What do metal production and fabrication companies see in the Cleveland Plus region? They see employment opportunities, quality regional institutions, and an endless flow of talent to help their metals operations grow.
Additive manufacturing (AM) represents the future of the manufacturing industry and Northeast Ohio is at the center of AM innovation. Home to America Makes, the national accelerator for additive manufacturing and 3D printing, Northeast Ohio is uniquely-positioned to help your business adopt and leverage AM technologies. With a strong manufacturing base, a variety of university and institutional resources, as well as connections to end-user markets already using 3D printing technology (like biomedical and aerospace), Northeast Ohio continues to build a thriving AM cluster that is progressively turning the region into an additive manufacturing hub.

A recent study conducted by the Youngstown Business Incubator, MAGNET (the Manufacturing Advocacy and Growth Network), America Makes and Team NEO looked at the opportunities additive manufacturing presents. What follows is a summarized version of the study’s findings.

This guide will highlight how, as a metals-related business, you can leverage Northeast Ohio’s additive manufacturing strengths to become more competitive in the global economy. To learn more about the region’s AM strengths, please visit: neohioamcluster.org.

Global Additive Manufacturing Landscape and Market Opportunities:

Additive manufacturing is forecasted to remain on a sizeable global growth trajectory over the next several years:

- Industry analysts, Wohlers Associates estimated in 2015 a global market of more than $5.2 billion for direct products and services, with an additional $1.8 billion in indirect revenue from in-house production, for a total market of $7 billion.

- This represents a 25% compound annual growth rate (CAGR), with most analysts predicting similar growth through 2020.

The tooling industry is projected to reap the greatest economic benefits:

- A recent study sized the U.S. AM tooling opportunity at $8.8 billion by 2020.
- Ohio is 2nd in the U.S. in tool, die & mold output with a 12% share, meaning that AM tooling production could represent a $1 billion sector in Ohio by 2020.
The Northeast Ohio Advantage:

- High concentration of universities training three-dimensional printing (3DP) design talent
- Historically strong manufacturing base and associated workforce
- World-class materials and biomedical assets
- Growing presence of innovators and innovation service providers

Northeast Ohio AM Organizations & Assets:

Organizations & Institutions:
Northeast Ohio is progressively developing an additive manufacturing network that is helping to position the region as the epicenter for AM innovation. Below are many of the organizations and institutions that are fueling Northeast Ohio’s expertise and growth:

Regional Economic Development and Entrepreneurial Support Organizations:
- America Makes provides a linking network of public and private entities committed to advancing the technology and industry for Additive manufacturing.
- BioEnterprise provides entrepreneurial support to high-technology companies which specialize in bio-science.
- JumpStart is a connected network of public, private and nonprofit entities throughout Northeast Ohio focused on providing support to entrepreneurs and fostering environments to facilitate their growth.
- MAGNET (Manufacturing Advocacy and Growth Network) educates, supports, and champions manufacturing in Northeast Ohio.
- Team NEO is an economic development organization focused on creating jobs and helping businesses thrive in Northeast Ohio.
- Youngstown Business Incubator facilitates the creation of high-value businesses through collaborative partnerships, assisting with commercialization process, counseling on go-to market strategies, and facilitating networking and funding opportunities.

Higher Education Institutions:
- Lorain County Community College - Smart Center
- Cuyahoga Community College - Digital Design and Manufacturing Curriculum
- Case Western Reserve University – Additive Manufacturing Studio in think[box]
- Youngstown State University – Center for Innovation in Advanced Manufacturing (CIAM)
Private Sector Organizations and National Associations:

- **ASM International** - World’s largest association of metals-centric materials, engineers and scientists
- **SME** – Dedicated to advancing and educating the manufacturing industry
- **Alliance for Working Together (AWT)** – A consortium of 75+ manufacturing companies working on the sustainability of manufacturing in the community

Northeast Ohio – The Right Location, Offering the Right Resources at the Right Time

**ENTREPRENEURIAL SUPPORT**

- **The Jumpstart Entrepreneurial Network**: A whole host of interconnected business incubators which have additive manufacturing programs – these include Youngstown Business Incubator, Akron Global Business Incubator, the Tech Belt Energy Innovation Center, The Incubator at MAGNET, Braintree Business Development Center, Austen BioInnovation Institute and BioEnterprise.
- **State supported investment programs**, such as Valley Growth Ventures, GLIDE Innovation Fund, North Coast Angel Fund, and the Akron ARCHAngels
- **Seeker-Solver Programs** coordinated through Team NEO that help connect small, emerging companies with anchor institutions for their mutual benefit.

**TECHNOLOGY ADOPTION**

- **ATAP** – Advanced Tooling Acceleration Program – Provides demonstrations on how to implement additive into low volume tooling
- **P3N (Precision Printed Parts Network)** – Educating business owners in the metal casting industry on the value of additive and how to implement it into their business
- **SANDCORE** – Champion the technology adoption of 3D printing for the metal casting industry.
- **MAGNET MEP** - Working to promote advanced industry and offer growth opportunities to inventive businesses and individuals through a team of expert engineers and growth advisers who help clients better understand additive manufacturing methods and how they can be applied practically.
Value Chain

With a robust value chain already in place, there is great opportunity for companies who decide to pursue additive manufacturing in Northeast Ohio. As such, the study identified 165 distinct companies and organizations directly involved in the AM supply chain. These assets were catalogued as having direct involvement in specific sectors of the AM supply chain; 35 companies were identified as having involvement in more than one sector. The following is a breakdown of the value chain segments identified in the study:

<table>
<thead>
<tr>
<th>Supply Chain</th>
<th># of Companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>85</td>
</tr>
<tr>
<td>Materials</td>
<td>19</td>
</tr>
<tr>
<td>Workforce</td>
<td>19</td>
</tr>
<tr>
<td>Third Party Research &amp; Development</td>
<td>18</td>
</tr>
<tr>
<td>Systems/System Parts</td>
<td>15</td>
</tr>
<tr>
<td>Design/Engineering</td>
<td>14</td>
</tr>
<tr>
<td>Third Party Testing</td>
<td>9</td>
</tr>
<tr>
<td>Post Processing</td>
<td>7</td>
</tr>
<tr>
<td>Sourcing</td>
<td>6</td>
</tr>
<tr>
<td>Value Added</td>
<td>3</td>
</tr>
</tbody>
</table>

Post-Processing: 4%
R&D: 9%
Workforce: 9%
Testing: 4%
Materials: 11%
Systems/Parts: 7%
Design/Engineering: 8%
Production: 44% (prototypes, parts, tooling)
End-Users

As the study notes, the biomedical and aerospace industries represent the lead end-user markets for additive manufacturing – two industries that are core to Northeast Ohio. In 2015, the aerospace and medical device industries were the primary drivers of the region’s tooling sector. To that end, the aerospace and medical device industries saw an 80% growth in metal usage in 2015, with revenue reaching nearly $88 million. By all indications, the sale of metals for AM purposes will continue to grow at a healthy rate in the years ahead.

○ **Biomedical Assets:**

Northeast Ohio is rich in biomedical assets, with world class hospitals that include the Cleveland Clinic, University Hospitals, NEOMED and Akron Children’s Hospital. The region also boasts major biomedical device OEMs such as Steris, Invacare, GoJo, GE Healthcare, Siemens, and Philips, as well as major research institutions that include Case Western Reserve University, the University of Akron and the Lerner Research Institute. Other assets include the region’s vibrant startup community fostered by organizations like BioEnterprise in Cleveland and the Austen BioInnovation Institute in Akron.

○ **Aerospace Assets:**

Globally, the aerospace industry has been the lead adopter of AM for finished part production, with hundreds of AM parts incorporated by Boeing and Airbus. This has been a significant growth sector for metal part production, for both mission critical and less critical interior components. Value drivers include weight reduction, parts consolidation and design-driven performance enhancements. However, AM part production applications in aerospace are limited primarily to Tier 1 suppliers such as GE, Alcoa, Pratt and Aerojet.

Interested in learning more about the benefits of adopting AM technologies to grow your business? Please contact:

Tim Fahey
Vice President, Industry and Innovation
tfahey@teamneo.org
216-363-6886