

| Manufacturing Innovation Program | Allocation Amount | Project  | Manufacturing Company | Location       |
|----------------------------------|-------------------|--|-----------------------|----------------|
| Bucknell University              | \$ 70,000.00      | <b>Product and Manufacturing Innovations for Water Sports Equipment</b> - To yield a series of testable full-scale prototypes, leading to a working design ready for commercialization by understanding how water sports equipment interacts with water surfaces.  | Gilson Snow, Inc.     | Winfield, PA   |
| Carnegie Mellon Univerisity      | \$ 69,999.00      | <b>Acoustic Monitoring for Additive Manufacturing Production</b> - To develop a monitoring system based on acoustics for application in laser powder additive manufacturing systems, which will result in sustantial commercial value.   | Robert Bosch, LLC     | Pittsburgh, PA |
| Carnegie Mellon Univerisity      | \$ 69,992.00      | <b>Effect on Densifaction and Resulting Properties of Binder Jet 3D Printed Biomaterials</b> - To study the effects of powder characteristics, processing parameters, and sintering kinetics on densifaction. Will result in advanced technology throughout development projects to manufacture complex parts such as medical implants, and to develop new markets for companies that supply powder. | The ExOne Company     | Irwin, PA      |
| Carnegie Mellon Univerisity      | \$ 64,060.00      | <b>3D Printed Conformal Sensors for In-situ Monitoring of Cracks in Critical Freight Car Components</b> - To develop a 3D printing technology that can fabricate low-power sensors on railcar components for their structural health monitoring.   | Wabtec Corporation    | Wilmerding, PA |
| Carnegie Mellon Univerisity      | \$ 69,991.00      | <b>An Innovative Electrochemical-Mechanical Grinding Approach for Creating High Quality Curved Surfaces</b> - To develop a new, unique and innovative process will have a great impact for addressing surface quality challenges for advanced manufacturing parts.   | Oberg Industries      | Freeport, PA   |

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| Carnegie Mellon Univerisity      | \$ 69,270.00      | <b>Autonomous Evaluation of Titanium Metal Components</b> - To support the metallurgical analysis processes at Perryman Company to reduce costs, increase productivity, and train workforce members in artificial intelligence (AI) applications.   | Perryman Company             | Houston, PA      |
| Carnegie Mellon Univerisity      | \$ 69,883.00      | <b>High-Throughput Materials Development for Metal-Cutting Tools in Advanced Manufacturing</b> - To develop a methodology to accelerate the discovery of processing routes for the fabrication of important coatings used to improve metal-cutting tools in advanced manufacturing. This method will accelerate the deployment of new materials for advanced manufacturing. | Kennametal                   | Latrobe, PA      |
| Drexel University                | \$ 64,877.00      | <b>Advanced Manufacturing of Architected Fiber-Reinforced Cementitious Composite</b> - To manufacture AFRC as a novel material that can be used to enhance the mechanical performance and service-life of infrastructure.   | TAKTL                        | Turtle Creek, PA |
| Drexel University                | \$ 42,790.00      | <b>Pharmacuetical Tablet Manufacturing</b> - Understanding, predicting and mitigating air entrapment defects in pharmaceutical tablet manufacturing.  | Merck                        | West Point, PA   |
| Drexel University                | \$ 69,553.00      | <b>The Cell Net: A New Method for Cell Sorting</b> - The Cell Nets ability to effectively separate and sort cells will solve Aptagen LLC's need for rapid and inexpensive cell sorting.   | Aptagen LC                   | Jacobus, PA      |
| Lehigh University                | \$ 70,000.00      | <b>Maintain Viability of PA Short-Run Foundry Through Advanced Manufacturing Technology</b> - To deliver more elastic capability by ensuring consistent quality and delivery while increasing revenue per order.  | Miller Fabrication Solutions | Brookville, PA   |

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| Lehigh University                | \$ 65,444.00      | <b>Encapsulated, Multifunctional Additives for Improving Bioplastics</b> - To improve the key features of bioplastics and allow the development of environmentally-friendly plastics by optimizing the composition, microstructure, and amount of the additives in Polylactic acid (PLA).   | TRuCapSol LLC         | Bethlehem, PA    |
| University of Pennsylvania       | \$ 67,684.00      | <b>Manufacturing Steerable Needles</b> - To investigate the manufacture of a steerable needle to improve treatments in which access to internal organs is difficult.  | Greppo Technologies   | Philadelphia, PA |
| University of Pennsylvania       | \$ 69,293.00      | <b>Additive Manufacturing of Filled Nanocellulose Materials</b> - To investigate the additive manufacturing of filled cellulose nanofibrils (CNF) materials to increase the solid content of inks being used in the printing industry, create less expensive ink, and reduce the cost of printed materials.   | Penncolor             | Hatfield, PA     |
| University of Pennsylvania       | \$ 70,000.00      | <b>Fabrication of collapsible tubular meshes as ultra-long lasting oral drug depots</b> - To design and fabricate slinky-like tubular meshes from biodegradable polymer fibers/yarns to create a drug capsule for prolonged gastric retention within the gastrointestinal tract. The entire package will be deployed and retained in the stomach to gradually release the encapsulated contents over time, from one day to two weeks. | Merck                 | West Point, PA   |

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| Penn State University            | \$ 69,558.00      | <b>Manufacturing/Wear Optimization of Resin-Bonded Composites with Graphene Nanofillers</b> - To develop an understanding of the optimal graphene types and manufacturing methods to incorporate them in resin-bonded carbon composites used industrially in seals and bearings applications. Research will help improve energy efficiency, reduce carbon footprint, and reduce the friction and energy losses, as well as component longevity and performance in a wide range of commercial products manufactured in Pennsylvania. | Morgan Advanced Materials and Technology, Inc. | State College, PA    |
| Penn State University            | \$ 68,350.00      | <b>Sustainable Casting Systems for Pennsylvania Foundries using non-Silica Aggregates</b> - To reduce the respirable silica exposure levels for manufacturing employees in Pennsylvania foundries, and to comply with new OSHA regulations.   | Pennsylvania Foundry Association               | Plymouth Meeting, PA |
| Bahrends College - PSU           | \$ 70,000.00      | <b>Additive Manufacturing Integration - Positioning the PA Investment Casting Industry for Sustainability &amp; Growth (AMI-4PAIC)</b> - To develop investment cast components design using additive manufacturing (AM) to reduce cost and decrease production times.   | Tech Cast, LLC.                                | Myerstown, PA        |
| University of Pittsburgh         | \$ 68,680.00      | <b>Two Step, Transient Liquid Phase Sintering (TST-LPS) of Binder-Jet 3D Printed Nickel-Based Superalloys</b> - To investigate a two-step transient liquid phase sintering process for binder jet printed nickel-based superalloys. The project could improve mechanical properties obtained with traditional manufacturing methods.  | The ExOne Company                              | North Huntingdon, PA |

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| University of Pittsburgh         | \$ 67,720.00      | <b>Advancing the Manufacturing of Complex Three-dimensional Ceramics Parts with a Novel Photoinhibition aided Ceramic Photopolymer based Additive Manufacturing (PinCPAM)</b> - To develop a fast digital light processing-based (DLP) photoinhibition aided photopolymerization additive manufacturing (PinCPAM) process to increase print speeds and photoinhibition zone thickness in advanced ceramic manufacturing. | Kennametal             | Latrobe, PA           |
| University of Pittsburgh         | \$ 69,037.00      | <b>Tungsten Carbide – Metal Composites Produced via Direct Metal Deposition</b> - To investigate the influence of deposition parameters on microstructure, crack initiation, hardness and strength of layered tungsten carbide-metal composites to reduce or eliminate residual porosity and stresses in the composites, which will help improve reliability.  | General Carbide Corp   | Greensburg, PA        |
| Robert Morris University         | \$ 69,860.00      | <b>Development and Commercialization of Laser Welding Systems for Joining Plastic Components</b> -To develop a laser welding system product line to serve the needs of the plastics manufacturing industry, and lead the domestic effort in plastic welding.   | Mecco                  | Cranberry, PA         |
| Temple University                | \$ 69,779.00      | <b>Prognostic Utility Asset Health Monitor</b> - To develop an integrated electronic apparatus with advanced data analytical algorithms for non-intrusive, health monitoring of utility assets. The apparatus can significantly reduce the inspection and repair costs of utility assets, and enhance the resiliency of aging infrastructure.  | The Fredericks Company | Huntingdon Valley, PA |

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| Villanova University             | \$ 50,336.00           | <b>Compressed Metal Foam-Based Cold Plates for Refrigerant-Based Electronics Cooling</b> - To explore the influence of metal foam properties on microevaporator cold plates (MCPs). Compressed metal-foam-based MCPs could provide a less-expensive tool and more effective means than traditional air cooling to remove the heat from computer servers in data centers.   | QuantaCool Corp            | Chadds Ford, PA |
| Villanova University             | \$ 69,591.00           | <b>Evaluation of Field Performance of Steel Fin Pile Foundations</b> - To provide new data for steel fin pile foundations engineering performance and load capacity compared to the conventional alternatives. Steel fin pile foundations utilize fins on the side of the piles to develop significant frictional resistance between the soil and the finned pile. The fins serve the purpose of increasing lateral and torsional resistance of the pile.    | Mission Critical Solutions | Alum Bank, PA   |
| Villanova University             | \$ 68,772.00           | <b>Manufacturing Process Optimization for Food and Biosolids Waste Conversion to Valuable Products</b> - To establish optimized hydrothermal carbonization (HTC) process conditions, which will convert waste water treatment solids and food waste into hydrochars and liquid by-products, which are suitable as solid fuel or as intermediate feedstocks for further upgrading into value-added products to be used for water and gas cleaning treatments. | SoMax BioEnergy LLC        | Spring City, PA |
| <b>Total</b>                     | <b>\$ 1,744,519.00</b> |  |                            |                 |