Smart Manufacturing @ NIST

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Presentation Overview

• What is NIST doing in Smart Manufacturing?

• Role of NIST in Standards

• Interoperability: Standards and Practice
Engineering Laboratory Goals

• Disaster-Resilient Buildings, Infrastructure, and Communities

• Cyber-Physical Systems

• Smart Manufacturing

• Sustainable and Energy-Efficient Manufacturing, Materials, and Infrastructure
Context: U.S. Manufacturing

- $2.1T in value added to the U.S. economy, highest multiplier effect of any economic sector
- 12.3 million manufacturing workers in the United States, accounting for 9 percent of the workforce
- In addition, manufacturing supports an estimated 18.5 million jobs in the United States—about one in six private-sector jobs
- Output per hour for all workers in the manufacturing sector has increased by more than 2.5 times since 1987
- Manufacturers in the U.S. perform more than three-quarters of all private-sector research and development (R&D) in the nation
Smart Manufacturing: the synthesis of advanced manufacturing capabilities and digital technologies to produce highly customizable products faster, cheaper, better, and greener

- Internet of Things/Ubiquitous Sensing
- Big data & advanced analytics
- Cloud computing
- Broadband communications, wireless
- Mobile computing/apps
- Security technologies
- Advances in additive processes/3D printing
- Advances in robotics
- Model-based everything
- Cyber-physical systems engineering
- Advances in materials
Primary Objective of the Smart Manufacturing Goal

Drive innovation and reduce risks of adoption of Smart Manufacturing technologies through measurement science and standards:

• EL products include:
  • Performance metrics
  • Measurement, testing methods, and artifacts
  • Predictive modeling and simulation tools
  • Information and knowledge modeling
  • Protocols and specifications
  • Reference Technical data

• Collaborations with academia and industry

• Critical technical contributions to standards
Common Themes in Advanced Manufacturing Trends Reports

• Additive Manufacturing

• Advanced Robotics

• Smart Manufacturing Systems Design and Analysis

• Smart Manufacturing Operations
Smart Manufacturing Measurement Science

Enabling Disruptive Process Technologies:

Additive Manufacturing

Enabling System Level Technologies:

System Design and Analysis

Operations Planning and Control

Robotic Systems
Sampling of Available Facilities

1. Industrial Control Systems Cybersecurity Test Bed

2. Industrial Wireless Systems Test Bed

3. Metal Additive Manufacturing (AM) Research Facility

4. Manufacturing Robotics Test Bed

5. Smart Manufacturing Systems (SMS) Test Bed
Role of NIST

• Does not develop standards, instead provide expertise to standards

• Work in collaboration with academia, industry, and SDOs

• Support innovation and advancement of standards through basic and applied research
Interoperability in General

• NIST conducts research to support advancing interoperability
  • Intra-domain (e.g., CAD-to-CAD)
  • Inter-domain (e.g., CAD-to-CAM, MCAD-to-ECAD)

• NIST needs interoperability of tools and data / information to support our research goals
Interoperability in MBSE

• Quick adoption of SysML 2.0 when published

• Canonical XMI, it’s a must!

• Reference models and repositories
Questions?