



# ADDITIVE MANUFACTURING

## Technical Interest Group

### Mission

The mission of our group is to provide a forum to present, promote and educate the SPE community in AM/3DP in the following areas:

- Material Development
- Equipment
- Process Technologies
- Product Design
- Mold + Mold Making
- Marketing
- Research + Development

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[Continue the Conversation](#)

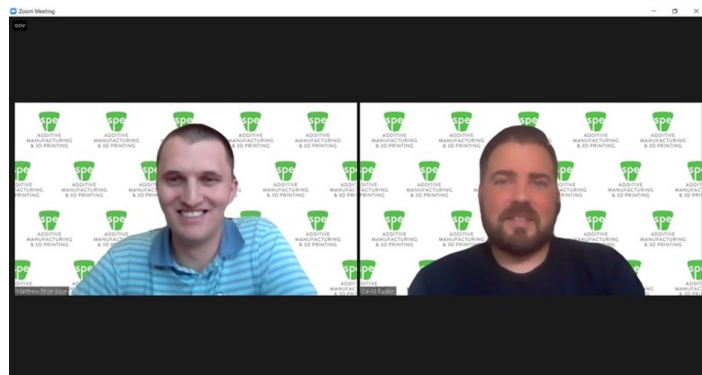


Photo Courtesy of Stratasys



Photo Courtesy of HP

## Message from the Chair + Past Chair



### Message from the Chair

It's an honor to follow Matthew Thompson in the Chair position of the SPE Additive Manufacturing "Technology Interest Group". Matt has done an amazing job building the Board of Directors for the group, and implementing systems for communication methods such as the newsletter and implementing the first website (made possible by the kind contributions of Jason Lopes).

My background with SPE spans a couple decades now, from my early days at Ferris State University to my serious involvement after meeting Al McGovern at ANTEC and joining the board of PD3. I think of myself as a plastics manufacturing technologist



Feng Cai, Cooper Standard



Drew Dravis, Make Superior Collective



Jay Dinsmore, Dinsmore, Inc.



Jack Dispenza, Design Results LLC.



Haleyanne Freedman, M. Holland



Rakesh Gupta, West Virginia University



Jennifer Howe, RENA Additive Manufacturing



Victor Jaker, Stratasys

who is not afraid to try new methods on a mission to develop better products. For those who know me, I concurrently think about the molecules in a manufacturing process while identifying the major barriers to overcome for manufacturing process adoption.

Over the last decade, Additive Manufacturing has experienced significant functional advancements that have proven the technology suitable to provide serial production parts in industrial/consumer applications. These advancements are due to 1) productivity improvements from point based to area based processing, and 2) the standardization of post processing methods; all enabling better looking more cost effective parts.

I'm a person that also appreciates goals and for the next year the SPE AM group will be focusing on "Quality Content - Curated by Experts". We will be looking to product Additive Manufacturing event from thought leaders in the industry through the channels of 1) technology presentations and 2) hands on factory level AM workshops.

Looking forward to the next year!

- David Tucker, Chair

### *Message from Outgoing Chair*

I am very pleased to announce David Tucker as the new Chair for the Society of Plastics Engineers (SPE) Additive Manufacturing (AM) Technical Interest Group (TIG). It has been an honor and a privilege to serve as Chair over the past two years, and I am grateful for the work of the previous chairs, Edwin Tam and Jack Dispenza, and our enthusiastic Board of Directors.

Over the past two years, we have contributed to grow and establish the framework for a technical chapter that aims to provide a forum to connect and educate the plastics industry about AM and the AM community about all things plastics. We have a well-established website, newsletter and social media presence, and we continue to provide multiple AM-related sessions at SPE's annual technical conference ANTEC and even hosted a virtual event in November 2020 entitled "Additive Manufacturing - What Happens after the Print".



Ellen Lee, Ford Motor Company



Jason Lopes, Carbon



Dana McCallum, Mantle



Ray Pearson, Lehigh University



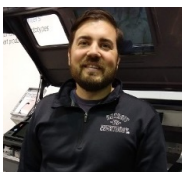
Mike Schorr, DyeMansion



Edwin Tam, Lincoln Design



Matthew Thompson, Toray Composite Materials



David Tucker,  
Forecast3D/GKN



Shu-Kai Yeh,  
National Taiwan University of Science + Technology

I know these are just a preview of what is to come for the AM chapter, and I am very excited to continue to the team as Past Chair and help it grow to become a premier technical organization to provide education resources, useful and community serving events, and connections between people, companies and technologies to plastics and AM.

- Matthew Thompson, Past Chair

## 2. Board News

Since our last newsletter, we have had welcomed several new Board of Directors members and said farewell to several who have stepped down from the Board as well.

Warm Welcome to the following new Board Members:

- Drew Davis has experience as Technical Account Manager, Xcentric Mold & Engineering, as well as additive manufacturing at Stratasys, resellers like Computer Aided Technology Inc. andGoEngineer, and plastic processors like Diversified Plastics Inc. Drew joined the board in June 2020 and serviced as Co-TPC in 2020-2021.
- Jason Lopes, Global Market Development Engineer, Carbon, with experience at Legacy Effects. Jason is a dynamic speaker and leader in the additive manufacturing industry. He received the Additive Manufacturing Users Group (AMUG) DINO (Distinguished Innovative Operator) award, the most prestigious honor given from that group, in 2012, and the Maker of the Year in 2017 by [3dprintingindustry.com](http://3dprintingindustry.com). Jason joined the Board in July 2020 and has served as Webmaster, including creating our website ([speadditivemanufacturing.org](http://speadditivemanufacturing.org)), keynote speaker at the “Additive Manufacturing - What Happens After the Print” event on Nov. 5, 2020, and currently serves at Vice Chair/TPC and Webmaster.
- Jennifer Howe, currently Head of Sales, NA, RENA Additive Manufacturing, with sales experience in AM at DyeMansion and EOS. Jennifer joined the Board in July 2020 and currently serves as Social Media Ambassador for the TIG’s LinkedIn profile.

- Michael “Mike” Schorr, Head of Application Consulting, DyeMansion, with additive and subtractive manufacturing experience at Under Armour and rapid prototyping at a supplier in the Aerospace & Defense sector. Mike joined the Board in February 2021 and currently serves as the Communications Committee Chair.
- Jay Dinsmore, CEO, Dinsmore, Inc., is an innovator, advocate, and leader in the additive manufacturing industry. Dinsmore, Inc., is an AM service and part provider with design, engineering, prototyping, and manufacturing capabilities across an array of technology platforms. Jay received the prestigious AMUG DINO award in 2019. He joined the Board in March 2021, and he was featured as a keynote speaker at the “Additive Manufacturing – What Happens after the Print” event Nov. 5, 2020. He currently serves as Event Coordinator.
- Haleyanne Freedman, Global Engineering Market Manager - 3D Printing/Additive Manufacturing, M. Holland Company, with experience at a 3D printing machine tool importer. Haleyanne serves as the North America National Chair for Women in 3D Printing. She joined the Board in September 2021.

Thank You to the following former Board members:

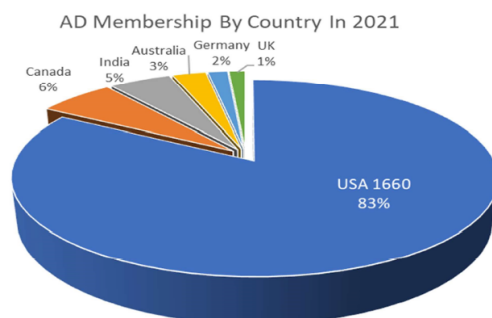
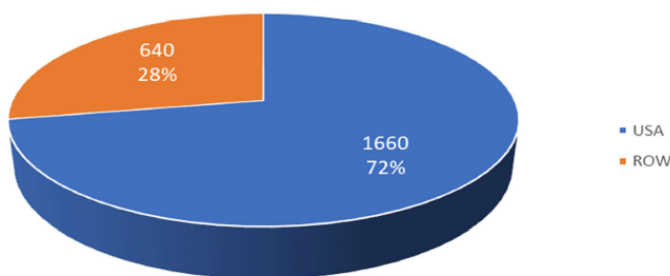
- Annette Lund, retired from Diversified Plastics, Inc., served 2016-2020
- Jason Lyons, PhD, current SPE President, Business Manager – Kepstan, Arkema, served 2015-2020
- Debora Massouda, PhD, currently President & CEO of Delaware Polymer R&D, served 2016-2020, including as Secretary 2018-2020
- Kalman Migler, PhD, currently Project Lead, Polymers Additive Manufacturing and Rheology, National Institute of Standards and Technology (NIST), served 2016-2021, including as Secretary 2016-2018 and Vice Chair/TPC 2018-2019



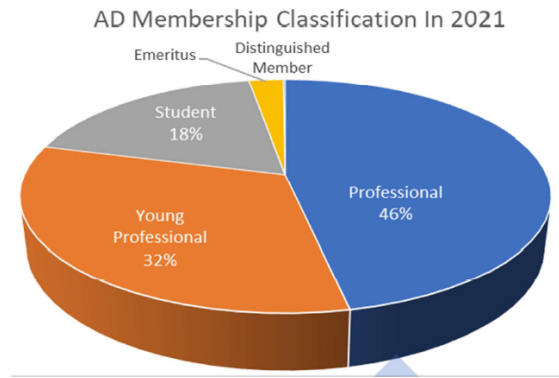
Congratulations to Dana McCallum for winning the AMUG DINO award in 2020. The Distinguished INnovator Operator (DINO) award is the most prestigious honor from the Additive Manufacturing Users Group (AMUG). Our other Board members who have won DINO awards are Jason Lopes and Jay Dinsmore.

### 3. TIG Membership Information

- Total membership: **2300** (as of September 1, 2021)







## 4. Additive Manufacturing - What Happens after the Print Event



The SPE AM Chapter hosted a full day virtual event on November 5, 2020, called Additive Manufacturing – What Happens after the Print: The Virtual Edition. This was a first of its kind event focusing on the finishing operations that happen after the 3D print, usually referred to as post-processing, which is a bit of a dirty little secret of 3D printing. These finishing operations include removing supports, tumbling and vapor smoothing, sealing, painting, metallization, and more.

The event included 10 talks from experts in the industry and technology providers in the post-processing area, featuring a morning keynote from Jason Lopes, Carbon, and an afternoon keynote from Jay Dinsmore, Dinsmore, Inc. The schedule was as follows:

#	Talk Title	Speaker	Speaker Affiliation
<b>Morning Moderators</b>		Dana McCallum; David Tucker	Carbon; Forecast 3D
0	Welcoming Remarks	Dana McCallum; Matthew Thompson	Carbon; Toray Composite
1	Keynote: Post Processing: Driving an Artistic Approach with a Technical Need	Jason Lopes	Carbon

- |   |  |                   |                          |
|---|--|-------------------|--------------------------|
| 2 | Navigating the Future of Additive: The Path to Producing Customer-Ready Parts at Scale | Daniel Hutchinson | PostProcess Technologies |
|---|--|-------------------|--------------------------|

- |   |  |                 |   |
|---|--|-----------------|---|
| 3 | Unlocking Performance and Transition to Production through Post-Processing of 3D Printed Parts | Joseph Crabtree | Additive Manufacturing Technologies (AMT) |
|---|--|-----------------|---|

- |   |   |              |             |
|---|---|--------------|-------------|
| 4 | Dialing in Design for Optimal Post-Processing | Alexandra Ju | Forecast 3D |
|---|---|--------------|-------------|

***Afternoon Moderators***

Drew Davis;  
Matthew Thompson

Xcentric  
Mold &  
Engineering;  
Toray  
Composite  
Materials  
America

- |   |   |              |               |
|---|---|--------------|---------------|
| 5 | Keynote: Why Having Diversity and Options for All of Your Finishing Needs Post Print Is Critical to Success Especially for Production | Jay Dinsmore | Dinsmore Inc. |
|---|---|--------------|---------------|

- |   |  |           |                |
|---|--|-----------|----------------|
| 6 | Plating on 3D Printed Plastic Parts vs. Injection Molded Plastic Parts – What's the Same, What's Different and Why Plating Is an Important Technology for Resin-Based AM Parts | Sean Wise | RePliForm Inc. |
|---|--|-----------|----------------|

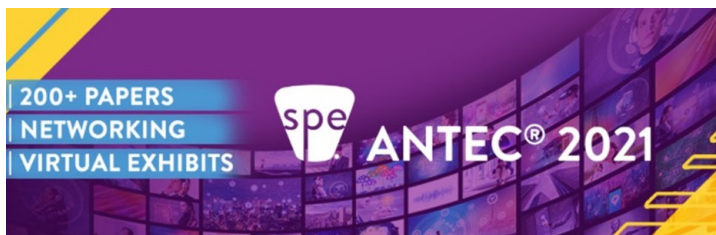
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| 7 | Creating the New Standard for High-Value End-Use Parts | Jennifer Howe and Michael Schorr | DyeMansion |
|---|--|----------------------------------|------------|

8	Paint: Blurring the Lines between Prototype and Production Parts	Greg Cebular	The Technology House
9	Applying Manufacturing Principles to Additive	John Oney	SurfacePrep
10	3D Printed Photopolymers: Poised for Manufacturing at Scale	Stephanie Benight	Tactile Materials Solutions
-	Virtual Cocktail Hour	REMO Virtual Networking Platform	

Sponsors were Dinsmore Inc. and Computer Aided Technology Inc., and coordination and execution of the event were accomplished by the SPE AM Chapter and SPE. Pricing was free for SPE AM Chapter members, \$49 for SPE members who were not members of the AM Chapter, free for students, and \$199 for non-members. The event was a success to introduce the SPE AM Chapter and SPE as a technical organization in the AM field and offer educational and networking benefits about the current state and future directions of AM post-processing. There were 62 total attendees, with an average of 42 attendees per talk, and 16 of them attended all of the talks and were entered into a Perfect Attendance Raffle which gave away a pair of Adidas 4D-printed shoes, provided by Carbon and printed using their Digital Light Synthesis (DLS) technology.

More information may be found on the webpage for the event on SPE's website: [4spe.org/i4a/pages/index.cfm?pageID=6207](https://4spe.org/i4a/pages/index.cfm?pageID=6207).

## 5. Additive Manufacturing Sessions at SPE's ANTEC 2021



powered matchmaking, and Virtual Exhibits.

SPE hosted its annual technical conference ANTEC 2021 in May 2021. The format was virtual again this year, including several categories as follows:

- ANTEC Industry Insights, May 5-7
- ANTEC Classic, May 10-21
- Others, such as ANTEC International, On-Demand Papers, Student Posters, Virtual Networking including AI-

The first session of ANTEC Classic in the morning on May 10 featured five Additive Manufacturing talks, and an additional seven talks were pre-recorded and given in the On-Demand

section. All of the 12 papers came from submissions through the standard SPE Call for Papers, and they all focused on material extrusion/fused filament fabrication (FFF) processes, except one which also covered machine learning and data-driven production.

The additive manufacturing presentations at ANTEC were as follows:

**Additive Manufacturing Session in ANTEC Classic Program, May 10**

#	Presentation Title	Presenter	Presenter Affiliation
-	<b>Moderator</b>	Matthew Thompson	Toray Composite Materials America
1	Large-scale extrusion-based 3D printing for highway culvert rehabilitation	Sunil Bhandari	Research Assistant (PhD candidate), University of Maine
2	Effect of Carbon Fiber On the Fracture Toughness of Fused Filament Fabricated CF/ABS Composites	Karun Kalia	PhD candidate, University of Massachusetts Lowell
3	Investigation and Realization of Watertight FDM Structures Made of Ultem 9085 in Pressurized Systems	Christian Elsner	Research Assistant, Direct Manufacturing Research Center (DMRC), University of Paderborn
4	Fused Filament Fabrication Feedstock Characterization via In-Line Rheology	Austin Colon,	Research Assistant (PhD candidate), University of Massachusetts Lowell
5	Enabling Mechanically Adaptive 4D-Printing with Cellulose Nanocrystals	Tyler Seguire	Graduate Research Assistant (Master's Student), Virginia Tech

**Additive Manufacturing On-Demand Section**

#	Presentation Title	Presenter	Presenter Affiliation
1	Characterization of polypropylene/hydrocarbon resin blends for 3D printing	Arit Das	Graduate Research Assistant, Virginia Tech



2	Machine Learning and Data-Driven Additive Manufacturing	Maryam Emami	Senior R&D Consultant, Al Materia Inc.
3	Effects of Steam Heat and Dry Heat Sterilization Processes on Polylactic Acid with Hydroxyapatite Composite Printed by FFF	Mauricio Fuentes	Teacher, Universidad Central del Ecuador
4	Fiber Orientation Measurements for Large Additive Manufactured Parts Using Optical and SEM Imaging	Rifat Ara Nargis	Graduate Research Assistant, Baylor University
5	3D Printing Sustainable Biocomposites From Recycled PLA and Micro-Crystalline Cellulose	Akhilesh Pal	Postdoctoral Fellow, University of Guelph
6	Comparative Study of Filled and Unfilled PLA Produced Via Injection Molding and 3D Printing	Chethan Savandaiah	Researcher, Kompetenzzentrum Holz GmbH
7	Experimental and Numerical Analysis of Inducing Crystallization on Polymer Melt by Altering Flow Area in Additive Manufacturing	Hussam Noor	PhD Student, Lehigh University

More information may be found on the ANTEC 2021 webpage on SPE's website: [4spe.org/i4a/pages/index.cfm?pageid=6098](https://www.spe.org/i4a/pages/index.cfm?pageid=6098).

## 6. SPE TIG Best Paper Award

Congratulations to the 2 winners for the ANTEC 2020 + 2021 SPE TIG Best Paper Awards. To view full articles, please click on the pictures below and login to your SPE account.

**2020**



*The Society of Plastics Engineers (SPE) Additive Manufacturing & 3D Printing  
Technical Interest Group (TIG) is pleased to present the*

### Best Paper Award

*of the Additive Manufacturing sessions at SPE's Annual Technical Conference ANTEC® 2020 to*

**Hongrui Chen<sup>1</sup>, Alec Redmann<sup>1</sup>, Rui Zhang<sup>2</sup>, Sue Mecham<sup>2</sup>, and Tim A. Osswald<sup>1</sup>**  
of <sup>1</sup>University of Wisconsin-Madison and <sup>2</sup>University of North Carolina at Chapel Hill

*for the paper entitled*

**3D Printed Hybrid Composite Structures - Design and Optimization of a Bike Saddle**

#### **Abstract:**

As designers and engineers continue to push the boundaries of high performance and lightweight design, the use of complex geometries and composite materials is growing. However, traditional composite manufacturing often requires the use of additional tooling and molds which can significantly increase the cost. In this study, a carbon fiber reinforced composite bike saddle is designed and manufactured to demonstrate a newly developed hybrid composite manufacturing process. Using a dual curing 3D printed epoxy to print the final part geometry and co-cure pre-impregnated carbon fiber reinforcement, the bike saddle can be optimized, designed and manufactured in less than 24 hours without tooling.



2021



*The Society of Plastics Engineers (SPE) Additive Manufacturing & 3D Printing  
Technical Interest Group (TIG) is pleased to present the*

## Best Paper Award

*of the Additive Manufacturing sessions at SPE's Annual Technical Conference ANTEC® 2021 to*

Sunil Bhandari<sup>1,2</sup>, Roberto A. Lopez-Anido<sup>1,2</sup>, James Anderson<sup>1</sup>, and Alexander Mann<sup>3</sup>  
of <sup>1</sup>Advanced Structures and Composites Center, University of Maine; <sup>2</sup>Department of Civil  
and Environmental Engineering, University of Maine; and <sup>3</sup>Maine Department of  
Transportation

*for the paper entitled*

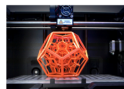
**Large-Scale Extrusion-Based 3D Printing for Highway Culvert Rehabilitation**

### Abstract:

A significant problem associated with repairing deteriorating highway culverts is the resultant lowered flow capacity. This can be mitigated by the use of culvert diffusers. Current culvert diffusers are made using fiberglass reinforced thermosetting epoxy polymers, which require custom made molds. This research work explores the use of large-scale 3D printed thermoplastic polymer composite to manufacture culvert diffusers. The research work shows that 3D printing technology reduces the manufacturing time as well as the cost of culvert diffusers. Large-scale 3D printing technology is well-suited for the manufacture of individualized culvert diffusers with unique geometrical designs without the need for molds. 3D printing technology is also capable of using different materials according to environmental requirements. The use of segmental manufacturing in conjunction with largescale 3D printing enables the manufacturing of culvert diffusers larger than the build envelope of the 3D printer. Different post-processing techniques used for cutting, finishing, and joining the 3D printed segments are discussed.



**SPE Additive  
Manufacturing/3Dp  
Technical Interest Group**



**Join or Renew Your Membership**

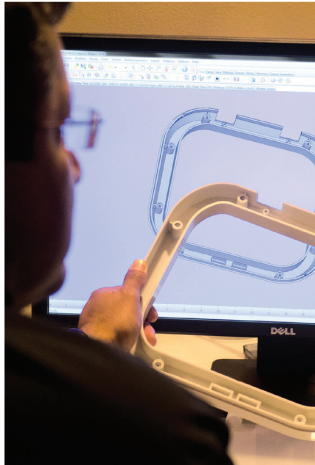


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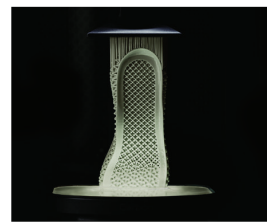
If you are SPE member, it is **free** to join!

Visit [www.4spe.org](http://www.4spe.org)

**Tell your friends and colleagues to  
join the SPE AM TIG to stay  
connected and learn the latest  
information about AM/3Dp.**



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\*Some restrictions apply.

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## Call for Sponsors

The Society of Plastics Engineers (SPE) Additive Manufacturing (AM) Technical Interest Group (TIG) invites you to take advantage of an opportunity to capture advertising space in our outgoing communications to our **2,300 members**. Help align your company's image with advanced technology and future trends by submitting your logo or designed ads which will feature on the SPE AM TIG website, newsletter, and other communications.

AM, also referred to as 3D printing (3Dp), has been a buzzword for several years, and the SPE AM SIG was born from this excitement in 2015. We have been active in arranging and running excellent and well-attended technical sessions at SPE's flagship annual technical conference and tradeshow ANTEC. In 2020, we presented a full-day virtual event called "Additive Manufacturing – What Happens after the Print" dedicated to the secondary, finishing operations on printed parts. In the July 2021-June 2022 term year, we are planning small, regional events as well as technical webinars, all of which will have sponsorship opportunities.

**Sponsorships include ad space in our newsletter** (first issue can be found at [speadditivemanufacturing.org/spring-2020-newsletter](https://speadditivemanufacturing.org/spring-2020-newsletter)) **and on our website** ([speadditivemanufacturing.org](https://speadditivemanufacturing.org)). Sponsoring companies' logos may also be featured in other outgoing communications, which will add marketing value to the companies and bring color to our content. Please also reach out to us if you have educational content, such as published articles or white papers, that you feel our membership would benefit in reading.

The following options are available:

1. Business card, 3.5" wide x 2" tall, \$100
2. Small, 4" wide x 4" tall, \$150
3. Medium, 4" wide x 6" tall, \$200
4. Large (Half Page), 8" wide x 5.25" tall, \$250
5. Full Page, 8.5" wide x 11" tall, \$500.

Rates cover the entire SPE year (July 1 – June 30). Payments are handled through [4spe.org](https://4spe.org), and **credit card payments are accepted**. Size limit for digital file is 700 kB.

Contact David Tucker, SPE AM TIG Chair, [davidt@forecast3d.com](mailto:davidt@forecast3d.com), for more information or to secure a sponsorship spot.