Thanks to advanced process manufacturing technology—or “smart manufacturing”—such a future isn’t far-fetched or that far off, asserts Keith Nosbusch, chairman and CEO of Rockwell Automation Inc., a Milwaukee-based provider of industrial automation products and services.

“Today, control, communications, information and power technologies are converging to enable the next industrial renaissance,” Nosbusch wrote in a whitepaper titled “Smart, Safe, Sustainable Manufacturing: A New U.S. Industrial Strategy for Competitiveness.” “At the heart of this renaissance are advanced, smart manufacturing technologies that blend the best in people, physical assets, business processes and data, and seamlessly connect the plant floor to the enterprise, supply chain and the customer.”

Nosbusch, who was appointed CEO of Rockwell Automation in February 2004, asserts that the application of such smart technologies “will bring competitiveness back into the U.S. manufacturing base.” But he believes the federal government has a critical role in helping bring some of these smart concepts to fruition.

That’s why Nosbusch and Rockwell have been pushing the Obama administration to provide additional funding for projects that would spur innovations in smart manufacturing technologies. He notes that the European Commission has approved 1.2 billion euros for a “Factories of the Future” program, which is part of the commission’s economic recovery plan.

“The European Union is ahead of the U.S. in the race to re-industrialize their manufacturing base with smart, safe and sustainable manufacturing,” Nosbusch wrote in the aforementioned whitepaper. “This is a race we must win.”

To stay in the smart race with other nations, the Obama administration and Congress need to “make smart manufacturing a top priority for federal R&D spending,” Nosbusch asserts.

Nosbusch urges the government to “rebalance the federal investment in R&D” to make applied research funding equal to basic science research. Nosbusch points out that funding for applied research dropped more than 40% in the 1990s, creating a $10 billion gap “that’s a detriment to manufacturing innovation.” Innovation—particularly process innovation—is “crucial to enable that next generation of smart manufacturing,” he asserts.

“There is a disconnect in that people don’t understand the importance of applied research as a complement to basic research,” Nosbusch tells INDUSTRYWEEK. “You need to bring it out of the labs and commercialize it to really get the value out of the basic research investment. And certainly we know that American investments in science and engineering have driven most of the innovations that underpin our economic prosperity and have for many years now.”

Nosbusch calls for the creation of a $2 billion federal R&D public-private partnership program that would create smart manufacturing innovation centers, which would have “test beds” to help mitigate the risk that companies would incur in researching and implementing smart manufacturing technolo-
gies on their own. The centers would bring together government, manufacturing and university resources to “accelerate the development of broadly applicable approaches and technologies,” he explains.

Nosbusch points to nanotechnology and biomaterials as an example of an area in which more government funding and support of smart manufacturing technologies can enable significant product and process breakthroughs. He asserts that the profound effects that nanomaterials can have will require the precision modeling and manufacturing that smart technology will enable.

“However, without smart manufacturing technology and standards for mass production of these bio- and nano-materials, they won’t be brought to commercialization. We think the government has a role here to catalyze the partnership between academia, industry and the national labs and focus on test beds where we can innovate manufacturing and mass production technologies that would allow new materials, new capabilities and new processes to be able to drive the next generation of advanced manufacturing in some of these areas,” Nosbusch tells IndustryWeek.

Three Smart Phases

Nosbusch sees smart technologies transforming manufacturing in three progressive phases.

In the first phase, “we’ll see plantwide and enterprisewide integration, in which smart manufacturing will interconnect the individual stages of manufacturing production to advance operations efficiency,” Nosbusch tells IndustryWeek. In this phase, smart manufacturing will integrate the various “islands” of efficiency—from the sensors to the computerized controls to the production management software that are found in a typical manufacturing facility—and “enable data sharing throughout the plant.”

In the second phase, in-plant modeling and data technologies will connect with high-performance computing platforms “to build significantly higher levels of manufacturing intelligence,” Nosbusch says.

“And complete production lines and plants will run at—you can think of it as variable speed—but with real-time flexibility,” Nosbusch explains. “And that’ll allow them to optimize outputs and conserve inputs and get closer to build-on-demand.”

This second phase also will connect factory-specific information to data throughout the supply chain—from raw material availability through the delivery of finished goods—and will spawn the aforementioned “smart grids,” he adds.

“This transformation will optimize the plant supply networks and continue to drive competitiveness in the U.S. manufacturing base,” he tells IndustryWeek.

In the third phase, smart manufacturing will transform industry in much the same way that the strategic use of information technology has transformed the business model of online retailer Amazon.com.

“The third step is where that manufacturing knowledge really drives toward not just optimized but flexible production where we’re able to reverse the flow of the old industrial supply chains that have been around now for a century,” which gave the consumer “the choice to consume what was mass produced,” Nosbusch says. “We think the flexible factories and IT-optimized supply chains will change the manufacturing processes to allow the manufacturer to customize products to individual needs.”

For example, manufacturers will be able to make medications with dosages and formulations that are specifically designed “to treat an individual’s makeup and, in some cases, DNA,” Nosbusch says.

In the third phase, the growing body of manufacturing knowledge will spur innovation that “provides market disruption in both products and processes,” he adds.

“That will allow for new markets, lower prices, new opportunities for growth and certainly wider choices for people,” Nosbusch says, pointing to Tata Motors’ $3,000 car—produced in a smart-designed factory in India—as an example. “We see that as the evolution of where this smart manufacturing and industrial renaissance is going.”

Nosbusch and Rockwell executives have held “multiple meetings” with the Obama administration and Congress to make the case for smart manufacturing funding, and the company recently launched a six-part Time magazine advertorial campaign titled “What is Smart Manufacturing?”. Rockwell also is one of 40 companies and universities that are part of a National Science Foundation initiative to create a roadmap for the implementation of smart manufacturing in the United States.

“We don’t believe you can have a sustained recovery without a viable, globally competitive manufacturing sector,” Nosbusch says. “That’s why we’re aggressively involved in this now.