a smarter, more streamlined manner; basically, for every new piece of legislation or new rule that gets enacted something has to come off the books." I think that's smart.

**Goldman:** I've always advocated that, in everything.

**O'Neil:** There are so many rules and regs, and not just the EPA; the enforcement is almost impossible and non-existent in many cases.

**Goldman:** And it is sometimes arbitrary, as you know.

**O'Neil:** Absolutely. I'd much rather have a set of fewer rules and regulations and have them made clear enough that they can be enforced with vigor. Then I think the impact would be greater than the volumes of misunderstood or unknown rules and regs that don't get enforced.

**Goldman:** Currently, they tend to put more stock in paperwork than in actual work.

**O'Neil:** Or impact.

**Goldman:** It's the same with conflict minerals, for as much money as is spent on the paperwork, if that were all somehow channeled to the people being oppressed, wouldn't that be



**A portfolio of flex via drilling solutions  
that presents you with possibilities... not limitations.**

**Setting the industry standard  
for all flex materials.**



**GemStone™ 5335xi™ Flex5335™ RedStone™ LodeStone™**

As a leader in PCB, ESI's flex PCB laser processing systems are used by the top ten FPC processors and are based on decades of laser-material interaction expertise applied to challenges in production. Our flex systems portfolio is designed to address a wide range of applications, enabling you to easily match the right system to your unique set of challenges and processing requirements.

Whether you're just getting started with FPC processing or are optimizing around specific applications, rely on ESI to provide the right laser technology and manufacturing expertise, paired with premier service and support, to drive quality results, higher profits, and shorter time to market.



**Learn more at [esi.com](http://esi.com)**

## IMPACT Interviews

more useful? And yet, it's totally non-productive as you know. You spend all that money on producing paperwork and it's gone.

**O'Neil:** Absolutely, it is a waste. It's interesting; we've made great strides in getting that 1502 [Dodd-Frank Act, Section 1502 on conflict minerals] frozen and the enforcement somewhat curbed, because I don't think anyone is going to stop the implementation of conflict-free. I think the good news is, we didn't come in with a "just get rid of it because we want to buy less expensive things" attitude. We came in with a belief in the intent of the legislation. We believe there's a better way to achieve those means even at the smelter level, and don't make the three-person firm dedicate one of those three people to just doing the paperwork.

**Goldman:** But they bring up this conflict minerals, but in reality, you need the particular minerals. Our industry needs these minerals. But they seem to say these minerals are by association conflict minerals as opposed to just the ones from a certain area. That's what I seem to hear from the feedback. We need gold. We know that there are other sources, but somehow, they lump it automatically as all gold is a conflict mineral. They say to just stop using it but you can't stop using it.

**O'Neil:** The tungsten, gold and the tantalum. Those are the minerals that are classified as being conflict-managed. There are some money operations in the DRC [Democratic Republic of Congo] which are following horrific practices that others aren't, and by avoiding the region in total it makes reporting easy, but everyone in the region suffers.

**Goldman:** Then you'd be getting your gold and tantalum elsewhere.

**O'Neil:** And even then, you're not sure because a lot of the gold and a lot of the metals that we use, a portion of those are recycled. So they're reclaimed.

**Goldman:** Do they count that too?

**O'Neil:** Well, that's part of the challenge, and that's why there's never been an enforcement activity.

**Goldman:** Well if there were, then there could be a challenge to it. Then whole thing would get knocked down.

**O'Neil:** Exactly.

**Goldman:** And so they don't do that. They just hold it over your head all the time.

**O'Neil:** The town seems to be very open to reworking versus repealing, and so I think reworking Dodd-Frank seems to be something that looks like it's going to get done, especially in the conflict minerals.

**Goldman:** Well hopefully in a reasonable amount of time. I wish they would regulate the energy industry as tightly as they regulate our industry. Every time I hear about another coal mine superfund site, all that drainage and the underground fires, or another government nuclear energy superfund site, I think, wait a minute...

**O'Neil:** Where were they then?



Sen. Tammy Duckworth (D-IL) speaks with attendees at IMPACT Washington, DC 2017.

## IMPACT Interviews

**Goldman:** Joe, thanks for your time today. Good to talk with you.

**O'Neil:** Thank you. Off to the next meeting! **PCB**

---

### Anaya Vardya American Standard Circuits

I spoke with Anaya Vardya, president and CEO of American Standard Circuits, a few days after the conclusion of IMPACT. I especially wanted his views as a first-timer there.

**Patty Goldman:** Anaya, as a first-time visitor to IMPACT, what were your impressions of the event?

**Vardya:** I thought it was a great event. I was very pleased that we were able to participate. Both Chairman Gordhan Patel and I participated. It's been on our radar for several years, but we've always ended up with scheduling conflicts; this year we were fortunate not to have one.

It was very beneficial for us. It's kind of a two-way dialogue, right? You get to listen to what the government is thinking of, you get to go participate, talk to the government representatives, your competitors, and your customers.

**Goldman:** A little bit of everything for everyone.

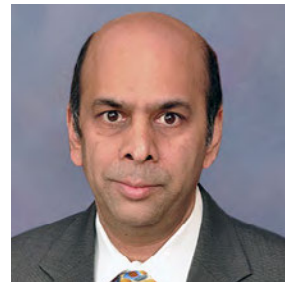
**Vardya:** Yes, there was a lot of interaction.

**Goldman:** Well, you picked a good year to come. I thought all the people who were invited to speak to us really were looking for information from us, and I don't remember that from last year. This year, they were so forthcoming and said, "Please tell us how you're doing, tell us what you need, we want to know." That was really great. Did you enjoy the trip to the EPA?

**Vardya:** I loved the trip to the EPA. It was good to meet administrator Pruitt. I thought he was

a good listener and that he was keen on understanding what some of our issues were, and intent on trying to get regulations removed that didn't make sense or that weren't based on science.

At the end of the day, we all want clean water and clean air. That's important to all of us because we live in the communities where our businesses are. But I think there are some regulations that don't need to be the way they are, and I felt like at least he was open to listening to us and was very engaged with our group.



Anaya Vardya

**Goldman:** In my opinion, it seems a big step forward to have been able to speak with the top person there. I don't recall EPA being on the agenda last year, so IPC must not have been able to get anybody to talk with our group. So to be able to speak to the top guy, I think that's very good.

**Vardya:** I was excited about that, for sure.

**Goldman:** Do any of the other speakers stand out in your mind?

**Vardya:** Well, I was quite impressed by Kim Ford, from the Department of Education. It was interesting to see that level of enthusiasm for what's going on today with their department, especially because she's been in the Washington, DC system for a very long time, and throughout the previous administration.

**Goldman:** Yes. I found that website she mentioned. It's interesting and there's a lot of useful information on it. Let's see, who else did we talk with? Senator Tammy Duckworth (D-IL), who's an amputee; that was pretty good, too.

**Vardya:** She was very impressive. And it's interesting, one of the things that I noticed is that on a lot of these core issues that impact our

## IMPACT Interviews

industry, I think the Democrats and the Republicans aren't that far apart, especially when it comes to job training and things like that. Job training is going to be a critical thing, and since we want to try to grow the manufacturing base in North America, employees are going to be the key to our success. Everybody needs to be trained. We need to have people that are actually going to work in factories.

**Goldman:** It's nice to see that Washington is recognizing that need. I was really impressed with the bill that she was going to introduce, where you could have this little fund set aside, sort of like an IRA—I believe she called it a “manufacturing RA” or something like that. A business could set aside money, tax-free, to purchase equipment or train people. I thought that was pretty nifty.

You can't just say, “Hey, we're going to bring back manufacturing” without having that whole other part: people trained and available to staff it and the capital equipment available with a fast depreciation schedule, along with everything else.

**Vardya:** I thought that was a very novel concept, I really did. I agree with you. We'll have to learn more about it.

**Goldman:** Did you get a chance to talk with your own senators and representatives on Wednesday afternoon?

**Vardya:** Yes, on Wednesday, after we had a couple of staff meetings, we met staffers from Senators Tammy Duckworth and Dick Durbin (D-IL). We talked to both of their staffs, and we talked a lot about conflict minerals. The other thing we discussed was tax reform. We focused on those two aspects, because obviously, tax reforms are important to all businesses. It is a key thing, and I think tax reform can really help people improve business in general.

We also had a quick meeting with one of the local representatives from the House of Representatives, Dr. Raja Krishnamoorthi (D-IL) from District Eight. We talked about some of these

same issues. He was very receptive; I think a lot of people are focused on getting more manufacturing jobs, for sure.

On Tuesday afternoon after the EPA visit, we met with Vice President Pence's Senior Domestic Policy Advisor, Daris Meeks, and it was very interesting. He basically said, “It's all about jobs, jobs, jobs, and we've been told that we need to listen to the people in industry and understand what the barriers are to creating more jobs.”

**Goldman:** There seems to have been an attitude change in DC.

**Vardya:** You participated in the lunch discussion, right? It seems like the administration is trying to do a lot to really encourage jobs, to try to help with breaking down barriers, and things like that, so I thought that was very encouraging.

**Goldman:** Yes, I noticed this year everybody seemed to be focused on businesspeople, people with businesses, in manufacturing and such. We seem to be the good guys this year. It was good all the way around.

**Vardya:** I thought the IPC team did an outstanding job of putting together a great lineup of people to speak to us and with us. We talked with the administration, members of Congress—Republicans and Democrats. So we got a diverse set of perspectives and a very diverse set of views from the meetings that were set up. I have to commend IPC on doing such an excellent job



Congressman Shimkus (R-IL) talks with attendees.

## IMPACT Interviews



Rep. Ken Schrader (D-OR) is presented with the IPC U.S. Government Impact Award in recognition of his bipartisan leadership on issues of importance to our industry. Presented by Phil Titterton, TTM, and John Mitchell, IPC.

of putting the whole event together. Again, given the fact that this was my first time, I was really impressed with all the briefing materials they put together and the whole package of information. I'm very impressed, and it was very good.

**Goldman:** They put together a tremendous amount of information for us: bios on all the speakers as well as everyone in our group, the briefing materials on the various departments (education, commerce, military, EPA), the key issues that we focused on. Then scheduling all the speakers during the day and at luncheons and dinners (including the awards dinner), and setting up meetings for everyone with their representatives. No spare time for us, right? It was quite a full schedule. And then to speak with your senators and representatives live, or perhaps their staff—that was a tremendous amount to coordinate, especially when you understand how packed their schedules seem to be. IPC staff supports so well, like you said, with all the briefing materials; but also, there's somebody at your side wherever you go to help you through the discussion and talking points if you need it.

**Vardya:** In fact, the other thing that I will add that was interesting is a small group of us broke away and met with one of the senior staffers in the Rules Committee. We met in the congressional building and we talked a lot about how the

rules work and what goes on, how bills come to the floor, and it was very insightful and interesting. Then, we got to go over and spend a few minutes in the actual House Chamber. That was a neat little tour that we ended up getting.

**Goldman:** That's great. It was quite a two-and-a-half days, really. I'm glad you went, and I'm glad I went. Hopefully, you'll go next year, schedule permitting.

**Vardya:** I absolutely will. I would really like to do that.

**Goldman:** Anaya, thanks so much for your time and thoughts.

**Vardya:** You're welcome. **PCB**

---

## Bill Johnson Congressman (R-OH)

Congressman Bill Johnson (R-OH) gave a great talk during the Monday evening dinner at the very beginning of IMPACT. I think if there had been a way to vote for him for any office, everyone at the dinner would have done so. I interviewed the congressman a week after the event, and he shared his views on the way things are going in the Capitol today. He also asked me to call him Bill—not Mr. Johnson or Congressman. Just Bill.

**Patty Goldman:** Bill, Monday evening you spoke about how President Trump is doing and things that are happening in Congress that affect business. If you could revisit those subjects for our readers, I would appreciate it.

**Bill Johnson:** Sure, I think this goes all the way back to the November election, when the American people made a conscious choice to go in a different direction. They want to see, and they're still wanting to see, the greatness of

## IMPACT Interviews

America return: innovation, competition, and leadership on the global stage. I believe that what you have seen happen over the first four to five months of President Trump's presidency is a move in that direction.

If you look at the number of bills that Congress has passed this session since the last election, it is more than any that have passed in the first 100 days since George H. W. Bush was president, far more than President Obama during his first term. If you look at the number of bills that have been signed into law by President Trump, it's far more than President Obama or any of the three previous predecessors to that.

There is no question that President Trump has hit the ground running, trying to do the very things that he promised that he was going to do during his campaign: regulatory reform; restore healthcare to the American people and take it out of the hands of unelected bureaucrats in Washington, D.C. Now, some of these things are still a work in progress, but by and large, we've seen the markets respond very favorably to President Trump's message of returning to America's greatness. Within a few weeks of the election, the stock market saw a major rally. These are historical moves by the American free-enterprise system to validate what the American people are asking for.

If you look at the number of Congressional Review Act measures, for example, I think there have now been 13 Congressional Review Act measures that have been signed into law, keeping one of the promises that President Trump made to roll back onerous regulations that are stifling job growth and slowing economic growth here in America. If you look at how many jobs have been created, I've seen various numbers, but certainly in excess of 350,000 jobs have been created just since the president took office.

Looking at our border security, we're at a 17-year low, a 61% drop in attempted border crossings on our southern border. The president is setting about doing what he said he was going to do and we're working very hard in the House to give him the avenue legislatively to do those



Representative Bill Johnson (R-OH) speaks to IMPACT attendees at the kick-off dinner.

things, so I'm very optimistic about the direction we're going. Now, have we solved everything? No, we haven't. We have not completed the healthcare reforms. That's still a work in progress. We passed it out of the House and it will soon go to the Senate so that the Senate can begin that work in earnest.

We've already made significant progress down the road on tax reform. Everybody acknowledges that letting the American people keep more of what they earn, letting businesses keep more of what they earn so that they can invest in research and development and new innovations, new products, that's going to make America that much more competitive on the global stage. Look at the budget that was just released by the President, a budget that balances. When was the last time we saw a budget come from the President that actually balances?

**Goldman:** It balances? How did he do that?

**Johnson:** That's something that we've got to talk about. There's no question about that. That doesn't mean that it's going to get a rubberstamp here in the House because we too in the House want to see a balanced budget. That's what we have supported for the last seven years. I have voted numerous times for a balanced budget amendment to the Constitution and I believe that the federal govern-

## IMPACT Interviews

ment should balance the budget. I think that should be a requirement, but be that as it may, we've certainly got evidence now that we have a President that understands the importance of bending that spending curve in the other direction, to begin addressing America's national debt and the rising deficits. There's a lot to be optimistic about.

**Goldman:** That's all good to hear. I will say we talked with you Monday night and the next day we had several speakers from Education, Commerce and Defense Departments. The IMPACT group also visited the EPA and the White House. In every case, every person we talked with was very receptive. They all said, "Tell us what's going on. Tell us what you need." It was different than it's been in the past. They met with the head of the EPA, Scott Pruitt, and he took notes and he assigned follow-ups to his staff, which was good. In our industry, we've often been considered the enemy. It was different to have all the people that we spoke with be receptive or interested in our side of it, so we were happy.

**Johnson:** Patty, this may sound a little bit melodramatic, I don't mean for it to, but it really comes down to whether you see the glass as half full or half empty. I think under the Trump administration, it is very clear that from an American leadership perspective, America's potential

to lead on the economic stage, on the international and diplomatic stage, on the military and national security stage, that the Trump administration looks at the glass as half full versus leading from behind, which is what we saw during the previous administration for eight years—indecisiveness creating uncertainty, leaving doubt in the minds of our friends and allies across the globe as to where we stood on particular issues, creating business uncertainty and a very business-unfriendly climate. I think it's a matter of seeing the glass as half full and I think the Trump administration sees that.

**Goldman:** I think we're all optimistic, even more optimistic after having been to IMPACT and speaking with these various agencies and seeing their interest in what business people have to say. It was very refreshing.

**Johnson:** One of the things I talked about there that I would probably like to get the word out on is that I think that there is a cultural, societal shift that is occurring because of a phenomenon that we've seen before. One of the things that's great about the American system of government is that every generation gets to write the next chapter of America's amazing journey. Every generation believes that they can do it better than the previous generation. I love that about the American attitude, the American fiber of our being, but at the same time, often-times we must learn and relearn the same lessons from history all over again.

When I talk about a societal, cultural shift occurring, it reminds me of what happened in the '60s, back during Vietnam. If you can recall, Vietnam was the first war that was brought into the American living room in real time. Prior to Vietnam—World War II, Korea, other conflicts that America was involved in—the American people only saw the war from a distance. They saw it in newsreels if they happened to go to a movie or they read it in a newspaper that might come out on Sunday, if they happened to read the newspaper, but it wasn't in their face day after day after day.



IMPACT attendees meet with EPA Administrator Scott Pruitt.

## IMPACT Interviews



Rep. John Shimkus (R-IL) is presented with the IPC Government Impact Award by Bhawmesh Mathur and John Mitchell.

The Vietnam War was different because we sat in our living rooms in the evenings and we listened to Walter Cronkite give the body count. We saw the horrific scenes coming back from the battlefield of American soldiers being shot, enemy soldiers being shot, and the carnage that was occurring there. The American people saw war in all of its inhumanity up close and personal, and they didn't just observe it. They engaged in it.

They engaged in it and it played out on our college campuses. It played out in the streets of our cities and it changed who America was. It had a cultural, societal-shaping impact here in America. Now, roll the clock forward. About 10 years ago, with the advent of the social media platforms—Facebook, Twitter, MySpace, Instagram, etc.—and a 24-hour-a-day opinion. I started to say “news cycle,” but it's more of an opinion cycle. The American people today are seeing inside of the American political and governing machinery from a perspective that they've never seen before.

**Goldman:** This is true.

**Johnson:** Much like they saw war for the first time during Vietnam, they're now seeing the sausage being made inside the American governing system and they don't like what they see because it's contentious. It's frustrating. It's agonizingly painful. It is slow. Sometimes it defies

common sense about why you can't move one way or another on a piece of legislation. Now you've got 300+ million people who are now not just observing the American political and governing process, but they're engaging it.

Just like they did in the Vietnam War. How are they engaging in it? Well, they're demanding action. They're demanding that things get done. Is that an unreasonable demand? Absolutely not, but I think what we have failed to do as a nation is remember that historically, our system was not designed to move fast. Our system was designed to be debated, to be deliberate, to be slow moving, and I think the testimony to that is the fact that we're over 240 years old and yet we have seen very little change to our Constitution.

Look at how many countries throughout the world where the president resigns, they abolish the legislature, and they rewrite the constitution. America isn't set up like that. We don't have an exit ramp that way, so we have to make the system work that we have because that's the way we were built. It was built as a pass-fail system and we must work together to pass. The problem comes in because of the instant gratification environment we've created for ourselves; let's think about it for a second.

Today, you don't have to plan what you're going to have for dinner. You don't have to buy it. You don't have to prepare it. You don't have to grow it. All you got to do is pull up in front of the marquee at the McDonald's or the Wendy's or the Burger King and three minutes later, you've got your meal in a bag, and you've not had to do much of anything except pay for it. You get that instant gratification. Same thing applies when I can order my dog food online and it shows up at my house literally within 24 hours. Everything has got to be right now. So the American people, and I'm as guilty of that as anybody, get frustrated with the slowness of our system in fixing big problems.

I think sometimes we believe that the contentiousness that we see inside of our governing machine is new phenomenon. Well, it's not. It has always been that way. It has always been contentious and hard to govern the greatest na-

## IMPACT Interviews

tion on the planet. Let me give you an example, starting at the very, very beginning.

That was the summer of 1787 with James Madison and George Washington, two of our most prominent founders. George Washington is the father of our country, our first president, and James Madison, one of the architects of the Constitution. They went into that summer, that Constitutional Convention, very, very close allies. They were in lockstep. They were friends. They were working together, and thank God that they did because look at the document that it produced. But at the same time, it created a lot of anxiety between the two of them to the extent that not too long after that summer ended, George Washington and James Madison never spoke to each other again for the rest of their lives. The point I'm making is: Governing is hard business.

It is not easy. Relationships are broken and alliances are built among people that you never thought you would build an alliance with to get movement forward, because if we allow the far left and the far right to dictate the governing process, those groups are extreme. If a number of people in the middle aren't willing to sit down and put relationship aside, like Washington and Madison did, like Ronald Reagan and Tip O'Neill did to get big things done, then we're going to stay in a quagmire. Do you understand what I'm saying?

**Goldman:** Yes, I certainly understand. I've read enough history to know that you're right. If it were easy or if it happened quickly, that would mean we had a dictatorship. That's how things happen quickly. Somebody says, "This is the way it is," but we don't work that way. We don't want that.

**Johnson:** I'm not sure how healthy it is to a representative form of government where 300 million plus people think that they need to or should engage on every micro decision that is made. Because that's not the way representative government works. Representative government works when we elect a president and members

of the House and members of the Senate to be our voice. If we don't like the job that they're doing, our voice is communicated in the ballot box with who we send there to do the things that we want them to do, but I think when we start having people take to the streets and protesting, that brings us down to the level of some other countries where there's no confidence and trust in the system of government anymore. I think it's a very tenuous place to be.

If I had a message for the American people, it would be "Let's again start looking at the glass as half full." If you're the biggest nation, the most powerful nation on the planet, that means that your problems, your issues are



Walking to Capitol Hill.

## IMPACT Interviews

manifold bigger than any other country on the planet. Those are big, big issues to resolve. You don't want to impulsively address those issues. You want to do it the right way and you want to do it in a way that's going to make it good for all Americans and protect and defend American values and American interests. I would urge everybody to just take a deep breath and not believe necessarily everything that comes across the social media platforms and the 24-hour-a-day opinion cycle about what's working and not working in our nation's capital. One of the greatest examples of two great, patriotic Americans that understood this phenomenon was Tip O'Neill and Ronald Reagan. During the day, the world spun around them, the media. I remember Sam Donaldson was Ronald Reagan's nemesis in the media. He always loved to try and catch Ronald Reagan with a tough question.

I can tell you about Ronald Reagan and Tip O'Neill. Many people did not realize that in the evenings after the legislative day was finished that Tip O'Neill would grab a bottle of Irish whiskey, two cigars and go over to the White House. They would sit there in the White House theater and watch cowboy movies and talk about the things that mattered in the big scheme of things. Things like how to bring the Soviet Union to its knees and bring down the Iron Curtain, how to bring about tax cuts that produced one of the best economic growth periods in American history.

That's what they were doing behind the scenes. We need American governing agents to be able and have the intestinal fortitude to do the same kinds of things.

**Goldman:** I agree, absolutely. Bill, thank you so much for your time. I really appreciate it. I could listen to you talk all day because it's very encouraging and very uplifting. Thank you so much.

**Johnson:** Thank you very much, Patty. It's good talking with you. Have a great day.

**Goldman:** You too, thank you. **PCB**

## Ending Thoughts by Patty Goldman

As I said in the title, you had to be there. All the interviews, all the thoughts, impressions, comments from the group cannot nearly capture the enthusiasm, the willingness to listen, the subjects discussed, the essence of the meetings with departments, representatives, and senators. You really had to be there.

Washington, D.C. is an impressive city with massive white stone government buildings everywhere. The energy is unmistakable and it's easy to get caught up in it. But if you think elected officials sit in pretty offices all day gabbing, arguing or eating fancy meals, you are mistaken. More than once we saw our speakers rush off, a staff person with schedule beside them, and neither able to join us for lunch because another meeting was scheduled immediately following ours.

More impressive was that IPC could coordinate the schedules of (by my count) 10–12 significant speakers, group meetings at the EPA, White House and up on the Hill, and individual meetings with numerous individual senators and representatives, all within a two-day window and without conflicts. For those of you who attended, you know how valuable this was. For those of you who didn't, you missed one heck of an event. **PCB**



Bhawnessh Mathur shakes hands with EPA Administrator Scott Pruitt (right).



# 2017 Programs

## July 12

### Wisdom Wednesday

*Highlights of IPC's PCB Technology Trends 2016 Study*

*For Members Only*

**Webinar**

## July 26-27

### IPC Technical Education

*Chicago, IL, USA*

**Workshop**

## September 16-21

### IPC Fall Committee Meetings

*Held in conjunction with SMTA International  
Rosemont, IL, USA*

**Meeting**

## October 3-4

### IPC & WHMA Wire Harness Manufacturing Conference

*Paris, France*

**Conference**

## October 3-4

### IPC Technical Education

*Paris, France*

**Workshop**

## October 9-10

### IMPACT Europe

*Brussels, Belgium*

**Meeting**

## October 17-18

### IPC Flexible Circuits-HDI Forum **Conference**

*Tutorials and Technical Conference  
Minneapolis, MN, USA*

## November 8

### IPC Technical Education

*held in conjunction with PCB Carolina  
Raleigh, NC, USA*

**Workshop**

## November 14-17

### IPC Committee Meetings

*held in conjunction with productronica  
Munich, Germany*

**Meeting**

## November 14-17

### IPC Hand Soldering Championship **Competition**

*held in conjunction with productronica  
Munich, Germany*

## December 6-8

### HKPCA International Printed Circuit & APEX South China Fair

*Shenzhen, China*

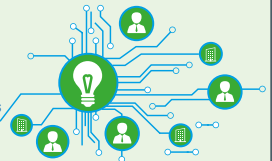
**Conference and Exhibition**



## Technical Education

*Professional development for engineering staff and managers*

July 26-27 in Chicago, IL



### IPC Technical Education — BEST PRACTICES IN DESIGN

#### EMI Control: Grounding, Power Distribution, Board Stack-up and More

**Rick Hartley, Principal Engineer for RHartley Enterprises**

The knowledge gained from this workshop can significantly reduce product develop time and cost, as well as improve product performance.

#### Design Challenges: Fine Pitch BGA Design; and Using Best Design Practices to Produce a More Manufacturable Board

**Susy Webb, Sr. PCB Designer for Design Science**

This class is two-in-one!

- 1) Explore the complexities of using fine pitch BGAs in designs.
- 2) Cover best practices to lower the time and cost to fabricate a quality board.

**Register**



Figure 1: Keynote by Phil Titterton, TTM.

# Review of the 2017 IPC Reliability Forum

by **Steve Williams**

THE RIGHT APPROACH CONSULTING

IPC continues to lead our industry by example with their inaugural Reliability Forum, held in Chicago in April. The event was focused on manufacturing high-performance products and featured industry royalty from both a speaker and audience standpoint.

## Event Background

The event steering committee charged with developing the forum was headed by Program Chair Michael Carano, and included Don Dupriest, Michael Jawitz, Craig Hillman, Gary Ferrari, Jack Fisher, Denny Fritz, and Sanjay Huprikar, VP of the IPC Member Services. Mike Carano, VP of RPB Chemical Technologies served as the forum's ringleader, host and emcee. I was fortunate enough to have been asked to participate and speak at the event, and I feel an obligation to let those who were not able to attend this year know what an invaluable educational opportunity this ongoing forum presents for our industry moving forward.

## The Audience

The forum was extremely well attended, with a veritable who's who of our industry's

supply chain, including raw material and equipment suppliers, PCB fabricators, contract manufacturers and OEMs. Companies represented included: Amphenol, Atotech, Aurora Circuits, CTS, DfR Solutions, Dow Chemical, Dow Electronic Material, DuPont-RTP, Embraer S.A., Extreme Engineering Solutions, FTG Circuits, HDP User Group International, Holaday Circuits, Intrinsic Materials, Inventec Performance Chemicals, IPC, KEMET Electronics, Lockheed Martin Space Systems, Lockheed Missiles and Fire Control, MacDermid Enthone, MED-EL, Minco, Motorola, Nexteer Automotive, Northrop Grumman, NSW Crane, NTS, Orbital, Park Electrochemical, Penn State University, Precision Analytical Laboratory, Prismview, Raytheon, RBP Chemical Technology, Rockwell Collins, Rolls-Royce, SAIC, Summit Interconnect, The Right Approach Consulting, ThingWeaver Solutions, TTM Technologies, Ventec, and ZESTRON.

## The Topics

The Steering Committee did a wonderful job of assembling a lineup of topics that were both relevant to the forum's theme of manufacturing high-performance products, and presenting insight from our industry's brightest technological minds. What follows is a brief highlight of each speaker's presentation.



**Mach**  
**630NP**  
NEXT GENERATION  
AUTO FILM  
LAMINATOR



# REASONS TO UPDATE YOUR DRY FILM APPLICATION PROCESS



## 1. Optimum Resolution of sub 5 mil features

The new EVEN Heat and EVEN Pressure Module provides for optimum film adhesion across the entire panel surface.

## 2. Change Lamination Rolls in seconds

Lamination Rolls are now available with different rubber styles to suit the PCB design and manufacturing process.

## 3. Enclosed Machine Cabinet

The machine enclosure minimizes the amount of contaminants reaching the surface of the copper.

## 4. Cassette Loading of Film

The loading of film off-line is reducing the change-over time by 50%.

## 5. Low Maintenance Cost

The new 630NP Laminator Series has been designed with higher reliability components and with easier access to key modules.

## 6. Ease of Use

The updated Programmable Logic Controller (PLC) provides for greater simplicity of all process operating functions along with easier operator training.

## 7. Increase YIELD and ROI

Initial findings are showing a reduction in "Opens" of 27%. The reduction of scrap material and improved productivity increases the ROI.



**MATRIX**  
CIRCUIT BOARD MATERIALS

**1-800-668-5447 • [www.matrixusa.us](http://www.matrixusa.us)**

TORONTO • SANTA ANA • SANTA CLARA • CHICAGO



Figure 2: Gary Ferrari, FTG.

## Keynote Presentation: What Makes our Organization a Global Leader

Phil Titterton, President of the Aerospace & Defense/Specialty Business Unit with TTM, presented tools, techniques and lessons learned on what it takes to be a successful PCB fabricator in today's global environment. Phil discussed the importance of DFM and its impact on reliability and the need to share best practices within our industry. Phil's advice to "park the ego at the door" was particularly telling as he explained that collective minds versus islands is critical to solving discrete problems and streamlining processes. This really resonated with me as some companies still believe that the key to success is to protect their trade secrets. There really are very little secrets; the key to success is in the execution!

## Building Reliability In: Design for Reliability

FTG Director of Technical Support Gary Ferrari presented on a variety of issues that affect reliability, such as life cycle development and the considerations of materials, construction, failure modes, and the effects of surface finish and via fill materials on reliability. One of Gary's key takeaways was that performance may equal reliability, but reliability absolutely equals performance. Gary presented a four-step process in life cycle development of: 1) Identify reliability requirements; 2) Identify life envi-



Figure 3: Gary Carter, ThingWeaver Solutions.

ronment; 3) Identify storage environments; and 4) Analyze and selection of components, materials, processes and strategies. A key portion of his presentation dealt with typical microvia failure modes and how to avoid them.

## Generic Protocols for Capture and Transfer of Design Data with IPC-2581

Gary Carter, principal of ThingWeaver Solutions, presented on the importance of collaboration in product development between all interested parties in the supply chain. Gary highlighted the perils of relying solely on Gerber data and focused on the need to employ intelligent data transfer to improve efficiency and quality in PCB design, fabrication and manufacturing assembly. He presented case study results and the "Smart PCB Digital Factory" solution that seeks to remove inefficiencies that exist across electronics design, fabrication, and test processes by replacing the "shopping cart" of engineering files with IPC-2581B.

## Reliable Use of Embedded Passives

Jimmy Baccam, senior electromechanical designer for Lockheed Martin, educated us on what embedded planar capacitance is and is not, along with the pros and cons of this technology. Jimmy continued with lessons learned from fabricating with thin dielectrics, thermal stress and shock testing. A great deal of techni-

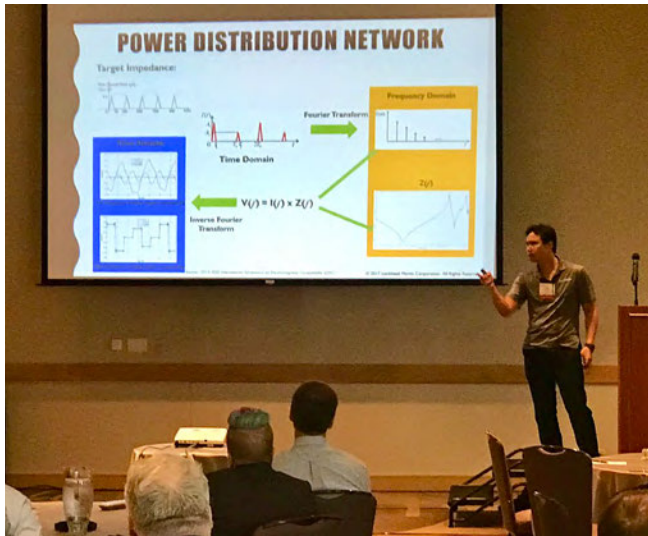


Figure 4: Jimmy Baccam, Lockheed Martin.

cal information was shared on the benefits of “being thin” and understanding power distribution.

### **How Fabrication Affects Reliability—Flowing Reliability from Design to Fabrication & Targeting a Precise Defect with Data: Reliability Report on WRAP for Plated Through-Holes**

Hardeep Heer, VP and CTO with FTG, presented on two topics impacting PCB reliability, the first focusing on the relationship between design and fabrication. Hardeep began with a review of the current acceptability standards across all market sectors, including life cycle expectations and failure rates. He discussed reliability testing, including thermal cycling and IST testing along with the associated results and data that can be achieved. A particularly informative section was his review of typical PCB failures and the processes and materials that impact reliability. Hardeep’s second presentation discussed WRAP plating, which is defined as “the electrolytic hole plating deposition continuously extending onto the surface from a plated via structure.” Hardeep presented the strategy of a joint DoE between FTG and PWB Interconnect to study the failure modes on WRAP plating. The schedule is to complete the DoE later this year and present the results to the industry at the 2018 IPC APEX EXPO conference.

### **Military Requirements for Reliability**

IPC Hall of Famer Dennis Fritz and Jeff Harms, Reliability & Maintainability Engineering with the Naval Surface Warfare Center, were up next. They presented an overview of military requirements that have an impact on product reliability, with a focus on environmental conditions. They reviewed the requirements of the military standards SD-15, Performance Specification Guide and MIL-STD- 810, Department of Defense Test Method Standard. Several test methods were reviewed that are used to evaluate a product’s capability to withstand environmental exposure, and concluded by providing a list of resources available to military contractors and suppliers.

### **Collision of Quality and Reliability Requirements**

Dennis Fritz reviewed a thought-provoking presentation on the synergy between quality and reliability, and the impact on both related



Figure 5: Denny Fritz, SAIC.

to design. Dennis presented a couple of key definitions as it relates to this interaction:

- **Reliability:** the ability to function as *expected*, under the *expected* operating conditions, for an *expected* period, without exceeding *expected* failure levels.
- **Quality:** the ability to produce the product, in the manner specified by the customer in the documentation package provided, including any test or legal requirements.

A review of the traditional evaluation methods was discussed, followed by an examination of both the strengths and shortcomings of traditional methods. Dennis discussed the reliability challenges of today's technology, including component miniaturization, additional assembly thermal cycles, lead-free temperature requirements, and the increased stresses placed on laminates. He concluded that while traditional PWB quality measurements are still necessary to keep fabrication processes in control, development of new measurements is needed to assure reliability of advanced technology.

### Physics of Failure

Craig Hillman, Ph.D., CEO and managing partner of DfR Solutions, presented a briefing on the IPC committee work regarding the need to develop modeling and simulations for physics of failure (PoF) requirements. Craig cited increasing interest from OEMs is driving the sup-

ply chain to perform these type of analyses, and the industry has a general lack of data in these areas. Craig defined the scope of the problem when he stated, "When product volumes easily run into the millions of units, even a 0.1% failure rate problem is a large issue." An interesting point was made when he presented the reasons that OEMs "hate" environmental testing, including: it takes too long, costs too much, is too late in the process, suppliers rarely fail their own testing, failures are not always relevant, and there is significant disagreement over what failure means.

The scope of the committee work is to identify best practices in the practical implementation of requirements for physics of failure analysis from the electronics supply chain, with a specific focus on component and assembly technology. Craig shared comments from a major PCB fabricator, who stated, "New, upfront methods of modeling must be developed and implemented to increase the ability to quickly discover and correct issues in designs to avoid latent field issues, reduce warranty costs, and increase customer satisfaction." The goal of the committee is to review the current 20+ standards and leverage the appropriate attributes to develop a new standard to meet the existing expectations of the industry.

### Voids in QFN Solder Joints: What should we use for maximum void criteria?

Dave Hillman, principal materials and process engineer with Rockwell Collins, presented on the impact of voids in solder joint reliability. Dave began with a review of packaging trends, including cost, low profile, electrical performance and thermal dissipation. He then moved on to reviewing the design impacts on solder joint performance, including assembly influences such as solder paste choice and reflow profile. A frank discussion followed regarding the "functionally vague" guidance on acceptable voiding, and the decision to develop a new acceptability criteria that is based on industry data leveraging the work done by the NASA DoD Consortia Team. Dave reviewed the test vehicle and components, thermal profile and testing protocol that was developed and results of the reliability tests performed. The con-

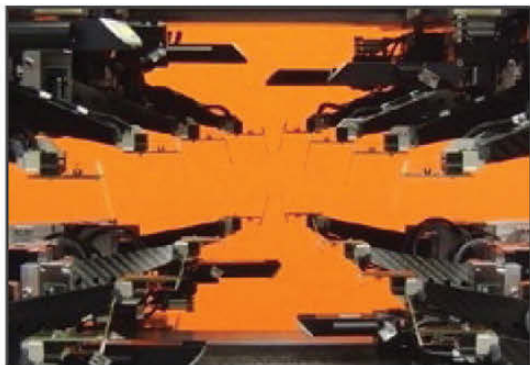


Figure 6: Jack Fisher and others discussing the importance of manufacturing high-performance products.

# Unrivalled Speed with Full Automation



**Introducing the atg A8-16a with 16 test probes at an unrivalled test speed of up to 250 measurements per second and full “lights out” Automation.**



Test area:	610 mm x 620 mm (24.0" x 24.4")
Number of test heads:	16 ( 8 top + 8 bottom side)
Smallest pad / pitch :	35 $\mu$ m (1.4 mil) / 80 $\mu$ m (3.2mil)
Test voltage:	Up to 1000V
Max. measurements / minute:	Up to 15000 measurements /min. *
Loading capacity:	390 mm , max. 80 kg weight
Max board weight:	20 lbs
Marking option:	Barcode label

**Get more info**

**atg Luther & Maelzer GmbH**

Zum Schlag 3 • 97877 Wertheim • Germany  
Phone +49-9342-291-0 • Fax +49-9342-395 10  
sales@atg-lm.com • www.atg-lm.com



clusion reached from the data was interesting, with the suggestion that solder joint reliability isn't the problem, but rather component functional integrity. Dave concluded by stating that the solution is an emphasis on component selection and producibility addressing the function requirements of either thermal transfer or electrical ground characteristics.

### Industry Consortium Work: How Collaborative Projects Help Your Organization

Jack Fisher, project facilitator of the High-Density Packaging User Group (HDPUG) presented next on a Collaborative Approach to Reliability Assessment. HDPUG is a project oriented industry consortium addressing the integration of new electronics component packaging and interconnect technologies into member company supply chains. Their mission is to drive innovations in the electronics industry, with over 50 electronics industry companies participating in the group. Jack reviewed the status of a couple current projects: Multiple Laminations, led by Ivan Straznicky of Curtiss-Wright, and the Optical Interface Phase II Project, led by Brice Achkir of Cisco, and M. Immonen with TTM. Jack concluded with the results of the recently closed Electro-Chemical Migration project, led by Mike Bixenman of KYZEN Corp. Significant data, information and results were shared on each of the projects.

### Mitigation of Pure Tin Risk by Tin-Lead SMT

David Pinsky, senior fellow with Raytheon Company reviewed the results of an industry round-robin study on components with pure tin finished terminations that are at risk for tin whisker growth and potential unreliability. The goal of the study was to evaluate the conditions under which typical SMT components will achieve self-mitigation, and a DoE was developed. Many potential factors for consideration were considered for inclusion in the study, and the four factors that were selected were 1) Component packages (16 P/Ns); 2) Board finish (OSP & SnPb HASL); 3) Pad size; and 4) Manufacturing processes. David reviewed the DoE specifics, data and results, including the results of new



Figure 7: David Pinsky, Raytheon.

boards (6–13 months old) and older boards (>5 years old). David presented the conclusions of the DoE, which included 1) Undersides of leads will be mitigated more often than upper sides of leads; 2) Opportunities exist for enhancing self-mitigation through process adjustments; 3) Parts outside of normal shelf life cannot be assumed to self-mitigate in the same manner as parts within normal shelf life.

### ENEPIG—Impact of Surface Finishes and No-clean Fluxes

Bill Fox, materials and process assoc. engineer with Lockheed Martin Company presented on the reliability of ENEPIG in small solder joints. The premise of Bill's discussion was that HDI drives finer features on the printed board, and as solder joints become smaller, HASL becomes problematic. Electroless Nickel/Electroless Palladium/Immersion Gold (ENEPIG) is a surface finish that has been demonstrated to have a variety of benefits, however, there are concerns that palladium above a certain thickness or content has an adverse effect on the solder joint. Bill reviewed the specifics and results of a number of experimental procedures that were developed to test for a number of conditions. The conclusions noted were 1) No noticeable extent of  $\text{PdSn}_4$  intermetallics in joints due to the lower Pd thickness of the ENEPIG specification; 2) Solder joints on ENEPIG demonstrat-



Figure 8: Bill Fox, Lockheed Martin.

ed good shear strength and comparable thermal cycling survivability to HASL; and 3) Pd content from a standard ENIG finish is acceptable for high reliability in small solder joints (1.5–2.5 mil). Bill ended by calling for additional discussions on two points: 1) Material and process details such as gold thickness, solder mask thickness, and solder volume are critical factors to very small solder joints, and 2) Gold at 3% in a solder joint may have been a factor in crack initiation, but thermal cycle failures are in the bulk solder joint.

### It's Time to Improve Component Standards and Measurement

Joe Rousseau, president of Precision Analytical Laboratory, asked the rhetorical question “should the industry care about component cleanliness?” and presented the results of a study by the ad hoc Cleanliness Team. The team member companies included IEC Electronics, Corfin Industries, Secure Components and Precision Analytical Laboratory, and focused on understanding the impact of component cleanliness on reliability. The team has completed the first two of the four phases of the study: Phase I—Printed Circuit Board (PCB) Cleanliness; Phase II—Component Cleanliness; Phase III—Printed Circuit Board Assembly (PCBA) Cleanliness; Phase IV—Reliability Cleanliness Limits.



Figure 9: Joe Rousseau, Precision Analytical Laboratory.

Joe’s call to action was to continue the dialog in the industry on the following topics:

- It’s time to improve component cleanliness standards and measurement
  - Start the discussion (Why should industry care?)
  - What is meant by “cleanliness”?
- What are the current industry techniques used for measuring ionic “cleanliness”?
  - Resistivity of Solvent Extract (R.O.S.E)
    - Ion Chromatography
    - GEIA-STD-0006, Requirements for Using Robotic Hot Solder Dip to Replace the Finish on Electronic Piece Parts
    - Data Comparison Study (R.O.S.E. vs. IC)
- Where do we go from here?

### Fresh Perspective on Test

William Graver, senior analyst with National Technical Systems (formerly Trace Laboratories), presented the thought-provoking question, “Is test an unnecessary evil, or a life-saving necessity?” William walked through a number of major reliability concerns in today’s environment, and presented some graphic examples of catastrophic reliability failures. Two major failure modes were reviewed in the form of case studies. The first study was on via-pad separation in rigid-flex PCBs, which exhibited a 25%



Figure 10: Yours truly presenting.

failure rate after two assembly thermal excursions. This was attributed to microetch chemical type, and size of the micro-via. The second study was on plating separation, which also had high failure rates after two assembly reflow cycles. The solutions to this issue were to replace button plating with pattern plate, and to use a thicker wrap plate per IPC Class 3. William concluded by reviewing methods for testing to eliminate failure mode:

- 5X reflow simulation
- Interconnect stress testing (IST)
- New thermal cycle method—CITC
- -100°C vacuum environment
- Extra DPA

## Inspection: Is it Necessary?

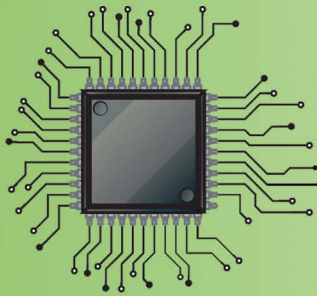
I batted cleanup for the event, and received some feedback the day before from Tony, a quality engineer colleague with one of my clients. After reading the first paragraph of the white paper I sent out as a teaser to the event, Tony

told me: “Steve, you are wrong. You can never get rid of all inspection in our business; it just is not possible.” I said: “You’re right, Tony, but when I send you the entire paper you will see that I am talking about eliminating the profit-sucking practice of using inspection as a Band-Aid to quality problems instead of fixing the process.”

I discussed the point that the customer is paying for our inefficient processes through scrap, rework and returns, and that this knee-jerk reaction has a triple impact on profits:

1. Inspection by definition is a non-value-add reactive process
2. It doesn’t address the root cause of the issue and assures it will resurface at some point
3. Inspection is not effective

The solution is to employ the appropriate best-practice tools in your operation, and a number of lean methodologies, tools and tech-



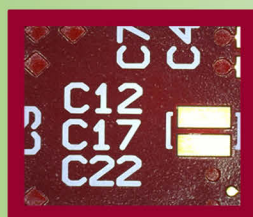
# MivaTek

**Global**



## LED Direct Imaging

*We give a dam...2.0 mil solder dams*



- > 2.0 mil solderdams
- > 4 mil mask defined pads
- > Colors: GRN, WHT, BLK, BLU, RED
- > Excellent camera registration
- > Legend printing using white SM
- > Inner and outerlayer imaging
- > Extensive North American support
- > 20 machines sold in North America

*MivaTek Global, LLC formerly Kuper Technology, LLC*

**Now Hiring :** *Sales Engineers, Applications Engineers and Technical Support*

MivaTek Global, LLC, PO Box 893, Concordville, PA 19331, Ph: (610) 620-3795

**Eastern US:** Brendan F. Hogan, M:(610) 620-3795, B.Hogan@MivaTek.Global

**Western US:** Kurt Weber, M:(714) 767-6367, Kurt@MivaTek.Global

**MIVA: LED DIRECT IMAGING**

niques were reviewed. The results of a study by Mikel J. Harry, PhD (the father of 6 Sigma) provided food for thought with the audience. Dr. Harry did a benchmark study of U.S. manufacturing companies, and found that the average sigma level in the U.S. is between 3.5 and 4 sigma. This means that the average company is spending 25% of their revenue on the Cost of Poor Quality (CoPQ). And remember who is paying for this: your customers. So, no matter how good you think (or tell your customers) you are, there is plenty of room for improvement. I ended with a remarkable stat:

Foolishly trying to “inspect in quality” by sorting has a greater impact on profit than:

- Raising prices on your product
- Hammering your suppliers for lower costs
- Most any other traditional profit enhancement initiatives

### Conclusion

These types of events are sorely needed in our industry, and critical for us to remain at the forefront of technology to support our customers. I look forward to seeing the Reliability Forum gaining momentum as it becomes an an-

nual must attend industry event. I'll close with a quote from the forum's driving force, Sanjay Huprikar, when I asked Sanjay about the motivation for developing this event:

“There is a real urgency in the electronics industry to put practical methodologies in place to improve reliability and this year's IPC Reliability Forum focused on processes and materials for long-term reliability. From the keynote presentation that provided an insider's perspective on the how product reliability is important for good business to the presentations on design for reliability, collision of quality and reliability requirements, the physics of failure, military requirements for reliability, and more, the event provided attendees with new strategies they were able to take back and implement right away.” **PCB**



**Steve Williams** is the president of The Right Approach Consulting LLC. To read past columns, or to contact Williams, [click here](#).

---

## Data I/O on Securing the Electronics Manufacturing Supply Chain

At the recent NEPCON China event in Shanghai, Anthony Ambrose, president and CEO of Data I/O Corp., speaks with I-Connect007's Stephen Las Marias about the cybersecurity challenges facing the electronics manufacturing industry, amid the proliferation of connected devices and the Internet of Things. Also discussed—traceability and security strategies to protect the electronics manufacturing supply chain.

**Stephen Las Marias:** Please tell us about your company.

**Anthony Ambrose:** Data I/O are the worldwide leader in programming solutions for manufacturing. We put the firmware and security solutions into the products that everybody uses every day. Things like cellphones, automotive electronics, Internet of Things. We are headquartered in the United States, with a very large operation in Shanghai.

**Las Marias:** Cybersecurity is one of the biggest issues facing the electronics manufacturing industry, especially with the proliferation of connected factories and the IoT. How are you helping customers address that issue?

**Ambrose:** You are right—cybersecurity is a big issue. The problem is worldwide in scope, across all sorts of products. Companies are turning to more secured solutions, both with products that are authentication chips or secure microcontrollers, which allows customers to secure their production, secure their supply chain much more effectively, and control and secure their firmware and maintain firmware integrity throughout the life of the product. This is really a breakthrough announcement in security for programming solutions. We are very pleased with partnering with Renesas.

To read the full interview, [click here](#).



THE best way to find a PCB fabricator, anywhere.

## AMERICAN STANDARD CIRCUITS, INC. (ASC)

West Chicago, Illinois, U.S.A.



## American Standard Circuits

Creative Innovations In Flex, Digital & Microwave Circuits

[Overview](#)[Contact](#)[Specs](#)[About](#)[Videos](#)[Photos](#)[Brochures](#)[News](#)

Welcome to ASC, Inc., the ideal PCB manufacturer for today's electronics industry. ASC Inc. has earned a solid reputation as a reliable source for printed circuit boards. Our focus is to provide PCBs for research and development as well as production requirements for business today.

We have the unique ability to adjust to the ever changing schedule in business today. Our flexibility is the key to saving your company time and money in the manufacturing cycle. From prototype to production, the ASC team will supply a quality product on time. ASC wants to establish a long term relationship with you and your company. We will be ready when needed. ASC is a reliable manufacturer that will be serving the electronics industry for many years to come.

**Markets:** Automotive, Communication, Computers, Industrial, Medical, Military/Aerospace

**Board Types:** Single-sided, Double-sided, Multilayer, Rigid-Flex, Other: Metal-Backed, Core Boards

**Capabilities:** Prototype, Small, Medium

**Services:** Assembly, Consulting, Design, Quick turn, Turn-key, Other: Asian Outsourcing

**Advanced Features:** Through-hole/buried vias, Bonded heat sinks, Controlled depth drilling, Controlled depth milling, Controlled Impedance, Etched/plugged vias, Heavy copper, Large area thermal relief

Click to see a partial list of registered OEMs!



[Click here to see a demo](#)

### Why YOU should Showcase:

- Capabilities listing for advanced search functionality
- Specialties and certifications listing
- Ability to upload brochures and videos
  - News, web and contact links

[www.thepcblist.com](http://www.thepcblist.com)

## **Off-the-Shelf Power-Generating Clothes Are Almost Here**

A lightweight, comfortable jacket that can generate the power to light up a jogger at night may sound futuristic, but materials scientist Trisha Andrew at the University of Massachusetts Amherst could make one today. They have invented a way to apply breathable, pliable, metal-free electrodes to fabric and off-the-shelf clothing so it feels good to the touch and transports enough electricity to power small electronics.

## **Eltek Inks Distribution Agreement with NCAB Group Italy**

Eltek Ltd., a global manufacturer and supplier of technologically advanced solutions in the field of printed circuit boards, announced today an agreement with NCAB Group Italy to distribute Eltek's products in Italy.

## **American Standard Circuits Earns Key Military Qualification MIL-PRF-50884F and Expands MIL-PRF-31032**

American Standard Circuits' CEO Anaya Vardya announced recently that his company has officially received its military qualification for flex and rigid-flex printed circuit boards: MIL-PRF- 50884F and MIL-PRF-31032C, QPL/QML Product Assurance Level, FSC 5998: Cage Code 4AA34: CN056313, VQ (VQE-17-031438).

## **Tucking in to NIST's '3D Printer' Testbed**

3D printing of metal objects is a booming industry, with the market for products and services worth more than an estimated \$2.3 billion in 2015—a nearly five-fold growth since 2010.

## **Faster, More Nimble Drones on the Horizon**

There's a limit to how fast autonomous vehicles can fly while safely avoiding obstacles. That's because the cameras used on today's drones can only process images so fast, frame by individual frame. Beyond roughly 30 miles per hour, a drone is likely to crash simply because its cameras can't keep up.

## **DARPA Picks Design for Next-Generation Spaceplane**

DARPA has selected The Boeing Company to complete advanced design work for the Agency's Ex-

perimental Spaceplane (XS-1) program, which aims to build and fly the first of an entirely new class of hypersonic aircraft that would bolster national security by providing short-notice, low-cost access to space.

## **Compunetics and Circuits, LLC Announce Acquisition**

Compunetics Inc. is pleased to announce it has concluded an agreement with Circuits, LLC to acquire the assets of Circuits, LLC, a flexible printed circuit board manufacturer located in Murrsville, Pennsylvania.

## **Beyond Scaling: an Electronics Resurgence Initiative**

The Department of Defense's proposed FY 2018 budget includes a \$75 million allocation for DARPA in support of a new, public-private "electronics resurgence" initiative. The initiative seeks to undergird a new era of electronics in which advances in performance will be catalyzed not just by continued component miniaturization but also by radically new microsystem materials, designs, and architectures.

## **UQ Partners with Lockheed Martin to Develop Next-Gen Computers for Aerospace Applications**

University of Queensland researchers have partnered with global technology leader Lockheed Martin to develop next generation computers for aerospace applications. ARC Future Fellow and project lead Professor Warwick Bowen said the partnership would develop a new approach to computer technology, with the potential for future commercial impacts in the aerospace industry.

## **All Flex Expands Primary Production Facility**

All Flex, a manufacturer of flexible printed circuit boards and flexible heaters, recently completed an expansion of its primary production facility in Northfield, Minnesota, increasing its fabrication footprint by 10%. With two facilities in Northfield, the company invested \$400K in consolidating its headquarters into one location, freeing up needed space for production capacity, fabrication processes, and improved material flow.

# Excellon

*Manufacturers of precision Micro-Machining  
Solutions for over 50 Years*



## COBRA II

*Hybrid laser system*



## 689

*6-station precision drilling  
and routing system*



## HS-1L DS

*Single-station, dual spindle  
high-speed system*



## 136L

*High accuracy and speed*



## 154L

*Large panel applications*



## HS-2L

*2-station, high-speed*



## 129

*Single-station precision system*

**Move into the future with the latest innovations  
in Fabrication Technology from the Industry Leader!**

# The Critical Importance of Rinsing, Part 1

by Michael Carano

RBP CHEMICAL TECHNOLOGY

In nearly every chemical process step in the PCB industry, rinsing is an immediate and required process step. Rinsing is typically a crucial step following a chemical process, and is thought to be one that requires little or no attention to function properly. However, problems caused by ineffective rinsing are responsible for many rejects, as well as huge operating costs in the waste treatment department.

It's a fact: Processing printed circuit boards consumes large volumes of a precious resource. However, there are ways to perform the function of removing contaminants from the printed circuit board and still conserve water.

At first thought, rinsing is often defined as the removal of process solution from the work, or in the case of the PCB industry, a panel. This is true, if not absolutely true. Rinsing, in general, is not the complete removal of the contaminants, but rather a dilution of a process solution from the work (panel) down to man-

ageable concentrations. With this definition in mind, rinsing systems can be designed to minimize harmful contaminants on a printed circuit board and reduce water consumption. I am often asked if there is some standard that can be applied to the rinsing process. Are all types of contaminants the same? Is there a hard and fast rule to rinsing? The short answer is, not really. What constitutes a manageable concentration is dependent upon three conditions:

1. The type of contaminant
2. The tolerance of the following process step for the contaminant in question
3. The effect the residual contaminants have on the work

Let us examine the contamination, or "drag-in," of an alkaline cleaner into a persulfate-based microetch vs. the same cleaner dragged into an acid copper plating bath. Both baths are



# How important are your connections?



## Plasma to improve reliability – *no bad connections!*

- > **Desmear**
- > **Etchback**
- > **Panel Cleaning**

### Plasma treatment in PCB Manufacturing:

- Removing resin smear
- Removing carbon byproducts from blind vias
- Efficient, economical and environmentally benign

**Contact us now to learn more.**

+1-800-326-1151

+1-925-827-1240

info@nordsonmarch.com

**nordsonmarch.com**



**VIA™ Series  
Plasma System**

**Nordson**  
MARCH

acidic, and some acidity will be neutralized by drag-in of alkaline residues. Depending upon the concentration of drag-in, the alkaline solution will have an almost negligible neutralization of the microetch. This is true because the acidity of the microetch is self-generated by the spontaneous decomposition of the persulfate, thus the decrease in acidity is, to some extent, automatically replenished.

When examining an acid copper plating bath, however, we know that this bath is extremely sensitive to contaminants, and can be ruined by the same level of contaminants that would have no effect on a microetch. We can conclude that a level of contaminants from an alkaline cleaner that one process solution can tolerate may not be tolerable for a different process solution. Manageable levels of contamination would need to be determined for each specific process.

In both cases discussed above, effective rinsing will prolong bath life of process solutions down the production line. An effective rinsing system that efficiently removes enough process solution can decrease chemical costs, lower reject rates, and ease the burden on waste treatment systems.

There are several myths associated with rinsing performance that deserve discussion. A common myth is that alkaline solutions are more difficult to rinse than acid solutions. Consequently, we often see rinses following alkaline cleaners using hot water, and/or extremely long exposure times. Let's examine these myths further.

These observations likely started due to the difficulty of removing the slick feeling that an alkaline solution gives when in contact with the skin. The slick feeling is never rinsed away, because the slickness is due to the fixed oils on your skin being converted to a soap by the alkalinity of the solution. What you wind up doing is converting this "soap" to hard water scum when rinsing your hands in water, or to a fatty acid, when rinsing in an acidic solution. Since these oils are not found on copper, soldermask, laminate, or other materials, rinsing alkaline solutions from printed circuit boards is no more difficult than rinsing acidic solutions.

Alkaline cleaners can also get blamed for

poor rinsing because of the presence of foam-generating surfactants in the formulations. The surfactants used in many alkaline cleaners generate large amounts of foam even at incredibly low concentrations. When a small amount of surfactant is dragged into a rinse tank, it can create a stable foam, even at concentrations that would not affect subsequent process steps. The cause of the foam, however, is not because the surfactants are not rinsed inadequately from the work, but because the presence of these surfactants in extremely minute amounts can cause substantial foam generation.

The perception that an alkaline cleaner would rinse poorly was further supported by the formulation chemistry. Some of the early alkaline cleaners were formulated using silicates. Calcium present in tap water was interacting with the silicates in these cleaners forming calcium silicate, which precipitated out of solution, and onto the work. Unfortunately, even extensive rinsing would not always help



Figure 1: Significant foam creation due to drag-in of the cleaner to a downstream process tank.

Ultra-low Transmission Loss Multi-layer Circuit Board  
Materials for ICT Infrastructure Equipment

# MEGTRON7

Laminate **R-5785(N)**  
Prepreg **R-5680(N)**

H-VLP2 Cu and Low Dk  
Glass-Cloth Specifications



## Features

- H-VLP2 copper foil and Low Dk glass-cloth allows for 30% loss improvement than MEGTRON 6
- Glass transition temperature (T<sub>g</sub>): 200°C (DSC)
- Reduce process cost (Improve drill processability and ENIG (Electro-Nickel Immersion Gold))

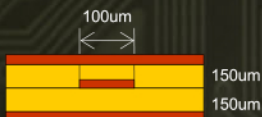
	Dk	Df
<b>R-5785(N)</b> <b>+ H-VLP2 Cu</b>	3.4	0.002 @ 12GHz
<b>R-5775</b>	3.6	0.004 @ 12GHz

## Applications

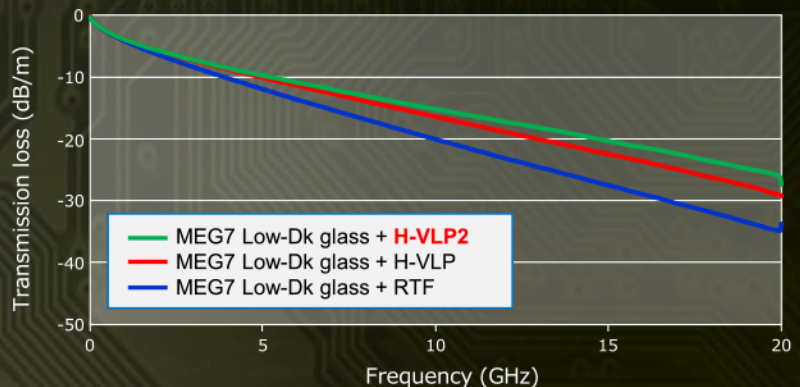
- High-end servers, High-end routers, Supercomputers, and other ICT infrastructure equipment, Antenna (Base station, Automotive millimeter-wave radar), etc.

## Transmission Loss

- Evaluation Sample



Line Length	1000 mm
Impedance	50 Ω
Copper Thickness	18 μm
Inner Cu Treatment	No-surface Treatment
Core Type	#1078 (RC67%) x 2ply
Prepreg Type	#1078 x 2ply



**Contact us**



**More information**



DISTRIBUTOR IN NORTH AMERICA  
**MATRIX USA INC.**  
TORONTO • SANTA ANA • SANTA CLARA • CHICAGO • MINNESOTA  
Visit our website at [www.matrixusa.us](http://www.matrixusa.us)

Partnering to go beyond.

**Electronic Materials**  
Panasonic Corporation

the situation, and rejects resulted. Thankfully the industry, and its suppliers, have grown up since that time, and silicates are no longer present in most of the cleaners used by the PCB industry. Regardless, do not assume only alkaline cleaners are more difficult to rinse. Some acid-based cleaners, due to the nature of the surfactants and wetting agents contained in the formulation, also pose rinsing challenges.

Wetting agents and surfactants can cause havoc with rinsing and subsequent cleaner drag-in to downstream operating process steps (Figure 1). When one sees excessive amounts of foam in subsequent processing cells, the red flag should be raised.

Still another theory, widely held throughout our industry, reasons that if work is left in a rinse tank for a longer period, better rinsing will be the result. Let us apply the dilution model we discussed earlier, as a review of this information would prove this theory to be false.

When a rack of PCBs is immersed in a rinse tank, the residual surface contamination is reduced to a practical minimum within 30 seconds, as the solution carried in on the surface of the work disperses into the rinse waters. A typical rinse tank of 100 gallons, with a water flow of five gallons per minute would decrease the concentration of the solution contaminants at a rate of only 5% for each minute that it remains in the rinse tank. Leaving the work in any longer would have virtually no effect.

It would be much preferable to have brief exposure times in many (presumably cascade) rinse tanks, which will result in a better dilution

rate of the contaminants, than a long exposure time in just a few rinse tanks.

There have been countless studies performed on rinsing mechanisms, and the literature is rife with information on achieving high-quality rinsing. Most studies are based upon multitudes of calculations of volume of water flow relative to number of rinse tanks in use.

In some areas, cascade rinsing is currently held in high favor even though this method can substantially increase water consumption. In other areas, PCB fabricators are constantly concerned with amount of water consumed. Both the price tag attached to each gallon of water consumed, and the cost of waste treating the rinse waters are major factors. We see therefore, that the “more is better” attitude to improving rinse water quality cannot be acceptable across the board.

This brings us to the ultimate question. Namely, how can we further improve rinse quality without increasing water consumption and waste generation? This question as well as additional concerns related to rinsing will be explored in a future column of “Trouble in Your Tank.” **PCB**

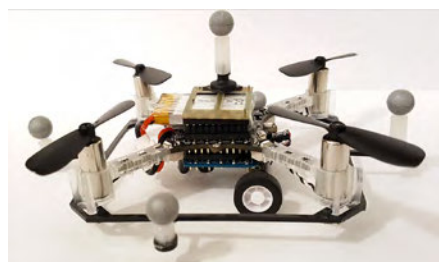


**Michael Carano** is VP of technology and business development for RBP Chemical Technology. To reach Carano, or read past columns, [click here](#).

---

## Drones that Drive

Many birds, insects, and other animals can both walk and take flight. Robots with similar versatility would open many possibilities, including machines that could fly into construction areas or disaster zones that aren't near roads and squeeze through tight spaces on the ground to transport.



Researchers from MIT's Computer Science and Artificial Intelligence Laboratory (CSAIL) are aiming to develop robots that can both maneuver around on land and take to the skies. [In a new paper](#), the team presented a system of eight quadcopter drones that can fly and drive through a city-like setting with parking spots, no-fly zones, and landing pads.

# **PCB BUYERS - compare nearly 1900 manufacturers now at *The PCB List*.**



*Quick Search*



*Advanced Search*



The best way to find a PCB fabricator, *anywhere*.

[www.thepcblist.com](http://www.thepcblist.com)

# Three Ways to Close the Skills Gap in U.S. Manufacturing

by John Mitchell

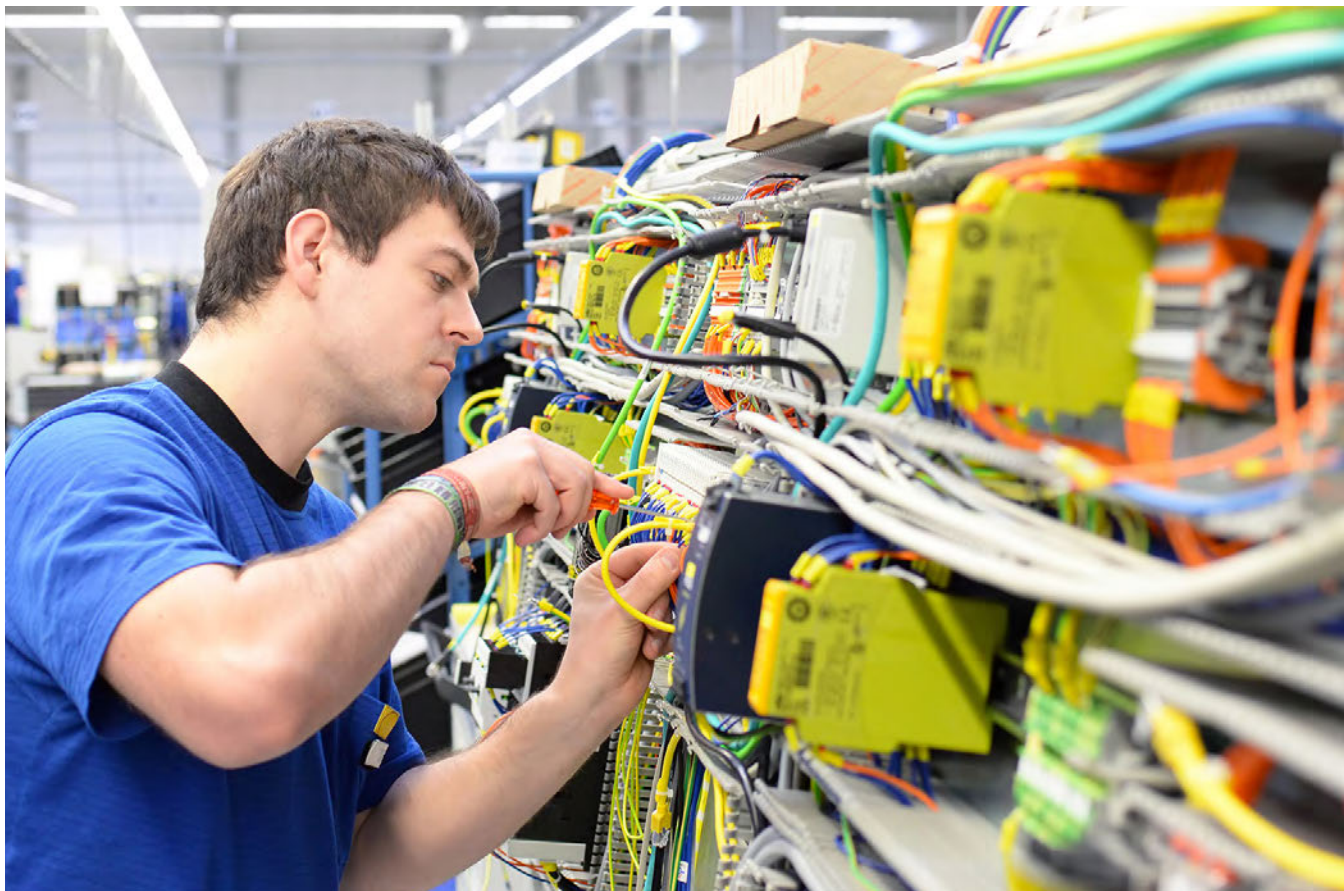
IPC—ASSOCIATION CONNECTING ELECTRONICS INDUSTRIES

The skills gap is a chronic problem in the manufacturing sector. Most manufacturing companies have a hard time aligning the talent needed to run their businesses with the talent that is available to work locally. And as new innovations emerge, new skills requirements emerge as well.

A new report<sup>[1]</sup> from the National Academies of Sciences, Engineering, and Medicine cites employer surveys and numerous industry and government reports in reaching the conclusion that the nation has an inadequate supply of skilled technical workers to achieve its competitiveness and economic growth objectives. In our sector, according to a 2015 study<sup>[2]</sup>

by the Manufacturing Institute, nearly 3.5 million manufacturing jobs are expected to become available in the United States over the next decade as current workers retire and the economy grows. Unfortunately, the skills gap is expected to leave 2 million of these jobs unfilled.

As an association that represents thousands of member facilities across the electronics industry supply chain, we decided to survey<sup>[3]</sup> our U.S. members [EMS companies] to gain insight into how the skills gap affects them. The results indicate that most of our member companies have trouble finding applicants with the necessary experience and technical skills.



# Six reasons why outsourcing CAM Engineering can be a great idea for you:



...and here is the delivered value:

	In-House	With Entelechy
Availability	48 weeks	52 weeks, 24/7
Overhead Cost	>30%	0%
Scalability	Limited	Unlimited
Redundancy	Variable	100% Bulletproof
Operational Efficiency	Status Quo	Continual Improvement
Total Cost	Fixed	Significantly lower

“ In our company, the CAM department was the bottleneck. As a result of our working with Entelechy, we can now accept orders that we had to refuse in the past.”

-Thomas Hofmann, CEO/Owner



**Click here to check out our risk-free Quick Start program»**

We deliver the highest quality PCB CAM and Mechanical CAD engineering services to customers around the world. We can help you beat your competition by teaming up with us.



**ENTELECHY GLOBAL**

[www.entelechyglobal.com](http://www.entelechyglobal.com)

Among production jobs, general assembler and hand solderer are the most difficult to fill. On the professional side, quality control, process and entry-level electrical engineers have been hardest to find. Insufficient experience is the most common reason that applicants do not qualify for most positions. However, for many technical professional positions, the leading reason jobs went unfilled was that there were no applicants at all.

Respondents cite many essential skills that are in short supply, but the most common ones are soldering for production jobs, and engineers with industry experience, especially in process, test, and quality control. Two-thirds of our member companies reported they would expand their operations if they knew that finding qualified workers would be no problem. Thus, finding solutions to the skills gap is a high priority if America wants to expand its manufacturing sector.

First, we need to do a better job of engaging kids in science, technology, engineering, and math (STEM) topics in elementary and middle school. Unfortunately, the Common Core standards<sup>[4]</sup> adopted by 44 states typically cover only language and math, with nothing on science and technology. Rather than attacking those standards, as some have done, policymakers should expand them and incentivize STEM teaching from kindergarten through 12th grade.

And America's educational standards should be tougher. Other nations set a high bar, pushing their youth to the top of the world rankings. Only by building U.S. students' skills and confidence in STEM subjects in their youth can the United States compete globally and build a solid pipeline of future engineers.

Second, we need to get rid of the notion that the only successful education is a liberal arts degree from college. Many noble and lucrative careers can be had by those who learn trades and technical specialties. In Germany, companies like Siemens and Bosch use apprenticeships to train their workers in advanced engineering and manufacturing. The model is used in professions like hospitality and banking as well. Such apprenticeship programs exist in the United States, but on a much smaller scale. Rather than cutting government funding for

these programs, leaders in education and business should work together to build them up.

IPC supports the bipartisan Strengthening Career and Technical Education for the 21st Century Act, H.R. 2353<sup>[5]</sup>, which is making its way through Congress and would provide federal support for career education programs. These steps are urgently needed, along with a broader strategy to ensure that continuous training is a high priority in our industry.

And third, there is much that we, the companies in our industry, can do on our own. We can host site visits or tours of our facilities and open our doors to local schools and the surrounding community to illustrate the importance of the electronics industry for the global economy. We can also develop a program or presentation to engage students and interest them in engineering careers. Companies may also offer intern programs for high school and college students. Additionally, IPC offers dozens of courses online and in-person, providing knowledge and certifications that can take current workers to the next level in their careers.

Only by raising the educational bar and building a stronger network of technical training programs can the United States hope to develop the workforce that it needs to compete in the global economy. **PCB**

### References

1. [Building America's Skilled Technical Workforce](#), the National Academies Press.
2. [The skills gap in U.S. manufacturing: 2015 and beyond](#), the Manufacturing Institute.
3. IPC survey: [Findings on the Skills Gap in U.S. Electronics Manufacturing—2017D1](#) (available for purchase).
4. [Common Core Standards—About the Standards](#)
5. [H.R.2353—Strengthening Career and Technical Education for the 21<sup>st</sup> Century Act](#)



**John Mitchell** is president and CEO of IPC—Association Connecting Electronics Industries. To read past columns or to contact Mitchell, [click here](#).

*The* JOHN MAXWELL **Team**

*Now an independent certified John Maxwell  
Team coach, teacher and speaker!*



**THE RIGHT APPROACH  
CONSULTING** LLC

**Quality systems.  
Process improvements.  
Business coaching.**

*I became a John Maxwell Certified Team Member so that I can help your business maximize its untapped potential and increase profits. The JMT Philosophy has made a difference for countless businesses around the world for more than 20 years.*



**CLICK TO LEARN HOW THE  
JMT PHILOSOPHY CAN  
HELP **YOUR** BUSINESS**

[TheRightApproachConsulting.com](http://TheRightApproachConsulting.com)





# Automotive Suppliers Must Manage Data for IMDS Compliance

**by Derrik Snider**  
IMDS DATA LLC

Suppliers of electronics parts and assemblies to the auto industry are finding IPC's voluntary material data reporting system (IPC-1752A) insufficient for automotive customers. The auto industry has adopted the International Material Data System (IMDS), which has different reporting requirements than IPC.

IMDS and IPC-1752A are different tools for reporting materials data, created by separate industries for different purposes. Suppliers of electronic parts and assemblies that will be part of a car must register their materials data in the IMDS database and obtain an IMDS number that will be required on a PPAP. Lower-tier suppliers are required by many higher-tier customers to provide the material data that IMDS requires as a condition of PPAP approval.

If a PCB fabricator has comprehensive and complete data describing all material substances in an assembly (in IPC or an equivalent format), it can provide its automotive customer

with sufficient data to comply with IMDS registration. For example, Figure 1A shows a portion of a hypothetical IPC material composition declaration (MCD) for two items on a supplier's BOM. Figure 1B illustrates how the same data on the two items would appear as part of an IMDS report. The arrows show how the IPC data would translate to the IMDS format.

Because the IPC data in Figure 1a is sufficient for IMDS, entering the data in the IMDS system would be relatively straightforward. Note that in Figure 1b the components would have to be correctly placed on the IMDS Tree Level for the part, and that material substance weights would have to be converted to percentages, a tedious and time-consuming task for many components.

A PCB fabricator supplying an automotive customer can fulfill their data reporting requirement in one of two ways:

1. Send complete data to the customer in IPC or equivalent format, or
2. Enter the data directly into the IMDS database

# Easily Remove Solder Mask with No Epoxy Laminate Attack!



Sometimes solder mask ends up on places it just doesn't belong and that is why we invented our patented **OS-953 Solder Mask Remover**. We formulated this product to be tough on solder mask yet gentle enough to not cause any damage to standard materials. Call or email us today to place your order, you will be glad you did!

## **OS-953\* Solder Mask Remover**

- Long-time industry standard
- Invented/Patented by OS-TECH
- Fast
- Long life
- Easy control
- No damage to standard materials

**\*Patented**

For over 45 years, our customers have come to rely on us for products that work extremely well. This, coupled with our commitment to personal service, is what makes us really outshine our competitors. We look forward to meeting you.

[insidesales@os-tech.com](mailto:insidesales@os-tech.com)

**OS TECH**  
*A company with chemistry*  
[www.os-tech.com](http://www.os-tech.com)


**CALL: 1 (888) OSTECH-1 • 1 (888) 678 3241 • 1 (972) 231-1522**

**Company Name: AEF Semiconductor**

**Mfgr. Item No. AEF 3153-IC-71462D2**

**Weight: 16 mg each**

Item / Subitem Name	Homogeneous Material	Substance	CAS	Weight	Unit of Measure	PPM
<b>Mold Compound</b>	Silica Fiber	SiO2	60676-86-0	0.000172	mg	364045
	Epoxy Resin		29890-82-2	0.000278	mg	39060
	Phenolic Resin		90123-35-4	0.000200	mg	28101
	Carbon Black	C	1333-86-4	0.000015	mg	2108
<b>Lead Frame</b>	Copper	Cu	7440-50-8	0.003423	mg	480944
	Nickel	Ni	7440-02-0	0.000107	mg	15034
	Silicon	Si	7440-21-3	0.000005	mg	3232
	Magnesium	Mg	7439-95-4	0.000005	mg	703



Tree Level	Substance Name	CAS No.	Quantity	Weight (g)	Portion (%)
I = 4	Mold Compound		1	0.003084	100
I = 5	Silica, Vitreous	60676-86-0			84
I = 5	Poly-co-Formaldehyde	29690-82-2			9
I = 5	Phenol, Polymer	90123-35-4			6.5
I = 5	Carbon Black	1333-86-4			0.5
I = 3	Lead Frame		1	0.003558	100
I = 4	Copper	7440-50-8			96.2
I = 4	Nickel	7440-02-0			3
I = 4	Silicon	7440-21-3			0.7
I = 4	Magnesium	7439-95-4			0.1

(Hypothetical examples: Only relevant data columns are shown.)

Figure 1: 1a. IPC MCD with sufficient data for IMDS compliance reporting, compared to 1b., a partial IMDS record for the two components in 1a. Note that substance weights have been changed to percent of total and the components have been placed on the IMDS BOM tree.

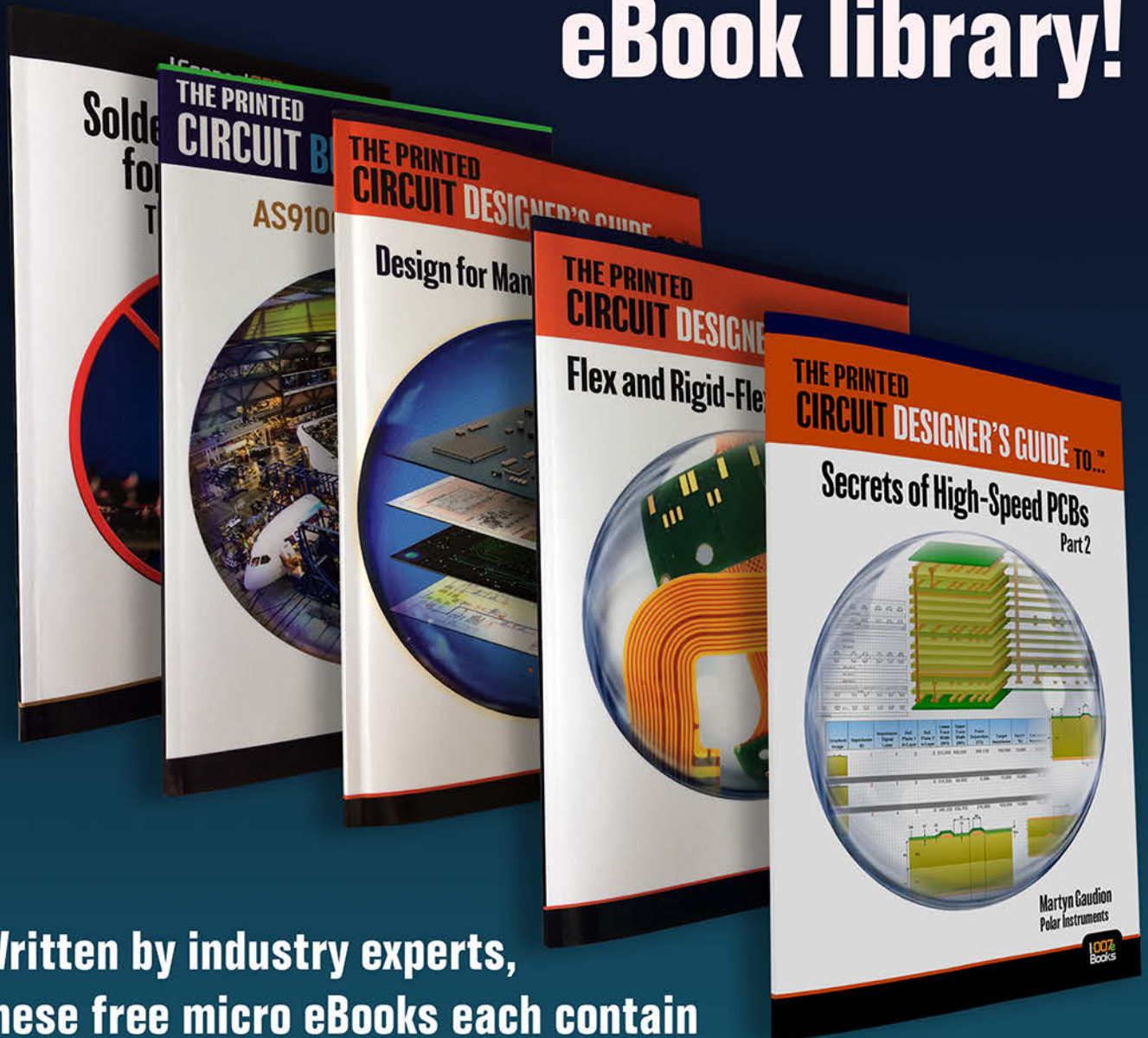
The first method is frequently used by lower-tier suppliers who are not totally dedicated to the automotive market. Of course, the fabricator must know what constitutes “complete” for IMDS. The second method is more practical for suppliers who produce primarily for the automotive market, and in fact it may be contractually required by their customers.

The problem many electronics manufacturers face is that their data is not comprehensive and complete enough for IMDS. The issue here is material data quality control. In prac-

tice, most BOMs have some missing or ambiguous materials data. A major reason for this is that comprehensive material documentation is generally not mandatory for doing business outside of the automotive industry; therefore, material data quality is not as important. Another reason is that many electronic components are purchased from commercial distributors outside of the automotive supply chain. These compete on price and delivery and have weak incentives to obtain and provide materials documentation. This works for most commer-



# Download free books from our micro eBook library!



Written by industry experts,  
these free micro eBooks each contain  
valuable information on relevant topics in  
an easy-to-read format.

Log in or register to access all our premium content at:

[myconnect007.com](http://myconnect007.com)



cial and industrial applications but causes problems for IMDS reporting.

IPC material data that is sufficient for IMDS, like the example in Figure 1a, is probably the exception. Since IPC reporting is voluntary, it is not often done unless it is a specific condition of purchase. If the IPC MCD is absent or incomplete, for any of the following reasons, then creating an MDS report is problematic:

- Missing weights
- Missing or incorrect CAS numbers
- Missing manufacturer name or part numbers
- Missing BOM tree hierarchy

Research is required to find the missing data. This may involve contacting the original component manufacturer or supplier, or searching the IMDS database to find exact or similar components previously entered. This can take considerable time and success is not assured. With proper material data quality control at purchasing and receiving and during production planning, this situation can be avoided.

I recall an extreme case when an engineer who was assigned to get an IMDS number for his company's automotive product declared:

*On my BOM I have about 80 components (resistors, capacitors, LEDs, etc.), some of which have multiple approved vendors. For example, one capacitor could be purchased from six different manufacturers. I have no way of knowing which manufacturers were used to produce our circuit board as we have our boards assembled by an outside source. There could be thousands of different combinations of components on the PCB. How do I handle this in IMDS?*

This engineer's dilemma reveals a level of material data quality that is not ready for IMDS prime time.

The problem here is that an IMDS number corresponds to a specific set of manufacturer's part numbers, chemical compositions and weights; in principle, the substitution of a single component part number requires the original IMDS record to be updated unless the chemical compositions and weights are nearly identical.

Tracking, checking and updating multiple component substitutions on IMDS is a nightmare.

One answer is to standardize on BOM of component part numbers specifically approved for the automotive application, and require outside suppliers to verify compliance by pro-

“Tracking, checking and updating multiple component substitutions on IMDS is a nightmare.”

viding complete IMDS data on the shipped parts, either in complete IPC format or directly in the IMDS. Component source substitutions can be allowed if the materials data variations are within certain tolerances. Ultimately it is the chemical substances, weights and location in the car that matter, not the manufacturer's brand.

These examples demonstrate that electronics fabricators who are new to the automotive industry, or whose automotive output is a small part of their total production volume, need to employ best practices in material data quality control. That process should begin with materials specification and purchasing and continue through incoming inspection, production planning and inventory control.

With sufficient IMDS data established early in the production process, creating IMDS compliance documents will be much easier and shipping delays can be avoided. **PCB**



**Derrik Snider** is a member of the American Society for Quality Control and a past examiner for the Malcolm Baldrige Award. He is the founder of IMDS Data LLC, which helps companies meet their IMDS requirements.

To contact Snider, [click here](#).

# Why choose Fein-Line?

## Because there is a Fine Line between winning ...and the alternative.

After more than 44 years in the industry, just about everyone knows the name Dan (Baer) Feinberg.

There are few in our industry that have his experience and expertise in just about every aspect of the business. Dan knows what works, and perhaps more importantly, what doesn't.

When additional expertise is needed, or when senior management just needs an independent opinion, companies large and small alike get the guidance of Fein-Line Associates, especially in the areas of New Product Market Entry and M&A Due Diligence.

In our business, there's a lot on the line, not just sometimes, but every time. The line between success and the alternative can be razor thin. That's why winning companies choose Fein-Line time after time.



**Dan (Baer) Feinberg**  
*Fein-Line Associates*

---

**Sales Training General Marketing Assistance · New Product Market Entry  
Merger and Acquisition Due Diligence · Printed Circuit Technology assessment  
Market Research (It may work but will it sell) · Expert Witness assignments  
Technology Transfer**

---



**Fein-Line Associates, Inc.**

P.O. Box 73355, San Clemente, CA 92673-0112

(949) 498-7866

[baer@feinonline.com](mailto:baer@feinonline.com)

[www.feinonline.com](http://www.feinonline.com)



## Senior Salesperson— Automotive Electronics

CheckSum is a leading supplier of PCBA test and on-board programming systems and fixtures to the worldwide electronics manufacturing industry. Our technology sets the industry standard in high-throughput solutions for automotive electronics with innovative solutions that meet the quality, speed, and economic requirements of the industry. Founded in 1987, CheckSum is a profitable private company with a broad customer base and a large market opportunity.

**Position:** CheckSum is seeking a senior salesperson to help us add new automotive electronics customers. We will shortly launch a new technology solution to further our throughput advantage and open doors with new customers.

### Requirements:

- Proven sales performer with a track record of landing new accounts and growing existing relationships
- Five years of experience selling CapEx electronic equipment required
- Experience selling automated board test equipment preferred
- General technical knowledge of electronics required
- Demonstrated ability to network to develop leads and multiple relationships at target accounts
- Salesforce fluency
- Strong communication skills
- Self-starter with a sense of urgency and an ability to work independently

**Compensation:** Negotiable depending on experience.

**Contact:** Please send resume and cover letter. To apply, click below.

[apply now](#)



ROYAL FLEX  
CIRCUITS

## Sales Professional \$200k Package

Royal Flex Circuits is a So-Cal-based company specializing in manufacturing flex circuits, rigid flex circuits and HDI PCBs for the military, medical and consumer markets. Royal Flex enjoys a 30+ year history in the PCB industry and has just completed a \$2M investment in new technology (lasers, LDI, vision drilling, AOI, etc.) and new engineering & production talent which has positioned the company for the next 10 years.

We are looking for an experienced sales professional capable of bringing in new accounts north of \$3M per year. We are not interested in a behind the desk, theory spouting, strategy creating sales manager. We want someone that has been in the PCB industry, has strong relationships, and can bring in business.

We offer a generous base salary of \$120k per year, with an attractive commission program which should push the total compensation to \$200k–\$250k. We have the best-in-industry medical, dental and vision insurance, with 90% of premiums paid by employer, as well as a fantastic 401k plan. Our biggest benefit is that we have a stellar reputation and incredible work ethic and integrity.

Please send resume and cover letter explaining why you are that perfect match for our company.

[apply now](#)

# CAREER OPPORTUNITIES



**LENTHOR ENGINEERING**  
MAKING THINGS **FLEXIBLE** IN A RIGID WORLD®  
311 Turquoise Street Milpitas, CA 95035 (Phone) 408-945-8787

## PROCESS ENGINEER

Responsible for developing and optimizing Lenthor's manufacturing processes from start up to implementation, reducing cost, improving sustainability and continuous improvement.

### Duties include but are not limited to:

- Participate in the evaluation of processes, new equipment, facility improvements and procedures.
- Improve process capability, yields, costs and production volume while maintaining safety and improving quality standards.
- Assist in employee training and certification.
- Work with customers in developing cost effective production processes.
- Engage suppliers in quality improvements and process control issues as required.
- Generate process control plan for manufacturing processes and identify opportunities for capability or process improvement.
- Participate in FMEA activities as required.
- Create detailed plans for IQ, OQ, PQ and maintain validated states as required.
- Participate in existing change control mechanisms such as ECOs and PCRs.
- Perform defect reduction analysis and activities.
- Participate in technology roadmap planning.
- Participate in new materials, processing or other developments as required.

### Experience & Education:

- BS degree in Engineering
- 2-5 years of proven work experience
- Excellent technical skills

Competitive salaries based on experience, comprehensive health benefits package, 401(k) and Quarterly Gain Sharing bonus available to eligible employees.

[apply now](#)



## Technical Service Specialist— Electronics

RBP Chemical Technology, a world-class supplier of proprietary chemicals and delivery devices for the printing, electronics, PCB, and medical implant industries, is looking for a technical service specialist in electronics.

This position is responsible for providing technical expertise to external and internal customers in the use of company products for the circuit board and PCMI industries; overseeing and conducting field installations; conducting process audits and developing reports; regularly visiting customers to present technical aspects of products and perform troubleshooting; consistently interfacing with sales and informing customers of updated information; training and facilitating lab personnel in use of pilot lab regarding product applications.

Travel required: 50–70%. We prefer position to be based in the Milwaukee, Wisc. area.

### Qualifications:

- Bachelors degree in Chemistry or related field required
- Minimum of 5 years' experience in circuit board manufacturing or a related technical service area
- Proficient in all areas of wet processes used in PCB manufacturing
- Excellent verbal/written communication skills
- Excellent troubleshooting skills
- Demonstrated knowledge/understanding of Windows-based software including Word, Excel, and PowerPoint
- Applied knowledge of customer service principles/processes
- Demonstrated problem solving/interpersonal skills

RBP offers competitive compensation as well as a comprehensive benefits package, including medical/life/disability and other insurance, 401(k).

[apply now](#)

# CAREER OPPORTUNITIES



## Outside Sales/ Key Account Managers

NCAB Group USA is adding to our existing outside sales team in various U.S. locations:

- Ontario, California
- Itasca, Illinois
- Irving, Texas
- Vancouver, Washington

This is a sales position that requires the ability to convert those cold calls into high-value customer meetings. What we are looking for:

- A “hunter” mentality
- The ability to create solid customer relationships
- A desire to excel and not settle for mediocrity
- 5+ years of experience in the PCB or semiconductor industry
- An excellent ability to present a product and do the “deep dive” during customer visits by asking open ended questions and identifying customer pain points
- The energy to move from prospecting to cold calls to getting the win
- Knowledge of “SPIN” selling
- A college degree
- Willingness to travel, domestically and globally
- U.S. citizens with a valid U.S. passport

Interested? Send your resume.

[apply now](#)

Visit us at [www.NCABGroup.com](http://www.NCABGroup.com)



Looking for an energetic  
**OUTSIDE SALES REPRESENTATIVE**  
Entry-level candidates welcome

**Job Description:** Grow business by setting up meetings with customers and handling presentations, selling products, and meeting customer needs. Required to meet customers face to face on weekly basis.

**Territory:** All U.S. states and parts of Canada.

**Skills/Qualifications:** Great communication skills; customer hospitality; meeting sales goals; closing skills; territory/account management; prospecting skills; negotiation; travel scheduling; computer and network skills (intermediate level); self-confidence; presentation skills; client relationships; motivation for sales; motivation to learn; loyalty to company; respect to customer and team member; patience; due obligation.

### Plus Aspects:

- Bachelor or higher degree
- Experience in outside sales
- Knowledge of print circuit boards

### MicroCraft offers:

- Domestic travel allowance
- International travel allowance
- 401(k) with company match
- 90% coverage on health insurance and dental insurance for the employee
- Life, AD&D, short term and long term disability for the employee
- PTO and holidays
- Good environment/helpful coworkers
- The opportunities to expand your knowledge

**Salary:** \$40,000 to \$75,000 or more. Your salary depends on your sales performance. This figure includes sales commission.

[apply now](#)

Contact: Kohei Maekawa

# CAREER OPPORTUNITIES



Arlon EMD, located in Rancho Cucamonga, California is currently interviewing candidates for **manufacturing** and **management positions**. All interested candidates should contact Arlon's HR department at 909-987-9533 or fax resumes to 866-812-5847.

Arlon is a major manufacturer of specialty high performance laminate and prepreg materials for use in a wide variety of PCB (printed circuit board) applications. Arlon specializes in thermoset resin technology including polyimide, high Tg multifunctional epoxy, and low loss thermoset laminate and prepreg systems. These resin systems are available on a variety of substrates, including woven glass and non-woven aramid. Typical applications for these materials include advanced commercial and military electronics such as avionics, semiconductor testing, heat sink bonding, high density interconnect (HDI) and microvia PCBs (i.e., in mobile communication products).

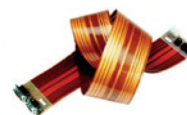
Our facility employs state of the art production equipment engineered to provide cost-effective and flexible manufacturing capacity allowing us to respond quickly to customer requirements while meeting the most stringent quality and tolerance demands. Our manufacturing site is ISO 9001: 2008 registered, and through rigorous quality control practices and commitment to continual improvement, we are dedicated to meeting and exceeding our customer's requirements.

[more details](#)



Advanced technology manufacturer of printed circuit boards in Huntington Beach, CA is looking for manufacturer's representatives in Southern California. Please forward inquiries to Crystal Barrett. (585) 254-2989 ext. 225

[apply now](#)



**all flex**  
Flexible Circuits • Heaters • Assemblies

## HELP WANTED

In order to support its continued growth and leadership position, All Flex Flexible Circuits and Heaters is seeking a TECHNICAL APPLICATION SALES ENGINEER for our inside sales team. Candidates are to have 5+ years in the PCB industry including a minimum of 2 years with flexible circuitry and/or flexible heaters. Experience in component assembly and flexible heater design is a plus.

The position involves providing extremely high responsiveness and follow-up to assigned accounts and new prospect inquiries. Although primarily an inside sales service provider, the individual must also be able to travel several times per year to support tradeshow and in-person customer support. The position provides technical application knowledge to assist customers in the design and use of flexible circuits, heaters, and assemblies, a key service that All Flex provides.

### Background to include:

- Success in a team environment
- Managing large customers – ideally in medical, military, aerospace, and industrial markets
- Proficiency in Microsoft Office Suite with good typing/keyboard skills
- Attention to detail
- Good organization skills in handling multiple activities at the same time
- Professional telephone and e-mail communication skills
- Experience working trade shows
- Good listening and customer management abilities

This position is located in Northfield, MN.

[apply now](#)

# CAREER OPPORTUNITIES



**ventec**  
INTERNATIONAL GROUP  
騰輝電子

## OEM Account Manager USA (IMS Materials)

Want to work for a globally successful and growing company and help drive that success? As a US-based key member of the global OEM Marketing Team, your focus will be on IMS (Insulated Metal Substrates) materials that deliver exceptional thermal performance, reliability and quality, particularly demanded by automotive and other LED lighting and DC power conversion applications. Combining your strong technical PCB manufacturing and design knowledge with commercial acumen, you will offer OEM customers (buyers, designers, reliability engineers and the people that liaise directly with the PCB manufacturers) advice and solutions for optimum performance, quality and cost.

### Skills and abilities required for the role:

- Technical background in PCB manufacturing/design.
- Solid understanding of IMS Materials.
- Sales knowledge and skills.
- Excellent oral and written communication skills in English.
- Experience in making compelling presentations to small and large audiences.
- Proven relationship building skills with partners and virtual teams.

*This is a fantastic opportunity to become part of a successful brand and leading team with excellent benefits.*

Please forward your resume to:

[apply now](#)

Mention "OEM Account Manager USA" in the subject line.



**MacDermid**  
PERFORMANCE SOLUTIONS

## Do you have what it takes?

MacDermid Performance Solutions, a Platform Specialty Products Company, and daughter companies manufacture a broad range of specialty chemicals and materials which are used in multi-step technological processes that enhance the products people use every day. Our innovative materials and processes are creating more opportunities and efficiencies for companies across key industries – including electronics, graphic arts, metal & plastic plating, and offshore oil production. Driving sustainable success for companies around the world, and at every step of the supply chain, takes talent. Strategic thinking. Collaboration. Execution.

The people of MacDermid Performance Solutions stand united by a guiding principle: That if it doesn't add value, don't do it. This belief inspires a unique culture where each team member has opportunities to imagine, create, hone and optimize. Do you have what it takes? Join our growing team of over 4,000 professionals across more than 50 countries with openings in research, finance, customer service, production and more.

MacDermid Performance Solutions and its affiliates are Equal Opportunity/Affirmative Action Employers.

[apply now](#)



## Experienced Sales Reps Needed

Candor is an advanced printed circuit board manufacturer with a unique manufacturing process. We can genuinely stand out among conventional board shops due to our unique Simplified Process.

Join the Candor team, targeting rapid high quality prototype PCB manufacturing.

We are looking for industry experienced sales reps to manage current customers and find new leads in the USA. Candor is in a unique position to hire onto our team using a very generous sliding commission rate. Contact Sunny Patel for details.

[apply now](#)

# CAREER OPPORTUNITIES



## ZENTECH

### Zentech Manufacturing is Hiring!

Looking to excel in your career and grow professionally in a thriving business? Zentech, with locations in Baltimore, MD and Fredericksburg, VA is rapidly growing and is seeking experienced professionals in all areas: engineering, manufacturing engineering, program management, testing, QA and SMT operations. Zentech offers an excellent benefit package including health/dental insurance and an employer matched 401(k) program.

Established in 1998, Zentech holds an ultimate set of certifications relating to the manufacture of mission-critical printed circuit card assemblies, including ISO:9001, AS9100, DD2345, ISO 13485, maintains an IPC 610 Trusted Source QML status, J-STD 001 with Space Certification and is ITAR registered.

[apply now](#)

[Click for drone video tour of Zentech Facility](#)



### PCB Front End CAM Engineer

Associates degree or better is required. Must have a minimum of 3 years of experience working for a printed circuit board manufacturer. Must have Valor Genesis software experience. Scripting knowledge is beneficial but not required. This is a full time salaried position on 1st shift. Pay commensurate with experience.

[apply now](#)



## eptac

TRAIN. WORK SMARTER. SUCCEED.

### Become a Certified IPC Master Instructor

We are growing! EPTAC, a leading provider in the electronics training industry is looking for some great people to join our team. If you love teaching, choosing the classes and times you want to work, and being your own boss, this may be the career for you. We are looking for instructors who have a passion for working with people to develop skills and knowledge. If you have a background in electronics manufacturing and an enthusiasm for education, drop us a line or send us your resume. We would love to chat with you. Opportunities available across U.S. and Canada, especially in our growing markets of California, Florida and New England. Some travel involved. IPC-7711/7721 or IPC-A-620 CIT certification a big plus.

[apply now](#)



## MivaTek

Global

### Application/Sales Engineers

Positions available in the Eastern, Midwest and Western United States. Positions will focus on supporting sales and applications development for Miva Technologies' DLP direct imaging system within the PCB and micro-electronics markets. Experience with photoresist and imaging preferred, but not required.

### Service Technicians

Positions available for Eastern and Western United States. Service technicians will support our rapidly expanding installed base of Miva Technologie's DLP imaging systems and other systems sold by the company.

Send resume and contact information for both jobs to Brendan Hogan.

[apply now](#)



## Application Engineer

The application engineer is the first contact for our customers who have technical questions or issues with our product. We value our customers and wish to provide them with highest quality of technical support.

### Key Responsibilities:

- Support customer base through a variety of mediums
- Log, troubleshoot, and provide overall escalation management and technical solutions
- Create various types of topic based content, such as online help, online user guides, video tutorials, knowledge base articles, quick start guides and more
- Distill complex technical information into actionable knowledge that users can understand and apply
- Continually develop and maintain product knowledge

### Requirements:

- Understanding of EDA electronic design software, schematic capture and PCB layout software
- Bachelor's degree in electronics engineering or equivalent experience
- Sales engineering and/or support engineering experience
- Circuit simulation and/or signal integrity experience
- Understanding of ECAD/ MCAD market segments
- Understanding of micro controllers, SoC architecture and embedded systems market
- Database experience preferred (i.e., MySQL, PostgreSQL, Microsoft Access, SQL, Server, FileMaker, Oracle, Sybase, dBASE, Clipper, FoxPro) etc.
- Experience with PLM/PDM/MRP/ERP software (Program Lifecycle Management) preferred
- Salesforce experience a plus

Salary based upon experience. Comprehensive benefits package and 401k plan. Openings in USA, UK, and Germany.

For more information, contact Altium.

[apply now](#)



Designed for Brilliance. Engineered for Production.

## Embedded Engineer— Portland Oregon

ESI, a pioneer and leading supplier of world-class production laser systems that help microtechnology customers achieve compelling yield and productivity gains, is looking for an embedded engineer.

As a software engineer, you are designing and delivering the embedded software that drives ESI's leading-edge manufacturing systems. The successful candidate will join a multi-disciplinary team focused on developing cutting edge technology in a fast-paced and technically challenging environment. Primary responsibilities will include embedded real-time system development, low-level machine control, system-level troubleshooting, and some supporting application level development.

### Desired experience includes:

- Highly proficient in C/C++ programming
- Proficient in working with and programming DSPs or microcontrollers
- Experience designing software for embedded systems with constrained resources
- Knowledge of different embedded runtime environments (Linux, bare metal, RTOS)
- International travel to support ESI system installations (<10%)
- Engineering degree with to 5–7 years of related experience, or equivalent combination of education and experience
- Fundamental engineering knowledge (basic physics, calculus, problem solving)

Interested? Please apply below.

[apply now](#)

# CAREER OPPORTUNITIES



**TECHNICA, U.S.A.**

Fulfilling Manufacturing Needs  
Throughout the Electronics Industry

## **Southern California Territory Sales Engineer**

Technica, USA, a Western regional manufacturer's representative/distributor, has an open sales position for our Southern California territory. The position will be responsible for selling and servicing our entire product line within the specified territory to the PCB manufacturing industry.

This position requires a highly self-motivated, hands on, confident individual of the highest integrity.

### **Required Skills:**

- BA/BS degree-desired, in a technical area is preferred
- Two years of outside/inside sales or manufacturing experience in the PCB manufacturing environment is desired
- Self-motivated self-starter with the ability to initiate and drive business with little supervision
- Independent worker with a strong commitment to customer satisfaction
- Understanding of consumable sales process
- Ability to organize activities and handle multiple projects simultaneously with effective and timely follow-up
- Ability to solve problems and make decisions for which there are no precedents or guidelines and be resourceful in nature
- Positive attitude while operating under pressure and be an independent problem-solver
- Computer skills in Windows, Outlook, Excel, Word and PowerPoint
- Must have a valid driver's license with good driving record

Please send resume.

[apply now](#)



**TECHNICA, U.S.A.**

Fulfilling Manufacturing Needs  
Throughout the Electronics Industry

## **Western Regional Equipment Service Technician**

Technica, USA, a Western regional manufacturer's representative/distributor has an opening for an equipment service technician covering the Western USA, including but not limited to, California, Oregon, Washington, Utah, Colorado, and Arizona. The position will be responsible for servicing our PCB fabrication equipment product line, including installation, troubleshooting, repair service, rebuild service, etc. This position requires a highly self-motivated, hands on, confident individual of the highest integrity.

Key responsibilities are to install and service equipment, conduct equipment audit, and provide technical service when appropriate to solve problems.

### **Required Skills:**

- 2+ years of experience in a PCB manufacturing environment or similar
- Willing to travel
- Positive "whatever it takes" attitude while operating under pressure
- Self-motivated self-starter with the ability to initiate action plans
- Ability to work independently with a strong commitment to customer satisfaction
- Excellent communication and interpersonal skills
- Strong ability to use all resources available to find solutions
- Computer skills with ability to write detailed service and equipment reports in Word
- Understanding of electrical schematics
- Able to work in and around equipment, chemical, and environmental conditions within a PCB manufacturing facility

Please send resume.

[apply now](#)

# CAREER OPPORTUNITIES



## SALES ACCOUNT MANAGER

This is a direct sales position responsible for creating and growing a base of customers. The account manager is in charge of finding and qualifying customers while promoting Lenthor's capabilities to the customer through telephone calls, customer visits and use of electronic communications. Experience with military and medical PWB/PWA a definite plus. Each account manager is responsible for meeting a dollar level of sales per month and is compensated with salary and a sales commission plan.

### Duties include:

- Marketing research to identify target customers.
- Initial customer contact (cold calling).
- Identifying the person(s) responsible for purchasing flexible circuits.
- Exploring the customer's needs that fit our capabilities in terms of:
  - Market and product
  - Circuit types used
  - Quantity and delivery requirements
  - Competitive influences
  - Philosophies and finance
  - Quoting and closing orders
  - Bonding
- Submitting quotes and sales orders
- Providing ongoing service to the customer
- Problem solving
- Developing customer information profiles
- Developing long-term customer strategies to increase business
- Participate in quality/production meetings.
- Assist in customer quality surveys
- Knowledgeably respond to non-routine or critical conditions and situations

Competitive salaries based on experience, comprehensive health benefits package and 401(k) Plan.

[apply now](#)



## Experienced PCB Sales Professional

With more than 30 years of experience, Prototron Circuits is an industry leader in the fabrication of high-technology, quick-turn printed circuits boards. Prototron of Redmond, Washington, and Tucson, Arizona are looking for an experienced sales professional to handle their upper Midwest Region. This is a direct position replacing the current salesperson who is retiring after spending ten years with the company establishing this territory.

The right person will be responsible for all sales efforts in this territory including prospecting, lead generation, acquiring new customers, retention, and growth of current customers.

This is an excellent opportunity for the right candidate. Very competitive compensation and benefits package available.

For more information, please contact Russ Adams at 425-823-7000, or [email your resume](#).

[apply now](#)

## Process Engineer (Redmond, Washington)

With more than 30 years of experience, Prototron Circuits is an industry leader in the fabrication of high-technology, quick-turn printed circuits boards. We are looking for an experienced PCB process engineer to join the team in our Redmond, Washington facility. Our current customer base is made up of forward-thinking companies that are making products that will change the world, and we need the right person to help us make a difference and bring these products to life. If you are passionate about technology and the future and believe you have the skills to fulfill this position, please contact Kirk Williams at 425-823-7000 or [email your resume](#).

[apply now](#)



## Proposal Coordinator— Saline Lectronics

Saline Lectronics provides electronic contract manufacturing to the commercial, medical, aerospace and telematics industries by delivering exceptional quality and value to achieve long-term, successful partnerships with our clients.

We are seeking to add an 'Excel Whiz' proposal coordinator to our Quoting Group.

**Primary Function:** The proposal coordinator will be responsible for responding to all incoming quotations in a timely manner. Day to day work may include identifying sources from vendors needing specific components, and successfully researching new sources for vendors to meet customer requirements. This role requires a candidate who is extremely comfortable with Microsoft Excel and can use V-Lookups and formulas with ease.

**Work Performed:** Supports all quoting activity; maintains knowledge of what information is required to obtain accurate quotes and ensures that the required information is available, or requests it from the account manager/sales engineer responsible for the given quote; prepares quote packages and solicits quotes from the supply base; analyzes quotations submitted for the best possible outcome for both companies; reviews final quotations with Saline Lectronics' president; organizes and submits quotations to the account manager/sales engineer for submission to customer.

[apply now](#)



## PCB Process Planner

Accurate Circuit Engineering (ACE) is an ISO 9001:2000 certified manufacturer of high-quality PCB prototypes and low-volume production for companies who demand the highest quality in the shortest time possible. ACE is seeking a skilled individual to join our team as a PCB process planner.

### Responsibilities will include:

- Planning job travelers based on job release, customer purchasing order, drawings and data files and file upon completion
- Contacting customer for any discrepancies found in data during planning and CAM stage
- Consulting with director of engineering regarding technical difficulties raised by particular jobs
- Informing production manager of special material requirements and quick-turn scheduling
- Generating job material requirement slip and verify with shear clerk materials availability
- Maintaining and updating customer revisions of specifications, drawings, etc.
- Acting as point of contact for customer technical inquiries

Candidate should have knowledge of PCB specifications and fabrication techniques. They should also possess good communication and interpersonal skills for interfacing with customers. Math and technical skills are a must as well as the ability to use office equipment including computers, printers, scanners, etc.

This position requires 3 years of experience in PCB planning and a high school level or higher education.

[apply now](#)

# TOP TEN



## Recent Highlights from PCB007

### 1 I Never Realised it Was so Complicated!

How many designers or assemblers have ever set foot in a PCB fabrication shop? Nowhere near enough! An initiative by SMART Group and Amphenol-Invotec gave a group of engineers from design, assembly and quality assurance positions the opportunity to learn a little about the realities of high-end PCB manufacture.



### 3 Deep Into Technology at Compunetics

There aren't many printed circuit companies in my neck of the woods. There is one, however, that has always fascinated me, and that is Compunetics, in Monroeville, Pennsylvania, a suburb of Pittsburgh. Having worked with them on the electrophoretic photoresist, a PPG product, many years ago, it was great to stop by and catch up with CTO Tim Schmitt and others.



### 2 Fein-Lines: Virus, Phishing, Ransomware...Oh My!

Malware, the collective name for viruses, Trojan horses and other malicious software that can infect your computer, has been in the news lately, probably more than at any time I can remember. Over the years, malware has evolved; it can affect smartphones and tablets as well as all computers.



### 4 HDP User Group 2017 European Meeting Highlights Technology Progress

The conference facility at the offices of Oracle, in the royal burgh of Linlithgow in West Lothian, Scotland, was the venue for the 2017 European meeting of the High Density Packaging User Group. I was delighted and privileged to be invited once again to sit in on the open session, an intense programme of technical presentations and discussions, project reviews, status updates and new project proposals.

## 5 Mitch Altman Discusses Bringing Youth into the PCB industry

Publisher Barry Matties is joined by Mitch Altman, creator of TV-B-Gone, a device that can turn off TVs in public, and co-founder of Noisebridge, an educational hackerspace based in San Francisco. In this interview, they discuss the importance of bringing youth into the PCB industry and how Noisebridge has inspired people of all ages to get started creating their own electronics.



## 8 All About Flex: Back-Bared Flexible Circuits

Back-bared pad flexible circuits are a distinctive type of single-sided flexible circuit providing some advantages over more standard circuits. In the printed circuit industry, back-bared pad circuit designs are also referred to as dual-access or reversed bared.



## 6 Global Impact on European PCB Fabrication: EIPC Summer Conference 2017, Day 1

Electronics industry professionals from 13 countries, mainly from Europe and Scandinavia, others from the USA, but some from as far away as India and Japan, gathered in Meriden, the centre of England, for the EIPC Summer Conference.



## 7 Innovator Bob Tarzwell Retires from PCB Industry to Focus on New Career in Art

I have known Bob Tarzwell for more than 18 years, since he first called me looking for some help with his company. His first words to me were, "Hi, my name is Bob Tarzwell and I own a shop in Carleton Place, Ontario. I need your help."



## 9 14th Electronic Circuits World Convention

The 14th Electronic Circuits World Convention (ECWC14) started in Seoul to the usual fanfare after the opening ceremonies of KPCA 2017. The ribbon-cutting ceremony was conducted by KP-CA's Jung Bong Hong and the representatives of the other WECC members.



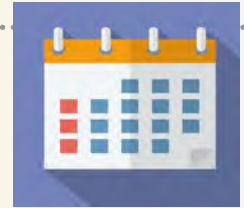
## 10 Eltek Appoints Kathy Nargi-Toth as President of Eltek USA Inc.

Eltek Ltd., a global manufacturer and supplier of technologically advanced solutions in the field of printed circuit boards, has named Kathy Nargi-Toth as president of Eltek USA Inc., the company's US subsidiary, effective June 5, 2017.



---

**For the latest PCB news and information, visit: [PCB007.com](http://PCB007.com)**



# Events

For IPC Calendar of Events,  
[click here.](#)

For the SMTA Calendar of Events,  
[click here.](#)

For the iNEMI Calendar of Events,  
[click here.](#)

For the complete PCB007 Calendar  
of Events, [click here.](#)

## **IPC Technical Education— Best Practices in Design**

July 26–27, 2017  
Chicago, Illinois, USA

## **24<sup>th</sup> FED Conference**

September 15–16, 2017  
Bonn, Germany

## **SMTA International 2017 Conference and Exhibition**

(IPC Fall Committee meetings held in conjunction  
with SMTAI)  
September 17–21, 2017  
Rosemont, Illinois, USA

## **IPC Fall Committee Meetings**

September 17–21, 2017  
Rosemont, Illinois, USA

## **electronicAsia**

October 13–16, 2017  
Hong Kong

## **IPC Flexible Circuits: HDI Forum**

October 17–19, 2017  
Minneapolis, Minnesota, USA

## **TPCA Show 2017**

October 25–27, 2017  
Taipei, Taiwan

## **productronica 2017**

(IPC Committee meetings held in conjunction  
with productronica)  
November 14–17, 2017  
Munich, Germany

## **HKPCA/IPC International Printed Circuit & South China Fair**

December 6–8, 2017  
Shenzhen, China

## **47th NEPCON JAPAN**

January 17–19, 2018  
Tokyo Big Sight, Japan

## **DesignCon 2017**

January 30–February 1, 2018  
Santa Clara, California, USA

## **IPC APEX EXPO 2018 Conference and Exhibition**

February 27–March 1, 2018  
San Diego, California, USA

## **Medical Electronics Symposium 2018**

May 16–18, 2018  
Dallas, Texas, USA



PUBLISHER: **BARRY MATTIES**  
barry@iconnect007.com

SALES: **ANGELA ALEXANDER**  
(408) 489-8389; angela@iconnect007.com

MARKETING SERVICES: **TOBEY MARSICOVETERE**  
(916) 266-9160; tobey@iconnect007.com

EDITORIAL:  
MANAGING EDITOR: **PATRICIA GOLDMAN**  
(724) 299-8633; patty@iconnect007.com

TECHNICAL EDITOR: **PETE STARKEY**  
+44 (0) 1455 293333; pete@iconnect007.com

CONTRIBUTING TECHNICAL EDITOR: **HAPPY HOLDEN**  
(616) 741-9213; happy@iconnect007.com

MAGAZINE PRODUCTION CREW:  
PRODUCTION MANAGER: **SHELLY STEIN**

MAGAZINE LAYOUT: **RON MEOGROSSI**

AD DESIGN: **MIKE RADOGNA, SHELLY STEIN, TOBEY MARSICOVETERE**

INNOVATIVE TECHNOLOGY: **BRYSON MATTIES**

COVER: **SHELLY STEIN**, PHOTO: **TECH. SGT. ANTHONY NELSON JR. , U.S. AIR FORCE**

I-Connect007 Presents



The PCB Magazine® is published by BR Publishing, Inc., PO Box 50, Seaside, OR 97138

©2017 BR Publishing, Inc. does not assume and hereby disclaims any liability to any person for loss or damage caused by errors or omissions in the material contained within this publication, regardless of whether such errors or omissions are caused accidentally, from negligence or any other cause.

July 2017, Volume 7, Number 7 • The PCB Magazine© is published monthly, by BR Publishing, Inc.

## ADVERTISER INDEX

atg Luther & Maelzer GmbH....	77	MivaTek Global.....	81
Burkle North America.....	9	Mutrax.....	17
DB Management.....	37	Nordson March.....	87
Electra Polymers.....	25	Ostech.....	97
Entelechy Global.....	93	Panasonic Laminates.....	89
ESI.....	61	The PCB List.....	83, 91
Excellon.....	85	Pluritec.....	47
Fein-line Associates.....	101	Prototron Circuits.....	55
Gardien.....	11	Rogers Corporation.....	13
Geek-a-Palooza.....	2	Taiyo America.....	5
I-Connect007 eBooks.....	3, 99	The Right Approach Consulting....	95
IPC.....	23, 71	Ucamco.....	27
Isola.....	7	Ventec International Group.....	31
Matrix USA.....	73	Viking Test.....	29
Mentor Graphics.....	21		

## Coming Soon to The PCB Magazine:

AUGUST:

**Process Step Elimination**  
Streamlining and  
automating your processes

SEPTEMBER:

**Process Engineering**  
Getting beyond day-to-day  
fire fighting

OCTOBER:

**Signal Integrity and  
Controlled Impedance**  
What it means to the circuit  
board manufacturer

# I-Connect007

GOOD FOR THE INDUSTRY

**the pcb design MAGAZINE**  
June 2017  
an IConnect007 publication

**the pcb magazine**  
July 2017  
IConnect007 Presents

**SMT**  
JULY 2017

**MIL/AERO**  
SPECIAL COVERAGE CIPC IMPACT 2017

**FREE SUBSCRIPTION**



[myconnect007.com](http://myconnect007.com)

#### EDITORIAL CONTACT

**Patty Goldman**

[patty@iconnect007.com](mailto:patty@iconnect007.com)

+1 724.299.8633 GMT-4



[mediakit.iconnect007.com](http://mediakit.iconnect007.com)

#### SALES CONTACT

**Barb Hockaday**

[barb@iconnect007.com](mailto:barb@iconnect007.com)

+1 916 365-1727 GMT-7



[www.iconnect007.com](http://www.iconnect007.com)