SOLUTION OPPORTUNITY BRIEF

Solution Opportunity Brief
Robotics
Manufacturing

Simplifying the Design Process Brings More Robots to Manufacturing

Powered by Intel® technology, NEXCOM develops prevalidated solutions that lower the development costs of industrial robotic systems

Today, robots perform about 10 percent of manufacturing tasks. Researchers estimate this will rise to nearly 25 percent for all manufacturing industries worldwide by 2025.[1]

Bringing the Smart Factory to Life

To stay competitive, manufacturers worldwide are searching for ways to control the rising costs of labor. Industrial robots can help factories reduce staff and lower costs, but most robotic systems are difficult to design and require the integration of components from multiple vendors.

NEXCOM has worked with a variety of innovative solution providers to develop preintegrated and prevalidated solutions for a range of robotics applications. The solutions feature Intel® processors for best-in-class performance and Intel® IoT Gateways for seamless and secure data transfer to the cloud. By making robotics simpler and more affordable, NEXCOM is helping factories reduce costs, increase productivity, and gain valuable insights from data analytics.

MANUFACTURING TASKS PERFORMED BY ROBOTS

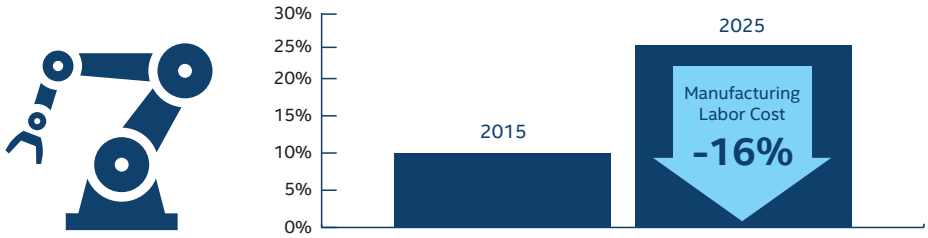

Figure 1. Smart factories can help reduce labor costs.
Source: Boston Consulting Group[1]

A Changing Workforce Challenges Manufacturing

In the coming years, factories will need to get smarter to stay competitive. Manufacturers, especially those in heavily industrial markets like China, must respond to rising wages and a shortage in skilled labor. The deployment of industrial robots can offset these rising costs, while connecting equipment to a smart, centralized infrastructure that collects and analyzes data to help optimize production.

However, designing robotic systems is a complex process that requires manufacturers to identify and integrate subsystems from multiple vendors. Today, robots deployed on factory floors require teams of specialists who have in-depth expertise installing, calibrating, and programming them. This setup typically takes weeks and the cost is many times the purchase price of the robot itself.[2]

Automation in Action

The emergence of the Internet of Things (IoT) in the manufacturing world is expected to have a profound impact on how factories operate. Systems that were once siloed can now communicate with each other to improve everything from supply chain management to quality control.

Robots are playing a big role in this transformation. Besides automating tasks, they can feed information to centralized systems that analyze data and find ways to improve production. According to a PricewaterhouseCoopers report,[3] factories are using robots for:

- Assembly
- High-precision machining tasks
- Transportation of materials or supplies
- Packaging
- Testing and inspection

Robotics Poised for Growth

Although industrial robots have been used in factories for decades, robots currently perform only around 10 percent of manufacturing tasks, on average. The Boston Consulting Group (BCG) estimates that by 2025, the portion of tasks performed by robots will rise to nearly 25 percent for all manufacturing industries worldwide.[1] Furthermore, in a recent BCG survey of U.S.-based manufacturers, 72 percent of executives said their companies will invest in automation or other advanced-manufacturing technologies in the next five years.[1]

Smart factories have enormous potential, including a reduction in labor costs and opportunities to increase throughput, boost yields, and reduce downtime through insights gained from data analytics. However, for this growth to occur, the economic benefits of robotics must not be consumed by the design and implementation of the systems.

Fast Implementation, Less Risk

To reduce the amount of effort and cost of deployment, manufacturers need streamlined robotics solutions—especially for applications that use a large array of subsystem vendors. NEXCOM, working closely with other solution providers in manufacturing, has developed pre-integrated and pre-validated solutions for a range of robotics applications. These systems incorporate components from many leading vendors and allow manufacturers to deploy robotics with much less development and risk.

One manufacturer seeking to reduce its labor content turned to NEXCOM to design an automated system that comprised delta robots and EtherCAT* master stations to coordinate PLCs, conveyers, sensors, gluing, and labeling equipment. The company, which produces wet wipes, required between 12 and 15 workers for each production line, eight of which performed detail-oriented packing tasks. In deploying NEXCOM's solution, the manufacturer expects to reduce its manpower requirements by about 30 percent. The company plans to replicate the system on other assembly lines that produce different products.

NEXCOM's other success stories include an intelligent robot controller that supports 4- to 7-axes robots with payloads from 5–300 kilograms; an automobile painting system, of which three hundred have been installed in an automaker's line; and a 6-axes, high-speed gantry system that supports machining devices travelling on a frame.

To achieve even higher levels of automation, NEXCOM also offers PC-based distributed control systems (DCS) that can be used to integrate various robotic arms. For example, in producing a smartphone chassis, electronics manufacturers often use a DCS to control the surface treatment process, which involves multiple robotic arms and a series of complicated chemical reactions. The DCS closely monitors and adjusts inlets and outlets as needed throughout the process. By enabling different robots to work together, NEXCOM helps manufacturers ensure higher-quality outcomes.

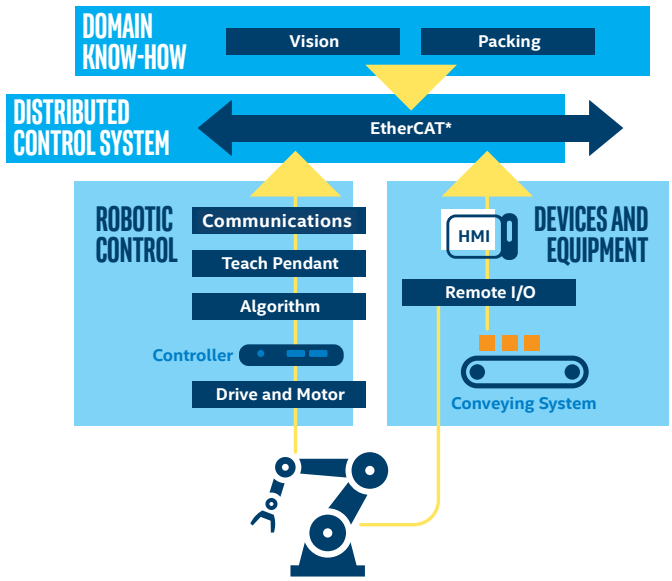

Figure 2. A typical robotic system includes several subsystems.

System Components

A robotic production line involves many aspects beyond the robots, some of which can be challenging. There are actuation controls, sensing, data processing, and operational intelligence that may present issues around system integration, machine-to-machine communication, and information integration. Taken a step further, smart manufacturing based on IoT, smart robots, cyber-physical systems, and big data technologies introduce additional layers of complexity. NEXCOM's robotics solutions come in all shapes and sizes, but typically include the following subsystems.

Robot Body
Made of high-strength materials and designed for harsh environments, the robot body plays a hands-on role in manufacturing by performing tasks such as welding, painting, packaging, and inspecting.

Robotic Control
These systems are responsible for sensing, motor driving, and movement functions that require sophisticated algorithms. Their design requires experience in remote teaching, application know-how, and networking technology suited to industrial environments (e.g., EtherCAT). Control systems may include:

- A controller: PC-based system controlling the robot body
- Algorithms: Application software running on the controller
- Teach pendant: Input device (HMI) enabling process control customization
- Communications: Devices supporting advanced communications capabilities

Devices and Equipment
In addition to the robotics, other systems are needed to complete the production line. Some examples include:

- Remote I/O: Peripheral devices communicating with sensors, actuators, and networks
- HMI: Panel PCs enabling operators to interact with the production equipment
- Conveying system: A variety of equipment for moving goods along the production line

Distributed Control System
This architecture is used to flexibly connect distributed I/Os, sensors, and drives so developers can implement robot design without concern for signal wiring length limitations.

Domain Know-How
Production lines may require special functions, such as vision inspection, that require particular expertise.

		APPLICATION			
SUBSYSTEM	COMPONENT	Wet Wipe Making	Intelligent Robot Controller	Auto Painting	Gantry
Domain Know-How		Auto Giving and Paste on-the-fly	Robotic Control	Auto Painting	Advanced Motion Control
Robot Body		Hiwin* RD403	Third-party 7-Axes Robot	KUKA* KR 16-3 LB/KR 100 TITAN	6-Axes Gantry
Robotic Control	Controller	NEXCOM* NET 3600E	NEXCOM NISE 104/105	Siemens* S7-300	NEXCOM NISE 3140
	Algorithm	NEXCOM	Third-party	KUKA*	TwinCAT*
	Communication	EtherCAT* (NEXCOM nexECM)	Third-party	Ethernet	EtherCAT
	Teach Pendant	Hiwin	Third-party	KUKA	N/A
	Drive and Motor	Panasonic* A5B		KUKA	HIWIN D2
Device and Equipment	Application Specific	Conveying System and ME Partner	Customer Choice	Car Painting	Conveying System
	HMI	NEXCOM IPPC 1632P	Rockwell* RSLogix 5000	NISE2100A	N/A
	Remote I/O	NEXCOM AXE-9200		Siemens PLC	VIPA I/O
Distributed Control System	Controller	NEXCOM IPPC 1632P	NEXCOM NISE 104/105	NEXCOM NISE 2100A	NEXCOM NISE 3140
	Communication	EtherCAT CODESYS*	Ethernet/IP	Ethernet	EtherCAT

Table 1. NEXCOM works with manufacturers and systems integrators to develop pre-integrated and pre-validated robotics solutions. This table shows the key components of four solutions supported by NEXCOM.

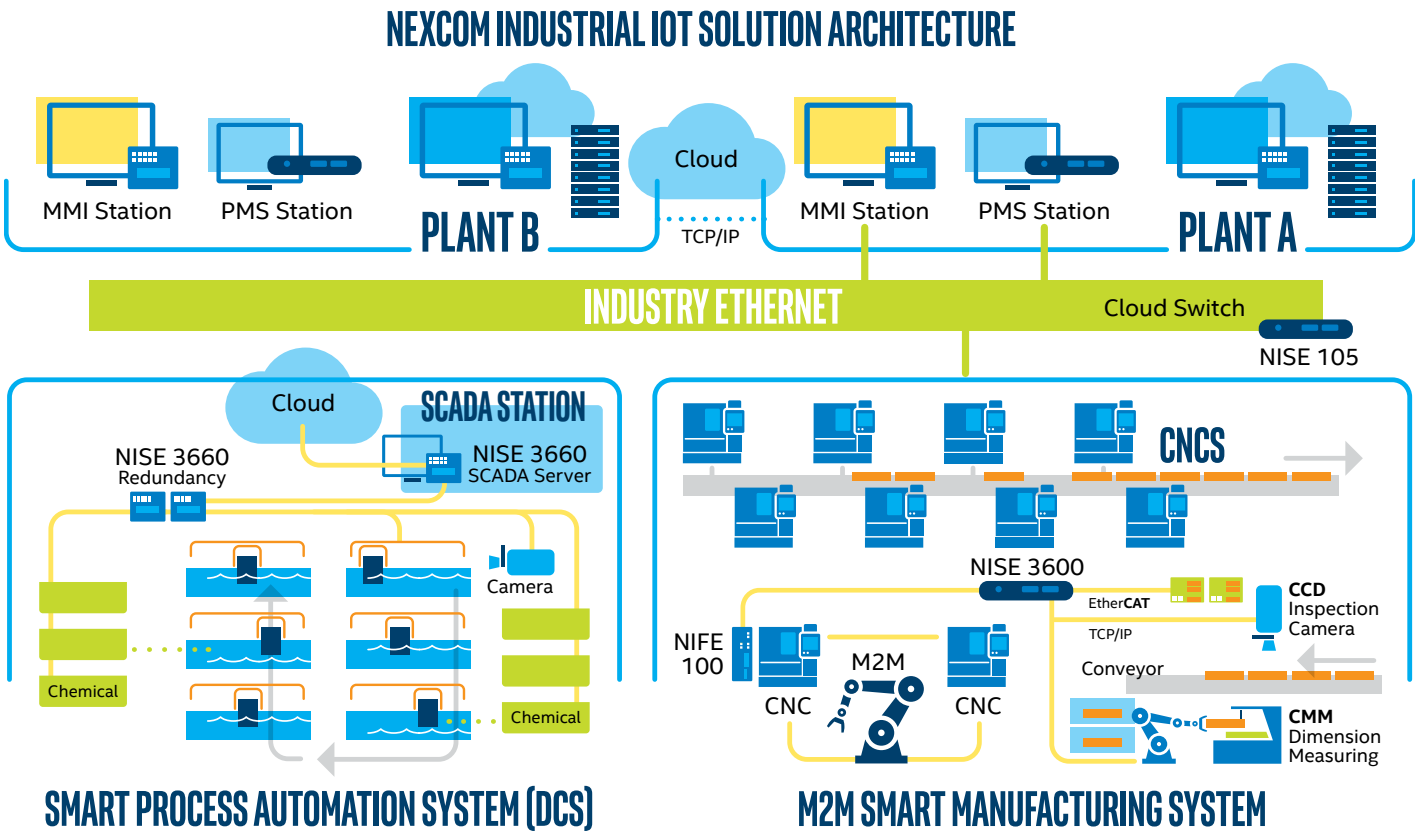

Figure 3. A smart electronics factory includes machine-to-machine (M2M) systems, smart process automation, and connected plants.

Scalable, Powerful Intel® Technologies

NEXCOM's family of controllers is based on Intel processors, which deliver high performance, long-life support, generational compatibility, and scalability. Multi-core Intel processors run at high clock speeds and can perform multiple jobs simultaneously, carrying out a major task with one core while performing additional tasks on the others. This enables one Intel processor to replace several legacy processors, improving the overall value of the solution.

Because all controllers run the same code base, NEXCOM can satisfy multiple cost/performance points. For example, the high-end NISE 3600E is a fanless system offering Intel® Core™ i7, Intel® Core™ i5, and Intel® Core™ i3 processor options. Still powerful enough to address the computation, communication, and control requirements in many manufacturing environments, the NEXCOM NIFE 100 is designed with the power-efficient Intel® Atom™ processor E3800 product family.

The NIFE 100 controller may run the Intel IoT Gateway software stack, developed in collaboration with McAfee and Wind River. The controller can connect to legacy and new industrial devices, enabling seamless and secure data flow between field devices and the cloud. The Intel IoT Gateway software stack can run application-specific software and integrates technologies and protocols for networking, embedded control, enterprise-grade security, and manageability.

For robotics solutions requiring vision, Intel® RealSense™ technology takes perceptual computing to the next level by understanding sensory input and movement-supported platforms. It supports facial and speech recognition, speech synthesis, and a depth sensor that enables operation in a 3-D space, such as detecting and avoiding obstacles, and planning a collision-free path.

Reduce Costs and Streamline Engineering

NEXCOM follows the Intel® Embedded Product Roadmap, benefiting from Intel's commitment to long-time product availability. This enables NEXCOM customers to reduce inventory for the typical 10-year lifecycle of robotics controllers. Since NEXCOM's solutions employ Intel processors end-to-end, from edge devices to cloud servers, the same development, validation, and test tools can be used throughout, which reduces costs and streamlines engineering tasks.

Simplifying Robotic Design

For many manufacturers, defining and deploying robotic solutions is prohibitively complex. Hardware, software, and networking components must be integrated, which is made more difficult by the need to work with a variety of suppliers. NEXCOM is making the process easier by providing validated recipes to manufacturers for a wide range of use cases. Manufacturers can work with NEXCOM to speed the time and reduce the cost of developing robotics, increasing their return on investment, while technologies from Intel enhance their scalability, performance, and long-term availability.

For More Information

NEXCOM is a leading provider of solutions for machine automation. For more information about NEXCOM, visit www.nexcom.com/applications/DetailByDivision/machine-automation.

To learn more about Intel IoT technologies, contact your Intel representative and visit intel.com/iot.

INTEL® IOT GATEWAY

Along with providing essential connectivity, the Intel® IoT Gateway acts as a data router and filter between data-generating sources—such as sensors and intelligent equipment—and the cloud. It enhances data security, accelerates actionable insight, and more importantly, saves money—with the Intel IoT Gateway, companies can securely transfer only data that has operational relevance to the cloud, lowering costs for data transmission and cloud storage.

1. Boston Consulting Group (BCG), "Takeoff in Robotics Will Power the Next Productivity Surge in Manufacturing," February 10, 2015, www.bcg.com/news/press/10feb2015-robotics-power-productivity-surge-manufacturing.aspx.

2. U.S. National Institute of Standards and Technology (NIST), "Robotic Systems for Smart Manufacturing Program," www.nist.gov/el/isd/ms/rssm.cfm.

3. PricewaterhouseCoopers, "The new hire: How a new generation of robots is transforming manufacturing," September 2014, https://www.pwc.com/us/en/industrial-products/assets/industrial-robot-trends-in-manufacturing-report.pdf.

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