



**Department of  
Job and Family Services**

TO STRENGTHEN OHIO'S FAMILIES WITH SOLUTIONS TO TEMPORARY CHALLENGES

# Advanced Manufacturing Industry Cluster



## Ohio Employment Trends

**April 2018**

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## Executive Summary

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- The advanced manufacturing cluster consists of 18 industries that use technology to improve products and/or processes. These varied manufacturing industries include, but are not limited to, plastic product manufacturing, machine shops and other fabricated metal manufacturing, industrial and other general purpose machinery manufacturing, iron and steel manufacturing, glass and glass product manufacturing, and electrical equipment and appliance manufacturing.
- Location quotients are a measure of how significant an industry is to a region's economy. Location quotients greater than 1.2 mean the industry's concentration of employment is significantly greater than the U.S. average. Nearly all the industries in the advanced manufacturing cluster have location quotients above 1.2. The exception is support activities for mining, which has a location quotient of .49.
- Employment in the advanced manufacturing cluster peaked in 2001. During the national recession of 2007-2009, cluster employment dropped faster than total covered employment in Ohio and the U.S.
- Machine shops; turned product; and screw, nut, and bolt manufacturing (NAICS 3327) and other general purpose machinery manufacturing (NAICS 3339) are expected to have employment increases of 1,840 and 1,040, respectively, between 2014 and 2024.
- About 54 percent of advanced manufacturing cluster workers are age 45 or older, compared to 45 percent of all Ohio workers. Businesses in the advanced manufacturing cluster may need to replace retiring workers sooner than businesses in other Ohio industries.
- Typical education at entry for 21 of the 25 largest occupations in the advanced manufacturing cluster is a high school diploma or less, and 20 of these occupations require on-the-job training.

## Introduction

Advanced manufacturing industries use technology to improve products and/or processes. The advanced manufacturing cluster consists of 18 industries: support activities for mining; petroleum and coal products manufacturing; plastics products manufacturing; glass and glass product manufacturing; other nonmetallic mineral product manufacturing; iron and steel mills and ferroalloy manufacturing; steel product manufacturing from purchased steel; nonferrous metal (except aluminum) production and processing; foundries; forging and stamping; boiler, tank, and shipping container manufacturing; machine shops, turned product, and screw, nut and bolt manufacturing; other fabricated metal product manufacturing; industrial machinery manufacturing; other general purpose machinery manufacturing; electric lighting equipment manufacturing; household appliance manufacturing; and electrical equipment manufacturing. Figure 1 shows annual employment<sup>1</sup> for the industries in the advanced manufacturing cluster, displayed according to their North American Industry Classification System (NAICS) codes. In 2016, the advanced manufacturing cluster made up 4.5 percent of Ohio's total private employment, or more than 206,000 workers.

**Figure 1. > Advanced Manufacturing Cluster Industries**

| NAICS Code | Industry Title  | 2016 Employment |
|------------|---|-----------------|
| 2131       | Support Activities for Mining   | 4,755           |
| 3241       | Petroleum and Coal Products Manufacturing                             | 5,046           |
| 3261       | Plastics Product Manufacturing  | 43,500          |
| 3272       | Glass and Glass Product Manufacturing                                 | 8,232           |
| 3279       | Other Nonmetallic Mineral Product Manufacturing                       | 7,789           |
| 3311       | Iron and Steel Mills and Ferroalloy Manufacturing                     | 7,747           |
| 3312       | Steel Product Manufacturing from Purchased Steel                      | 7,392           |
| 3314       | Nonferrous Metal (except Aluminum) Production and Processing          | 5,740           |
| 3315       | Foundries   | 12,653          |
| 3321       | Forging and Stamping  | 9,970           |
| 3324       | Boiler, Tank, and Shipping Container Manufacturing                    | 7,713           |
| 3327       | Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing | 24,722          |
| 3329       | Other Fabricated Metal Product Manufacturing                          | 18,751          |
| 3332       | Industrial Machinery Manufacturing                                    | 9,697           |
| 3339       | Other General Purpose Machinery Manufacturing                         | 24,257          |
| 3351       | Electric Lighting Equipment Manufacturing                             | NA              |
| 3352       | Household Appliance Manufacturing                                     | NA              |
| 3353       | Electrical Equipment Manufacturing                                    | 8,165           |

Source: Quarterly Census of Employment and Wages

<sup>1</sup> Federal laws (including the Confidential Information Protection and Statistical Efficiency Act of 2002) prohibit data from being published if doing so might identify a company. Throughout this report, data fields marked "NA" have been suppressed for confidentiality.

## Industry Employment Concentration

An industry's location quotient (LQ) is a measure of how significant that industry is to a region's economy. Figure 2 lists the advanced manufacturing industries and their corresponding location quotients. Values greater than 1.2 mean the industry's concentration of employment in Ohio is significantly greater than the U.S. average. This suggests these establishments serve advanced manufacturing needs beyond Ohio. Fifteen advanced manufacturing industries had 2016 location quotients greater than 1.2: steel product manufacturing from purchased steel (LQ 3.54); foundries (LQ 2.87); forging and stamping (LQ 2.74); other nonmetallic mineral product manufacturing (LQ 2.72); glass and glass product manufacturing (LQ 2.58); nonferrous metal (except aluminum) production and processing (LQ 2.54); iron and steel mills and ferroalloy manufacturing (LQ 2.52); other general purpose machinery manufacturing (LQ 2.51); industrial machinery manufacturing (LQ 2.32); boiler, tank, and shipping container manufacturing (LQ 2.26); plastic product manufacturing (LQ 2.04); machine shops, turned product, and screw, nut, and bolt manufacturing (LQ 1.88); other fabricated metal product manufacturing (LQ 1.86); electrical equipment manufacturing (LQ 1.57); and petroleum and coal products manufacturing (LQ 1.21).

**Figure 2. > Industry Location Quotients, 2016**

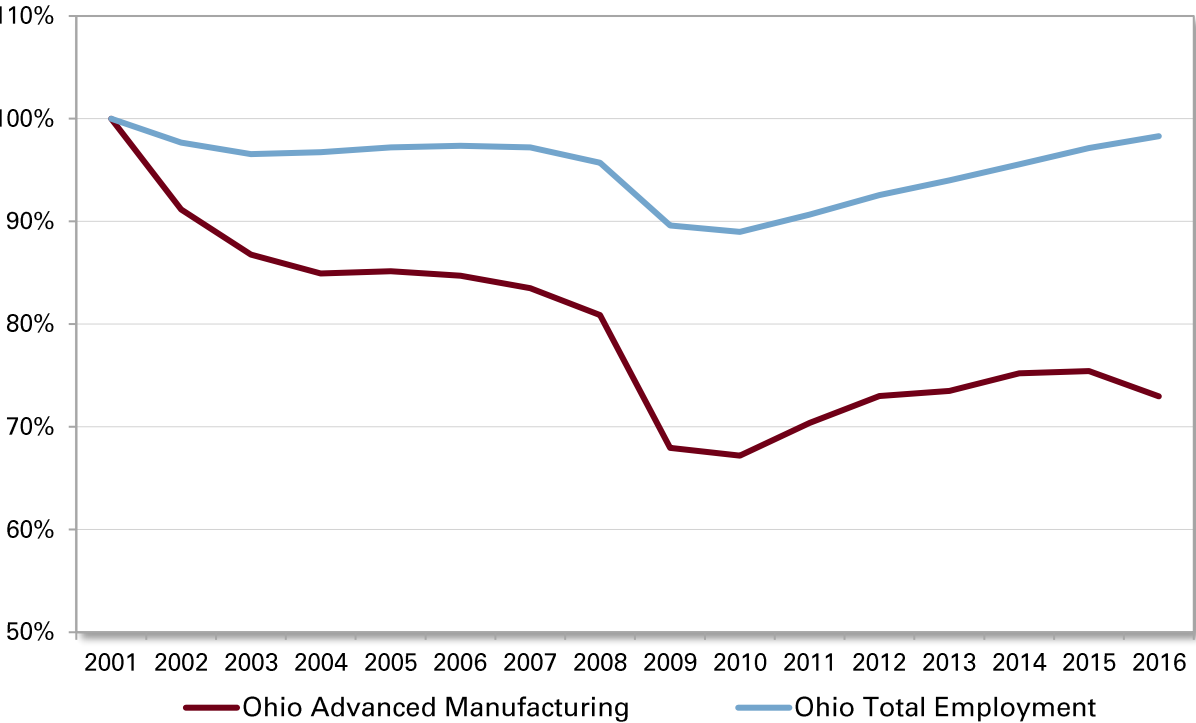
| NAICS Code | NAICS Title   | Location Quotient |
|------------|---|-------------------|
| 2131       | Support Activities for Mining   | 0.49              |
| 3241       | Petroleum and Coal Products Manufacturing                             | 1.21              |
| 3261       | Plastics Product Manufacturing  | 2.04              |
| 3272       | Glass and Glass Product Manufacturing                                 | 2.58              |
| 3279       | Other Nonmetallic Mineral Product Manufacturing                       | 2.72              |
| 3311       | Iron and Steel Mills and Ferroalloy Manufacturing                     | 2.52              |
| 3312       | Steel Product Manufacturing from Purchased Steel                      | 3.54              |
| 3314       | Nonferrous Metal (except Aluminum) Production and Processing          | 2.54              |
| 3315       | Foundries   | 2.87              |
| 3321       | Forging and Stamping  | 2.74              |
| 3324       | Boiler, Tank, and Shipping Container Manufacturing                    | 2.26              |
| 3327       | Machine Shops; Turned Product: and Screw, Nut, and Bolt Manufacturing | 1.88              |
| 3329       | Other Fabricated Metal Product Manufacturing                          | 1.86              |
| 3332       | Industrial Machinery Manufacturing                                    | 2.32              |
| 3339       | Other General Purpose Machinery Manufacturing                         | 2.51              |
| 3351       | Electric Lighting Equipment Manufacturing                             | NA                |
| 3352       | Household Appliance Manufacturing                                     | NA                |
| 3353       | Electrical Equipment Manufacturing                                    | 1.57              |

Source: U.S. Bureau of Labor Statistics

# Cluster Employment Trends

Figure 3 shows the percent change in annual employment for the advanced manufacturing cluster<sup>2</sup> and total employment in Ohio from 2001 to 2016. Both declined following the 2001 national recession. The recession had a greater impact on the advanced manufacturing cluster than on total employment. From 2001 to 2005, Ohio’s total employment declined by 2.4 percent, while the advanced manufacturing cluster declined 14.9 percent. The next national recession occurred from 2007 to 2009, during which Ohio total employment declined 6.8 percent, and advanced manufacturing industry cluster employment declined 18.6 percent. While total Ohio employment has recovered since the recession of 2007 to 2009, the advanced manufacturing cluster has had more modest increases. In 2016 Ohio total employment was 98 percent of its 2001 employment level; the advanced manufacturing cluster was 73 percent of its 2001 employment.

**Figure 3. Ohio Advanced Manufacturing Cluster and Ohio Total Employment as a Percentage of 2001 Employment, 2001 - 2016**

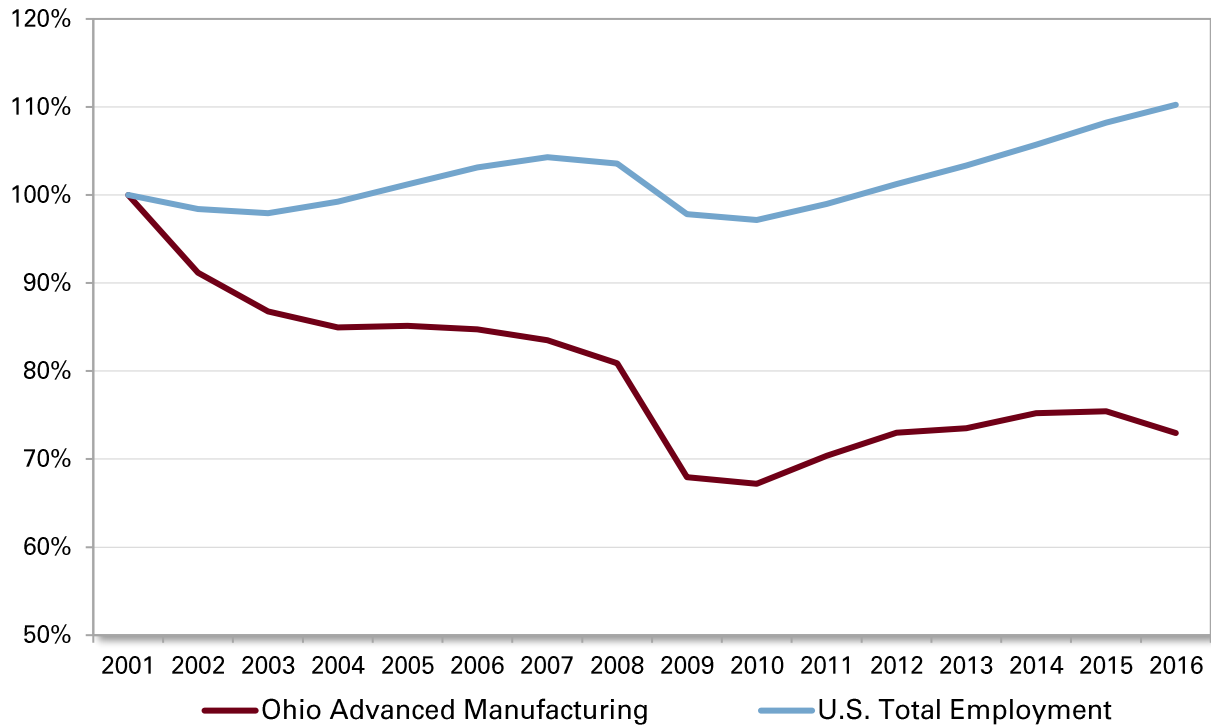


Source: Quarterly Census of Employment and Wages

<sup>2</sup> Figures 3, 4, and 5 contain data for only part of the advanced manufacturing cluster. Data for electric lighting equipment manufacturing (NAICS 3351) and household appliance manufacturing (NAICS 3352) have been omitted because of data suppression during the period. These industries account for less than 10 percent of total cluster employment.

Figure 4 shows the percent change in annual Ohio advanced manufacturing cluster employment and U.S. total employment from 2001 to 2016. From 2004 through 2008, Ohio advanced manufacturing employment declined. It increased from 2012 to 2015 but still lags considerably behind its 2001 employment level.

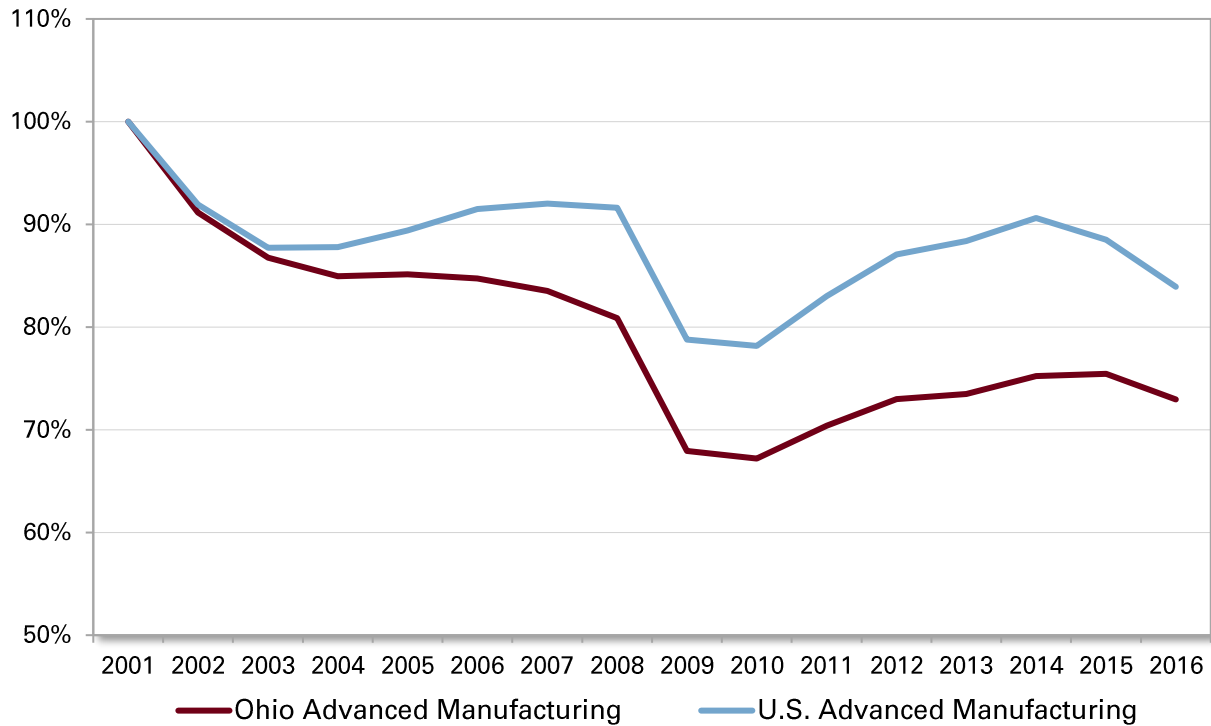
**Figure 4. U.S. Total Employment and Ohio Advanced Manufacturing Employment as a Percentage of 2001 Employment, 2001 - 2016**



Source: U.S. Bureau of Labor Statistics

Figure 5 shows the percent change in annual advanced manufacturing employment from 2001 to 2016 for Ohio and the U.S. Both experienced similar declines after the 2001 recession and during the 2007 to 2009 recession. Advanced manufacturing employment increased from 2012 to 2016 but remains below pre-recession levels.

**Figure 5. U.S. and Ohio Advanced Manufacturing Employment as a Percentage of 2001 Employment, 2001 - 2016**



Source: U.S. Bureau of Labor Statistics



## Industry Employment Trends

This section presents annual employment data from 2000 to 2016 for each industry in the cluster. The nation experienced two recessions during this period, in 2001 and from late 2007 to mid-2009, and each industry in the cluster responded to the recessions differently. Since 2010, overall employment in the cluster increased, while the number of establishments decreased.

### Support Activities for Mining: NAICS 2131

This industry provides support services required for the mining and quarrying of minerals and for the extraction of oil and gas. From 2000 to 2016, employment in this industry grew by 2,992 jobs (169.7 percent) and 225 establishments.

**Figure 6. > Support Activities for Mining**

| Year                  | Establishments | Employment    |
|-----------------------|----------------|---------------|
| 2000                  | 227            | 1,763         |
| 2001                  | 236            | 1,884         |
| 2002                  | 248            | 1,883         |
| 2003                  | 250            | 2,186         |
| 2004                  | 242            | 2,272         |
| 2005                  | 258            | 2,389         |
| 2006                  | 269            | 2,590         |
| 2007                  | 283            | 2,915         |
| 2008                  | 287            | 3,119         |
| 2009                  | 288            | 2,879         |
| 2010                  | 280            | 2,566         |
| 2011                  | 293            | 2,863         |
| 2012                  | 318            | 3,389         |
| 2013                  | 354            | 4,606         |
| 2014                  | 404            | 6,474         |
| 2015                  | 455            | 6,450         |
| 2016                  | 452            | 4,755         |
| <b>Net Change</b>     | <b>225</b>     | <b>2,992</b>  |
| <b>Percent Change</b> | <b>99.1%</b>   | <b>169.7%</b> |

Source: Quarterly Census of Employment and Wages

### Petroleum and Coal Products Manufacturing: NAICS 3241

This industry transforms crude petroleum and coal into usable products; the dominant process is petroleum refining. Between 2000 and 2016, the industry lost 447 jobs (-8.1 percent) and 40 establishments.

**Figure 7. Petroleum and Coal Products Manufacturing**

| Year                  | Establishments | Employment   |
|-----------------------|----------------|--------------|
| 2000                  | 158            | 5,493        |
| 2001                  | 157            | 5,025        |
| 2002                  | 152            | 4,676        |
| 2003                  | 151            | 4,613        |
| 2004                  | 148            | 4,685        |
| 2005                  | 143            | 4,757        |
| 2006                  | 137            | 4,552        |
| 2007                  | 128            | 4,608        |
| 2008                  | 127            | 4,539        |
| 2009                  | 121            | 4,319        |
| 2010                  | 123            | 4,311        |
| 2011                  | 128            | 4,426        |
| 2012                  | 128            | 4,524        |
| 2013                  | 122            | 4,869        |
| 2014                  | 120            | 4,869        |
| 2015                  | 118            | 4,785        |
| 2016                  | 118            | 5,046        |
| <b>Net Change</b>     | <b>-40</b>     | <b>-447</b>  |
| <b>Percent Change</b> | <b>-25.3%</b>  | <b>-8.1%</b> |

Source: Quarterly Census of Employment and Wages

### Plastic Product Manufacturing: NAICS 3261

This industry is primarily engaged in processing new or spent plastic resins into intermediate or final products, using such processes as compression molding, extrusion molding, injection molding, blow molding, and casting. During the recession of 2007-2009, industry employment lost 9,559 jobs (-20.4 percent). Industry employment declined to a low of 37,241 in 2009. Between 2009 and 2016, plastic product manufacturing gained 6,259 jobs (16.8 percent).

**Figure 8. Plastic Product Manufacturing**

| Year                  | Establishments | Employment     |
|-----------------------|----------------|----------------|
| 2000                  | 861            | 61,566         |
| 2001                  | 851            | 56,589         |
| 2002                  | 852            | 55,900         |
| 2003                  | 838            | 53,081         |
| 2004                  | 812            | 51,100         |
| 2005                  | 797            | 50,715         |
| 2006                  | 787            | 49,349         |
| 2007                  | 741            | 46,800         |
| 2008                  | 736            | 44,122         |
| 2009                  | 727            | 37,241         |
| 2010                  | 722            | 38,301         |
| 2011                  | 722            | 38,802         |
| 2012                  | 711            | 39,876         |
| 2013                  | 684            | 40,843         |
| 2014                  | 685            | 41,940         |
| 2015                  | 684            | 42,583         |
| 2016                  | 672            | 43,500         |
| <b>Net Change</b>     | <b>-189</b>    | <b>-18,066</b> |
| <b>Percent Change</b> | <b>-22.0%</b>  | <b>-29.3%</b>  |

Source: Quarterly Census of Employment and Wages

### Glass and Glass Products Manufacturing: NAICS 3272

This industry is primarily engaged in manufacturing glass and/or glass products. Between 2000 and 2009, the industry lost 6,335 jobs (-46.6 percent) and 54 establishments. This industry lost 1,458 jobs (-16.7 percent) during the 2007 to 2009 national recession. From 2010 to 2016, employment increased by 1,067 jobs (14.8 percent).

**Figure 9. Glass and Glass Products Manufacturing**

| Year                  | Establishments | Employment    |
|-----------------------|----------------|---------------|
| 2000                  | 158            | 13,609        |
| 2001                  | 154            | 12,823        |
| 2002                  | 143            | 11,933        |
| 2003                  | 138            | 10,953        |
| 2004                  | 134            | 9,843         |
| 2005                  | 127            | 9,159         |
| 2006                  | 127            | 8,982         |
| 2007                  | 120            | 8,732         |
| 2008                  | 111            | 8,268         |
| 2009                  | 104            | 7,274         |
| 2010                  | 92             | 7,215         |
| 2011                  | 96             | 7,485         |
| 2012                  | 93             | 7,643         |
| 2013                  | 91             | 7,573         |
| 2014                  | 92             | 7,411         |
| 2015                  | 85             | 6,974         |
| 2016                  | 85             | 8,282         |
| <b>Net Change</b>     | <b>-73</b>     | <b>-5,327</b> |
| <b>Percent Change</b> | <b>-46.2%</b>  | <b>-39.1%</b> |

Source: Quarterly Census of Employment and Wages

### Other Nonmetallic Mineral Product Manufacturing: NAICS 3279

This industry manufactures nonmetallic mineral products (except clay products, refractory products, glass products, cement and concrete products, lime, and gypsum products). Between 2000 and 2009, the industry lost 2,050 jobs (-24.0 percent). This industry lost 1,235 jobs (-16.0 percent) during the 2007 to 2009 national recession. However, from 2010 to 2016, the industry gained 1,034 jobs (15.3 percent).

Figure 10.

### Other Nonmetallic Mineral Product Manufacturing

| Year                  | Establishments | Employment   |
|-----------------------|----------------|--------------|
| 2000                  | 165            | 8,540        |
| 2001                  | 160            | 8,082        |
| 2002                  | 162            | 7,674        |
| 2003                  | 167            | 7,035        |
| 2004                  | 172            | 7,350        |
| 2005                  | 178            | 7,597        |
| 2006                  | 188            | 7,766        |
| 2007                  | 205            | 7,725        |
| 2008                  | 209            | 7,126        |
| 2009                  | 211            | 6,490        |
| 2010                  | 206            | 6,755        |
| 2011                  | 206            | 6,792        |
| 2012                  | 193            | 6,998        |
| 2013                  | 186            | 7,021        |
| 2014                  | 182            | 7,343        |
| 2015                  | 182            | 7,572        |
| 2016                  | 177            | 7,789        |
| <b>Net Change</b>     | <b>12</b>      | <b>-751</b>  |
| <b>Percent Change</b> | <b>7.3%</b>    | <b>-8.8%</b> |

Source: Quarterly Census of Employment and Wages

### Iron and Steel Mills and Ferroalloy Manufacturing: NAICS 3311

This industry is primarily engaged in one or more of the following: (1) direct reduction of iron ore; (2) manufacturing pig iron in molten or solid form; (3) converting pig iron into steel; (4) making steel; (5) making steel and manufacturing shapes (e.g. bar, plate, rod, sheet, strip, wire); (6) making steel and forming pipe and tube; and (7) manufacturing electrometallurgical ferroalloys. Between 2000 and 2009, the industry lost 12,799 jobs (-58.6 percent). Employment in this industry has fluctuated since 2010. From 2010 to 2016, the iron and steel mills and ferroalloy manufacturing industry lost 1,821 jobs (-19.0 percent).

**Figure 11. Iron and Steel Mills and Ferroalloy Manufacturing**

| Year                  | Establishments | Employment     |
|-----------------------|----------------|----------------|
| 2000                  | 49             | 21,844         |
| 2001                  | 55             | 18,502         |
| 2002                  | 59             | 15,210         |
| 2003                  | 66             | 14,808         |
| 2004                  | 66             | 13,611         |
| 2005                  | 64             | 13,395         |
| 2006                  | 60             | 12,640         |
| 2007                  | 61             | 12,931         |
| 2008                  | 62             | 12,664         |
| 2009                  | 61             | 9,045          |
| 2010                  | 61             | 9,568          |
| 2011                  | 60             | 10,166         |
| 2012                  | 62             | 10,053         |
| 2013                  | 60             | 9,240          |
| 2014                  | 57             | 8,938          |
| 2015                  | 60             | 8,532          |
| 2016                  | 61             | 7,747          |
| <b>Net Change</b>     | <b>12</b>      | <b>-14,097</b> |
| <b>Percent Change</b> | <b>24.5%</b>   | <b>-64.5%</b>  |

Source: Quarterly Census of Employment and Wages

### Steel Product Manufacturing from Purchased Steel: NAICS 3312

This industry is primarily engaged in manufacturing iron and steel tube and pipe, drawing steel wire, and rolling or drawing shapes from purchased iron or steel. Between 2000 and 2009, the industry lost 5,775 jobs (-44.4 percent) and 18 establishments. Employment in this industry has fluctuated since 2010. Between 2010 and 2013, the industry lost 291 jobs (-4.0 percent) and reached a low of 7,095 total industry employment. From 2013 to 2016, the steel product manufacturing from purchased steel industry gained 297 jobs (4.2 percent) and gained eight establishments.

**Figure 12.** Steel Product Manufacturing from Purchased Steel

| Year                  | Establishments | Employment    |
|-----------------------|----------------|---------------|
| 2000                  | 136            | 13,009        |
| 2001                  | 138            | 12,195        |
| 2002                  | 138            | 11,089        |
| 2003                  | 127            | 10,286        |
| 2004                  | 109            | 9,361         |
| 2005                  | 111            | 9,075         |
| 2006                  | 115            | 9,456         |
| 2007                  | 119            | 9,247         |
| 2008                  | 121            | 8,818         |
| 2009                  | 118            | 7,234         |
| 2010                  | 120            | 7,386         |
| 2011                  | 120            | 7,791         |
| 2012                  | 108            | 7,666         |
| 2013                  | 93             | 7,095         |
| 2014                  | 95             | 7,371         |
| 2015                  | 98             | 7,240         |
| 2016                  | 101            | 7,392         |
| <b>Net Change</b>     | <b>-35</b>     | <b>-5,617</b> |
| <b>Percent Change</b> | <b>-25.7%</b>  | <b>-43.2%</b> |

Source: Quarterly Census of Employment and Wages

### Nonferrous Metal (except Aluminum) Production and Processing: NAICS 3314

This industry is primarily engaged in one or more of the following 1) smelting ores into nonferrous metals; 2) primary refining of nonferrous metals (except aluminum) by electrolytic methods or other processes; 3) recovering nonferrous metal or alloys (except aluminum) from scrap; 4) alloying purchased nonferrous metals (except aluminum); 5) rolling, drawing, and/or extruding shapes from purchased nonferrous metals (except aluminum); and 6) recovering nonferrous metals and alloys (except aluminum) from scrap and rolling, drawing, and/or extruding shapes. Between 2000 and 2009, the industry lost 7,230 jobs (-61.0 percent) and lost 12 establishments. Employment in this industry has fluctuated since 2010. Between 2010 and 2016, the industry gained 1,106 jobs (23.9 percent) and gained five establishments.

**Figure 13. Nonferrous Metal (except Aluminum) Production and Processing**

| Year                  | Establishments | Employment    |
|-----------------------|----------------|---------------|
| 2000                  | 62             | 11,845        |
| 2001                  | 68             | 10,798        |
| 2002                  | 66             | 9,621         |
| 2003                  | 62             | 8,904         |
| 2004                  | 59             | 8,519         |
| 2005                  | 55             | 8,567         |
| 2006                  | 52             | 8,284         |
| 2007                  | 51             | 6,035         |
| 2008                  | 51             | 5,896         |
| 2009                  | 50             | 4,615         |
| 2010                  | 50             | 4,634         |
| 2011                  | 50             | 4,838         |
| 2012                  | 51             | 5,125         |
| 2013                  | 53             | 5,792         |
| 2014                  | 56             | 5,813         |
| 2015                  | 54             | 5,887         |
| 2016                  | 55             | 5,740         |
| <b>Net Change</b>     | <b>-7</b>      | <b>-6,105</b> |
| <b>Percent Change</b> | <b>-11.3%</b>  | <b>-51.5%</b> |

Source: Quarterly Census of Employment and Wages



### Foundries: NAICS 3315

This industry is primarily engaged in pouring molten metal into molds or dies to form castings. Between 2000 and 2009, the industry lost 13,569 jobs (-51.4 percent) and 65 establishments. Employment in this industry has fluctuated since 2010. From 2010 to 2016, foundries gained 648 jobs (5.4 percent).

**Figure 14.** Foundries

| Year                  | Establishments | Employment     |
|-----------------------|----------------|----------------|
| 2000                  | 273            | 26,415         |
| 2001                  | 271            | 23,343         |
| 2002                  | 254            | 20,333         |
| 2003                  | 247            | 18,508         |
| 2004                  | 237            | 17,906         |
| 2005                  | 234            | 18,009         |
| 2006                  | 226            | 17,167         |
| 2007                  | 226            | 17,891         |
| 2008                  | 220            | 16,449         |
| 2009                  | 208            | 12,846         |
| 2010                  | 211            | 12,005         |
| 2011                  | 201            | 12,407         |
| 2012                  | 199            | 13,052         |
| 2013                  | 196            | 13,057         |
| 2014                  | 191            | 13,795         |
| 2015                  | 199            | 13,976         |
| 2016                  | 195            | 12,653         |
| <b>Net Change</b>     | <b>-78</b>     | <b>-13,762</b> |
| <b>Percent Change</b> | <b>-28.6%</b>  | <b>-52.1%</b>  |

Source: Quarterly Census of Employment and Wages

### Forging and Stamping: NAICS 3321

This industry is primarily engaged in one or more of the following: (1) manufacturing forgings from purchased metals; (2) manufacturing metal custom roll forming products; (3) manufacturing metal stamped and spun products (except automotive, cans, coins); and (4) manufacturing powder metallurgy products. Employment fluctuated from 2001 to 2007. Between 2007 and 2009, the industry lost 3,308 jobs (-25.1 percent). Employment in this industry has fluctuated since 2010, which was the lowest employment for the 17-year period at 9,890 employees. From 2010 to 2012, the forging and stamping industry gained 1,317 jobs (13.3 percent). Between 2012 and 2016, forging and stamping lost 1,237 jobs (-11.0 percent) and lost 26 establishments.

**Figure 15.** > **Forging and Stamping**

| Year                  | Establishments | Employment    |
|-----------------------|----------------|---------------|
| 2000                  | 248            | 14,968        |
| 2001                  | 251            | 13,859        |
| 2002                  | 256            | 12,457        |
| 2003                  | 256            | 11,945        |
| 2004                  | 255            | 12,107        |
| 2005                  | 258            | 12,516        |
| 2006                  | 254            | 13,116        |
| 2007                  | 256            | 13,200        |
| 2008                  | 272            | 12,706        |
| 2009                  | 265            | 9,892         |
| 2010                  | 258            | 9,890         |
| 2011                  | 254            | 10,333        |
| 2012                  | 255            | 11,207        |
| 2013                  | 244            | 11,026        |
| 2014                  | 241            | 10,876        |
| 2015                  | 232            | 10,670        |
| 2016                  | 229            | 9,970         |
| <b>Net Change</b>     | <b>-19</b>     | <b>-4,998</b> |
| <b>Percent Change</b> | <b>-7.7%</b>   | <b>-33.4%</b> |

Source: Quarterly Census of Employment and Wages

### Boiler, Tank, and Shipping Container Manufacturing: NAICS 3324

This industry is primarily engaged in one of the following: (1) manufacturing power boilers and heat exchangers; (2) cutting, forming, and joining heavy gauge metal to manufacture tanks, vessels, and other containers; and (3) forming light gauge metal containers. Between 2007 and 2009, the industry gained 632 jobs (7.6 percent); this is the only advanced manufacturing industry to post gains during the 2007-2009 recession. Employment has fluctuated since 2010. From 2010 to 2016, boiler, tank, and shipping container manufacturing lost 715 jobs (-8.5 percent). Between 2000 and 2016, this industry has lost 2,042 jobs (-20.9 percent) and lost five establishments.

**Figure 16.** Boilers, Tank, and Shipping Container Manufacturing

| Year                  | Establishments | Employment    |
|-----------------------|----------------|---------------|
| 2000                  | 122            | 9,755         |
| 2001                  | 126            | 9,383         |
| 2002                  | 123            | 8,298         |
| 2003                  | 119            | 8,283         |
| 2004                  | 122            | 8,344         |
| 2005                  | 122            | 8,003         |
| 2006                  | 115            | 8,035         |
| 2007                  | 111            | 8,272         |
| 2008                  | 112            | 8,619         |
| 2009                  | 117            | 8,904         |
| 2010                  | 112            | 8,428         |
| 2011                  | 119            | 8,504         |
| 2012                  | 117            | 8,459         |
| 2013                  | 112            | 8,268         |
| 2014                  | 112            | 8,289         |
| 2015                  | 113            | 8,056         |
| 2016                  | 117            | 7,713         |
| <b>Net Change</b>     | <b>-5</b>      | <b>-2,042</b> |
| <b>Percent Change</b> | <b>-4.1%</b>   | <b>-20.9%</b> |

Source: Quarterly Census of Employment and Wages

**Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing: NAICS 3327**

This industry is primarily engaged in one of the following: (1) machining metal and plastic parts and parts of other composite materials on a job or order basis, known as machine shops; (2) machining precision turned products; or (3) manufacturing metal bolts, nuts, screws, rivets, and other industrial fasteners. Between 2007 and 2009 the industry lost 5,087 jobs (-19.1 percent) and 19 establishments. Employment in this industry has fluctuated since 2010. From 2010 to 2016, machine shops; turned product; and screw, nut, and bolt manufacturing gained 2,813 jobs (12.8 percent) and lost 102 establishments.

**Figure 17. Machine Shops; Turned Product; and Screw, Nut and Bolt Manufacturing**

| Year                  | Establishments | Employment    |
|-----------------------|----------------|---------------|
| 2000                  | 1902           | 30,274        |
| 2001                  | 1915           | 27,783        |
| 2002                  | 1881           | 24,812        |
| 2003                  | 1852           | 24,155        |
| 2004                  | 1782           | 24,990        |
| 2005                  | 1760           | 26,408        |
| 2006                  | 1731           | 26,642        |
| 2007                  | 1715           | 26,685        |
| 2008                  | 1720           | 26,621        |
| 2009                  | 1696           | 21,598        |
| 2010                  | 1663           | 21,909        |
| 2011                  | 1637           | 24,229        |
| 2012                  | 1615           | 25,401        |
| 2013                  | 1605           | 25,205        |
| 2014                  | 1598           | 25,966        |
| 2015                  | 1580           | 26,111        |
| 2016                  | 1561           | 24,722        |
| <b>Net Change</b>     | <b>-341</b>    | <b>-5,552</b> |
| <b>Percent Change</b> | <b>-17.9%</b>  | <b>-18.3%</b> |

Source: Quarterly Census of Employment and Wages

## Other Fabricated Metal Product Manufacturing: NAICS 3329

This industry is primarily engaged in manufacturing fabricated metal products (except forgings and stampings, cutlery and hand tools, architectural and structural metals, boilers, tanks, shipping containers, hardware, spring and wire products, machine shop products, turned products, screw, and nuts and bolts). The industry experienced its first employment decline in 2001 and continued to decline through 2010. Between 2000 and 2007, this industry lost 6,698 jobs (-20.6 percent) and 69 establishments. During the most recent recession between 2007 and 2009, the industry lost 4,050 jobs (-15.7 percent) and 19 establishments. Employment in this industry has fluctuated since 2010. From 2010 to 2016, other fabricated metal product manufacturing lost 2,251 jobs (-10.7 percent) and lost 28 establishments.

**Figure 18. Other Fabricated Metal Product Manufacturing**

| Year                  | Establishments | Employment     |
|-----------------------|----------------|----------------|
| 2000                  | 491            | 32,472         |
| 2001                  | 495            | 30,268         |
| 2002                  | 480            | 27,619         |
| 2003                  | 469            | 26,833         |
| 2004                  | 439            | 26,481         |
| 2005                  | 420            | 26,164         |
| 2006                  | 422            | 25,765         |
| 2007                  | 422            | 25,774         |
| 2008                  | 412            | 25,171         |
| 2009                  | 403            | 21,724         |
| 2010                  | 388            | 21,002         |
| 2011                  | 374            | 22,095         |
| 2012                  | 365            | 22,632         |
| 2013                  | 366            | 21,664         |
| 2014                  | 369            | 21,085         |
| 2015                  | 362            | 20,576         |
| 2016                  | 360            | 18,751         |
| <b>Net Change</b>     | <b>-131</b>    | <b>-13,721</b> |
| <b>Percent Change</b> | <b>-26.7%</b>  | <b>-42.3%</b>  |

Source: Quarterly Census of Employment and Wages

### Industrial Machinery Manufacturing: NAICS 3332

This industry is primarily engaged in manufacturing industrial machinery, such as food and beverage manufacturing machinery, semiconductor manufacturing machinery, sawmill and woodworking machinery (except handheld), machinery for making paper and paper products, printing and binding machinery and equipment, textile making machinery, and machinery for making plastics and rubber products. Between 2000 and 2007, the industrial machinery manufacturing industry lost 2,341 jobs (-18.4 percent) and 36 establishments. During the 2007-2009 recession, the industry lost 1,938 jobs (-18.7 percent) and 21 establishments. Employment in this industry has fluctuated since 2010. From 2010 to 2016, other fabricated metal product manufacturing gained 1,648 jobs (20.5 percent) and lost 19 establishments.

**Figure 19. Industrial Machinery Manufacturing**

| Year                  | Establishments | Employment    |
|-----------------------|----------------|---------------|
| 2000                  | 329            | 12,692        |
| 2001                  | 322            | 10,814        |
| 2002                  | 312            | 9,550         |
| 2003                  | 309            | 9,573         |
| 2004                  | 308            | 9,684         |
| 2005                  | 301            | 9,985         |
| 2006                  | 297            | 9,798         |
| 2007                  | 293            | 10,351        |
| 2008                  | 284            | 9,954         |
| 2009                  | 272            | 8,413         |
| 2010                  | 262            | 8,049         |
| 2011                  | 255            | 8,620         |
| 2012                  | 251            | 8,617         |
| 2013                  | 251            | 9,344         |
| 2014                  | 247            | 9,635         |
| 2015                  | 245            | 10,084        |
| 2016                  | 243            | 9,697         |
| <b>Net Change</b>     | <b>-86</b>     | <b>-2,995</b> |
| <b>Percent Change</b> | <b>-26.1%</b>  | <b>-23.6%</b> |

Source: Quarterly Census of Employment and Wages

### Other General Purpose Machinery Manufacturing: NAICS 3339

This industry is primarily engaged in manufacturing pumps and compressors, material handling equipment, and general purpose machinery (except ventilation, heating, air-conditioning, and commercial refrigeration equipment; metal working machinery; engines, turbines, and power transmission equipment; pumps and compressors; and material handling equipment). Between 2000 and 2007, the industry lost 7,179 jobs (-22.1 percent) and 74 establishments. During the most 2007-2009 recession, the industry lost 4,294 jobs (-17.0 percent) and 20 establishments. Employment in this industry has fluctuated since 2010. From 2010 to 2016, other general purpose machinery manufacturing gained 4,098 jobs (20.3 percent) and lost 27 establishments.

**Figure 20. Other General Purpose Machinery Manufacturing**

| Year                  | Establishments | Employment    |
|-----------------------|----------------|---------------|
| 2000                  | 529            | 32,431        |
| 2001                  | 529            | 29,534        |
| 2002                  | 504            | 25,926        |
| 2003                  | 489            | 24,329        |
| 2004                  | 465            | 24,312        |
| 2005                  | 460            | 24,724        |
| 2006                  | 465            | 25,898        |
| 2007                  | 455            | 25,252        |
| 2008                  | 450            | 24,831        |
| 2009                  | 435            | 20,958        |
| 2010                  | 417            | 20,159        |
| 2011                  | 412            | 21,619        |
| 2012                  | 411            | 23,192        |
| 2013                  | 406            | 23,701        |
| 2014                  | 398            | 24,260        |
| 2015                  | 397            | 25,031        |
| 2016                  | 390            | 24,257        |
| <b>Net Change</b>     | <b>-139</b>    | <b>-8,174</b> |
| <b>Percent Change</b> | <b>-26.3%</b>  | <b>-25.2%</b> |

Source: Quarterly Census of Employment and Wages

### Electric Lighting Equipment Manufacturing: NAICS 3351

This industry is primarily engaged in manufacturing electric light bulbs and tubes and parts and components (except blanks for electric light bulbs), electric lighting fixtures (except vehicular), nonelectric lighting equipment, lamps shades (except glass and plastics), and lighting fixture components (except current-carrying wiring devices). From 2000 to 2007, the industry lost 3,961 jobs (-45.6 percent) and 45 establishments. Between 2007 and 2009, the industry lost 1,659 jobs (-35.1 percent) and five establishments. Employment in this industry has fluctuated since 2010. From 2010 to 2015, electric lighting equipment manufacturing lost 132 jobs (-4.7 percent) and 10 establishments.

**Figure 21. Electric Lighting Equipment Manufacturing**

| Year                  | Establishments | Employment |
|-----------------------|----------------|------------|
| 2000                  | 112            | 8,684      |
| 2001                  | 144            | 8,244      |
| 2002                  | 128            | 7,623      |
| 2003                  | 117            | 7,138      |
| 2004                  | 95             | 6,234      |
| 2005                  | 79             | 5,474      |
| 2006                  | 72             | 5,256      |
| 2007                  | 67             | 4,723      |
| 2008                  | 70             | 3,972      |
| 2009                  | 62             | 3,064      |
| 2010                  | 61             | 2,823      |
| 2011                  | 54             | 2,881      |
| 2012                  | 53             | 2,976      |
| 2013                  | 55             | 2,946      |
| 2014                  | 52             | 2,667      |
| 2015                  | 51             | 2,691      |
| 2016                  | 50             | NA         |
| <b>Net Change</b>     | <b>NA</b>      | <b>NA</b>  |
| <b>Percent Change</b> | <b>NA</b>      | <b>NA</b>  |

Source: Quarterly Census of Employment and Wages



### Household Appliance Manufacturing: NAICS 3352

This industry is primarily engaged in manufacturing small electric appliances and electric housewares; household-type fans (except attic fans); household-type vacuum cleaners and other electric household-type floor care machines; household-type cooking appliances; household-type laundry equipment; household-type refrigerators, upright and chest freezers; and other electrical and nonelectrical major household-type appliances, such as dishwashers, water heaters, and garbage disposal units. From 2000 to 2007, the industry lost 3,441 jobs (-23.0 percent) and two establishments. Between 2007 and 2009, the industry lost 2,371 jobs (-20.6 percent) and five establishments. Employment in this industry has fluctuated since 2010. From 2010 to 2015, the most recently disclosed year, household appliance manufacturing gained 671 jobs (7.3 percent) and lost three establishments.

**Figure 22. Household Appliance Manufacturing**

| Year                  | Establishments | Employment |
|-----------------------|----------------|------------|
| 2000                  | 35             | 14,966     |
| 2001                  | 38             | 14,448     |
| 2002                  | 33             | 14,612     |
| 2003                  | 37             | 13,771     |
| 2004                  | 36             | 13,022     |
| 2005                  | 38             | 12,075     |
| 2006                  | 34             | 11,139     |
| 2007                  | 33             | 11,525     |
| 2008                  | 30             | 10,918     |
| 2009                  | 28             | 9,154      |
| 2010                  | 25             | 9,185      |
| 2011                  | 23             | 9,357      |
| 2012                  | 25             | 9,627      |
| 2013                  | 24             | 9,749      |
| 2014                  | 22             | 10,014     |
| 2015                  | 22             | 9,856      |
| 2016                  | 22             | NA         |
| <b>Net Change</b>     | <b>-13</b>     | <b>NA</b>  |
| <b>Percent Change</b> | <b>-37.1%</b>  | <b>NA</b>  |

Source: Quarterly Census of Employment and Wages

### Electrical Equipment Manufacturing: NAICS 3353

This industry is primarily engaged in manufacturing power, distribution, and specialty transformers; electric motors, generators, and motor generator sets; switchgear and switchboard apparatus; relays; and industrial controls. From 2000 to 2007, the industry lost 2,915 jobs (-23.4 percent) and 22 establishments. Between 2007 and 2009, the industry lost 1,012 jobs (-10.6 percent) and four establishments. Employment in this industry has fluctuated since 2010. From 2010 to 2016, electrical equipment manufacturing gained 463 jobs (6.0 percent) and lost 20 establishments.

**Figure 23. Electrical Equipment Manufacturing**

| Year                  | Establishments | Employment    |
|-----------------------|----------------|---------------|
| 2000                  | 219            | 12,466        |
| 2001                  | 200            | 11,690        |
| 2002                  | 201            | 10,619        |
| 2003                  | 196            | 9,679         |
| 2004                  | 188            | 9,450         |
| 2005                  | 190            | 9,137         |
| 2006                  | 193            | 9,379         |
| 2007                  | 197            | 9,551         |
| 2008                  | 195            | 9,630         |
| 2009                  | 193            | 8,539         |
| 2010                  | 184            | 7,702         |
| 2011                  | 174            | 7,936         |
| 2012                  | 172            | 8,405         |
| 2013                  | 173            | 8,357         |
| 2014                  | 172            | 8,480         |
| 2015                  | 167            | 8,638         |
| 2016                  | 164            | 8,165         |
| <b>Net Change</b>     | <b>-55</b>     | <b>-4,301</b> |
| <b>Percent Change</b> | <b>-25.1%</b>  | <b>-34.5%</b> |

Source: Quarterly Census of Employment and Wages

## **The Advanced Manufacturing Workforce**

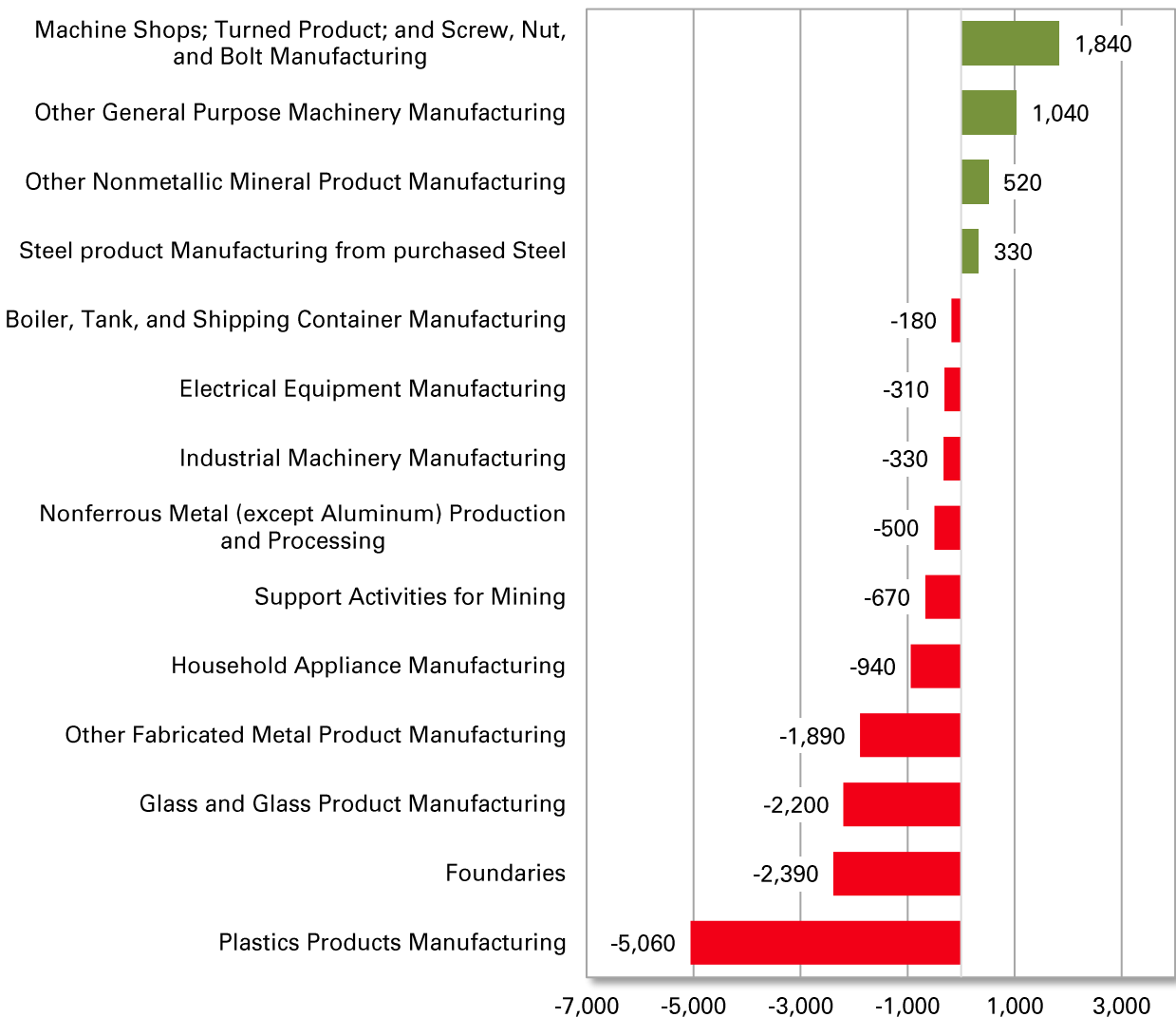
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Three factors affect an industry's workforce needs. The first is industry growth or decline. Growing industries need more workers; shrinking industries need fewer. The second is the need to replace workers who leave to work in other industries, for retirement or for other reasons. Even shrinking industries can have significant replacement needs. The last factor is the availability of trained workers or workers who can be trained. The following section examines projected industry employment, worker age and education distributions, and the projected occupational needs for the advanced manufacturing cluster.

## Projected Employment Change, Ohio 2014 - 2024

Figure 24 shows the long-term employment projections for the industries in the advanced manufacturing cluster. Although the advanced manufacturing cluster is expected to lose more than 10,810 jobs from 2014 to 2024, a few industries within the cluster are expected to grow. The largest and fastest growth is expected to occur in the machine shops; turned product; and screw, nut, and bolt manufacturing industry, with as many as 1,840 new jobs (7.1 percent). Growth is also projected for other general purpose machinery manufacturing (1,040 jobs), other nonmetallic mineral product manufacturing (520 jobs), and steel product manufacturing from purchased steel (330 jobs). Plastic products manufacturing is expected to continue to shrink through 2024.

**Figure 24. > Projected Employment Change, 2014 - 2024**

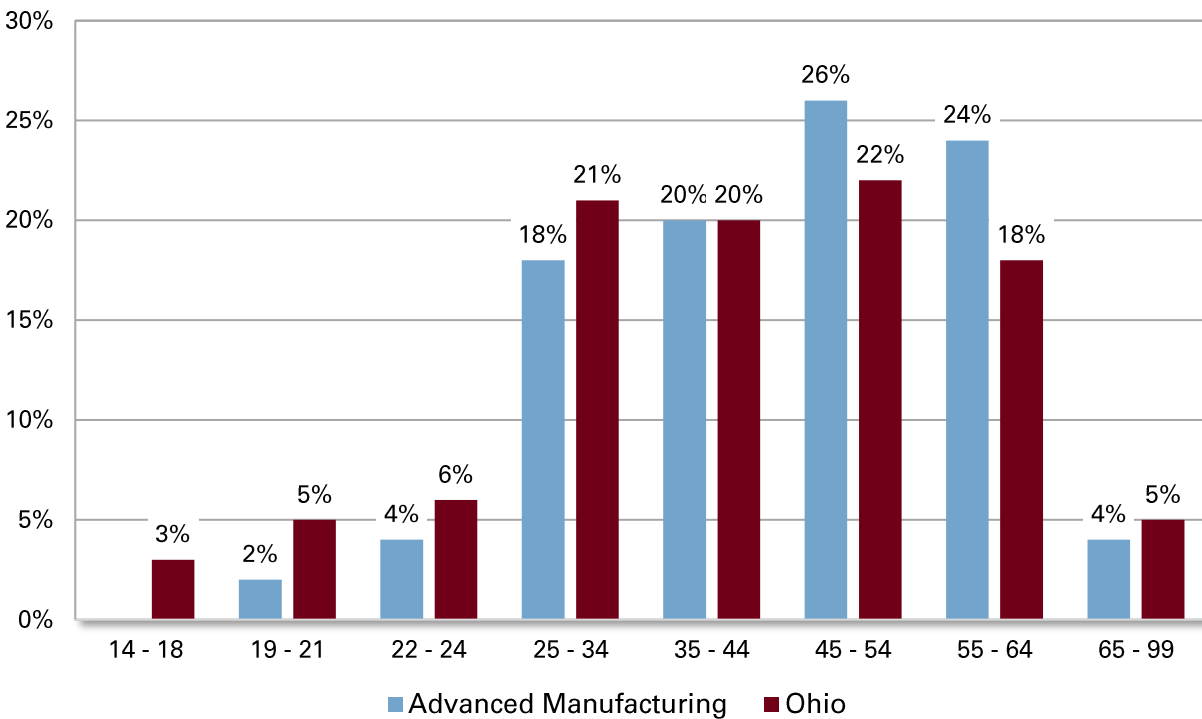


Source: Ohio Bureau of Labor Market Information

## Age Distribution of Ohio Workers

Figure 25 shows the age distribution of workers in the advanced manufacturing industry cluster compared to all Ohio workers for the fourth quarter of 2016. On average, workers in the advanced manufacturing cluster are older than workers in all Ohio industries. About 54 percent of cluster workers are age 45 or older, compared to 45 percent for all Ohio workers. Businesses in the advanced manufacturing cluster may need to replace retiring workers sooner than businesses in other Ohio industries.

**Figure 25.** Age Distribution of Ohio Workers

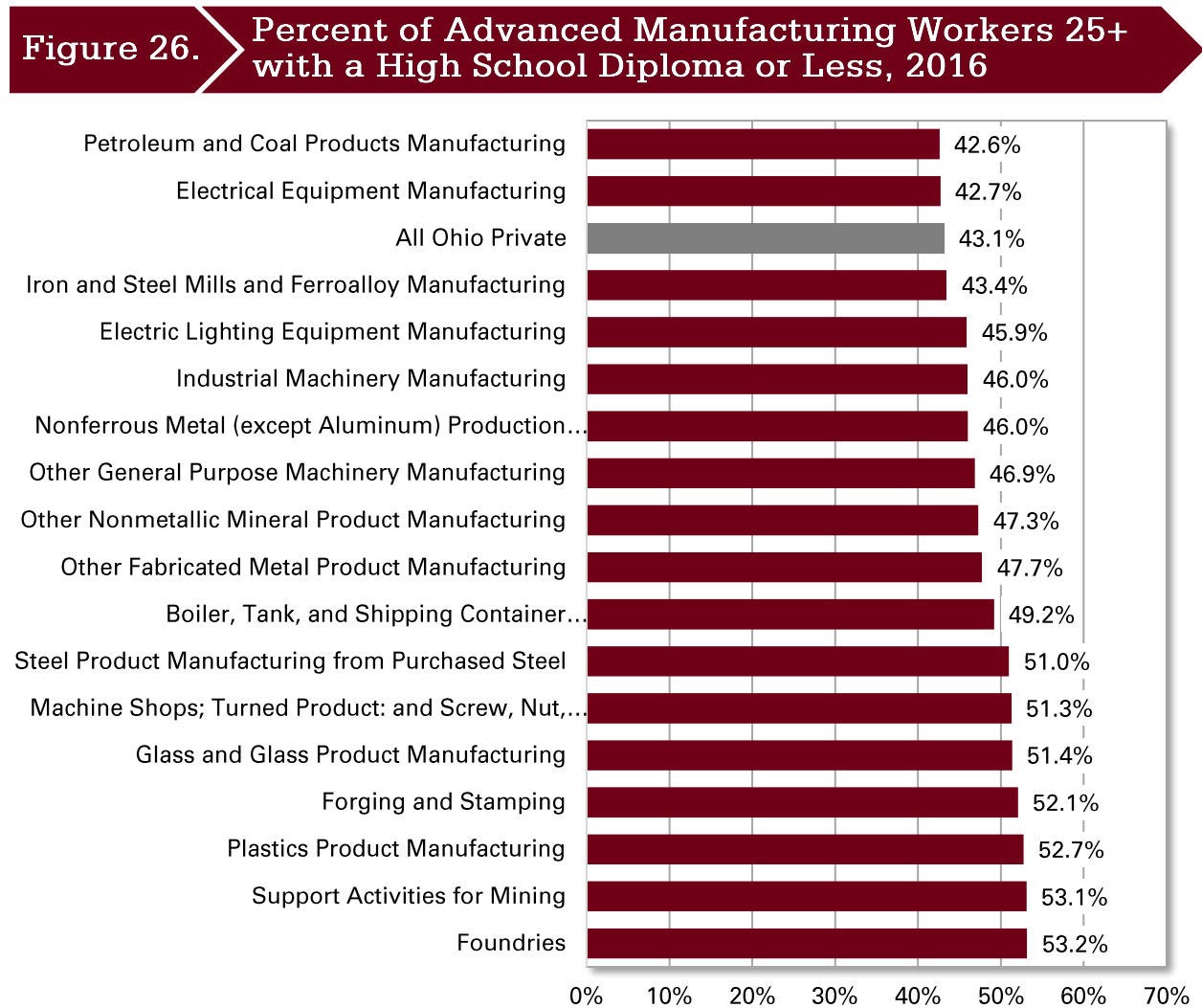


Source: U.S. Census of Quarterly Workforce Indicators, 2016 Q4

## Advanced Manufacturing Education and Training Needs

Because of an aging workforce, advanced manufacturing industries need to recruit workers. As Figure 26 shows, occupations in this cluster have low training and education requirements.

Across all Ohio private industries, an average of 43.1 percent of workers had a high school diploma or less in 2016. Among the advanced manufacturing cluster industries, 15 had a higher percentage of employees with a high school diploma or less, ranging from 43.4 to 53.2 percent. Two industries, electrical equipment manufacturing (42.7 percent) and petroleum and coal products manufacturing (42.6 percent), had a smaller percentage of workers with a high school diploma or less compared to all Ohio private industry employees.



Source: U.S. Census of Quarterly Workforce Indicators, 2016 Q4

Although every business has a unique set of jobs, businesses in the same industry and related industries tend to employ similar occupations. Figure 27 shows the typical education levels, on-the-job training (OJT) and related work experience associated with the 25 occupations that make up the largest share of employment in the advanced manufacturing cluster. Entrants in 21 of the top 25 occupations typically have a high school diploma or less. Twenty of those occupations require only short-, moderate-, or long-term OJT.<sup>3</sup>

**Figure 27. Typical Education, OJT and Related Work Experience Needs for the 25 Largest Advanced Manufacturing Occupations**

| SOC Code | Occupational Title   | Typical Education level at Entry  | OJT/Related Experience |
|----------|--|-----------------------------------|------------------------|
| 11-1021  | General and Operations Managers  | Bachelor's degree                 | None                   |
| 11-3051  | Industrial Production Managers   | Bachelor's degree                 | None                   |
| 17-2112  | Industrial Engineers   | Bachelor's degree                 | None                   |
| 17-2141  | Mechanical Engineers   | Bachelor's degree                 | None                   |
| 41-4012  | Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products | High school diploma or equivalent | Moderate-term OJT      |
| 43-5071  | Shipping, Receiving, and Traffic Clerks  | High school diploma or equivalent | Short-term OJT         |
| 43-9061  | Office Clerks, General   | High school diploma or equivalent | Short-term OJT         |
| 49-9041  | Industrial Machinery Mechanics   | High school diploma or equivalent | Long-term OJT          |
| 49-9071  | Maintenance and Repair Workers, General  | High school diploma or equivalent | Long-term OJT          |
| 51-1011  | First Line Supervisors of Production and Operating Workers                                   | High school diploma or equivalent | None                   |
| 51-2092  | Team Assemblers  | High school diploma or equivalent | Moderate-term OJT      |
| 51-4011  | Computer Controlled Machine Tool Operators, Metal and Plastic                                | High school diploma or equivalent | Moderate-term OJT      |
| 51-4021  | Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic             | High school diploma or equivalent | Moderate-term OJT      |
| 51-4023  | Rolling Machine Setters, Operators, and Tenders, Metal and Plastic                           | High school diploma or equivalent | Moderate-term OJT      |
| 51-4031  | Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic      | High school diploma or equivalent | Moderate-term OJT      |
| 51-4041  | Machinists   | High school diploma or equivalent | Long-term OJT          |
| 51-4072  | Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic  | High school diploma or equivalent | Moderate-term OJT      |
| 51-4081  | Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic                     | High school diploma or equivalent | Moderate-term OJT      |
| 51-4111  | Tool and Die Makers  | High school diploma or equivalent | Long-term OJT          |
| 51-4121  | Welders, Cutters, Solderers, and Brazers   | High school diploma or equivalent | Moderate-term OJT      |
| 51-9061  | Inspectors, Testers, Sorters, Samplers, and Weighers   | High school diploma or equivalent | Moderate-term OJT      |
| 51-9198  | Helpers Production Workers   | No formal educational credential  | Short-term OJT         |
| 53-7051  | Industrial Truck and Tractor Operators   | No formal educational credential  | Short-term OJT         |
| 53-7062  | Laborers and Freight, Stock, and Material Movers, Hand                                       | No formal educational credential  | Short-term OJT         |
| 53-7064  | Packers and Packagers, Hand  | No formal educational credential  | Short-term OJT         |

Source: U.S. Bureau of Labor Statistics

<sup>3</sup> Short-term OJT lasts less than one month. Moderate-term OJT lasts one to 12 months and may include informal training. Long-term OJT lasts more than 12 months and combines work experience with formal classroom instruction.

## Advanced Manufacturing Industry Staffing Patterns

A staffing pattern refers to the number and types of occupations typically needed by an industry. The following tables show the most common occupations in each industry's staffing pattern and each occupation's projected employment. The occupations below are described by their Standard Occupational Classification (SOC) code.

### Support Activities for Mining: NAICS 2131

Roustabouts, oil and gas (SOC code 47-5071) is the largest occupation in this industry, followed by service unit operators, oil and gas. All occupations in this industry are projected to shrink through 2024.

**Figure 28. > Support Activities for Mining**

| SOC Code | Occupational Title   | 2014 | 2024 | Numeric Change | Percent Change |
|----------|--|------|------|----------------|----------------|
| 47-5071  | Roustabouts, Oil and Gas                                       | 536  | 447  | -89            | -16.6%         |
| 47-5013  | Service Unit Operators, Oil, Gas, and Mining                   | 522  | 435  | -87            | -16.7%         |
| 43-9061  | Office Clerks, General   | 437  | 372  | -65            | -14.9%         |
| 47-1011  | First-Line Supervisors of Construction Trades and Extraction   | 396  | 356  | -40            | -10.1%         |
| 53-3032  | Heavy and Tractor-Trailer Truck Drivers                        | 332  | 328  | -4             | -1.2%          |
| 47-2073  | Operating Engineers and Other Construction Equipment Operators | 295  | 266  | -29            | -9.8%          |
| 49-9041  | Industrial Machinery Mechanics                                 | 295  | 318  | 23             | 7.8%           |
| 53-7073  | Wellhead Pumpers   | 200  | 180  | -20            | -10.0%         |
| 11-1021  | General and Operations Managers                                | 151  | 136  | -15            | -9.9%          |
| 47-2061  | Construction Laborers  | 151  | 136  | -15            | -9.9%          |
| 47-5012  | Rotary Drill Operators, Oil and Gas                            | 133  | 117  | -16            | -12.0%         |
| 47-5011  | Derrick Operators, Oil and Gas                                 | 118  | 104  | -14            | -11.9%         |

Source: Ohio Bureau of Labor Market Information



### Petroleum and Coal Products Manufacturing: NAICS 3241

The two largest occupations – petroleum pump system operators, refinery operators, and gaugers (SOC code 51-8093) and first-line supervisors of production and operating workers (SOC code 51-1011) – collectively employ over 1,000 people. Only one occupation, industrial machinery mechanics (SOC 49-9041), has expected growth; all other occupations in this industry are projected to shrink through 2024.

**Figure 29. > Petroleum and Coal Products Manufacturing**

| SOC Code | Occupational Title   | 2014  | 2024 | Numeric Change | Percent Change |
|----------|--|-------|------|----------------|----------------|
| 51-8093  | Petroleum Pump System Operators, Refinery Operators, and Gaugers                             | 1,000 | 972  | -28            | -2.8%          |
| 51-1011  | First-Line Supervisors of Production and Operating Workers                                   | 394   | 383  | -11            | -2.8%          |
| 51-2092  | Team Assemblers  | 270   | 262  | -8             | -3.0%          |
| 51-9023  | Mixing and Blending Machine Setters, Operators, and Tenders                                  | 254   | 246  | -8             | -3.1%          |
| 47-2071  | Paving, Surfacing, and Tamping Equipment Operators   | 198   | 191  | -7             | -3.5%          |
| 53-3032  | Heavy and Tractor-Trailer Truck Drivers  | 152   | 148  | -4             | -2.6%          |
| 41-4012  | Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products | 144   | 140  | -4             | -2.8%          |
| 49-9041  | Industrial Machinery Mechanics   | 106   | 123  | 17             | 16.0%          |
| 51-9061  | Inspectors, Testers, Sorters, Samplers, and Weighers   | 102   | 100  | -2             | -2.0%          |
| 53-7051  | Industrial Truck and Tractor Operators   | 102   | 99   | -3             | -2.9%          |
| 11-3051  | Industrial Production Managers   | 89    | 87   | -2             | -2.2%          |
| 49-9071  | Maintenance and Repair Workers, General  | 82    | 79   | -3             | -3.7%          |
| 11-1021  | General and Operations Managers  | 75    | 73   | -2             | -2.7%          |
| 43-5071  | Shipping, Receiving, and Traffic Clerks  | 73    | 68   | -5             | -6.8%          |
| 47-2061  | Construction Laborers  | 73    | 71   | -2             | -2.7%          |
| 43-9061  | Office Clerks, General   | 69    | 64   | -5             | -7.2%          |
| 51-9111  | Packaging and Filling Machine Operators and Tenders  | 64    | 62   | -2             | -3.1%          |
| 47-2152  | Plumbers, Pipefitters, and Steamfitters  | 58    | 56   | -2             | -3.4%          |
| 17-2171  | Petroleum Engineers  | 54    | 52   | -2             | -3.7%          |
| 19-4031  | Chemical Technicians   | 53    | 51   | -2             | -3.8%          |
| 47-2111  | Electricians   | 51    | 49   | -2             | -3.9%          |

Source: Ohio Bureau of Labor Market Information

### Plastics Products Manufacturing: NAICS 3261

Molding, coremaking, and casting machine setters, operators (SOC code 51-4072) is the largest occupation in this industry. Two occupations, industrial machinery mechanics (SOC code 49-9041) and maintenance workers for machinery (SOC code 49-9043), are expected to grow; all other occupations in this industry are projected to shrink through 2024.

**Figure 30. > Plastics Products Manufacturing**

| SOC Code | Occupational Title   | 2014  | 2024  | Numeric Change | Percent Change |
|----------|--|-------|-------|----------------|----------------|
| 51-4072  | Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic  | 6,281 | 4,695 | -1,586         | -25.3%         |
| 51-4021  | Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic             | 2,501 | 1,869 | -632           | -25.3%         |
| 51-2092  | Team Assemblers  | 2,319 | 2,166 | -153           | -6.6%          |
| 51-9061  | Inspectors, Testers, Sorters, Samplers, and Weighers   | 2,147 | 2,005 | -142           | -6.6%          |
| 51-1011  | First-Line Supervisors of Production and Operating Workers                                   | 1,669 | 1,559 | -110           | -6.6%          |
| 51-9198  | Helpers--Production Workers  | 1,646 | 1,461 | -185           | -11.2%         |
| 51-4031  | Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic      | 1,551 | 1,159 | -392           | -25.3%         |
| 51-4081  | Multiple Machine Tool Setters, Operators and Tenders, Metal and Plastic                      | 1,515 | 1,415 | -100           | -6.6%          |
| 53-7064  | Packers and Packagers, Hand  | 1,352 | 1,263 | -89            | -6.6%          |
| 49-9071  | Maintenance and Repair Workers, General  | 1,177 | 1,100 | -77            | -6.5%          |
| 43-5071  | Shipping, Receiving, and Traffic Clerks  | 1,044 | 926   | -118           | -11.3%         |
| 53-7062  | Laborers and Freight, Stock, and Material Movers, Hand                                       | 1,018 | 951   | -67            | -6.6%          |
| 41-4012  | Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products | 990   | 925   | -65            | -6.6%          |
| 51-9041  | Extruding, Forming, Pressing, and Compacting Machine Setters                                 | 790   | 701   | -89            | -11.3%         |
| 11-3051  | Industrial Production Managers   | 690   | 645   | -45            | -6.5%          |
| 51-9121  | Coating, Painting, and Spraying Machine Setters, Operators                                   | 629   | 587   | -42            | -6.7%          |
| 49-9041  | Industrial Machinery Mechanics   | 580   | 650   | 70             | 12.1%          |
| 49-9043  | Maintenance Workers Machinery  | 544   | 559   | 15             | 2.8%           |
| 11-1021  | General and Operations Managers  | 543   | 507   | -36            | -6.6%          |
| 53-7051  | Industrial Truck and Tractor Operators   | 540   | 504   | -36            | -6.7%          |
| 51-9023  | Mixing, and Blending Machine Setters, Operators, and Tenders                                 | 520   | 486   | -34            | -6.5%          |
| 51-9111  | Packaging and Filling Machine Operators and Tenders  | 477   | 446   | -31            | -6.5%          |
| 43-4051  | Customer Service Representatives   | 473   | 442   | -31            | -6.6%          |
| 17-2112  | Industrial Engineers   | 463   | 414   | -49            | -10.6%         |
| 51-4111  | Tool and Die Makers  | 458   | 385   | -73            | -15.9%         |
| 43-9061  | Office Clerks, General   | 427   | 379   | -48            | -11.2%         |

Source: Ohio Bureau of Labor Market Information

### Glass and Glass Products Manufacturing: NAICS 3272

The largest occupation in the glass and glass products manufacturing industry is inspectors, testers, sorters, samplers, and weighers (SOC code 51-9061). All occupations in this industry are projected to shrink through 2024.

**Figure 31. > Glass and Glass Products Manufacturing**

| SOC Code | Occupational Title   | 2014 | 2024 | Numeric Change | Percent Change |
|----------|--|------|------|----------------|----------------|
| 51-9061  | Inspectors, Testers, Sorters, Samplers, and Weighers                                 | 675  | 476  | -199           | -29.5%         |
| 51-9032  | Cutting and Slicing Machine Setters, Operators, and Tenders                          | 667  | 469  | -198           | -29.7%         |
| 51-2092  | Team Assemblers  | 577  | 408  | -169           | -29.3%         |
| 51-9041  | Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders | 348  | 233  | -115           | -33.0%         |
| 53-7051  | Industrial Truck and Tractor Operators   | 329  | 232  | -97            | -29.5%         |
| 51-1011  | First-Line Supervisors of Production and Operating Workers                           | 230  | 163  | -67            | -29.1%         |
| 51-9195  | Molders, Shapers, and Casters, Except Metal and Plastic                              | 218  | 154  | -64            | -29.4%         |
| 51-9198  | Helpers - Production Workers   | 211  | 141  | -70            | -33.2%         |
| 49-9071  | Maintenance and Repair Workers, General  | 210  | 149  | -61            | -29.0%         |
| 51-9199  | Production Workers, All Other  | 183  | 130  | -53            | -29.0%         |
| 53-7062  | Laborers and Freight, Stock, and Material Movers, Hand                               | 165  | 117  | -48            | -29.1%         |
| 51-9023  | Mixing and Blending Machine Setters, Operators, and Tenders                          | 158  | 112  | -46            | -29.1%         |
| 43-9061  | Office Clerks, General   | 80   | 54   | -26            | -32.5%         |
| 43-5071  | Shipping, Receiving, and Traffic Clerks  | 78   | 52   | -26            | -33.3%         |

Source: Ohio Bureau of Labor Market Information

### Other Nonmetallic Mineral Product Manufacturing: NAICS 3279

The largest occupation in the other nonmetallic mineral product manufacturing industry is mixing and blending machine setters, operators, and tenders (SOC 51-9023). All occupations in this industry are projected to grow over the next 10 years.

**Figure 32. > Other Nonmetallic Mineral Product Manufacturing**

| SOC Code | Occupational Title   | 2014 | 2024 | Numeric Change | Percent Change |
|----------|--|------|------|----------------|----------------|
| 51-9023  | Mixing and Blending Machine Setters, Operators, and Tenders                                  | 528  | 567  | 39             | 7.4%           |
| 51-2092  | Team Assemblers  | 314  | 338  | 24             | 7.6%           |
| 41-4012  | Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products | 250  | 270  | 20             | 8.0%           |
| 51-1011  | First-Line Supervisors of Production and Operating Workers                                   | 199  | 214  | 15             | 7.5%           |
| 49-9071  | Maintenance and Repair Workers, General  | 198  | 213  | 15             | 7.6%           |
| 51-9195  | Molders, Shapers, and Casters, Except Metal and Plastic                                      | 189  | 204  | 15             | 7.9%           |
| 51-6091  | Extruding and Forming Machine Setters, Operators and Tender                                  | 188  | 203  | 15             | 8.0%           |
| 51-4041  | Machinists   | 174  | 207  | 33             | 19.0%          |
| 51-9041  | Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders         | 171  | 176  | 5              | 2.9%           |
| 11-1021  | General and Operations Managers  | 162  | 175  | 13             | 8.0%           |
| 43-9061  | Office Clerks, General   | 150  | 154  | 4              | 2.7%           |
| 53-7062  | Laborers and Freight, Stock, and Material Movers, Hand                                       | 136  | 147  | 11             | 8.1%           |
| 51-9032  | Cutting and Slicing Machine Setters, Operators, and Tenders                                  | 130  | 140  | 10             | 7.7%           |
| 11-3051  | Industrial Production Managers   | 107  | 116  | 9              | 8.4%           |
| 51-9199  | Production Workers, All Other  | 106  | 115  | 9              | 8.5%           |
| 43-5071  | Shipping, Receiving, and Traffic Clerks  | 88   | 90   | 2              | 2.3%           |
| 17-2112  | Industrial Engineers   | 83   | 89   | 6              | 7.2%           |

Source: Ohio Bureau of Labor Market Information

### Iron and Steel Mills and Ferroalloy Manufacturing: NAICS 3311

The largest occupation in this industry is rolling machine setters, operators, and tenders (SOC code 51-4023). Two occupations, industrial machinery mechanics (SOC code 49-9041) and computer-controlled machine tool operators (SOC code 51-4011), are expected to grow over the next 10 years; the rest of the occupations are expected to shrink through 2024.

**Figure 33. > Iron and Steel Mills and Ferroalloy Manufacturing**

| SOC Code | Occupational Title  | 2014  | 2024  | Numeric Change | Percent Change |
|----------|---|-------|-------|----------------|----------------|
| 51-4023  | Rolling Machine Setters, Operators, and Tenders, Metal and Plastic                      | 1,388 | 1,374 | -14            | -1.0%          |
| 49-9041  | Industrial Machinery Mechanics  | 974   | 1,156 | 182            | 18.7%          |
| 51-4051  | Metal-Refining Furnace Operators and Tenders  | 790   | 782   | -8             | -1.0%          |
| 49-9071  | Maintenance and Repair Workers, General   | 605   | 599   | -6             | -1.0%          |
| 51-1011  | First-Line Supervisors of Production and Operating Workers                              | 422   | 417   | -5             | -1.2%          |
| 51-9061  | Inspectors, Testers, Sorters, Samplers, and Weighers                                    | 278   | 275   | -3             | -1.1%          |
| 53-7021  | Crane and Tower Operators   | 264   | 261   | -3             | -1.1%          |
| 51-4052  | Pourers and Casters, Metal  | 200   | 158   | -42            | -21.0%         |
| 51-9198  | Helpers - Production Workers  | 199   | 187   | -12            | -6.0%          |
| 51-4034  | Lathe and Turning Machine Tool Setters, Operators, and Tenders, Metal and Plastic       | 183   | 145   | -38            | -20.8%         |
| 51-2092  | Team Assemblers   | 181   | 179   | -2             | -1.1%          |
| 47-2111  | Electricians  | 171   | 169   | -2             | -1.2%          |
| 49-1011  | First-Line Supervisors of Mechanics, Installers, and Repairers                          | 167   | 165   | -2             | -1.2%          |
| 17-2112  | Industrial Engineers  | 151   | 150   | -1             | -0.7%          |
| 51-4022  | Forging Machine Setters, Operators, and Tenders, Metal and Plastic                      | 145   | 115   | -30            | -20.7%         |
| 51-4031  | Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic | 129   | 102   | -27            | -20.9%         |
| 11-3051  | Industrial Production Managers  | 128   | 126   | -2             | -1.6%          |
| 51-4191  | Heat Treating Equipment Setters, Operators, and Tenders, Metal and Plastic              | 127   | 101   | -26            | -20.5%         |
| 43-9061  | Office Clerks General   | 111   | 104   | -7             | -6.3%          |
| 51-4011  | Computer-Controlled Machine Tool Operators, Metal and Plastic                           | 109   | 129   | 20             | 18.3%          |
| 49-9045  | Refractory Materials Repairers, Except Brickmasons                                      | 92    | 91    | -1             | -1.1%          |

Source: Ohio Bureau of Labor Market Information

## Steel Products Manufacturing from Purchased Steel: NAICS 3312

The largest occupation in this industry is rolling machine setters, operators, and tenders (SOC code 51-4023). Most of the occupations in this industry are expected to grow through 2024.

**Figure 34.** Steel Products Manufacturing from Purchased Steel

| SOC Code | Occupational Title   | 2014 | 2024 | Numeric Change | Percent Change |
|----------|--|------|------|----------------|----------------|
| 51-4023  | Rolling Machine Setters, Operators, and Tenders, Metal and Plastic                           | 788  | 855  | 67             | 8.5%           |
| 51-4031  | Cutting, Punching, and Press Machine Setters, Operators, and Tenders                         | 474  | 412  | -62            | -13.1%         |
| 49-9071  | Maintenance and Repair Workers, General  | 381  | 413  | 32             | 8.4%           |
| 51-1011  | First-Line Supervisors of Production and Operating Workers                                   | 271  | 294  | 23             | 8.5%           |
| 51-9061  | Inspectors, Testers, Sorters, Samplers, and Weighers   | 241  | 261  | 20             | 8.3%           |
| 51-4191  | Heat Treating Equipment Setters, Operators, and Tenders, Metal and Plastic                   | 223  | 194  | -29            | -13.0%         |
| 53-7062  | Laborers and Freight, Stock, and Material Movers, Hand                                       | 212  | 230  | 18             | 8.5%           |
| 51-4041  | Machinists   | 207  | 248  | 41             | 19.8%          |
| 51-2092  | Team Assemblers  | 200  | 217  | 17             | 8.5%           |
| 51-4121  | Welders, Cutters, Solderers, and Brazers   | 191  | 208  | 17             | 8.9%           |
| 51-4035  | Milling and Planing Machine Setters, Operators, and Tenders                                  | 182  | 159  | -23            | -12.6%         |
| 53-7021  | Crane and Tower Operators  | 170  | 185  | 15             | 8.8%           |
| 51-4034  | Lathe and Turning Machine Tool Setters, Operators, and Tenders, Metal and Plastic            | 159  | 138  | -21            | -13.2%         |
| 17-2112  | Industrial Engineers   | 132  | 143  | 11             | 8.3%           |
| 43-5071  | Shipping, Receiving, and Traffic Clerks  | 131  | 135  | 4              | 3.1%           |
| 51-9198  | Helpers - Production Workers   | 116  | 120  | 4              | 3.4%           |
| 11-3051  | Industrial Production Managers   | 115  | 125  | 10             | 8.7%           |
| 11-1021  | General and Operations Managers  | 114  | 124  | 10             | 8.8%           |
| 43-5061  | Production, Planning, and Expediting Clerks  | 114  | 124  | 10             | 8.8%           |
| 53-7051  | Industrial Truck and Tractor Operators   | 105  | 115  | 10             | 9.5%           |
| 41-4012  | Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products | 103  | 112  | 9              | 8.7%           |
| 51-4011  | Computer-Controlled Machine Tool Operators, Metal and Plastic                                | 92   | 120  | 28             | 30.4%          |
| 43-9061  | Office Clerks, General   | 86   | 89   | 3              | 3.5%           |
| 49-9041  | Industrial Machinery Mechanics   | 81   | 106  | 25             | 30.9%          |
| 51-4081  | Multiple Machine Tool Setters, Operators, and Tenders, Metal                                 | 79   | 86   | 7              | 8.9%           |
| 49-9043  | Maintenance Workers, Machinery   | 78   | 94   | 16             | 20.5%          |
| 51-9199  | Production Workers, All Other  | 78   | 85   | 7              | 9.0%           |
| 43-5081  | Stock Clerks and Order Fillers   | 76   | 82   | 6              | 7.9%           |

Source: Ohio Bureau of Labor Market Information

### Nonferrous Metal (except Aluminum) Production and Processing: NAICS 3314

The largest occupation in this industry is extruding and drawing machine setters, operators, and tenders (SOC code 51-4021). All occupations are expected to shrink over the next 10 years.

**Figure 35. Nonferrous Metal (except Aluminum) Production and Processing**

| SOC Code | Occupational Title  | 2014 | 2024 | Numeric Change | Percent Change |
|----------|---|------|------|----------------|----------------|
| 51-4021  | Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic        | 395  | 304  | -91            | -23.0%         |
| 53-7062  | Laborers and Freight, Stock, and Material Movers, Hand                                  | 256  | 247  | -9             | -3.5%          |
| 51-4111  | Tool and Die Makers   | 239  | 207  | -32            | -13.4%         |
| 51-9198  | Helpers - Production Workers  | 239  | 219  | -20            | -8.4%          |
| 51-1011  | First-Line Supervisors of Production and Operating Workers                              | 196  | 189  | -7             | -3.6%          |
| 47-2111  | Electricians  | 164  | 158  | -6             | -3.7%          |
| 51-9061  | Inspectors, Testers, Sorters, Samplers, and Weighers                                    | 164  | 158  | -6             | -3.7%          |
| 51-4031  | Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic | 129  | 99   | -30            | -23.3%         |
| 51-4033  | Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders  | 107  | 82   | -25            | -23.4%         |
| 49-9071  | Maintenance and Repair Workers, General   | 99   | 95   | -4             | -4.0%          |
| 51-4191  | Heat Treating Equipment Setters, Operators, and Tenders, Metal and Plastic              | 97   | 75   | -22            | -22.7%         |
| 43-5081  | Stock Clerks and Order Fillers  | 87   | 83   | -4             | -4.6%          |
| 17-3029  | Engineering Technicians, Except Drafters, All Other                                     | 85   | 82   | -3             | -3.5%          |
| 43-5071  | Shipping, Receiving, and Traffic Clerks   | 85   | 78   | -7             | -8.2%          |
| 11-3051  | Industrial Production Managers  | 78   | 75   | -3             | -3.8%          |
| 43-9061  | Office Clerks, General  | 78   | 71   | -7             | -9.0%          |
| 51-4022  | Forging Machine Setters, Operators, and Tenders, Metal and Plastic                      | 74   | 57   | -17            | -23.0%         |
| 11-1021  | General and Operations Managers   | 72   | 70   | -2             | -2.8%          |
| 49-1011  | First-Line Supervisors of Mechanics, Installers, and Repairers                          | 67   | 65   | -2             | -3.0%          |
| 17-2112  | Industrial Engineers  | 63   | 60   | -3             | -4.8%          |
| 43-6014  | Secretaries and Administrative Assistants, Except Legal, Medical, and Executive         | 61   | 56   | -5             | -8.2%          |

Source: Ohio Bureau of Labor Market Information

### Foundries: NAICS 3315

The two largest occupations – team assemblers (SOC code 51-2092) and foundry mold and coremakers (SOC 51-4071) – collectively employ more than 2,000 people. With the exception of computer-controlled machine tool operators of metal and plastic, all occupations in this industry are expected to shrink through 2024.

**Figure 36. Foundries**

| SOC Code | Occupational Title   | 2014  | 2024  | Numeric Change | Percent Change |
|----------|--|-------|-------|----------------|----------------|
| 51-2092  | Team Assemblers  | 1,288 | 1,125 | -163           | -12.7%         |
| 51-4071  | Foundry Mold and Coremakers  | 1,239 | 867   | -372           | -30.0%         |
| 51-4072  | Molding, Coremaking, and Casting Machine Setters, Operators                            | 995   | 697   | -298           | -29.9%         |
| 51-9022  | Grinding and Polishing Workers, Hand   | 754   | 626   | -128           | -17.0%         |
| 51-4041  | Machinists   | 662   | 636   | -26            | -3.9%          |
| 51-4052  | Pourers and Casters, Metal   | 650   | 454   | -196           | -30.2%         |
| 51-4033  | Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders | 612   | 428   | -184           | -30.1%         |
| 51-1011  | First-Line Supervisors of Production and Operating Workers                             | 546   | 477   | -69            | -12.6%         |
| 49-9044  | Millwrights  | 490   | 471   | -19            | -3.9%          |
| 51-9061  | Inspectors, Testers, Sorters, Samplers, and Weighers                                   | 479   | 419   | -60            | -12.5%         |
| 51-4051  | Metal-Refining Furnace Operators and Tenders   | 353   | 309   | -44            | -12.5%         |
| 51-9198  | Helpers - Production Workers   | 316   | 262   | -54            | -17.1%         |
| 51-9199  | Production Workers, All Other  | 305   | 267   | -38            | -12.5%         |
| 49-9071  | Maintenance and Repair Workers, General  | 305   | 266   | -39            | -12.8%         |
| 17-2112  | Industrial Engineers   | 220   | 192   | -28            | -12.7%         |
| 47-2111  | Electricians   | 219   | 191   | -28            | -12.8%         |
| 49-9043  | Maintenance Workers, Machinery   | 201   | 193   | -8             | -4.0%          |
| 53-7062  | Laborers and Freight, Stock, and Material Movers, Hand                                 | 197   | 172   | -25            | -12.7%         |
| 51-4011  | Computer-Controlled Machine Tool Operators, Metal and Plastic                          | 193   | 202   | 9              | 4.7%           |
| 11-1021  | General and Operations Managers  | 176   | 154   | -22            | -12.5%         |
| 11-3051  | Industrial Production Managers   | 175   | 153   | -22            | -12.6%         |
| 51-4111  | Tool and Die Makers  | 172   | 135   | -37            | -21.5%         |
| 53-7051  | Industrial Truck and Tractor Operators   | 147   | 128   | -19            | -12.9%         |

Source: Ohio Bureau of Labor Market Information



### Forging and Stamping: NAICS 3321

The largest occupation in this industry is cutting, punching, and press machine setters, operators, and tenders (SOC code 51-4031). Many occupations should see growth over the next 10 years.

**Figure 37. > Forging and Stamping**

| SOC Code | Occupational Title   | 2014  | 2024  | Numeric Change | Percent Change |
|----------|--|-------|-------|----------------|----------------|
| 51-4031  | Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic      | 1,625 | 1,362 | -263           | -16.2%         |
| 51-4022  | Forging Machine Setters, Operators, and Tenders, Metal and Plastic                           | 706   | 591   | -115           | -16.3%         |
| 51-2092  | Team Assemblers  | 643   | 674   | 31             | 4.8%           |
| 51-4011  | Computer-Controlled Machine Tool Operators, Metal and Plastic                                | 560   | 704   | 144            | 25.7%          |
| 51-1011  | First-Line Supervisors of Production and Operating Workers                                   | 483   | 506   | 23             | 4.8%           |
| 51-4111  | Tool and Die Makers  | 389   | 367   | -22            | -5.7%          |
| 51-4041  | Machinists   | 371   | 427   | 56             | 15.1%          |
| 51-9061  | Inspectors, Testers, Sorters, Samplers, and Weighers   | 334   | 350   | 16             | 4.8%           |
| 41-4012  | Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products | 278   | 291   | 13             | 4.7%           |
| 51-4121  | Welders, Cutters, Solderers, and Brazers   | 269   | 281   | 12             | 4.5%           |
| 11-1021  | General and Operations Managers  | 252   | 264   | 12             | 4.8%           |
| 49-9071  | Maintenance and Repair Workers, General  | 237   | 248   | 11             | 4.6%           |
| 53-7062  | Laborers and Freight, Stock, and Material Movers, Hand                                       | 194   | 203   | 9              | 4.6%           |
| 11-3051  | Industrial Production Managers   | 190   | 199   | 9              | 4.7%           |
| 43-5071  | Shipping, Receiving, and Traffic Clerks  | 184   | 183   | -1             | -0.5%          |
| 51-9198  | Helpers - Production Workers   | 162   | 161   | -1             | -0.6%          |
| 49-9041  | Industrial Machinery Mechanics   | 152   | 191   | 39             | 25.7%          |
| 51-2099  | Assemblers and Fabricators, All Other  | 152   | 159   | 7              | 4.6%           |
| 51-9121  | Coating, Painting, and Spraying Machine Setters, Operators, and Tenders                      | 151   | 158   | 7              | 4.6%           |
| 17-2141  | Mechanical Engineers   | 148   | 155   | 7              | 4.7%           |
| 51-4034  | Lathe and Turning Machine Tool Setters, Operators, and Tenders, Metal and Plastic            | 148   | 124   | -24            | -16.2%         |
| 43-5081  | Stock Clerks and Order Fillers   | 139   | 146   | 7              | 5.0%           |
| 17-2112  | Industrial Engineers   | 119   | 124   | 5              | 4.2%           |

Source: Ohio Bureau of Labor Market Information

## Boiler, Tank, and Shipping Container Manufacturing: NAICS 3324

The two largest occupations – welders, cutters, solderers, and brazers (SOC code 51-4121) and packaging and filling machine operators and tenders (SOC code 51-9111) – together employ more than 1,000 people.

**Figure 38.** Boiler, Tank, and Shipping Container Manufacturing

| SOC Code | Occupational Title   | 2014 | 2024 | Numeric Change | Percent Change |
|----------|--|------|------|----------------|----------------|
| 51-4121  | Welders, Cutters, Solderers, and Brazers   | 639  | 641  | 2              | 0.3%           |
| 51-9111  | Packaging and Filling Machine Operators and Tenders  | 605  | 607  | 2              | 0.3%           |
| 51-9198  | Helpers - Production Workers   | 565  | 538  | -27            | -4.8%          |
| 17-2199  | Engineers, All Other   | 383  | 384  | 1              | 0.3%           |
| 51-4122  | Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders                      | 382  | 306  | -76            | -19.9%         |
| 51-1011  | First-Line Supervisors of Production and Operating Workers                                   | 279  | 279  | 0              | 0.0%           |
| 51-9121  | Coating, Painting, and Spraying Machine Setters, Operators, and Tenders                      | 263  | 263  | 0              | 0.0%           |
| 51-4031  | Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic      | 228  | 182  | -46            | -20.2%         |
| 51-9061  | Inspectors, Testers, Sorters, Samplers, and Weighers   | 225  | 225  | 0              | 0.0%           |
| 49-9071  | Maintenance and Repair Workers, General  | 210  | 210  | 0              | 0.0%           |
| 53-7062  | Laborers and Freight, Stock and Material Movers, Hand  | 207  | 207  | 0              | 0.0%           |
| 51-2092  | Team Assemblers  | 205  | 206  | 1              | 0.5%           |
| 51-2041  | Structural Metal Fabricators and Fitters   | 198  | 199  | 1              | 0.5%           |
| 49-9043  | Maintenance Workers, Machinery   | 191  | 210  | 19             | 9.9%           |
| 51-4041  | Machinists   | 161  | 177  | 16             | 9.9%           |
| 51-4081  | Multiple Machine Tool Setters, Operators, and Tenders, Metal, and Plastic                    | 136  | 136  | 0              | 0.0%           |
| 43-5071  | Shipping, Receiving, and Traffic Clerks  | 115  | 109  | -6             | -5.2%          |
| 11-1021  | General and Operations Managers  | 112  | 112  | 0              | 0.0%           |
| 43-9061  | Office Clerks, General   | 108  | 103  | -5             | -4.6%          |
| 41-4012  | Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products | 105  | 105  | 0              | 0.0%           |
| 11-3051  | Industrial Production Managers   | 94   | 94   | 0              | 0.0%           |
| 13-1023  | Purchasing Agents, Except Wholesale, Retail, and Farm Products                               | 94   | 94   | 0              | 0.0%           |
| 53-7051  | Industrial Truck and Tractor Operators   | 90   | 90   | 0              | 0.0%           |
| 43-6014  | Secretaries and Administrative Assistants, Except Legal, Medical, and Executive              | 88   | 83   | -5             | -5.7%          |
| 47-2111  | Electricians   | 83   | 83   | 0              | 0.0%           |

Source: Ohio Bureau of Labor Market Information

## Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing: NAICS 3327

The two largest occupations in this industry are machinists (SOC code 51-4041) and computer-controlled machine tool operators and tenders of metal and plastic (SOC code 51-4011); both are expected to grow over the next 10 years. Many occupations should see growth over the next 10 years.

**Figure 39. Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing**

| SOC Code | Occupational Title  | 2014  | 2024  | Numeric Change | Percent Change |
|----------|---|-------|-------|----------------|----------------|
| 51-4041  | Machinists  | 6,508 | 7,595 | 1,087          | 16.7%          |
| 51-4011  | Computer-Controlled Machine Tool Operators, Metal and Plastic   | 2,077 | 2,650 | 573            | 27.6%          |
| 51-4034  | Lathe and Turning Machine Tool Setters, Operators, and Tenders, Metal and Plastic                         | 1,339 | 1,152 | -187           | -14.0%         |
| 11-1021  | General and Operations Managers   | 962   | 1,022 | 60             | 6.2%           |
| 51-4121  | Welders, Cutters, Solderers, and Brazers  | 897   | 947   | 50             | 5.6%           |
| 51-9061  | Inspectors, Testers, Sorters, Samplers, and Weighers  | 787   | 842   | 55             | 7.0%           |
| 51-4031  | Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic                   | 776   | 667   | -109           | -14.0%         |
| 51-1011  | First-Line Supervisors of Production and Operating Workers  | 744   | 792   | 48             | 6.5%           |
| 43-9061  | Office Clerks, General  | 698   | 704   | 6              | 0.9%           |
| 41-4012  | Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products              | 677   | 724   | 47             | 6.9%           |
| 11-3051  | Industrial Production Managers  | 624   | 665   | 41             | 6.6%           |
| 51-9198  | Helpers - Production Workers  | 541   | 549   | 8              | 1.5%           |
| 51-4111  | Tool and Die Makers   | 503   | 485   | -18            | -3.6%          |
| 51-4035  | Milling and Planing Machine Setters, Operators, and Tenders, Metal and Plastic                            | 446   | 378   | -68            | -15.2%         |
| 43-5071  | Shipping, Receiving, and Traffic Clerks   | 431   | 438   | 7              | 1.6%           |
| 51-4081  | Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic                                  | 405   | 434   | 29             | 7.2%           |
| 51-4033  | Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Plastic | 385   | 329   | -56            | -14.5%         |
| 43-6014  | Secretaries and Administrative Assistants, Except Legal, Medical, and Executive                           | 345   | 348   | 3              | 0.9%           |
| 17-2141  | Mechanical Engineers  | 341   | 365   | 24             | 7.0%           |
| 49-9071  | Maintenance and Repair Workers, General   | 312   | 332   | 20             | 6.4%           |
| 53-7062  | Laborers and Freight, Stock, and Material Movers, Hand  | 277   | 296   | 19             | 6.9%           |
| 51-2092  | Team Assemblers   | 264   | 282   | 18             | 6.8%           |

Source: Ohio Bureau of Labor Market Information

### Other Fabricated Metal Product Manufacturing: NAICS 3329

The largest occupation in this industry is machinists (SOC 51-4041). With the exception of machinists and computer-controlled machine tool operators (SOC code 51-4011), the number of jobs in this industry is expected to decline through 2024.

**Figure 40. > Other Fabricated Metal Product Manufacturing**

| SOC Code | Occupational Title   | 2014  | 2024  | Numeric Change | Percent Change |
|----------|--|-------|-------|----------------|----------------|
| 51-4041  | Machinists   | 1,472 | 1,487 | 15             | 1.0%           |
| 51-9061  | Inspectors, Testers, Sorters, Samplers, and Weighers   | 1,435 | 1,318 | -117           | -8.2%          |
| 51-4011  | Computer-Controlled Machine Tool Operators, Metal and Plastic                                | 958   | 1,056 | 98             | 10.2%          |
| 51-4121  | Welders, Cutters, Solderers, and Brazers   | 815   | 749   | -66            | -8.1%          |
| 51-1011  | First-Line Supervisors of Production and Operating Workers                                   | 744   | 683   | -61            | -8.2%          |
| 51-4031  | Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic      | 652   | 479   | -173           | -26.5%         |
| 51-4081  | Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic                     | 616   | 566   | -50            | -8.1%          |
| 53-7062  | Laborers and Freight, Stock, and Material Movers, Hand                                       | 561   | 515   | -46            | -8.2%          |
| 41-4012  | Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products | 526   | 483   | -43            | -8.2%          |
| 17-2112  | Industrial Engineers   | 427   | 392   | -35            | -8.2%          |
| 11-3051  | Industrial Production Managers   | 400   | 367   | -33            | -8.2%          |
| 43-5071  | Shipping, Receiving, and Traffic Clerks  | 399   | 348   | -51            | -12.8%         |
| 11-1021  | General and Operations Managers  | 351   | 322   | -29            | -8.3%          |
| 17-2141  | Mechanical Engineers   | 344   | 316   | -28            | -8.1%          |
| 51-4111  | Tool and Die Makers  | 268   | 222   | -46            | -17.2%         |
| 43-9061  | Office Clerks, General   | 259   | 226   | -33            | -12.7%         |
| 53-7064  | Packers and Packagers, Hand  | 250   | 230   | -20            | -8.0%          |
| 51-2099  | Assemblers and Fabricators, All Other  | 211   | 193   | -18            | -8.5%          |
| 43-5061  | Production, Planning, and Expediting Clerks  | 210   | 193   | -17            | -8.1%          |

Source: Ohio Bureau of Labor Market Information

## Industrial Machinery Manufacturing: NAICS 3332

The largest occupation in this industry is team assemblers (SOC code 51-2092). With the exception of computer-controlled machine tool operators and industrial machinery mechanics, the number of jobs in this industry is expected to shrink over the next 10 years.

**Figure 41. Industrial Machinery Manufacturing**

| SOC Code | Occupational Title  | 2014 | 2024 | Numeric Change | Percent Change |
|----------|---|------|------|----------------|----------------|
| 51-2092  | Team Assemblers   | 863  | 848  | -15            | -1.7%          |
| 17-2141  | Mechanical Engineers  | 531  | 521  | -10            | -1.9%          |
| 51-4041  | Machinists  | 496  | 535  | 39             | 7.9%           |
| 51-4121  | Welders, Cutters, Solderers, and Brazers  | 401  | 393  | -8             | -2.0%          |
| 11-1021  | General and Operations Managers   | 372  | 366  | -6             | -1.6%          |
| 41-4012  | Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products              | 361  | 354  | -7             | -1.9%          |
| 51-1011  | First-Line Supervisors of Production and Operating Workers  | 270  | 265  | -5             | -1.9%          |
| 51-2099  | Assemblers and Fabricators, All Other   | 231  | 227  | -4             | -1.7%          |
| 51-4031  | Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic                   | 217  | 171  | -46            | -21.2%         |
| 43-5071  | Shipping, Receiving, and Traffic Clerks   | 209  | 195  | -14            | -6.7%          |
| 51-4011  | Computer-Controlled Machine Tool Operators, Metal and Plastic   | 185  | 218  | 33             | 17.8%          |
| 13-1023  | Purchasing Agents, Except Wholesale, Retail, and Farm Products  | 179  | 176  | -3             | -1.7%          |
| 11-3051  | Industrial Production Managers  | 173  | 170  | -3             | -1.7%          |
| 43-6014  | Secretaries and Administrative Assistants, Except Legal, Medical, and Executive                           | 173  | 161  | -12            | -6.9%          |
| 51-4033  | Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Plastic | 172  | 135  | -37            | -21.5%         |
| 51-2022  | Electrical and Electronic Equipment Assemblers  | 167  | 164  | -3             | -1.8%          |
| 17-3013  | Mechanical Drafters   | 153  | 135  | -18            | -11.8%         |
| 51-9198  | Helpers - Production Workers  | 149  | 139  | -10            | -6.7%          |
| 17-2112  | Industrial Engineers  | 143  | 140  | -3             | -2.1%          |
| 49-9071  | Maintenance and Repair Workers, General   | 142  | 139  | -3             | -2.1%          |
| 17-2071  | Electrical Engineers  | 140  | 137  | -3             | -2.1%          |
| 43-4051  | Customer Service Representatives  | 138  | 135  | -3             | -2.2%          |
| 51-9061  | Inspectors, Testers, Sorters, Samplers, and Weighers  | 132  | 130  | -2             | -1.5%          |
| 11-2022  | Sales Managers  | 116  | 114  | -2             | -1.7%          |
| 51-4111  | Tool and Die Makers   | 113  | 99   | -14            | -12.4%         |
| 51-9121  | Coating, Painting, and Spraying Machine Setters, Operators  | 113  | 111  | -2             | -1.8%          |
| 51-2031  | Engine and Other Machine Assemblers   | 112  | 110  | -2             | -1.8%          |
| 49-9041  | Industrial Machinery Mechanics  | 109  | 128  | 19             | 17.4%          |
| 51-9199  | Production Workers, All Other   | 104  | 102  | -2             | -1.9%          |
| 41-4011  | Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products                     | 96   | 94   | -2             | -2.1%          |

Source: Ohio Bureau of Labor Market Information

### Other General Purpose Machinery Manufacturing: NAICS 3339

The two largest occupations, team assemblers (SOC code 51-2092) and machinists (SOC code 51-4041), together employ almost 5,000 people; both occupations are expected to grow through 2024. With the exception of office clerks, general and shipping, receiving, and traffic clerks, all occupations in this industry are expected to grow through 2024.

**Figure 42. > Other General Purpose Machinery Manufacturing**

| SOC Code | Occupational Title   | 2014  | 2024  | Numeric Change | Percent Change |
|----------|--|-------|-------|----------------|----------------|
| 51-2092  | Team Assemblers  | 2,909 | 3,030 | 121            | 4.2%           |
| 51-4041  | Machinists   | 1,815 | 2,080 | 265            | 14.6%          |
| 51-4011  | Computer-Controlled Machine Tool Operators, Metal and Plastic                                | 1,294 | 1,617 | 323            | 25.0%          |
| 51-4121  | Welders, Cutters, Solderers, and Brazers   | 1,058 | 1,102 | 44             | 4.2%           |
| 17-2141  | Mechanical Engineers   | 754   | 785   | 31             | 4.1%           |
| 41-4012  | Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products | 660   | 688   | 28             | 4.2%           |
| 51-1011  | First-Line Supervisors of Production and Operating Workers                                   | 580   | 605   | 25             | 4.3%           |
| 43-9061  | Office Clerks, General   | 531   | 526   | -5             | -0.9%          |
| 43-5071  | Shipping, Receiving, and Traffic Clerks  | 482   | 478   | -4             | -0.8%          |
| 51-4081  | Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic                     | 436   | 455   | 19             | 4.4%           |
| 53-7062  | Laborers and Freight, Stock, and Material Movers, Hand                                       | 423   | 441   | 18             | 4.3%           |
| 17-2112  | Industrial Engineers   | 406   | 423   | 17             | 4.2%           |
| 11-1021  | General and Operations Managers  | 391   | 408   | 17             | 4.3%           |
| 49-9071  | Maintenance and Repair Workers, General  | 359   | 374   | 15             | 4.2%           |
| 51-9061  | Inspectors, Testers, Sorters, Samplers, and Weighers   | 359   | 374   | 15             | 4.2%           |
| 43-5081  | Stock Clerks and Order Fillers   | 349   | 363   | 14             | 4.0%           |
| 43-4051  | Customer Service Representatives   | 342   | 356   | 14             | 4.1%           |
| 17-3026  | Industrial Engineering Technicians   | 327   | 341   | 14             | 4.3%           |
| 17-2071  | Electrical Engineers   | 295   | 307   | 12             | 4.1%           |
| 51-2022  | Electrical and Electronic Equipment Assemblers   | 277   | 289   | 12             | 4.3%           |
| 13-1023  | Purchasing Agents, Except Wholesale, Retail, and Farm Products                               | 274   | 285   | 11             | 4.0%           |
| 43-5061  | Production, Planning, and Expediting Clerks  | 262   | 273   | 11             | 4.2%           |
| 11-3051  | Industrial Production Managers   | 259   | 270   | 11             | 4.2%           |
| 13-2011  | Accountants and Auditors   | 257   | 268   | 11             | 4.3%           |

Source: Ohio Bureau of Labor Market Information

### Electrical Equipment Manufacturing: NAICS 3353

The largest occupation in the electrical equipment manufacturing industry is electrical and electronic equipment assemblers (SOC code 51-2022). With the exception of machinists (SOC code 51-4041) and computer-controlled machine tool operators (SOC code 51-4011), the number of jobs in this industry is expected to shrink over the next 10 years.

**Figure 43. Electrical Equipment Manufacturing**

| SOC Code | Occupational Title   | 2014  | 2024  | Numeric Change | Percent Change |
|----------|--|-------|-------|----------------|----------------|
| 51-2022  | Electrical and Electronic Equipment Assemblers   | 1,265 | 1,238 | -27            | -2.1%          |
| 51-2021  | Coil Winders, Tapers, and Finishers  | 757   | 742   | -15            | -2.0%          |
| 51-2092  | Team Assemblers  | 403   | 395   | -8             | -2.0%          |
| 43-5071  | Shipping, Receiving, and Traffic Clerks  | 348   | 324   | -24            | -6.9%          |
| 51-9061  | Inspectors, Testers, Sorters, Samplers, and Weighers   | 332   | 325   | -7             | -2.1%          |
| 51-4041  | Machinists   | 304   | 327   | 23             | 7.6%           |
| 51-1011  | First-Line Supervisors of Production and Operating Workers                                   | 232   | 227   | -5             | -2.2%          |
| 51-4031  | Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic      | 197   | 154   | -43            | -21.8%         |
| 41-4012  | Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products | 168   | 164   | -4             | -2.4%          |
| 49-9071  | Maintenance and Repair Workers, General  | 165   | 161   | -4             | -2.4%          |
| 51-2099  | Assemblers and Fabricators, All Other  | 162   | 159   | -3             | -1.9%          |
| 51-4121  | Welders, Cutters, Solderers, and Brazers   | 156   | 153   | -3             | -1.9%          |
| 17-2071  | Electrical Engineers   | 152   | 149   | -3             | -2.0%          |
| 17-2141  | Mechanical Engineers   | 150   | 147   | -3             | -2.0%          |
| 11-3051  | Industrial Production Managers   | 133   | 130   | -3             | -2.3%          |
| 17-2112  | Industrial Engineers   | 124   | 122   | -2             | -1.6%          |
| 51-4011  | Computer-Controlled Machine Tool Operators, Metal and Plastic                                | 115   | 135   | 20             | 17.4%          |
| 51-4072  | Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic  | 109   | 85    | -24            | -22.0%         |
| 43-5061  | Production, Planning, and Expediting Clerks  | 107   | 105   | -2             | -1.9%          |
| 51-2041  | Structural Metal Fabricators and Fitters   | 107   | 105   | -2             | -1.9%          |
| 11-1021  | General and Operations Managers  | 98    | 96    | -2             | -2.0%          |
| 53-7062  | Laborers and Freight, Stock, and Material Movers, Hand                                       | 85    | 84    | -1             | -1.2%          |

Source: Ohio Bureau of Labor Market Information

## Summary

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More than 206,000 Ohioans work in the advanced manufacturing industry cluster. Ohio's location near more than 60 percent of the U.S. and Canadian population makes it ideal. Overall employment in the cluster is expected to decline over the next 10 years. However, growth is expected in four industries: (1) machine shops; turned product; and screw, nut, and bolt manufacturing; (2) other general purpose machinery manufacturing; (3) other nonmetallic mineral product manufacturing; and (4) steel product manufacturing from purchased steel. Employment in this cluster has declined since 2001. During the 2007–2009 recession, employment in the cluster fell more steeply than Ohio or U.S. total employment. Although cluster employment has grown since 2010, it has not fully recovered. Most occupations in this cluster require a high school diploma or less with on-the-job training. Between 42.6 percent to 53.2 percent of workers in this cluster have a high school diploma or less.



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