



Feature Interview by Stephen Las Marias
I-CONNECT007

Aculon Inc. commercializes unique surface coatings leveraging nanotechnology and other surface modification techniques. The company's original focus was the optical industry, developing treatments of prescription eyewear, sunglasses and other optics. In 2010, the company launched its electronics business, and since then has been one of the leading providers of nanocoating for stencils. Since 2012, Aculon has been a supplier of nanocoating to protect printed circuits from waterproofing. In 2015, the company launched its own series of Aculon branded products called NanoProof.

In an interview with *SMT007 Magazine*, Aculon Chairman and CEO Edward Hughes speaks about addressing their customers' challenges and ensuring customer satisfaction.

Stephen Las Marias: What challenges are your customers facing?

Edward Hughes: In electronics, we have two core products—NanoClear for stencils and NanoProof for PCB waterproofing. The challenges for stencil producers are both cost and complexity. There is tremendous cost pressure to reduce stencil costs at the same time as complexity increases as apertures become smaller due to miniaturization. For PCBs, waterproofing is a huge issue not just for mobile phones but also other premium electronics. NanoProof allows customers to waterproof their device in a cost effective, easy to apply manner without costly vacuum equipment.

For NanoClear, we added repellency functionality to stencils that paybacks in hard savings in generally less than 200 prints. As a result, our customers enjoy dramatic improvements in first pass yield and lower consumables costs for an investment of less than \$50 per stencil. For NanoProof, we are providing a more effective waterproofing solution up to and including IPX-7 that is both cost effective and easier to apply than alternative conformal coatings or vacuum deposition processes.

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Las Marias: What are the major drivers for growth for your company?

Hughes: We have terrific penetration of the stencil market with our NanoClear products



Edward Hughes, Aculon

in the United States. For NanoClear, most of the growth is coming from Europe and Asia. For NanoProof, the growth is all coming from OEMs wanting to waterproof their devices. 2018 is going to be the year when most premium electronics offer some form of waterproofing and

traditional solutions such as conformal coatings do not cut it.

Las Marias: What trends do you see as you look out at the electronics manufacturing industry?

Hughes: Increased complexity and functionality of PCB design. Both trends mean that the use of nanocoating with stencils or PCBs is going to be more prevalent.

Las Marias: What percentage of your customers do you work closely with from design to assembly?

Hughes: Very few. Most customers come to us as either the stencil does not print well and they need a nanocoating, or the marketing team has decided they need waterproofing for the device and the engineering team has been tasked with making something work without changing the design.

Las Marias: What is your customer satisfaction goal?

Hughes: Very high. Once we get spec'd into a product, we stay with the product for years.

Las Marias: What is the most important attribute for customer service?

Hughes: Speed. We need to get back to our customers quickly.

Las Marias: What is the cost of not meeting customers' needs?

Hughes: You do not spec'd into a program and lose the business opportunity.

Las Marias: What is your biggest unfulfilled need from your supply base?

Hughes: Inventory. Some of our raw materials are either custom or in high demand. As our business grows, we are placing more demands on our suppliers and some are struggling to keep up.

Las Marias: How important is the technical expertise of the customer service staff?

Hughes: Very. While our customers don't necessarily understand all the details of our chemistry solutions, being able to understand their needs is critical to not only establishing credibility early on but also allowing us to offer a solution that works.

Las Marias: What is the most important feedback/metrics you want from your customers?

Hughes: Repeat orders. If they like it, they continue to buy.

Las Marias: How would you rate your responsiveness to all customer requests?

Hughes: Excellent. As a smaller company, we are very nimble and so can customize development quickly to meet customer needs.

Las Marias: What is a recent example of how you exceeded customer expectations?

Hughes: Much of our work is covered by confidentiality agreements but an excellent publicized example is a Rauland Borg case study using NanoClear. Within a six-month time frame, Rauland Borg applied NanoClear on all



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their stencils and were able to reduce defects by 52%, increase SMT throughput by over 30%, and save over \$1 million per year. Their total investment was less than \$5,000 in NanoClear products.

Las Marias: Highlight some best practices to improve the electronics assembly process.

Hughes: We are a big believer in Chrys Shea's research in the SMT industry for improving print processes. Her best practice recommendation for improving the SMT print process is something she calls "the trifecta". She recommends a combination of: (1) using softer wipe paper; (2) using engineered solvents; and (3) using NanoClear nanocoating on all your stencil. She has developed tons of data that shows

it saves money, improves print quality, and is easy to do.

Las Marias: Is there anything else you'd like to add?

Hughes: 2018 is going to be another great year for Aculon. The market is moving towards needing more nanocoatings whether it is for better stencil printing or for waterproofing. We have industry leading products in both categories and are well positioned for continued growth.

Las Marias: Thank you very much, Edward.

Hughes: Thank you. SMT007

Making IoT Possible with a New Breed of Memristors

The Internet of Things (IoT) is coming, that much we know. But still it won't, not until we have components and chips that can handle the explosion of data that comes with IoT. Two hurdles need to be overcome. First, current transistors in computer chips must be miniaturized to the size of only few nanometers. Second, analyzing and storing unprecedented amounts of data will require equally huge amounts of energy.

Sayani Majumdar, Academy Fellow at Aalto University, along with her colleagues, is designing technology to tackle both issues. They have designed and fabricated the basic building blocks of future components in what are called "neuromorphic" computers inspired by the human brain.

In their recent article in *Advanced Functional Materials*, Majumdar and her team show how they have fabricated a new breed of "ferroelectric tunnel junctions", that is, few-nanometer-thick ferroelectric thin films sandwiched between two electrodes. They have abilities beyond existing technologies and bode well for energy-efficient and stable neuromorphic computing.

The junctions work in low voltages of less than 5 V and with a variety of electrode materials—including silicon used in chips in most of our electronics. They also can retain data for more than 10 years without power and be manufactured in normal conditions. We are no longer talking of transistors, but 'memristors'.

"What we are striving for now, is to integrate millions of our tunnel junction memristors into a network on a one square centimeter area. We can expect to pack so many in such a small space because we have now achieved a record-high difference in the current between on and off-states in the junctions and that provides functional stability. The memristors could then perform complex tasks like image and pattern recognition and make decisions autonomously," says Majumdar.

