ASME

Digital Engineering

Standards Development Activities
Providing Tools to Enable a Model-Based Enterprise and Guidance on Data Workflows

October 28, 2020
Additive Manufacturing Data Management Workshop
Kate Hyam, Project Engineering Manager ASME Standardization and Testing
What is ASME?

ASME helps the global engineering community develop solutions to real-world challenges.

- Standards and Certification
- Conformity Assessment
- Courses
- Conferences
- Publications
- ASME.org
- Engineering Education
- Government Relations
- Engineering for Change
- Membership
ASME at-a-Glance

• Established in 1880
• 100,000+ members in 140+ countries
  – Includes 28,000+ students
• 350 staff in Offices: US – Europe – Asia
  – HQ: New York City
  – Little Falls (NJ); Houston (TX); Washington DC
  – Brussels (EU); Beijing (China); New Delhi (India)
• Standards and Certification
  – 1884 Year first standard published
  – 500+ Standards
  – 700 Committees
  – 5900 Volunteers (Total)
  – 1290 Volunteers (International)
Enable the True Digital Thread

The Digital Thread requires a Model Based Approach for Data Consumption Across the Product Lifecycle

- A Model-Based method digitally enables design data for downstream consumption, without human intervention, to achieve the digital thread.
- A Model-Based Enterprise digitally consumes feedback to automate continuous improvement.
- Model-Based Enterprise is unique from Industrial Internet as it is based on digital product requirement and design definition data vs production process performance data.

Single Source Traceability

Continuous Improvement Thread

Analysis  Supplier RFQ  Mfg. Engineering  Production  Quality Control  Customer
ASME Model-Based Enterprise (MBE)

- **Charter:** Develop standards or related products that provide rules, guidance, and examples for the creation, use and reuse of model-based datasets, data models, and related topics within a Model-Based Enterprise.

- **Areas of Concentration**
  - Types of models and their intended uses
  - Rules for representing requirements and constraints
  - Types of features and data elements for model-based datasets
  - Schemas for datasets
  - Management of links between product definition and process definition
  - Rules governing data quality
  - Creation, management, and use of product definition and process definition data
  - Management of discrepancies between existing standards affecting MBE and MBD
ASME MBE Recommendation Report

A Starting Point for MBE Standards Activities

- Developed by the ASME MBE Steering Group, which consisted of 8 existing ASME volunteers and 2 new members
- Establishes direction, activities, priorities, and organizational structure of the ASME MBE Standards Committee and its subcommittees
- Provides methodology for developing MBE standards using a model-based approach
- Outlines a roadmap for the MBE standards development process
- Describes a marketing and adoption strategy for MBE

“MBE will transform industry by increasing productivity, quality, profitability, and types of products, and by reducing wasted effort, wasted time, non-value-added work, lost information, missed opportunities, and time to market.”

Download: go.asme.org/MBEreport
ASME MBE Committee Structure

MBE Standards Committee
10 Members

MBE Subject Matter Expert Support Group
~ 75+ Members

Near Term Strategy Working Group (chartered)

Terms Working Group (chartered)

Use Cases & Model Based Standards Development Working Group (chartered)

MBE Framework Working Group (chartered)
ASME MBE Meetings

MBE Meetings Week - November 16-20, 2020

• Fredric Constantino – MBE Standards Committee Staff
  – ASME S&C Project Engineering Advisor
  – Phone: 212-591-8684
  – E-mail: ConstantinoF@asme.org

• Michelle Pagano – MBE Staff Support
  – ASME S&C Engineer
  – Phone: 212-591-8399
  – E-mail: PaganoM@asme.org

• ASME MBE Standards Committee C&S Connect Page

• ASME MBE Redmine Collaboration Site
ASME Y14 Standards Additive Manufacturing Standards

Model Based Definition Standards
• Y14.41-2019 Digital Product
• Definition Data Practices
• Y14.46-2017 Product Definition for Additive Manufacturing
• Y14.47-2019 Model Organization Practices
• Y14.48 - Universal Direction and Load Indicators (in development)

Committees meet in Spring and Fall
Contact Fred Constantino at ConstantinoF@asme.org for more information.
# ASME Verification & Validation (V&V) Committee – started 2008

<table>
<thead>
<tr>
<th>CHARTER</th>
<th>Description</th>
<th>Year</th>
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<tbody>
<tr>
<td>V&amp;V 10</td>
<td>Computational Solid Mechanics</td>
<td>2001</td>
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<tr>
<td>V&amp;V 20</td>
<td>Computational Fluid Dynamics and Heat Transfer</td>
<td>2004</td>
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<tr>
<td>V&amp;V 30</td>
<td>Computational Simulation of Nuclear System Thermal Fluids Behavior</td>
<td>2010</td>
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<td>V&amp;V 40</td>
<td>Computational Modeling of Medical Devices</td>
<td>2011</td>
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<tr>
<td>V&amp;V 50</td>
<td>Computational Modeling for Advanced Manufacturing</td>
<td>2016</td>
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<td>V&amp;V 60</td>
<td>Computational Modeling for Energy Systems</td>
<td>2017</td>
</tr>
<tr>
<td>V&amp;V 70</td>
<td>Machine Learning Applied to Mechanistic &amp; Process Modeling</td>
<td>2019</td>
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Coordinate, promote, and foster the development of standards that provide procedures for **assessing and quantifying the accuracy and credibility** of computational models and simulations.
ASME V&V Meetings

V&V Meetings Week - November 9-13, 2020
• Kate Hyam - V&V, V&V 40 and V&V 60 Staff
  – Phone: 212-591-8704
  – E-mail: hyamk@asme.org
• Fredric Constantino – V&V 50 Staff
  – Phone: 212-591-8684
  – E-mail: ConstantinoF@asme.org
• Michelle Pagano – V&V 10 and V&V 30 Staff
  – Phone: 212-591-8399
  – E-mail: PaganoM@asme.org
• Dan Papert – V&V 20 and V&V 70 Staff
  – Phone: 212-591-8399
  – E-mail: papertd@asme.org
• ASME V&V Activities related to standards, the Journal of VVUQ, Challenge Problems and Annual Symposium

ASME
Setting the Standard
Prognostics and Health Management - Manufacturing

PHM – Prognostics and Health Management
- Prognostics is the process of predicting the reliability of a product or process
- Health Management refers to the process of measurement, recording, and monitoring equipment deviation from normal operation conditions

• Subcommittee on Monitoring, Diagnostics, and Prognostics for Manufacturing Operations Charter: Develop standards and guidelines that advance the design and implementation of monitoring, diagnostic, and prognostic capabilities, along with ways of verifying and validating their performance, to enhance adaptive maintenance and operational control strategies within manufacturing.

• 1st Guideline Document – Determining When and Where PHM Should be Integrated in Manufacturing Operations
  - Help companies assess the health of their equipment, subsystems, work cells, and the overall process
  - Identification of Critical Metrics and Pain Points (e.g. OEE, KPIs)
  - Develop Business Case and Determine where to Implement PHM

• Committee Formed in July 2018
Big Data/Digital Transformation Workflows and Applications

• Guideline on Big Data/Digital Transformation Workflows and Applications for the Oil and Gas Industry – publication December 2020

• Committee on Digital Engineering/Big Data/Digital Transformation forming in early 2021

Contact Kate Hyam at hyamk@asme.org for more information.
Additional Activities

- PTC Committee on Control and Quality Improvement of Process Data
  - Develop procedures and guidelines for using techniques such as data validation and reconciliation to determine the quality of measurements, reduce the uncertainties, and assess reconciled results.

- Manufacturing and Advanced Manufacturing Standards Committee formation of a new Subcommittee on Additive Manufacturing
  - Develop standards or related products that provide rules, guidance, and examples of the design, manufacture and quality assurance of additively manufactured parts.

- Bioprinters (Hardware) Standards Committee
  - Develop, review and maintain guidelines and standards for bioprinters hardware requirements. This document provides guidelines for extrusion bioprinting calibration of devices, operations, compatibility, and interoperability of these components to best print ex vivo tissue results.
Questions?

Thank you for your kind attention!

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