



SMARTECHMARKETS  
P U B L I S H I N G

# *Additive Manufacturing with Metal Powders – 2017*

A DIGITAL PRESENTATION OF MARKET TRENDS IN METAL ADDITIVE MANUFACTURING

# ABOUT SMARTECH PUBLISHING

---

- LEADING PROVIDER OF INDUSTRY ANALYSIS REPORTS AND CONSULTING SERVICES FOR THE 3D PRINTING AND ADDITIVE MANUFACTURING INDUSTRY
- BROADEST AND DEEPEST MARKET RESEARCH CATALOGUE ON 3D PRINTING AND ADDITIVE MANUFACTURING IN THE WORLD
- COVERAGE OF OPPORTUNITY AREAS ACROSS THE INDUSTRY WITH IN-DEPTH STUDIES AND MARKET DATA
- PURPOSE-BUILT PROPRIETARY ADDITIVE MANUFACTURING MARKET OPPORTUNITY MODELS FOR RELIABLE FORECASTING OF 3D PRINTING BUSINESS OPPORTUNITIES
- CLIENT ROSTER INCLUDES THE LARGEST 3D PRINTER FIRMS, MATERIALS FIRMS AND INVESTORS IN THE WORLD

SMARTECHMARKETS  
P U B L I S H I N G

# SMARTECH PUBLISHING: COVERAGE AREAS

---

## VERTICALS

AEROSPACE  
AUTOMOTIVE  
MEDICAL  
DENTAL  
EDUCATION  
ELECTRONICS  
JEWELRY  
OIL & GAS  
SERVICE BUREAUS

## MATERIALS

BIOMATERIALS  
CERAMICS  
COMPOSITES  
METALS  
NICKEL ALLOYS  
POLYMERS  
PRECIOUS METALS  
STAINLESS STEEL  
TITANIUM  
ALUMINUM

## EQUIPMENT

PERSONAL 3D PRINTERS  
PROFESSIONAL 3D PRINTERS  
PRODUCTION 3D PRINTERS  
SOFTWARE  
3D SCANNERS

# SMARTTECH MARKETS TEAM

---

## SCOTT DUNHAM, VICE PRESIDENT OF RESEARCH



Scott Dunham is Vice President of Research at SmarTech Publishing. He has authored more than a dozen in-depth market research studies on various aspects of the 3D printing industry and consulted for major companies in the sector giving him one of the widest perspectives on the technology in the world. He has spoken at **Additive Aerospace, Additive Disruption, Rapid, and Inside 3D Printing.**

With six years in technology based market research, five devoted to 3D printing, Scott has expertise in identifying opportunities in the 3D printing industry and years of research experience in the areas of advanced manufacturing and 3D printing.

Scott holds a BA in Marketing & Research from the University of Kentucky's Gatton School of Business and Economics.

# Metal Additive Manufacturing in 2017 – A Pivotal Year

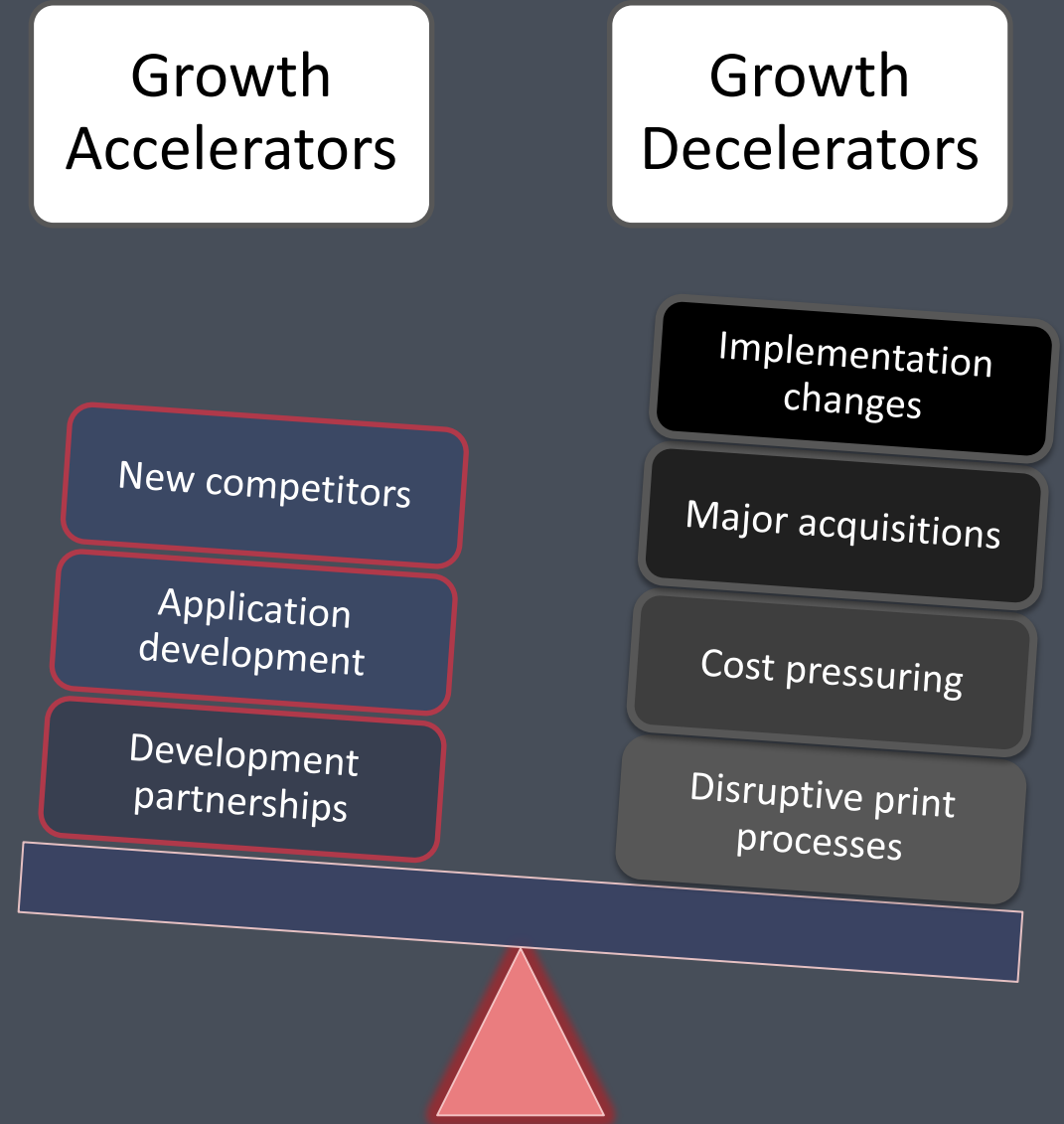
# Historic Change: Unlocking Demand for Real AM Solutions

The AM market is entering a period unlike any in its history.

Growth is fragmented across segments, uneven, with a measurable slow down from explosive start of the decade.

**Yet, reports market wide present a picture of unprecedented demand for additive manufacturing solutions.**

How will competitors unlock this pent up demand, and where does the disconnect exist?

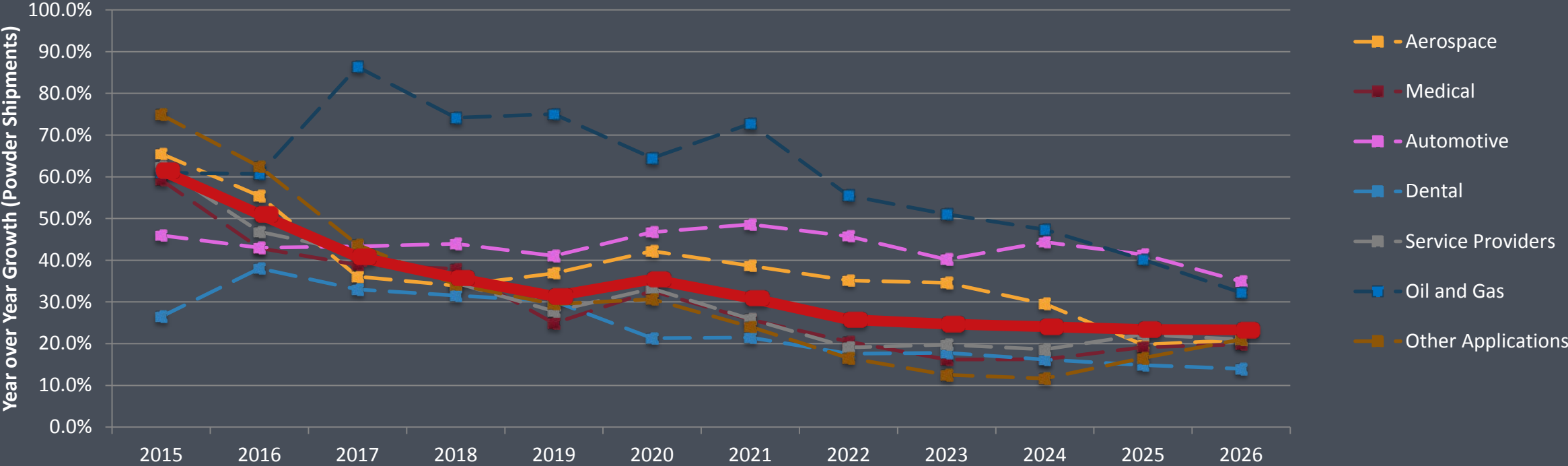


# Metal Additive Manufacturing – Growth Outlook by Industry Segment

Medical and Aerospace are rapidly becoming established markets for metal additive manufacturing technologies and applications.

Over the coming decade, SmarTech has identified three additional markets for metal additive manufacturing that are likely to grow to major opportunities.

Projected AM Metal Powder Shipment Growth, by Industry, 2015-2026(e)



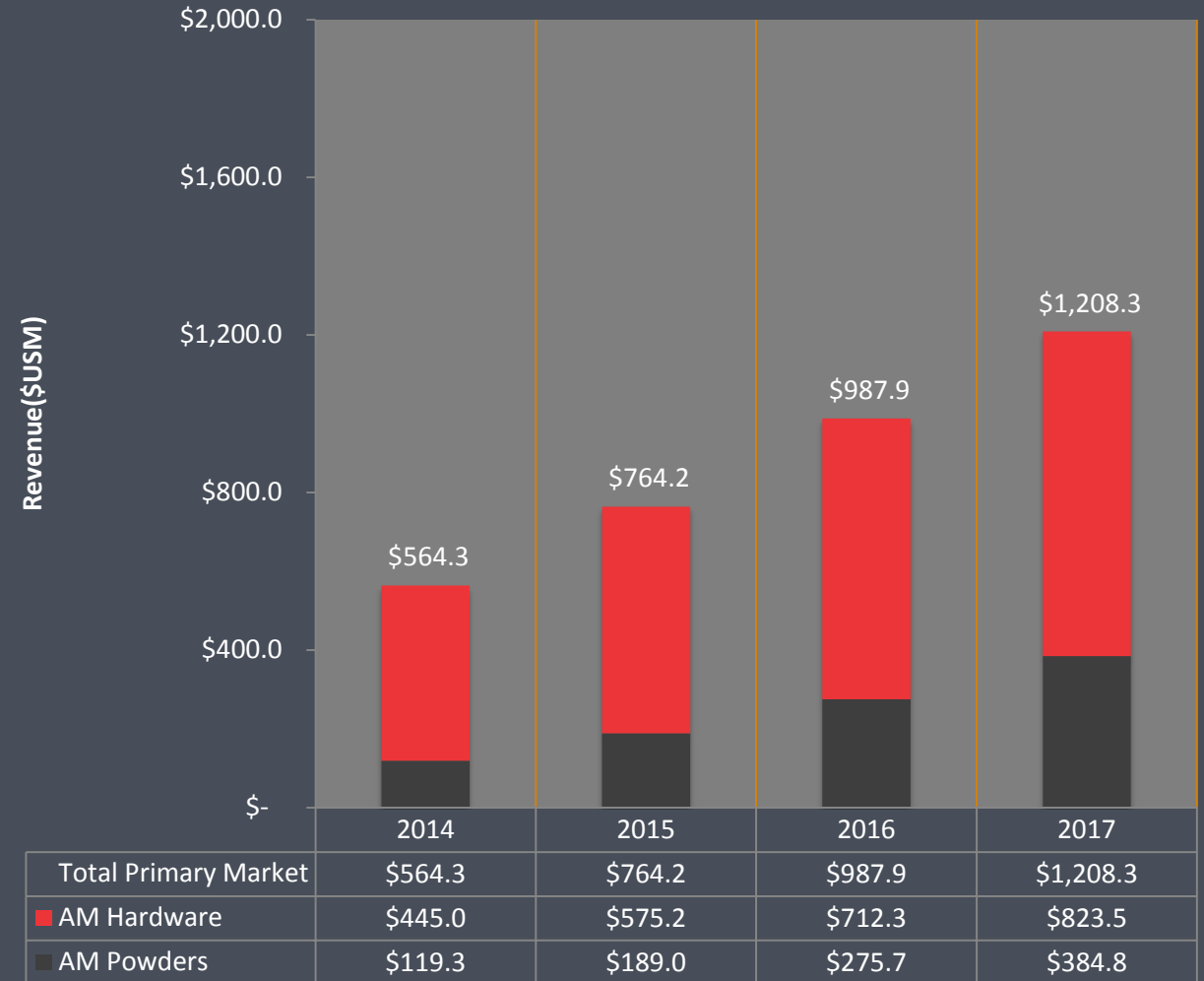
# Metal Additive Manufacturing – Primary Market Size to Date

Steady growth from 2015-2017 is expected, with revenue generating growth trailing pent-up demand for metal AM solutions.

2017 primary market growth of between 20 to 25 percent expected for third year in a row, after 50 to 100 percent growth in 2013 and '14.

Growth in metal AM services by industry expected to thrive during this period of muted primary market growth.

Total Primary Metal AM Market Size, by Category, 2014-2017





# New Competitors & Disruptive Print Processes

New metal additive manufacturing print processes are entering early stages of commercial impact

Still others are still under development, but show long term promise

New methods seek primarily to reduce overall costs, while adding potential for increased precision or greater flexibility in application

These processes continue to create a market scenario that can be difficult to navigate

	Associated Costs	Build Volume & Scalability	Part Performance	Precision & Complexity
Metal Laser Powder Bed Fusion	3	5	7	9
Metal Electron PBF	4	5	7	8
Directed Energy Deposition	4	8	7	4
Metal Binder Jetting	6	7	5	8
<b>Nano Particle Jetting</b>	<b>3</b>	<b>5</b>	<b>7</b>	<b>10</b>
<b>Atomic Diffusion AM</b>	<b>8</b>	<b>5</b>	<b>5</b>	<b>8</b>
<b>Tiled Laser Manufacturing</b>	<b>3</b>	<b>8</b>	<b>7</b>	<b>8</b>

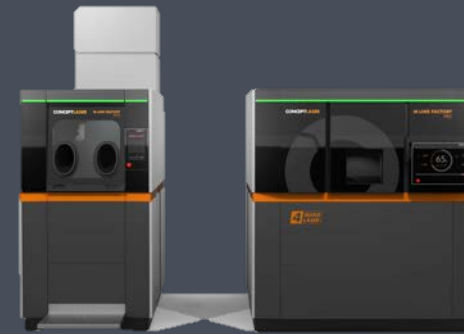
# Significant Changes to Metal AM Technology Taking Effect in 2017

Though new processes show promise and expand the cost spectrum for metal AM, the widely adopted laser powder bed fusion process is advancing with the need for serial manufacturing solutions.

## Integrated Architecture (Classic)



## Distributed Architecture (New)



Decoupled production & processing units

These changes will significantly disrupt the dynamics of the metal AM market in 2017 and 2018 as end users will now be split into choosing an 'integrated' or 'distributed' style system.

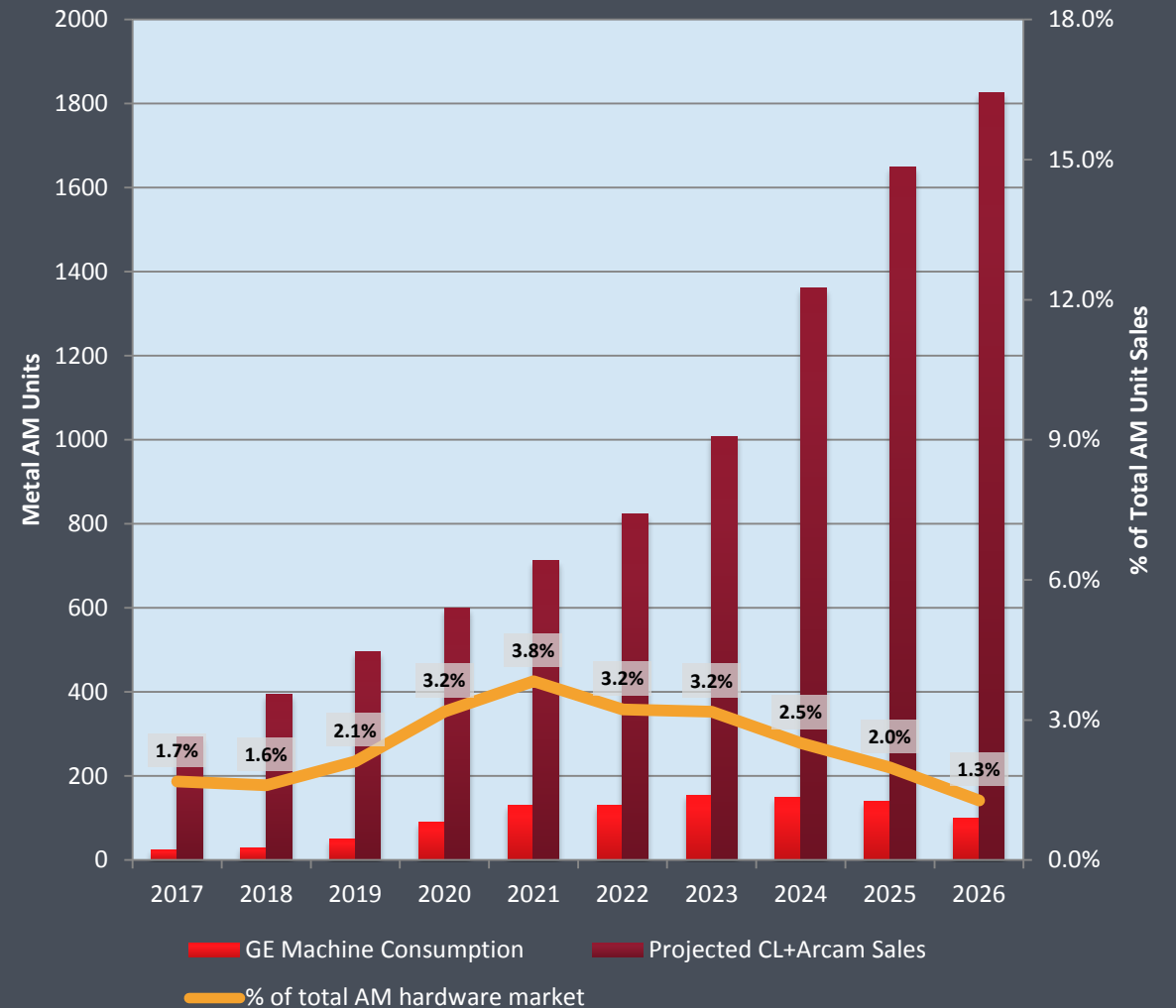
# Consolidation and the Redefining of Market Stakeholders

The next phase of metal additive manufacturing will be enabled by expertise development in existing processes. This is spurring major *end users* in the market to take a more direct stake through acquisition.

GE's landmark dual acquisition, as well as users such as Michelin developing its own hardware internally for external sale, are expected to be highly beneficial to the market.

Hardware supply will not be constrained significantly as a result of internal machine consumption. Internal demand will continue to spur growth, but with benefits to the external market.

Analysis of General Electric AM Activity on Hardware Market, 2017-2026



# Consolidation and the Redefining of Market Stakeholders

Industrial laser and machine tool manufacturers are also keen to take a leading role in the market, and are making acquisitions and developing their own pure-play additive processes to compete directly in powder bed fusion and more direct additive markets.

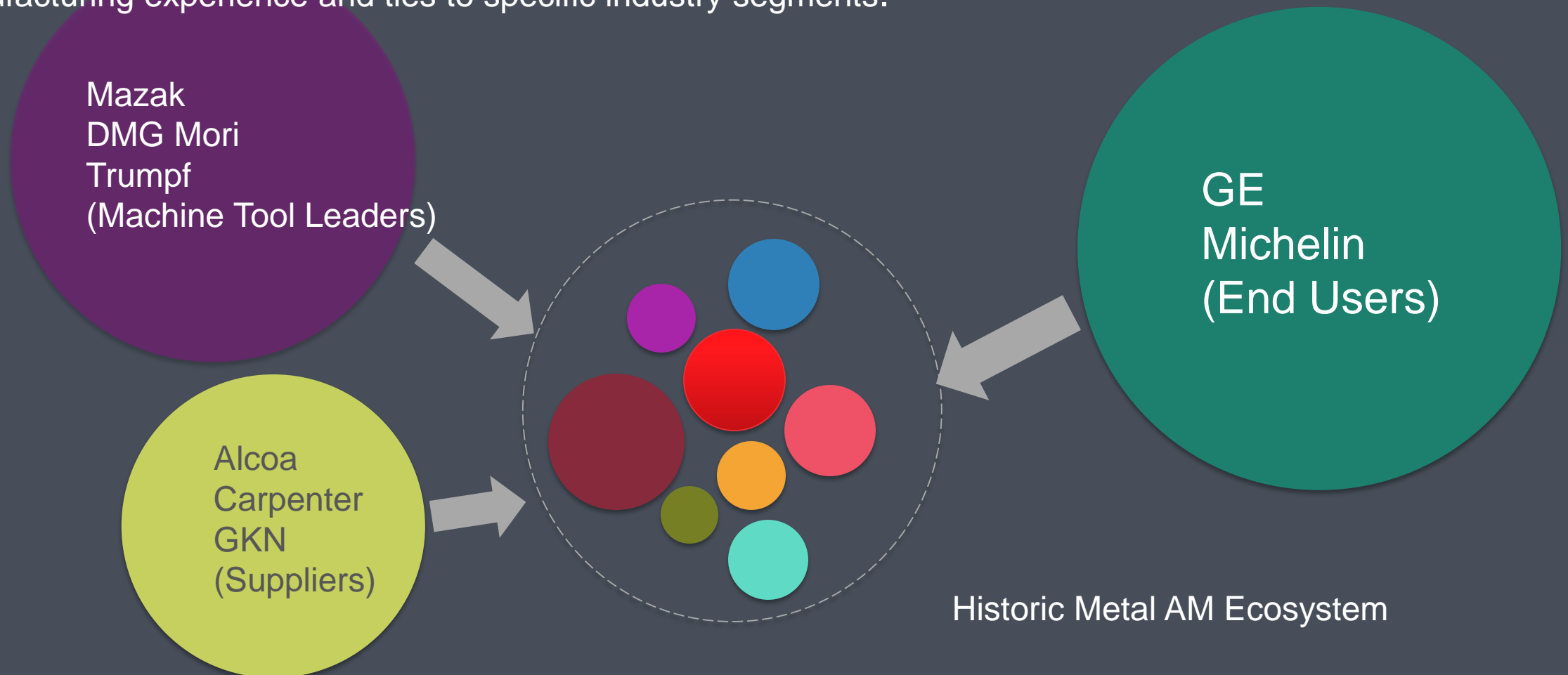
Hybrid additive and subtractive laser manufacturing systems are also becoming commonplace, but their long term viability is still yet to be proven.

Company	Additive Products	Technology
Trumpf	TruLaser Cell 7000 Series (DED), TruPrint 1000, 3000, and 5000 (PBF)	TruLaser series combines directed energy deposition additive production with laser cutting and welding, TruPrint series is pure play additive with powder bed fusion
Matsuura	LUMEX Avance 25 & 60	Powder Bed Fusion with integrated subtractive milling
Sodick	OPMLab 250L and 350L	Powder Bed Fusion with integrated subtractive milling
Fryer/Optomec	LENS Hybrid Metal 3D Systems	Directed energy deposition technology integrated into a vertical CNC milling system
DMG Mori	Lasertec 65	Directed energy deposition technology integrated into 5-axis CNC milling system
Mazak	INTEGREX i-400AM	Directed energy deposition technology integrated into 5-axis CNC milling system
Adira	Unknown	Developing 'Tiled Laser Melting' process utilizing both PBF and DED additive processes, as well as integrated laser cutting
OR Laser	ORLAS CREATOR	Pure metal powder bed fusion

# Consolidation and the Redefining of Market Stakeholders

A rapid amount of maturation all happening at once is a net positive for the industry, but has presented some growing pains which we expect will continue in 2017.

The next generation of stakeholders in the market are multinational, multi-billion companies with extensive manufacturing experience and ties to specific industry segments.



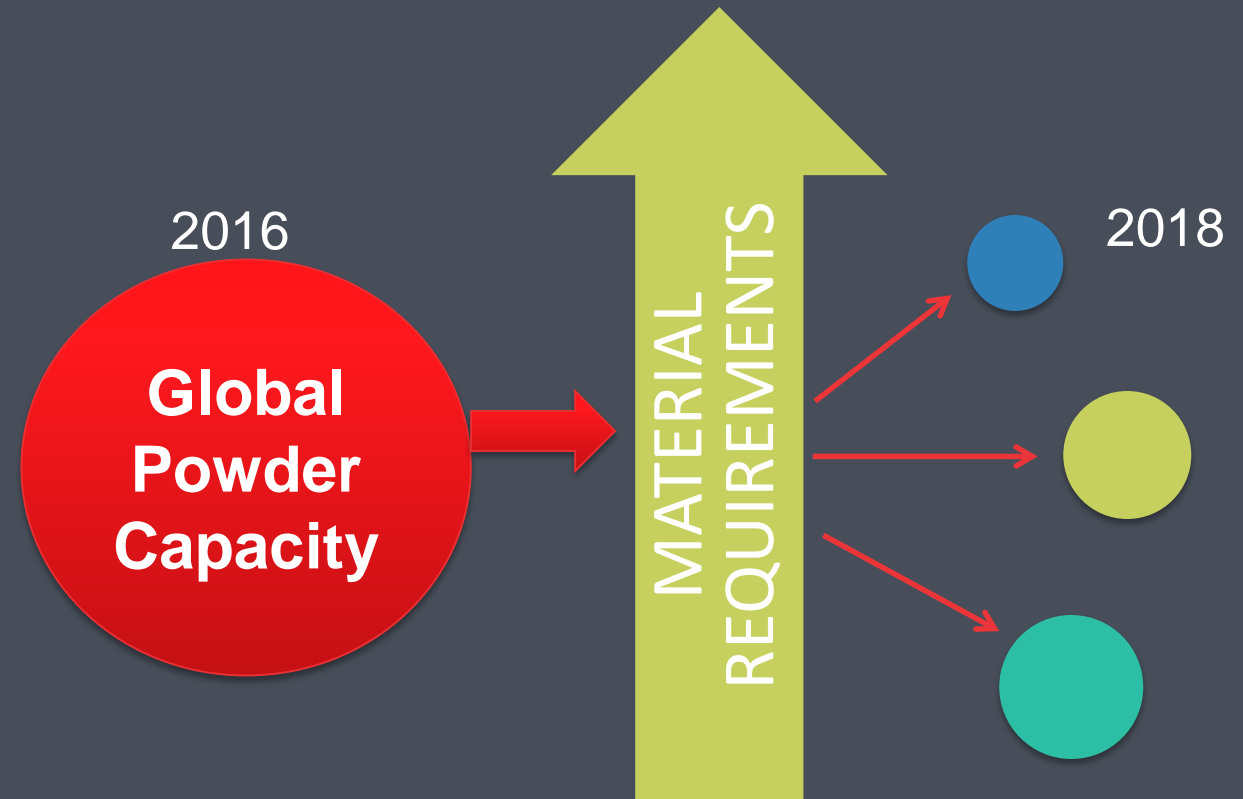
# Trends in Metal Additive Manufacturing Materials

# Increase in Production Applications and Effects on AM Materials

The industry shift in production applications for AM, particularly in aerospace, but also on the horizon in energy, automotive, and industrial equipment, are creating some constraints in the supply chain for metal powders.

- Tightening of powder characteristics
- Increasing requirements for traceability

This is creating a field of potential opportunities for both existing and new supply chain players to capture market share and establish a position

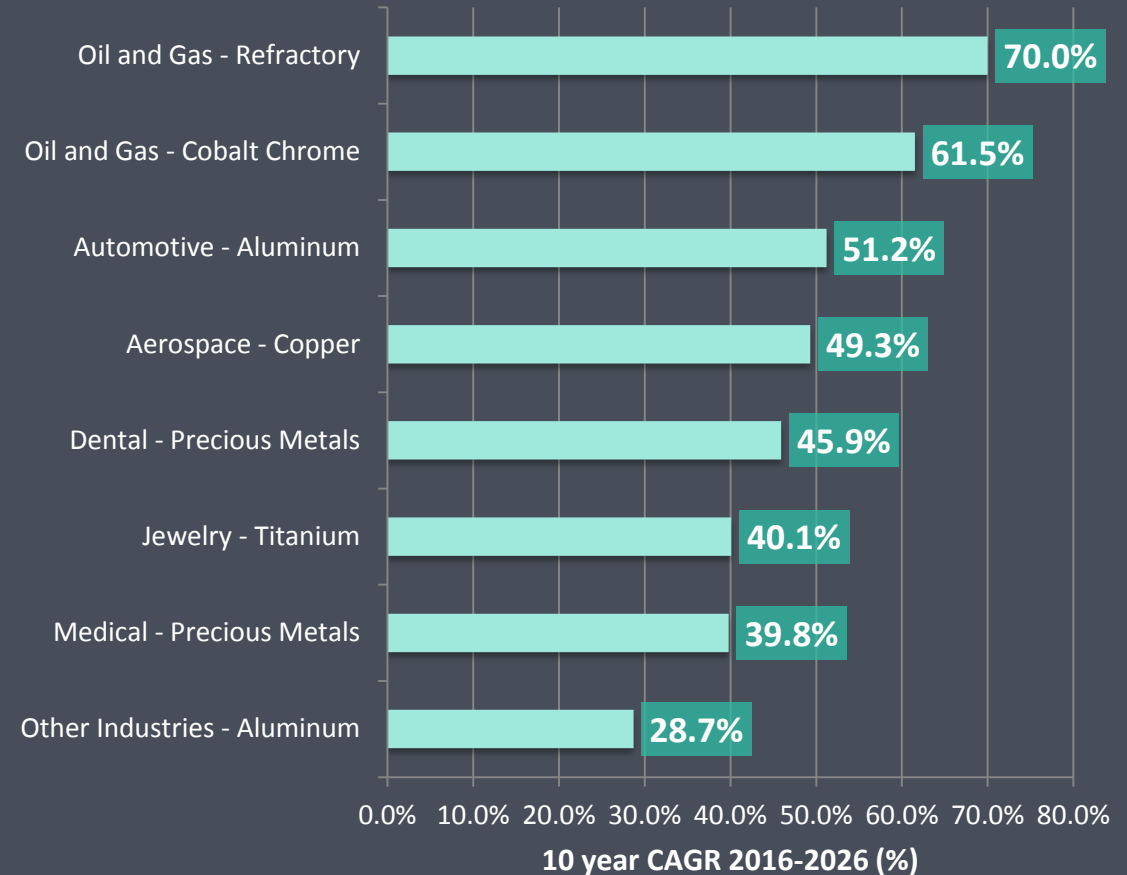


# AM Powder Opportunities by Industry

Forecasted growth in AM powder by alloy groups below shows significant opportunities in aerospace, but also through providers of metal additive manufacturing services via emerging markets

	2016	2022	2026
Titanium	Medical	Medical	Medical/Aero
Nickel	Aero	Aero	Aero
Steels	Service	Service	Auto
Cobalt Chrome	Med/Dental/Aero	Aero	Aero
Aluminum	Service/Others	Service/Aero	Others
Others (refractory)	Service	Aero	Aero
Copper	Service	Service	Service

**Fastest Growing AM Alloys, Selected Industries, 2016-2026**

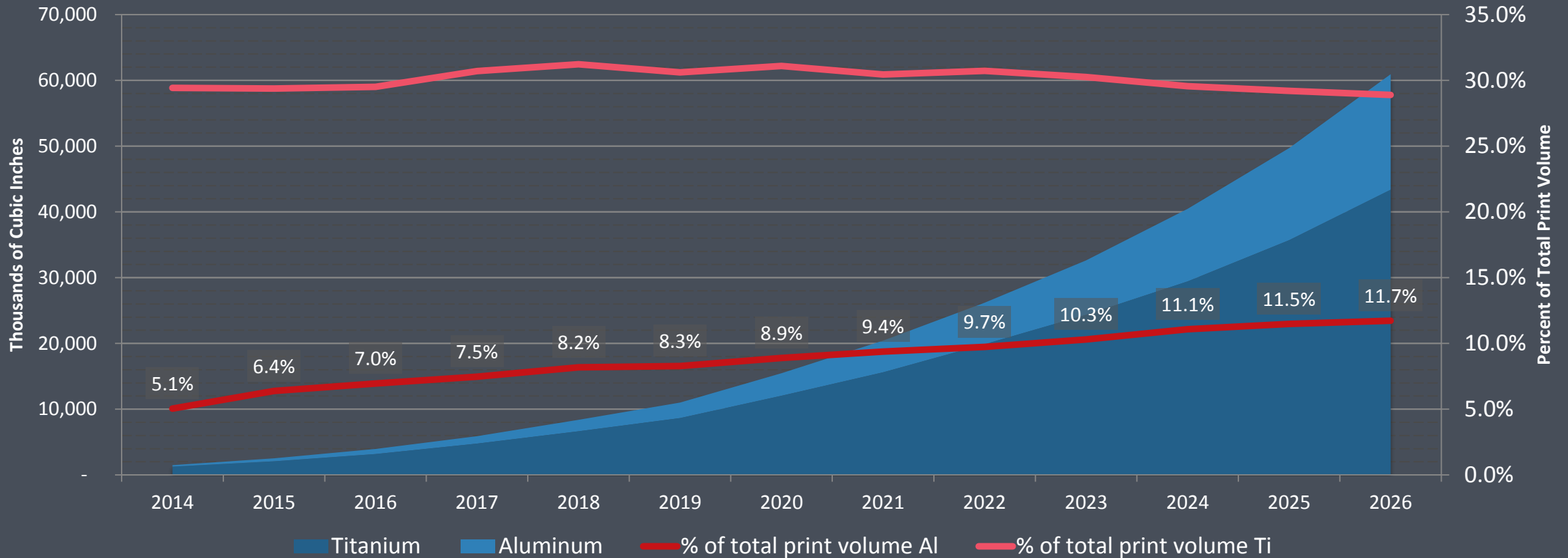




# Lightweight Metals – Future Outlook

Lightweight metals in aluminum and titanium are expected to expand in overall share of printed volume through more widespread printing of structural parts in aircraft and automobiles. Titanium aluminides are already being used in small quantities today, but could significantly increase.

Projected Metal Powder Print Volume, Thousands of Cubic Inches, by Alloy Group 2014-2026(e)

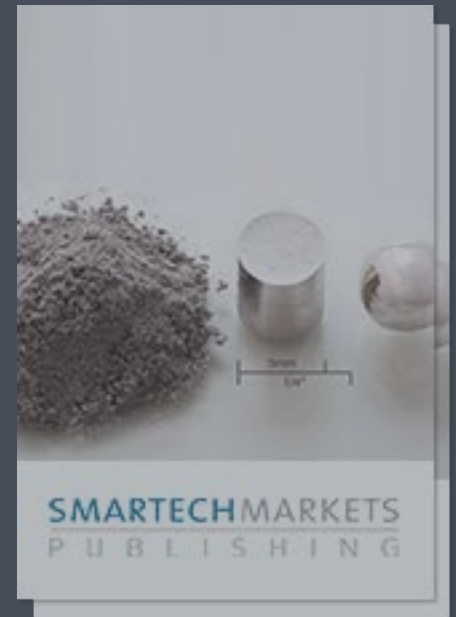


SmarTech Publishing Knows Metal Additive Manufacturing

# *Additive Manufacturing with Metal Powders – 2017*

## Report Features:

- 148 pages of written analysis and market data
- Entirety of ecosystem coverage – powders, machines, applications, and markets
- Forecast data by....
  - Hardware market share (units sold) for 2016 by metal AM technology subgroup
  - Powder supplier market share for 2016
  - Powder revenue opportunities, shipments, and volume estimates by 8 primary alloy groups
  - Powder revenue estimates by region (NA, EU, AP, Rest of World)
  - Powder shipments and revenues by key adopting industry segment
  - Metal AM system sale and installation data by technology, installation by geography, revenue opportunities by technology



# AREAS OF COVERAGE: METALS

## SMARTTECH PUBLISHING WAS THE FIRST TO PUBLISH EXTENSIVE STUDIES OF THE ADDITIVE MANUFACTURING METAL MARKET BY METAL TYPE



### ADDITIVE MANUFACTURING WITH METAL POWDERS 2017: AN OPPORTUNITY ANALYSIS AND TEN-YEAR FORECAST:

The metal additive manufacturing segment has continued on a path of explosive growth. This report explores the imminent shift from tactical manufacturing of low-volume components and prototypes to serial production and integration into established manufacturing environments.

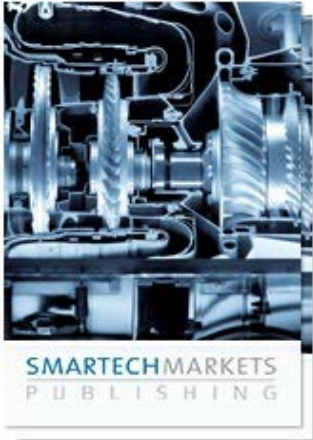


### THE PRODUCTION MANAGER'S COMPLETE GUIDE TO: 3D PRINTING WITH METALS:

This guide is an accessible entry point for production managers into the world of metal additive manufacturing. It is focused on the requirements and practical aspects of implementing metals printing including providing direction on equipment choice, process integration and materials selection.

# AREAS OF COVERAGE: METALS

## SMARTTECH PUBLISHING WAS THE FIRST TO PUBLISH EXTENSIVE STUDIES OF THE ADDITIVE MANUFACTURING METAL MARKET BY METAL TYPE



### OPPORTUNITIES FOR NICKEL ALLOYS IN ADDITIVE MANUFACTURING – 2017

The first ever multi-market deep dive research study into AM with nickel alloys utilizing powder based 3DP. Covers current and future potential for short run and serial production utilizing AM. Over the next decade, nickel alloys will become the second most demanded material for AM processes.



### TITANIUM OPPORTUNITIES IN ADDITIVE MANUFACTURING – 2017

Up to the minute report on AM titanium market opportunities. With revenues exceeding all other alloy groups in the next decade, titanium is becoming the largest opportunity for metal AM, with its high strength to weight ratio, biological inertness, and other desirable properties when combined with AM.

# CONTACT US

**Web:** [www.smartechpublishing.com](http://www.smartechpublishing.com)

**Address:** 2025 Library Avenue, Suite 402, Crozet, VA 22932

**Phone:** 434-872-9008

**Fax:** 434-872-9014

**Twitter:** [@SmarTechPublish](https://twitter.com/SmarTechPublish)

**LinkedIn:** [SmarTech Publishing](https://www.linkedin.com/company/smartech-publishing)

**Email:** [info@smartechpublishing.com](mailto:info@smartechpublishing.com)

**Purchasing Questions:** [sales@smartechpublishing.com](mailto:sales@smartechpublishing.com)

**SmarTech European Office:** [STeurope@smartechpublishing.com](mailto:STeurope@smartechpublishing.com)