



NIST Roadmapping Workshop

Measurement Science for Prognostics and Health Management of Smart Manufacturing Systems

SCOPE & OBJECTIVES

Scope

- Focus is on *Prognostics and Health Management for Smart Manufacturing Systems (PHM4SMS)*
- Includes methods and technologies to develop and deploy for manufacturing:
 - Diagnostics
 - Prognostics
 - Condition Monitoring
 - Maintenance



Objectives



- Identify key measurement science needs, challenges, and gaps that are hindering the development and deployment of health monitoring, diagnostics, and prognostics technologies at multiple levels within a factory
- Identify the priorities and next steps to address these measurement science needs, challenges, and gaps



We are a Diverse Group...



Process v. Product

- Range from very simple to very complex
 - Few to many moving parts
 - Few to many relationships among components, sub-processes, etc.
- Both consist of physical components that work together to produce one or more capabilities
- Physical components (and therefore, functional capabilities) will degrade over time
- Maintenance may or may not be required throughout its life



Measurement Science...



Used in the context of creating critical-solution enabling tools – metrics, models, and knowledge – for U.S. manufacturers. This includes:

- Development of...
 - Performance metrics
 - Measurement and testing methods
 - Predictive modeling and simulation tools
 - Reference materials (e.g. data sets)
 - Artifacts
 - Protocols
 - Technical data
 - Knowledge modeling
- Conduct of inter-comparison studies and calibrations
- Evaluation of technologies, systems, and practices
- Development of the technical basis for standards, codes, guidelines, and/or practices



Wednesday, November 19, 2014

7:30 am	Registration and Networking Continental Breakfast	
8:30 am	Opening Plenary Session <ul style="list-style-type: none">• Welcome ~ Howard Harary, NIST• Workshop Scope and Objectives ~ Brian Weiss, NIST	
9:00 am	Keynote Presentation: Health Management of Smart Manufacturing Systems <ul style="list-style-type: none">➤ Al Salour, The Boeing Company	
9:30 am	Panel 1: PHM Capabilities, Best Practices, Challenges, and Needs <ul style="list-style-type: none">➤ Moderator ~ Greg Vogl, NIST➤ Panelists ~<ul style="list-style-type: none">Andrew Inman, ToyotaCarl Byington, Impact Technologies/SikorskyWilliam Marscher, Mechanical Solutions, Inc.David Siegel, Predictrionics Corp.	
10:30 am	Break	
10:45 am	Panel 2: Performance Assessment – Monitoring and Measurement <ul style="list-style-type: none">➤ Moderator ~ Moneer Helu, NIST➤ Panelists ~<ul style="list-style-type: none">Harry Kekedjian, Ford Motor CompanyKai Goebel, NASAWilliam Sobel, System InsightsJohn Oskin, Sage Clarity	
11:45 am	Morning Wrap up and Instructions for Breakout Sessions <ul style="list-style-type: none">➤ Joan Pellegrino, Energetics Incorporated	
11: 50 am	Lunch	NIST Cafeteria, Bldg. 101
	Breakout Sessions <p>After lunch, participants will move to their assigned breakouts:</p> <ul style="list-style-type: none">• PHM Manufacturing Process Techniques and Metrics Bldg. 217, Rm. H105• PHM Performance Assessment Bldg. 215, Rm. C103-106• PHM Infrastructure – Hardware, Software, and Integration Bldg. 217, Rm. H103	
1:00 pm	Breakout Session I: Desired Capabilities <ul style="list-style-type: none">➤ Envisioned future: What capabilities do we want and need the most	
	Flexible Break	
3:00 pm	Breakout Session II: Challenges and Barriers for Achieving the Capabilities <ul style="list-style-type: none">➤ Barriers limiting implementation and/or integration➤ Measurement and standards barriers, challenges, and gaps	
4:30 pm	Adjourn Day 1	
5:15-7:15 pm	Optional no-host networking dinner at the Dogfish Head Alehouse (across from NIST's Main Gate) Note: Please let Brian Weiss know by lunchtime if you will be joining the evening group.	

Today's Agenda



Thursday, November 20, 2014

7:45 am **Networking Continental Breakfast**

8:30 am **Plenary Session**

- **Day 2 Overview ~ Albert Wavering**, NIST

8:35 am **Keynote Presentation: Recent Advances and Transformation Direction of PHM**

- **Jay Lee**, University of Cincinnati

9:05 am **Panel 3: PHM and the Human Element**

- **Moderator ~ Patrick Brown**, University of Cincinnati
- **Panelists ~**
 - Thomas Mooney**, SOAR Engineering LLC
 - Andrew Hess**, The Hess PHM Group

10:05 am **Transition Break**

Breakout Sessions

Participants will return to their assigned breakouts:

- PHM Manufacturing Process Techniques and Metrics Bldg. 217, Rm. H105
- PHM Performance Assessment Bldg. 215, Rm. C103-106
- PHM Infrastructure – Hardware, Software, and Integration Bldg. 217, Rm. H103

10:20 am **Breakout Session III: Prioritization of Challenges**

- Review, clarify, and vote on the top challenges
- Determine R&D priorities
- Identify standardization priorities

11:45 am **Box Lunch**

12:30 pm **Breakout Session IV: Pathways for Measurement Science Roadmap**

- **Small groups work to develop roadmap elements:**
 - R&D, standards, and other approaches for addressing priority challenges
 - Next steps and actionable plan

1:45 pm **Transition Break**

2:00 pm **Plenary Session**

- **Breakout Group Reports**

3:00 pm • **Workshop Wrap up and Next Steps**

- **Brian Weiss**, NIST

3:15 pm **Adjourn Workshop**

3:30 pm **Optional briefing on NIST Robotic Systems for Smart Manufacturing Program**

Tomorrow's Agenda

