MPD
MICROWAVE
PRODUCT DIGEST

Editorial Statement of Purpose

Microwave Product Digest serves RF and microwave design engineers, research and development engineers, applications engineers and engineering managers. These professionals, working in facilities that serve both the commercial and government markets, are involved with the design, development, application, and use of systems and subsystems, devices, and techniques involving frequencies from RF to light.

Editor
Karen Hoppe
editor@mpdigest.com

Senior Production Manager
Kerry Mortensen
kerry@mpdigest.com

Graphic Designer
Derek Wood
wooodd@swbell.net

Copy Editor
Sue Goldenberg

Product Manager
Claire Ferrante
products@mpdigest.com

Website Coordinator
Kerry Mortensen
socialmedia@mpdigest.com

Publisher
Liesbeth Severiens
liesbeth@mpdigest.com

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Managing Director Claire Ferrante

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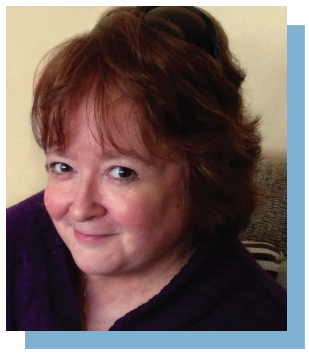
FROM THE EDITOR

Welcome to our IMS2021 Show Issue!



Karen Hoppe

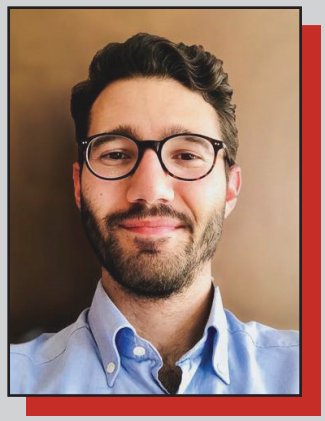
We may not be past the pandemic just yet, but things are slowly getting back towards normal, and IMS2021 will have both in-person and virtual show offerings to help ease us back into show business. The first part of the show, in Atlanta from June 7 through 10, will have a scaled-down version of the usual event, including technical sessions, workshops, the exhibition floor, and more. This will be followed up with a virtual event from June 20 through 25, and I can tell you that the virtual booths look terrific.

Our company policy will not permit us to join you in Atlanta, but this issue will be shipped to the book bins on the exhibit floor. Those visiting our virtual booth will be able to click on a link to view the digital edition of May, ensuring that all attendees will have access to our show issue.

No matter which version of the show you attend, it will be wonderful to see —or "see"— our friends and colleagues, along with the new products sure to be on display. We look forward to connecting with you!

In My Opinion

Keeping City Infrastructure in Good Repair



Lorenzo Amicucci
Business Development Manager
Nordic Semiconductor

Even rules of etiquette have been recast in the wake of COVID-19. Handshakes and hugs are an obvious casualty, but many other daily conventions have come in for change. Consider how we use elevators. In the millions of elevator rides that take place each day, passengers have long observed rules such as "always face forwards", "avoid private conversations" and "don't stand too close to others". Suddenly, with virus containment now front of mind, in some elevators passengers are even instructed to face the wall. Harvard's School of Public Health also tells us to cease all conversations and even consider positioning ourselves in elevators in a checkerboard pattern. With some elevators declaring "maximum one person", it would also seem that loneliness - rather than getting too close to others – is a more likely problem for passengers.

These changes are just the pointy end of a much bigger shift in how essential services—like elevators, moving ways and transit systems—will operate in a post-COVID era. These systems will need to work harder and smarter, supporting more trips due to the fact fewer people are allowed per trip. They may also need to be available for service over longer periods of the day, to accommodate frequent but necessary cleaning and sanitizing stops. With these greater uptime demands will come more wear and tear. All in the face of shrinking pool of skilled maintenance specialists.

The situation is forcing a radical rethink about maintenance and condition monitoring, particularly for services like elevators where reliability hasn't been a strong suit. Despite being pivotal to urban living, the elevator industry annually experiences over 24 million breakdowns and 190 million hours of downtime according to ThyssenKrupp, a major player in the elevator sector. Reactive servicing models, in which technicians are dis-

Opinion, Con't on pg 5

In This Issue

Opinion, Con't from pg 3

patched only after a fault is apparent, are largely to blame, and do nothing for passenger convenience or the elevator supplier's bottom line.

A New Promise

Now, with advancements in sensor and network technologies, the promise of radically extended uptime for critical equipment like elevators could be within reach. Under a concept called "predictive maintenance", wireless sensors placed on equipment can capture data about a spectrum of performance indicators. For complex machinery like elevators, this could include data indicators such as heat, friction, noise, vibration, and location. When analysed, this data can reveal critical information about the health of equipment, which is then relayed to service teams who can respond accordingly and in a timely way.

The capability of modern IoT devices means these solutions are being designed elegantly and in a way that minimises bandwidth costs. For example, Nordic's nRF9160 SiP incorporates a powerful Arm Cortex M33 processor that is capable of sensor data acquisition, edge computing and basic AI data analysis. This supports the ability to analyse the data collected from sensors locally, with only data about anomalies or meaningful insights about the equipment needing to be transmitted.

The maturing of cellular IoT standards—specifically LTE-M and NB-IoT, both of which the nRF9160 supports—is another plus point for predictive maintenance applications. Cellular IoT's low power consumption is critical for solutions using sensors that need to run for years on battery power. In the future, low power wireless sensors may even be powered by harvesting energy from the very vibrations they're monitoring. Finally, the fact that cellular IoT networks are part of existing network infrastructure that is attracting continued investment also promises further future innovation in the design of these solutions.

A Win for all Players

Consulting firm McKinsey estimates predictive maintenance could reduce maintenance costs by 10-to-40 percent, equipment downtime by 50 percent and equipment capital investment by three to five percent by extending the useful life of machinery. The savings could translate to an economic impact of nearly $630 billion per year in 2025.

So, it's no surprise that these solutions are being considered for a wide range of industries and services. Think of any service critical to the reliable operation of a city—sewers, water tanks, bridges, ATMs, and automated parking gates—and a maintenance revolution driven by sensors and cellular networks beckons.

Wireless sensor-based predictive maintenance could also spur uptake of the next generation of environmentally sustainable infrastructure in cities. Devices like the nRF9160 SiP are already supporting smart power grids by detecting minor faults such as fires and power surges. It's easy to imagine these devices similarly underpinning future critical infrastructure such as electric vehicle charging stations.

The impact of this technology may be so profound that it even dramatically re-shapes entire business models. Some equipment makers have sensed an opportunity to shift to selling their equipment "as a service", a change made possible by having access to data about how their equipment is performing and being used.

To understand this, imagine elevator companies selling "number of elevator trips" to building managers, rather than actual elevators. For customers, this approach means large up-front capital expenditures are instead converted to a 'pay-as-you-go' operating expense, with payments contractually linked to the performance of the service. By delivering better customer experiences, the as-a-service model also benefits suppliers through stronger customer relationships.

Due to the skills and capabilities involved, the successful implementation of predictive maintenance solutions will depend on collaboration across a variety of parties, including equipment manufacturers, network operators, technology service providers, data analytics companies and others. Should this occur, for many industries it would seem—to invoke elevator parlance—that the only way is up.

• NORDIC SEMICONDUCTOR •