EMPIRE STATE MANUFACTURING & INNOVATION

A FuzeHub Periodical, Issue 1, Fall 2018

INDUSTRY 4.0:

How it's transforming shop floors

FACES OF NYS MANUFACTURING

An inside look at two New York State manufacturers

> INDUSTRY INSIGHTS

Inside subway, rail, and transit car manufacturing

> NEW YORK MANUFACTURING EXTENSION PARTNERSHIP

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WELCOME

EMPIRE STATE MANUFACTURING & INNOVATION



Welcome to the first edition of Empire State Manufacturing & Innovation, a FuzeHub periodical for New York State's manufacturers, technology companies and everyone that is interested in innovation-led economic growth.

Manufacturing industries are being transformed by emerging technologies and new advancements in production capabilities. Through this publication, we'll bring you

information on the capabilities, expertise, products, and processes that are defining the next generation of manufacturing. Additional features include insights from industry experts and snapshots of area manufacturers.

Read on to explore how your organization can take advantage of the opportunities for growth and competitiveness being created by these developments. Visit us any time at www.fuzehub.com to take the next step to engage with New York State's many innovation assets.

Dere June

ELENA GARUC EXECUTIVE DIRECTOR, FUZEHUB

ABOUT FUZEHUB

FuzeHub is a not-for-profit organization that connects New York's small and mid-sized manufacturing companies to the resources, programs and expertise they need for technology commercialization, innovation and business growth. We help companies navigate New York State's robust network of industry experts at Manufacturing Extension Partners centers, university research centers, business incubators, economic development organizations and other providers.

FuzeHub is the statewide New York Manufacturing Extension Partnership Program (NY MEP) center, supported by Empire State Development's Division of Science, Technology & Innovation. NY MEP is part of the National Institute of Standards and Technology's Hollings Manufacturing Extension Partnership.

New York State's Manufactu What You Nee

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Industry Insight: Train, Subway, & Tr

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New York State Manufacturing & Technology Ecosystem

ew York State is an innovation powerhouse. In 2017, the state was home to 317 degreegranting institutions of higher education and six federal laboratories. Nine of them are "R1" institutions (doctoral universities with the highest level of research activity)-the second-most in the country.

New York logged \$5.45 billion in academic research and development expenditures, the second highest of any state, in the most recent year for which data is available. In 2016, there was \$4.6 billion in federal research and development investment to New York-based federal agencies and laboratories. The state ranks third in the country for the country for number of patents issued to its residents. In 2015, New York State itself expended more on research and development (\$366 million) than any other state but one.

New Yorkers aren't just at the forefront of new inventions and technological innovations— they're creating and manufacturing them. About 440,000 people are employed in manufacturing across the state, spread out over 16,000 establishments. From bakeries in Manhattan, to paper mills in Potsdam, to machine shops in Buffalo, to the shop floors of semiconductor, advanced electronics, adhesive, and medical device producers, the Empire State's manufacturers are dispersed across the state's diverse economic landscape.

Across the United States and beyond, communities are realizing the power of economic development strategies that build on the synergies and partnerships among universities, industry, entrepreneurs, and start-up ecosystems. Terms like "economic gardening" and "innovation orchards" reflect what New York State already does

well: cultivating innovation and growth in the companies and early-stage ventures that already call it home.

For many years, New York State programs—especially those of Empire State Development's Division of Science, Technology & Innovation (NYSTAR)have represented a sustained, holistic investment in technology-driven economic development programs, supporting both university research as well as hands-on assistance to companies at every stage of their life cycle. These strategic investments cover a range of emerging industries and enabling technologies including but not limited to advanced materials. biotechnology and life sciences, renewable energy, materials processing, optics and imaging, integrated photonics, software and digital media, and electronics technologies.

Economic Impact of New York State Innovation Assets



Empire State Development's Division of Science, Technology & Innovation (NYSTAR)

development and commercialization in New York State. NYSTAR offers programs that assist companies from start-up through maturity, leveraging the state's unparalleled investments in world-class technology

assets and expertise. Roughly \$55 million in funding is provided annually to support more than 70 centers that offer direct assistance to New York State companies, creating a network of vital assets for enabling technology- and manufacturingled growth and job creation.

NEW YORK MANUFACTURING EXTENSION PARTNERSHIP:

Ten regional centers and one statewide center (FuzeHub) providing growth and innovation services to small and mid-sized manufacturers.

IMPACTS FROM 2012-2016

21,577 jobs created/retained \$3.8 billion in non-job economic impact

NEW YORK STATE HIGH PERFORMANCE COMPUTING CONSORTIUM:

High-speed networks and high-performance platforms that enable companies and researchers to make scientific breakthroughs and to accelerate the engineering and design of innovative products and processes.

IMPACTS FROM CONTRACT YEAR:

45 jobs created/retained \$13 million in non-job economic impact

NEW YORK STATE INNOVATION HOT SPOTS & CERTIFIED BUSINESS INCUBATORS:

Program providing start-ups with physical space, access to capital, coaching and mentoring, networking, prototype development, technical services, and tax benefits.

IMPACTS FROM CONTRACT YEAR

864 jobs created/retained • \$114 million in non-job economic impact

NYSTAR programs represent substantial and critical state investments in New York State's innovation ecosystem, and the following infographics highlight the

economic impact of these investments: job creation and retention, new and retained sales, cost savings, non-state funds or investments acquired, and capital expenditures experienced by private sector companies due to their engagement with NYSTAR-supported organizations.

CENTERS FOR ADVANCED TECHNOLOGY:

Fifteen university research centers performing basic and applied research, development, and technology transfer in multiple technology areas, in collaboration with private industry.

IMPACTS FROM 2011/12–2015/16 CONTRACT YEAR: 4,032 jobs created/retained • \$2.7 billion in non-job economic impact.

\$2.1 billion in non-job economic impact

CENTERS OF EXCELLENCE:

Twelve university research centers performing academic-industry R&D, product commercialization, and promotion of private sector investment in high-tech fields.

17,166 jobs created/retained

IMPACTS FROM CONTRACT YEAR:



Ask an Expert with Dr. John T. Wen

Dr. John T. Wen is the head of Industrial and **Systems Engineering** and a professor in the **Department of Electrical**, **Computer, and Systems Engineering with a joint** appointment in the **Department of Mechanical**, Aerospace, and Nuclear **Engineering at Rensselaer Polytechnic Institute (RPI).**

He also plays a leadership role in the Advanced Robotics for Manufacturing (ARM) Institute, a federally supported innovation institute in the Manufacturing USA network that is using advanced robotics – an important part of Industry 4.0 – to strengthen manufacturing.

Q: Industry 4.0 is a concept that everyone seems to recognize but that few can clearly define. How do you define Industry 4.0, and what's the larger context?

The First Industrial Revolution was propelled by the invention of the steam engine and started with mechanization replacing manual labor. The Second Industrial Revolution introduced mass production and large-scale manufacturing, enabled by standardized parts, components and processes. Digitization and computers ushered in the Third Industrial Revolution, leading to manufacturing automation.

Industry 4.0, or the Fourth Industrial Revolution, is purportedly the next wave of transformative advances in manufacturing. Aside from the hype, my understanding of industry 4.0 is the interoperability, integration and information exchange between processes, devices and systems in manufacturing, industrial and business operations. This would allow plug-and-play of sensors and machines from different vendors, and the integration of massive amounts of distributed and heterogeneous data with analytic tools to guide operations and decision-making. Industry 4.0 is closely related to the industrial internet, the Internet of Things (IoT), and cyber-physical systems (CPS) - all of which are about highly interconnected systems of data, information, action and decisions.

Today, common standards allow us to seamlessly and simultaneously use a mouse, gamepad, monitor, cameras, and processors from multiple vendors. Imagine you are a manufacturer and you can monitor and access not only manufacturing processes, but also the status and history of parts inventory, delivery time, supplier cost, machine productivity and quality, and customer demand and requirements, all in real time. This could revolutionize factory operations, production scheduling, and supply chain management.

Industry 4.0 also draws on recent advances in machine learning, artificial intelligence, and big data to efficiently and effectively extract intelligence from data. These tools could operate through a centralized cloud or edge resources for faster responses.



Q: There's a perception that Industry 4.0 is just for big There are a number of Manufacturing USA institutes that work companies with deep pockets. If Industry 4.0 is for with various aspects of Industry 4.0: the Advanced Robotics small-to-medium manufacturers, too, why aren't more for Manufacturing (ARM) Institute, the Clean Energy Smart companies embracing it? Manufacturing Innovation Institute (CESMII), the Digital Manufacturing and Design Innovation Institute (DMDII), and others. Many companies, universities, and non-profits actively participate in these institutes. I would recommend manufacturers interested in Industry 4.0 contact FuzeHub for a consultation and possible referrals.

Large companies are building tools and infrastructure related to Industry 4.0, such as IBM's Smarter Planet, GE's Brilliant Factories, and Siemens's Digital Factories. Governments are also making significant investments, including the European Union's "Factories of the Future" initiative. And there are lots of public-private partnerships, such as the Industrial Internet Consortium (IIC).

 \diamond

These efforts go beyond manufacturing. They also encompass buildings, transportation, energy, and the environment. For example, IBM, RPI, and the Fund for Lake George are collaborating on the Jefferson Project to provide Lake George with a multitude of sensors to monitor, model, and predict lake ecology and health, as well as the impact of human activities.

Industry 4.0 is extremely broad and may be leveraged at many different scales. Small and medium-sized manufacturers (SMMs) may have already adopted some practices that are enabled by Industry 4.0. For example, many SMMs apply Lean Six Sigma techniques to improve performance and reduce process variability. This requires the collection of voluminous amounts of heterogeneous process data.

> Some SMMs use data to construct models and develop predictive analytics for planning, scheduling, and maintenance. Some SMMs integrate sensors such as machine vision and force sensors with robots to increase the level of automation. The technologies that empower these activities are all under the Industry 4.0 umbrella.

There are cloud-based tools available to SMMs through vendors such as Amazon and Microsoft to help with process modeling and optimization. Even machine learning and neural network are becoming affordable as Nvidia and Intel introduce neuromorphic chips. However, the barrier of adoption for SMMs remains high since these tools still require specialists to integrate and deploy them effectively. There are also risks in terms of data integrity, security, and privacy.



Q: Some people talk about Industry 4.0 as a journey rather than a destination. If a journey is a proper analogy, what are some ways that manufacturers can get started on their Industry 4.0 journey?

Industry 4.0 is not a single technology, and it is still rapidly evolving. It does represent a holistic philosophy towards manufacturing systems, using data from all parts of the system to gain insights and improve operations. In this sense, the adoption of Industry 4.0 is like a journey, embracing the philosophy and deploying it as the technology matures.

Optimax Systems



MANUFACTURER HIGHLIGHT

> Optimax Systems, Inc., of Ontario, N.Y., manufactures small volumes of highprecision optics for quick delivery. Founded in 1991, this

Rochester-area company specializes in the production of asphere, cylinder, sphere, and plano/flat optics for aerospace, medical devices, semiconductors, solar, digital technologies, and military applications. Today, Optimax is America's leading supplier of prototype optics.

Like other small-to-medium manufacturers (SMM), Optimax wants to control costs, forecast accurately, and accelerate decisionmaking. Larger companies have bigger budgets, but that does not mean smaller manufacturers cannot implement Industry 4.0 technologies to achieve their goals. Sometimes, the right opportunity is all that is needed to get started.

According to Kris Harris, the company's IT manager, Optimax "wants to know what large manufacturers are doing."

That's why Harris and a colleague, Collin Paran, attended a National Institute of Standards and Technology (NIST) conference in Gaithersburg, Maryland, where Industry 4.0 was a hot topic.

Optimax works with its local NY MEP center in the Finger Lakes, NextCorps

Thinking Big and Staying Focused

Harris and Paran understood that an SMM could face challenges, but that did not deter Optimax from beginning its Industry 4.0 journey.

"We have different software systems," Harris explains, "but we need to get everything to speak the same language."

Larger companies have dedicated resources to address routing issues. Optimax had Harris and Paran, a data engineer with manufacturing responsibilities.

Fortunately, the company has other assets, too.

"The guys on the floor are the subject matter experts," says Harris. "They understand what's important and what's not." That's critical because Industry 4.0 technologies can collect more data than a manufacturer needs. Optimax also remained focused on the task at hand.

"We were encouraged to re-evaluate the algorithms behind how we cost things," Paran says.

From Data to Actionable Information

Industry 4.0 isn't just about attaching sensors to machines. The Fourth Industrial Revolution uses a cyber-physical interface that improves human-machine interactions. At Optimax, sensors on automated equipment collect data such as temperature, humidity, and fluid levels. There is also an analytics dashboard that, as Paran says, "empowers our floor operators to make more rapid data-driven decisions."

Machine diagnostics can improve preventive maintenance programs, but there is more to cost control than reducing downtime. That is why Industry 4.0 at Optimax aggregates all the direct labor hours, displays those hours, and alerts operators who forget to start or stop tracking their time. The company is testing these technologies on several cells and is already getting more accurate costing.

Industry 4.0 Advice

Based on his experience, Kris Harris recommends that SMMs that want to implement Industry 4.0 focus on a single system, cybersecurity, and NIST standards.

"Agree on one system," he advises. "The larger companies pick one system and use it to model things. In manufacturing, this is referred to as Model Based Enterprise (MBE) solutions."

He adds, "Having disparate systems makes it too easy for a bad actor to breach your digital infrastructure."

Harris also recommends connecting with the right resources.

"Make sure you're involved in NIST and keep up with what they're rolling out in terms of standards and recommendations," he says.

For his part, Paran has a prediction of his own. The manufacturing engineer and data scientist says that "machine learning is coming—and it's exciting".



Optimax products are used in aerospace, medical devices, semiconductors, solar, digital technologies, and military applications.

Industry 4.0 Feature

MANUFACTURER HIGHLIGHT



MPI, Inc., of Poughkeepsie manufactures wax injection molding equipment that generates higher casting yields for increased productivity and greater throughput. Wax injection molding, part of the first step in the investment casting process, creates highly accurate molds that

companies in the aerospace, automotive, medical, and other industries use to create precision metal parts.

As a supplier of wax room solutions, MPI uses innovative technologies to meet the needs of industry leaders like Pratt & Whitney, Rolls-Royce, and Hitachi. The MPI Technology Center, a state-of-the-art wax room where customers can observe fully automated operations, is what Aaron Phipps, vice president of manufacturing and engineering, calls "the centerpiece of our manufacturing facility."

The MPI Technology Center

MPI is a small to mid-sized manufacturer (SMM), but its Technology Center is a world-class resource. Along with advanced automation, the Poughkeepsie company is applying other Industry 4.0 solutions to manufacturing challenges. Industry 4.0 is not a one-size-fits-all technology but rather a family of technologies that use a cyber-physical interface to improve how humans and machines interface.



AARON PHIPPS

Vice President of Manufacturing and Engineering, MPI Systems.

MDi

For example, the MPI Technology Center features advanced equipment for pick-and-place welding and automated wax injection molding. The welding operation, Phipps says, gathers "lots of locational data that's of interest." During welding, the runner and the surface are measured automatically to adjust the robot accordingly.

MPI Systems also uses Industry 4.0 technologies for the visual inspection of parts. RFID-enabled machine trays support operations, too. Workers feed the machinery and pick the patterns, but automation reduces variations and provides greater process control.

"With all of our equipment," Phipps says, "the controls are built right into the machine."

Cyber-Physical Interfaces

With Industry 4.0, the data that is gathered from machine sensors is invaluable.

"If I have an issue with runner compensation," Phipps offers as an example, "I can trace the variation to see where it came from."

In turn, Phipps says, a company can get answers to questions such as "What's causing it to fail? Why didn't it compensate? Where's the variation?"

Companies that buy equipment from MPI are eager to acquire this intelligence.

"We have some incredibly powerful tools for diagnostics," Phipps says. The company also provides top-notch technical support. With a customer's permission, a machine can "dial out" over a virtual private network (VPN) to provide data for remote troubleshooting.

Yet there are data-related challenges. Users have different key performance indicators (KPIs). Production personnel want a simple operational interface, but managers need a dashboard with





MPI works with its local NY MEP center in the Mid-Hudson, the Manufacturing & **Technology Enterprise Center (MTEC)**

business value. Some customers gather so much data that they need to limit storage times.

"You can have gigabytes per part," Phipps says, "and thousands of parts per day is terabytes."

Winning with Industry 4.0

"Customers tend to get excited about the amount of data they can collect," Phipps explains, "but they need to have a plan to implement and use it. This is where we come in."

Manufacturers also need to address security concerns to support vendor access to equipment.

"We've been automated in the wax room for over a decade," Phipps concludes, "but it's taken people a decade to recognize the full potential of that."

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Industry 4.0

How it's Transforming Shop Floors



Industry 4.0 is a family of technologies that enable manufactures to not only effectively collect, analyze and share data that adds business value, but also effectively act upon that data. This Fourth Industrial Revolution is not just about digitization or automation. Rather, it is about applying cyber-physical systems to make shop floors faster, more flexible, more productive and more cost-efficient.

Industry 4.0 Feature

Industry 4.0 is not only for large multi-national manufacturers. Small-to-medium manufacturers (SMMs) have lower Industry 4.0 adoption rates, but some SMMs are getting ahead of the curve - and the competition. In New York State, manufacturers can leverage public and private resources to start their Industry 4.0 journey or advance to the next step.

Simulation, Monitoring, and Operational Management

The Center of Excellence in Advanced & Sustainable Manufacturing (COE-ASM) at Rochester Institute of Technology, a specialized R&D center that is supported by New York State and part of the Golisano Institute for Sustainability, is a key New York State asset for helping companies adopt Industry 4.0.

COE-ASM Director Mike Thurston and Senior Program Manager Mark Krystofik are leveraging new technologies to make Industry 4.0 more accessible to manufacturers around the state. For example, companies that work with COE-ASM can digitally simulate processes before they happen, monitor ongoing processes in real-time, and use connected assets for improved information flow. "We've done a lot of work in various manufacturing applications to figure out how to take complex data and use it for predictive operational management," Dr. Thurston says.

The support that COE-ASM offers for Industry 4.0 solutions can also help manufacturers to improve energy usage and reduce peak demand. Lean manufacturing is driving increased interest, too. "A lot of companies that want to go lean are embracing digital technologies," says Dr. Krystofik. "They can get the information that they need, act upon it, and make advancements in production and efficiency."

Optimax Systems Inc. of Ontario, N.Y., (see the Company Feature) offers a local example.

"They're pretty advanced for a smaller company," Dr. Krystofik explains. By using displays, inexpensive tablets, and in-house apps, Optimax "can see the status of the shop floor and figure out where to intervene." That's important for one of America's leading manufacturers of precision optics.

Downstate and in conjunction with ITAC, the New York Manufacturing Extension Partnership (MEP) center serving New York City, COE-ASM is offering digital manufacturing awareness workshops. "We are looking for good projects that can have a real impact," Dr. Krystofik says. "The more we can define examples of business problems that can be solved, the more companies we can help."

Some of the technologies COE-ASM is deploying were developed by the Digital Manufacturing and Design Innovation Institute (DMDII), a Chicago-based, public-private partnership that is part of the Manufacturing USA network of institutes. In New York State, Rochester Institute of Technology is a partner. "We've been involved with DMDII since it started," says Dr. Thurston.

By working with New **York State-funded** assets and innovative companies, manufacturers of all sizes can derive data-driven value.

Compliance for the Factories of the Future

Solving business problems with Industry 4.0 is not a one-size-fitsall proposition, and there are many companies with technologies or services that can help implement elements of it. Perdix Software, Inc. of Rochester works with manufacturers of all sizes to improve quality, achieve compliance, and increase profits. MOLI[™], the company's product, is an abbreviation for the Multi-Operation Lean Intelligence System[™].

"MOLI is an assistant for manufacturing," says co-founder and CEO Steven Smith.

For example, MOLI can notify the entire shop floor about quality issues in real-time and create training records that are required for ISO 9001 and ISO 13485 compliance. The system features screens on kiosks that can either travel with a worker or remain with production equipment, replacing paper "job travelers."

MOLI also integrates with enterprise resource planning (ERP) software and with shipping systems for FedEx and UPS. Perdix is building a customer relationship management (CRM) system, too.

"We're building an AI that can run a company," Smith says.

Machine learning, a branch of artificial intelligence (AI), enables predictions to be made from large amounts of data.

Today, Perdix Software's clients include Roechling Medical Rochester, part of the Medical Division within the Roechling Group, a global company with headquarters in Mannheim, Germany.

As a manufacturer of highly-engineered plastic components and finished devices for the medical industry, Roechling Medical Rochester operates an ISO 13485, ISO 9001, and FDA registered facility. Compliance is critical.

MOLI may run entire manufacturing facilities someday, but helping medical device manufacturers like Roechling Medical



Rochester meet ISO 9001 and ISO 13485 requirements is a more immediate and achievable goal.

"We're very pleased with the MOLI module that we are working with," says Joe Lenhardt, vice president of operations at Roechling Medical Rochester. "Steven Smith and his team at Perdix are great to work with, and we are developing some really useful applications to streamline our shop floor operations."

Overcoming Industry 4.0 Obstacles

Temboo, a New York City software company with tools for digital transformation, is also providing manufacturers with Industry 4.0 solutions. The Temboo Toolkit includes pre-built Internet of Things (IoT) apps and lets developers upgrade existing manufacturing equipment with IoT capabilities. IoT, an Industry 4.0 technology, is the network of physical objects with internet connectivity.

Trisala Chandaria, Temboo's co-founder and CEO, cites "the lack of IoT developers" as "one of the biggest hurdles" that SMMs face with Industry 4.0. Outside consultants can be costly, and lengthy implementation and installation timelines can delay a manufacturer's return on investment (ROI). But Temboo's Kosmos IoT System, she says, includes "code generation software and powerful machine learning capabilities" that any manufacturer's IT department can use.

Temboo's software, Chandaria says, works with "any type of hardware" so that SMMs can "quickly deploy connected sensors to existing equipment." This enables companies to "unlock the value of the data from their facilities" while achieving a faster ROI. For manufacturers, the benefits include waste reduction, automated compliance monitoring, and shop floor alerts.

Although Temboo is still seeking to partner with a New York State manufacturer, the company cites Monginis Foods Pvt. Ltd. from Mumbai, India, and Global Garden Products Italy S.p.A. as

success stories. With 14 factories, Monginis is using Temboo's IoT solutions for product loss prevention, contamination detection, food safety, ISO certification, and cold-chain storage. Global Gardens, a manufacturer of lawn and garden equipment, uses Temboo for deep machine monitoring and data analysis and aggregation.

Industry 4.0 for New York State Manufacturers

Across New York State, manufacturers in various market segments are adopting Industry 4.0 technologies. Larger companies continue to capture the headlines, but smaller manufacturers are addressing challenges and reaping the rewards of the Fourth Industrial Revolution. By working with New York State-funded assets and innovative companies, manufacturers of all sizes can derive data-driven value.

Find smart solutions that will help your company discover the value of your data. fuzehub.com/manufacturer-solutions



MANUFACTURING USA UPDATE

Manufacturing USA

ver the past several years, the U.S. government has invested in a new wave of technical assets and expertise to stimulate manufacturing innovation—including significant new capabilities in New York State. This federal program, known as Manufacturing USA, is a network of 14 different manufacturing innovation institutes.

The Manufacturing USA institutes are public-private partnerships that each have a distinct technology focus area but all work toward a common goal: to secure America's future through manufacturing innovation, education, and collaboration. The institutes focus on moving promising, early-stage research into proven capabilities ready for adoption by U.S. manufacturers. Their membership includes manufacturers and researchers from universities and government laboratories. The institutes provide members with access to state-ofthe-art facilities and equipment, as well as workforce training and skills development customized to support new technology areas. Collaboration at the institutes and across the network creates an innovation community ushering in the next generation of manufacturing supply chains located in America and employing Americans.

New York-based institutions are playing leading roles in many of the institutes, and New York State has invested in several. Three are headquartered in New York State: the American Institute for Manufacturing Integrated Photonics (AIM Photonics), the **REMADE** Institute (focused on reducing net-energy costs and material wastes and emissions in manufacturing), and the RAPID Institute (focused on chemical process intensification).

The institutes have engaged their membership in conducting R&D projects that advance their respective technology roadmaps. They are making progress in moving discoveries in U.S. universities and research laboratories to the shop floor throughout the country. Several have developed education and training programs to help prepare the workforce for emerging industries and a renewal of advance manufacturing.

The New York Manufacturing Extension Partnership (NY MEP), of which FuzeHub is a part, maintains several staff members dedicated to helping New York



American Institute for Manufacturing **Integrated Photonics (AIM Photonics) REMADE Institute – the Clean Energy** Manufacturing Innovation Institute for **Reducing Embodied-energy and Decreasing Emissions in Materials Manufacturing**

Institute

Clean Energy Smart Manufacturing Innovation Institute (CESMII) **Digital Manufacturing and Design Innovation** Institute (DMDII)

Institute for Advanced Composites Manufacturing Innovation (IACMI)

DID YOU KNOW?

small businesses

State manufacturers and technology companies leverage the institutes' research and development. This team has helped companies adopt additive manufacturing in the development of new products, implement smart and digital manufacturing on their shop floors, and position themselves to become part of the supply chains of emerging industries like integrated photonics.

To learn more and get connected with the institutes or experts in these fields, visit fuzehub.com/manufacturing-usa

MANUFACTURING USA INSITUTES

Rapid Advancement in Process Intensification Deployment (RAPID) Institute

Advanced Robotics for Manufacturing (ARM)

Out of all the Manufacturing USA Institutes, there are 830 industry members, of which 2/3 are manufacturing firms, including 361

America Makes: The National Additive Manufacturing Innovation Institute

NextFlex, America's Flexible Hybrid **Electronics Manufacturing Innovation** Institute

PowerAmerica

LIFT – Lightweight Innovations for Tomorrow

Advanced Functional Fabrics of America (AFFOA)

National Institute for Innovation in **Manufacturing Biopharmaceuticals (NIIMBL)**

BioFabUSA: The Advanced Regenerative Manufacturing Institute

The institutes' workforce and education programs have reached 28,000 people

Ask an Expert: **Cory Albrecht** on Cybersecurity

FuzeHub interviewed Cory Albrecht, director of the Advanced Institute for Manufacturing (AIM) at Mohawk Valley Community College, about his organization's work helping small companies meet cybersecurity requirements. 0^{3} AIM is part of the New York Manufacturing Extension Partnership (NY MEP) and serves manufacturers in the Mohawk Valley region.

CYBERSECURITY FOR **MANUFACTURERS**

- 38% of security breaches cost the company more than \$1 million (Deloitte).
- Small companies are not at any less risk than large ones.
- Defense contractors and many of their suppliers are now required to comply with federal cybersecurity requirements. New York State is home to over 10,000 defense contractors, of which over 1,600 are manufacturers.

their cybersecurity vulnerabilities. Contact fuzehub.com today for more information.

The Advanced Institute for Manufacturing has taken a lead in providing cybersecurity consulting to small manufacturers in New York State. What do small manufacturers need to know about cybersecurity?

The most important thing that small manufacturers need to know is that cybersecurity is not an issue that can be put on the back burner. Unfortunately, some small companies list cybersecurity as a low priority issue because they don't think they're a target for these sorts of attacks, or because they think it's going to be an expensive undertaking. The reality is that small and mediumsized manufacturers are one of the most targeted groups for cyberattacks, and there are many steps companies can take to protect themselves that cost little to nothing. A very small investment up front can help save a company from a businessclosing disaster down the line. It's also worth mentioning that cybersecurity does not just exist in the technological realm. Our risk assessments also look at the storage and protection of paper documents, prototypes, and the physical security of buildings. Attackers do not limit themselves to strictly technological attacks, and as a result, companies need to consider more than just their network security when looking to protect themselves.

Please tell us about a time or two that you've helped a manufacturer become more secure.

So far, our most prominent success stories have come from the metalworking industry. AIM's cybersecurity team recently was able

to provide cyber remediation to a manufacturer that was the victim of an attack in which we assisted in the recovery of their data and aided them in preventing a similar attack from happening again. In another instance, we were able to work with a company in a proactive fashion. We looked at its current security, met with its IT contractor, reviewed company policies, and conducted employee interviews to help determine the gaps in the company's security. Then we developed a report that outlined each issue, gave suggestions for remediation, and prioritized the order in which these issues should be resolved. In both of



Cory Albrecht, Director of The Advanced Institute for Manufacturing (AIM).

Cory Albrecht is the director of the Advanced Institute for Manufacturing (AIM). Since 2007, Cory has been assisting manufacturers in the Mohawk Valley Region through the New York Manufacturing Extension Partnership program.

these cases, the amount of money that needed to be invested in new equipment was either minimal or nothing at all, which was a surprise to them. Most of the recommendations made were amendments to company policy and additional employee training.

As with most programs that MEP centers offer throughout New York State, it is better to be proactive with cybersecurity, and not reactive to the damage and company reputation.

What makes cybersecurity such a prominent industry cluster in the Mohawk Valley? And how can the region's cybersecurity assets contribute to a strengthened, more secure manufacturing base?

One of the Mohawk Valley's strongest assets is our cybersecurity knowledge base. We have a variety of colleges that have cybersecurity academic and research programs. This, along with the strong government and military presence at the Griffiss Institute and the Air Force Research Laboratory (AFRL), allows us to communicate with some of the greatest cybersecurity minds in the world and apply that expertise to the small manufacturers in the area. The AFRL alone has more than 1,200 local employees and an annual budget exceeding \$1 billion. This investment

Here's what your company needs to know about cybersecurity risks and regulations.

Manufacturers' cybersecurity risks are increasing with the rise of connective technologies on the production floor (analytics, sensors, robotics, etc.) and the growing volumes of data companies collect from their processes.

The New York Manufacturing Extension Partnership can help small manufacturers assess and address

has also helped spur the development of a cluster of defense contractors calling the Mohawk Valley region home. This regional cyber ecosystem will continue to offer cutting-edge network and cybersecurity resources to manufacturers throughout the Mohawk Valley and New York State.

The National Institute of Standards and Technology (NIST) has issued guidance for federal agencies to ensure that sensitive federal information remains confidential when stored in non-government information systems and organizations. How do these requirements affect New York State manufacturers with Department of Defense contracts?

AIM is working to develop solutions for the new NIST 800-171 Defense Federal Acquisition Requirement that went into effect on Dec. 31, 2017. This NIST cybersecurity regulation ensures that all manufacturers that have Department of Defense contracts and are working with Controlled Unclassified Information (CUI) have a plan for cyber and network security compliance in place. Our cybersecurity team has been working with NIST and other cybersecurity resources to offer awareness, education, assessment and training to manufacturers in New York State. In order to obtain or retain a Department of Defense contract from 2018 forward, manufacturers need to be sure they are in compliance with the standards in this publication in regards to cybersecurity and information assurance.

THE NEW YORK MANUFACTURING EXTENSION PARTNERSHIP: **REAL OUTCOMES FOR REAL MANUFACTURERS**

Statewide program helps small manufacturers grow, create jobs, save costs, and become more competitive

he New York Manufacturing Extension Partnership (NY MEP), a network of organizations that provide growth and innovation services to small and mid-sized manufacturers in every corner of the state, helps hundreds of

companies a year create and retain jobs, increase profits, and save time and money. In 2017, manufacturers receiving New York

MEP expertise were able to create or retain about 5,400 jobs, boost or retain over \$600 million in sales, save over \$71 million in

their operations, and make \$213 million in new capital investments as a result of such projects.

The eleven not-for-profit organizations that comprise the NY MEP assist companies all over New York State,

providing affordable services in the areas of technology acceleration, product development and prototyping, process improvements, innovation strategies, quality control, manufacturing scaleup, supply chain assistance, and new market strategies. NY MEP is supported

Manufacturing

Extension Partnership

NY MEP's work touches every region of the state. In Western New York, Insyte Consulting recently developed a sales and marketing strategy to help a Wyoming County electrical manufacturer diversify into new markets. Insyte also helped an Erie County pressure sensor supplier to the aerospace and automotive industries upgrade its quality management systems to retain existing business and attract new clients that require ISO 9001:2015 certification. In the Capital Region, the Center for Economic Growth recently

\$929 MILLION

IN COMPANY COST SAVINGS, NEW CLIENT INVESTMENTS, TOTAL INCREASED/ **RETAINED SALES**

2017 IMPACTS] REFERENCE: NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY · MANUFACTURING EXTENSION PARTNERSHIP

MAKING AN IMPACT ON NEW YORK STATE MANUFACTURING

5,433 **JOBS**

NEW AND RETAINED

through a combination of federal and state funding: It is part of the National Institute of Standards and Technology's Hollings Manufacturing Extension Partnership and is administered by Empire State Development's Division of Science, Technology & Innovation (NYSTAR).

assisted an Albany-area bottling company to navigate the complex process of evaluating energy efficiency investments and implementing solar energy generation. The company will now save \$2.4 million in energy costs over the next 25 years.

Reference: National Institute of Standards and Technology, Manufacturing Extension Partnership (2017).

> For more information on New York MEP. visit fuzehub.com/ny-mep-homo

NY MEP CENTERS CAN BE FOUND IN **EVERY CORNER OF NEW YORK STATE:**

- Capital Region: Center for Economic Growth (CEG)
- Central New York: TDO
- Finger Lakes: NextCorps
- Long Island: Manufacturing and Technology **Resource Consortium (MTRC) at Stony Brook** University
- Mid-Hudson: Manufacturing & Technology Enterprise Center (MTEC)
- Mohawk Valley: Advanced Insitute for Manufacturing (AIM) at Mohawk Valley Community College
- New York City: Industrial and Technology Assistance **Corporation (ITAC)**
- North Country: CITEC Business Solutions
- Southern Tier: Alience for manufacturing & Technology (AM&T)
- Western New York: Insyte Consulting
- Statewide Center: Fuzehub



NORTH COUNTRY SOLUTIONS FORUM

t FuzeHub Solutions Forums, New York State Local and Statewide Resources companies make face-to-face connections with Along with FuzeHub and the event hosts, the Solutions Forum business and technical resources that receive state, local featured business and technical resources from across the region or federal funding to provide manufacturing-related and throughout New York State. Local organizations that assistance. As the statewide Manufacturing Extension Partnership met with manufacturers included the Institute for Advanced (MEP), FuzeHub holds these events around the state and in Manufacturing at Clinton Community College, whose president, conjunction with regional MEP Centers and other assets. Ray Di Pasquale, kicked-off the event.

Through a series of one-on-one meetings, companies can discover potential solutions to challenges in areas such as industrial automation, equipment financing, product design, workforce development, materials research, and manufacturing scale-up - just to name a few. Prior to the event, FuzeHub assesses each company's needs and matches attendees with the right resources.

"Our whole point is to help these companies get access to these resources," said Elena Garuc, executive director of FuzeHub, in an interview with the Press-Republican, a North Country newspaper that covered the event.

On Tuesday, June 19, 2018, approximately 25 attendees from northern New York participated in the North Country Solutions Forum at the Institute for Advanced Manufacturing at Clinton Community **College in Plattsburgh. Attendees included Create** O&P, a manufacturer of 3D printed orthotics and prosthetics, and Potsdam Sensors, a startup that is developing next-generation sensors for air quality measurements.

The North Country Solutions Forum was powered by FuzeHub and hosted by four local organizations: CITEC Business Solutions, the North Country's regional MEP Center; the Center for Advanced Materials Processing (CAMP) at Clarkson University; The Development Corporation (TDC); and the North Country Chamber of Commerce, based in Plattsburgh.

A RECAP OF FUZEHUB'S SIGNATURE EVENT FOR NYS MANUFACTURERS

Other local resources included the SUNY Canton Career Ready Education and Training Center, the regional office of the Workforce Development Institute, and the North Country Small Business Development Center.

The Center for Integrated Electric Energy Systems at Stony Brook University and the Trade Adjustment Assistance Center near Binghamton traveled a long way. The Hudson Valley Advanced Manufacturing Center at SUNY New Paltz also made the trip. From the Albany area, Empire State Development deployed resources that included experts in defense diversification and the Global NY program.

North Country manufacturers also met with the RPI Center for Automation Technologies and Systems, the Clean Energy Smart Manufacturing Innovation Institute, and the Cornell Center for Materials Research. The New York State Pollution Prevention Institute performed double-duty and also represented the Rochester Institute of Technology's Center of Excellence in Advanced and Sustainable Manufacturing.

Power Lunch

At the conclusion of the matchmaking portion of the Solutions Forum, attendees and resources alike were treated to a lunchand-learn presentation by CAMP Director Marilyn Freeman. Entitled "Advanced Manufacturing and Disruptive Manufacturing Technology," Freeman's presentation encouraged manufacturers to think critically during a time of rapid technological change.

"It's okay to be disruptive," Freeman explained, "if you have a positive impact."

> Check fuzehub.com for upcoming **Solutions Forums!**



Industry Insight: Train, Subway, & **Transit Car Manufacturing**

In FuzeHub's "Industry Insight" series, we take a look at select manufacturing industries of strategic importance to New York State—in this case, the manufacturing of train, subway, and transit cars. Read on to learn about the industry's outlook, products and markets, and supply chains, as well as how the industry's performance may provide opportunities for your business.

he manufacturers who produce industrial, mining and railroad locomotives; railroad, light-rail, subway and transit cars; railroad rolling stock; and railroad equipment make up a \$17.1 billion industry in the United States. This industry is expected to grow at a rate of 7.2 percent annually over the next five years, after contracting somewhat from 2013-2018.

This growth will be driven mostly by economy-wide rising industrial output, as most cars that are in use in the United States are for freight, carrying products like coal, grain and metal parts. Other growth factors include the expansion of passenger rail infrastructure, aging systems needing retrofitting to meet safety and emissions standards, and demand from countries with large extractive resource industries. Moreover, Buy America regulations

that affect the vast majority of U.S. rail transportation help protect U.S. producers from more intense foreign competition than would otherwise be the case.

When demand for train cars increases, expect demand to also increase for key inputs including iron and steel castings, metal pipes and tubes, roller bearings, and electrical control equipment.

New York State is home to 6.6 percent of U.S. manufacturers in this industry, the third highest concentration of all states. Neighboring Pennsylvania is home to some of the biggest locomotive manufacturers, such as GE Transportation and Brookville Equipment Corporation, offering potential business opportunities for suppliers across the border in New York. There are clusters of transportation equipment manufacturers in New York's



Southern Tier and the North Country, both of which treat this as a priority growth industry. Recently, New York City's transit authority, as well as an upstate counterpart, placed historically large equipment orders, stimulating activity throughout the industry's supply chain. Relatedly, Alstom's location in Hornell is building high-speed trains for Amtrak's Acela service line, bringing globally leading technology from Europe to the United States for the first time. Meanwhile, Plattsburgh is home to significant manufacturing operations of Bombardier and Nova Bus.

There are several disruptive technologies on the horizon with the potential to greatly impact this sector and its supply chain. These include advanced robotics; autonomous and near autonomous vehicles; energy storage; 3D printing; and advanced materials. Several research universities in New York have significant expertise in these areas. If your company manufacturers the transportation equipment inputs listed above, remember that you can contact FuzeHub to inquire about resources for adopting or advancing some of the technologies that will be important to your continued competitiveness.

This article includes market research from IBISWorld Industry Report 33651, "Train, Subway & Transit Car Manufacturing in the US," April 2018.

Infographic information source: www.ibisworld.com.



rooks' Machine Products of Unadilla, N.Y., is a national leader in aerospace stamping and forming. This thirdgeneration, family-owned business also provides machining services to companies who make everything from components for hotel lighting and security fencing to tattoo machines.

"My dad taught me not to be cornered into one market," says Bradford Brooks, the company's general manager.

Bradford "Brad" Brooks began working for the family business as a machinist more than 30 years ago. He studied architectural design and engineering in Texas and returned to upstate New York with a knowledge of computer-aided design (CAD) and computer programming. Brad also began building and racing cars at Watkins Glen, New York's home for road racing and NASCAR.

When Brad's scooter racing team needed a logo, he used AutoCAD and a wire electrical discharge machine (EDM) to craft keychains. In 1995, EDM Today magazine even featured his design in its "EDM Art" section. Brad is now retired from racing, but he's still driving the family business in new directions while continuing its winning ways.



PRODUCTS COMPRISING THE \$17.1 BILLION U.S. TRAIN, SUBWAY, & TRANSIT CAR MANUFACTURING INDUSTRY



Brooks' Vachine Products

BRADFORD BROOKS

From Machine Shop to Precision Manufacturer

Brad's grandfather, Fay Brooks, started Brooks' Machine Products in 1946 while working as a pressroom supervisor at a subsidiary of Bendix in Sidney, N.Y. Fay wanted to support and produce his own inventions, but he also provided machine shop services to local companies. After Fay died in 1970, his son Walter became president. During the 1980s, Walter expanded the business and hired his son Brad.

Technically, we're a machine shop," Brooks says, "but we prefer the terms 'contract manufacturer' and 'solutions engineering.'

Today, Brooks' Machine Products supplies machined parts to Continental Motors, a major manufacturer of aircraft engines. The Unadilla company also supplies Amphenol, one of the world's largest interconnect manufacturers for aerospace and defense.

"A lot of stamping and forming businesses lack the ability to do small, precision parts," Brad says. "We can make the tooling, and we can make the parts."

As part of Amphenol's supply chain, Brooks' Machine Products once hosted a site visit with players from McDonnell Douglas, Boeing, and NASA.

"They were very impressed by the cleanliness and the organization of our shop," Brad says.

Other stamping companies specialize in "big heavy-duty work," he adds, but "we do fine MIL-SPEC parts," along with FAR 21 work for aircraft components.

Machined Parts, Tooling, and Panel Punches

During the 1990s, Brooks' Machine Products won a contract with the company that supplied interconnects for the Space Shuttle. That NASA program ended, but the Unadilla business remains strong because of its diversified customer base and precision-machining expertise.

We help small operations and large national corporations, and do precise work with stainless steel, aluminum, copper, brass and most other metals.

Brooks' Machine Products also supplies machined parts to small-to-medium manufacturers like Custom Electronics of Oneonta, another New York State company that Brad's grandfather helped get started. Before moving to its own building in 1967, Custom Electronics operated out of a small section of Fay Brooks' original machine shop. Today, the electronics manufacturer has 50 employees.

Brooks' Machine Products is also selling more panel punches, or knock-out punches, which are hand tools for working with sheet metal.

"The competition makes a similar tool," Brad says, "but it's more complex, three times the price, and most of it is made in Europe." By contrast, the panel punch that's made in Unadilla is fully designed and made in the United States.

Forging Connections

Managing a manufacturing operation is time-consuming, but that hasn't stopped Brad from serving his community. Like his



Brooks' Machine Products stamps parts like this from beryllium copper.

father Walt, Brad is a past president of the Unadilla Rotary. He's also a past chair of the Chenango-Delaware-Otsego Workforce Development Board, which coordinates employment and training resources across three counties. Brad's son Mark is also working in the company and training to be the fourth generation leadership of this family business.

As general manager of Brooks' Machine Products, Bradford Brooks has also connected with resources like the Workforce Development Institute (WDI). Several years ago, his company was awarded a WDI grant that helped pay for a laser marking machine. Brad has also attended several FuzeHub Solutions Forums to explore how his company can leverage New York's other innovation assets.



Brooks' Machine Products is an important part of the Unadilla business community.



COMPETITION 2018 NOVEMBER 7-8

FuzeHub enters its second year hosting the Commercialization Competition, part of the **Jeff Lawrence Innovation Fund**. The **\$350,000 Commercialization Competition** is a two-day event in Albany, NY that will feature a pitch competition showcasing innovative early stage companies, panel discussions and networking opportunities. Join us and help grow the entrepreneurial network here in New York State by helping to launch these businesses toward success.

Up to seven companies will be awarded \$50,000 each to help move their projects forward.



Empire State Manufacturing and Innovation: Issue 1, Fall 2018





he Arc, Oneida-Lewis Chapter, serves people with intellectual and developmental disabilities in central and northern New York. As part of its mission, this community-based organization provides employment opportunities for the people it serves through Progress Industries, an integrated workshop specializing in assembly, packaging, and kitting.

Today, Progress Industries employs people in Utica, operates a 43,000-sq. ft. warehouse in Marcy, and maintains a facility in Lewis County that performs light manufacturing. All three locations are busy, but they are also eager to do more.

"We have the capability and desire to take on more manufacturing work," says Louis Manzo, director of business development. "We are willing to work with customers to purchase machines based on need and can source materials for them."

Because of new requirements, organizations that once operated as "sheltered workshops" must change their business models. To achieve this transformation, Progress Industries is working with the Manufacturing Extension Partnership (MEP) network.

Meeting Demand and Ready to Do More

In Utica, Progress Industries houses a high-speed shrink wrap assembly machine that can process thousands of operations per day.

"One application," Manzo explains, "is for a book distributor who needs to put several books together for shipment."

The Utica location also has band sealing and inserting equipment. Manzo's office is in Utica, but he's also focused on finding opportunities for the Marcy and Lewis County operations.

At the warehouse in Marcy, workers perform kitting for a food and beverage manufacturer. Bottles are shipped to the facility and then put into cardboard boxes for distribution. The warehouse also separates and salvages plastic and metal parts that would otherwise add to the customer's waste stream. Contract-based funding supported the opening of this warehouse last fall, but the facility still has available space.

With more work," Manzo says, "we could have another full-time assembly line running there.

In Lewis County, employees use bandsaws and jigsaws to cut pieces of plastic and perform other light manufacturing tasks. Manzo would like to find more customers for this rural workshop, with the goal being "more growth plus more steady work." In total, Progress Industries has approximately 60 customers; however, a subset of companies provides most of the opportunities.

"Warehousing can be an entry point," Manzo says, but "many people don't realize we can provide true manufacturing and assembly work, too."

Transformations and Partnerships

To pursue its goals, the Arc, Oneida-Lewis Chapter, took advantage of an opportunity from the New York State Rehabilitation Association (NYSRA), now part of the New York Alliance for Inclusion and Innovation. As a NYSRA member, The





An employee packages bottles for Progress Industries.

Arc was eligible to receive consulting services through its local MEP center, the Advanced Institute of Manufacturing (AIM) in Utica.

Everton Henriques, FuzeHub's New York MEP solutions director, visited Manzo and helped facilitate this connection. Cory Albrecht, AIM's director, then met with The Arc's executive team along with AIM's Sean Crossnan. After the initial discovery phase was complete, The Arc engaged Bob Dunn, an AIM consultant with decades of business development experience.

"Now," Manzo explains, "we can directly target companies instead of waiting for businesses to come to us."

Business transformations can be challenging, but Manzo recognized The Arc's new requirements as a "good opportunity to determine not just how we can do things better, but how we can grow."

For Manzo, who left a job in insurance to begin his Arc career at Progress Industries six years ago, the business transformation has been rewarding in many ways. "The evolution," as he calls it, has

> deepened his involvement in both production and pricing. The Arc has also won government contracts at both the state and federal levels.

"We had to transform our business," Manzo says, "to become more integrated into the community."

New York State Programs for Manufacturers:

Manufacturers are busy with the day-to-day operations of their businesses, making it difficult to have comprehensive awareness of the state programs available to them. New York State offers a variety of programs designed to help manufacturers maintain profitability and expand. FuzeHub is pleased to present this Resource Report for companies to use as a reference.

Empire State Manufacturing and Innovation: Issue 1, Fall 2018

A FuzeHub Resource Report

New York State Programs for Manufacturers:

A FuzeHub Resource Report

New York Manufacturing Extension Partnership: Services for Small Manufacturers

The New York Manufacturing Extension Partnership (NY MEP) is a network of organizations that provide growth and innovation services to small and midsized manufacturers in every corner of the state to help them create and retain jobs, increase profits, and save time and money.

NY MEP is administered by Empire State Development, New York's economic development agency, and is part of the National Institute of Standards and Technology's Hollings Manufacturing Extension Partnership.

NY MEP provides a variety of services:

- Innovation strategies
- Process improvements
- Quality control
- Manufacturing scale-up
- Sustainable manufacturing
- Supply chain assistance
- Technology acceleration
- New market strategies
- Product development and prototyping
- Entrepreneurial and start-up assistance, including financing and grant information
- Other services tailored to key New York industry clusters

Manufacturers can find their local NY MEP center by contacting FuzeHub, the statewide New York MEP center, for a consultation to discuss their needs and to be matched with the appropriate resource.

In addition, FuzeHub offers Manufacturing Grants (*fuzehub.com/innovation-fund*) designed to spur technology development and commercialization across New York State. Non-profit organizations apply for

these funds to help reduce the costs to manufacturers of undertaking projects like prototype development, manufacturing scale-up, and other projects to advance production capabilities.

New York State Innovation Assets: Assisting Manufacturers with Technology Development

Empire State Development's Division of Science, Technology & Innovation (NYSTAR) supports 15 Centers for Advanced Technology and 13 Centers of Excellence. These university-based research centers are charged with working with businesses on R&D, commercialization, and adoption of new technologies. Each center is focused on a field of strategic importance to manufacturers-for example, ceramics, materials, biomedicine, energy systems, automation, electronics, sensors, data science, 3D printing, nanotechnology, and sustainable manufacturing. NYSTAR also supports a number of other technology development centers with matching funds for their federal grants, including the National Science Foundation-funded Cornell Center for Materials Research.

Manufacturers can also take advantage of state-supported high performance computing assets to optimize their engineering processes and accelerate product developments or improvements using state-of-the-art simulation models.

Companies in need of guidance in the areas of intellectual property and regulation—for example, a manufacturer seeking to bring a new medical device to market—can use the services of the New York State Science & Technology Law Center.

Young companies can also take advantage of NYSTAR-supported Innovation Hot Spots and New York State Certified Business Incubators. These 30 organizations offer support to manufacturers and other companies, including physical space, access to capital, mentoring, networking connections, prototype development, and access to technical services. Innovation Hot Spots also offer certain tax benefits to client businesses.

Consolidated Funding Application:

New York State offers a single channel through which to access a wide variety of grant programs available from multiple agencies: the Consolidated Funding Application (CFA). The application is open every summer. Grants that manufacturers can apply for directly have included the following:

- Empire State Development Grant Funds (capital grant funding for companies making investments leading to job creation)
- Excelsior Jobs Program (tax credits for firms creating or retaining jobs or making significant investments)
- NYSERDA Energy Efficiency **Programs** (engineering analysis to help companies make informed energy decisions; energy assessments for small commercial enterprises; technical and financial support for installing energy-efficient electrical equipment in new and renovated industrial buildings; financial support for other energy efficiency improvements in industrial facilities; and performance-based assistance to manufacturers implementing energy efficiency and process improvements)
- ReCharge New York (allocations of lower-cost electricity to businesses planning expansions)
- Workforce Development (grants to offset the cost of training new and existing employees)

Global NY: Helping Manufacturers Boost Exports

Global NY, a program of Empire State Development, offers resources to offset the costs of pursuing new export markets. These include rolling grants of up to \$25,000 to companies for market customization and product adaptation or for participating in trade missions and workshops. Global NY also administers the federally supported State Trade & Export Promotion (STEP) program, through which companies—especially manufacturers—can access funds to participate in foreign trade missions and sales trips. In 2017, New York distributed \$602,000 in STEP funds, led trade missions to Indonesia and Vietnam, and coordinated industry-specific exhibitions in South Africa and China.

START-UP NY: Tax-Free Operation Near College Campuses

START-UP NY offers new and expanding businesses the opportunity to operate tax-free for 10 years on or near eligible university or college campuses in New York State. Partnering with these schools gives businesses direct access to advanced research laboratories, development resources, and experts in key industries.

Other Economic Development Incentives and Programs for Businesses

Empire State Development (ESD) offers a host of other channels through which manufacturers can explore potential incentives, access loans and capital, consult with business mentors, position themselves for government procurement opportunities, and otherwise improve their business prospects. For example, manufacturers can take advantage of direct loans from the New York State Job Development Authority when undertaking capital expansions and equipment purchases, lowering their exposure to private financing. Some programs are focused on the needs of small businesses and/or minority- or woman-owned businesses. A call to your ESD regional office is the best way to start exploring these options.

On a related note, New York State since 2015 has maintained a zero percent corporate tax rate on eligible manufacturers

Workforce Development Institute: Interactive Grants

New York is fortunate to have this unique organization providing targeted manufacturing growth solutions throughout the state. Among its programs are interactive grants through which regional WDI staff work directly with a business to develop a tailored response to a particular workforce or growth challenge. Manufacturing and energy are WDI's biggest areas of focus, and it is highly flexible and streamlined in delivering assistance to companies.

New York State Energy Research and Development Authority (NYSERDA): Facilitating Investments in Energy Efficiency

Manufacturers interested in resources for making growth-oriented investments in energy efficiency should investigate NYSERDA's full range of offerings to industry.

NYS Department of Environmental Conservation: Assistance with Greening Your Business

As part of the Department of Environmental Conservation (DEC)'s mandate to protect and enhance the



environment, the agency partners with companies to help them find ways to make their businesses more environmentally sustainable.

NYS Pollution Prevention Institute: Resources for Sustainability in Manufacturing

DEC also helps fund the New York State Pollution Prevention Institute (NYSP2I), an organization that helps companies implement cost-effective sustainability solutions, leveraging new technologies from higher education institutions across the state.

Workforce Development Initiatives for Manufacturing

A common refrain today is that manufacturers find it increasingly difficult to hire a qualified workforce. However, there are many initiatives underway to address the manufacturing workforce shortage at various stages of the pipeline, in every corner of the state. This FuzeHub blog post describes some of the efforts that companies and economic development organizations are pursuing to help bridge the skills gap and prepare for future growth: fuzehub.com/fuzehub-blog/ manufacturing-workforce-programsacross-new-york.

OVERWHELMED?

FUZEHUB CAN HELP YOU NAVIGATE STATE RESOURCES

If you're a manufacturer, submit a request to FuzeHub (fuzehub.com) to receive a free consultation and guidance from our matching specialists regarding resources that best meet your needs.



OCT

23-24

AT THE 2018 NY

ANNUAL MEETING

network here in New York State.

WHAT'S NEXT UPCOMING FUZEHUB EVENTS

A FUZEHUB WEBINAR: ADVANCED ELECTRONICS AND ENERGY SYSTEMS

This webinar will be the fourth presentation in the four-part Advanced Electronics Business Connection Forum webinar series. Tune in and connect with emergy systems innovators.

b fuzehub.com/webinar-electronicsb2b



WEBINAR: ADVANCED ELECTRONICS & ENERGY SYSTEMS

EMERGING TECHNOLOGY SHOWCASE & NYSTAR ANNUAL MEETING 2018

Learn about the capabilities, expertise, products, and processes that are defining the next generation of manufacturing, and explore how your organization can take advantage of the opportunities they are creating.

b fuzehub.com/emerging-tech-2018



FuzeHub Educates Hardware Innovators for Success in Manufacturing

n 2018, FuzeHub launched a new program to help New York State cleantech innovators succeed on their path to manufacturing the products. Using the Build4Scale™ curriculum recently developed by the U.S. Department of Energy (DOE), FuzeHub and its partners across the state are training hardware start-up companies to avoid the common pitfalls of product design by teaching them manufacturing design fundamentals in the early stages of prototype development, as well as providing them with the know-how they need to work with manufactures.



Dan Radomsk æy developer Build4Scale

FuzeHub was one of four organizations nationwide to win the DOE's American Inventions Made Onshore (AIM Onshore) prize competition and is using the award funds to conduct an initial series of training workshops in Buffalo, Binghamton, and Long Island. Dan Radomski, who was a key Build4Scale curriculum developer, is serving as the lead instructor.

FuzeHub leverages the manufacturing expertise and longstanding manufacturing networks of the New York Manufacturing Extension Partnership (NY MEP) to advance the goal of helping energy technology innovators close the manufacturing-readiness gap. To ensure that participating start-ups receive needed support on their pathway to domestic manufacturing, FuzeHub is partnering with its regional NY MEP counterparts, initially including Buffalo-based Insyte Consulting, the Binghamton-based Alliance for Manufacturing & Technology, and the Stony Brookbased Manufacturing and Technology Resource Consortium. Additionally, FuzeHub partners frequently with business incubators across New York State, and it is also collaborating with the Long Island-based Clean Energy Business Incubator Program (CEBIP), the Southern Tier Clean Energy Incubator, Launch NY, and other organizations to identify young companies that can benefit most from the training.

Going forward, FuzeHub looks forward to building on this program to serve hardware start-ups in all industries, beyond just cleantech. New York State is a rich environment for the development of new technologies, and FuzeHub and NY MEP are well positioned to help ensure that entrepreneurs are successful in bringing their innovations to production here in the Empire State.

MAGE: ISTOCK.COM/SARAH5

fuzehub.com/commercialization-competition

FUZEHUB COMMERCIALIZATION COMPETITION 2018

showcasing innovative early stage companies, panel discussions and

networking opportunities. Join us and help grow the entrepreneurial

This two-day event in Albany, NY will feature a pitch competition

Empire State Manufacturing and Innovation: Issue 1, Fall 2018



FALL 2018 WORKSHOPS:

Buffalo Long Island Binghamton

For more information, visit www.fuzehub.com/build4scale-ny



i, a for **FuzeHub** P.O. Box 1186 Albany, NY 12210





FuzeHub will connect you with resources that you need to help your business grow.

fuzehub.com/manufacturer-solutions