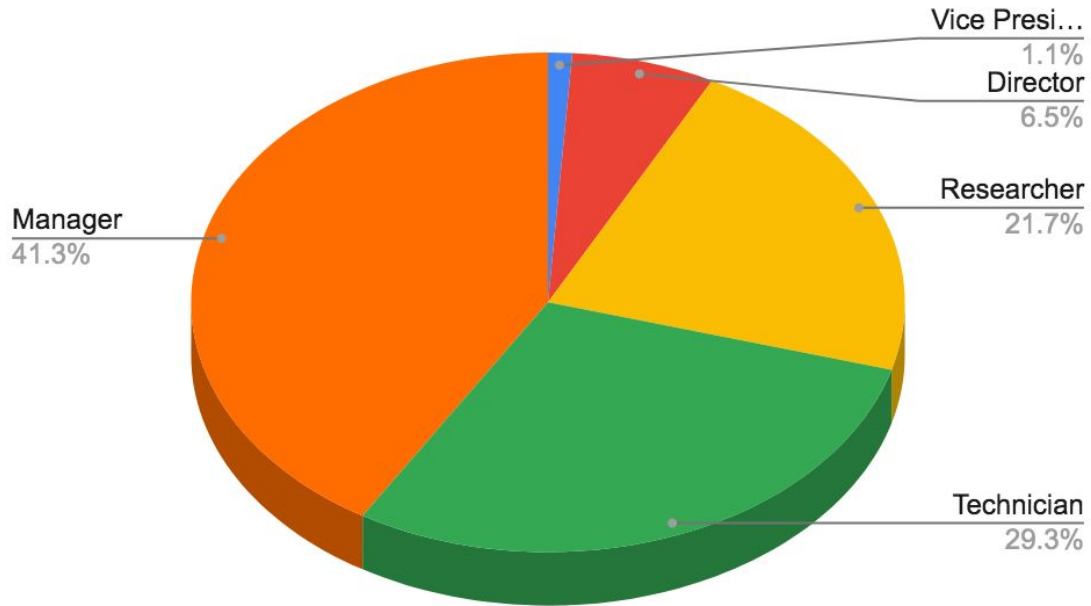


Additive Manufacturing Job Openings by Title

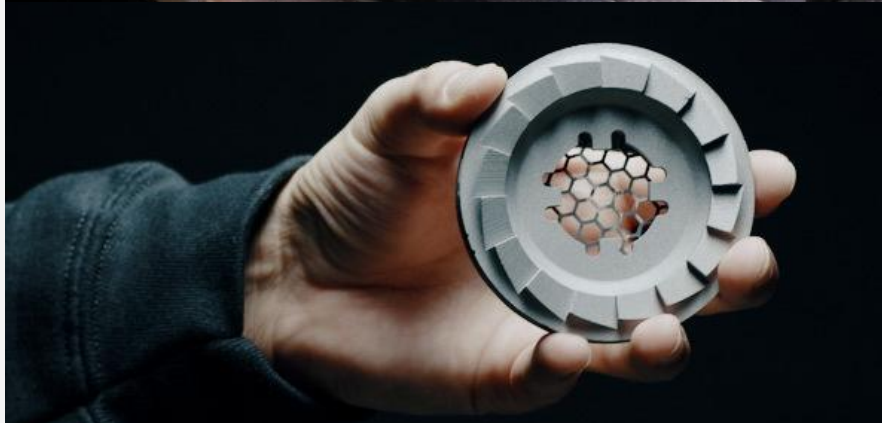


The Additive Manufacturing Job Market: Goals for Job Applicants

Introduction

Much has been said about the projections for additive manufacturing (AM) demand in the coming years. The size of the projected demand depends on the particular market analysis. However, all are in agreement that, even post COVID, the Global AM Market is expected to increase by a factor of 10 by 2025. The major driving factors of the Global AM Market are believed to be the huge application area, financial support from governments; and rapid product growth at a low cost.

We do not however hear much about one of the major constraints on AM adoption. In order, to realize the full potential of AM, manufacturing organizations must have a capable and skilled AM workforce. In this small study, we examined the job descriptions from companies, currently hiring for AM, for commonalities in their AM related job requirements. The insights from this analysis can be used by persons preparing for a career in AM or as goals for educational institutions considering adding AM training programs.

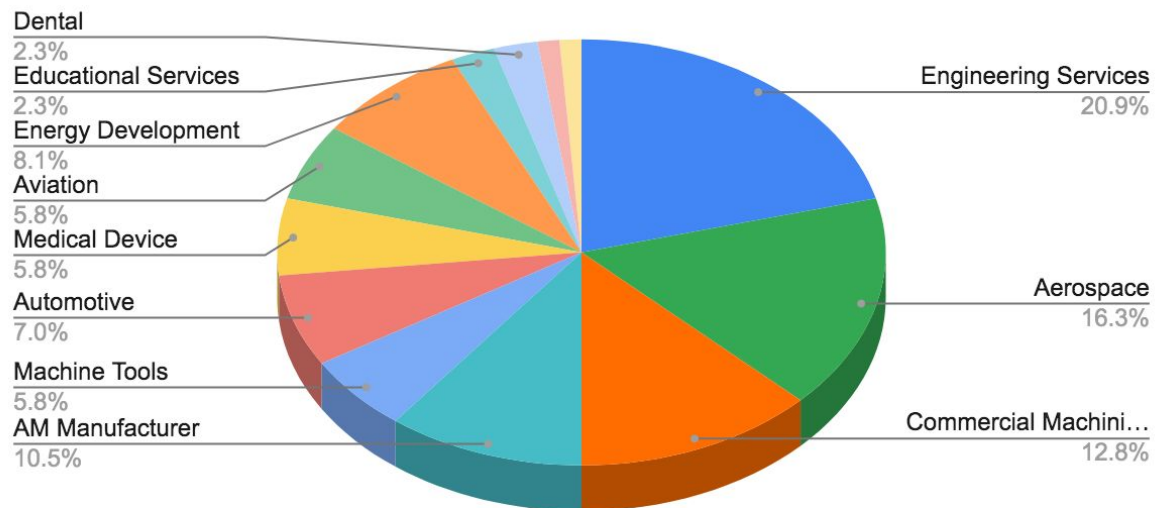


Methodology

In order to examine the current job market in AM, a google search was performed using the keywords “Additive Manufacturing Jobs”. The resulting jobs openings were then pared down to remove duplicates. After a list of 92 unique job openings were obtained corresponding to publication from December 1, 2020 to January 22, 2021; the corresponding job descriptions and were examined for commonalities in AM related requirements and the results were organized using the following criteria:

- 1. Industry-** All the companies was categorized by industry using the company’s self identified SIC code identifier, with the exception of companies that manufacture additive manufacturing machines. AM manufacturers were separated out into their own category regardless of their self identified SIC Codes.
 - AM Manufacturer
 - Automotive
 - Aviation
 - Commercial Machining & Equipment
 - Dental
 - Educational Services
 - Electrical Apparatus
 - Energy Development
 - Engineering Services
 - Investment Firm
 - Machine Tools
 - Medical Device
 - Metal Products
 - Oil & Gas
 - Physicians & Mental Health Specialist
 - Research and Development in the Physical, Engineering, and Life Sciences
- 2. Material Group-** In order to get an idea of the relative importance of material group in the job openings; we tallied all the material groups that would be used by the successful candidate in their new role. We found *metal, polymer, ceramic, and composites* listed.
- 3. Primary Role-** A list of all the roles that were mentioned in the job description data set was tabulated. A primary role was determined, for each job description, by the emphasis of that role in the description. In this category only one entry per company was allowed.
 - Business Development
 - Design (software)
 - Education
 - Machine Operations
 - Product Development
 - Production
 - Quality
 - Sales
- 4. AM Related Requirements-** Job requirements related to AM were tabulated for a simplified list of 8 overall requirements. This requirements set could easily have been subdivided further but we resisted the urge to do so as we believe that we could gather insights without further subdivision. In this category multiple entries were possible.
 - AM Certification
 - AM Experience: hands on experience with AM.
 - AM/CAD Expertise:CAD expertise with an emphasis on AM design rules.
 - CNC: to be used in AM post processing.
 - Engineering Degree
 - Knowledge in AM: theoretical knowledge of AM.
 - Metallurgy of AM:advanced knowledge of metallurgy related to AM.
 - Scanning Experience: experience using optical scanners for reverse engineering of parts.
- 5. Job Title-** The following job titles were obtained directly from the job descriptions:
Director, Manager, Researcher, Technician, and Vice President.

Additive Manufacturing Job Openings by Industry



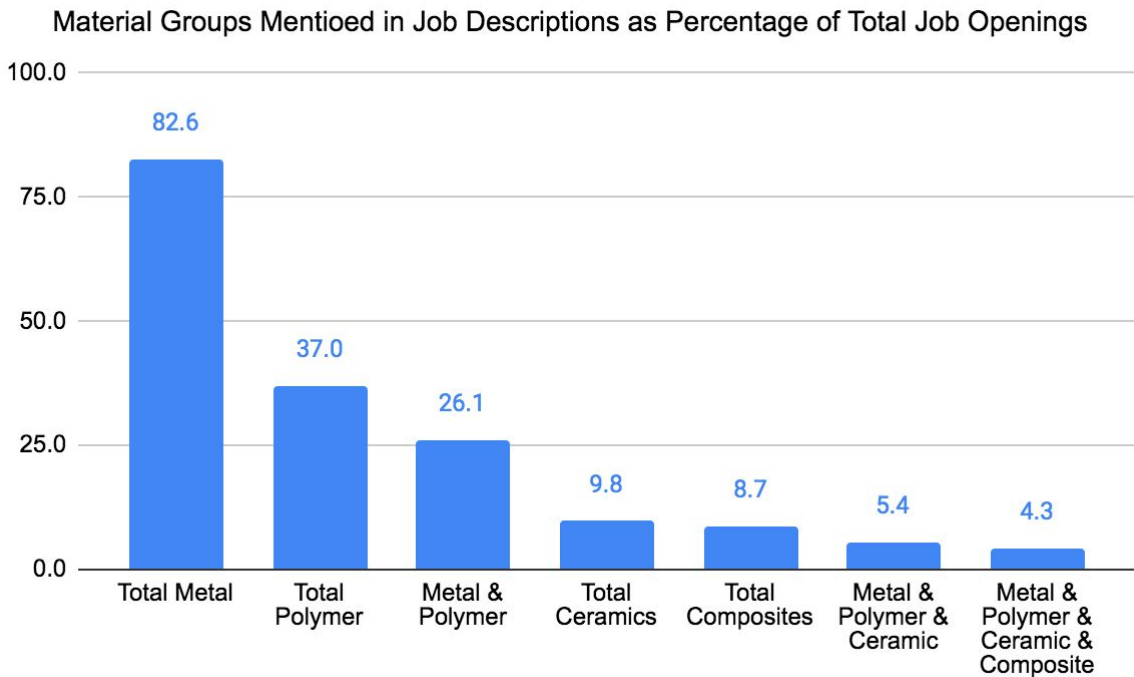
Industry

The main takeaway from the analysis by industry is that there is a diversity in the industries hiring for AM. Companies manufacturing AM machines naturally seek candidates in the AM arena and for this reason they were separated out. However, in this data set they are not the largest sector seeking AM hires (10.5%). Engineering Services (20.9%), Aerospace (16.3%) and Commercial Machining & Equipment (12.8%) have greater percentages of job openings. Aerospace and Commercial Machining were two of the early adopters of AM. Engineering Services are companies that are providing AM solutions to a variety of industries including aerospace, government, automotive etc through contracts. Could it be that the strong showing from Engineering Services is because many companies are not ready to take the AM plunge yet and feel safer outsourcing this technology to Engineering Services? The expectation is that AM will be adopted across many more industries and this data set shows the beginnings of the process unfolding.

Applied Technical Services

Material: Copper
Scale: 100 μm

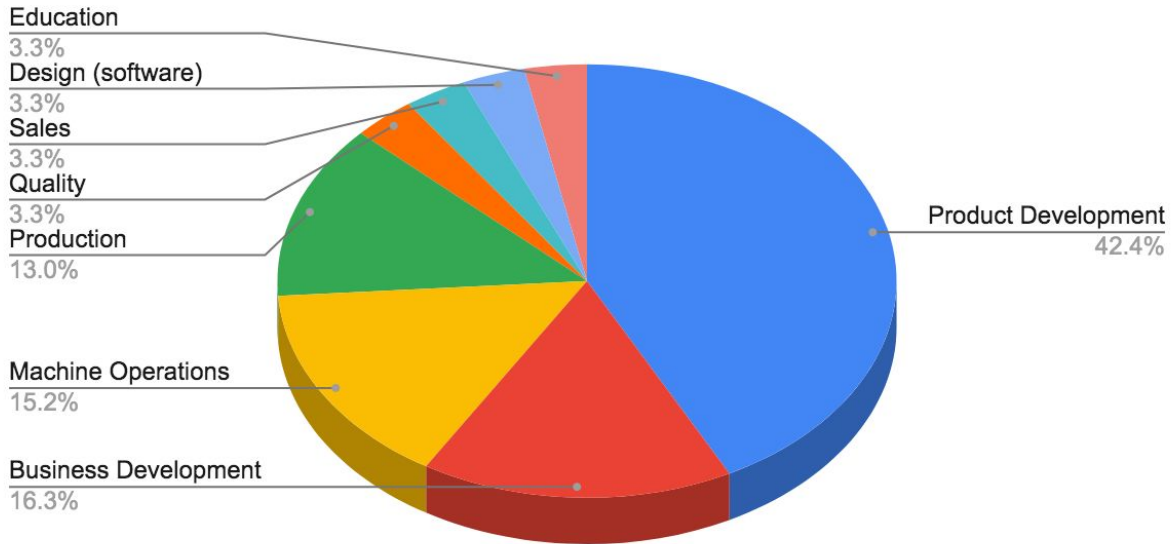
Desktop Metal Studio System™



Material Group

Instead of tabulating specific AM technologies, we elected to keep things simple and tabulate the mention of any material group. In this category multiple entries per job description were possible. This data set was dominated by mentions of Metal (82.6%) with total polymer mentions coming in second (37.0%), and metal & polymer mentions (26.1%) third. A smaller percentage of job descriptions mentioned Ceramics (9.8%) and Composites (8.7%). Metal mentions overlapping with Polymer & Ceramics mentions were found in 5.4 % of the job descriptions, and in 4.3%, all four material group were mentioned.

Primary Roles from Additive Manufacturing Job Descriptions



Primary Role

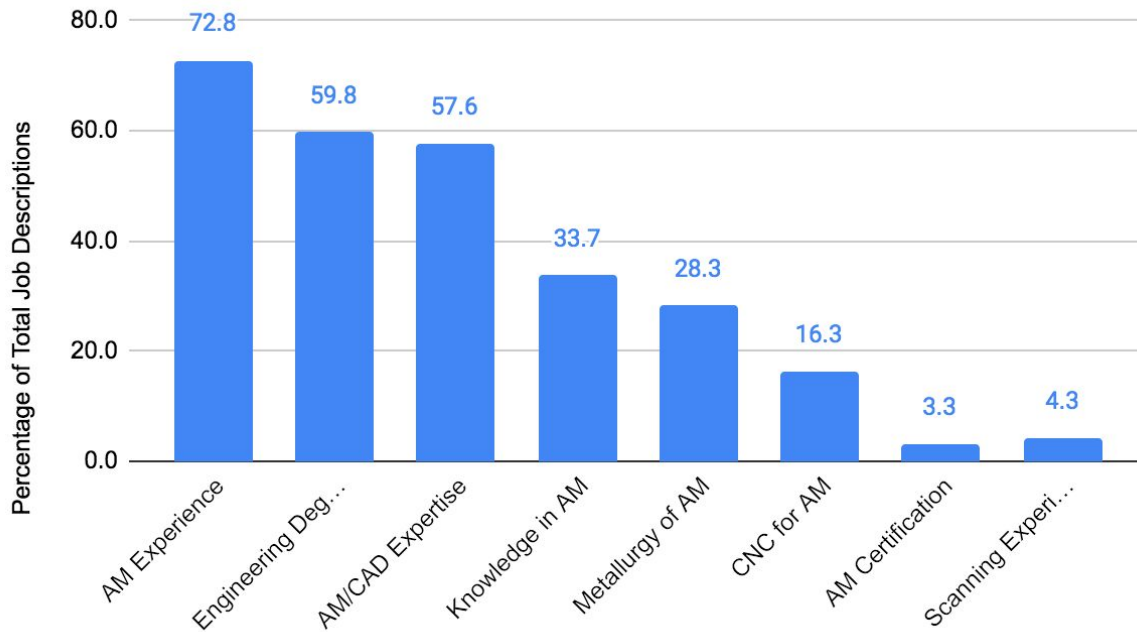
(see Methodology for Definition)

The data showed that companies are looking for hires that will perform a primary role along with variety of subroles within the AM team. Product development (42.4%) was the role most companies are seeking to fill. Business Development at (16.3%) indicates that these companies that have committed to AM and are hiring strategists to lead these initiatives. The large percentage of these sectors taken together (58.7%) is in keeping with the widespread belief that AM is at an inflection point where companies are adopting the technology but need to develop the technology to meet their own needs. The third and fourth sectors were Machine Operations (15.2%) and Production (13.0%), respectively. A primary role that we expect to grow significantly with further AM adoption is Quality (3.3%). While Quality Control was mentioned in conjunction with several of the primary roles outlined above, we believe that as AM production gets more normalized through product and business development, there will be much more emphasis on hiring people whose primary role will be to certify end use parts for quality.

How Additive Manufacturing is Redefining Product Development in Manufacturing

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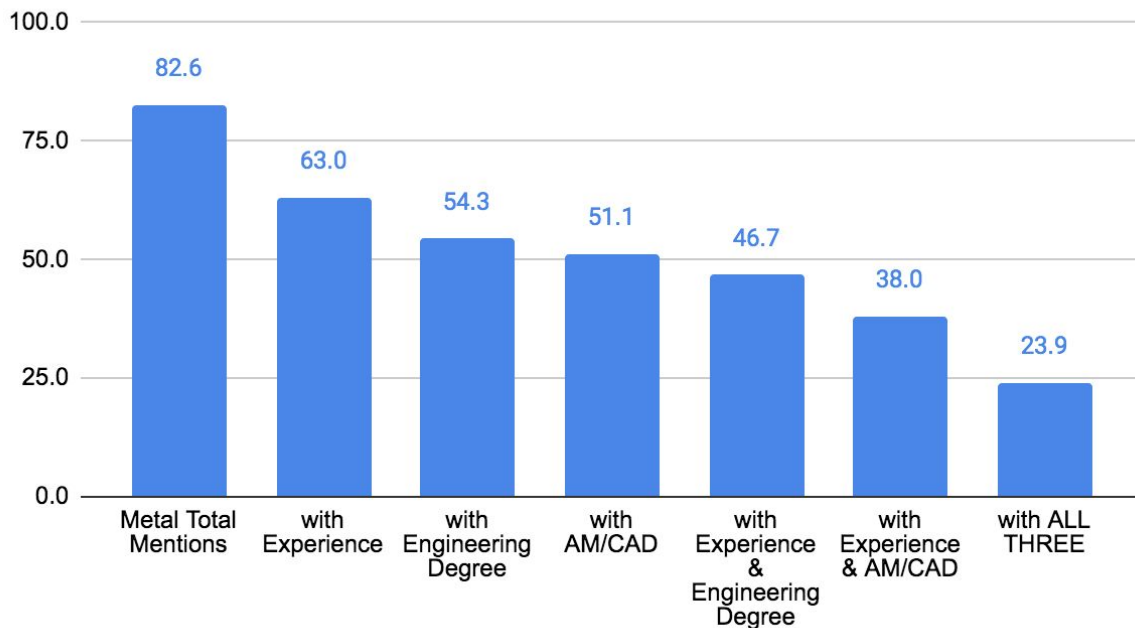
Additive Manufacturing Related Requirements from Job Descriptions



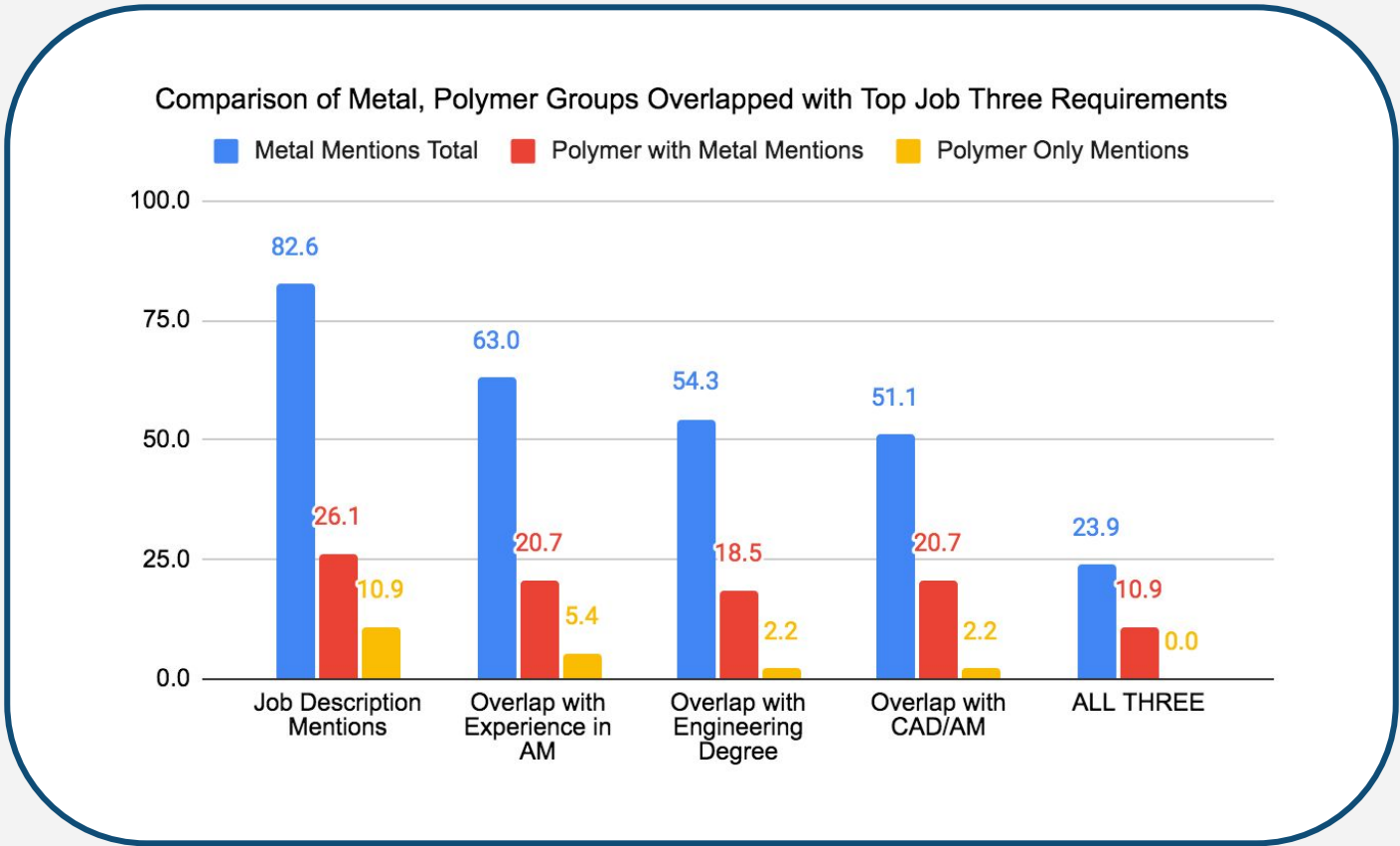
AM Related Requirements

The data showed that in general, companies are hoping to hire someone with a multidisciplinary background that includes a variety of skills and competencies for their AM teams. In this category, each job description could have multiple entries. The most sought after AM related requirements in this data set were AM Experience (72.8%), a degree in some form of Engineering (59.8%) and AM/CAD Expertise (57.6%).

Total Metal Group Mentions Overlapped with Top Three AM Requirements

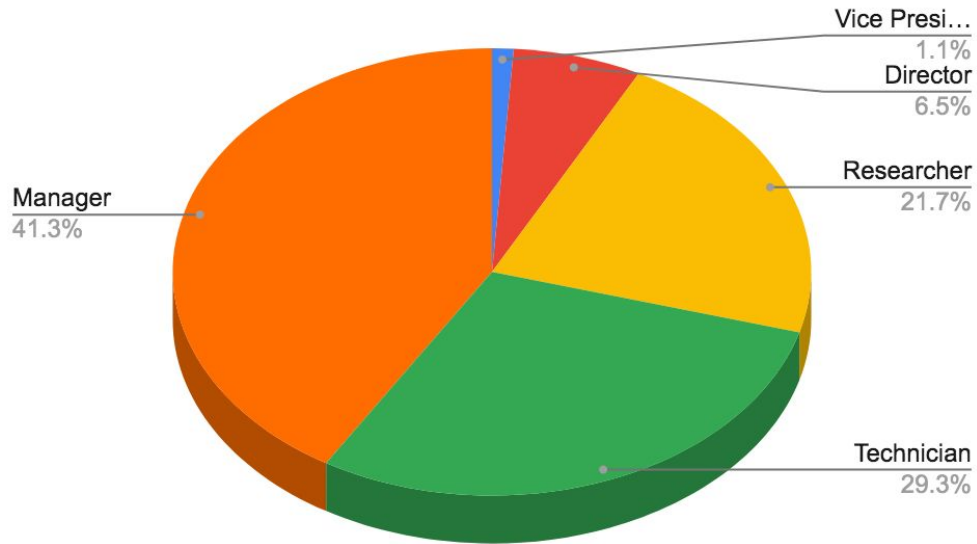


The overlap of the *Total Metal Group Mentions* (the top material mentioned) with the *Top Three AM Related Requirements* shows a strong correlation with AM Experience. It was found that 63.0% of the total job descriptions that mentioned metal group required AM Experience; 54.3% that mentioned metal also required an Engineering Degree; and 51.1% that mentioned metal also required AM/CAD expertise. The percentage of job descriptions that mentioned metal and required both AM Experience and an Engineering degree was 46.7%; the percentage that mentioned metal and required both AM Experience and AM/CAD was lower at 38.0%; and finally the percentage that mentioned metal and required all three was 23.9%. When examining the 23.9% that mentioned metal and required all three top requirements further; it was found that 70% were for product development in managerial positions.



The above is a comparison between the top two material groups overlapped with top three AM related requirements. This graph demonstrates the dominance of metal AM in the current AM job market. Polymer AM is significant, but a greater portion of polymer group mentions occurs in conjunction with metal. The job descriptions for positions focussed solely on polymer is a relatively small percentage of the total. This could mean that companies that have job descriptions that only mention polymer have a full AM team already working with metal AM and therefore are looking for someone to specialize in polymers only. The only thing we know for sure is that in the current job market metal AM job openings (with or without polymer) are dominant over polymer AM only openings.

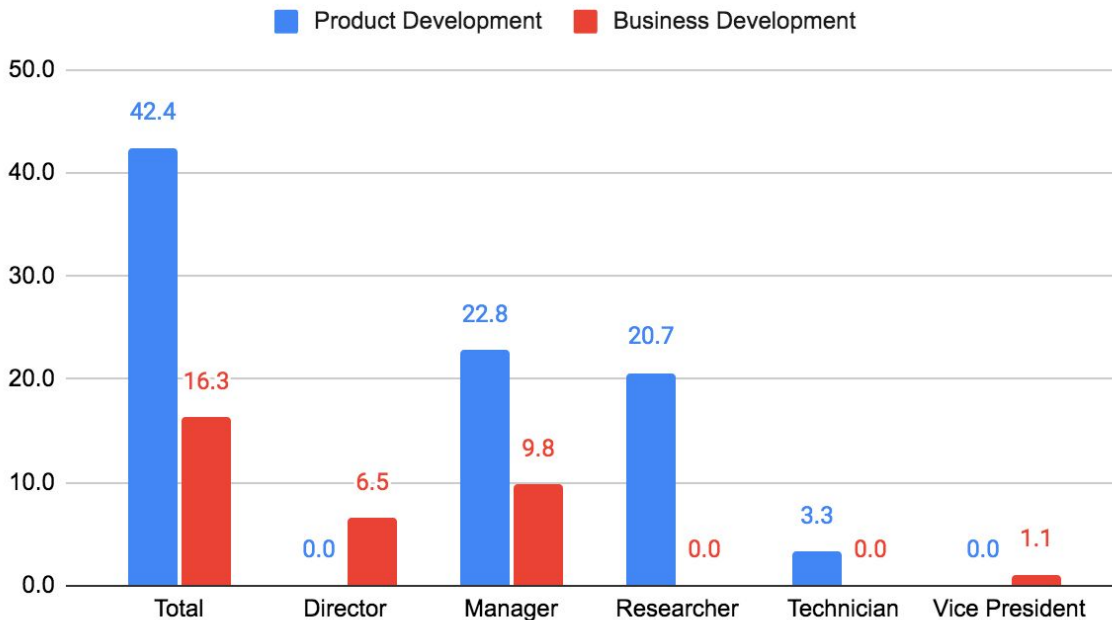
Additive Manufacturing Job Openings by Title



Job Title

In this data set, each company was allowed one entry. Companies are mostly hiring for Manager positions (41.3%), although not necessarily with direct reports, Technician (29.3%) and Researcher (21.7%) positions were second and third, respectively.

Overlap of Product, Business Development with Job Title as Percentage of the Total



The above graph shows that while business development typically falls within the realm of Directors or Vice Presidents, companies are hiring also under the manager job title for those being tasked with this responsibility. Possibly the intention is to hire talent early in their career development for promotion to higher positions later. Product development follows the expected trend showing manager and researchers mostly tasked with this responsibility.



University of Maine: Advocating for Advanced Manufacturing

Summary

Based on our analysis of AM job description, it would be safe to say that anyone looking for a career in AM should at a minimum obtain a degree in engineering, experience in metal AM, and/or knowledge of the application of AM design rules using CAD and AM specific software. At the moment there appears to be enormous opportunity to help define additive manufacturing strategies even at the managerial level. The AM industry is expected to grow 10x in the next decade, persons that prepare themselves for a career in AM now will have plenty of career opportunities for the foreseeable future.

APPENDIX

METAL AM MACHINES FOR THE CREATION OF A PROFESSIONAL METAL AM PARTS SHOP IN ACADEMIC SETTINGS

We believe that through investments in **industrial grade metal AM machines**, educational institutions can quickly prepare their students for the AM job market through the creation of a Professional Metal AM Parts Shop. Student staff can gain hands-on experience by designing and producing functional parts for internal and external customers while building the skills needed for next-generation manufacturing careers. Bringing an industry standard additive manufacturing machine to your campus allows students to explore new applications for AM by fostering collaborations between research institutions and industry. A well managed AM PARTS SHOP can provide the educational institution with a source of income that can contribute to the expansion of the AM program. Below you will find descriptions of two industrial grade metal additive manufacturing machines currently in use in professional environments to make end use production parts that are also ideal in academic settings: Desktop Metal Studio System 2™ and Desktop Metal Production System P-1™.

Desktop Metal Studio System™ 2

Easy Two-Step Processing ↔ High Quality Parts ↔ Designed for the Office
No Special Facilities Requirement

Making complex, high-performance metal parts has never been easier. Featuring a breakthrough two-step process, next-generation Separable Supports, and a software-controlled workflow, the Studio System 2 makes it simpler than ever to produce custom metal parts.



**ALREADY ADOPTED BY INDUSTRY PROFESSIONALS
FROM A VARIETY OF SECTORS**

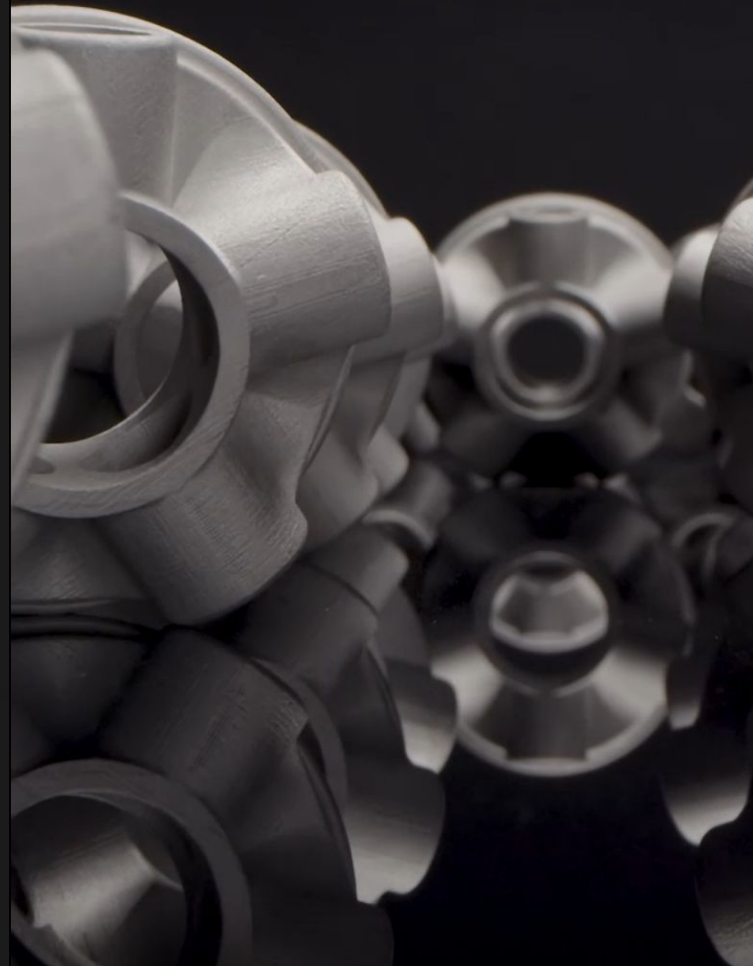
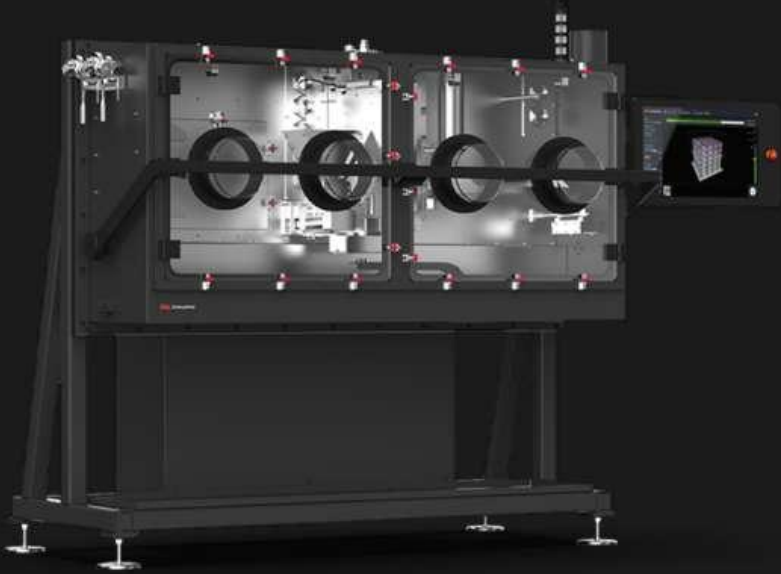
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Desktop Metal Production System P-1™

Excellent Part Quality ↔ Competitive Cost Per Part ↔ Best in Class Repeatability
Wide Material Compatibility

Designed to bridge the gap between benchtop development and mass production, the P-1 featuring a state-of-the-art print bar with native 1200 dpi, an inert processing environment, and Desktop Metal's patent-pending Single Pass Jetting technology, supports non-reactive and reactive materials at speeds more than 10 times those of laser powder bed fusion technologies.



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About Rich Port 3D Solutions, Inc.

Rich Port 3D Solutions is a consulting and industrial 3D printer reselling company headquartered in the US territory of Puerto Rico-servicing the Caribbean since 2014. As an industrial 3D solutions resource, we are dedicated to helping Caribbean businesses compete on the world stage in additive manufacturing technologies by paving the way for its uptake in the Caribbean.