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About the Editors

Andy Kunkel—Triad Production Group

Kevin T. Slattery, DSc—Kevin is a Principal ADDvisor® at The Barnes Global Advisors (formerly The Barnes Group Advisors). His primary expertise is in Metallic Additive and Metals Manufacturing, focusing on test program development, process and product verification, qualification, and certification. He has supported over 25 clients on five continents throughout the entire additive manufacturing value chain—from raw material to finished components. He is a 2020 Ambassador for America Makes and was part of the Materials Challenge Silver Medal team in the US Air Force Rapid Sustainment Office Advanced Manufacturing Olympics.

Kevin was previously Chief Scientist for Additive Manufacturing at Boeing Research and Technology (BR&T). He was responsible for developing and integrating the technology roadmaps and development plans for metallics additive manufacturing for the entire company, along with building and leading a multi-skilled team to execute and deliver the technology throughout the enterprise. Prior to that, he was Chief Scientist for Metals, Ceramics, and Mechanical Systems at BR&T, with the responsibility for portfolio development and coordination, while executing the additive manufacturing portion.

He served as Division Chief Engineer for the US Navy and US Air Force fighter aircraft and US Army rotorcraft in Boeing's military sustainment organization. From 1997 to 2012, he was on the BR&T Metals Team as a researcher and senior manager, where he primarily developed advanced low-cost titanium-processing technologies supporting all Boeing products. He was the technical and programmatic lead in implementing the first aerospace metal-additive-manufactured structural aircraft components for both spares and production, with five other first-in-the-industry technology implementations.

He began his career at McDonnell Douglas (now Boeing) as a nondestructive testing engineer, where he developed inspection technologies for metallic and composite components, along with integrating the impact of discontinuities with the acceptance criteria for carbon/epoxy composites.

Dr. Slattery holds a BS and MS in Metallurgical Engineering from the University of Missouri-Rolla (now Missouri S&T), and a DSc in Material Science and Engineering from Washington University in St. Louis. He currently holds 37 US patents, with another 14 applications pending; along with 36 significant publications and conference presentations.

(Eliana Fu)

Eliana Fu, PhD—Eliana is Industry Manager of the Aerospace and Medical division at TRUMPF. She is an enthusiastic advocate for additive manufacturing with a strong background in traditional manufacturing. She has a master's degree and PhD in Materials Science and Engineering from Imperial College, University of London. One of her specialties is in traditional titanium manufacturing. Her work experience includes eight years as Research and Development Services Engineer at Titanium Metals Corporation, or "TIMET," as well as time at Firth Rixson and TWI in the United Kingdom. She has spent the last few years working in the space flight industry at SpaceX and, more recently, with Relativity Space, where, as Senior Engineer for Additive Technologies, she immersed herself in the world of three-dimensional (3D) printing and additive manufacturing. She has even been featured in *National Geographic*'s six-part "MARS" television miniseries.

She is currently a member of ASTM International's F42.07.02 Technical Subcommittee for Additive Manufacturing for Spaceflight and has participated as an advisor on Mayor of Los Angeles Eric Garcetti's committee on Advanced Manufacturing. She is the ambassador for the new Las Vegas chapter of Women in 3D Printing and a science, technology, engineering, and mathematics (STEM) volunteer for USC Viterbi School's K12 STEM program and regularly participates in other educational STEM outreach programs.

In addition to traditional and additive manufacturing, Eliana's specialties include supplier quality and raw material specifications. She holds Massachusetts Institute of Technology xPro certificates in Additive Manufacturing for Innovative Design and Production (2019) and Leadership Principles for Scientists, Engineers, and Researchers (2020).

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Unsettled Issues in Additive Manufacturing and Improved Sustainability in the Mobility Industry

Abstract

Additive manufacturing (AM), also known as "3D printing," is often touted as a sustainable technology, especially for metallic components, since it produces either net or near-net shapes versus traditionally machined pieces from larger mill products. While machining from rectilinear or cylindrical mill products is often the case in aerospace, most of the metal parts used in the world are made from flat-rolled products and are quite efficient in metal utilization. Additionally, some aspects of the AM value chain, such as the use of powder that falls outside of the desired size for AM, are often not accounted for when determining sustainability. Finally, since the first production AM parts have only recently entered service, the end-of-life aspect of the AM cycle and the impact of AM on the overall sustainability of the system have not yet been demonstrated. Therefore, the primary question regarding the effectiveness of AM as a more sustainable technology for the mobility industry in general, and for a particular product, needs to be asked and answered.

As the fifth in an ongoing series of SAE EDGE™ Research Reports on AM, the overall sustainability of several metallic AM technologies and material combinations—from the feedstock to disposal life cycle—is assessed. Using a series of scenarios, these factors will be compared with parts made using conventional technologies for both the present and future (2040) states.

NOTE: SAE EDGE™ Research Reports are intended to identify and illuminate key issues in emerging, but still unsettled, technologies of interest to the mobility industry. The goal of SAE EDGE™ Research Reports is to stimulate discussion and work in the hope of promoting and speeding resolution of identified issues. These reports are not intended to resolve the challenges they identify or close any topic to further scrutiny.

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