Check out the assembly line of the future (w/ Video)

May 20 2014, by Miles O'brien

“Made to order,” a phrase that began with the service industry, is now vital to manufacturing's future. Manufacturing production has recently grown at its fastest pace in more than a decade, creating more economic value per dollar spent than any other sector. Adding to this surge is customization--the ability to quickly and efficiently make what you want when you want it. Rapid, efficient customization is becoming a reality for high-tech engineers, students and "maker" enthusiasts. Credit: NBC Learn, U.S. Patent and Trademark Office, and National Science Foundation

There's no shortage of ideas about how to use nanotechnology, but one of the major hurdles is how to manufacture some of the new products on a large scale. With support from the National Science Foundation (NSF), University of Massachusetts (UMass) Amherst chemical engineer Jim Watkins and his team are working to make nanotechnology more

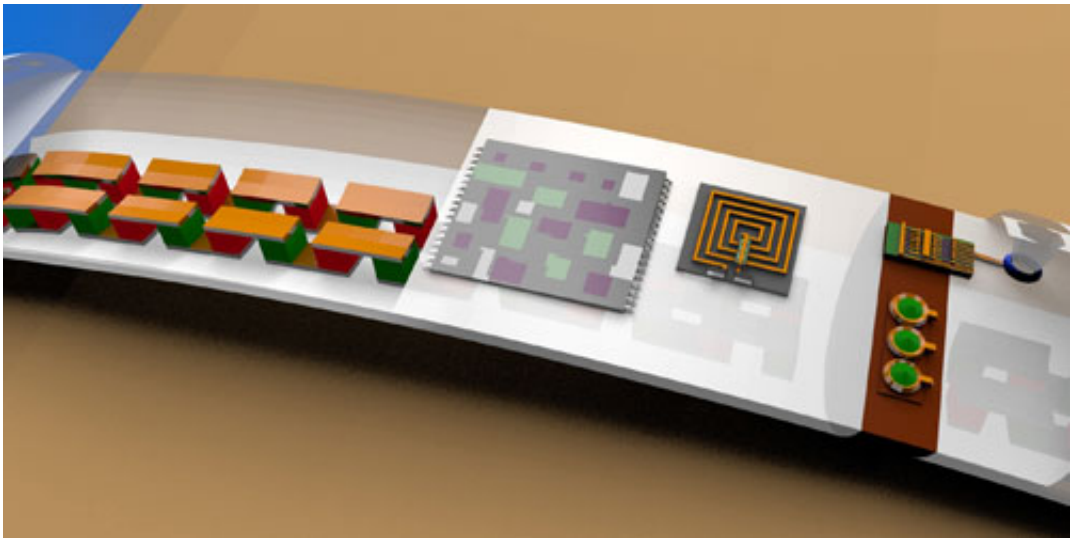
practical for industrial-scale manufacturing.

One of the projects they're working on at the NSF Center for Hierarchical Manufacturing (CHM) is a roll-to-roll process for nanotechnology that is similar to what is used in traditional manufacturing. They're also designing a process to manufacture printable coatings that improve the way solar panels absorb and direct light. They're even investigating the use of self-assembling nanoscale products that could have applications for many industries.

"New nanotechnologies can't impact the U.S. economy until practical methods are available for producing products, using them in high volumes, at low cost. CHM is researching the fundamental scientific and engineering barriers that impede such commercialization, and innovating new technologies to surmount those barriers," notes Bruce Kramer, senior advisor in the NSF Engineering Directorate's Division of Civil, Mechanical and Manufacturing Innovation (CMMI), which funded the research.

"The NSF Center for Hierarchical Manufacturing is developing platform technologies for the economical manufacture of next generation devices and systems for applications in computing, electronics, energy conversion, resource conservation and human health," explains Khershed Cooper, a CMMI program director.

"The center creates fabrication tools that are enabling versatile and high-rate continuous processes for the manufacture of nanostructures that are systematically integrated into higher order structures using bottom-up and top-down techniques," Cooper says. "For example, CHM is designing and building continuous, roll-to-roll nanofabrication systems that can print, in high-volume, 3-D nanostructures and multi-layer nanodevices at sub-100 nanometer resolution, and in the process, realize hybrid electronic-optical-mechanical nanosystems."



In 2012, NSFawarded $55.5 million to university consortia to establish three new Engineering Research Centers (ERCs) to advance interdisciplinary nanosystems research and education in partnership with industry. Over the next five years, these Nanosystems ERCs, or NERCS, are expected to advance knowledge and create innovations that address significant societal issues, such as the human health and environmental implications of nanotechnology. At the same time, they will advance the competitiveness of U.S. industry. The centers are: the NSF Nanosystems Engineering Research Center for Advanced Self-Powered Systems of Integrated Sensors and Technology (ASSIST), led by North Carolina State University; the NSF Nanosystems Engineering Research Center for Nanomanufacturing Systems for Mobile Computing and Mobile Energy Technologies (NASCENT), led by the University of Texas at Austin; and the NSF Nanosystems Engineering Research Center for Translational Applications of Nanoscale Multiferroic Systems (TANMS), led by the University of California Los Angeles. As appropriate to the particular areas of research, each NERC will include the societal and environmental implications of the nano-enabled scientific and technological breakthroughs. Credit: Illustrated by Narayanan Ramanan, North Carolina State University

Provided by National Science Foundation