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SKAA WIRELESS

Edmonton-based Eleven
Engineering unveils wireless
audio standard p.8

NEMA RATED

L-Com delivers overview of
NEMA rated enclosures p.14

CIRCULAR ECONOMY

Best practices when shifting
focus to sustainability
and reusability p.23

THERMAL MANAGEMENT

*How to choose the best cooling system
to protect your application p.10*

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10



8

INSIDE

EP&T

NOVEMBER/DECEMBER 2019

Columns

4 EDITORIAL

Government legislation lacking on cybersecurity

8 WEST TECH REPORT

Alberta tech triumph as Eleven Engineering unveils SKAA standard

In every issue

6 NEWSWATCH

26 NEW PRODUCTS

29 AD INDEX

30 A LOOK BACK

New York trade show was epicentre in electronics design

COVER STORY

10

OPTIMIZING THERMAL MANAGEMENT

How to choose a cooling unit that suits your application.

14

NEMA RATED ENCLOSURES

A brief overview of NEMA rated enclosures for electronics.

18

TRANSFORMATIVE TECHNOLOGY

Stay one step ahead by using technology to transform your company.

23

SUSTAINABILITY IN DESIGN

Best practices for OEMs seeking to implement the circular economy into production



18



23

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Photos (this page, from top): Getty Images; Eleven Engineering; SGS

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Canadian cybersecurity legislation lacking, surveys show

Government isn't doing enough to protect businesses, consumers from data theft



While the federal government continues to introduce cybersecurity consortiums and guidance, tech security professionals on the front lines know that these efforts do little to protect their businesses and consumers from attacks and data loss.

"The resource divide that exists across small and large enterprise, combined with standards inconsistencies, make us vulnerable to attacks," according to Chris Hickman, chief security officer at Keyfactor, provider of secure digital identity management solutions.

A recent survey by Keyfactor revealed that 87% of cybersecurity professionals think more privacy and security legislation is required to better protect Canada's businesses and consumers. The survey showed that 58% of respondents think regulators and elected Canadian officials are not doing enough to standardize security guidance on measures like data encryption.

These survey results were conducted with IT security professionals at SecTor, a security education conference that I attended in Toronto this past October.

"Many of today's large-scale breach events are the result of basic security measures that are overlooked or neglected," added Hickman. "Attackers looking for low-hanging fruit are commonly able to infiltrate a business's network – and its customers – by compromising vulnerable IoT (Internet of Things) devices or stealing highly sensitive keys and digital certificates."

Public Key Infrastructure (PKI) is a tried and tested security tool that protects digital identities across people, software and technology. However, PKI management remains a manual process for many organizations.

The survey also found that:

- 50% of respondents cite manual and complex processes as their greatest challenge in managing PKI;
- 43% of respondents were most concerned about their ability to securely adopt DevOps, cloud and IoT.

Supporting the perspective of an uneven cybersecurity landscape in Canada, the Canadian Internet Registration Authority (CIRA) released its

latest survey report that engaged both private and public sector institutions across Canada – aimed at learning more about how they are coping with the increase in cyber threats.

The report indicates 71 per cent of organizations experienced at least one cyber-attack that impacted the organization in some way, including time and resources, out of pocket expenses, and paying ransom.

CIRA VP of product development Dave Chiswell said, "It is encouraging to see the increase in awareness of cyber threats, but there is still much to do. There is no silver bullet for cybersecurity, it requires constant vigilance, multiple layers, and employee awareness. We are committed to helping Canadian businesses and institutions implement the tools, platforms and processes that are required to protect their networks."

Smart home concerns

'Smart Homes' has emerged as the most mentioned vulnerable Internet of Things (IoT) technology among leading cybersecurity influencers on Twitter, according to data and analytics firm GlobalData.

"As the phenomenal growth of the adoption of Internet of Things (IoT) devices by both consumers and enterprises continue to increase, so too does the potential security threats," says Prashant Saxena at GlobalData.

Among all the individual smart home related devices tracked by GlobalData's cybersecurity study, the number of mentions on Smart TVs was highest, followed by security cameras and kids toys.

"Security must be ingrained at the time of manufacturing of the IoT device before the hardware is imposed into the system. This may reduce the quantity of possible misses in security settings," Saxena adds.

Whether large or small, it is quite evident that Canadian businesses are struggling with security resourcing. Without stronger government standardization and actionable support, businesses and consumers downstream will continue to face increasing security risks. **EP&T**

STEPHEN LAW

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SMART DEVICES

SMART HOME DEVICES SEE STEADY GROWTH

The worldwide market for smart home devices is expected to grow 23.5% year over year in 2019 to nearly 815 million device shipments, according to a report by International Data Corporation (IDC). Worldwide shipments are forecast to be more than 1.39 billion in 2023 with a five-year compound annual growth rate (CAGR) of 14.4%.

“Driving the market’s growth over the next few years is a combination of downward pressure on prices from intensifying competition; rising adoption of smart assistants; and rising consumer awareness of the conveniences, costs savings and energy reductions that smart home devices provide,” says Adam Wright, senior research analyst, consumer IoT, IDC.

The United States will represent the lion’s share of unit shipments in each year and will grow at a compound annual growth rate of 9.5% over the forecast period, reaching more than 560 million units shipped in 2023. China is the second-largest country by shipment volume in each year but represents the highest growth rate at a CAGR of 22.6% between 2019 and 2023, followed by Canada with a CAGR of 19.9% and Western Europe with a CAGR of 14.7%.

FUTURE WATCH

IEEE UNVEILS ELECTRONICS ROADMAP

Technical professional organization IEEE released the 2019 Heterogeneous Integration Roadmap (HIR), mapping out the future of electronics by identifying technology requirements and potential solutions. The primary objective was to stimulate pre-competitive collaboration among industry, academia and government to accelerate progress.

The roadmap provides professionals, industry, academia and research institutes a comprehensive, strategic forecast of technology over the next 15 years. The HIR also delivers a 25-year projection for heterogeneous integration of emerging devices and materials with longer research-and-development timelines.

“Today, we are seeing emerging technologies—such as AI, 5G, edge, cloud, and data center, autonomous vehicles and wearable technology—that hold great promise for improving



Amazon Echo Family of smart devices.

the lives of individuals across the globe,” says William Chen, chair of the HIR and ASE Fellow. “With its broad input from industry and academia, the HIR represents an invaluable resource that sets the course for continued electronics industry growth, greater technology innovation and enhanced performance of devices across a wide variety of applications that can bring increased benefits to humanity.”

The electronics industry relies on the integration of separately manufactured components into higher-level assemblies to enable enhanced functionality and operations. This heterogeneous integration of wireless and mixed signal devices, bio-chips, power devices, optoelectronics and microelectromechanical systems in a single package places new requirements on the electronics industry as these diverse components are introduced into System-in-Package (SiP) architectures for the tremendous array of industries where electronics are used.

IOT

IOT DEVICES COULD BE ‘ASBESTOS’ OF THE FUTURE

There are currently believed to be seven billion internet of things (IoT) devices worldwide. Forecasts vary, but the consensus is the number will grow exponentially over the coming years, with some estimates as high as 40-billion connected IoT devices by 2025.

“Security in IoT devices has repeatedly been shown to be lacking: from a vulnerable child location-tracking watch to office printers at risk to

Russian cyberattacks,” says Rob Scammell, technology reporter at GlobalData. “Often, this is as simple as device owners failing to change the password from a weak factory setting. In the race to get products to market ahead of competitors, security is also often an afterthought. The ever-growing number of IoT devices, in combination with this lax security, is a perfect storm for cyberattacks.”

The proliferation of ‘stupid’ internet-connected smart devices will be the “IT asbestos of the future”, cybersecurity expert Mikko Hyppönen has warned.

“Asbestos was such a great innovation. It looked like a miracle material, originally,” explained Hyppönen, chief research officer at Finnish cybersecurity firm F-Secure.

He draws parallels between the rampant use of cancer-causing asbestos in the 1960s and 1970s to the cybersecurity risks that come with the explosion of smart devices worldwide today.

“Such a great innovation, which then decades later turned out to be the worst innovation. What’s happening right now, around us, I guess would be characterized as IT asbestos,” Hyppönen adds.

“So this is going to happen, whether we like it or not. Everything will become a computer and right now this seems like an excellent idea, to many of the companies in this business,” Hyppönen continues. “This is not the first time technology has taken us in the wrong direction. So I think this is dangerous. It’s very dangerous for our privacy. It’s dangerous for our security. This is what our kids will hate us for.”



EDA SOLUTIONS

EMA DESIGN AUTOMATION MARKS 30 YEARS

EMA Design Automation Inc., Rochester NY-based full-service provider and innovator of electronic design automation (EDA) solutions, is celebrating 30 years.

EMA began a relationship with Cadence Design Systems in 1998 selling the Cadence Studio-level Allegro product line. Today, EMA sells both the Cadence Allegro and OrCAD product lines, as well as several EMA products, including Ultra Librarian, TimingDesigner and Circuitspace, to expand and enhance the user experience. EMA has also earned the Cadence Channel Partner of the Year award multiple times, given to a single recipient among Cadence's 50+ global channel partners each year. In addition to Cadence, EMA has secured other partnerships in the industry, including SiliconExpert, DigiKey and Arena, to name a few.

"I am proud, but humbled, with the accomplishments we have made, the respect that we have received and the partnerships we have established in the industry," says Manny Marcano, president and CEO of EMA.

PHOTONICS

CMC TO FACILITATE SILICON PHOTONICS WAFER RUNS FOR EUROPEAN CLIENTS

CMC Microsystems will facilitate silicon photonics wafer runs through Advanced Micro Foundry (AMF) of Singapore with local European support from Circuits Multi-Projects (CMP) of France.

CMC, a Kingston ON-based organization that assists researchers and industry across Canada's National Design Network develop innovation in microsystems and nanotechnologies, will be promoting AMF manufacturing services to its European client base in universities, research laboratories, and industrial companies.

Gord Harling, president of CMC, said the new arrangement will enable CMP to support access to AMF through the long-standing relationship CMC has in place.

"The partnership keeps both organizations and our clients at the leading edge of silicon photonics manufacturing. Collaborating internationally



EMA Throwback
Photo from 2003.

increases the number of options for prototype manufacturing by our respective clients."

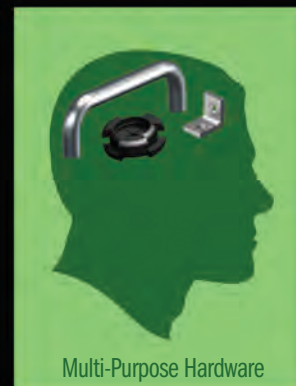
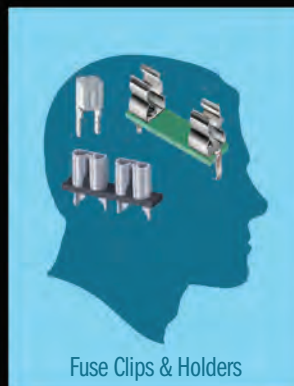
"The AMF – CMC – CMP partnership and collaboration is a great contribution to the ongoing expansion of the CMP services in MTM technologies and more specifically in Silicon Photonics.

The European academic ecosystem will have local access and support of the technology in the frame of the Europractice IC and CAD services. **EP&T**

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ELEVEN ENGINEERING

Edmonton-based fabless semi specialists produces SKAA wireless audio standard



There is currently no universally adopted wireless audio standard. But Eleven Engineering Inc. is working to build it. Led by CEO John Sobota, who carries himself with the confidence and vision of an *Albertan Steve Jobs*, Eleven is embarking on a journey to make sound transmission from any device, as easy, or perhaps even easier, than plugging in an RCA cable into a speaker.

There are currently other ways to transmit wireless audio, namely WIFI and Bluetooth. However, none of those standards were designed specifically to address sound transmission. Wi-Fi has limited functionality and Bluetooth requires pairing and the connection is often unreliable.

These pain points are eliminated with Eleven's new standard named SKAA, which works with iOS, Android mobile devices, Mac, Windows computers, televisions and nearly any product with a line output, S/PDIF output or a headphone jack. What's more, with SKAA, you can watch a movie while streaming sound to speakers without latency issues, which plague the likes of WIFI or Bluetooth systems.

In environments laden with heavy Wi-Fi and Bluetooth traffic, SKAA navigates through these hostile environments with award-winning reliability. They have spent years partnering with Bose, Harman Kardon and LG, to name a few. To date, 20 companies are integrating SKAA chips in their products.

West Tech Report recently took the opportunity to chat with Sobota, and Eleven Engineering's executive vice president of sales and marketing, Rex Whitehead to discover how the firm got

its start, and what has helped them get to the forefront of the wireless audio industry, while discussing longer-term goals for their flagship product.

"I started my career at Transalta, and with every promotion, I felt my job becoming less enjoyable. I had a desire to do something a more high-tech," says Sobota. When Transalta planned layoffs, Sobota was ready. But, when his name wasn't on the exit list, he was disappointed instead of relieved. He realized it was time to leave Transalta.

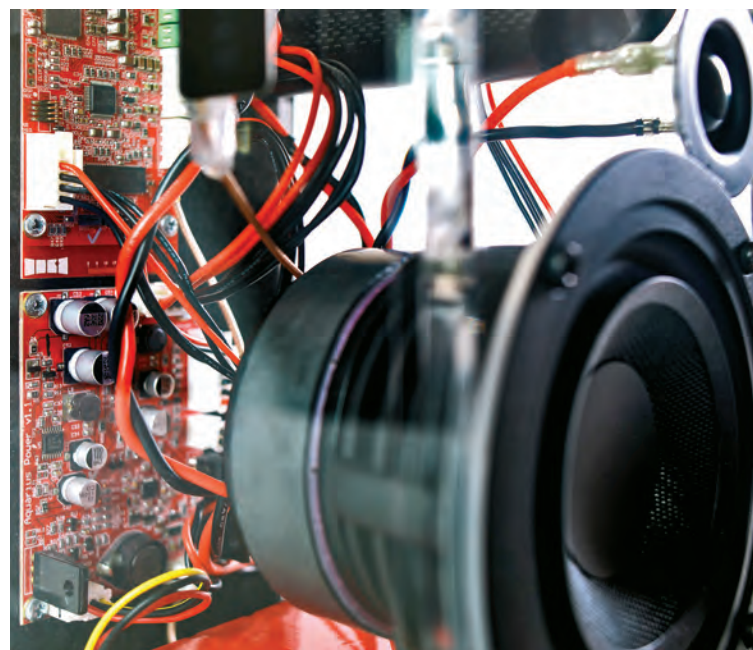
"I decided to run with plan B. I finished my MBA at night and did Eleven Engineering full-time," he says. "It started out as a consultancy, with projects ranging from satellites to a head tracker that help paraplegics use computers. We cut our teeth working on other people's projects."

Jobs-esque approach

They began to build chips, working primarily with RCA in their video game controls department. When RCA shut down their entire New Jersey and Chicago offices in the wake of the 9/11 incident, Sobota decided to focus solely on audio.

By 2004, they were an audio chip company, and by 2006, the firm's second XInC chip was launched, and partnerships with Bose and others took off. Thus the *Steve Jobs-esque* like journey unfolded as they spent over a decade and a half, in Sobota's words; "maniacally focused on creating an incredible product."

Eleven's engineering team has 18 staff, with satellite offices in China, Taiwan and the US. Sobota spends almost half his time in China, working to integrate his group's designs into products and ensuring that the China team is supported so that pro-



This shows a motherboard with both Eleven Engineering's chip (Ginseng SiP — the long rectangular chip to the right of the white connector) and partner's chip (the Infineon Merus Class D audio amp — top left chip). This 'off the shelf' motherboard is called Strawberry.

duction goes as expected.

They also benefit from their proximity to one of Canada's largest computer engineering programs at the University of Alberta.

"The handshake partnership that we have with the University of Alberta... gifts us with the best students that they train," says Sobota. Eleven is heavily involved in the University's Capstone projects, where students build something with everything they have learned, which, as Sobota explains, is much more challenging than building something on paper.

"It separates the real engineers from the pretenders. We act as a client for these courses, and we're invited to the final presentations and we give our ratings on all groups, whether they used our chips or not," he says.

Eleven is facing challenges though, in particular, in getting the big audio companies to jump on board with a new standard like SKAA.

"The first hurdle is that new standard is typically a C-level (CEO, CTO, etc.) decision so it is much more difficult that simply an engineering manager choosing a current flavor of Bluetooth chip," Sobota explains. "An engineering manager may base a decision on cost or familiarity, but to adopt a new standard like SKAA, the decision must be elevated to C-level as this decision can redirect an entire brand's product vision and marketing."

Eleven's executive VP sales & marketing Rex Whitehead says that major Japanese players have become industry followers — instead leaders in the last decade.

In response, Eleven is bulking up. They have signed a formal co-marketing agreement with Infineon, an \$8-billion semiconductor giant, and they are embracing a next gen amplifier technology called Meris.

"Infineon has demonstrated a desire to not sit on their laurels with regard to cutting edge technology. Bluetooth was never designed for audio. Wifi was never designed for audio. Young people will recognize these problems much earlier," says Sobota.

Eleven is seeing younger, more agile companies jumping on board such as Soundboks, a company whose staff's average age is likely below 30. Soundboks is using SKAA to broadcast massive, pro-level, battery powered sound through giant portable speakers.

"These young, new aggressive companies are looking at the technical merits, the advantage that SKAA offers, something that sets them apart. Not just another follower who is blindly chasing a technology without really knowing why they are doing it," adds Whitehead. **EP&T**



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Selecting the optimal thermal management technology

How to choose a cooling system that protects electronics in your application. **BY ADAM WELLS, PFANNENBERG**



The use of cooling technology is ubiquitous across industry, yet choosing the correct technology for a specific application can prove a challenge. Each choice depends on a variety of factors and the wrong choice could lead to tremendous losses for a business.

As thermal management technology options proliferate, choosing the correct cooling product can ensure continuous operation at low cost by

protecting critical electronic systems. An incorrect choice could be disastrous, resulting in decreased productivity and efficiency, increased maintenance frequency and even compromised safety. In order to avoid these costly mistakes, facilities engineers should evaluate both cooling requirements and ambient circumstances before selecting a technology. These include heat load, the ambient temperature range, the presence of particulates or debris, enclosure

location and material, and various other specifications. This brief guide will equip engineers with a basic framework to determine the best thermal management option for an application.

Higher enclosure temperature than ambient temperature

In the majority of applications, a standard filter fan matches requirements. As far as thermal management goes, these are the baseline product for most enclo-

sure and electronics cooling.

Filter fans simply utilize pressure differentials to displace warm air in an enclosure with cooler, ambient air from outside. These products are affordable, effective, and can be utilized in multiple contexts to meet specific business needs.

As useful as they are, filter fans rely on outside air that is both clean and non-hazardous, and some cases in which ambient air is cooler than the target enclosure temperature require protection from the elements.

In food preparation plants where particulates fill the air, in factories where airborne chemicals would corrode electrical components, and in other cases for which total separation between the cooled enclosure and the outside air is required, the ideal solution is an air-to-air heat exchanger.

While still offering the cost efficiencies that come with using ambient air, an air-to-air exchanger offers a variety of cooling capacities while ensuring total separation of enclosure and ambient air. Applications include



Engineers should evaluate cooling requirements and ambient circumstances before selecting their thermal management solution.

indoor-temperature-controlled environments, common in IT sector and food and beverage applications.

Higher ambient temperatures

Both filter fans and air-to-air heat exchangers are only viable, however, if the temperature inside the enclosure should be higher than in the ambient environment. Otherwise, alternate cooling technologies will offer a better solution.

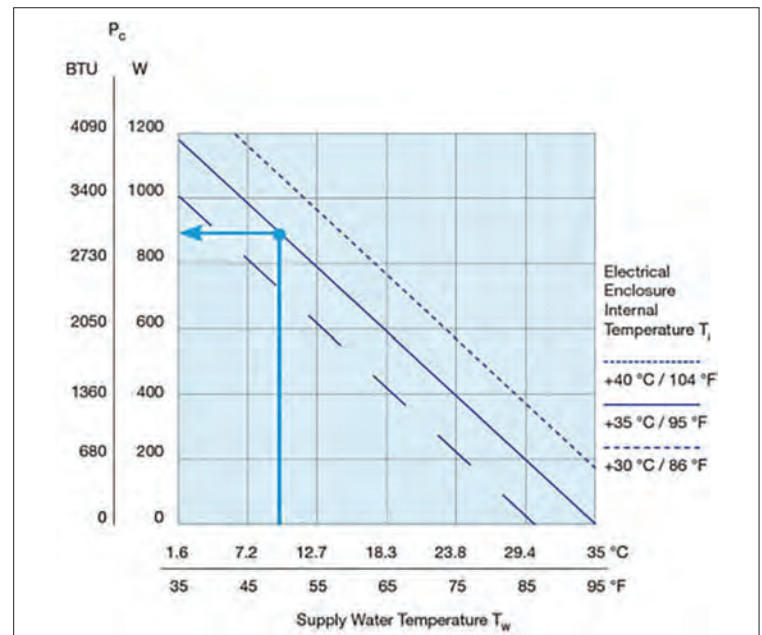
The primary alternative is a closed loop cooling unit. These units actively pump out heat from the enclosure while simultaneously cooling the air with an evaporator. This process, when

coupled with a dehumidifier, allows closed loop cooling units to operate without relying on a cooler ambient temperature. Like air-to-air exchangers, the enclosure is completely separated from the ambient air.

With extremely hot or dirty outside conditions, however, a closed loop cooling unit may not suffice. In these circumstances, chillers and air-to-water heat exchangers offer preferable methods of heat removal. A chiller is used for cooling needs that involve high or fluctuating heat-loads, precise temperature controls, or the need for flexibility in the location of the cooling unit. The food and beverage industry, for example, often utilizes

these technologies to fit their specific cooling requirements. Chillers operate like basic refrigerators and can be modified based on coolant type, heat-load needs, or environment type. Alternatively, an air-to-water heat exchanger transfers heat into an on-site water source. This allows for cooling without any heat be-

major improvement in operations. For one large plastics manufacturer, plastic dust in the air constantly coated the heat-exchanging coil inside the factory AC units, causing them to fail. Pfannenberg suggested an enclosed system to fix the problem in the form of a combined chiller and air-to-water



The performance of an air-to-water heat exchanger depends on the difference in the water temperature and enclosure air temperature.

ing transferred into the ambient environment. If a water source is not available on site, a cooling solution involving a system made of both chiller and air to water

exchanger, ultimately saving the manufacturer thousands of dollars in downtime and maintenance. The selection process is complicated, and utilizing the expertise of application engi-

As thermal management technology options proliferate, choosing the correct cooling product can ensure continuous operation at low cost by protecting critical electronic systems.

Thermal management expertise can save costs

Although these are the basic rules of thumb for proper thermal management, considerations must be made for sizing and wattage requirements, along with any other factors that may result in an exception to these guidelines. Recall that a wrong choice in cooling technology can prove costly: productivity, energy efficiency, equipment longevity, maintenance, safety, and overall cost all could be affected.

The right advice can result in

neers is often the most efficient way to ensure the proper selection of a cooling system.

The need for proper cooling technology provides a first line of defense against the degradation of critical electronics, facilitating innovation in the new digital economy. To fully capitalize on the latest thermal management technologies, businesses must prudently consider all variables and conditions during the selection process. **EP&T**

Pfannenberg Inc. manufactures thermal management products & solutions.



Air-to-air heat exchangers can offer an efficient solution in harsh industrial conditions.



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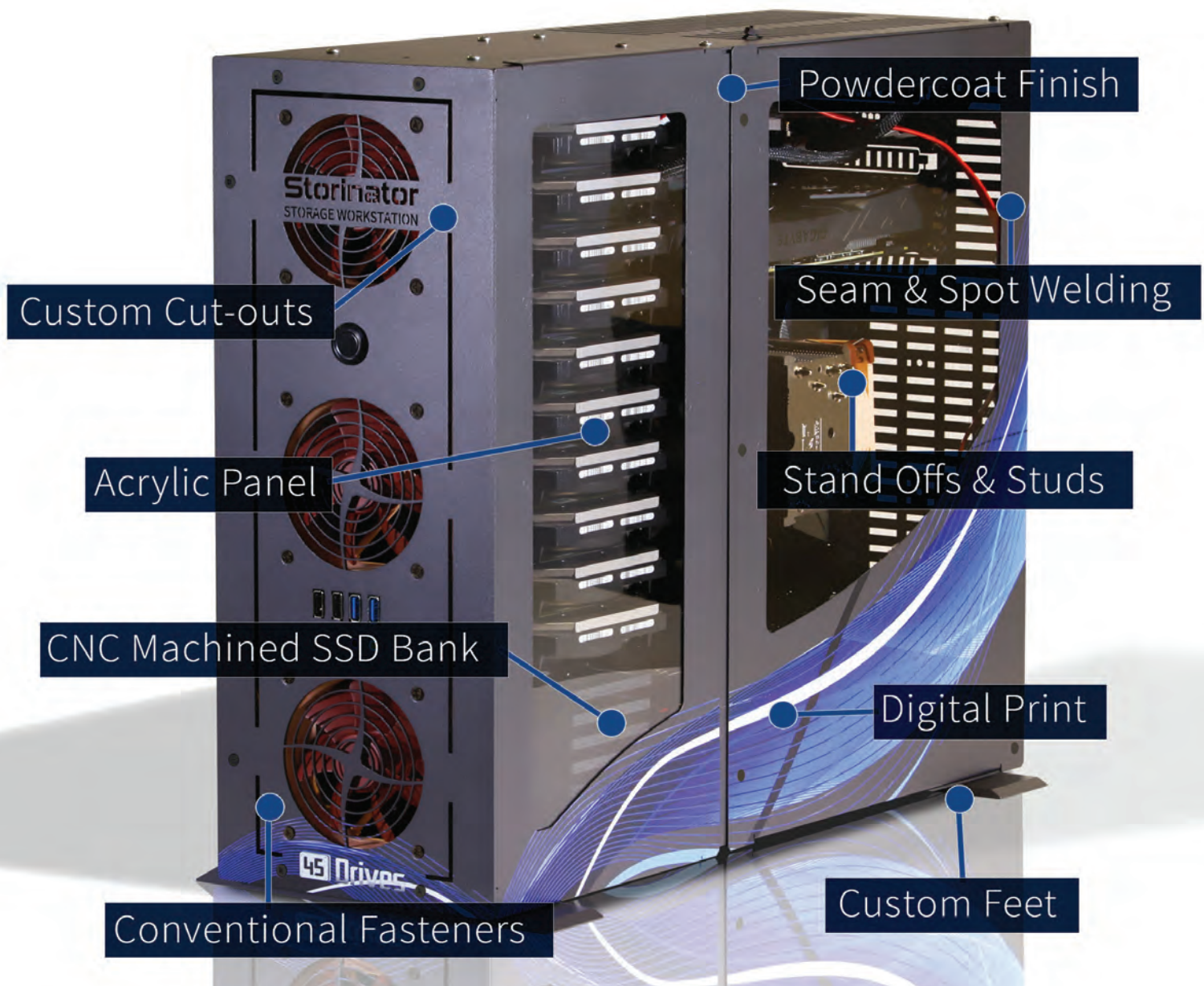
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A brief overview of NEMA rated enclosures

BY MANUEL MARTINEZ



Enclosures are critical to any outdoor or indoor equipment installation exposed to the elements and harsh industrial environments. The applications can range from WLAN equipment installations for IT infrastructure to hydraulic or pneumatic controls for industrial automation. A great deal of consideration is necessarily put into a facility's various equipment installs and their respective interconnects. This is due to the fact that any seemingly inconsequential environmental factors such as small transient surges or even consistent exposure to the sun's rays will chip away at the integrity of these equipment installations ultimately causing failures not to mention intentional or unintentional tampering. The process of troubleshooting and repairing /replacing equipment leads to plant or data center downtime — a costly repercussion that has, in the past, put companies out of business. Similar to how jacketing material is often the most prominent factor to consider for interconnect exposed to harsh environments, an enclosure to protect equipment is paramount to the continued operational lifetime of critical apparatus.

NEMA ratings

The materials and construction of a National Electrical Manufacturers Association (NEMA) rated enclosure can vary to better suit particular applications. All of these enclosures are rated to protect personnel against access to hazardous parts and to also provide protection to the equipment inside the enclosure against solid foreign objects such as dirt [1]. There are labels for additional levels of protection as

Provides a Degree of Protection Against the Following Conditions	Type of Enclosure									
	3	3X	3R*	3RX*	3S	3SX	4	4X	5	6P
Access to hazardous parts	X	X	X	X	X	X	X	X	X	X
Ingress of water (Rain, snow, and sleet **)	X	X	X	X	X	X	X	X	X	X
Sleet ***	---	---	---	---	X	X	---	---	---	---
Ingress of solid foreign objects (Windblown dust, lint, fibers, and flyings)	X	X	---	---	X	X	X	X	X	X
Ingress of water (Hosedown)	---	---	---	---	---	---	X	X	X	X
Corrosive agents	---	X	---	X	X	X	---	X	---	X
Ingress of water (Occasional temporary submersion)	---	---	---	---	---	---	---	---	X	X
Ingress of water (Occasional prolonged submersion)	---	---	---	---	---	---	---	---	---	X

* These enclosures may be ventilated.

** External operating mechanisms are not required to be operable when the enclosure is ice covered.

*** External operating mechanisms are operable when the enclosure is ice covered.

* These enclosures may be ventilated.

** External operating mechanisms are not required to be operable when the enclosure is ice covered.

*** External operating mechanisms are operable when the enclosure is ice covered.

Image 1.

Location-Type	1	2	3	3X	3R	3RX	3S	3SX	4	4X	5	6P	12	12K	13
Non-hazardous-indoor	X	X							X	X	X	X	X	X	X
Non-hazardous-outdoor			X	X	X	X	X	X	X	X	X	X			

Image 2.

shown in Image 1.

Image 2 shows the various ratings for non-hazardous locations. It should be noted that hazardous locations involve a level of combustibility where the enclosure must be able to either contain an explosion, or prevent combustion around highly ignitable oil or dust.

Enclosure options

While all NEMA enclosures must meet the requirements of its particular rating, the construction of these components can vary. For instance, a NEMA-rated enclosure can either be powered or unpowered where the powered variants will include a weather-proof cable conduit to connect to power and may include opaque or windowed lids that allow visual inspection of installed equipment without the need to open the enclosure. Powered variants may also include thermostat controlled heaters or fans or both to aid in maintaining ideal operational temperatures for the installed

equipment. This also prolongs the life of the internal equipment. Unpowered versions are available in completely unmodified forms as well as models with blank mounting plates, they are also available in vented models as well. Other enclosure options may include DIN mounting rails to easily install circuit breakers or industrial control equipment (see image 3).

Typical enclosure properties

NEMA-rated enclosures are necessarily gasketed to prevent ingress of minor leaks and falling dust. In particular our FRP (Fiberglass Reinforced Polyester) enclosures have several additional features to aid in this. They include mushroom head covers along with the gasketing to provide extra protection against moisture and dust while the ribbed cover corners increase the strength of the enclosure. It is preferred that mounting be as straightforward as possible to mitigate the cost and time of

installation, therefore having mounting flanges already as a part of the enclosure mold simplifies the process for rapid deployment of a system. An assortment of Pole Mounting kits are able to be attached to this integrated mounting flange to allow a robust means for securing the enclosures onto a variety of different diameter pole. (see image 4).

Aluminum mounting plates are often used on the interior of enclosures as aluminum is a lightweight material that is corrosion resistant and relatively easy to work with and drill into. It also operates with a high thermal conductivity so an aluminum mounting plate would readily conduct heat off of sensitive electrical equipment and provide a wider surface area to radiate that heat away. Grounding lugs are often necessary on enclosures as

NEMA-rated enclosures are gasketed to prevent ingress of minor leaks and falling dust

the power/data lines they are connected with often function as a path for transient surges. These surges can chip away at the integrity of the electrical equipment, eventually causing catastrophic damage. Grounding lugs allow for the surges to be redirected to ground thus protecting the internal circuitry.

Enclosure materials

The materials for the enclosure can vary from metals such as stainless steel and aluminum to thermoplastics such as

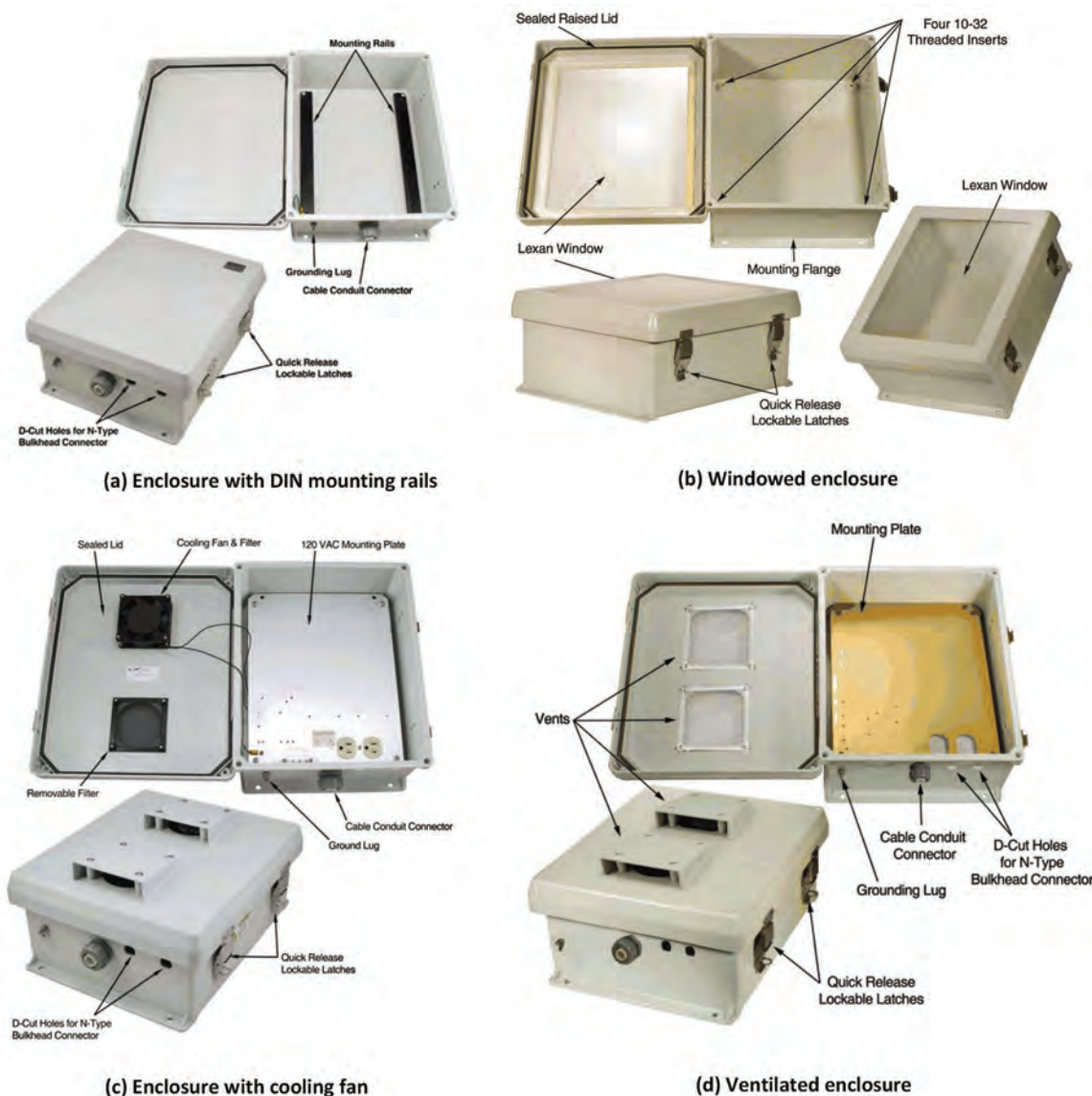


Image 3.

Mushroom Head Cover



Ribbed Cover Corners



Molded Mounting Flanges



Image 4.

acrylonitrile butadiene styrene (ABS) or fiberglass reinforced polyester (FRP). Metals have the inherent benefit of shielding from electromagnetic interference (EMI), this is especially relevant in medical device and telecommunications/RF equipment. And, as emission and immunity requirements of radio systems in licensed or unlicensed spectrum spaces becomes tighter, shielding

is increasingly important. Plastics such as ABS and FRP have the benefit of cost-effectiveness and light weight as compared to metals. ABS in particular does not need the welding equipment that metals need or the extra labor that FRP requires. All of these materials have high resistance to corrosion, UV resistance and fire retardant properties when various paints, laminates,

coating, or plating materials are utilized. FRP is formed as a polymer matrix reinforced with glass fibers so has a very high load bearing strength and is most resistant to deforming when the deforming force is parallel to the polymer fibers. On the other hand, FRP is weakest when at pressure points perpendicular to the fibers, causing this material to often have less impact strength

than other materials.

The FRP material generates a very high thermal resistance by trapped air within the blocks of glass fiber. This property is particularly useful in humid and swampy conditions where the enclosure can inherently resist heat flow into the box. Metals, however, can more readily conduct this heat, which can be a pro or con depending on the environment. For this reason, many stainless steel or aluminum NE-MA-rated enclosures will have ventilation or a cooling fan.

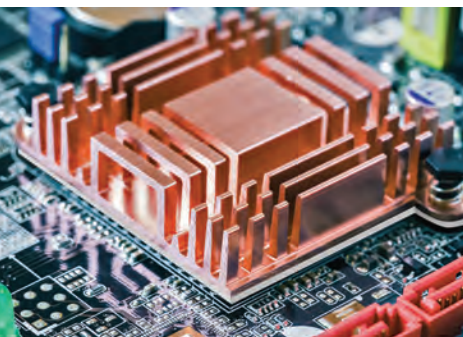
NEMA/IEC

NEMA, (National Electrical Manufacturers Association) and the IEC (International Electrotechnical Commission) are two standards groups, which have devised two different rating systems for enclosures, which define the enclosures resistance to dust, moisture, water immersion and ice. The IEC's rating is referred to as the IP or Ingress Protection rating. The table below outlines NEMA and IEC IP enclosure ratings. This chart only works in one direction from NEMA to IEC. An IP rating only considers protection against ingress of solid foreign objects and ingress of water.

Conclusion

NEMA-rated enclosures are leveraged in myriad industries to protect equipment from harsh outdoor and indoor environmental conditions or tampering. These enclosures can be composed of several materials designed to protect against moisture or UV. There are numerous organizations such as the International Electrotechnical Commission (IEC) or Canadian Standards Association (CSA) that have standards that overlap with NEMA. Additional conformance tests such as flammability tests can also be necessary depending upon the location and environment in which an enclosure will be employed. All enclosures must therefore be taken on a case-by-case basis where application-specific requirements are taken into account. **EP&T**

Manuel Martinez is product manager at L-Com Inc.



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7.12 CFM of airflow. The nominal noise level is 26.0db and it has a life expectancy of 70,000 hours when operated at 40 degrees C and 65% relative humidity.

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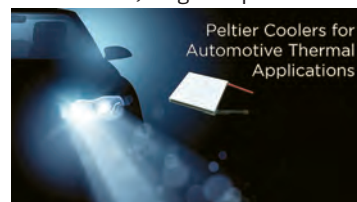
gry applications involving explosive atmospheres or flammable gases. Constructed for Zone 2 equipment that require a spark proof fan design with a higher air flow, product delivers air flows of 500 to 830 CFM.

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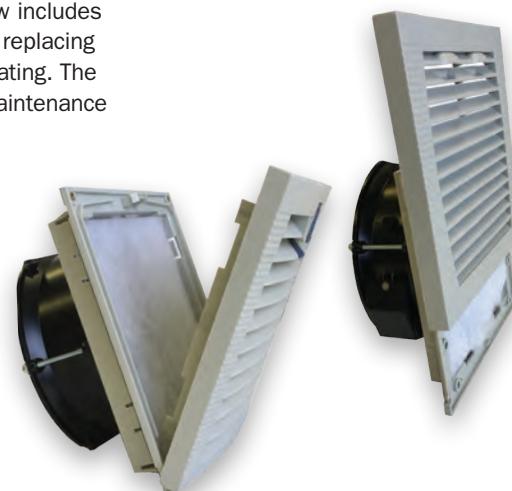
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Staying one step ahead

Using the latest emerging production technology to transform your company. **BY SCOTT HALE**



In electronic manufacturing environments 3D printing is becoming more of a standard than an exception.

➔ We're living and working in an age of unprecedented disruption. New technology is transforming the way that companies in every sector operate. The most successful companies are redefining how they leverage technology to have the biggest impact on their market. They are not just looking to shave a few minutes from their assembly or quality processes. They are instead taking a step back, and looking at their process in its entirety, then re-inventing those stages that are costing them

business.

When you look at industries like the taxi and hotel industries for instance, you see that the biggest players now don't own any taxis (Uber) or own any hotels (Airbnb). These are just a few examples of disrupting the existing market with a completely new way of attacking a business problem. To go one step farther, extreme customer responsiveness has become the norm. With video streaming services like Netflix, it's possible to watch countless movies, whenever and wherever you want.

Buyer expectations for business-to-business customers have evolved as well. It's more important than ever to stay ahead of digital disruption. Leveraging technology in innovative ways is the key to building a competitive advantage in your market and growing your business. 'Industry 4.0' is a broad term that you hear about a lot today, and it means different things to different people. I believe it is about leveraging today's technology to create value. This can manifest itself in a number of ways, from Top Line Growth, to Bottom-line Cost

Savings, to Risk Mitigation. Here are a few examples to consider:

Driving top-line growth through customer insight, marketing and design

Savvy companies are deploying technology to respond rapidly to customer needs. As an example, IMAGINiT has worked with a playground equipment manufacturer to create online product configuration tools that enable sales teams to quickly respond to buyers' needs on the fly.

As part of the sales process, this company needed to be able to show playground installation visuals to city parks departments or regional school districts. In the past, it took weeks to create these eye-catching images.

Now, the playground can be created virtually in minutes, right in front of the customer and modified instantly, based on live feedback, to things such as color, placement, and structure features. The result is a project won much faster.

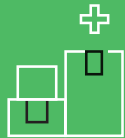
Transforming business with bottom-line cost savings

In manufacturing, 3D printing is becoming more of a standard than an exception. It has the potential to reduce operational costs and enhance efficiency. It is not being used just for "rapid prototyping" anymore. In some cases, industrial equipment replacement parts can be made to order onsite with a 3D printer in a matter of hours, or even min-

Makers of electronic devices can save time and money by accessing the wide array of 3D printers and materials available today

utes. With the wide array of printer types and materials available to print with today, this option can result in thousands of dollars in savings of time and outsource part replacement costs.

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For many electronic OEMs, high expenses lie in the process of sharing data between business systems.

Another significant area of expense for many manufacturers lies in the process of sharing data between business systems. Entering information into a CAD design system, then transferring that same BOM information to your PLM or CRM systems is an issue for many. Significant time is lost, and the opportunity for error is introduced every time data is re-entered.

We have worked with many companies that are looking to eliminate this bottom-line expense and automate the process of sharing data throughout the entire manufacturing organization. In one case, a medical products company was challenged with making sure that their vaulted engineering data was integrated with their company PLM system. This manual re-entry process has now been completely automated.

Risk mitigation is key

Augmented Reality (AR) is a term that is rapidly becoming a

buzzword. While virtual reality (VR) can provide you with a digital view of how the completed model or project will look. AR goes one step further and combines your virtual model data with data captured from the existing real world. With aug-

While virtual reality can provide users with a digital view of how the completed model or project will work, augmented reality goes one step further and combines your virtual model with data captured from existing real world.

mented reality, information about an existing environment is captured through photogrammetry or 3D scanning techniques. The augmented view is then created digitally from that information, combined with the new virtual model design and digitally annotated to provide additional insight about how the new design may work in the existing available space. Many

building renovation projects begin with this approach, as it provides a cost-effective way to mitigate risk and become aware of construction issues earlier in the process.

One more way to mitigate risk is leveraging predictive maintenance

status and helped them to configure a link back to their engineering system that relayed data regarding the exact position and orientation of the machine when the issue occurred. This sped up the process of trouble shooting and future design planning.

Conclusion

In this ever-changing world of disruption, every business needs to allocate time regularly to review their entire process and the issues that are keeping them from reaching their goals. Only then will management teams be in a position to consider where technology can be applied in new ways. The examples discussed here are just the tip of the iceberg. Digital disruption is a powerful way to grow your revenues, reduce your costs, and boost your competitive advantage. **EP&T**

Scott Hale is vice president consulting services, IMAGINiT Technologies

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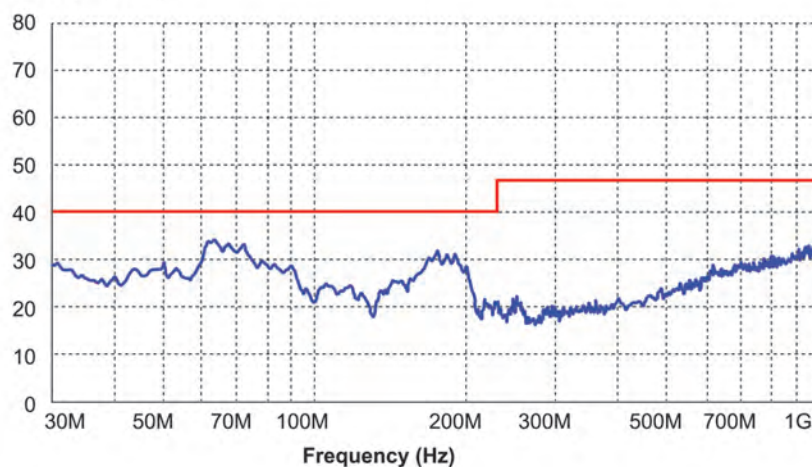
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CUS150M	150W	O, E, B, F	2x4"	Class I / II
CUS200M	200W	O, E	3x5"	Class I
CUS1500M	1500W	E	5x2.5x10.3"	Class I

* E = Enclosed, O = open frame, P = pcb mount, F internal fan, B conduction cooling

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Best practice for OEMs moving into the circular economy

BY DAVID LINDER



Manufacturers of Electronic Equipment are increasingly moving away from the 'linear economy' in response to the demands of authorities and consumers. The old progression of 'make, use, dispose' is no longer acceptable. Manufacturers instead need to focus on developing commercially viable products that comply with market regulations and yet also conform to the demands of a 'circular economy'.

The primary driver behind the concerns of environmentally aware consumers and NGOs is the 'linear economy' model's inefficient use of resources. It uses high levels of raw materials and, because the product is disposed of when it reaches its end-of-life, it is wasteful. Consumers and authorities are starting to request products where the materials, components, and even the products themselves can be reused or repurposed. In a 'circular economy', resources are utilized for as long as possible.

The key principles of the

'circular economy' are sustainability, renewability and reusability. Manufacturers should be designing products with a focus on reuse, recovery and/or recycling. Durability and the ability to restore, need to be considered in a model that intends to:

- Minimize the use of raw materials
- Maximize the useful life of materials and other resources through resource recovery
- Minimize the waste generated at the end-of-life of a product and its packaging

However, this model is not without its own difficulties. The costs associated with developing products in the 'circular economy' may be more unknown than those in the 'linear economy'. For example, to create a product that conforms to the 'circular economy' model, it may have to be more robust and this sometimes means more of a raw material is required. The right raw material might also be environmentally unfriendly in comparison to a less robust material.

These costs need to be offset against the greater value gained from developing a product that can be renewed, reused and recycled. It may be that by improving a product in these terms, the negatives created by making the product more robust are cancelled.

To design products for the 'circular economy' manufacturers need to introduce its philosophy from the very start of the design process. A new product needs to be designed to consider raw materials in relation to compliance and performance ability. Design engineers should also consider the perspective of ease of disassembling for reuse or material recovery. Leaving this until the end of the product development process may incur far greater costs for the company. Manufacturers also need to ensure their supply chains are robust in their ability to procure and supply materials and products that meet these design criteria.

Manufacturers should understand the materials they plan to use in their products, and the

regulations put in place in relation to these materials that aim to protect the environment. The supply chain therefore becomes a vital part of the process. Manufacturers need to control their supply chains to ensure source materials comply with published regulations and do not originate from violent regions or areas where human employment practices fail to meet internationally accepted standards.

Best practices in terms of developing and producing electronic devices in the 'circular economy' involves a different attitude to product and raw material testing. Factors such as compliance testing and evaluation can no longer be left to the end of the development process, they need to be considered from the start. In this way, manufacturers can create products that conform to the demands of authorities and consumers, but which are still commercially viable. **EP&T**

David Linder is chemistry & RSTS technical manager at SGS.



ARTICULATING PASTE RETAINERS IMPROVE SMT PRINTING

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Fourth generation design of articulating paste retainer incorporates new features and benefits for SMT printing users. Devices serve as an important part of the SMT squeegee that keeps the solder paste within the printing

area of the stencil. Product gives users full adjustability, both up-down positions and left-right positions and enables users to quickly loosen and remove the paste retainer to allow easier cleaning during product changeover. Unit provides a parallel leaf spring configuration that delivers a gentle degree of freedom, with a soft spring load in the Z direction that

allows the paste retainer to ride close to the stencil, or in contact with the stencil without causing damage to or coining of the foil. The leaf spring design holds the paste retainer in a rigid vertical orientation, maximizing the damping function to keep the solder paste in the print area.

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tion, practically eliminating escapes and false calls. An optical head and 6-stage ring lighting provide illumination for all types of components, side cameras provide multiple vision angles, and circular lighting gives consistent illumination throughout the field of view.

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T4000 RFID thermal barcode printer line of high-performance enterprise-grade industrial printing solution provides prints and encodes both standard and on-metal RFID labels and tags. Unit is suitable for use in healthcare, manufacturing, supply chain, IT and service yard industries. On-metal tags typically include a foam insulator and a metal foil backing that makes them compatible with



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most standard RFID printers / encoders, but the T4000 was engineered to handle the media with ease. Product provides ease of use, high productivity and the flexibility of printing on-metal or RFID tags.

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YCP10 Solder Paste Printer includes innovative features for speed, accuracy, and consistent quality. Unit delivers standard Solder Paste Roll Volume Detection, while providing adjustable

squeegee angle and optimum aperture fill for the spectrum of printed circuit board assembly challenges. Units provide improved print consistency throughout the entire production run, regardless of pauses and/or delays in production.



Product's printing quality is similar to flagship models, compatible with large circuit boards and accommodates a wide variety of stencil frames.

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CONFORMAL COATING UNIT HAS SERVO-CONTROLLED 4-AXIS MOTION OPTION

PVA

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CONSTANT POWER MODE LED DRIVER OPERATES 100-305VAC

ELECTRO SONIC



Mean Well XLG-100 series 100W ac-dc LED driver delivers constant power mode, operating from 100 thru 305Vac and provides models with different rated currents – ranging between 700mA and 800mA. Device's high efficiency up to 92% also features fanless design, while the entire series is able to operate within the range of -40°C to +90°C case temperature under free air convection. Product's metal housing and IP67 ingress protection levels allow it to fit into both indoor and outdoor applications.

➤ www.e-sonic.com

DIN RAIL POWER SUPPLY DELIVERS NARROW 84MM WIDTH

TDK-LAMBDA

DRB480-48-1 AC-DC DIN Rail mount power supply provides an efficiency of up to 93%, waste heat has been reduced, allowing the use of a compact enclosure size featuring a power density of 6 Watts per inch³. Device has an operating input range of 90 to 264Vac and can deliver 48V at 10A. The output can be adjusted from 48 to 52.8V to offset voltage drops in cabling or where OR-ing diodes/FETs are used in a redundant configuration. A dc Okay relay and a



front panel LED provides output status. The convection cooled unit can operate in ambient temperatures of -20

to +70°C (with a cold start at -40°C), with linear derating above 50°C to 62.5% load at 70°C. The design of the product ensures that electrolytic capacitor temperature rises are minimized.

➤ www.tdk-lambda.com

OSCILLOSCOPE DOUBLES MAXIMUM BANDWIDTH TO 16GHZ

ROHDE & SCHWARZ

R&S RTP high-performance oscilloscope family includes 13GHz and 16GHz models. The compact, multi-purpose lab instrument is scalable from the 4GHz minimum up to the full 16GHz bandwidth. Units provide powerful debugging functions such as the high-speed serial pattern trigger using hardware-based clock-data-recovery (CDR) up to 16Gbps, or the DDR4 signal integrity and compliance test.



Units provide time domain reflection (TDR) and transmission (TDT) analysis to characterize and debug signal paths.

➤ www.rohde-schwarz.com/ad/press/rtp

1/16TH BRICK DC-DC CONVERTER BOOSTS PERFORMANCE

MURATA POWER SOLUTIONS

UWS-Q12 series 9-36Vdc Vin Range 1/16th brick dc-dc converter delivers high performance and class-leading I/O isolation. In an industry standard 1/16th brick pinout, device provides a

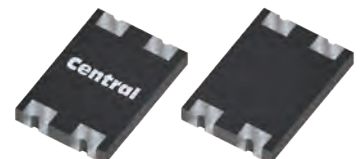


basic I/O insulation system rated at 2,250Vdc isolation with a fully regulated dc output. Product series offers single modules with outputs of 3.3V, 5V, 12V, 15V, and 24Vdc all rated at 50W. Units come with a universal Vin range and a high efficiency of up to 91%, plus an operating temperature range between -40 to +85°C — with derating.

➤ www.murata-ps.com

SCHOTTKY BRIDGE RECTIFIERS COME IN LOW PROFILE BR DFN PACKAGE

CENTRAL SEMICONDUCTOR



Top view Bottom view

CBRDFSH series of Schottky bridge rectifiers are available in 1.0A — 2.0A, 40V — 100V options. Devices are packaged in low profile BR DFN surface mount case and feature highly desirable energy efficiency. The full wave bridge devices utilize individual glass passivated die to reduce leakage and improve performance and reliability. Devices provide forward voltage (VF) as low as 500mV. The BR DFN package is 1.2mm in height, 54% lower than the comparable HD DIP, ensuring that low board profile is maintained.

➤ www.centralsemi.com/featured-products/27

POTTING COMPOUND RESISTS HIGH TEMPERATURES

MASTER BOND

Supreme 121AO NASA low outgassing approved epoxy is suitable for

bonding, sealing and potting applications. Featuring a high glass transition temperature of 200-210°C, product resists temperatures up to 550°F. This system exhibits an element of toughness and is not as stiff as conventional epoxies that withstand extreme temperatures. Product has a noteworthy strength



profile with a tensile modulus of 750,000 to 850,000 psi at room temperature and a compressive strength of 26,000 to 28,000 psi. Its thermal conductivity is 4-5 BTU-in/(ft²·hr·°F), and it is also electrically non-conductive. Shrinkage upon cure is exceptionally low.

➔ www.masterbond.com

DOUBLE PULSE SOFTWARE SPEEDS TEST PROCESS

TEKTRONIX

Double Pulse Test software plugin for Keithley's AFG31000 Arbitrary/Function Generator makes it possible to perform crucial double pulse testing in less than a minute. Software allows users to quickly define pulse parameters from a single window on the AFG31000's large touchscreen



display and then generate the pulses they need to perform testing. The application provides impedance adjustment of pulse width and the time gap between each pulse, up to 30 pulses. Pulse widths can range from 20ns to 150µs.

➔ Tek.com

CURRENT COMPENSATED CHOKES COME IN HORIZONTAL, VERTICAL MOUNTING

SCHAFFNER

RC series current compensated chokes are available with horizontal and vertical mounting options. Standard current ranges are from 0.25 to 0.7A with voltages up to



250Vac. Product series of 'Reduced Complexity' devices includes a range of small form factor common

mode choke designs, manufactured without potting. This reduces the weight and improves the quality, as there are less steps in the production process. It also fulfills the latest customer requirements in terms of recyclability and environmental friendliness.

➔ www.schaffner.com

FPGAS ALLEVIATE MEMORY BOTTLENECKS

XILINX

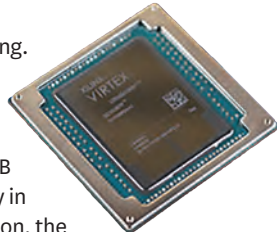
Virtex UltraScale+ HBM FPGAs alleviate memory bottlenecks with integrated HBM. Devices are suitable for latency-sensitive workloads that process large datasets such as adaptable AI inference; database acceleration and data analytics; video transcoding;

security processing.

With devices with up to 8GB currently in production, the 16GB version is sampling now and entering production this fall. Products provide high on-chip memory density with up to 500Mb of total on-chip integrated memory, plus up to 16GB of high-bandwidth memory (HBM) Gen2 integrated in-package for 460GB/s of memory bandwidth.

Device's embedded HBM controller and enhanced integration enables maximum bandwidth, efficient routing complexity and optimized power efficiency for compute, storage and network applications.

➔ www.xilinx.com/products/silicon-devices/fpga/virtex-ultrascale-plus-hbm.html



PANEL MOUNT LED INDICATORS SERVE HARSH ENVIRONMENTS

LEDTRONICS

PT503B series of energy-saving LED panel indicators are geared to harsh environments where durability and

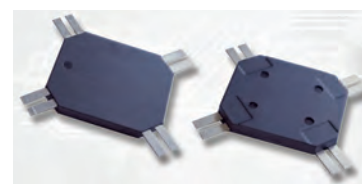


accurate light reading are vital. Devices are IP66 rated and create negligible heat generation and are sunlight-visible LED light colors. Energy-saving devices are suitable in such industries as defense and aerospace, utilities, industrial automation, robotics and automotive. Devices feature male tab terminal connectors for easier installation, while providing sharper, faster and higher-intensity illumination and improved visibility.

➔ www.ledtronics.com

3D COIL ELECTRO-MAGNETIC SENSOR INTEGRATES EASILY

PREMO



3D14EMR-ULP series 3D Coil electro-magnetic sensor (fully isotropic) is ready to be integrated into Smartphones and other devices such as key fobs, smartcard key fobs and wearable devices with a real height of less 1mm above the pcb. Device is designed for secure access (passive keyless entry), real-time location systems (RTLS) and also for immersive 3D virtual experience motion tracking and Augmented Reality.

➔ www.grupopremo.com

RAPID CELLULAR IOT PROTOTYPING PLATFORM HAS GLOBAL CERTIFICATION

NORDIC SEMICONDUCTOR

'Thingy:91' rapid cellular IoT prototyping platform is certified for global, low-power, long-range LTE-M/NB-IoT applications, comes with Arm TrustZone security, and includes a full range of sensors, plus embedded support courtesy of a Nordic nRF52840 advanced multiprotocol



System-on-Chip (SoC) for complementary ultra-low power

short-range wireless technologies such as Bluetooth 5, Thread, Zigbee and ANT. Product is equipped with a Nano (4FF) eSIM card from iBasis preloaded, which comes with 10MB of data bundled to enable automatic, instant, out-of-the-box cellular LTE-M and NB-IoT connectivity and roaming in a long and growing list of countries with cellular IoT networks.

➔ www.nordicsemi.com

REFLECTIVE SENSOR ELIMINATES NEED FOR PERIPHERAL CIRCUITRY

TT ELECTRONICS



OPB9001 pcb sensor module for industrial and medical applications provides 24-30 volt input compatibility and features 4-pin connectors for simple programming and operation. Device includes the OPB9000 reflective sensor and eliminates the need for peripheral circuitry like resistors, regulators and capacitors as such functionality is integrated into its small, robust package. The reflective device can detect objects as far away as 50mm using standard 90% reflective material, as well as objects as small as 2.5mm depending on the object distance.

➔ www.ttelectronics.com

SENSOR PLATFORM SPEEDS DEVELOPMENT OF WEARABLES

SUUNTO

Movesense ready-to-use motion sensor and software development kit serves the design of wearables. The 1.44-inch, 0.35-ounce sensor includes a built-in accelerometer, gyroscope, magnetometer, ECG and heart rate measurement with chest strap, and temperature sensor. Devices provide built-in memory for custom applications and for logging data, as well as Bluetooth connectivity to transmit it. Sensor platform includes mobile application for iOS and Android for collecting raw data.

➔ www.suunto.com



**HIGH-SPEED CARD
EDGE CONNECTOR
PROVIDES FLEXIBLE
STACKING HEIGHTS****HIROSE ELECTRIC**

FX27 Series 0.8 mm pitch board-to-board connector allows for flexible stacking heights. The high-speed card edge device allows for varying board stack heights by simply changing the length the printed circuit board (pcb) interposer, eliminating the need for different height connectors. Device provides an increased XY axis floating range compared to previous high-speed FunctionMax family connectors. Now supporting a floating range of ± 1.2 mm in both the X and Y directions, board-to-board connector absorbs stress from misalignment while tightening screws and pcb shrinkage caused by high temperatures. Device also has a wide self-alignment range of ± 0.7 mm in both the X and Y directions.

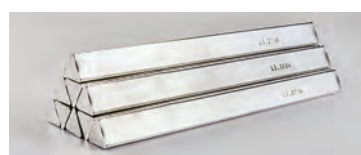
➤ www.hirose.com

**QUICK-CONNECT
TECHNOLOGY ENABLES
FLEXIBLE PRODUCTION****HARTING**

Han ES Press HMC series interface can be installed quickly without tools and is robust enough to be connected and disconnected ten-thousand times. Product supports flexible production delivering the ability to quickly install machines and modules, reconfigure them at will and operate them without disruption. This quick-connect technology device provides High Mating Cycles, as the contact inserts are equipped with a pre-tensioned cage clamp that is triggered by an actuator. If the actuator is pushed into the contact chamber, the cage clamp returns to its original position and secures the conductor. Only a screwdriver is needed to release the connection.



➤ www.harting.ca

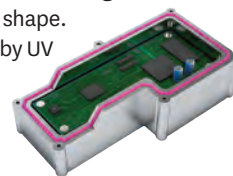
**SOLDER BAR SERVES
AS ALTERNATIVE TO
SILVER-BEARING
PRODUCT****NATHAN TROTTER**

NT100Ge Solder Bar is a high-quality, low-cost alternative to silver-bearing solder. The eutectic tin-coppernickel alloy creates a shiny, smooth, robust interconnect for a wide range of electronics assembly requirements. With a melting temperature of 441°F, product is compatible with all wave and selective solder equipment. Similar to the effect of phosphorous in Sn63 alloys, the small addition of Germanium in this product serves as a de-oxidant, which keeps drossing to a minimum. Product provides a low-copper solder solution for pcb fabrication applications, such as the hot air solder leveling process.

➤ www.nathantroutter.com

**LIQUID SEALANTS
ARE FAST CURING
IN ANY SHAPE****DELO**

PHOTOBOND SL4165 silicone-free liquid sealant for automotive and electronic designs, protects from dust, air, water. The flow-resistant, highly viscous liquid product can be applied in the desired height and any geometric shape. Product cures by UV light or visible light in a matter of seconds without thermal influence, enabling the CIPG process. Product has a compression set of 15% and improves elastic recovery, ensuring reliable sealing and helping meet IP67 tightness requirements. Product is one-component and free of solvents as well as paint-wetting impairment substances.



➤ www.delo-adhesives.com

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Jason Bauer, Media Sales Manager, jbauer@ept.ca
Or **Joanna Malivoire**, Account Manager, jmalivoire@ept.ca



PRODUCT SOURCE GUIDE



Annex Business Media is pleased to announce Jason Bauer as Media Sales Manager at EP&T.

No stranger to trade publications, Bauer is at home in the media world, having worked as a

consultative, senior level sales professional with more than 15-years' experience, selling across multiple media platforms including; print, online/mobile + digital OOH.

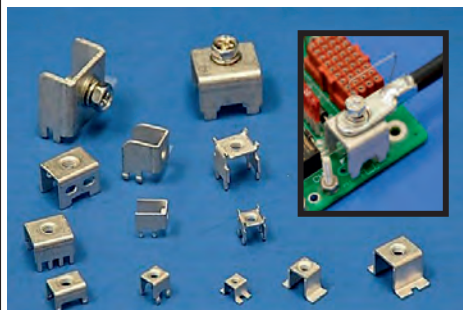
His last position was as national sales manager with Cineplex Media Inc., responsible for providing integrated media solutions across the motion picture media's full range of product offerings - including; cinema, digital signage, online/mobile and print.

Bauer has also served as Group Publisher at APG Media, leading and managing daily operations of all facets of digital and print publishing including; sales and marketing efforts of 15 niche enthusiast lifestyle, automotive and action sport publications and their respective online properties.

"I look forward to immersing myself in the world of electronics and getting to know our customer base, while working on initiatives to help them achieve their goals," Bauer says.

Jason can be reached at 416-510-6797 or jbauer@ept.ca

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AD INDEX

Absopulse Electronics Ltd.	29
Allied Electronics & Automation	OBC
BEA Lasers	29
Blockmaster	29
Coilcraft	3
Digi-Key Corporation	OFC, IFC
Diverse Electronics	29
Electro Sonic Group Inc.	5
Electronic Products & Technology	22
Electrosources 2020	28
EMA Design Automation Inc	29
EMX Enterprises Ltd	7
EPTECH 2020	24-25
Hammond Mfg Co.	IBC
Interpower Corporation	17
Newark element 14 Electronics	19
Orion Fans	16
Phoenix Contact Ltd	9
Protocase	12-13
Schleuniger, Inc.	29
Schurter Inc.	29
TDK-Lambda Americas Inc.	21
Transducers USA	29

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<https://www.schurter.com/switches>

A Look Back

Celebrating four decades of electronics design



Marking its 40th anniversary this year, EP&T will feature this special column throughout 2019, providing readers with a peek at our past, while paying homage to our history.



Intel's first microcontroller, the MCS-48 microcontroller (μ C) series, was originally released in 1976. Its first members were 8048, 8035 and 8748. Initially this family was produced using NMOS technology, in the early 1980s it became available in CMOS technology. It was still manufactured into the 1990s to support older designs that still used it. Pictured here is the Intel 8248 single-chip microcomputer, part of the product family referenced in an Intel paper issued and displayed during ELECTRO 79 — an electronics design trade show held in New York City in 1979.

In this issue, A Look Back puts its focus on a news item, titled: New York's ELECTRO '79 sets the stage for the 80s, which appeared in EP&T's June issue in 1979.

The original column stated:

Billed as the biggest electronic conference and show of the decade — ELECTRO 79 held in April of 1979 in New York City, was probably just that. Almost rivalling the huge IEEE-sponsored shows of the 1960s which used to take up to five floors of the New York Coliseum, more than 30,000 engineers visited the three-floor exhibit space containing more than 400 booths, displaying the ware of

as many manufactures and distributor organizations.

The theme of ELECTRO 79 was *'Electronics for the early 1980s: Its impact on industry and the individual.'*

At the conference, the emphasis was less on microcomputers than had been the case at major electronic shows of the past few years. The consensus in the industry seemed to be that microprocessors have come of age as an accepted design tool, another component that the designer must consider when looking at a new system, instrument or control component.

For circuit designers, probably the most necessary technical

session had to do with analog-to-digital LSI, the merger of linear and digital technology on a single chip.

Back in the day, engineers described how their devices were becoming practical design components in three extremely well received papers:

- Intel's Rob Walker described the company's 8022 single-chip microcomputer that allocates 30% of its chip area to voltage comparator, oscillator, zero-crossing detector and 8-bit A-to-D converter. He then gave as a design example a microwave oven controller using the chip that he claimed reduces overall system cost by reducing components.

- Michael Timko of Analog

Devices described his company's work using integrated injection logic (I²L) to produce high-accuracy linear bipolar monolithic wafers that can include high-density digital circuitry. He gave an illustration of the AD574 2-chip, 8-bit data acquisition system fabricated with the new technology: It can interface to a microprocessor bus with additional circuitry.

- In another paper dealing with PL technology, Phil Marcoux of Signetics described how that process had allowed integrated digital and linear circuits to be produced which perform the functions of A-to-D converter and telecommunications coder-decoder (codec). **EP&T**



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