AOMC Labor Market Study

Findings and Recommendations

Appalachian Ohio MANUFACTURERS' COALITION

D BYERS & Associates LLC

Listen. Empower. Connect. Learn. Grow.

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Study Background

This labor market study was commissioned as a part of the Ohio Manufacturing Workforce Partnership initiative. Appalachian Ohio Manufacturers Coalition (AOMC) stakeholders identified the lack of comprehensive understanding of manufacturing company dynamics, characteristics, needs and resources as a barrier to advancing the sector in the region. AOMC contracted with D Byers & Associates, LLC to conduct the study, with the following goals in mind:

- Obtain relevant, objective, timely, and accurate labor market information;
- Determine and quantify, where possible, key manufacturer needs and priorities;
- Strengthen career pathways and guide skill attainment with education and training providers for good jobs, economic opportunity, and manufacturing growth.

Study Process

The study was comprised of an online survey and eleven key informant interviews to acquire additional insight into key questions. To prepare for survey dissemination, D Byers & Associates compiled a master list of manufacturing companies and contacts from various sources. The online survey was drafted after extensive research into existing regional labor market data and review of similar surveys created state and nationwide. D Byers & Associates and AOMC worked together to refine and finalize survey content, and the survey was administered via Zoho Survey. Survey completion status was tracked and the team followed up to drive completion via phone calls and e-mails. The team then developed protocols and conducted eleven key informant interviews. Survey and interview data was analyzed, integrated, and presented.

Key Findings

Key findings from the survey and interviews related to company characteristics, in-demand occupations, equipment used, the nature of and challenges with education and training partnerships, and hiring dynamics are summarized in the sections below. More detailed survey data and visuals, including charts and tables, can be found in the appendices. Data from additional survey questions not highlighted in the key findings is also included.

Fifty-eight (58) respondents across the AOMC region, West Virginia, and Perry County completed the survey. Several companies submitted more than one response, with the multiple responses completed by unique individuals. For analysis purposes, these responses were treated separately. One company submitted two responses by the same individual and these responses were treated as one response. The D Byers & Associates team conducted eleven key informant interviews to acquire additional insight into key topics.

Company Characteristics

Company characteristics data was sourced from the survey.

Company Sub-Sector

The survey asked respondent companies to select one or more NAICS codes that best described the type of product(s) they manufacture. For analysis purposes, each company was classified into one of five groups based on the NAICS code(s) selected. Respondent companies sorted into the following manufacturing sub-sector categories, with half of responses (29) falling into a single predominant sub-sector and the other half falling into two or more sub-sectors or the "Other" category.

- Plastics/Rubber and Chemical Manufacturing—11
- Primary and Fabricated Metal Manufacturing—10
- Machinery, Electrical Engineering, and Electronics Manufacturing—8
- Two or more subsectors—12 (75% percent, nine companies, chose at least one of the NAICS codes that were classified into the previous three subsectors)
- Other—17 (food, wood products, medical devices, furniture, transportation, nonmetallic mineral products, petroleum and coal, and single-product manufacturers)

Company Size

The survey asked respondent companies how many people they employed in the AOMC region, in the state of Ohio, nationwide, and worldwide. For analysis purposes, the figure given for the number of employees in the state of Ohio was used to classify companies into small, medium, and large sizes. One company's size data was not usable.

- Small—0-50 employees: 25 companies
- Medium—50-125 employees: 12 companies
- Large: 125+ employees: 20 companies

Usual Education Credential Required

The survey asked respondents about the usual education credential required for the most commonly hired jobs at their facilities. Almost three-quarters (70%) of respondents reported that a high school degree or GED was required for their most commonly hired positions. The next most commonly required credential for these positions was no credential at all (13%.)

Occupations

Respondents were asked to select from a list which occupations they hire and employ at their facilities. Frequencies were tabulated across each occupation and the most commonly employed and hired occupations were consistent across all manufacturing subsectors and company sizes. More than a third of companies reported that they hired and employed the following occupations:

- Supervisors (69% of respondents)
- Production workers (69% of respondents)
- Forklift operators (67% of respondents)
- Welders (53% of respondents)
- Quality control technicians (53% of respondents)
- Mechanical engineers (52% of respondents)

- Machinists—non-CNC (43% of respondents)
- Fabricators/assemblers (41% of respondents)
- CAD Operators (41% of respondents)
- CNC Machinists (40% of respondents)
- Grinding, abrading, buffing and polishing machine operators (38% of respondents)

Several commonly hired occupations were specific to a subsector or company size group.

- Chemical Engineers, Chemical Operators, Lab Technicians (Plastics/Rubber & Chemical Manufacturing), Electricians (Primary and Fabricated Metal Manufacturing), Mill Operators (>1 NAICS subsector)
- Electricians, Industrial Lab Technicians, Industrial Engineer (large companies-125+ employees)

Interview participants identified several occupations as being particularly difficult to source qualified candidates, due to high demand, specialized skills required, or other factors such as location of the company:

- CNC Machinists
- Quality Control Technicians
- Multi-craft Maintenance Technicians
- Engineers

Equipment

Respondents were asked to select from a list equipment regularly used at their facilities. Frequencies were tabulated across each type of equipment and the most commonly used equipment was consistent across all manufacturing subsectors and company sizes—predominantly welding and metalworking. Greater than a third of companies across all subsectors and sizes used the following equipment:

- Welders (73% of respondents)
- TIG Welders (68% of respondents)
- MIG Welders (59% of respondents)
- Grinders (50% of respondents)
- Stick welders (48% of respondents)
- Mill (43% of respondents)
- Brazing welders (39% of respondents)
- PLC's (34% of respondents)

Education and Training Partnerships

In the interviews, companies consistently emphasized that training was one of their most significant business challenges. They report that this is due primarily to insufficient training facilities and their geographic disbursement and non-responsiveness of education and training facilities to the needs that have been expressed. Additionally, because new employees are often needed on the production floor right away, companies often do not have the time to

conduct a comprehensive internal training process. This causes frustration both for the new employees and supervisors, and sometimes mistakes causing production slowdown and waste.

Companies also reported that many new hires start without basic computer technology and software skills. One company representative said:

"The biggest thing: anyone that comes in this door needs to know how to use a PC. I spend most of my time teaching people how to use a mouse to navigate a web page. This includes young people, who are more accustomed to phones and tablets."

When companies have instituted internship programs with area high schools and community and technical colleges, they have not generally yielded positive long-term results. One company representative said:

"We have not yet been successful in bringing people in the door [from our internship program], there haven't been a lot of fruits to come off that tree."

The survey data offered additional insight into the training challenges companies face. Overall, only 35% of respondents reported partnering with education and training institutions to upskill incumbent workers or for work-based learning opportunities. Education and training partnerships vary significantly across company size and subsector groups.

Small companies (less than 50 employees in Ohio) struggle the most to partner with education and training institutions. They reported that they partner with education and training facilities for incumbent worker training and/or work-based learning opportunities at the lowest rate of the company size groups (21%.) In contrast, half (50%) of large companies (125+ employees in Ohio) reported partnering with education and training facilities. Furthermore, small companies are less satisfied with external training even when they do have partnerships. Of the small companies that reported they **do** partner with education and training facilities, only 42% said that the providers offered training their employees needed, while 100% of medium and 50% of the large companies said they did. Of the small companies that reported they **do not** partner, 60% said that providers do not offer the training their employees needed, while only a third (33%) of companies in the medium group and 38% in the large group who do not partner said they do not.

With regard to subsector groups, Plastics/Rubber and Chemical Manufacturing companies report partnering with education and training providers at a higher rate than any of subsector group (55%.) Companies in the "Other" subsector category partnered at the lowest rate (25%.) Plastics/Rubber and Chemical Manufacturing companies do not have the highest satisfaction rate, however—only 50% of those companies who **do** partner said that the providers offered training their employees needed, while 100% of Machinery, Electrical Engineering, and Electronics companies who partnered said they did. Of companies who reported they **do not** partner with education and training providers, 80% of companies in the >1 NAICS category group reported that these providers did not offer the training their employees needed, while 33% of companies in the Other group said they did not.

Hiring Dynamics

Survey respondents were asked to identify methods used to recruit new employees.

Frequencies were tabulated across methods. The most common method companies used (69% of respondents) was employee referrals and networks.

In the interviews, companies reported that a background in manufacturing skills and knowledge, even if informal, is helpful when hiring entry-level employees. Good candidates often come from farming and agricultural communities where mechanical, maintenance and/or electrical acumen is required for daily life. Additionally, those that have been involved recreationally with motocross, racers, or home improvement projects often demonstrate good baseline mechanical aptitude. One company representative said:

"Experience trumps education."

However, companies also emphasized that most positions require a low level of specialized skill if the employee is willing to learn. One company representative said:

"We're not looking for skills, we just need hard workers."

Companies do want job candidates to have more life skills and general workplace competencies. One company representative said:

"It would be helpful to have a course that focuses on workforce/business etiquette. There are issues with tardiness. Also, I've had to tell people how to dress here."

Companies also wish that secondary schools offered students more exposure to manufacturing careers. One company representative said:

"Schools should start touring facilities and asking questions of the manufacturers."

Interview participants reported that higher-paid, more professional positions like engineers were difficult to hire for because of the rural geography of the region and difficulty competing on wages. For the same reason, retention can in general be an issue for smaller companies. One company representative said:

"We always bring in new people. We're at the bottom of the food chain and can't afford to pay a lot so competition with wages is an issue. We're always in training mode [because of this]."

On the other hand, some smaller companies reported in interviews that retention is only difficult for certain positions.

The interviews revealed that most companies lack a formal advancement or employee development process. However, some companies offer opportunities for wage increases through job classification, and report that advancement is possible for hard workers. One company representative said:

"For people who do show initiative, the sky's the limit."

Recommendations

Given the growing workforce shortage and skills gap specifically within the engineering technologies, this study resulted in actionable implications for industry representatives, educators, and for job-seekers and the technical colleges incumbent workforce alike. Focused requests and expectations of employers upon educational institutions (from K12, to career and technical centers, to post-secondary) continue to be steeped in technical and technology-based skills training, as well as work-readiness skills (often referred to as essential skills or 21st century soft skills) training for both emerging and current workers.

Similarly, employers' expectations for the educators and training providers are to provide flexible, accelerated curriculum models (predominantly non-college-credit) and frameworks that speak directly to their needs for attracting a new workforce, while also strengthening and advancing the current workforce.

The retention and employability of the trained workforce has proven to be key to this research, as influencing a climate of continuous learning within the manufacturing and engineering technology-based organizations is pertinent to not just attracting and retaining a skilled workforce, but also to strengthening an economy by impacting the productivity of the employers and employees.

Employer Recommendations

According to the National Skills Coalition website, "Workforce development is about investing in people, and making sure that workers and businesses have the skills they need to compete in today's economy. And it's about investing in proven strategies that connect workers with skills training and career pathways that lead to skilled, well-paying jobs at growing companies."

It is incumbent upon the employers to remain or to become actively engaged in conversations with the local educators and training providers. Although employers are feeling the pressure to produce more with less human capital, the demand for a technology driven workforce is predicted to continue rising, predominantly in the manufacturing sector, where many jobs in Ohio are going unfilled, and some experts proclaim the problem is projected to worsen.

Employers should also recognize the education and training providers as a partner in finding resolve to the widening workforce gap; they must help drive the solution strategy conversations, clearly articulating what is expected of the future workforce and what is lacking in the current workforce; they must provide the on-the-job training experiences and mentorship opportunities that will help alleviate the skills gap and that will enrich the student and employee experience, thus leading to greater retention; and they must entrust the educators to move the strategies forward, working in tandem as strategic alliance partners. As the workforce becomes more highly skilled and better educated through our educational institutions, the employers, the employees, and the economy, all prosper, and the workforce skills gap begins to close.

Educational Recommendations

Among dozens of recently published economic impact reports, forecasts, and articles, an emerging theme has been, paradoxically, enrollment at technical and community colleges is

declining while the demand for workers who possess training provided by such educational institutions continues to rise. This being common language across the nation, technical and community colleges (as well as career technical centers) are uniquely positioned to improve enrollment and job-readiness efforts that will benefit the students and employers alike. Educators should begin or continue implementing measures to more actively expose students to career options within the manufacturing and engineering-technology industry; recruiting students into training and work-based learning programs; and improving upon the sound strategies and calculated risks that are critical to filling the in-demand careers existing in the industry sector.

By increasing enrollment and retention, and by providing a comprehensive, yet flexible series of curricula that encompass the work-ready skills, soft skills, and technical skills demanded for these positions, educators will be doing a service not just to the community, to the local employers, and to the economy, but also to the students who will become the skilled workforce with an outlook toward long-term financial stability. This begins by establishing and strengthening employer relations; listening intently to their needs; and offering more flexible scheduling options while also exploring additional funding solutions to support the volume of employer requests.

Further, institutions must more effectively leverage their relationships with local, state and national elected officials, as many training programs and technical education opportunities have been successful because of state and federal legislation and grant funding. As educators and training providers meet the evolving needs of the industry, and as they introduce a new generation to the rewards of working in the manufacturing and engineering technology sector, partnerships between education and employers will intensify, retention will improve, enrollment numbers will climb, and the workforce gap will diminish.

Jobseekers and Incumbent Workforce Recommendations

Jobseekers, the under-employed, the laborer that wishes to advance, and the traditional student as a future member of the workforce, all must recognize employers are witnessing and expressing grave concern in the skills gap. Technical skills gaps can be overcome by enrolling in a program at the local technical college, or often by reaching out to a mentor or supervisor. With respect to the gap that exists in the 21st century skills or soft skills, such as work-readiness, leadership, sales, communication, and customer service, similar pathways for improvement are available.

Furthermore, the workforce and future workforce population must recognize that developing and upskilling will lead to positive future dividends. It is also important for this populace to be open to correcting the misconceptions and negative stereotypes of the manufacturing and engineering technology sector involving predominantly unskilled, repetitive tasks on a manufacturing floor. Likewise, one must be open to the exposure and the opportunities that exist for technically advanced, motivated individuals seeking a career trajectory and lucrative positions within the industry.

Similarly, it is imperative to do research and seek out the educational and employer opportunities that exist for internships, apprenticeships, scholarships, tuition assistance, and degree or certification programs. It is also essential that students share within their classrooms,

schools, and homes the value of a career within the manufacturing sector and the truth about the intense rigor of technical training and aptitude with an understanding and ability to articulate a shorter term, more affordable education does not equate to the worth and value of the job at the end of it. Lower tuition with abbreviated pathways to completion, in this industry, are well aligned with increased market demands and job availability; thereby, well positioned to contribute to the shrinkage of the workforce gap.

AOMC Industry Sector Partnership Recommendations

As a sector partnership, there is opportunity for leveraging county and regional data, metrics, and tools to drive economic growth, building credibility in the sector partnership framework through the collective data that provide irrefutable evidence of the growing quality of the manufacturing and engineering technology-focused workforce by also closing the skills gap. Through a focus on employer engagement, partnership building, employer-driven and technology centered program development, and more intentional integration of technical and soft skills into training, the impact on local, state, and federal policy and legislation can be tracked and then carefully corroborated. Leading active engagement sessions; stepping into advisory roles within the educational institutions; coordinating career exploration opportunities; addressing objections such as budget restrictions through the exploration of creative funding solutions; creating additional on-the-job-training and mentorship opportunities for students and jobseekers; and proactively aligning to the conclusions of this research will propel the region closer to the goal of unifying manufacturing stakeholders to enforce economic development initiatives and workforce development systems.

Finally, by recognizing there is not a one-size-fits-all solution to bridging the workforce gap, the AOMC is better poised to align and assemble employers, educators, elected officials, community leaders, and economic development and workforce practitioners on a regular basis to build a better workforce as they focus on the intersection of workforce skills and the future of the manufacturing and engineering technologies industries. It is incumbent upon the AOMC to leverage the outcomes of the research to continue to define common goals among all stakeholders that will boost outcomes for all involved.

Additional Initiatives for AOMC to Consider:

- Form an AOMC training consortium for small manufacturing companies to create greater "market power" for working with training institutions
- Plan Educator Nights at regional facilities
- Help companies develop career ladders to aid in employee retention
- Determine and execute follow-up strategy for survey respondents, including recruitment
- Consider expansion into Perry County
- Engage in strategic planning
- Evaluate how to use survey data:
    - *To position for investments that align with AOMC's priorities (funding scan)*
    - *To work effectively with education and training providers*
    - *To improve the value proposition for potential new members*

Appendix A: Overall Findings Detail

This appendix contains detailed survey data and visuals, including charts and tables, for the overall survey sample. Data from additional survey questions not highlighted in the key findings is also included.

Fifty-seven (57) respondents across the AOMC region, West Virginia, and Perry County completed the survey. Several companies submitted more than one response to the survey, with the multiple responses completed by unique individuals. For analysis purposes, these responses were treated separately.

Company Characteristics

Company Sub-Sector

The survey asked respondent companies to select one or more NAICS codes that best described the type of product(s) they manufacture. For analysis purposes, each company was classified into one of five groups based on the NAICS code(s) selected. Respondent companies sorted into the following manufacturing sub-sector categories, with half (29) falling into a single predominant sub-sector and the other half falling into two or more sub-sectors or the "Other" category.

Figure 1: Manufacturing Company Subsector Categories

Manufacturing Company Type
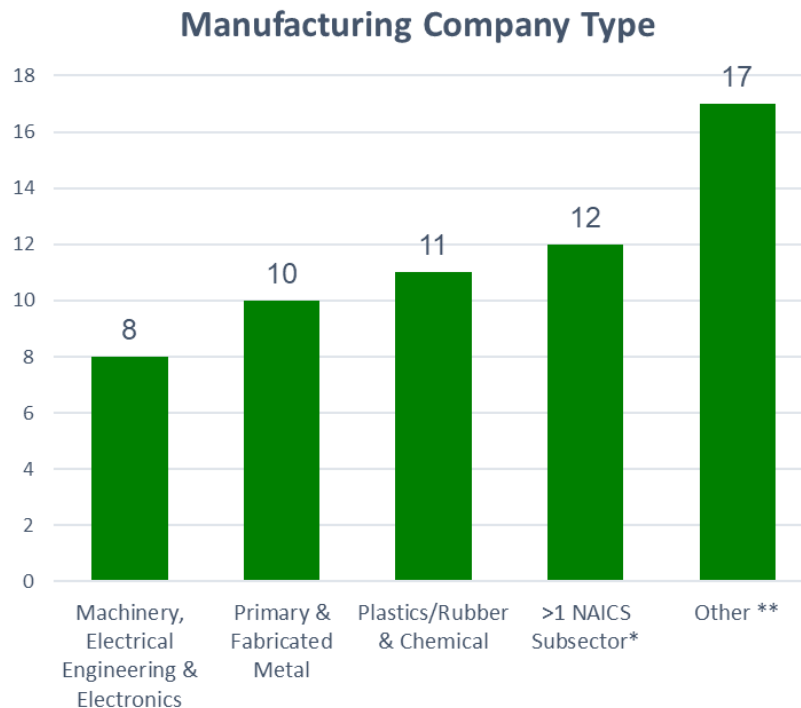
*9 (75%) companies identified as at least one of the NAICS codes included in the previous three subsectors.
**Other manufacturing categories included food, wood products, medical device, furniture, transportation, nonmetallic mineral products, petroleum and coal, and single-product manufacturers.*

The survey asked respondents how many people they employed in the AOMC region, in the state of Ohio, nationwide, and worldwide. For analysis purposes, the number of employees in the state of Ohio was used to classify companies into small, medium, and large sizes.

One respondent's size data was not usable.

- ○ Small—0-50 employees: 25 companies
- ○ Medium—50-125 employees: 12 companies
- ○ Large: 125+ employees: 20 companies

Figure 2. Company Size Categories
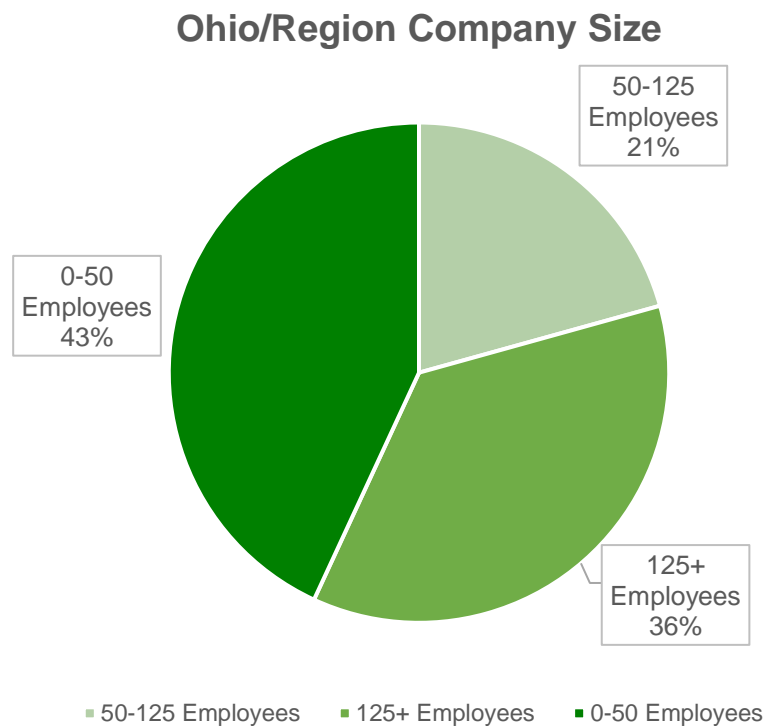
Ohio/Region Company Size

Usual Education Credential Required

The survey asked respondents about the usual education credential required for the most commonly hired jobs at their facilities. Almost three-quarters (70%) of respondents reported that a high school degree or GED was required for their most commonly hired positions. The next most commonly required credential for these positions was no credential at all (13%.) Postsecondary, nondegree credentials, associate degrees, and other credentials (Bachelor's degree or experience) were all required by 5.6% of respondents.

Four respondents did not answer this survey question.

Figure 3: Usual Education Credential Required
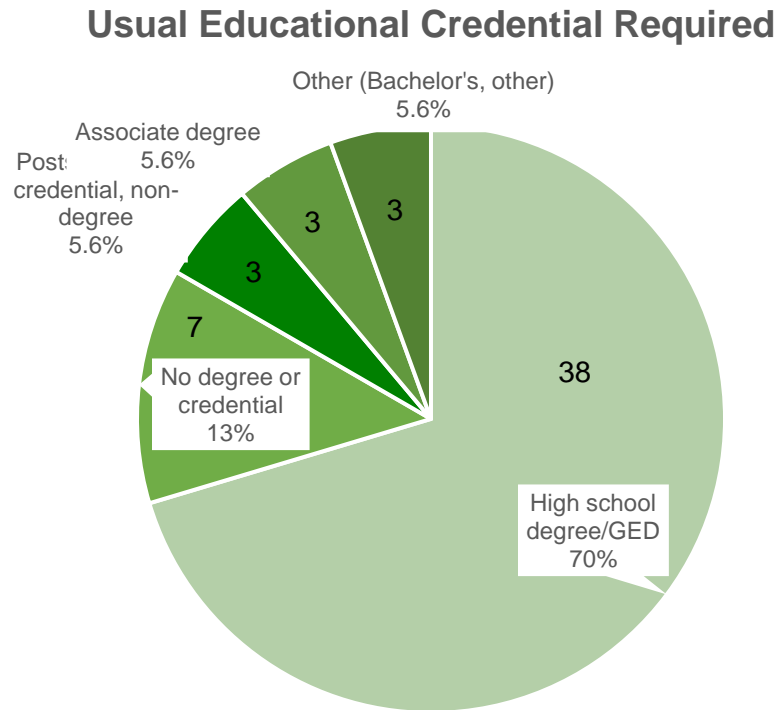
Usual Educational Credential Required

Other (Bachelor's, other)
5.6%

Associate degree
5.6%

Post credential, non-degree
5.6%

3

3

3

7

No degree or credential
13%

38

High school degree/GED
70%

Occupations

Respondents were asked to select from a list which occupations they hire and employ at their facilities. Frequencies were tabulated across each occupation and the most commonly employed and hired occupations were consistent across all manufacturing subsectors and company sizes. More than a third of companies reported that they hired and employed occupations shown in the chart below.

Figure 4: Most Commonly Employed Occupations
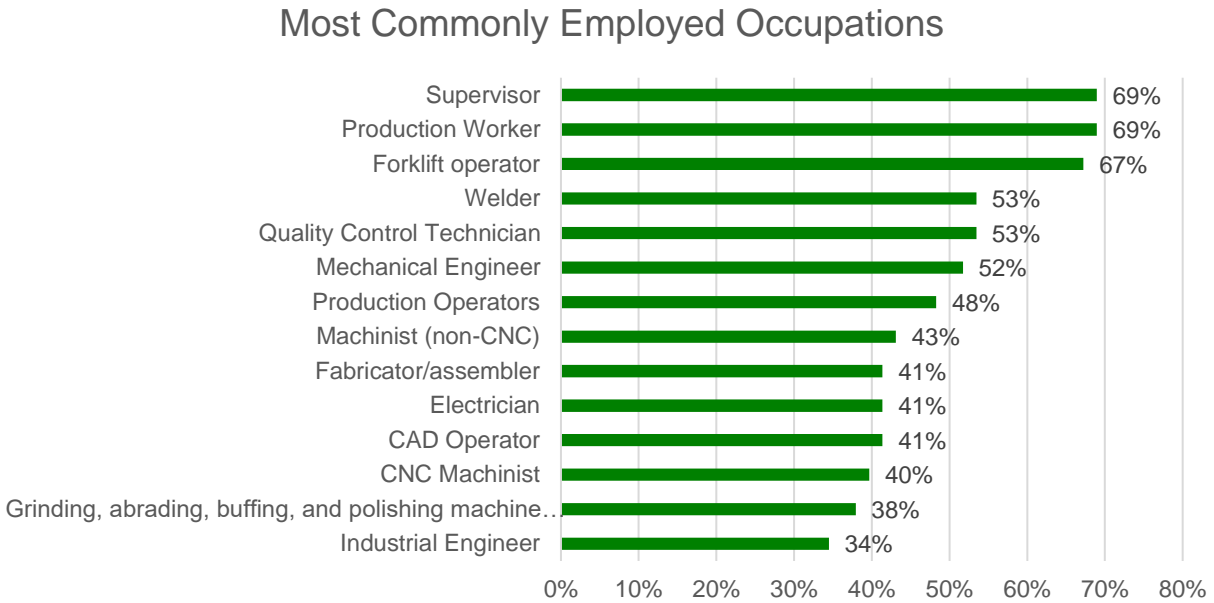
Most Commonly Employed Occupations

Occupation	Percentage
Supervisor	69%
Production Worker	69%
Forklift operator	67%
Welder	53%
Quality Control Technician	53%
Mechanical Engineer	52%
Production Operators	48%
Machinist (non-CNC)	43%
Fabricator/assembler	41%
Electrician	41%
CAD Operator	41%
CNC Machinist	40%
Grinding, abrading, buffing, and polishing machine…	38%
Industrial Engineer	34%

Equipment

Respondents were asked to select from a list which equipment is regularly used at their facilities. Frequencies were tabulated across each type of equipment and the most commonly used equipment was consistent across all manufacturing subsectors and company sizes—predominantly welding and metalworking equipment.

Figure 5: Most Commonly Used Equipment

Most Commonly Used Equipment

Equipment	Percentage
Welder	73%
TIG Welding	68%
MIG Welding	59%
Grinder	50%
Stick Welding	48%
Mill	43%
Plasma Cutter	41%
Brazing Welding	39%
Allen Bradley (PLC)	34%
CNC Mill	34%
CNC Lathe	32%
Lathe	32%
Industrial Pumps…	30%
Press Brake	29%
Metal Shear	27%
Conveyor System	27%
Straight Line Saw	25%
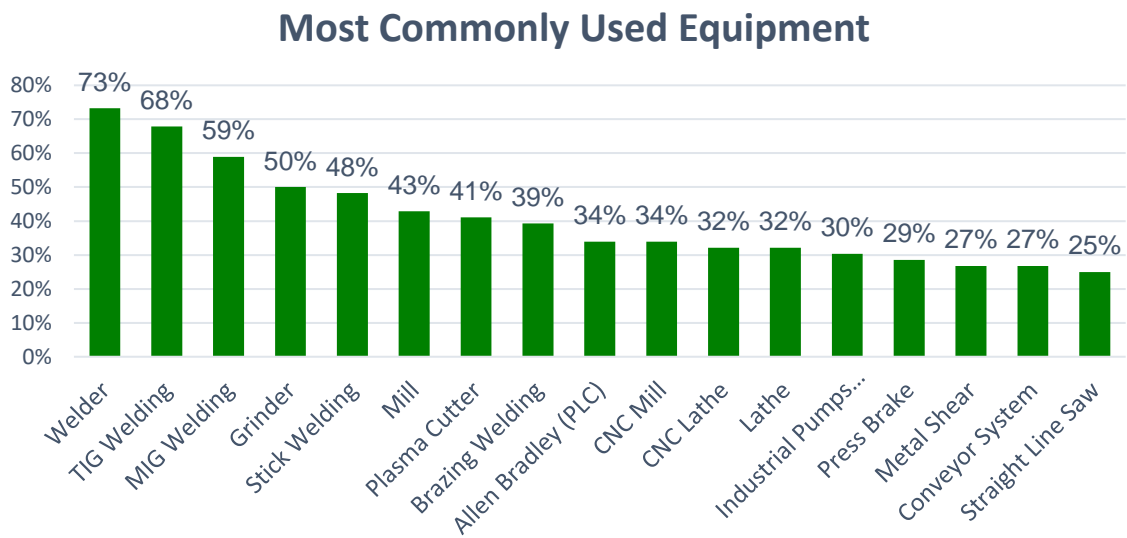
Most Important Competencies

Respondents were asked to select the top five personal effectiveness, academic and workplace competencies important to their facilities. Frequencies were tabulated across each competency. The most frequently selected competencies are shown below.

Figure 6. Most Important Competencies

PERSONAL EFFECTIVENESS
- Dependability/reliability (98%)
- Integrity (93%)
- Adaptability/flexibility (89%)
- Initiative (82%)
- Interpersonal skills (54%)

ACADEMIC
- Communication-listening/speaking (91%)
- Critical and analytical thinking (90%)
- Basic computer skills (88%)
- Reading (83%)
- Mathematics (67%)

WORKPLACE
- Teamwork (97%)
- Problem solving/creative thinking (81%)
- Working with tools and technology (69%)
- Personal health and safety (64%)
- Checking, examining, and recording (53%)

Process Technologies and Software

Respondents were asked to identify the process technologies and software utilized at their facilities. Frequencies were tabulated across each technology and type of software. The frequencies are shown below. Only software that more than 25% of respondents reported using is identified in the table.

Figure 7. Process Technologies Used

Process Technologies
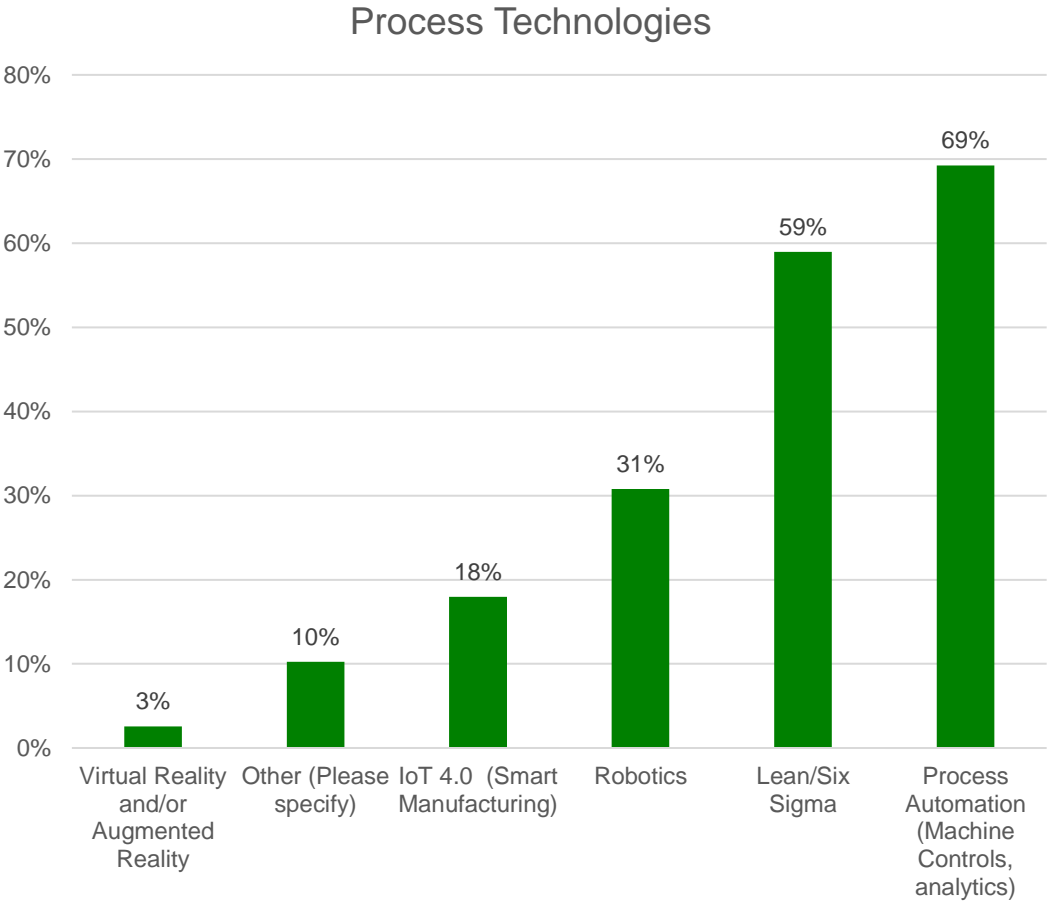
Table 1. Software Used

Software	Percent of Respondents That Use
Communications and Graphics Software	
MS Word	93%
MS Excel	90%
MS Outlook	90%
MS PowerPoint	90%
Adobe Illustrator	31%
MS Project	31%
Adobe Photoshop	29%
Google Docs	29%
MS Access	29%

Software	Percent of Respondents That Use
CAD/CAM Software	
Autodesk AutoCad	73%
Other	22%
Electronic Design Software	
SolidWorks PCB	50%
Other	42%

Education and Training Partnerships

Respondents were asked to indicate whether they actively partnered with education and training providers to upskill incumbent workers or for work-based learning opportunities. Overall, 35% (20 companies) reported partnering. (One respondent did not answer this question.)

Figure 8. Education/Training Provider Partnerships

Active Partnerships with Education/Training Providers

YES 35%

n=20

n=37

NO 65%
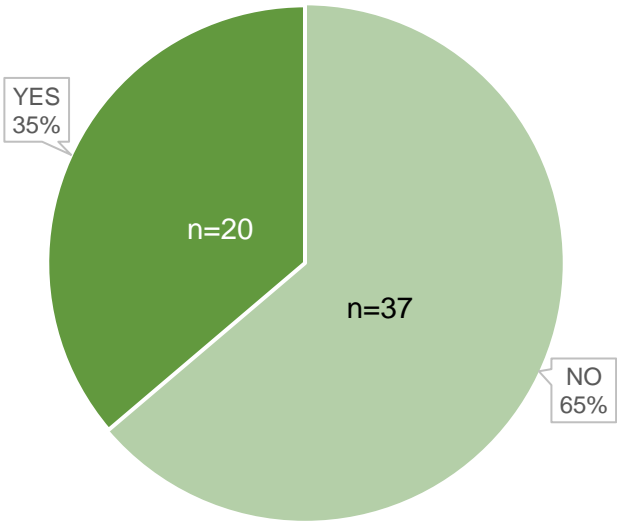
Missing data one respondent

Of the 20 respondents that indicated they actively partner, 12 (60%) indicated that these providers offer training their employees need. Six respondents (30%) indicated that these providers did not offer needed training, and two respondents did not answer the question.

Of the 37 respondents that indicated they do not actively partner, 15 (41%) indicated that these providers offer training their employees need. Fourteen respondents (38%) indicated that these providers did not offer needed training, and eight respondents did not answer the question.

The top three education/training provider partners survey respondents identified were Washington County Career Center in Marietta (14 respondents), Washington State Community College in Marietta (12 respondents) and Marietta College in Marietta (5 respondents.)

Zane State College - Cambridge was identified as an education/training partner by three respondents.

The Ohio State University Manufacturing Extension Partnership, Hocking College in Nelsonville, Mid-East Career Center and Technology in Zanesville, and Morgan High School in McConnelsville were identified as education/training partners by two respondents each.

The following education/training providers were identified by one respondent each:

- o Belmont College, St. Clairsville
- o Muskingum University, New Concord
- o Ohio University, Main Campus, Athens
- o Ohio University, Southern Campus, Ironton
- o Ohio University, South Centers Extension (MEP)
- o Ohio University, Zanesville Campus, Zanesville
- o Shawnee State University, Portsmouth
- o Swiss Hills Career Center, Woodsfield
- o Zane State College, Zanesville
- o Buckeye Career Center, New Philadelphia
- o Belmont-Harrison Career Center, St. Clairsville
- o Buckeye Hills Career Center, Thurman
- o New Horizons Computer Learning

Hiring

Survey respondent companies were asked to identify methods used to recruit new employees. Frequencies were tabulated across methods. The most common method respondents used (69%) was employee referrals and networks.

Table 2. Employee Recruitment Methods

Employee Recruitment Method	Percent of Respondents
Employee referrals and networks	69% (40)
Indeed	53% (3
Advertise on your company website	52% (30)
Community/Technical Colleges	45% (26)
Four-year colleges/Universities	29% (17)

Employee Recruitment Method	Percent of Respondents
Temp Agency	29% (17)
Classified Ads	28% (16)
Headhunter/Recruiter	28% (16)
Ohio Means Jobs/Jobs and Family Services	28% (16)
Social Media	24% (14)
Industry-Specific Job Boards	14% (8)
Zip Recruiter	7% (4)
Monster	5% (3)

Other employee recruitment methods listed by one company each included hiring from union halls, walk-ins completing applications, radio ads and LinkedIn.

Appendix B: Findings Detail by Manufacturing Subsector

Company Characteristics

Size

The table below shows the size of survey respondents when classified by subsector. Size classified by the number of employees in the state of Ohio (0-50, small; 50-125, medium; 125+, large.)

Of note, a greater share of companies classified as "Other" and Primary and Fabricated Metal were small companies than the other subsectors, and a greater share of Plastics/Rubber and Chemical Manufacturing and Primary and Fabricated Metal were large companies.

Table 3. Company Size, by Subsector Group

Subsector Group	0-50 employees	50-125 employees	125+ Employees	No size data	Total
Plastics/Rubber & Chemical Manufacturing	2 (18%*)	4 (36%)	5 (45%)		**11**
Primary and Fabricated Metal Manufacturing	5 (50%)	-	5 (50%)		**10**
Machinery, Electrical Engineering & Electronics Manufacturing	3 (38%)	4 (50%)	1 (12%)		**8**
>1 NAICS Subsector	4 (33%)	4 (33%)	3 (25%)	1 (8%)	**12**
Other Manufacturing	11 (65%)	-	6 (35%)		**17**
Total	**25**	**12**	**20**	**1**	**58**

Due to rounding, percentages may not total exactly 100%

Usual Education Credential Required

The survey asked respondent companies about the usual education credential required for the most commonly hired jobs at their facilities. Of note, Primary and Fabricated Metal companies all reported that a high school degree/GED was the usual credential required.

Table 4. Usual Education Credential Required, by Subsector

Subsector Group	High school/GED	PS Credential (non-degree)	No degree	Associates	Bachelor's & Other	Total
Plastics/Rubber & Chemical Manufacturing	6 (60%*)	1 (10%)	2 (20%)	1 (10%)	-	10
Primary and Fabricated Metal Manufacturing	10 (100%)	-	-	-	-	10
Machinery, Electrical Engineering & Electronics Manufacturing	5 (72%)	-	1 (14%)	-	1 (14%)	7
>1 NAICS Subsector	8 (80%)		1 (10%)		1 (10%)	10
Other Manufacturing	9 (52%)	2 (12%)	3 (18%)	2 (12%)	1 (6%)	17
Total	**38**	**3**	**7**	**3**	**3**	**54****

Due to rounding, percentages may not total exactly 100%
**Four respondents did not answer the education credential question.

Occupations

The table below shows the most common occupations in the overall sample and the number of subsectors in which these occupations were listed in the **top six** most commonly hired.

Table 5. Number of Subsector Groups with Occupations in Top Six Most Commonly Hired

Occupation	Number of Subsector Groups with Occupations in Top Six Most Commonly Hired
Supervisor	5—All
Production Worker	5 –All
Forklift operator	4 –All except Plastics/Rubber and Chemical
Quality Control Technician	3–Machinery, Electrical Engineering, & Electronics; >1 NAICS Subsector; Other

Occupation	Number of Subsector Groups with Occupations in Top Six Most Commonly Hired
Welder	3– Primary and Fabricated Metal; Machinery, Electrical Engineering, & Electronics; Other
CAD Operator	2—>1 NAICS Subsector; Other
Fabricator/assembler	2—Machinery, Electrical Engineering, & Electronics; Other)
Machinist (CNC)	2 –Primary and Fabricated Metal; Machinery, Electrical Engineering, & Electronics
Machinist (non-CNC)	2—Primary and Fabricated Metal; Machinery, Electrical Engineering, & Electronics
Mechanical Engineer	2 – Plastics/Rubber and Chemical; Other

For the most part, common occupations reflected the patterns of the overall survey sample, though certain occupations are found commonly only in one subsector. Top occupations found only in one subsector are Chemical Engineers, Chemical Operators, and Lab Technicians (Plastics/Rubber & Chemical), Electricians (Primary and Fabricated Metal), and Mill Operators (>1 NAICS subsector). The figure on the next page demonstrates in detail common occupations found in each subsector. Occupations in the figure represent those which 50% or more of respondents in each subsector reported to be in their top six occupations.

Figure 10. Top Occupations, by Subsector

Plastics/Rubber & Chemical Manufacturing (11)	Primary and Fabricated Metal Manufacturing (10)	Machinery, Electrical Engineering & Electronics Manufacturing (8)	>1 NAICS Subsector (12)	Other Manufacturing (17)
Supervisor (64%)	Supervisor (70%)	Supervisor (88%)	Forklift operator (92%)	Forklift operator (82%)
Chemical Engineer & Production Worker (64%)	CNC and non-CNC Machinists (70%)	Fabricator/assembler (88%)	Production Worker, Quality Control Technician (75% each)	Production worker (65%)
Mechanical Engineer (55%)	Welder (70%)	Non-CNC Machinist (75%)	Supervisor and CAD Operator (59% each)	Fabricator/assembler and supervisor (59% each)
Laboratory Technicians and Chemical Operators (55%)	Production Worker (70%)	Production Worker, Quality Control Technician, Welder, CNC Machinist (63% each)	Mill operator (58%)	Mechanical Engineer (53%)
	Forklift Operator and Electricians (60%)			Welder, Quality Control Technician, CAD Operator (47% each)

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Equipment

Respondents were asked to select from a list which equipment is regularly used at their facilities. Frequencies were tabulated across each type of equipment and the most commonly used equipment was consistent across all manufacturing subsectors—predominantly welding and metalworking equipment. Certain types of commonly used equipment are specific to the Plastics/Rubber and Chemical Manufacturing subsector (27% of companies use pelletizers, granulators, injection molders, and articulated robots.) The figure on the next page demonstrates in detail common equipment used in each subsector. Occupations in the figure represent those which 50% or more of companies in each subsector reported to be in their top six types of equipment used.

Figure 11. Top Equipment, by Subsector

Plastics/Rubber & Chemical Manufacturing (11)	Primary and Fabricated Metal Manufacturing (10)	Machinery, Electrical Engineering & Electronics Manufacturing (8)	>1 NAICS Subsector (12)	Other Manufacturing (17)
Welder (73%)	Grinder (80%)	Welder and TIG Welder (75%)	TIG Welder (75%)	Welder (76%)
Stick Welder (64%)	Metal shear (60%)	Mill (75%)	Welder and MIG Welder (67%)	TIG Welder (65%)
Allen Bradley PLC (64%)	CNC Lathe and Mill (60%)	MIG and Stick Welder (63%)	Stick Welder (58%)	MIG Welder (53%)
Conveyer, single & multi system (64%)	Welder and TIG Welder (60%)	CNC Lathe and Mill (63%)	CNC Mill, Brazing Welding, and Plasma Cutter (50%)	
MIG & TIG Welders, Extruder (55%)	Industrial Pumps (60%)	Manual Lathe (50%)		
	Plasma cutter, single & multi conveyer system (50%)			

Education and Training Partnerships

Respondents were asked to indicate whether they actively partnered with education and training providers to upskill incumbent workers or for work-based learning opportunities. When broken down by subsector, the data reveals some differences in partnership patterns.

Plastics/Rubber and Chemical manufacturing companies partnered with education and training providers at the highest rate (50%) and Machinery, Electrical Engineering and Electronics Manufacturing companies and companies in the Other category partnered at the lowest rate (25%).

Table 6. Active Partnerships with Education/Training Providers, by Subsector

Subsector	Yes	No	Total
Plastics/Rubber & Chemical Manufacturing	6 (55%*)	5 (45%)	**11**
Primary and Fabricated Metal Manufacturing	4 (40%)	6 (60%)	**10**
Machinery, Electrical Engineering & Electronics Manufacturing	2 (25%)	6 (50%)	**8**
>1 NAICS Code	4 (33%)	8 (67%)	**12**
Other	4 (25%)	12 (75%)	**16**
Total	**20**	**37**	**57****

Due to rounding, percentages may not total exactly 100%
**One respondent missing data

Of the 20 respondents that indicated they actively partner, there was a small amount of variation in satisfaction by subsector. Only half of Primary and Fabricated Metal companies who partnered said that providers offered the training their employees needed, while all (100%) of the Machinery, Electrical Engineering, and Electronics Manufacturing companies and two-thirds (67%) of the Plastics/Rubber and Chemical Manufacturing, >1 NAICS code group, and Other companies who partnered said that providers offered training they needed.

Table 7. Whether Providers Offer Needed Training (those who partner)

Subsector	Yes	No	Total
Plastics/Rubber & Chemical Manufacturing	4 (67%*)	2 (33%)	6
Primary and Fabricated Metal Manufacturing	2 (50%)	2 (50%)	4
Machinery, Electrical Engineering & Electronics Manufacturing	2 (100%)	-	2
>1 NAICS Code	2 (67%)	1 (33%)	3
Other	2 (67%)	1 (33%)	3
Total	12	6	18**

Due to rounding, percentages may not total exactly 100%
**Missing data*

Of the 37 respondents that indicated they **do not** actively partner, companies in the >1 NAICS subsector group were least satisfied with training offerings—80 percent said providers did not offer the training they needed.

Table 8. Whether Providers Offer Needed Training (those who do not partner)

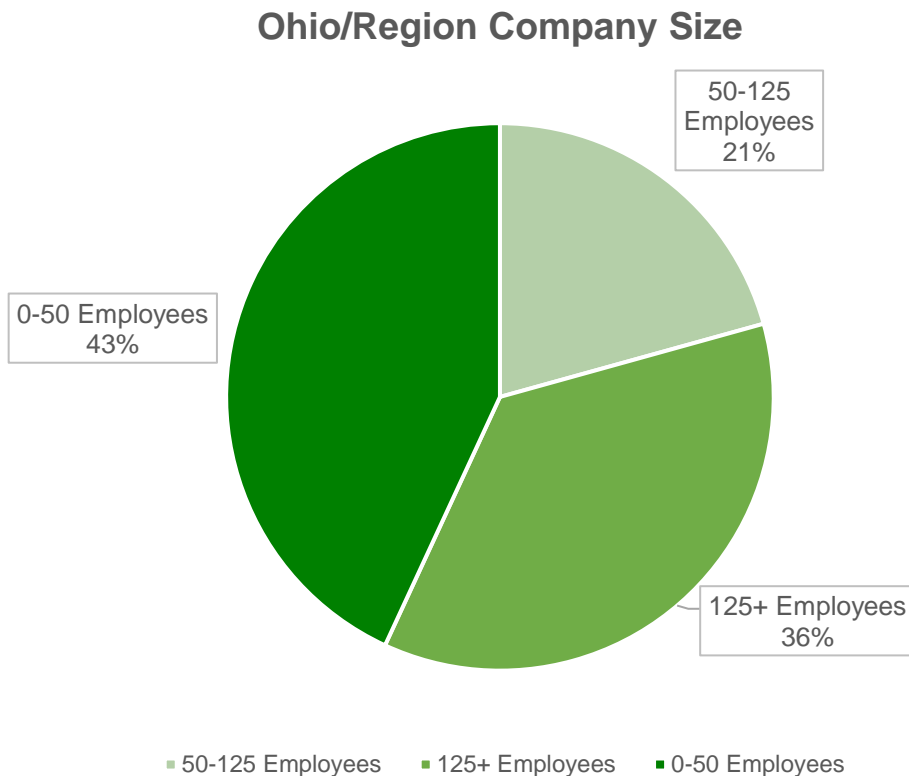| Subsector	Yes	No	Total
Plastics/Rubber & Chemical Manufacturing	3 (60%*)	2 (40%)	5
Primary and Fabricated Metal Manufacturing	2 (67%)	1 (33%)	3
Machinery, Electrical Engineering & Electronics Manufacturing	1 (25%)	3 (75%)	4
>1 NAICS Code	1 (20%)	4 (80%)	5
Other	8 (67%)	4 (33%)	12
Total	15	14	29**

Due to rounding, percentages may not total exactly 100%
**Eight respondents missing data*

Appendix C: Findings Detail by Company Size

This appendix contains detailed survey data and visuals, including charts and tables, with results broken down by company size groups. The survey asked respondent companies to report the number of people they employee in the AOMC region, the state of Ohio, nationwide, and worldwide. For analysis purposes, each company was classified into one of three groups based on the number of employees in the state of Ohio. Respondents sorted into the following size categories: small (0-50 employees); medium (50-125 employees); and large (125+ employees.)

Figure 12. Company Size Categories

Ohio/Region Company Size

- 50-125 Employees 21%
- 0-50 Employees 43%
- 125+ Employees 36%

Legend: ■ 50-125 Employees ■ 125+ Employees ■ 0-50 Employees

Company Characteristics

Subsector

The table below shows the subsector of survey respondent companies when classified by size. Five groups of subsectors were identified.

Of note, a greater share of companies classified as Plastics/Rubber and Chemical manufacturing and Primary and Fabricated Metal manufacturing were also classified in the large company group than the other subsectors. The Other subsector group had the greatest percentage of small companies (44%.)

Table 9. Subsector, by Company Size

Company Size (Number of Employees in OH/Region)	Plastics/Rubber & Chemical	Primary & Fabricated Metal	Machinery, Electrical Engineering & Electronics	>1 NAICS Subsector	Other	Total
Small (0-50 employees)	2 (8%*)	5 (20%)	3 (12%)	4 (16%)	11 (44%)	**25**
Medium (50-125 employees)	4 (33%)	-	4 (33%)	4 (33%)	-	**12**
Large (125+ employees)	5 (25%)	5 (25%)	1 (5%)	3 (15%)	6 (30%)	**20**
Total	**11**	**10**	**8**	**11**	**17**	**57***

Due to rounding, percentages may not total exactly 100%
One respondent's size data was not usable.

Usual Education Credential Required

The survey asked respondents about the usual education credential required for the most commonly hired jobs at their facilities. Small companies require a high school degree/GED at the highest rate, and small and medium companies are equally likely to require no credential. Large companies also frequently require a high school degree/GED, and the second most commonly required credential in that group was a postsecondary (non-degree) credential.

Table 10. Usual Education Credential Required, by Company Size

Company Size (Number of Employees in OH/Region)	High School/GED	PS Credential (non-degree)	No degree	Associates	Bachelors/Other	Total
Small (0-50 employees)	19 (76%*)	-	3 (12%)	1 (4%)	2 (8%)	**25**
Medium (50-125 employees)	4 (44%)	1 (11%)	3 (33%)	1 (9%)	-	**9**
Large (125+ employees)	14 (74%)	2 (11%)	1 (5%)	1 (5%)	1 (5%)	**19**
Total	37	3	7	3	3	**53****

Due to rounding, percentages may not total exactly 100%
**One company's size data was not usable; four companies did not answer the education credential question.*

Occupations

The table below shows the most common occupations in the overall sample and the number of subsectors in which these occupations were listed in the **top six** most commonly hired.

Table 11. Number of Company Size Groups with Occupations in Top Six Most Commonly Hired
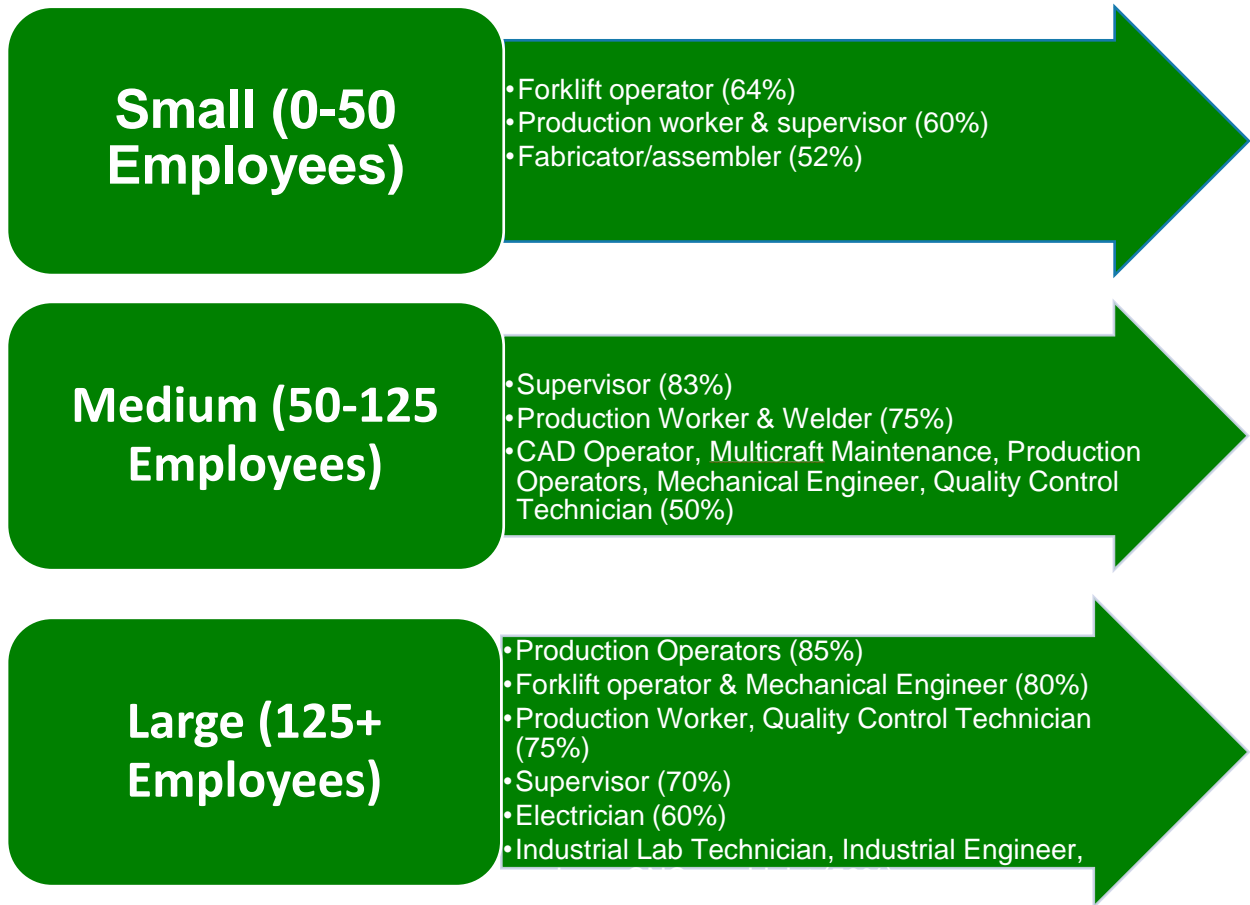
Occupations	Number of Company Size Groups with Occupations in Top Six Most Commonly Hired
Forklift Operator	3—All
Production Worker	3—All
Supervisor	3-All
CAD Operator	2 (0-50 employees & 50-125 employees)
CNC Machinist	2 (0-50 employees and 50-125 employees)

Occupations	Number of Company Size Groups with Occupations in Top Six Most Commonly Hired
Industrial Engineer	2 (50-125 employees & 125+ employees)
Mechanical Engineers	2 (50-125 employees & 125+ employees)
Production Operators	2 (50-125 employees & 125+ employees)
Quality Control Technician	2 (50-125 employees & 125+ employees)
Welder	2 (0-50 employees & 50-125 employees)
Drill press operator	1 (0-50 employees)
Industrial Laboratory Technician	1 (125+ employees)
Multi-craft maintenance	1 (50-125 employees)
Non-CNC Machinist	1 (125+ employees)

Common occupations reflected the patterns of the overall survey sample. The figure on the next pages demonstrates in detail common occupations found in each company size group. Occupations in the figure represent those which 50% or more of companies in each company size group reported to be in their top six occupations.
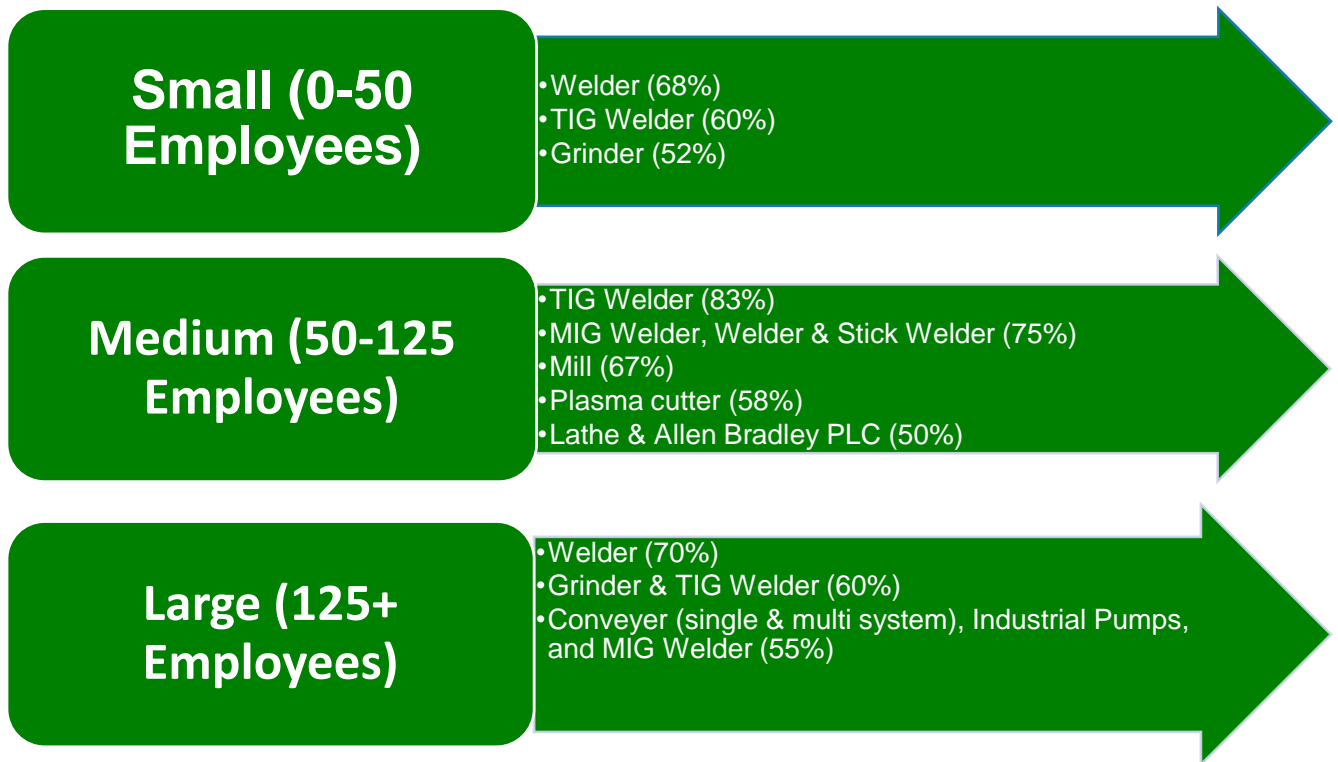
Figure 13. Top Occupations, by Company Size Group

Small (0-50 Employees)
- Forklift operator (64%)
- Production worker & supervisor (60%)
- Fabricator/assembler (52%)

Medium (50-125 Employees)
- Supervisor (83%)
- Production Worker & Welder (75%)
- CAD Operator, Multicraft Maintenance, Production Operators, Mechanical Engineer, Quality Control Technician (50%)

Large (125+ Employees)
- Production Operators (85%)
- Forklift operator & Mechanical Engineer (80%)
- Production Worker, Quality Control Technician (75%)
- Supervisor (70%)
- Electrician (60%)
- Industrial Lab Technician, Industrial Engineer,

Equipment

Respondents were asked to select from a list which equipment is regularly used at their facilities. Frequencies were tabulated across each type of equipment and the most commonly used equipment was consistent across all company size groups—predominantly welding and metalworking equipment. The figure demonstrates in detail common equipment used in each company size group. Equipment in the figure represent those which 50% or more of companies in each subsector reported to be in their top six types of equipment used.

Figure 14. Top Equipment, by Company Size Group

Small (0-50 Employees)
- Welder (68%)
- TIG Welder (60%)
- Grinder (52%)

Medium (50-125 Employees)
- TIG Welder (83%)
- MIG Welder, Welder & Stick Welder (75%)
- Mill (67%)
- Plasma cutter (58%)
- Lathe & Allen Bradley PLC (50%)

Large (125+ Employees)
- Welder (70%)
- Grinder & TIG Welder (60%)
- Conveyer (single & multi system), Industrial Pumps, and MIG Welder (55%)

Education and Training Partnerships

Respondents were asked to indicate whether they actively partnered with education and training providers to upskill incumbent workers or for work-based learning opportunities. When broken down by company size group, the data reveals some differences in partnership patterns.

Large companies partnered with education and training providers at the highest rate (50%) and small companies partnered at the lowest rate (21%.)

Table 12. Active Partnerships with Education/Training Providers, by Company Size Group

Company Size (Number of Employees in OH/Region)	Yes	No	Total
Small (0-50 employees)	5 (21*%)	19 (79%)	**24**

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Company Size (Number of Employees in OH/Region)	Yes	No	Total
Medium (50-125 employees)	5 (42%)	7 (58%)	12
Large (125+ employees)	10 (50%)	10 (50%)	20
Total	20	36	56**

*Due to rounding, percentages may not total exactly 100%
**Two respondents missing data—one respondent's size data was unusable

Of the 20 respondents that indicated they actively partner, there was also minor variation in satisfaction by company size group. The numbers in each cell are small, and data is missing, so these numbers should be interpreted with caution. Only half of the large companies who partnered reported that providers offered the training they needed, as opposed to all of the medium companies and two-thirds of small companies.

Table 13. Whether Providers Offer Needed Training (those who partner)

Company Size (Number of Employees in OH/Region)	Yes	No	Total
Small (0-50 employees)	2 (66*%)	1 (33%)	3
Medium (50-125 employees)	5 (100%)	-	5
Large (125+ employees)	5 (50%)	5 (50%)	10
Total	12	6	18**

*Due to rounding, percentages may not total exactly 100%
**Missing data

Of the 36 respondents with usable size data that indicated they **do not** actively partner small companies were the least satisfied with training offerings—60 percent said providers did not offer the training they needed.

Table 14. Whether Providers Offer Needed Training (those who do not partner)

Company Size (Number of Employees in OH/Region)	Yes	No	Total
Small (0-50 employees)	6 (40*%)	9 (60%)	15
Medium (50-125 employees)	4 (67%)	2 (33%)	6
Large (125+ employees)	5 (63%)	3 (38%)	8
Total	**15**	**14**	**29****

Due to rounding, percentages may not total exactly 100%
**Missing data

Appendix D: Participating Companies

- Allnex
- American Heavy Plate Solutions, LLC
- Athens Mold and Machine, Inc,
- Caron Products & Services, Inc.
- Cimarron
- Contraxx Furniture
- Dimex, LLC
- Duke Energy
- E.I. DuPont De Nemours and Company
- Energizer Holdings
- Eramet Marietta Inc.
- EZG Manufacturing
- Farrar Scientific
- Ferroglobe (Globe Metallurgical, Inc.
- Global Cooling, Inc.
- Grimm Scientific Industries, Inc,
- Haessly Hardwood Lumber Co.
- Hi-Vac Corporation
- Inland Hardwood Corporation
- International Converter (A Novolex Company)
- Jax Mold and Machine
- Kraton Polymers U.S. LLC
- Ludowici Roof Tile
- Mahle Engine Components USA, Inc.
- Marietta Industrial Enterprises, Inc.
- Metaltech Steel Company
- Miba Bearings US, LLC
- Miba Sinter USA LLC
- Micro Machine Works, Inc.
- Mitutoyo America Corporation
- Mondo Polymer Technologies, Inc.
- Orion, Engineered Carbons, LLC
- PCC Airfoils LLC
- Pioneer Pipe/Pioneer Group
- Profusion Industries, LLC
- QuickLoadz Delivery System LLC
- Quidel Corporation (former Diagnostic Hybrids)
- Remram Recovery, LLC
- Shade Manufacturing LLC
- Shagbark Seed & Mill
- Shelly and Sands

- Skuttle Manufacturing Company
- Snowville Creamery, LLC
- Solvay Specialty Polymers
- Star Engineering, Inc.
- Stewart McDonald
- Stonebridge Operating
- Teikoku USA
- Terra Sonic International, LLC
- Terra Sonic International, LLC
- The AMES Companies, Inc.
- The Imperial Electric Company
- Thermo Fisher Scientific Inc.
- Vanguard Paints & Finishes, Incorporated

Appendix E: Survey

PDF

AOMC Labor Market Survey Final Zoho Version 6-25-2021.pdf

Appendix F: Interview Protocol

AOMC Labor Market Survey Interview Guide

Section 1: Big Picture Trends and General Information

 • Tell me a little bit about your company. What keeps you up at night and what are you doing to address those challenges? What is going well in your business? *Other prompts can include*: What do you manufacture? How long have you been in business? How has the business changed since you started? *This is basically an icebreaker question to start the conversation.*

Section 2: Identifying Hiring Needs

- What are your current workforce needs? What is your business's top workforce priority over the next five years? ten years?
- How do you foresee these needs changing in the future? *Follow up*: What critical positions will be most affected by an aging workforce?

- What positions do you have the most difficulty filling? Why are these positions difficult to fill?

- What recommendations would you give to educational institutions, including high schools, technical/vocational schools and colleges, seeking to improve the job preparedness of their graduates?

Section 3: Retention and Work-Based Training

- Generally speaking, do you feel that workforce retention is a challenge for your business? Are there specific positions or skills where retention is an issue? If so, what are they?
- Why don't new hires succeed? *Follow up*: What is the most common reason workers leave positions at your business?
- Tell me about the types of work-based learning opportunities, such as internships, apprenticeships, on-the-job training, earn and learn, that your company offers. *Follow up question*s: How effective have those programs been? What kinds of results have you seen from these initiatives?
- Do you have a process in place for recognizing leadership or advancement potential? Are employees expressing a desire to stay or advance, but feel they're not supported or have no advancement opportunities?