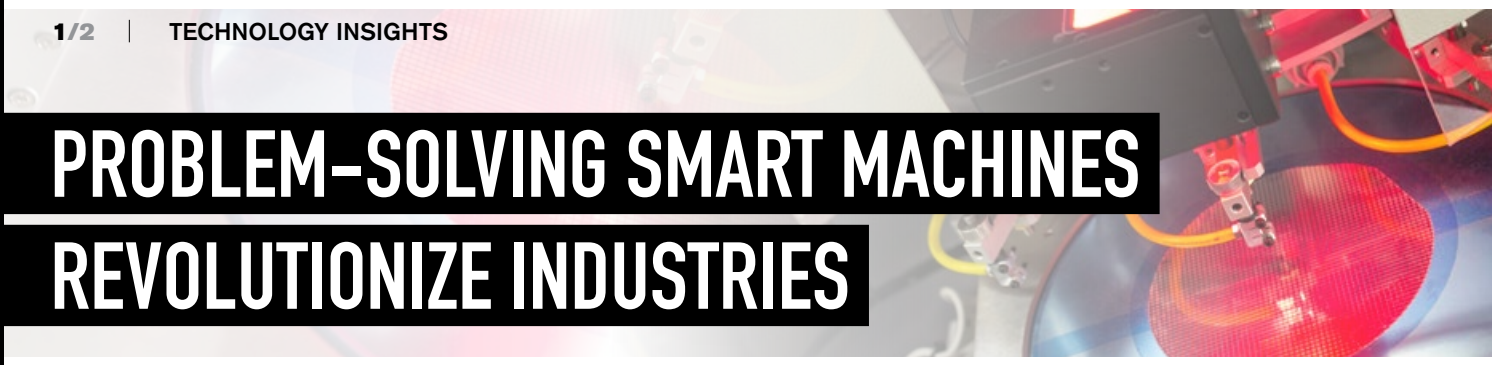

PROBLEM-SOLVING SMART MACHINES REVOLUTIONIZE INDUSTRIES

National Instruments' modular, certified, and rugged hardware and software platform gives machine builders a consistent approach from design through deployment.

In the semiconductor industry, competitive advantage relies on efficient production and standardization. With global competition intensifying, semiconductor companies are rapidly adopting wafer-processing machines that push the limits of chip manufacturing by incorporating vision-guided motion control, optics, and sensors to increase precision and throughput. These intelligent devices, which use machine-to-machine (M2M) technology, are loosely known as "smart machines." They must rapidly adapt to different die sizes and shapes on the wafers to enable the production of different chip types for different customers.

Smart machines are revolutionizing the automotive industry (think self-driving cars), manufacturing, health care, mining, and welding. Robots can perform efficiently in environments where humans might struggle. For example, an automated pipeline welder can easily traverse a pipeline in the desert or on the frozen tundra, performing highly precise welding while inspecting the work for quality control.

The key benefits of smart machines include their ability to solve problems without human intervention and to make predictions or adjustments in real time, based on the input of environmental and systems data. Consider robotically assisted medical devices, such as Intuitive Surgical's da Vinci system. Such devices incorporate highly precise laser sensors that adapt to human tissue and prevent damage during surgeries, resulting in better outcomes and faster healing for patients.

In all these areas, smart machines are replacing traditional machines that are either controlled (or primarily controlled) by humans or are designed for a single purpose. Now machine builders are creating more flexible multipurpose machines that address such new needs as smaller lot sizes; customized products; and highly integrated products that combine different functions in a single device, such as health and fitness wearables.

Today's Challenges for Smart-Machine Builders and Designers

Smart machines require the convergence of numerous disciplines, including systems engineering, computer science, software engineering, electronics engineering, mechanical engineering, networking, and materials science. Those disciplines are continually evolving, while emerging requirements from the Industrial Internet of Things (IIoT) and Industry 4.0 drive further complexity.

For example, sensors are critical for enabling smart-machine builders to create environmentally aware systems that can ensure the health of important mechanical components. Control systems must be able to integrate that sensor data quickly to provide intelligent feedback and automated actions when they're needed—for instance, in ordering a replacement part for a failing appliance. Machine builders need to understand how to merge previously separate process, direct-control, coordination/supervision, organization, and management layers. That's a highly specialized and scarce skill set.

Finding employees with that skill set or retraining existing staff in it aren't always viable choices. In addition, building modern smart machines requires that team members from separate areas collaborate effectively in ways they haven't done before. For example, a decision by the mechanical team to change the material and weight of a component can affect motor sizing.

Customization is another challenge. Today's sophisticated market requirements and companies' convergence and integration needs make it prohibitively expensive to develop fully customized systems in-house. Purchasing smart-machine infrastructure subsystems, however, isn't a flexible enough option for many applications and companies.

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New Approaches to Building Smart Machines

Fortunately, companies have new ways to blend their competitive need for customization with their economic need for standardization and best practices. So-called "mechatronics"—the merging of mechanical systems, electronic systems, computers, and control systems—is an industrywide effort to improve the process of designing smart machines. With it, National Instruments (NI) has developed a flexible platform of modular, certified, and rugged hardware and software that provides a consistent approach to prototyping all the way through testing and deployment.

The NI RIO platform enables engineers to configure a modular embedded system with I/O and program automation tasks with one graphical design tool. And NI LabVIEW tools provide graphical and text-based programming and support collaboration so that team members across design disciplines can create, code, communicate, and test design functions in a single system. As a result, developers can be more productive because they don't have to use multiple products from multiple vendors, such as programmable logic controllers (PLCs), industrial PCs (IPCs), and systems for modular I/O motion, vision, and measurement.

With the NI RIO platform, smart-machine manufacturers can focus their time and resources on the unique features and functions of their products, rather than on their control and IO infrastructures. That focus can deliver customer-centric products and a competitive advantage. This novel platform also reduces the overall cost of ownership, bringing customers stronger profits and competitive pricing. A survey of 1,000 NI customers found that adopting NI RIO enabled teams to produce four embedded projects for the R&D budget (based on $1 million annually) of one project using the traditional custom embedded approach.

Finally, the NI RIO platform helps companies incorporate the latest technologies, including system-on-a-chip (SoC), heterogeneous computing, high-speed signals, multiple sensor interfaces, and multiple communications protocols. These advanced technologies are necessary for smart-machine builders, yet require specialized expertise. The prebuilt, certifiable NI RIO platform removes complexities because it's easy to customize.

National Instruments offers global services and support and an ecosystem of more than 9,000 engineers who can help machine builders understand, use, customize, and augment the platform over time. To learn more, please visit the NI Smart Machines Webcast site.

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