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Research to Standards

ADDITIVE MANUFACTURING

Recent Progress on ASTM Research & Standardization Efforts

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ASM Handbook Vol. 24



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- ASM Handbook, Volume 24:
 - Additive Manufacturing Processes (475 pages and 40+ chapters)
- Editors
 - Dr. David L. Bourell
 - Dr. William Frazier
 - Dr. Howard Kuhn
 - Dr. Mohsen Seifi



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Background



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- Overview of AM R&D portfolio and their impact on AM standards portfolio
- New program development in workforce development
- Expansion of in-person workshops attracting over 300 AM professionals in Paris, Virginia and Texas
- AM CoE's COVID-19 response
- And more...



2019
-20

Annual Report

ASTM INTERNATIONAL

**Additive Manufacturing
Center of Excellence**

www.amcoe.org

AM CoE R&D Projects (Rounds 1 & 2)



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R&D Projects



Round 1: 2018-2019 (5 projects)



Post Processing (Surface finishing and Characterization)



LB-PBF Process Qualification



Feedstock (Powder quality guide)



Polymer AM Test Specimen Design



Mechanical Testing of Metal AM

Round 2: 2019-2020 (9 projects)



Standardization of Data Pedigree



LB-PBF Process Qualification – Phase II



Design Guide for Post-Processing



Polymer AM Design Value Tests



Powder Spreadability



Dynamic Testing of Polymer AM



Rapid Quality Inspection Specimen (RQIS)



In-process Monitoring



Design Guides for AM Processes

LAUNCHED **14** Total Research Projects

ADDRESSING **25** Total Standards Gaps

IMPACTING **53** Total Standards

<https://www.amcoe.org/projects>



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Research to Standardization



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1. Work item scoping and registration	2. Draft under development	3. Editorial support and pre-ballot	4. Undergoing balloting and final approval of a standard
TBD	WK62867 WK65929 WK66682 WK71391 WK73340 WK74390	WK66030 WK71393 WK71395	WK49229* WK65937* WK66029 WK72172 WK73444 Approved: ASTM F3413 – 19

* Existing Work Items

	Completed
	In process
	Upcoming

Status Key:

1. Work item scoping and registration
2. Draft under development
3. Editorial Support and Pre-Ballot
4. Undergoing Balloting and Final approval as a standard

PARTNER	FUNDING YEAR	PROJECT	STANDARD WORK ITEM	STATUS			
				1	2	3	4
	2018	1801: Metal AM Testing	WK49229				
	2019	1901: Rapid Quality Inspection Specimen	WK71395				
	2018	1802: AM Post Processing	WK66682				
	2019	1902: Data Pedigree	WK72172				
	2018	1803: AM Feedstock Evaluation	WK66030				
	2019	1903: AM Powder Spreadability	WK71393				
	2019	1904: Design for Post Processing	WK73444				
	2019	1905: Design Guides for AM Processes	WK62867 F3413-19 (WK62946)				
	2019	1906: In-process Monitoring	WK74390				
	2018/2019	1804/1907: LB-PBF Process Qualification	WK65937 WK65929				
	2018	1805: Polymer AM Testing	WK66029				
	2018	1805: Polymer AM Testing	WK71391				
	2019	1908: Polymer AM Design Value Tests	TBD				
	2019	1909: Dynamic Testing of Polymer AM	WK73340				



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3rd Round of Projects

2020 Request for Ideas



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- The idea solicitation process was expanded to all ASTM members as a membership benefit
 - Over 60 ideas were received during the survey
- Submissions addressed a wide range of challenges in AM that members face, including:
 - Design, Data, and Modeling
 - Feedstock
 - Processes and Post processing
 - AM Testing
 - Inspection and Qualification
- Project selection process
 - Ideas were evaluated by the F42.90.05 team
 - AM CoE Partners are developing SOWs
 - Projects will start in October 2020



3rd round of R&D Projects



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Lead	Project Title	Material	Topic
	Specimen Design for Compression Testing of Metallic Lattice Structures		
	Common Data Exchange Format (CDEF) for Powder Characterization		
	Metal Powder Feedstock Recycling and Sampling Strategies		
	Recycling and Re-Use of Polymer Powders		
	Miniature Tensile Specimens for Additive Manufacturing		
	Volume-Traceability (VT) Development in Porosity Characterization with XCT for Integrity and Quality Assurance of AM Parts		
	Development of Specification for Maraging Steel		
	Thermal Tolerance Test for LB-PBF Process Parameters		
	Continuation of AM Polymer Projects (Design Value and Dynamic Testing)*		

Material

-  Metal
-  Polymer
-  Ceramic

Topic

-  Design, Data, & Modeling
-  Feedstock
-  Processes & Post-Processes
-  Testing
-  Qualification



* Continuation of projects initiated in 2019

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New Project Call Mechanism



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New Call for Projects (CFP) mechanism allowing non-AM CoE partners to receive support to conduct targeted R&D projects

■ Objectives

- Allow the AM community to participate in Research to Standardization initiative
- Evaluate the possibility of bringing on additional partners to the AM CoE team, to further accelerate standard development in AM

PROPOSAL DUE	NOVEMBER 24, 2020
SELECTION ANNOUNCEMENT	JANUARY 2021
ANTICIPATED START DATE	MARCH 2021



The poster features the ASTM logo and the text 'CENTER of EXCELLENCE Research to Standards ADDITIVE MANUFACTURING' on the left. On the right, it reads: '2020 Call for Projects Submit Your Proposal! Funding Opportunities for Research Organizations Informational Webinar: November 2, 2020 Proposal Deadline: November 24, 2020'. The background is a dark blue image of a 3D printed part.



Update: Snapshot of ISO/ASTM Standards



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Terminology	Methods, process & materials			Test methods	Data & design			Environmental, health & safety	AM in aerospace applications			AM for plastics
ISO/ASTM 52900: General principles Part 1: Terminology	ISO 17296-2: Overview of process categories and feedstock			ISO 17296-3: Main characteristics and corresponding test methods	ISO 17296-4: Overview of data processing	ISO/ASTM 52910: Standard Guidelines for Design for AM		ISO/ASTM CD 52931: Standard guideline for use of metallic materials	ISO/ASTM WD 52926-1: Qualification principles — Qualification of machine operators for metallic parts production	ISO/ASTM WD 52926-2: Qualification principles — Qualification of machine operators for metallic parts production for PBF-LB	ISO/ASTM WD 52926-3: Qualification principles — Qualification of machine operators for metallic parts production for PBF-EB	ISO 27547-1: Plastics — Preparation of test specimens of thermoplastic materials using mouldless technologies: General principles, and laser sintering of test specimens
ISO/ASTM 52921: Standard practice for part positioning, coordinates & orientation	ISO/ASTM 52903-1: Material extrusion based AM of plastic materials: Feedstock materials	ISO/ASTM FDIS 52903-2: Material extrusion based AM of plastic materials: Process/Equipment	ISO/ASTM CD 52903-3: Material extrusion based AM of plastic materials: Parts	ISO/ASTM 52901: Requirements for purchased AM parts	ISO/ASTM 52911-1: Technical Design Guideline for PBF: PBF-LB of metals	ISO/ASTM 52911-2: Technical Design Guideline for PBF: PBF-LB of polymers	ISO/ASTM PWI 52911-3: Technical Design Guideline for PBF: PBF-EB of metals	ISO/ASTM CD 52932: Determination of particle emission rates from desktop 3D printers using material extrusion				
	ISO/ASTM 52904: Standard Practice for metal PBF process to meet critical applications	ISO/ASTM CD TR 52906: Standard practice for intentionally seeding replica into AM structures	ISO/ASTM 52907: Technical specification on metal powders	ISO/ASTM DTR 52905: NDT of AM products	ISO/ASTM PRF TR 52912: Technical report for the design of functionally graded AM parts	ISO/ASTM PWI 52914: Design — Standard guide for material extrusion processes	ISO/ASTM DIS 52915: Standard specification for AM file format (AMF) v1.2	ISO/ASTM WD 52933: Standard specification on indoor air quality management	ISO/ASTM WD 52926-4: Qualification principles — Qualification of machine operators for metallic parts production for DED-LB	ISO/ASTM WD 52926-5: Qualification principles — Qualification of machine operators for metallic parts production for DED-Arc	ISO/ASTM WD 52935: Qualification principles — Qualification of coordinators for metallic parts production	ISO/ASTM DIS 52924: Qualification principles - Quality grades for AM of polymer parts
	ISO/ASTM AWI 52908: Post-processing - Spec'n for QA & post processing of PBF metallic parts	ISO/ASTM AWI 52909: Guideline orientation/ location dependence of mechanical properties for metal PBF		ISO/ASTM WD 52917: Guideline for conducting round robin studies	ISO/ASTM WD 52916: Optimized medical image data for AM	ISO/ASTM CD TR 52918: Data formats — File format support, ecosystem and evolutions	ISO/ASTM PWI 52922: Design — Directed Energy Deposition	ISO/ASTM PWI 52934: Standard guideline for hazard risk ranking and safety defense	ISO/ASTM DIS 52941: System performance & reliability — Standard test method for acceptance of PBF machines for metallic materials for aerospace	ISO/ASTM FDIS 52942: Qualification principles — Qualifying machine operators of PBF-LB machines in aerospace applications	ISO/ASTM PWI 52944: Process characteristics & performance - Specification for PBF processes in aerospace applications	ISO/ASTM DIS 52925: Qualification principles - Qualification of polymer materials for PBF-LB
	ISO/ASTM PWI 52920: Qualification principles — conformity assessment at AM facilities	ISO/ASTM CD 52924: Qualification principles - Quality grades for AM of polymer parts	ISO/ASTM WD 52925: Qualification of polymer materials for PBF-LB	ISO/ASTM WD 52919-1: Test method of sand mold for metalcasting: Mechanical properties	ISO/ASTM PWI 52923: Design decision support	ISO/ASTM DIS 52950: General principles — Overview of data processing	ISO/ASTM PWI 52951: Data packages for AM parts					ISO/ASTM DIS 52925: Qualification principles - Qualification of polymer materials for PBF-LB
	ISO/ASTM PWI 52928: Powder life cycle management	ISO/ASTM WD TS 52930: Guideline for IQ/OQ/PQ of PBF-LB equipment		ISO/ASTM NP 52919-2: Test method of sand mold for metalcasting: Physical properties								ISO/ASTM WD 52936-1: PBF-LB of polymers: General principles, prep'n of test specimens
				ISO/ASTM PWI 52927: Process characteristics and performance - Test methods					ISO/ASTM PWI 52943-1: Specification for DED using wire and beam in aerospace applications	ISO/ASTM PWI 52943-2: Specification for DED using wire and arc in aerospace applications	ISO/ASTM PWI 52943-3: Specification for DED using laser blown powder in aerospace applications	

Published
ISO/ASTM
[60]

Available
As Draft
[40,50]

Working
Document
[10,20,30]

Cancelled

Updated: As of 08/2020



Credit: David Hardacre

List of Published standards (As of 07/2020)



15 Standards published by ASTM Only

ASTM F2971-13	Standard Practice for Reporting Data for Test Specimens Prepared by Additive Manufacturing
ASTM F3049-14	Standard Guide for Characterizing Properties of Metal Powders Used for Additive Manufacturing Processes
ASTM F3001-14	Standard Specification for Additive Manufacturing Titanium-6 Aluminum-4 Vanadium ELI (Extra Low Interstitial) with Powder Bed Fusion
ASTM F3091/F3091M-14	Standard Specification for Powder Bed Fusion of Plastic Materials
ASTM F3122-14	Standard Guide for Evaluating Mechanical Properties of Metal Materials Made via Additive Manufacturing Processes
ASTM F2924-14	Standard Specification for Additive Manufacturing Titanium-6 Aluminum-4 Vanadium with Powder Bed Fusion
ASTM F3056-14e1	Standard Specification for Additive Manufacturing Nickel Alloy (UNS N06625) with Powder Bed Fusion
ASTM F3055-14a	Standard Specification for Additive Manufacturing Nickel Alloy (UNS N07718) with Powder Bed Fusion
ASTM F3184-16	Standard Specification for Additive Manufacturing Stainless Steel Alloy (UNS S31603) with Powder Bed Fusion
ASTM F3187-16	Standard Guide for Directed Energy Deposition of Metals
ASTM F3213-17	Standard for Additive Manufacturing — Finished Part Properties — Standard Specification for Cobalt-28 Chromium-6 Molybdenum via Powder Bed Fusion
ASTM F3302-18	Standard for Additive Manufacturing — Finished Part Properties — Standard Specification for Titanium Alloys via Powder Bed Fusion
ASTM F3318-18	Standard for Additive Manufacturing — Finished Part Properties — Specification for AlSi10Mg with Powder Bed Fusion — Laser Beam
ASTM F3301-18a	Standard for Additive Manufacturing — Post Processing Methods — Standard Specification for Thermal Post-Processing Metal Parts Made Via Powder Bed Fusion ^{1, 2}
ASTM F3335-20	Standard Guide for Assessing the Removal of Additive Manufacturing Residues in Medical Devices Fabricated by Powder Bed Fusion

10 Standards published by ISO/ASTM

ISO/ASTM52900-15	Standard Terminology for Additive Manufacturing — General Principles — Terminology ^{1, 2}
ISO/ASTM52901-16	Standard Guide for Additive Manufacturing — General Principles — Requirements for Purchased AM Parts
ISO/ASTM52915-16	Standard Specification for Additive Manufacturing File Format (AMF) Version 1.
ISO/ASTM52910-18	Additive manufacturing — Design — Requirements, guidelines and recommendations
ISO/ASTM52902-19	Additive manufacturing — Test artifacts — Geometric capability assessment of additive manufacturing systems
ISO/ASTM52921-13(2019)	Standard Terminology for Additive Manufacturing—Coordinate Systems and Test Methodologies
ISO/ASTM52907-19	Additive manufacturing — Feedstock materials — Methods to characterize metallic powders
ISO/ASTM52911-1-19	Additive manufacturing — Design — Part 1: Laser-based powder bed fusion of metals
ISO/ASTM52911-2-19	Additive manufacturing — Design — Part 2: Laser-based powder bed fusion of polymers
ISO/ASTM52904-19	Additive Manufacturing — Process Characteristics and Performance: Practice for Metal Powder Bed Fusion Process to Meet Critical Applications

4 Standards published by ISO

ISO 17296-2:2015	Additive manufacturing — General principles — Part 2: Overview of process categories and feedstock
ISO 17296-3:2014	Additive manufacturing — General principles — Part 3: Main characteristics and corresponding test methods
ISO 17296-4:2014	Additive manufacturing — General principles — Part 4: Overview of data processing
ISO 27547-1:2010	Plastics — Preparation of test specimens of thermoplastic materials using mouldless technologies — Part 1: General principles, and laser sintering of test specimens

List of Under Development standards (continued)

20 Standards currently under development: ASTM

ASTM WK66029	New Guide for Mechanical Testing of Polymer Additively Manufactured Materials
ASTM WK66030	Quality Assessment of Metal Powder Feedstock Characterization Data for Additive Manufacturing
ASTM WK67454	Additive manufacturing -- Feedstock materials -- Methods to characterize metallic powders
ASTM WK69371	Standard practice for generating mechanical performance debits
ASTM WK69731	New Guide for Additive Manufacturing -- Non-Destructive Testing (NDT) for Use in Directed Energy Deposition (DED) Additive Manufacturing Processes
ASTM WK71391	Additive Manufacturing -- Static Properties for Polymer AM (Continuation)
ASTM WK71393	Additive manufacturing -- assessment of powder spreadability for powder bed fusion (PBF) processes
ASTM WK71395	Additive manufacturing -- accelerated quality inspection of build health for laser beam powder bed fusion process
ASTM WK48549	AMF Support for Solid Modeling: Voxel Information, Constructive Solid Geometry Representations and Solid Texturing
ASTM WK72172	Additive manufacturing -- General principles -- Overview of data pedigree
ASTM WK65937	Additive Manufacturing -- Space Application -- Flight Hardware made by Laser Beam Powder Bed Fusion Process
ASTM WK69730	Additive Manufacturing -- Wire for Directed Energy Deposition (DED) Processes in Additive Manufacturing
ASTM WK69732	Additive Manufacturing -- Wire Arc Additive Manufacturing
ASTM WK72317	Additive Manufacturing -- Powder Bed Fusion -- Multiple Energy Sources
ASTM WK72457	Additive manufacturing processes -- Laser sintering of polymer parts/laser-based powder bed fusion of polymer parts -- Qualification of materials
ASTM WK66637	Additive Manufacturing -- Finished Part Properties -- Specification for 4340 Steel via Laser Beam Powder Bed Fusion for Transportation and Heavy Equipment Industries
ASTM WK67583	Additive Manufacturing -- Feedstock Materials -- Powder Reuse Schema in Powder Bed Fusion Processes for Medical Applications
ASTM WK70164	Additive Manufacturing -- Finished Part Properties -- Standard Practice for Assigning Part Classifications for Metallic Materials
ASTM WK71891	Additive Manufacturing of Titanium-6 Aluminum-4 Vanadium ELI (Extra Low Interstitial) with Powder Bed Fusion for Medical Devices
ASTM WK66682	Evaluating Post-processing and Characterization Techniques for AM Part Surfaces

List of standards (continued)



45 Standards currently under development: ISO/ASTM

ISO/ASTM 52903-1	Additive manufacturing — Material extrusion-based additive manufacturing of plastic materials — Part 1: Feedstock materials
ISO/ASTM DIS 52903-2	Additive manufacturing — Standard specification for material extrusion based additive manufacturing of plastic materials — Part 2: Process — Equipment
ISO/ASTM DTR 52905	Additive manufacturing — General principles — Non-destructive testing of additive manufactured products
ISO/ASTM CD TR 52906	Additive manufacturing — Non-destructive testing and evaluation — Standard guideline for intentionally seeding flaws in parts
ISO/ASTM AWI 52908	Additive manufacturing — Post-processing methods — Standard specification for quality assurance and post processing of powder bed fusion metallic parts
ISO/ASTM AWI 52909	Additive manufacturing — Finished part properties — Orientation and location dependence of mechanical properties for metal powder bed fusion
ISO/ASTM PWI 52911-3	Additive manufacturing -- Technical design guideline for powder bed fusion -- Part 3: Standard guideline for electron-based powder bed fusion of metals
ISO/ASTM PRF TR 52912	Additive manufacturing - Design - Functionally graded additive manufacturing
ISO/ASTM PWI 52913-1	Additive manufacturing -- Test methods for characterization of powder flow properties for AM applications - Part 1: General requirements
ISO/ASTM PWI 52914	Additive manufacturing -- Design -- Standard guide for material extrusion processes
ISO/ASTM WD 52916	Additive manufacturing — Data formats — Standard specification for optimized medical image data
ISO/ASTM WD 52917	Additive manufacturing — Round Robin Testing — Guidance for conducting Round Robin studies
ISO/ASTM CD TR 52918	Additive manufacturing — Data formats — File format support, ecosystem and evolutions
ISO/ASTM WD 52919-1	Additive manufacturing — Test method of sand mold for metalcasting — Part 1: Mechanical properties
ISO/ASTM WD 52919-2	Additive manufacturing — Test method of sand mold for metalcasting — Part 2: Physical properties
ISO/ASTM PWI 52920-1	Additive manufacturing — Qualification principles — Part 1: Conformity assessment for AM system in industrial use
ISO/ASTM WD 52920-2	Additive manufacturing — Qualification principles — Part 2: Requirements for industrial additive manufacturing sites
ISO/ASTM DIS 52921	Additive manufacturing — General principles — Standard practice for part positioning, coordinates and orientation
ISO/ASTM PWI 52922	Additive manufacturing -- Design -- Directed energy deposition
ISO/ASTM PWI 52923	Additive manufacturing -- Design decision support
ISO/ASTM DIS 52924	Additive manufacturing — Qualification principles — Classification of part properties for additive manufacturing of polymer parts
ISO/ASTM DIS 52925	Additive manufacturing — Qualification principles — Qualification of polymer materials for powder bed fusion using a laser
ISO/ASTM WD 52926-1	Additive manufacturing — Qualification principles — Part 1: Qualification of machine operators for metallic parts production

ISO/ASTM WD 52926-2	Additive manufacturing — Qualification principles — Part 2: Qualification of machine operators for metallic parts production for PBF-LB
ISO/ASTM WD 52926-3	Additive manufacturing — Qualification principles — Part 3: Qualification of machine operators for metallic parts production for PBF-EB
ISO/ASTM WD 52926-4	Additive manufacturing — Qualification principles — Part 4: Qualification of machine operators for metallic parts production for DED-LB
ISO/ASTM WD 52926-5	Additive manufacturing — Qualification principles — Part 5: Qualification of machine operators for metallic parts production for DED-Arc
ISO/ASTM PWI 52927	Additive manufacturing -- Process characteristics and performance - Test methods
ISO/ASTM PWI 52928	Powder life cycle management
ISO/ASTM NP 52930	Guideline for installation -- Operation -- Performance Qualification (IQ/OQ/PQ) of laser-beampowder bed fusion equipment for production manufacturing
ISO/ASTM CD 52931	Additive manufacturing — Environmental health and safety — Standard guideline for use of metallic materials
ISO/ASTM WD 52932	Additive manufacturing — Environmental health and safety — Standard test method for determination of particle emission rates from desktop 3D printers using material extrusion
ISO/ASTM NP 52933	Additive manufacturing — Environment, health and safety — Consideration for the reduction of hazardous substances emitted during the operation of the non-industrial ME type 3D printer in workplaces, and corresponding test method
ISO/ASTM PWI 52934	Additive manufacturing -- Environmental health and safety -- Standard guideline for hazard risk ranking and safety defense
ISO/ASTM NP 52935	Additive manufacturing — Qualification Principles — Qualification of coordinators for metallic parts production
ISO/ASTM WD 52936-1	Additive manufacturing — Qualification principles — Laser-based powder bed fusion of polymers — Part 1: General principles, preparation of test specimens
ISO/ASTM PWI 52937	Additive manufacturing — Qualification principles — Qualification of designers for metallic parts production
ISO/ASTM DIS 52941	Additive manufacturing — System performance and reliability — Standard test method for acceptance of powder-bed fusion machines for metallic materials for aerospace application
ISO/ASTM DIS 52942	Additive manufacturing — Qualification principles — Qualifying machine operators of laser metal powder bed fusion machines and equipment used in aerospace applications
ISO/ASTM PWI 52943-1	Additive manufacturing -- Process characteristics and performance -- Part 1: Standard specification for directed energy deposition using wire and beam in aerospace applications
ISO/ASTM PWI 52943-2	Additive manufacturing -- Process characteristics and performance -- Part 2: Standard specification for directed energy deposition using wire and arc in aerospace applications
ISO/ASTM PWI 52943-3	Additive manufacturing -- Process characteristics and performance -- Part 3: Standard specification for directed energy deposition using laser blown powder in aerospace applications
ISO/ASTM PWI 52944	Additive manufacturing -- Process characteristics and performance -- Standard specification for powder bed processes in aerospace applications
ISO/ASTM DIS 52950	Additive manufacturing — General principles — Overview of data processing
ISO/ASTM PWI 52951	Additive manufacturing -- Data packages for AM parts

AM Data Management and Schema Workshop

December 2019, Tyson, VA



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- Collaborative workshop with America Makes
- Two-day event: 20 technical talks, panel, roadmapping session
- Objective:
 - Identify challenges, gaps, and pain points
 - Discuss solutions
 - Build a momentum



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nTopology

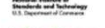
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Supporting Organizations



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Roadmap Methodology



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- **Gaps and Challenges:** Participants brainstormed gaps and challenges in small groups and voted on the highest priorities for the AM community.
- **Potential Solutions:** Participants brainstormed solutions to the priority gaps and challenges from the previous exercise and again voted on the highest priority solutions for the AM community.
- **Detailed Action Plans:** Participants worked in small groups to develop detailed action plans for the highest priority solutions by identifying major tasks, milestones, stakeholder roles, and resource requirements.



Highest Rated Gaps



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Data Acquisition

- Potential for manual data entry to lead to human error



Data Security

- Data traceability/integrity/provenance
- Protection of intellectual property (IP) during data sharing



Data Practices

- Minimum viable data packages
- Common terms and semantics for data definition



Data Management

- The need for unique, unified data identifiers (e.g., bar codes, alphanumeric tags, etc.) for AM data



Data Use

- Correlating data to part performance
- Format or presentation mode of data

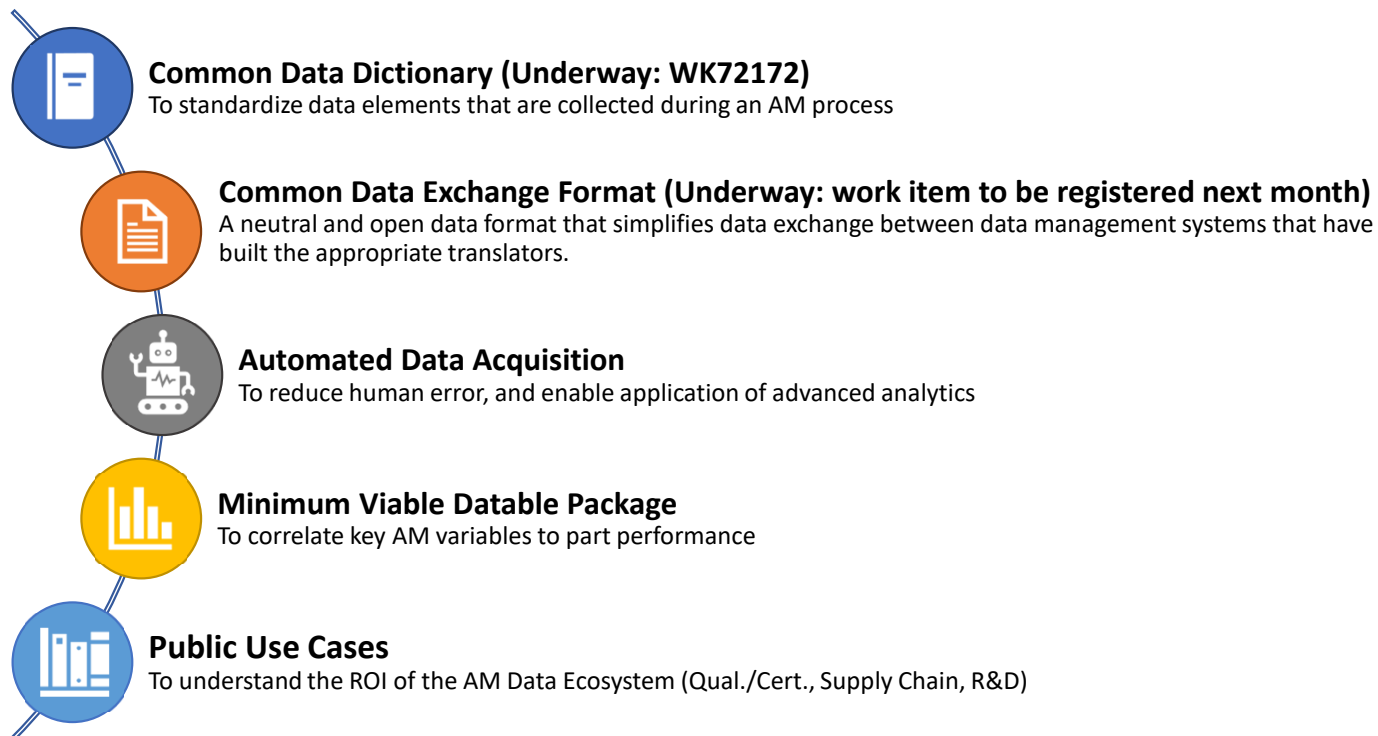
Number of Gaps: 37



Highest Rated Action Plans



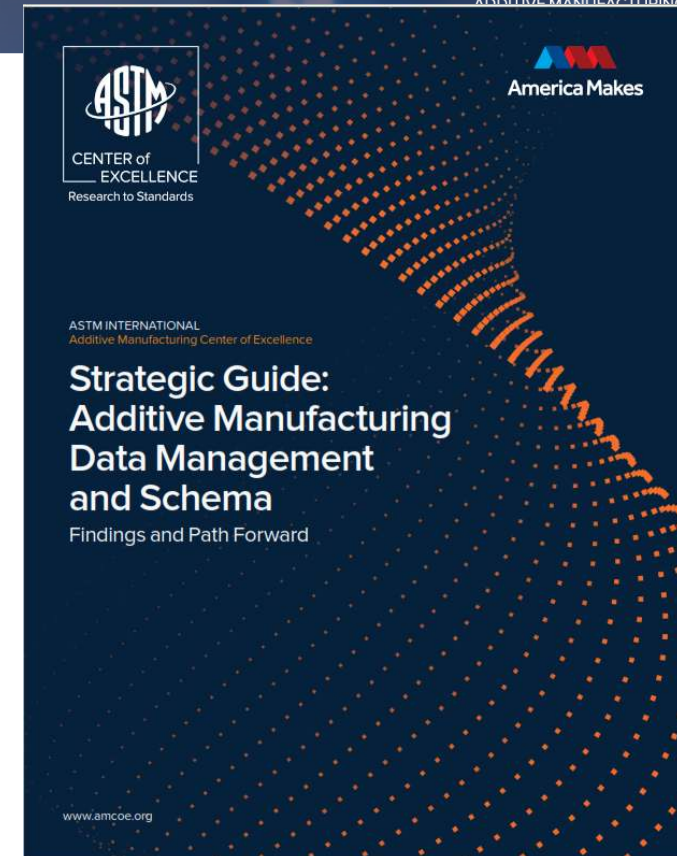
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Strategic Guide

- Based on inputs from participants
- Summarized gaps and challenges with respect to Data in AM, and provided solutions and action plans

Download at: <https://amcoe.org/rd-publications>



Data Initiatives/Activities

Formation of F42.08



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Data Pedigree Project
2nd round of R&D projects

AM Data Subcommittee
Recommended during the road-
mapping session discussions

CDD Work Item
“Overview of Data Pedigree”
Post-Balloting stage

CDEF Work Item
“Common Data Exchange Format”
Scoping and Registration

Oct. 2019

Dec. 2019

Feb. 2020

Jul. 2020

Aug. 2020

Jul. 2020

Nov. 2020

AM Data Workshop
ASTM Int. & America Makes

Strategic Guide
based on inputs from the
workshop participants

AM CoE R&D Team update
Addition of two AM Data Experts
Mr. Matthew Jacobsen
Mr. Chuck Browne

Formation of F42.08:

- Based on input from the AM Data Workshop
- A dedicated forum for AM Data experts to identify gaps and develop standards
- Approved by the ASTM Committee F42 Executive Team on Feb. 2020

F42.08 Officers



Chair
Alex Kitt,
EWI



Vice-Chair
Yan Lu,
NIST



Secretary
Peter Coutts,
Penn State
ARL



Data Initiatives/Activities

Work Items



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- ASTM WK72172: New Practice for Additive manufacturing -- General principles -- Overview of data pedigree
 - The standard identifies classes of AM data (buckets), important terms for data that fit within those buckets, and relationships that exist between the buckets.
 - Balloting completed, negative comments are being addressed (Tech contact: Yan Lu, NIST)
- NEXT: Common Data Exchange Format (CDEF)
 - Facilitates data sharing among data management systems, Will be registered in Nov. 2020 (Lead org: EWI)
- ASTM WK73978: New Specification for Additive Manufacturing -- Data Registration
 - This standard practice comprises actions that users need take to register datasets and store them in a repository.
 - Tech contact: Shawn Feng, NIST
- Several other data related activities at F42 ISO/ASTM joint groups such as JG64, JG67, JG70, JG73



Data Initiatives/Activities

In-Process Monitoring Project



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- Assessment of State-of-the-Art of In-Process Control and In-Situ Monitoring for Additive Manufacturing

- Conducted literature review of available monitoring technique
- Evaluated TRL/MRL level
- Conducted survey (20+ experts in North America and Europe)
- Report to be published for public before end of the year

- Data structure a primary concern

- High spatial resolution sensor data produces very large volumes of data
- Real time data processing is challenging and expensive
- Parameterization reduces data volume for analysis and storage, but loses fidelity
- Variation between companies constrains development of universal acceptance criteria
- Standardization of data simplification will be necessary for allowance in certification/qualification



Data Initiatives/Activities

Cyber Security Training Award



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- America Makes Open Project Call
 - ASTM and Auburn University: AM Cyber security training



- Need to create cyber security standards

Data Initiatives/Activities

NASA-ASTM Cooperative Agreement



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- This cooperative agreement will be the basis to expand the AM CoE and NASA's evolving partnership
 - Three-year contract
 - Formalize collaboration aimed at supporting projects identified by NASA for the AM CoE execution
- First project
 - Qualification framework for laser beam powder bed fusion (LB-PBF) AM processes
 - One of the largest impediments to the growing implementation of AM into many applications.
 - Need to standardize process qualification that ultimately contribute to robust data generation, collection and specification



Upcoming AM CoE Annual Flagship Event – ICAM 2020



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- 10 panel discussions
- 220+ organizations
- 300+ presentations
- 400+ attendees
- Award ceremony



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The background of the slide features a dark blue upper section with bright orange sparks emanating from the right side. Below this is a light gray horizontal band containing the contact information. The lower section of the slide shows a textured, metallic surface with three large, overlapping, semi-transparent blue circles positioned across it.

For more information contact:

Dr. Mohsen Seifi

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