



MINNESOTA STATE

Advanced Manufacturing
Center of Excellence

ATE Regional Center

2020 ENVIRONMENTAL SCAN

Minnesota Manufacturing Needs and Resources

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2020 Environmental Scan of Manufacturing in Minnesota

Executive Summary

Introduction

Manufacturing is the most important private sector industry within Minnesota. Within the state, there are more than 8,300 manufacturing establishments, and Minnesota manufacturers are responsible for 327,549 jobs. The industry represents the single largest private sector component of Minnesota's GDP, totaling \$49.2 Billion, or 16 percent of total GDP.

Given the large percentage of GDP and jobs which manufacturers are responsible for within the state, fulfilling the talent needs of the state's employers is critical to the economic vitality of individual employers, and the entire state.

With that in mind, Minnesota State Advanced Manufacturing Center of Excellence (the Center) has conducted an environmental scan, pulling together details and findings on manufacturing resources and needs within the state. This scan includes labor market information, a summary of K12 education and outreach efforts, and details of current manufacturing training models primarily in use by Minnesota's institutions of higher education.

Minnesota State Advanced Manufacturing Center of Excellence (the Center) is an innovative, collaborative effort between education and industry to recruit, educate, and train workers for dynamic careers in advanced manufacturing.

The vision of the Center is to be known as a the leader in engaging industry, enhancing education, and inspiring students, with proven impact in meeting manufacturer-identified challenges, providing resources for educators, and growing a skilled and diverse pool of manufacturing talent.

The Center began in 2005 with a legislative designation as a Minnesota Center of Excellence. The effort was led by Bemidji State University (BSU) and included seven community and technical college partners. Originally known as 360 Advanced Manufacturing Center of Excellence, the Center has grown to include 18 two-year college members. Together, these post-secondary education partners have worked with Minnesota manufacturers to meet their talent needs and connect individuals to rewarding careers in this important industry.

The Center's mission is to promote manufacturing careers and build pathways that lead individuals to rewarding employment in the industry. This work has included creating career and educational pathways, changing the perception of manufacturing careers, and increasing the diversity of the manufacturing workforce.

Early on, the Center identified the career pathway model, a best practice in education for life-long learning, as a model for its own programs. In 2007, the Center designed and launched the 360 Seamless Career Pathway, which has enabled the articulated block transfer of approximately 30 credits of common curriculum across member colleges for fields of study critical to manufacturing businesses.

"Manufacturers form the bedrock of many Minnesota communities. They offer high-wage, high-skill jobs that create economic opportunity and stability for the present and future."

*Bob Kill, President and CEO
Enterprise Minnesota*



In 2010, 360 eTECH was launched, enhancing the 360 Seamless Career Pathway with the addition of a 16-credit Production Technologies certificate and a 30-credit Welding Technology certificate. The consortial-based program is delivered by eight members of the Center through a blended format incorporating online learning with intensive weekend labs and is aligned to the Manufacturing Skills Standards Council (MSSC) Certified Production Technician (CPT) credential.

The Center continues to be on the forefront of educational practice and manufacturing skills training, leading efforts to advance a competency-based education model, enhancement of existing curriculum, and development of new curriculum.

The Center is a strong advocate for manufacturing careers in Minnesota and the greater region. In 2009, the organization joined the Manufacturing Institute's Dream It. Do It. network to promote the manufacturing industry and manufacturing careers. Since then, under the Dream It. Do It. banner, the Center has developed a numerous resources and events for engaging target audiences—middle school and high school youth, educators, and parents—with a recruitment strategy promoting the industry and careers.

Noteworthy accomplishments of the Center include the following:

- Partner colleges increased their number of graduates by 33% compared to non-partner colleges (Wilder Research, 2017).
- Partner colleges increased the number of diploma and associate degree graduates by 40% (Wilder Research, 2017).
- Partner colleges increased their total program enrollment by 40% (Wilder Research, 2017).
- Partner colleges demonstrated a student persistence and retention rate of 77% (EvaluATE, 2018).
- Graduates from college partners have better technical skills related to the job and are better prepared for the job (Wilder Research, 2017).
- Partner colleges showed a significant increase in student graduate diversity (race, gender, first generation college student status) (Wilder Research, 2017).
- The number of graduates of color is more than double that of non-partner colleges (Wilder Research, 2017).
- Dream It Do It events have increased perception and interest in manufacturing careers and STEM by 49% (Wilder Research, 2018).



Manufacturing Outlook

Manufacturing in the United States slowed slightly in 2019, probably because of trade uncertainties and longstanding workforce shortages. Manufacturers have less confidence in 2019 than 2018 along with great concern about attracting and retaining a quality workforce. The industry is projecting growth, but the rate of growth has slowed.

In contrast, during the same period, Minnesota manufacturers had nearly record high levels of confidence, with 93 percent reporting that they are confident about the future of their company. The worker shortage is the dominant issue impacting future growth of Minnesota manufacturers.

Minnesota Labor Market

According to DEED's Quarterly Census of Employment and Wages (QCEW) data, Minnesota was home to 8,322 manufacturing establishments providing 327,549 jobs through the third quarter of 2019. Manufacturing accounted for 11.2 percent of total employment in the state, making it the second largest industry behind health care and social assistance (503,325 jobs), and just ahead of retail trade (292,234 jobs).

These manufacturers provided over \$5.5 billion in total payroll through the third quarter of 2019, again making it the second largest industry behind only health care and social assistance. Average annual wages in manufacturing were \$67,288 in 2019, which was nearly 17 percent higher than the total of all industries.

According to DEED's 2016 to 2026 Employment Outlook data, Minnesota's manufacturing industry is projected to lose 5,400 jobs over the next decade, a 1.7 percent decline. However, the state is still expected to have significant demand for production workers over the next ten years due to a large number of labor force exit openings – jobs that become available because the existing worker retires out of the labor force. **There may be as many as 246,504 total openings for production occupations in the state,**¹ including occupational transfer openings, jobs that open because a worker changes occupation.

*There may be as many as
246,504 total openings for
production occupations in
the state.*

*(Source: DEED's 2016-2026
Employment Outlook)*

New graduates and other jobseekers will be important in filling the workforce pipeline in the manufacturing industry, which is exhibiting a trend toward a larger percentage of older workers. In 2018, one-fourth (25.0 percent) of workers in the industry were 55 years or older, up from just 12.8 percent of the workforce back in 2003. In contrast, less than 9 percent of workers in the industry were under 25 years of age, down from almost 11 percent in 2003. Likewise, the percent of workers from 25 to 44 years of age dropped from 51.3 percent of the total in 2003 to just 43 percent in 2018.

¹ DEED [Quarterly Census of Employment & Wages \(QCEW\) Q3 2019](#)



Manufacturing Education

Minnesota has a robust network of post-secondary institutions. The Twin Cities campus of the University of Minnesota is the largest university in the state with 50,943 enrolled in the 2018-19 academic year, making it the sixth largest American campus by enrollment size. The Minnesota State system of colleges and universities is the third largest system of state colleges in the United States, including 30 colleges, seven universities, and 54 campuses. More than 350,000 attend Minnesota State colleges each year, and more than 35,000 degrees, certificates, and diplomas are awarded annually.

*Forty percent of
manufacturing jobs require
post-secondary education.
(Source: DEED Job Vacancy Survey
2019)*

Manufacturing education within Minnesota is very strong. There are 29 post-secondary institutions within the state that provide manufacturing-related programs. Together, these institutions are responsible for a total of 219 manufacturing-related programs, resulting in certificates, diplomas, Associate of Applied Science degrees, Bachelor's degrees, Master's degrees, and other awards.

College Perspective

Interviews of college deans found that face-to-face programs are the delivery mode of choice and most reported that enrollment is increasing. Most students who enroll in these programs complete them, and their job placement is 100 percent. For students who do not complete an academic program, the number one reason is dropping out of school to take a job. The labor market is so tight that most students can get a good job without finishing. However, most of the colleges reported strong relationships with local employers who support program completion, or in some cases, the college has worked on an early out with the employer if the student is getting close to graduation.

Student barriers to enrollment and/or completion include family issues, cost, and time. Older students already in the workforce are more likely to have issues balancing school and work.

Custom Training

Custom training is also reporting a slight increase in demand, particularly for leadership development and industrial maintenance. Leadership training is in demand because of the large numbers of exits as baby boomers retire, and younger workers need to take a new position in leadership. Industrial maintenance is in demand because of increasing levels of automation. More machines on the floor mean more maintenance and those who have these skills are in high demand.

Impact of COVID-19

Beginning mid-March 2020, credit based training and custom training providers were forced to deliver education remotely, due to the coronavirus pandemic. While online is not the delivery mode of choice for either, both reported that it has gone well and anticipate some changes in delivery going forward, and possibly more content being delivered virtually. This would not have occurred without the executive order directing people to stay at home.



The pandemic has also created a deep and significant impact with manufacturers. Some have closed temporarily. Others, deemed essential, have repurposed their facilities to manufacture personal protective equipment and medical supplies. Many have experienced severe challenges in their supply and vendor chains. On top of that, the slowing economy indicates an overall downturn in consumer buying patterns, which will reduce GDP and product demand.

The situation relating to the pandemic has been rapidly evolving on all fronts. The only thing that is certain is that there will be changes.

Youth Outreach

Youth outreach is an important strategy to increase the manufacturing talent pipeline. Dream It. Do It. Minnesota has led several outreach initiatives, with major work including Statewide Tour of Manufacturing, the Dream It. Do It. Minnesota Digital Badge Pathway, and implementation of female recruitment strategies.



DREAM IT. DO IT. MN STATEWIDE TOUR OF MANUFACTURING SPONSORS

PLATINUM LEVEL SPONSORS:



These efforts have been shown to be extremely successful:

- Statewide Tour of Manufacturing has grown exponentially, year over year, with 648 manufacturing tours hosted in 2019. There were participating 209 manufacturers, 495 educators, and 10,521 students.
- Dream It. Do It. Minnesota Digital Badge Pathway has proven to be successful engaging youth in manufacturing career exploration—353 youth have created digital badge pathway accounts and 637 badges have been earned.
- New marketing efforts designed to appeal to females have helped to increase the number of girls participating in outreach events 755 percent over the previous year.





Youth Interest

Prior research on youth interest conducted by the Center in 2015 indicated youth interest in manufacturing careers to be as low as three percent. A fresh look at current data sources reveal a much more positive outlook, with 27 percent of Generation Z individuals saying they would consider working in the manufacturing industry. Even with this increase, the need for additional outreach is still indicated, particularly among populations such as minorities and females, which are underrepresented in the manufacturing workforce. Minnesota manufacturing workforce demographic data shows that females comprise 29 percent and minorities comprise 15 percent of the manufacturing workforce.

Members of Generation Z are hearing the message that manufacturing offers rewarding career opportunities. That's the finding of a survey by Leading2Lean (L2L), which says **32 percent of young Americans ages 18-22 have had manufacturing suggested to them as a career option, compared to 18 percent of Millennials and only 13 percent of the general population**. The L2L Manufacturing Index also found that a majority (59 percent) of Generation Z agrees trade schools offer promising career opportunities for high school students.

The Global Manufacturing Industry

Technology advances continue to impact every aspect of society, especially the world of manufacturing. These advances are part of what is coming to be known as Industry 4.0, a phrase first coined in Germany in 2011, referring to the Fourth Industrial Revolution—the intersection of traditional manufacturing platforms and the latest smart technology. The focus is on the use of large-scale manufacturer-to-manufacturer (M2M) and Internet of Things (IoT) deployments, using increased automation, improved communication and monitoring, and incorporating smart machines that analyze and diagnose issues without the need for human intervention.

Industry 4.0 is already seeing factories become increasingly automated and self-monitoring as the machines within are given the ability to analyze and communicate with each other. This then free ups their human co-workers, granting companies much smoother processes that leave employees open for other tasks.

Rapidly evolving technology is changing the way products are manufactured, but it is not reducing the need for human involvement. Instead, that human involvement is taking a different form and future employees will need even greater ability to work with smart tools and technologies, as well as soft skills.

Industry 4.0 provides the backdrop for this environmental scan, in which the Minnesota State Advanced Manufacturing Center of Excellence examines the manufacturing industry and manufacturing education that prepares the technicians of tomorrow to take their place within this rapidly advancing industry.

Manufacturing in the United States

Manufacturers contributed \$2.37 trillion to the U.S. economy in the second quarter of 2019. This was not far from the all-time high recorded in the fourth quarter of 2018, which was \$2.365 trillion. In the second quarter, value-added output for durable goods increased from \$1.336 trillion to \$1.342 trillion, a new record, with nondurable goods activity also higher, up from \$1.002 trillion to \$1.013 trillion. Overall, manufacturing accounted for 11.1 percent of GDP in the economy.²

Top Five Facts

- There are 12.865 million manufacturing workers in the United States, the most since November 2008, accounting for 8.4 percent of the workforce.³
- In 2018, the average manufacturing worker in the United States earned \$87,185 annually, including pay and benefits.⁴
- Manufacturers have one of the highest percentages of employees (92 percent) who are eligible for employer-paid health benefits.⁵
- Over the next decade, 4.6 million manufacturing jobs will likely be needed, and 2.4 million are expected to go unfilled due to the skills gap.⁶
- Taken alone, manufacturing in the United States would be the eighth-largest economy in the world. With \$2.18 trillion in value added from manufacturing in 2017, only seven other nations (including the U.S.) would rank higher in terms of their GDP.⁷

² Bureau of Economic Analysis, 2019

³ Bureau of Labor Statistics

⁴ Ibid.

⁵ Ibid.

⁶ Deloitte and The Manufacturing Institute

⁷ Ibid.

National Manufacturing Outlook

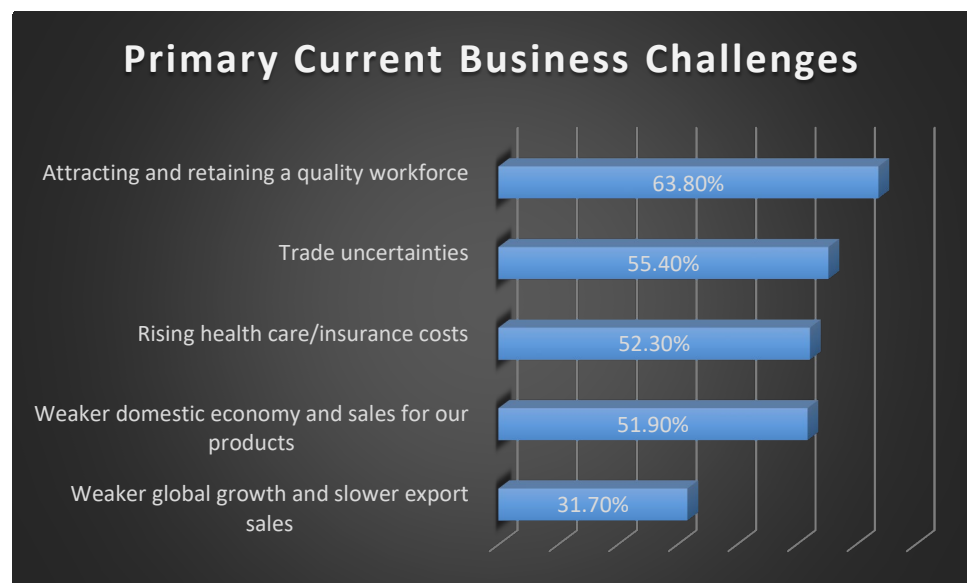
According to the National Association of Manufacturers (NAM), the growth of the manufacturing industry slowed in 2019. Primary challenges facing manufacturers have included ongoing trade uncertainties and longstanding workforce shortages. These challenges have contributed to a decrease in business confidence.⁸

As 2019 ended, the turbulence of this year began to stabilize in the United States and around the world. The announcement of Phase One of the United States-Mexico-Canada trade agreements and long-term reauthorization of the Ex-Im Bank will likely result in increased optimism among manufacturers.

The NAM survey reported several key indicators:

Manufacturing confidence is lower than the previous year. Only 67.6 percent of manufacturing respondents reporting a positive outlook for their company, well below the 88.7 percent who characterized their business outlook as somewhat or very positive one year prior, during the fourth quarter of 2018. Small (fewer than 50 employees) and medium sized firms (50-499 employees) are more confident than large firms (500 or more employees). This is likely because larger manufacturers tend to be more engaged globally, and as a result, are more sensitive to slowing growth and trade uncertainties.

Manufacturers have great concern about attracting and retaining a quality workforce. When asked what their primary current business challenges were, the number one cited concern was “attracting and retaining a quality workforce.” A full 63.8 percent of manufacturers were concerned about the talent pipeline. The second and third highest concerns were trade uncertainties (55.4 percent) and rising health care/insurance costs (52.3 percent).



Manufacturers are projecting growth, but the growth rate has slowed. In the first quarter of 2018, manufacturers expected nearly 6 percent growth in sales. At the end of 2019, the expected sales growth dropped to 2.1 percent. Capital investments, exports, and full-time employment have shown a similar slowing in growth, with capital investments expected to grow 0.8 percent, exports expected to grow 0.3 percent, and full-time employment expected to grow 0.8 percent.

⁸ National Association of Manufacturers, NAM Manufacturers’ Outlook Survey Fourth Quarter 2019

This slowing growth rate must be understood within the context of the tremendous growth the industry has demonstrated over the past three decades. During this timeframe, manufacturers have become extremely “lean” (efficient) and more competitive globally. The output per hour for all workers in the manufacturing sector has increased by more than 2.25 times since 1987 and the output for durable goods manufacturers has exceeded 2.6 times the output per worker seen three decades ago.

The Bureau of Labor Statistics projects 589,100 production occupations will need to be filled between 2018 and 2028.⁹

Minnesota Manufacturing Outlook

Manufacturing has been, and continues to be, a strong component of Minnesota’s economy. The industry experienced a significant impact during the recession of 2008 and 2009, as evidenced by a drop in employment of about 42,000 jobs. Over the last ten years, the industry has rebounded, bringing back about 29,000 jobs.¹⁰

A recently published survey, conducted by Enterprise Minnesota, provides a compelling picture of the current situation of the manufacturing industry in the state. Four hundred manufacturing executives from across the state were interviewed. The survey was conducted between March 2 and 23, 2020. When the interview process started, no one knew the pandemic was coming and the deep impact it would have.

Beginning with the President Trump’s emergency declaration in response to the COVID-19 pandemic on March 13, the interview findings show marked changes in the confidence of manufacturers. Approximately 58 percent of the interviews were completed before March 13 and the remaining interviews were conducted between March 13 and March 23.

The survey found Minnesota manufacturers to have a high level of financial confidence, with 89 percent of respondents expressing confidence in the future of their company.¹¹ However, a comparison of responses between March 2 and March 12 with responses between March 13 and 23, shows a definite drop in confidence after the pandemic struck; 93 percent were confident about the financial future of their company before March 13, but that confidence rate dropped 9 points among those interviewed later.

A lower percentage of Minnesota manufacturers (27 percent) are anticipating expansion compared to 2019 (49 percent). This decrease was even more dramatic after the President declared a national emergency. Only 11 percent of manufacturers interviewed after March 13 said 2020 would be a year of economic expansion. Furthermore, a full **46 percent said 2020 would be a year of recession**, 37 points higher than those predicting recession prior to COVID.

The survey also showed drops in expected revenue, profitability, and capital expenditures in comparison to 2019. The percentage of manufacturers expecting increases in gross revenues decreased by 15 percent. The percentage of manufacturers expecting increases in profitability decreased by seven percent. The percentage expecting an increase in capital expenditures decreased by five percent.

The Worker Shortage is the Dominant Issue Impacting Future Growth

⁹ U.S. Bureau of Labor Statistics, Occupational Employment Statistics, and Employment Projections

¹⁰ DEED, Quarterly Census of employment, Q3 2019

¹¹ Enterprise Minnesota, 2020 State of Manufacturing



The qualified worker shortage remains the biggest challenge to the growth of Minnesota manufacturers. Five years ago, 21 percent of manufacturers cited this as a top concern. In 2020 this concern has reached a critical status, **with 40 percent of manufacturers identifying attracting and retaining a qualified workforce as their biggest challenge to growth.** For employers with more than 50 employees, the worker shortage was an even larger concern, with 78 percent indicating that their inability to attract qualified candidates made growth “difficult.”

78 percent of Minnesota manufacturers with 50 or more employees say that attracting and retaining a qualified workforce is their biggest challenge to growth.

When asked how they were navigating around the worker shortage, the largest percentage (59 percent) said they were focusing on developing current employee skills, up 23 points from 2019.

Impact of COVID-19

Spring 2020 has seen COVID-19 impacting all sectors of business and society. Millions of Americans have been asked to stay at home—don’t go to work, don’t go to school, don’t leave the house at all, unless you must. Minnesota’s Governor Walz issued a stay at home order, effective March 27. Manufacturers classified as “critical” were allowed to continue operations, amid concerns of protecting employees and slowing the spread of the virus.

The pandemic has created a host of challenges for manufacturers in Minnesota and across the United States. A recent survey by the National Association of Manufacturers found that 80 percent of manufacturers expect the pandemic to have a financial impact on their business. This is significantly higher than the 48 percent of cross-industry companies concerned about financial impact.¹² The challenges are two-fold: first, many manufacturing jobs are on-site and cannot be carried out remotely; second, the slow-down in economic activity is expected to reduce demand for products in the United States and globally.

The National Association of Manufacturers has released an “American Renewal Action Plan,” outlining recommendations that will position manufacturers to lead the recovery and renewal of the American economy. Strategies identified in the plan included a herculean effort on the part of manufacturers to provide personal protective equipment and medical supplies; best practices for employee health; legal reform that removes liability from manufacturers who remain open and/or who have donated PPE to medical staff and no longer have it for their own employees; and financial support that will strengthen the manufacturing industry.¹³

Multiple manufacturing associations, including Central Minnesota Manufacturers Association (CMMA), Minnesota Precision Manufacturing Association (MPMA) and Tri-State Manufacturers’ Association (TSMA), began offering weekly webinars for manufacturers during this unprecedented time. These weekly webinars began March 24 and are supported by the Center. Topics have included: how to navigate immediate labor concerns; contracts and COVID-19, what you need to know about orders and payments; supply chain solutions, how to remain operational and stay essential; proper prevention in manufacturing environments; 3D printing solutions for operational needs; boosting morale to keep your team strong; and turning challenges into opportunities.

¹² National Association of Manufacturers, NAM Coronavirus Outbreak Special Survey, March 2020

¹³ National Association of Manufacturers, American Renewal Action Plan

Minnesota manufacturers are working to combat the spread of the virus. 3M and Medtronic are leading the way in manufacturing personal protective equipment (PPE) and ventilators. These companies, and others, have mobilized staff on production lines to increase output of these critical supplies.

3M Chairman and CEO Mike Roman plans to double the company's output of N95 masks, as well as pledging to increase its production of hand sanitizer.¹⁴ Efforts like these can help to mitigate nationwide shortages in PPE.

Medtronic, another Minnesota-based company, has pledged to double its output of mechanical ventilators. In order to accomplish that goal, the company is doubling its 250-person staff at its Ireland-based manufacturing site. This expansion will involve transferring workers from other Medtronic sites and changing to a 24/7 production cycle.¹⁵

Another company, Abbott Laboratories, headquartered in Illinois, has facilities in Plymouth and St. Paul Minnesota. Abbott has been authorized to begin mass-producing and distributing a new molecular test which will help to meet the increased demand for testing.

It isn't only big companies that are stepping up. Wyoming Machine, a small metal fabricator with fewer than 60 employees in Stacy, MN has ramped up production to create a precision piece, used in the assembly of ventilators.

These are a few examples of companies that are stepping up production capacity and output during the pandemic. Others have had to slow down, shut down, or are struggling to continue operations. Food manufacturing and processing facilities have seen some of the biggest challenges. Global food processor JBS USA announced the indefinite closure of its Worthington pork plant and the idling of more than 2,000 workers there due to a coronavirus outbreak. The meat sector has been particularly hard-hit by the pandemic, with outbreaks traced to facilities in Illinois, South Dakota and elsewhere.

While manufacturers are doing their part to address shortages of medical supplies and equipment, they are also facing challenges in keeping their employees working amidst concerns of the virus spreading. At the same time, the pandemic has created awareness among the American public that more manufacturing needs to be done in the United States, for reasons of security. There is no ready solution, but the pandemic has been a major disruption and many cascading effects will likely unfold in coming years.

¹⁴ Minnpost, 3/23/2020, Jessica Lee. "Minnesota Companies Ramp Up Production to Combat COVID-19,"

¹⁵ Ibid



Minnesota Labor Market Information

Labor Market Information Overview

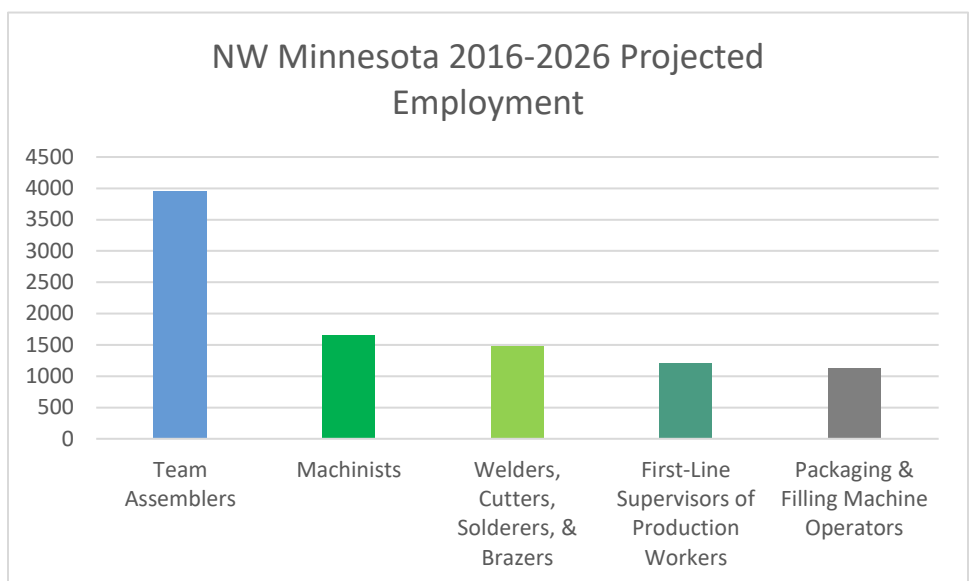
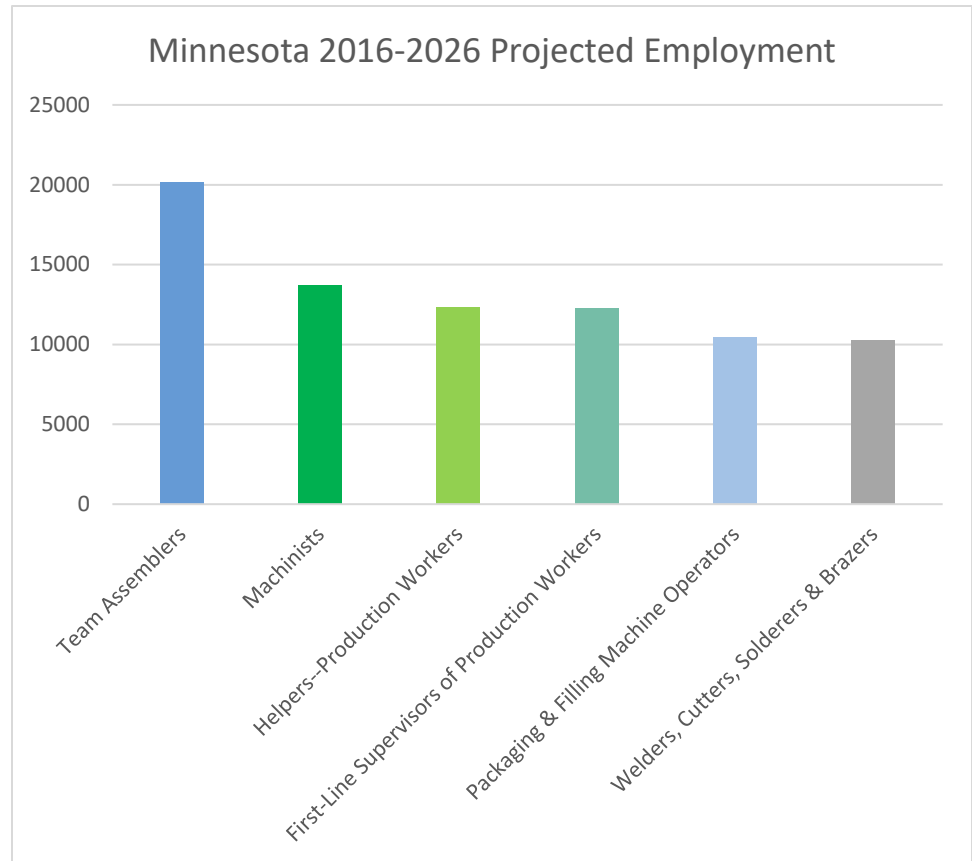
Entire State

Manufacturing industry labor market information was obtained from Minnesota Department of Employment and Economic Development (DEED) for each region of the state, as well as for the entire state. The Minnesota occupations with the highest projected 2016-2026 employment are: team assemblers (20,141); machinists (13,723); helpers—production workers (12,349); first-line supervisors of production workers (12,293); packaging & filling machine operators (10,421); and welders, cutters, solderers, & brazers (10,240).

According to DEED's Job Vacancy Survey data, there were just under 59,000 manufacturing job vacancies reported in the second quarter of 2019.

Northwest Region

In the northwest region of the state, the occupations with the highest projected 2026 employment are: Team Assemblers (3,949); Machinists (1,647); Welders Cutters, Solderers, & Brazers (1,472); First-Line Supervisors of Production Workers (1,213); and Packaging & Filling Machine Operators (1,119).





According to DEED's Job Vacancy Survey data, there were just over 4,500 manufacturing job vacancies reported by employers in Northwest Minnesota in the second quarter of 2019.

Northeast Region

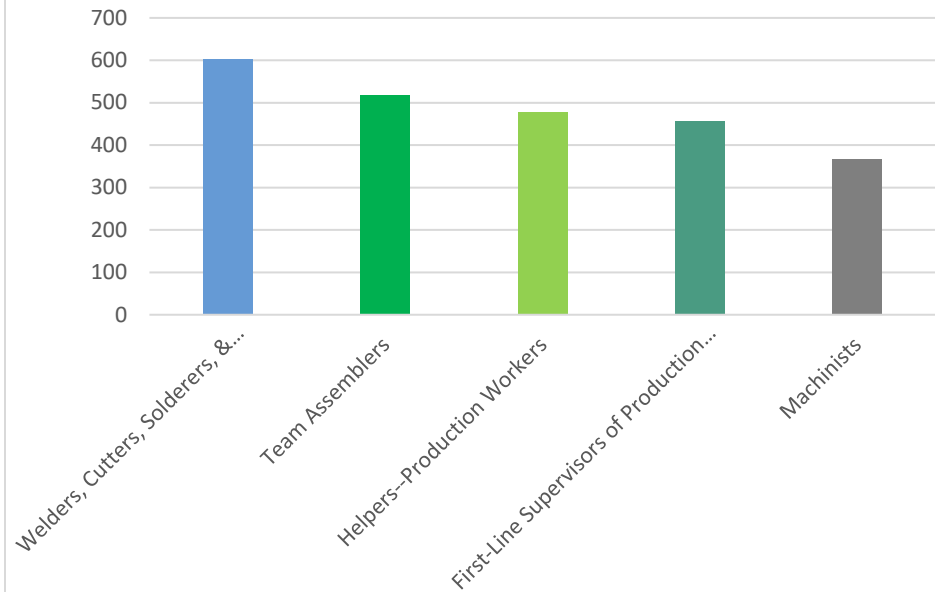
In the northeast region, the occupations with the highest projected 2026 employment are: welders, cutters, solderers, & brazers (603); team assemblers (517); helpers—production workers (478); first-line supervisors of production workers (456); and machinists (366).

According to DEED's Job Vacancy Survey data, there were just over 2,800 manufacturing job vacancies reported by employers in Northeast Minnesota in the second quarter of 2019.

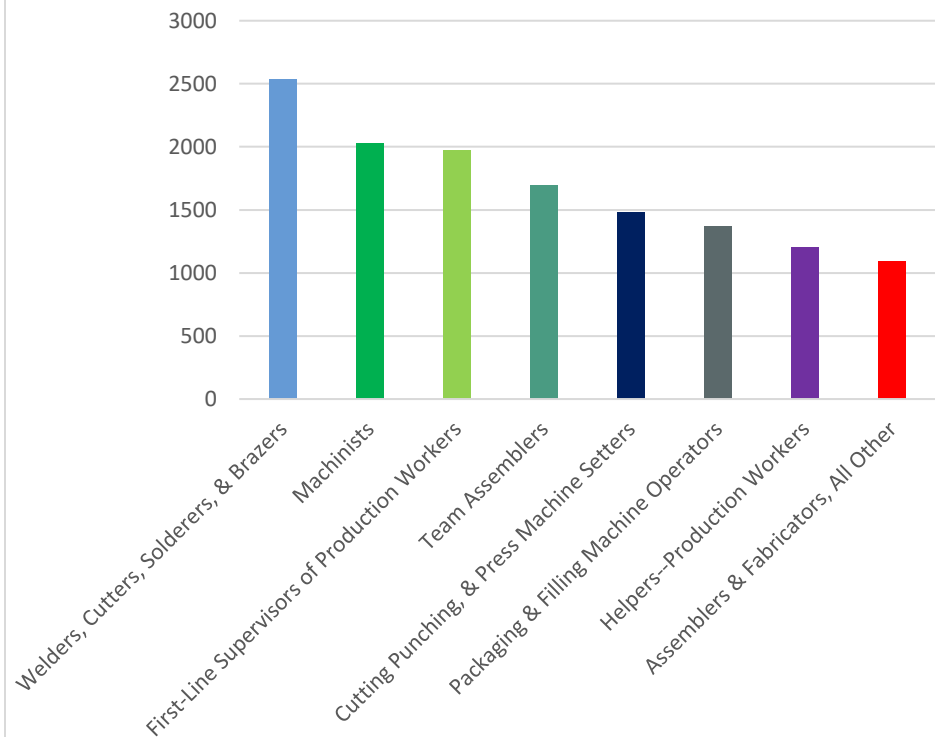
Central Region

In the central region, the occupations with the highest projected 2026 employment are: welders, cutters, solderers, & brazers (2,531); machinists (2,029); first-line supervisors of production workers (1,973); team assemblers (1,693); cutting punching, & press machine setters (1,480); packaging & filling machine operators (1,366); helpers--production workers (1,203); and assemblers & fabricators, all other (1,095).

NE Minnesota 2016-2026 Projected Employment



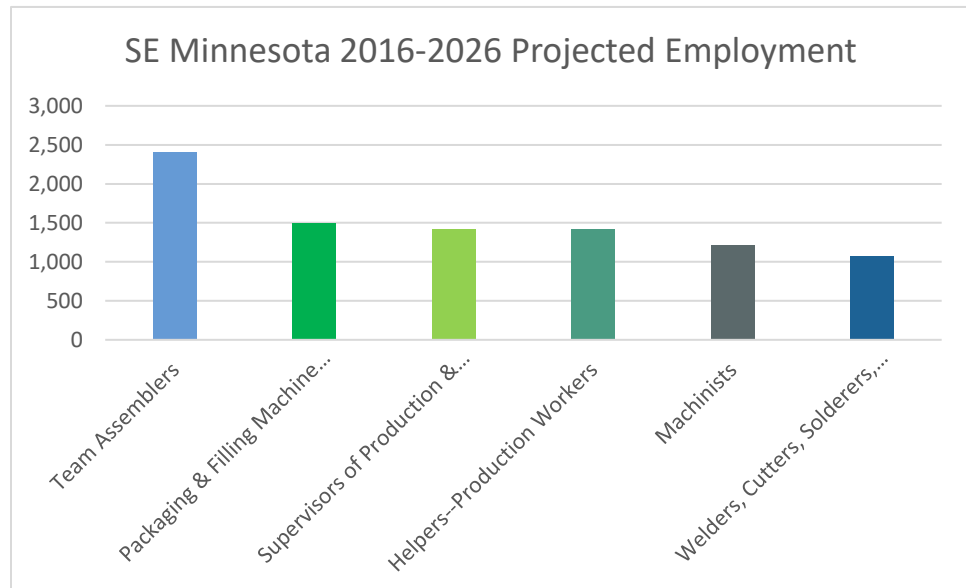
Central MN 2016-2026 Projected Employment



According to DEED's Job Vacancy Survey data, there were just under 6,500 job vacancies reported by employers in Central Minnesota in the second quarter of 2019.

Southeast Region

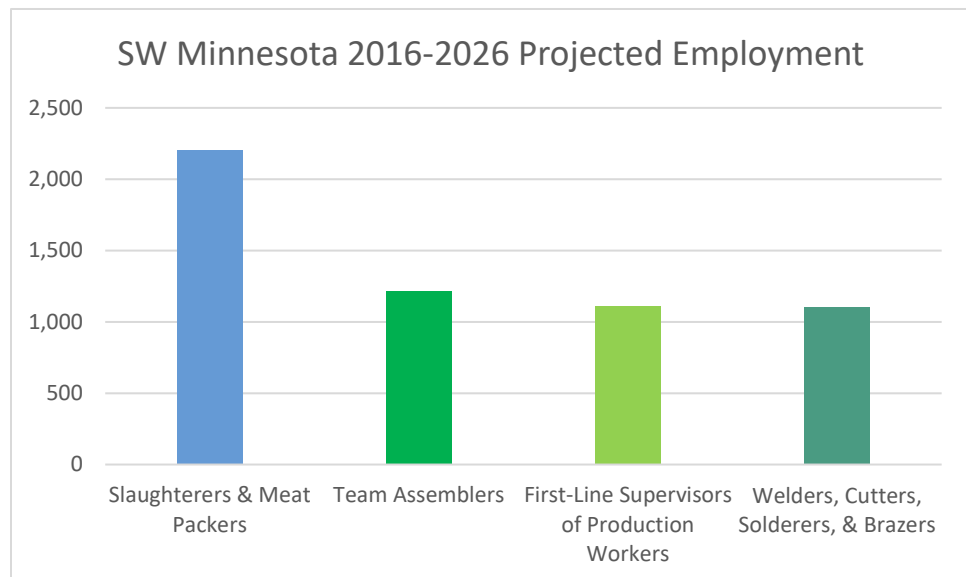
In the southeast region, the occupations with the highest projected 2026 employment are: team assemblers (2,408); packaging & filling machine operators (1,497); supervisors of production & operating workers (1,421); helpers--production workers (1,419); machinists (1,209) and welders, cutters, solderers, & brazers (1,074).



According to DEED's Job Vacancy Survey data, there were just over 5,300 job vacancies reported by employers in Southeast Minnesota in the second quarter of 2019.

Southwest Minnesota

In the southwest region, the occupations with the highest projected 2026 employment are: slaughterers & meat packers (2,021); team assemblers (1,215); first-line supervisors of production workers (1,114); and welders, cutters, solderers, & brazers (1,102).



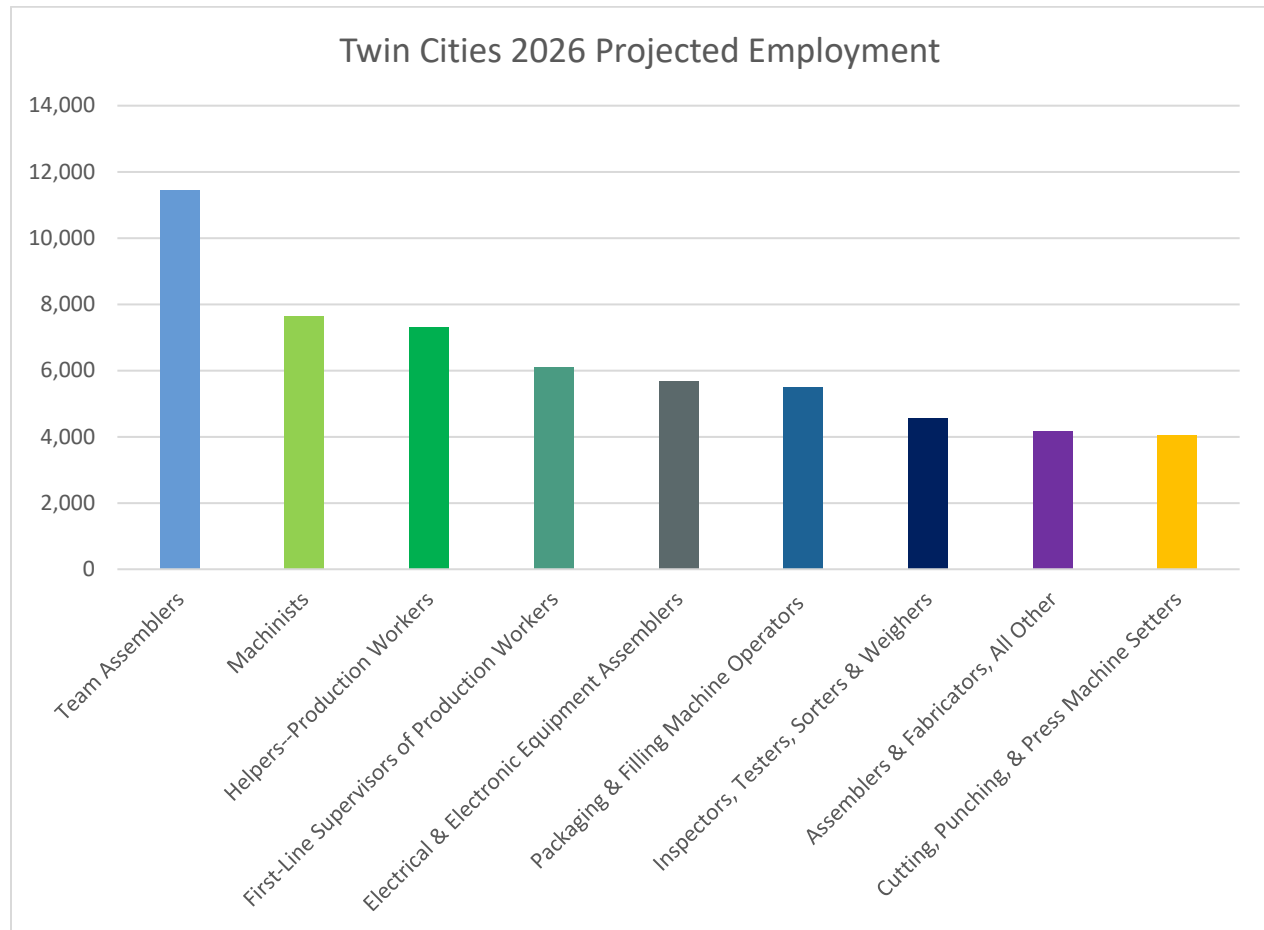
According to DEED's Job Vacancy Survey data, there were approximately 4,800 job vacancies reported by employers in Southwest Minnesota in the second quarter of 2019.



Twin Cities

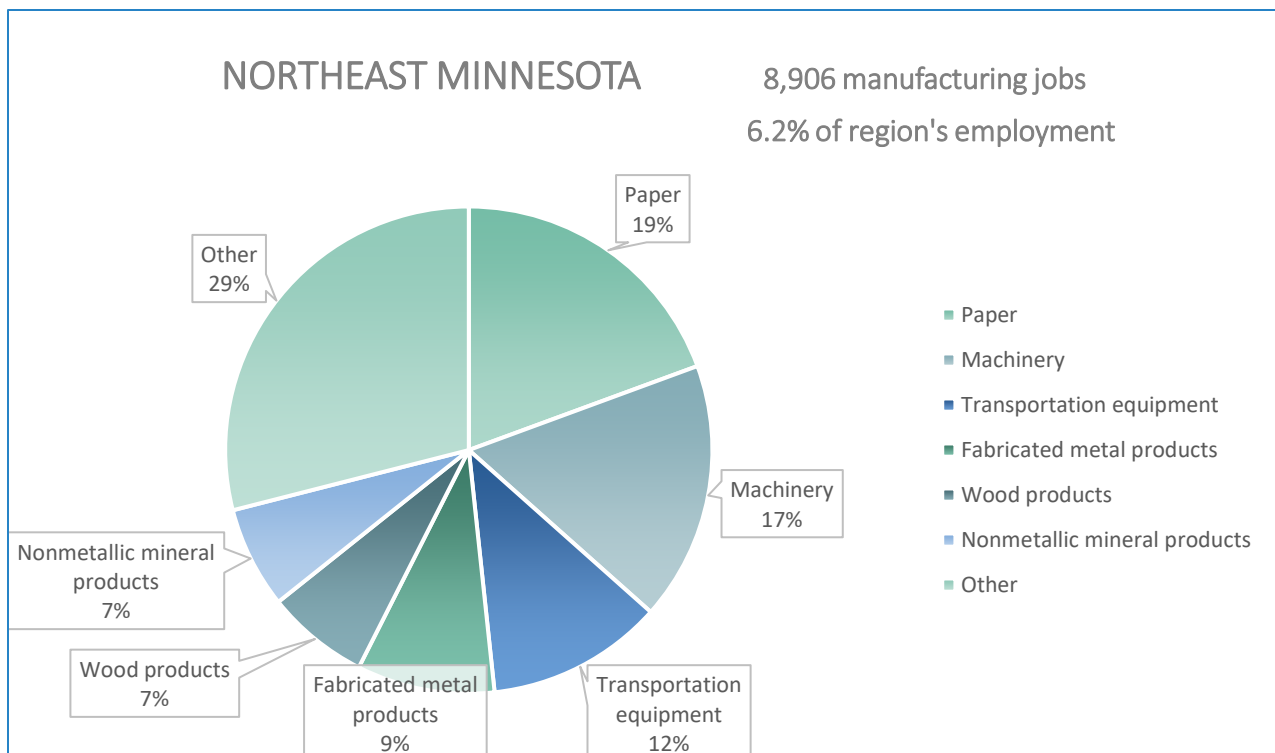
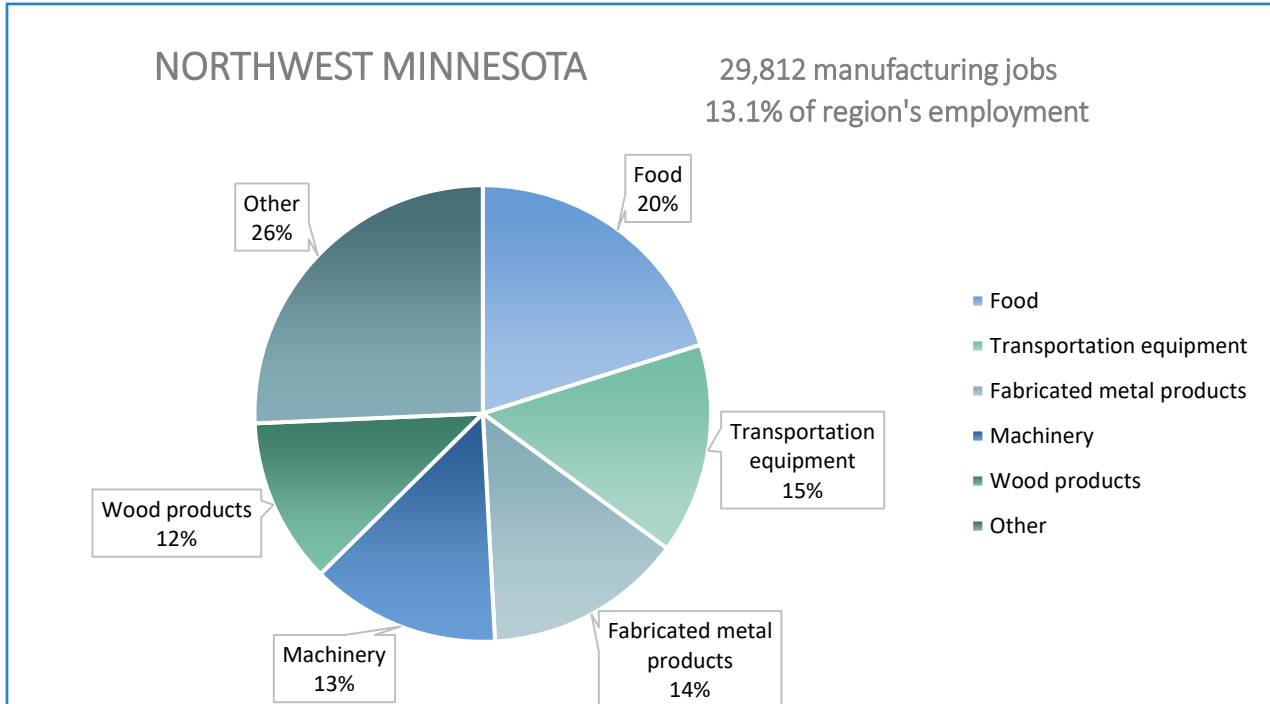
In the Twin Cities region, the occupations with the largest 2026 employment projections are: Team Assemblers (11,444); Helpers--Production Workers (7,300); Machinists (7,641); Assemblers & Fabricators, All Other (4,167); First-Line Supervisors of Production Workers (6,109); Packaging & Filling Machine Operators (5,491); Electrical & Electronic Equipment Assemblers (5,663); Inspectors, Testers, Sorters & Weighers (4,575); Production Workers, All Other (3,145); and Cutting, Punching, & Press Machine Setters (4,041)

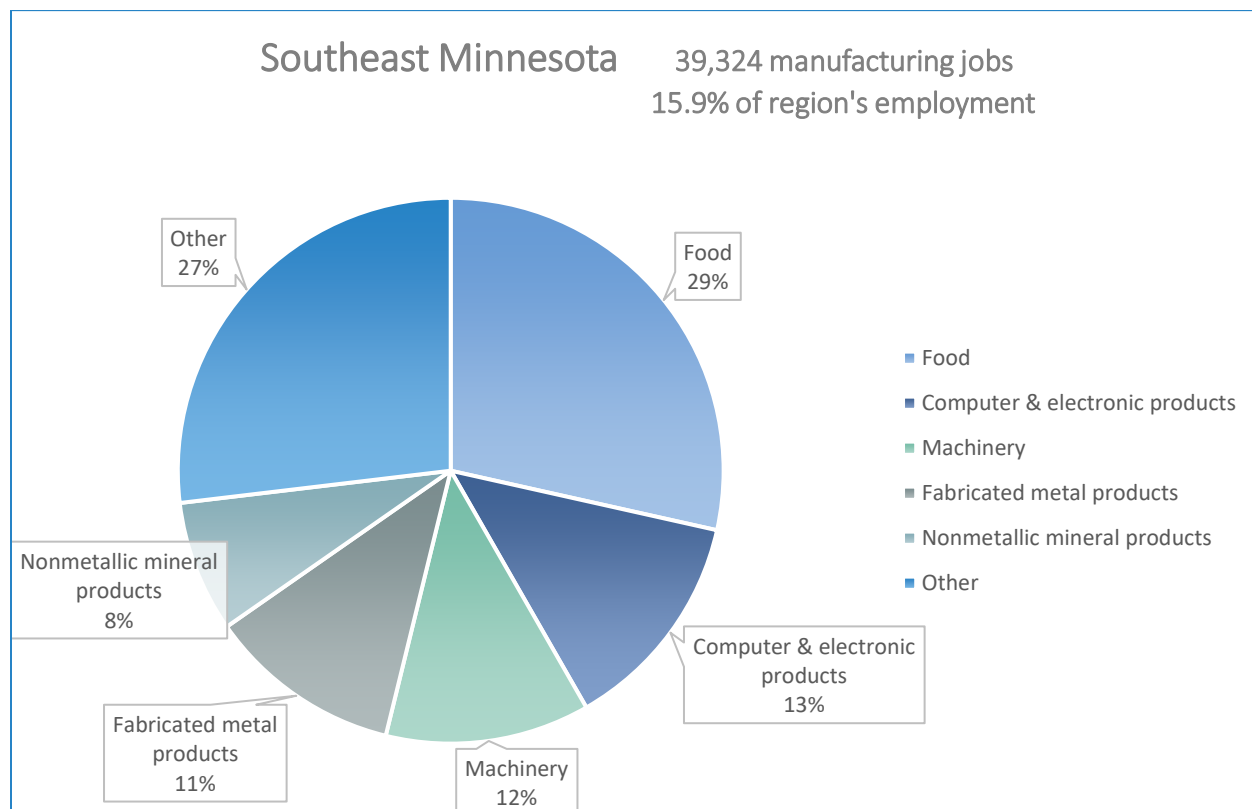
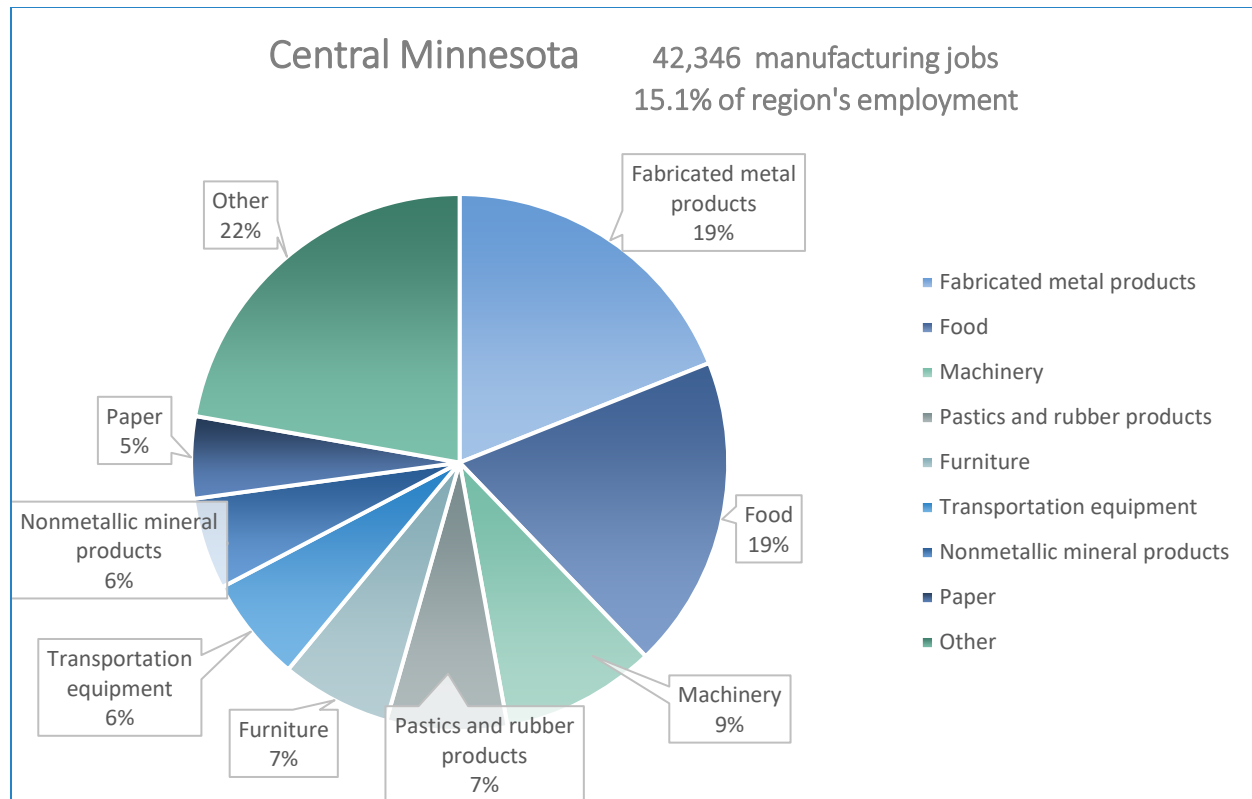
According to DEED's Job Vacancy Survey data, there were approximately 31,000 job vacancies reported by employers in the Twin Cities region in the second quarter of 2019.

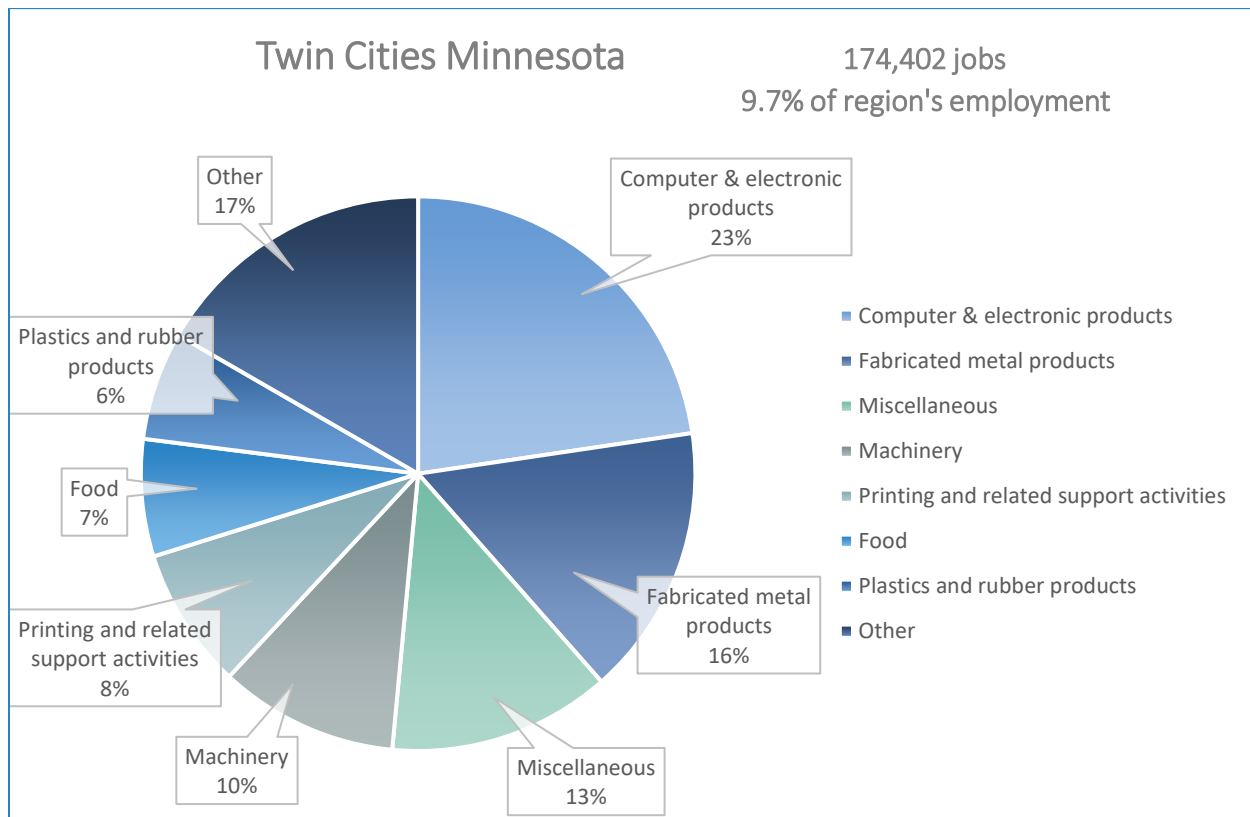
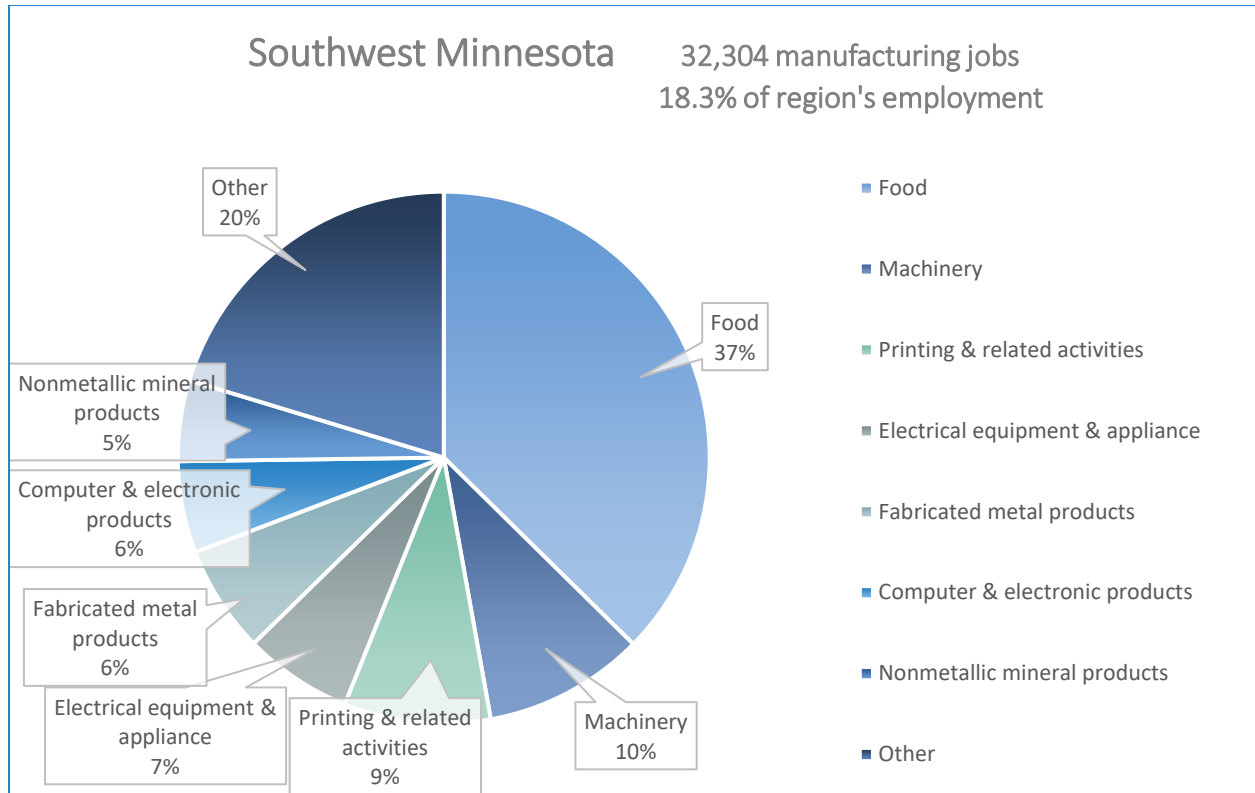


Regional Dashboard

The pie charts, pages 17-19, present a snapshot of the number of manufacturing jobs, the manufacturing industries that are most prevalent within each Minnesota region, and each industry's contribution toward total manufacturing employment within the region.







Labor Market Information Detail

Minnesota Manufacturing Overview

According to DEED's [Quarterly Census of Employment and Wages](#) (QCEW) data, Minnesota was home to 8,322 manufacturing establishments providing 327,549 jobs through the third quarter of 2019. Manufacturing accounted for 11.2 percent of total employment in the state, making it the second largest industry behind health care and social assistance (503,325 jobs), and just ahead of retail trade (292,234 jobs).

These manufacturers provided over \$5.5 billion in total payroll through the third quarter of 2019, again making it the second largest industry behind only health care and social assistance. Average annual wages in manufacturing were \$67,288 in 2019, which was nearly 17 percent higher than the average wages of all industries.

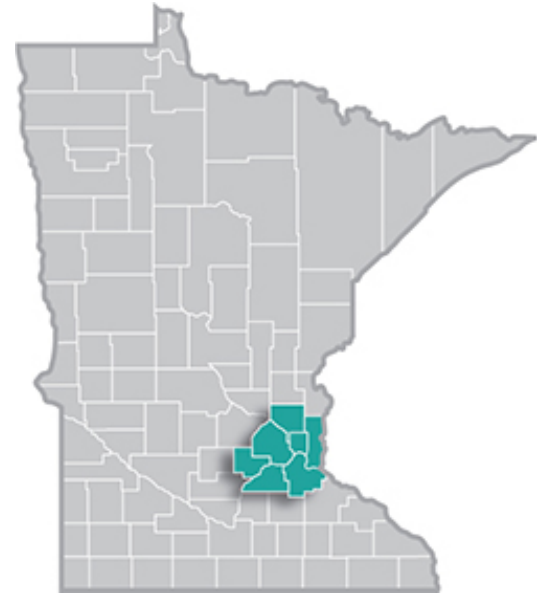


Table 1. Minnesota Manufacturing Industry Employment Statistics, Quarter 3 2019

NAICS Code	NAICS Industry Title	Number of Firms, Q3 2019	Number of Jobs, Q3 2019	Quarterly Payroll, Q3 2019	Avg. Annual Wages, Q3 2019
0	Total, All Industries	180,007	2,914,501	\$41,945,112,419	\$57,564
31	Manufacturing	8,322	327,549	\$5,511,113,951	\$67,288
311	Food Manufacturing	707	47,951	\$632,672,380	\$52,728
334	Computer and Elec. Product Manufacturing	514	45,951	\$1,273,991,399	\$110,864
332	Fabricated Metal Product Manufacturing	1,633	44,856	\$672,211,563	\$59,904
333	Machinery Manufacturing	848	33,906	\$559,525,333	\$65,988
339	Miscellaneous Manufacturing	1,157	26,754	\$424,770,860	\$63,492
323	Printing and Related Support Activities	656	20,378	\$295,676,207	\$58,032
326	Plastics and Rubber Products Manufacturing	376	16,964	\$232,509,717	\$54,808
325	Chemical Manufacturing	242	12,474	\$263,849,091	\$84,604
321	Wood Product Manufacturing	331	11,945	\$153,770,133	\$51,480
336	Transportation Equipment Manufacturing	229	11,368	\$152,329,423	\$53,560
327	Nonmetallic Mineral Product Manufacturing	348	11,035	\$172,789,200	\$62,608
337	Furniture and Related Product Manufacturing	486	9,491	\$134,614,891	\$56,732
335	Electrical Equipment, and Comp. Mfg.	176	8,672	\$139,243,236	\$64,220
322	Paper Manufacturing	99	8,539	\$150,947,434	\$70,668
331	Primary Metal Manufacturing	88	6,105	\$99,185,725	\$64,948
312	Beverage and Tobacco Product Manufacturing	181	4,639	\$45,993,435	\$39,624
314	Textile Product Mills	139	2,380	\$23,292,952	\$39,104
324	Petroleum and Coal Products Manufacturing	20	1,982	\$58,386,760	\$117,832
316	Leather and Allied Product Manufacturing	21	1,157	\$16,905,424	\$58,396
315	Apparel Manufacturing	60	656	\$5,260,388	\$32,032
313	Textile Mills	11	338	\$3,188,400	\$37,700

Source: DEED [Quarterly Census of Employment & Wages \(QCEW\)](#) program

Food Manufacturing is the largest sector in Minnesota, with 47,951 jobs, followed by Computer and Electronic Product Manufacturing, which had 45,951 jobs through the third quarter of 2019. Combined, those two sectors accounted for 28.7 percent of the state's manufacturing employment.

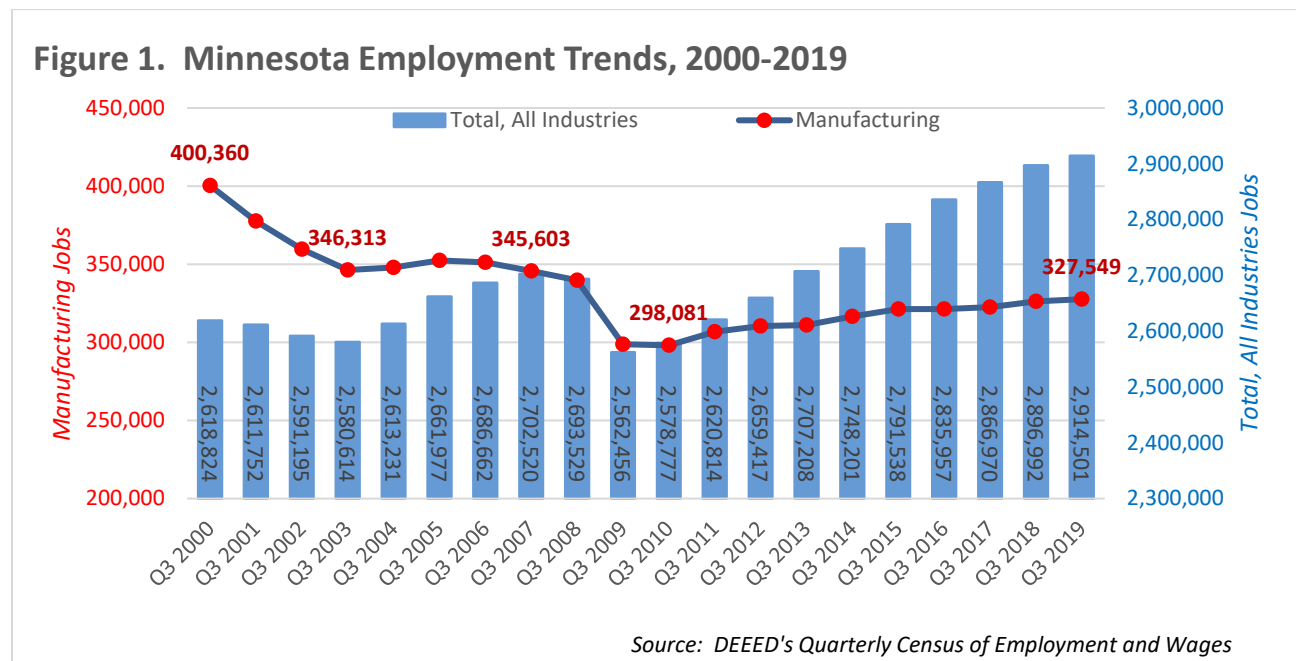
The state also had large numbers of jobs in Fabricated Metal Product Manufacturing (44,856 jobs), Machinery Manufacturing (33,906 jobs), Miscellaneous Manufacturing (26,754 jobs), and Printing and Related Support Activities (20,378 jobs). Those four sectors combined for another 38.4 percent of total manufacturing employment in the state.

Minnesota also has notable employment in the Plastics and Rubber Product Manufacturing (16,964 jobs), Chemical Manufacturing (12,474 jobs), Wood Product Manufacturing (11,945 jobs), Transportation Equipment Manufacturing (11,368 jobs), Nonmetallic Mineral Product Manufacturing (11,035 jobs), Furniture and Related Product Manufacturing (9,491 jobs), Electrical Equipment Manufacturing (8,672 jobs), and Paper Manufacturing (8,539 jobs) sectors.

Average annual wages in manufacturing (\$67,288) were about 17 percent higher than the total of all industries (\$57,564), led by extremely high average weekly wages in Petroleum and Coal Products Manufacturing (\$117,832), Computer and Electronic Product Manufacturing (\$110,864), Chemical Manufacturing (\$84,604), Paper Manufacturing (\$70,668), Machinery Manufacturing (\$65,998), Primary Metal Manufacturing (\$64,948), and Electrical Equipment and Appliance Manufacturing (\$64,220).

Industry Trends

Between 2000 and 2010, the manufacturing industry experienced employment declines in Minnesota. Manufacturers cut huge numbers of jobs during the 2001 recession, then mostly held steady from 2003 to 2007. The state's manufacturers suffered even more significant job losses during the recession from 2008 to 2010, dropping to a low of 298,081 jobs through the third quarter of 2010. However, with the addition of 28,800 jobs between 2010 to 2019 (a 9.6 percent increase) **manufacturers in the state are now responsible for 327,549 jobs.**



Due to recent gains, Minnesota manufacturers have 28,782 more jobs now than in 2009, the end of the recession. Manufacturing employment was still down about 5 percent from 2006 to 2019, while the total of all industries surpassed its pre-recession peak in 2013 and is now up over 227,000 jobs since 2006, an 8.5 percent increase in jobs.

The biggest job declines from 2009 to 2019 occurred in Paper Manufacturing which decreased by 2,122 jobs, or 19 percent. In sum, 17 of the 21 manufacturing sectors had more jobs in 2019 than in 2009, including eleven that added more than 15 percent of their employment with the largest job gains occurring in Fabricated Metal Product Manufacturing, which added nearly 8,000 jobs. Minnesota also saw big gains in Machinery Manufacturing, Miscellaneous Manufacturing, and Plastics and Rubber Products Manufacturing.

Twelve of the 21 sectors added jobs in the past year, and 12 of the 21 sectors were up since the third quarter of 2014, showing a widespread and relatively strong recovery from the Great Recession (see Table 2).

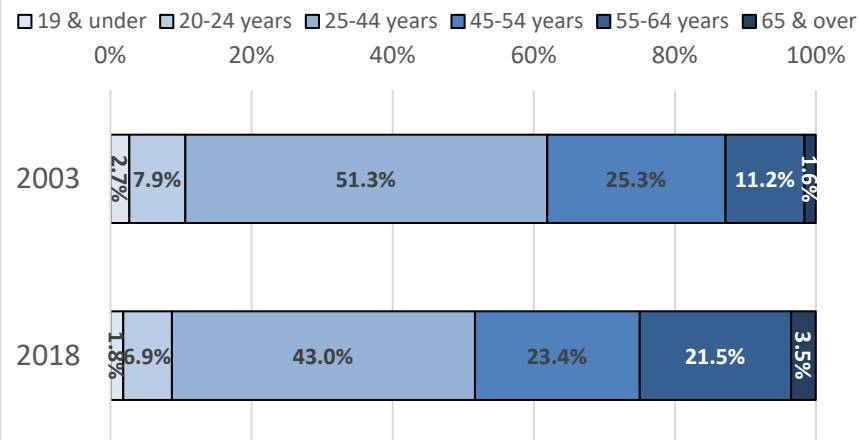
Table 2. Minnesota Manufacturing Industry Trends, 2009-2019							
NAICS Industry Title	Number of Jobs, Q3 2019	1-Year Trend, Q3 2018-Q3 2019		5-Year Trend, Q3 2014-Q3 2019		10-Year Trend, Q3 2009-Q3 2019	
		Numeric Change	Percent Change	Numeric Change	Percent Change	Numeric Change	Percent Change
Total, All Industries	2,914,501	+17,509	+0.6%	+166,300	+6.1%	+352,045	+13.7%
Manufacturing	327,549	+1,334	+0.4%	+10,998	+3.5%	+28,782	+9.6%
Food Manufacturing	47,951	-912	-1.9%	+857	+1.8%	+3,096	+6.9%
Computer and Electronic Prod. Mfg.	45,951	+94	+0.2%	+637	+1.4%	-699	-1.5%
Fabricated Metal Product Mfg.	44,856	+773	+1.8%	+2,053	+4.8%	+7,917	+21.4%
Machinery Manufacturing	33,906	-155	-0.5%	+1,134	+3.5%	+5,329	+18.6%
Miscellaneous Manufacturing	26,754	+1,692	+6.8%	+3,802	+16.6%	+4,572	+20.6%
Printing and Related Support Activities	20,378	-313	-1.5%	-3,689	-15.3%	-5,599	-21.6%
Plastics and Rubber Products Mfg.	16,964	+10	+0.1%	+1,857	+12.3%	+4,231	+33.2%
Chemical Manufacturing	12,474	-19	-0.2%	+2,428	+24.2%	+2,502	+25.1%
Wood Product Manufacturing	11,945	+14	+0.1%	+797	+7.1%	+521	+4.6%
Transportation Equipment Mfg.	11,368	+447	+4.1%	-311	-2.7%	+1,803	+18.8%
Nonmetallic Mineral Product Mfg.	11,035	+84	+0.8%	+1,351	+14.0%	+2,213	+25.1%
Furniture and Related Product Mfg.	9,491	-219	-2.3%	-7	-0.1%	+933	+10.9%
Electrical Equipment, Comp. Mfg.	8,672	+343	+4.1%	-340	-3.8%	+337	+4.0%
Paper Manufacturing	8,539	-271	-3.1%	-853	-9.1%	-2,122	-19.9%
Primary Metal Manufacturing	6,105	+29	+0.5%	-24	-0.4%	+1,317	+27.5%
Beverage and Tobacco Product Mfg.	4,639	+360	+8.4%	+1,809	+63.9%	+2,292	+97.7%
Textile Product Mills	2,380	-571	-19.3%	-139	-5.5%	+279	+13.3%
Petroleum and Coal Products Mfg.	1,982	-76	-3.7%	-386	-16.3%	-280	-12.4%
Leather and Allied Product Mfg.	1,157	+69	+6.3%	-1	-0.1%	+152	+15.1%
Apparel Manufacturing	656	-11	-1.6%	-15	-2.2%	-87	-11.7%
Textile Mills	338	-36	-9.6%	+34	+11.2%	+74	+28.0%

Source: DEED [Quarterly Census of Employment & Wages \(QCEW\)](#) program

New graduates and other jobseekers will be important in filling the workforce pipeline in the manufacturing industry, which is exhibiting a trend toward a larger percentage of older workers. In 2018, one-fourth (25.0 percent) of workers in the industry were 55 years or older, up from just 12.8 percent of the workforce back in 2003. In contrast, less than 9 percent of workers in the industry were

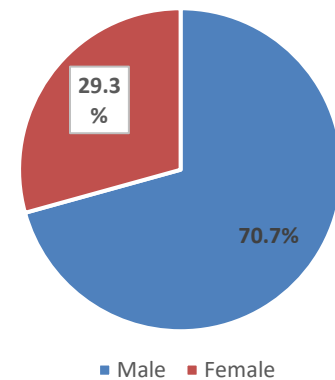
under 25 years of age, down from almost 11 percent in 2003. Likewise, the percent of workers from 25 to 44 years of age dropped from 51.3 percent of the total in 2003 to just 43 percent in 2018 (see Figure 3).

Figure 3. Minnesota Manufacturing Workforce Demographics, 2003-2018



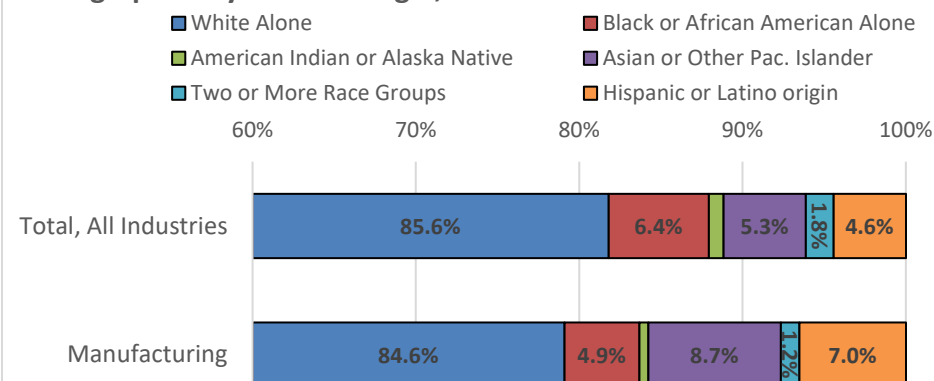
Source: DEED Quarterly Employment Demographics

Figure 4. Minnesota Manufacturing Industry Workforce Demographics, 2018



Further demographic data from DEED's Quarterly Employment Demographics program shows that the manufacturing industry is relatively non-diverse, with males accounting for 71 percent of workers (see Figure 4), and about 85 percent reporting white as their race (see Figure 5). However, the racial diversity of the workforce has changed over time, with the number of manufacturing workers identifying as white alone declining by 13 percent from 2003 to 2018, compared to a 48.5 percent increase in the number of jobholders of other race groups. Likewise, the number of Hispanic or Latino workers in manufacturing jumped by 25 percent from 2003 to 2018. In the face of tight labor markets, manufacturers may need to tap into new labor pools in order to attract the talent they need to grow and replace existing workers in the future.

Figure 5. Minnesota Manufacturing Industry Workforce Demographics by Race or Origin, 2018



Source: Quarterly Workforce Indicators

Industry Demand

The recent growth in manufacturing employment has led to an increased number of [job vacancies](#) across the state. The 11,120 job vacancies reported by manufacturing employers in the second quarter of 2019 was the third highest number ever recorded in the second quarter, only 1,200 less than the peak in 2018. Likewise, the 12,972 job vacancies posted in the fourth quarter of 2018 was the highest number reported in a fourth quarter, about 2,900 more than the fourth quarter of 2017, and about 6.5 times higher than the lowest number reported in 2009 (see Figure 2).

Figure 2. Minnesota Manufacturing Job Vacancies, 2001-2019



Source: DEED Job Vacancy Survey

The median wage offered for these vacancies increased to \$18.12 per hour in the second quarter of 2019, up about \$2.06 compared to the same survey in the second quarter of 2018 and up nearly \$7.60 from the second quarter of 2001. Over one half of the manufacturing vacancies required at least 1 year of experience, and **40 percent required postsecondary education**. Manufacturing employers continue to place a high premium on related work experience, especially in comparison to other industries. Just 3 percent of the openings were part-time, as compared to 35 percent of vacancies across all industries (see Table 3).

Table 3. Minnesota Manufacturing Job Vacancy Survey, 2nd Quarter 2019

NAICS Industry Title	Number of Job Vacancies	Median Wage Offer	Percent Part-time	Percent Requiring Postsecondary Education	Percent Requiring 1+ Years Work Experience
Total, All Industries	146,513	\$15.00	35%	30%	45%
Manufacturing	11,120	\$18.12	3%	40%	57%

Source: DEED [Job Vacancy Survey](#)

The largest number of manufacturing vacancies were production occupations, including metal and plastic workers, textile and furnishing workers, food processing workers, assemblers and fabricators, printing workers, supervisors of production workers, and other production occupations. The median wage offer for these positions was \$15.00 but ranged between \$12 and \$29 per hour. Manufacturers in Minnesota were also looking to hire sales and office, transportation and material moving, engineering, management, and installation, maintenance, and repair workers (see Table 4).

Table 4. Minnesota Production Occupations Job Vacancy Survey, 2nd Quarter 2019

SOC Occupational Title	Number of Job Vacancies	Median Wage Offer	Percent Part-time	Percent Requiring Postsecondary Education	Percent Requiring 1+ Years Work Experience
Total, All Occupations	146,513	\$15.00	35%	30%	45%
Production Occupations	7,084	\$15.00	6%	17%	38%
Supervisors of Production Workers	359	\$29.10	1%	57%	93%
Assemblers & Fabricators	1,011	\$14.47	3%	6%	34%
Food Processing Workers	1,347	\$12.09	10%	0%	11%
Metal Workers & Plastic Workers	1,706	\$17.99	1%	41%	57%
Printing Workers	492	\$14.92	1%	20%	41%
Textile, Apparel, & Furnishings Workers	255	\$13.55	29%	9%	26%
Woodworkers	353	\$14.83	4%	5%	20%
Plant & System Operators	84	\$21.72	4%	36%	79%
Other Production Occupations	1,476	\$14.98	9%	5%	31%
Office & Administrative Support	10,318	\$14.91	36%	13%	48%
Transportation & Material Moving	10,748	\$15.78	35%	3%	37%
Architecture & Engineering	2,721	\$29.01	0%	94%	91%
Management	4,685	\$40.42	2%	84%	97%
Installation, Maintenance, & Repair	5,342	\$17.84	10%	24%	55%
Sales & Related	18,010	\$13.00	40%	7%	41%

Source: DEED [Job Vacancy Survey](#)

Industry Occupational Employment

DEED's Occupational Employment Statistics (OES) program provides detailed employment and wage data for a wide range of occupations involved in manufacturing. In sum, there were an estimated 214,230 people working in production occupations in Minnesota, accounting for about 7.4 percent of total employment in the state. Median hourly wages for production occupations were \$18.68 in 2019 but ranged from \$12 at the low end to \$44 at the high end.

As noted above, in addition to production occupations, manufacturers also require the services of workers in several other occupational groups, such as office and administrative support, transportation and material moving, architecture and engineering, management, and installation, maintenance and repair. Not surprisingly, wages were higher for higher-level positions (see Table 5).

Table 5. Minnesota Occupational Employment & Wage Statistics, 2019

SOC Occupational Title	Estimated Statewide Employment	Statewide Median Hourly Wage
Total, All Occupations	2,867,700	\$20.95
Production Occupations	214,230	\$18.68
Office & Administrative Support	405,970	\$19.10
Transportation & Material Moving	177,580	\$18.48
Architecture & Engineering	56,070	\$37.53
Management	171,250	\$51.26
Installation, Maintenance, & Repair	100,030	\$23.13
Sales & Related	277,070	\$14.97
Business & Financial Operations	164,510	\$33.03
Computer & Mathematical	96,020	\$40.96

Source: DEED [Occupational Employment Statistics \(OES\)](#) program

Team assemblers, first-line supervisors, machinists, and more are the most common jobs found at manufacturing firms in Minnesota, according to DEED's Occupational Staffing Matrix data. Median hourly wages for these manufacturing positions ranged from a low of about \$14 for production helpers and packers and packagers to a high of about \$30 per hour for first-line supervisors and tool and die makers. Almost all the production-related manufacturing occupations can be gained with a high school diploma and learned through on-the-job training, though some also benefit from vocational training or associate degrees (see Table 6).

Table 6. Minnesota's Top 30 Production-related Manufacturing Occupations, 2019 Wage Data			
SOC Code	SOC Occupational Title	Estimated State Employment	Median Hourly Wage
512092	Team Assemblers	32,050	\$16.39
511011	First-Line Supervisors of Production & Operating Workers	11,780	\$30.58
512099	Assemblers & Fabricators, All Other	32,050	\$16.39
514041	Machinists	12,870	\$24.34
513023	Slaughterers & Meat Packers	4,140	\$15.69
519111	Packaging & Filling Machine Operators & Tenders	10,320	\$17.02
514121	Welders, Cutters, Solderers, & Brazers	9,410	\$21.65
519061	Inspectors, Testers, Sorters, Samplers, & Weighers	10,090	\$20.16
537062	Laborers & Freight, Stock, & Material Movers, Hand	43,790	\$16.56
514031	Cutting, Punching, & Press Machine Setters, Metal/Plastic	5,610	\$21.10
515112	Printing Press Operators	6,220	\$21.31
499041	Industrial Machinery Mechanics	6,650	\$26.92
512022	Electrical & Electronic Equipment Assemblers	8,920	\$17.60
519198	Helpers--Production Workers	8,400	\$14.60
514011	Computer-Controlled Machine Tool Operators, Metal/Plastic	3,310	\$21.68
537051	Industrial Truck & Tractor Operators	6,450	\$19.94
519199	Production Workers, All Other	4,270	\$17.57
499071	Maintenance & Repair Workers, General	24,320	\$21.03
537064	Packers & Packagers, Hand	10,250	\$13.09
513099	All other food processing workers	1,040	\$14.10
514072	Molding, Coremaking & Casting Machine Setters & Operators	3,950	\$17.64
533032	Truck Drivers, Heavy & Tractor-Trailer	34,860	\$23.42
512023	Electromechanical Equipment Assemblers	8,920	\$17.60
519121	Coating, Painting, & Spraying Machine Setters & Operators	2,760	\$19.89
513092	Food Batchmakers	4,680	\$16.73
519196	Paper Goods Machine Setters, Operators, & Tenders	1,800	\$20.79
515113	Print Binding & Finishing Workers	2,710	\$17.05
517011	Cabinetmakers & Bench Carpenters	3,120	\$19.99
519032	Cutting & Slicing Machine Setters, Operators, & Tenders	1,940	\$19.66
514111	Tool & Die Makers	1,760	\$28.55

Source: DEED [Occupational Employment Statistics \(OES\)](#) program

In addition to the production-related occupations, manufacturers also rely heavily on sales and office workers including manufacturing sales representatives, customer service representatives, and production, planning, shipping, and traffic clerks; transportation and material moving workers such as truck drivers and packers and packagers; engineering occupations like industrial, mechanical, and electrical engineers; management positions such as industrial production and general managers; and business and financial operations occupations like accountants and auditors. Many of these occupations require higher education, but also offer higher wages (see Table 7).

Table 7. Minnesota's Top 20 Office-related Manufacturing Occupations, 2019 Wage Data

SOC Code	SOC Occupational Title	Estimated State Employment	Median Hourly Wage
414012	Sales Representatives, Manufacturing, exc. Technical Products	33,060	\$31.44
434051	Customer Service Representatives	58,710	\$18.55
172112	Industrial Engineers	9,620	\$42.36
111021	General & Operations Managers	46,440	\$45.84
435071	Shipping, Receiving, & Traffic Clerks	15,030	\$17.72
113051	Industrial Production Managers	5,230	\$48.92
172141	Mechanical Engineers	8,340	\$40.17
433031	Bookkeeping, Accounting, & Auditing Clerks	31,110	\$21.43
173026	Industrial Engineering Technicians	3,340	\$24.80
131023	Purchasing Agents, exc. Wholesale, Retail & Farm Products	#N/A	#N/A
439061	Office Clerks, General	55,140	\$17.90
414011	Sales Representatives, Manufacturing, Technical Products	5,450	\$38.19
435061	Production, Planning, & Expediting Clerks	5,340	\$24.28
132011	Accountants & Auditors	22,960	\$32.46
435081	Stock Clerks & Order Fillers	35,190	\$13.80
119041	Engineering Managers	4,080	\$67.49
172071	Electrical Engineers	3,910	\$46.65
151133	Software Developers, Systems Software	6,460	\$51.99
151132	Software Developers, Applications	19,970	\$46.58
173023	Electrical & Electronic Engineering Technicians	1,920	\$29.90

Source: DEED [Occupational Employment Statistics \(OES\)](#) program

Industry Outlook

According to DEED's 2016 to 2026 Employment Outlook data, Minnesota's manufacturing industry is projected to lose 5,400 jobs over the next decade, a 1.7 percent decline. That contrasts with overall growth of 5.9 percent in the total of all industries in the state.

Twelve of the 20 sectors are expected to see job declines in the next decade, with the most severe losses projected in Printing and Related Support Activities, Computer and Electronic Product Manufacturing, and Paper Manufacturing. Those three industries are expected to account for a significant portion of the state's total job decline.

In contrast, the state is expected to see big job increases in Miscellaneous Manufacturing, Plastics and Rubber Products Manufacturing, and Beverage and Tobacco Product Manufacturing, as well as gains in Chemical Manufacturing and Nonmetallic Mineral Product Manufacturing (see Table 8).



Table 8. Minnesota Manufacturing Industry Projections, 2016-2026

NAICS Code	Industry	Estimated Employment 2016	Projected Employment 2026	Percent Change 2016-2026	Numeric Change 2016-2026
0	Total, All Industries	3,097,300	3,278,900	+5.9%	+181,600
31	Manufacturing	317,411	312,018	-1.7%	-5,393
311	Food Manufacturing	46,402	46,750	+0.8%	+348
334	Computer & Electronic Product Mfg.	45,594	42,700	-6.3%	-2,894
332	Fabricated Metal Product Mfg.	42,134	42,150	+0.0%	+16
333	Machinery Manufacturing	33,021	33,570	+1.7%	+549
339	Miscellaneous Manufacturing	24,307	25,400	+4.5%	+1,093
323	Printing & Related Support Activities	22,733	19,700	-13.3%	-3,033
326	Plastics & Rubber Products Mfg.	15,473	16,350	+5.7%	+877
325	Chemical Manufacturing	11,399	12,000	+5.3%	+601
321	Wood Product Manufacturing	11,199	11,080	-1.1%	-119
327	Nonmetallic Mineral Product Mfg.	10,239	10,655	+4.1%	+416
336	Transportation Equipment Mfg.	10,966	10,523	-4.0%	-443
337	Furniture & Related Product Mfg.	9,535	9,400	-1.4%	-135
322	Paper Manufacturing	9,312	8,270	-11.2%	-1,042
335	Electrical Equipment & Appliances	8,413	7,480	-11.1%	-933
331	Primary Metal Manufacturing	6,044	5,690	-5.9%	-354
312	Beverage & Tobacco Product Mfg.	3,682	4,300	+16.8%	+618
314	Textile Product Mills	2,549	2,400	-5.8%	-149
324	Petroleum & Coal Products Mfg.	2,263	2,000	-11.6%	-263
316	Leather & Allied Product Mfg.	1,084	800	-26.2%	-284
315	Apparel Manufacturing	740	500	-32.4%	-240

Source: DEED [Employment Outlook](#)

Occupational Outlook

The projected job losses in the manufacturing industry are expected to carry over into production occupations as well, leading to a projected 2.0 percent decline from 2016 to 2026 in Minnesota. However, the state is still expected to have significant demand for production workers over the next ten years due to a large number of labor force exit openings – jobs that become available because the existing worker retires out of the labor force. **There may be as many as 246,504 total openings for production occupations in the state**, including occupational transfer openings, jobs that open because a worker changes occupation.

However, 44 of the 89 production occupations are expected to see new job growth from 2016 to 2026, led by Helpers – Production Workers, Machinists, Welders, Cutters, Solderers, and Brazers, and First Line Supervisors of Production; Computer Numerically Controlled Machine Tool Programmer, Dental Laboratory Technicians, and Ophthalmic Laboratory Technicians, which are all projected to grow more than 10 percent.

In contrast, the biggest declines are projected for Team Assemblers, Electric Equipment Assemblers, Assemblers and Fabricators, All Other, Inspectors, Testers, Sorters, Samplers, and Weighers, Electromechanical Equipment Assemblers, Prepress Technicians and Workers, Structural Metal Fabricators, Grinding and Polishing Workers, Hand, and Pourers and Casters, Metal, which are all expected to lose more than 10 percent of their jobs.



Regardless of growth or decline, every occupation is expected to at least have some total openings from 2016 to 2026 due to labor force exits and occupational transfers. The largest number of total openings are projected for Team Assemblers, Production Helpers, Machinists, and Packaging and Filling Machine Operators, which are all expected to have at least 4,000 total openings in the state (see Table 9).

Table 9. Top 25 Minnesota Production Occupation Projections, 2016-2026

SOC Code	SOC Occupational Title	Estimated Employment 2016	Projected Employment 2026	Percent Change 2016-2026	Numeric Change 2016-2026	* Labor Force Exit Openings 2016-2026
0	Total, All Occupations	3,097,300	3,278,900	+5.9%	+181,600	+1,480,027
510000	Production Occupations	224,787	220,282	-2.0%	-4,505	+92,681
512092	Team Assemblers	23,388	20,141	-13.9%	-3,247	+9,296
519198	Helpers--Production Workers	10,756	12,349	+14.8%	+1,593	+6,193
514041	Machinists	13,012	13,723	+5.5%	+711	+4,643
512099	Assemblers & Fabricators, All Other	8,199	7,072	-13.7%	-1,127	+3,261
511011	First-Line Supervisors of Production Workers	11,936	12,293	+3.0%	+357	+3,862
519111	Packaging & Filling Machine Operators	10,262	10,421	+1.5%	+159	+4,888
512022	Electrical & Electronic Equipment Assemblers	8,087	6,641	-17.9%	-1,446	+3,733
519061	Inspectors, Testers, Sorters & Weighers	9,282	8,226	-11.4%	-1,056	+3,639
519199	Production Workers, All Other	5,550	5,708	+2.8%	+158	+2,212
514031	Cutting, Punching, & Press Machine Setters	8,444	8,104	-4.0%	-340	+2,994
515112	Printing Press Operators	6,587	6,202	-5.8%	-385	+2,489
514011	Computer-Controlled Machine Tool Operators	4,531	4,724	+4.3%	+193	+1,278
514121	Welders, Cutters, Solderers, & Brazers	9,585	10,240	+6.8%	+655	+2,640
513011	Bakers	3,009	3,146	+4.6%	+137	+1,976
516011	Laundry & Dry-Cleaning Workers	3,094	3,083	-0.4%	-11	+2,070
513099	Food Processing Workers, All Other	1,780	1,825	+2.5%	+45	+774
514072	Molding, Coremaking & Casting Machine	2,690	2,503	-7.0%	-187	+951
518031	Water/Wastewater Treatment Plant Oper.	2,548	2,479	-2.7%	-69	+716
515113	Print Binding & Finishing Workers	3,676	3,459	-5.9%	-217	+2,706
516031	Sewing Machine Operators	2,641	2,589	-2.0%	-52	+1,485
519121	Coating, Painting, & Spraying Machine Setters	2,874	2,960	+3.0%	+86	+832
513021	Butchers & Meat Cutters	2,468	2,636	+6.8%	+168	+1,146
513092	Food Batchmakers	4,635	4,747	+2.4%	+112	+2,577
517011	Cabinetmakers & Bench Carpenters	2,890	2,980	+3.1%	+90	+1,370
512041	Structural Metal Fabricators & Fitters	1,025	885	-13.7%	-140	+330

* Labor Force exit Openings are the projected number of workers leaving an occupation and exiting the labor market entirely (most labor force exits are related to workers retiring)

Source: DEED [Employment Outlook](#)

Northwest Minnesota – Manufacturing Overview

According to DEED's [Quarterly Census of Employment and Wages](#) (QCEW) data, the 26-county Northwest Minnesota region was home to 830 manufacturing establishments providing 29,812 jobs through the third quarter of 2019. Manufacturing accounted for 13.1 percent of total employment in the region, making it the second largest industry behind health care and social assistance (38,958 jobs) and having slightly more jobs than retail trade (28,189 jobs).

These manufacturers provided about \$370 million in total payroll in the third quarter of 2019, making it the second largest industry in terms of payroll as well. Average annual manufacturing wages in Northwest Minnesota were \$49,504 in 2019, which was over \$8,000 and 20.4 percent higher than the total of all industries (see Table 1).

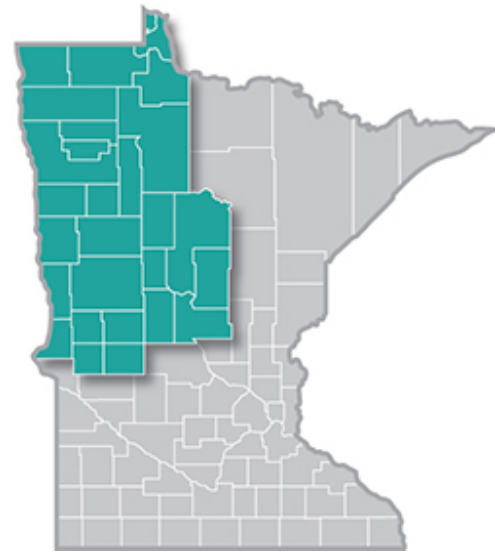


Table 1. Northwest Minnesota Manufacturing Industry Employment Statistics, Quarter 3 2019

NAICS Code	NAICS Industry Title	Number of Firms, Q3 2019	Number of Jobs, Q3 2019	Quarterly Payroll, Q3 2019	Avg. Annual Wages, Q3 2019
0	Total, All Industries	17,277	227,095	\$2,337,305,374	\$41,132
31	Manufacturing	830	29,812	\$369,145,034	\$49,504
311	Food Manufacturing	88	5,956	\$75,949,960	\$50,960
336	Transportation Equipment Manufacturing	33	4,414	\$57,519,181	\$52,104
332	Fabricated Metal Product Manufacturing	162	4,166	\$49,633,510	\$47,632
333	Machinery Manufacturing	98	3,977	\$54,623,903	\$54,912
321	Wood Product Manufacturing	72	3,467	\$42,646,778	\$49,192
323	Printing & Related Support Activities	52	1,297	\$11,039,749	\$34,008
327	Nonmetallic Mineral Product Manufacturing	54	1,082	\$16,402,154	\$60,632
334	Computer & Electronic Product Manufacturing	19	948	\$13,433,389	\$56,680
326	Plastics & Rubber Products Manufacturing	29	931	\$9,959,819	\$42,744
339	Miscellaneous Manufacturing	88	838	\$8,566,940	\$40,872
331	Primary Metal Manufacturing	6	641	\$8,239,111	\$51,376
337	Furniture & Related Product Manufacturing	60	642	\$7,020,487	\$43,732
314	Textile Product Mills	18	374	\$2,990,497	\$31,980
325	Chemical Manufacturing	12	394	\$5,333,834	\$54,132
312	Beverage & Tobacco Product Manufacturing	20	299	\$1,747,181	\$23,348
335	Electrical Equipment, Appliance Manufacturing	5	137	\$1,564,966	\$45,656
324	Petroleum and Coal Products Manufacturing	3	14	\$193,951	\$55,380

Source: DEED [Quarterly Census of Employment & Wages \(QCEW\)](#) program

Food Manufacturing was easily the largest sector in Northwest Minnesota, with 5,956 jobs at 88 establishments, and just under \$76 million in quarterly payroll. The largest subsectors in Food Manufacturing include Animal Slaughtering and Processing (2,210 jobs), Sugar and Confectionary Product Manufacturing (1,080 jobs), and Other Food Manufacturing (783 jobs). The Northwest region also had notable employment in Fruit and Vegetable Preserving and Specialty Food Manufacturing, Animal Food Manufacturing, and Dairy Product Manufacturing.

The second largest – but most well-known – manufacturing sector in the region is Transportation Equipment Manufacturing, which had 4,414 jobs at 33 establishments through the third quarter of 2019. Jobs in the sector were five times more concentrated in Northwest Minnesota than the rest of the state, with the region providing nearly 40 percent of statewide employment in the sector.

Combined, those two sectors accounted for over one-third (34.7 percent) of the region’s manufacturing jobs. Northwest Minnesota also had notable numbers of jobs in Fabricated Metal Product Manufacturing (4,166 jobs); Machinery Manufacturing (3,977 jobs), and Wood Product Manufacturing (3,467 jobs), which was also more than three times more concentrated in the region than the rest of the state. Those three sectors also combined for more than one-third (38.9 percent) of total manufacturing employment in the region.

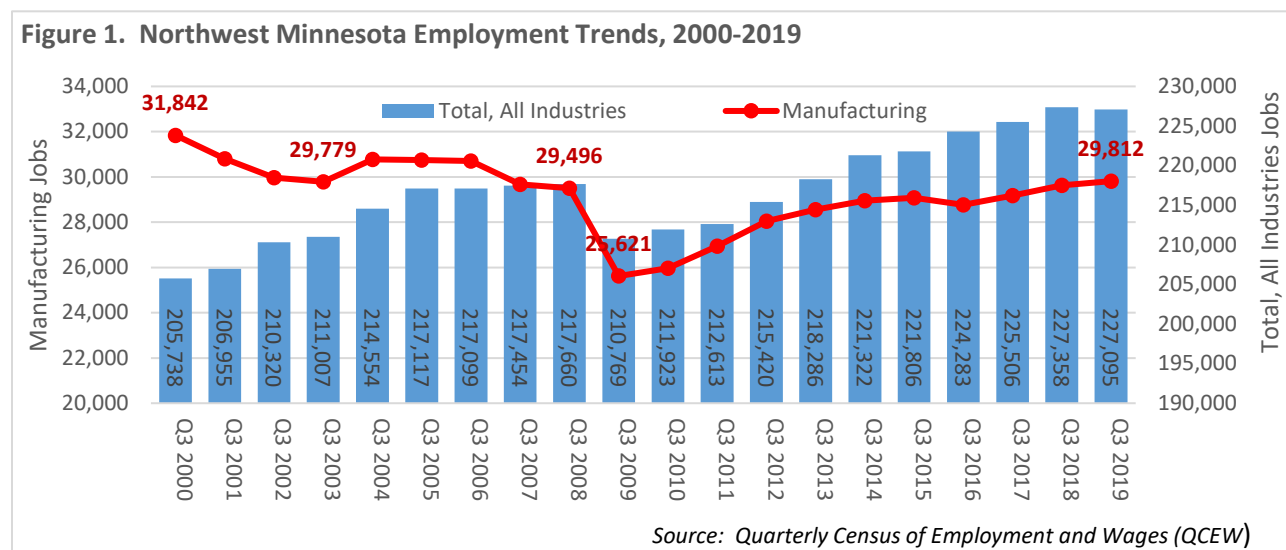
Northwest Minnesota also has smaller employment numbers in the Printing and Related Support Activities (1,297 jobs), Nonmetallic Mineral Product Manufacturing (1,082 jobs), Computer and Electronic Product Manufacturing (948 jobs), Plastics and Rubber Product Manufacturing (931 jobs), Miscellaneous Manufacturing (838 jobs), Furniture and Related Product Manufacturing (642 jobs), and Primary Metal Manufacturing (641 jobs) sectors. The region also has a small number, but a relatively high concentration, of employment in the Textile Product Mills sector (374 jobs).

Average annual wages in manufacturing (\$49,504) were 20.4 percent higher than the total of all industries (\$41,132), led by high average annual wages in Nonmetallic Mineral Product Manufacturing (\$60,632), Computer and Electronic Product Manufacturing (\$56,680), Machinery Manufacturing (\$54,912), Chemical Manufacturing (\$54,132), and Transportation Equipment Manufacturing (\$52,104).

Industry Trends

Manufacturers in Northwest Minnesota cut about 2,000 jobs during the 2001 recession, then enjoyed a slight recovery, and mostly held steady from 2003 to 2008. The region’s manufacturers suffered even more significant job losses during the recession from 2008 to 2010, dropping nearly 4,000 jobs in one year, to a low of 25,621 jobs through the third quarter of 2009. However, manufacturers in the region have again enjoyed a slow but steady recovery, regaining about 4,200 net new jobs over that time period, recently recovering all jobs that were lost in the recession (see Figure 1).

Since the end of the recession, manufacturers in Northwest Minnesota now have approximately 4,200 more jobs than ten years ago, in 2009. Manufacturing employment was up 16.4 percent from 2009 to



2019, while the total of all industries surpassed its pre-recession peak in 2013 and is now up about 16,300 jobs since 2009, a 7.7 percent increase in jobs.

In sum, 13 of the 16 manufacturing sectors had more jobs in 2019 than in 2009, including ten that increased more than 20 percent of their employment. The largest job gains occurred in Machinery Manufacturing, which added 1,249 jobs, based on expansions in Material Handling Equipment Manufacturing and Packaging Machinery Manufacturing. The other large growth was in Fabricated Metal Product Manufacturing, which expanded by 947 jobs. Northwest Minnesota also saw important job gains in Food Manufacturing, Transportation Equipment Manufacturing, Nonmetallic Mineral Product Manufacturing, Plastics and Rubber Products Manufacturing, and Computer and Electronic Product Manufacturing.

The biggest job declines in the past decade occurred in Wood Product Manufacturing, which sliced 475 jobs from 2009 to 2019, 12 percent of its previous employment level. The losses were heaviest in Other Wood Product Manufacturing, which cut over 450 jobs from 2009 to 2019. The other large decline in the region occurred in the Furniture and Related Product Manufacturing sector, which eliminated 287 jobs over the last 10 years.

Encouragingly, 12 of the 16 sectors added jobs since the third quarter of 2014, while only 7 of the 16 sectors gained jobs in the past year. Like the ten-year trends, the most notable recoveries in the past five years occurred in Machinery Manufacturing, Food Manufacturing and Miscellaneous Manufacturing. The Beverage & Tobacco Product Manufacturing sector saw notable growth as well, adding nearly 200 jobs in the past 5 years, a nearly 200 percent increase (see Table 2).

Table 2. Northwest Minnesota Manufacturing Industry Trends, 2009-2019

NAICS Industry Title	Number of Jobs, Q3 2019	1-Year Trend, Q3 2018-Q3 2019		5-Year Trend, Q3 2014-Q3 2019		10-Year Trend, Q3 2009-Q3 2019	
		Numeric Change	Percent Change	Numeric Change	Percent Change	Numeric Change	Percent Change
Total, All Industries	227,095	-263	-0.1%	+5,773	+2.6%	+16,326	+7.7%
Manufacturing	29,812	+186	+0.6%	+863	+3.0%	+4,191	+16.4%
Food Manufacturing	5,956	-26	-0.4%	+252	+4.4%	+769	+14.8%
Transportation Equipment Mfg.	4,414	+275	+6.6%	-530	-10.7%	+497	+12.7%
Fabricated Metal Product Mfg.	4,166	+69	+1.7%	+28	+0.7%	+947	+29.4%
Machinery Manufacturing	3,977	+65	+1.7%	+605	+17.9%	+1,249	+45.8%
Wood Product Manufacturing	3,467	-114	-3.2%	-135	-3.7%	-475	-12.0%
Printing & Related Support Activities	1,297	-30	-2.3%	-92	-6.6%	-75	-5.5%
Nonmetallic Mineral Product Mfg.	1,082	-33	-3.0%	+82	+8.2%	+287	+36.1%
Computer & Electronic Product Mfg.	948	-9	-0.9%	+11	+1.2%	+263	+38.4%
Plastics & Rubber Products Mfg.	931	-3	-0.3%	+45	+5.1%	+266	+40.0%
Miscellaneous Manufacturing	838	+19	+2.3%	+264	+46.0%	+235	+39.0%
Primary Metal Manufacturing	641	-14	-2.1%	-46	-6.7%	+140	+27.9%
Furniture & Related Product Mfg.	642	-17	-2.6%	+32	+5.2%	-287	-30.9%
Chemical Manufacturing	394	-15	-3.7%	+131	+49.8%	+171	+76.7%
Beverage & Tobacco Product Mfg.	299	+42	+16.3%	+197	+193.1%	+225	+304.1%
Electric Equipment Manufacturing	137	+11	+8.7%	NA	NA	+98	+251.3%

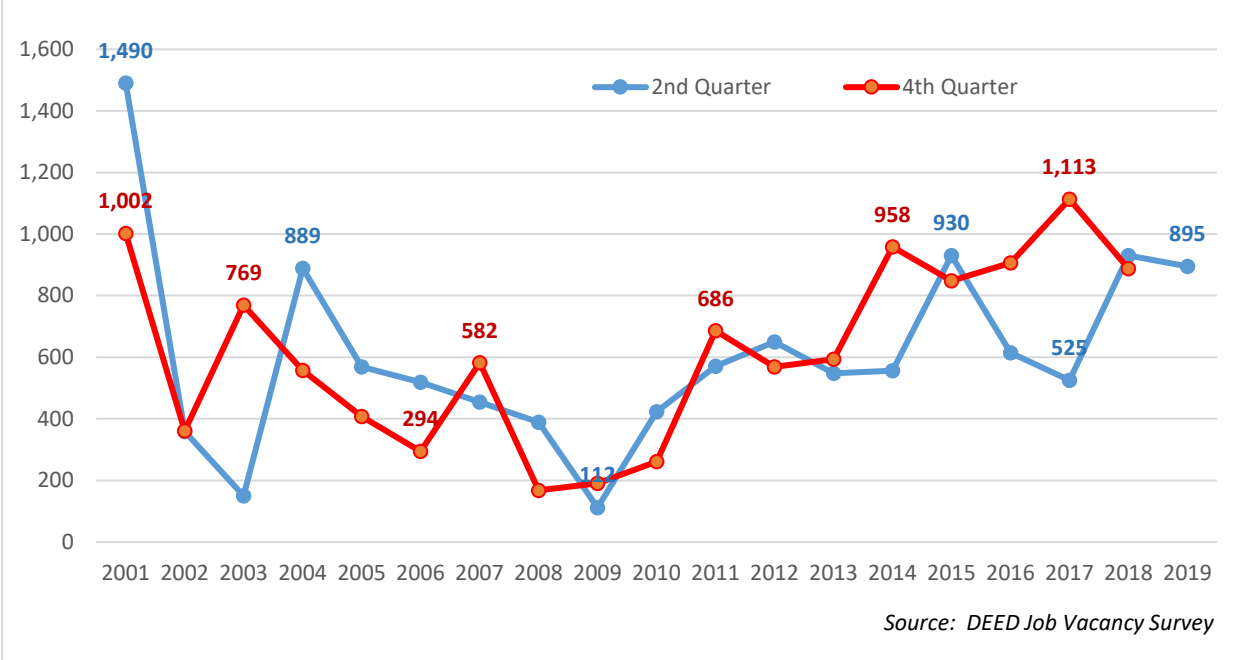
Source: DEED [Quarterly Census of Employment & Wages \(QCEW\)](#) program



Industry Demand

The steady recovery in manufacturing employment in recent years has led to a steadily increasing number of [job vacancies](#) across the Northwest Minnesota region as well, with demand reaching levels not seen since the early 2000s. The 895 job vacancies reported by manufacturing employers in the second quarter of 2019 was the eighth highest number posted since 2001, and was more than five times more openings than the 168 vacancies posted in 2008, at the start of the recession (see Figure 2).

Figure 2. Northwest Minnesota Manufacturing Job Vacancies, 2001-2019



The median wage offered for these vacancies held steady at about \$16.73 per hour in the second quarter of 2019 and 40 percent of the manufacturing vacancies required at least 1 year of experience or postsecondary education, similar past years. Only 1 percent of posted manufacturing openings were part-time, as compared to 45 percent of vacancies across all industries (see Table 3).

Table 3. Northwest Minnesota Manufacturing Job Vacancy Survey, 2nd Quarter 2019

NAICS Industry Title	Number of Job Vacancies	Median Wage Offer	Percent Part-time	Percent Requiring Postsecondary Education	Percent Requiring 1+ Years Work Experience
Total, All Industries	13,020	\$14.28	42%	21%	30%
Manufacturing	895	\$16.73	1%	19%	40%

Source: DEED [Job Vacancy Survey](#)

The largest number of manufacturing vacancies were for transportation and material moving occupations with 998 vacancies with a median wage offer of \$15.84. Next was production occupations, including metal and plastic workers, food processing workers, assemblers and fabricators, supervisors of production workers, textile and furnishing workers, and other production occupations. The median wage offer for these positions was \$14.17 but ranged between \$11 and \$24 per hour. Manufacturers in Northwest Minnesota were also looking to hire sales and office, installation, maintenance, and repair workers, management, and engineering occupations (see Table 4).

Table 4. Northwest Minnesota Production Occupations Job Vacancy Survey, 2nd Quarter 2019

SOC Occupational Title	Number of Job Vacancies	Median Wage Offer	Percent Part-time	Percent Requiring Postsecondary Education	Percent Requiring 1+ Years Work Experience
Total, All Occupations	13,020	\$14.28	42%	21%	30%
Production Occupations	642	\$14.17	5%	9%	25%
Supervisors of Production Workers	14	\$24.06	18%	8%	73%
Assemblers & Fabricators	39	\$13.57	0%	8%	32%
Food Processing Workers	111	\$13.35	17%	0%	14%
Metal Workers & Plastics Workers	231	\$15.22	0%	18%	25%
Textile, Apparel, & Furnishing Workers	19	\$11.71	N/A	N/A	N/A
Other Production Occupations	135	\$14.26	2%	4%	37%
Office & Administrative Support	533	\$14.22	53%	20%	38%
Transportation & Material Moving	998	\$15.84	24%	3%	30%
Architecture & Engineering	155	\$23.99	1%	90%	66%
Management	197	\$28.69	1%	71%	78%
Installation, Maintenance, & Repair	289	\$19.44	8%	28%	62%
Sales & Related	1,831	\$12.85	55%	3%	18%

Source: DEED [Job Vacancy Survey](#)

Industry Occupational Employment

DEED's Occupational Employment Statistics (OES) program provides detailed employment and wage data for a wide range of occupations involved in manufacturing. In sum, there were an estimated 25,080 people working in production occupations in Northwest Minnesota, accounting for about 11.2 percent of total employment in the region. Median hourly wages for production occupations were \$17.85 in 2019 but ranged from \$12.17 at the low end to \$28.03 at the high end.

As noted above, in addition to production occupations, manufacturers also required the services of workers in several other occupational groups, such as office and administrative support, transportation and material moving, architecture and engineering, management, and installation, maintenance and repair. Not surprisingly, wages were higher for the higher-level positions (see Table 5).

Table 5. Northwest Minnesota Occupational Employment & Wage Statistics, 2019

SOC Occupational Title	Estimated Regional Employment	Regional Median Hourly Wage	Estimated Statewide Employment	Statewide Median Hourly Wage
Total, All Occupations	223,830	\$18.09	2,867,700	\$20.95
Production Occupations	25,080	\$17.85	214,230	\$18.68
Office & Administrative Support	30,320	\$17.29	405,970	\$19.10
Transportation & Material Moving	12,960	\$18.04	177,580	\$18.48
Architecture & Engineering	3,810	\$30.39	56,070	\$37.53
Management	10,210	\$40.67	171,250	\$51.26
Installation, Maintenance, & Repair	8,340	\$21.28	100,030	\$23.13
Sales & Related	19,880	\$13.12	277,070	\$14.97
Business & Financial Operations	7,620	\$27.77	164,510	\$33.03
Computer & Mathematical	3,250	\$31.64	96,020	\$40.96

Source: DEED [Occupational Employment Statistics \(OES\)](#) program

Team assemblers, first-line supervisors, machinists, and more are the most common jobs found at manufacturing firms in Minnesota, according to DEED's Occupational Staffing Matrix data. Median hourly wages for these manufacturing positions ranged from a low of less than \$11 per hour for food processing workers to a high of \$28 per hour for first-line supervisors of production and operating workers. Almost all the production-related manufacturing occupations can be gained with a high school diploma and learned through on-the-job training, though some also benefit from vocational training or associate degrees (see Table 6).

Table 6. Northwest Minnesota Top 30 Production-related Manufacturing Operations, 2019 Wage Data			
SOC Code	SOC Occupational Title	Estimated Regional Employment	Median Hourly Wage
512092	Team & All Other Assemblers	5,200	\$17.24
511011	First-Line Supervisors of Production & Operating Workers	1,590	\$28.03
514041	Machinists	1,440	\$20.18
513023	Slaughterers & Meat Packers	510	\$13.97
519111	Packaging & Filling Machine Operators & Tenders	1,240	\$16.71
514121	Welders, Cutters, Solderers, & Brazers	1,860	\$20.05
519061	Inspectors, Testers, Sorters, Samplers, & Weighers	1,140	\$19.67
537062	Laborers & Freight, Stock, & Material Movers, Hand	3,100	\$15.36
514031	Cutting, Punching, & Press Machine Setters, Metal/Plastic	820	\$18.60
515112	Printing Press Operators	390	\$18.43
499041	Industrial Machinery Mechanics	660	\$22.44
512028	Electrical & Electronic Equipment Assemblers	520	\$17.14
519198	Helpers--Production Workers	490	\$15.21
514011	Computer-Controlled Machine Tool Operators, Metal/Plastic	630	\$17.90
537051	Industrial Truck & Tractor Operators	580	\$19.05
519199	Production Workers, All Other	160	\$17.68
499071	Maintenance & Repair Workers, General	2,350	\$19.02
537064	Packers & Packagers, Hand	530	\$12.73
513099	All other food processing workers	240	\$14.37
514072	Molding, Coremaking & Casting Machine Setters & Operators	380	\$16.54
533032	Truck Drivers, Heavy & Tractor-Trailer	3,130	\$20.87
512028	Electromechanical Equipment Assemblers	520	\$17.14
519121	Coating, Painting, & Spraying Machine Setters & Operators	430	\$18.60
513092	Food Batchmakers	370	\$15.13
519196	Paper Goods Machine Setters, Operators, & Tenders	#N/A	\$20.79
515113	Print Binding & Finishing Workers	130	\$16.36
517011	Cabinetmakers & Bench Carpenters	310	\$18.10
519032	Cutting & Slicing Machine Setters, Operators, & Tenders	340	\$18.84
514111	Tool & Die Makers	210	\$27.79

Source: DEED [Occupational Employment Statistics \(OES\)](#) program

In addition to the production-related occupations, manufacturers also rely heavily on sales and office workers including manufacturing sales representatives, customer service representatives, and production, planning, shipping, and traffic clerks; transportation and material moving workers such as truck drivers and packers and packagers; engineering occupations like industrial, mechanical, and electrical engineers; management positions such as industrial production and general managers; and business and financial operations occupations like accountants and auditors.

Many of these occupations require higher education, but also offer higher wages. For example, all the engineering positions have median wages above \$34 per hour in Northwest Minnesota, with median wages topping \$55 per hour for engineering managers, but also require bachelor's degrees at the minimum. Likewise, software developers, industrial production managers, and general and operations managers all earn well over \$30 per hour, and all require bachelor's degrees. In contrast, sales representatives required just a high school diploma, but also offered relatively high wages (see Table 7).

Table 7. Northwest Minnesota Top 20 Office-related Manufacturing Occupations, 2019 Wage Data

SOC Code	SOC Occupational Title	Estimated Regional Employment	Median Hourly Wage
414012	Sales Representatives, Manufacturing, exc. Technical Products	2,050	\$25.48
434051	Customer Service Representatives	2,980	\$16.77
172112	Industrial Engineers	520	\$37.52
111021	General & Operations Managers	2,390	\$35.96
435071	Shipping, Receiving, & Traffic Clerks	1,100	\$18.15
113051	Industrial Production Managers	370	\$42.59
172141	Mechanical Engineers	650	\$34.47
433031	Bookkeeping, Accounting, & Auditing Clerks	2,720	\$19.05
173026	Industrial Engineering Technicians	300	\$24.52
131023	Purchasing Agents, exc. Wholesale, Retail & Farm Products	750	\$29.11
439061	Office Clerks, General	4,200	\$16.98
414011	Sales Representatives, Manufacturing, Technical Products	#N/A	\$55.36
435061	Production, Planning, & Expediting Clerks	400	\$21.93
132011	Accountants & Auditors	1,260	\$28.03
435081	Stock Clerks & Order Fillers	2,870	\$12.41
119041	Engineering Managers	210	\$55.28
172071	Electrical Engineers	190	\$38.21
151133	Software Developers, Systems Software	120	\$44.86
151132	Software Developers, Applications	330	\$39.42
173023	Electrical & Electronic Engineering Technicians	190	\$24.46

Source: DEED [Occupational Employment Statistics \(OES\)](#) program

Industry Outlook

According to DEED's 2016 to 2026 Employment Outlook data, the Northwest Minnesota manufacturing industry is projected to gain 1,885 jobs over the next decade, a 6.6 percent increase. This is greater than the overall growth of 4.2 percent across the total of all industries in Northwest Minnesota, and contrasts with the state of Minnesota as a whole, which is projected to lose about 5,400 manufacturing jobs from 2016 to 2026, a 1.7 percent decline.

Thirteen of the 17 manufacturing sectors are expected to add jobs, led by continued strong growth in Machinery Manufacturing, which is projected to gain 1,221 net new jobs, a 33.2 percent expansion. The region may also see job growth in Fabricated Metal Manufacturing, Miscellaneous Manufacturing, Food Manufacturing, and Plastics and Rubber Products Manufacturing.

In contrast, four of the 17 sectors are expected to see job declines in the next decade, with the most severe losses projected in Transportation Equipment Manufacturing, Wood Product Manufacturing, Furniture and Related Product Manufacturing, and Apparel Manufacturing. Those four sectors are expected to lose almost 600 jobs combined (see Table 8).

Table 8. Northwest Minnesota Manufacturing Industry Projections, 2016-2026

NAICS Code	Industry	Estimated Employment 2016	Projected Employment 2026	Percent Change 2016-2026	Numeric Change 2016-2026
0	Total, All Industries	262,786	273,747	+4.2%	+10,961
31	Manufacturing	28,471	30,356	+6.6%	+1,885
311	Food Manufacturing	5,752	5,932	+3.1%	+180
332	Fabricated Metal Product Mfg.	3,902	4,270	+9.4%	+368
336	Transportation Equipment Mfg.	4,250	3,992	-6.1%	-258
333	Machinery Manufacturing	3,682	4,903	+33.2%	+1,221
321	Wood Product Manufacturing	3,445	3,245	-5.8%	-200
323	Printing & Related Support Activities	1,359	1,379	+1.5%	+20
326	Plastics & Rubber Products Mfg.	875	1,043	+19.2%	+168
327	Nonmetallic Mineral Product Mfg.	983	963	-2.0%	-20
334	Computer & Electronic Product Mfg.	884	888	+0.5%	+4
331	Primary Metal Manufacturing	719	872	+21.3%	+153
337	Furniture & Related Product Mfg.	585	491	-16.1%	-94
339	Miscellaneous Manufacturing	860	1,128	+31.2%	+268
314	Textile Product Mills	435	448	+3.0%	+13
325	Chemical Manufacturing	341	389	+14.1%	+48
322	Paper Manufacturing	131	140	+6.9%	+9
312	Beverage & Tobacco Product Mfg.	125	159	+27.2%	+34
315	Apparel Manufacturing	18	7	-61.1%	-11

Source: DEED [Employment Outlook](#)

Occupational Outlook

The projected job gains in the manufacturing industry are expected to carry over into production occupations as well, leading to a projected 6.1 percent increase from 2016 to 2026 in Northwest Minnesota. Also, the region is expected to have significant demand for production workers over the next ten years due to many labor force exit openings – jobs that become available because the existing worker retires out of the labor force. There may be as many as 9,000 total openings for production occupations in the region due to these retirements and exit openings.

Overall, 38 of the 57 production occupations are expected to see new job growth from 2016 to 2026, led by Machinists; Welders, Cutters, Solderers, and Brazers; Helpers – Production Workers, and Butchers and Meat Cutters, which are all expected to grow by about 15 percent. In addition to those occupations, Team Assemblers and First-line Supervisors of Production Workers are expected to gain more than 100 net new jobs during the time frame as well.

In contrast, the biggest declines are projected for Cabinetmakers and Bench Carpenters, Inspectors, Testers, Sorters, Samplers, and Weighers, Bakers, and Cutting and Slicing Machine Setters and Operators. Sixteen of the 57 production occupations are expected to lose jobs.

Regardless of growth or decline, every occupation is expected to at least have some openings from 2016 to 2026. The largest number of total openings are projected for Team Assemblers, Machinists, and Welders, Cutters, Solderers, and Brazers. First Line Supervisors of Production Workers; Cutting, Punching, and Press Machine Setters; and Packaging and Filling Machine Operators will also remain in high demand over the next decade due to new hires and labor force exit openings (see Table 9).

Table 9. Top 25 Northwest Minnesota Production Occupation Projections, 2016-2026

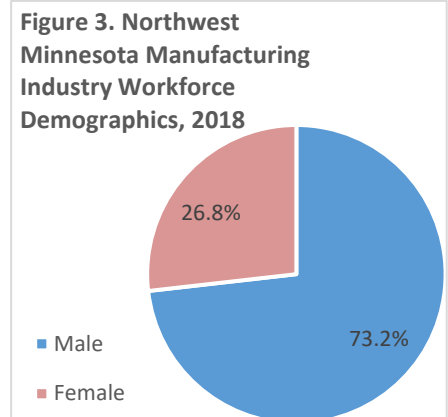
SOC Code	SOC Occupational Title	Estimated Employment 2016	Projected Employment 2026	Percent Change 2016-2026	Numeric Change 2016-2026	* Labor Force Exit Openings 2016-2026
0	Total, All Occupations	262,786	273,747	+4.2%	+10,961	+130,759
510000	Production Occupations	21,624	22,952	+6.1%	+1,328	+8,926
512092	Team Assemblers	3,807	3,949	+3.7%	+142	+1,656
514041	Machinists	1,419	1,647	+16.1%	+228	+532
514121	Welders, Cutters, Solderers, & Brazers	1,272	1,472	+15.7%	+200	+365
512099	Assemblers & Fabricators, All Other	381	373	-2.1%	-8	+161
511011	First-Line Supervisors of Production Workers	1,113	1,213	+9.0%	+100	+371
514031	Cutting, Punching, & Press Machine Setters	899	958	+6.6%	+59	+336
519111	Packaging & Filling Machine Operators	1,031	1,119	+8.5%	+88	+508
514011	Computer-Controlled Machine Tool Operators	349	394	+12.9%	+45	+103
519198	Helpers--Production Workers	842	966	+14.7%	+124	+485
518031	Water/Wastewater Treatment Plant & System	453	450	-0.7%	-3	+129
519061	Inspectors, Testers, Sorters & Weighers	776	753	-3.0%	-23	+318
519199	Production Workers, All Other	335	373	+11.3%	+38	+139
512022	Electrical & Electronic Equipment Assemblers	110	98	-10.9%	-12	+53
516011	Laundry & Dry-Cleaning Workers	327	319	-2.4%	-8	+216
513099	Food Processing Workers, All Other	197	209	+6.1%	+12	+87
513021	Butchers & Meat Cutters	199	232	+16.6%	+33	+97
513011	Bakers	210	187	-11.0%	-23	+127
517011	Cabinetmakers & Bench Carpenters	209	172	-17.7%	-37	+89
515112	Printing Press Operators	374	381	+1.9%	+7	+147
519121	Coating, Painting, & Spraying Machine Setters	333	379	+13.8%	+46	+102
516031	Sewing Machine Operators	362	377	+4.1%	+15	+210
514072	Molding, Coremaking & Casting Machine Setters	289	304	+5.2%	+15	+109
519023	Mixing & Blending Machine Setters & Operators	124	126	+1.6%	+2	+45
517041	Sawing Machine Setters & Operators	260	244	-6.2%	-16	+102
514111	Tool and Die Makers	193	211	+9.3%	+18	+79

* Labor Force Exit Openings are the projected number of workers leaving an occupation and exiting the labor market entirely (most labor force exits are related to workers retiring)

Source: DEED [Employment Outlook](#)

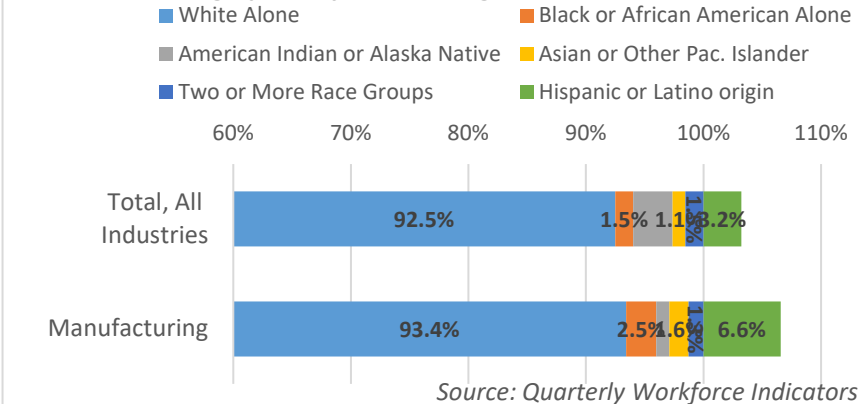
Data from DEED's Quarterly Employment Demographics (QED) program shows that the manufacturing workforce in the Northwest region is relatively non-diverse. Through 2018, nearly three-quarters (73.2%) of manufacturing workers are male, compared to 26.8 percent that are female (see Figure 3). In comparison, the workforce is much more evenly split between genders across the total of all industries, with about 52.5 percent of workers in the region being female, and the other 47.5 percent being male.

Additional demographic data from the U.S. Census Bureau's Quarterly Workforce Indicators (QWI) program show that the manufacturing workforce is also not very racially diverse. More than 93 percent of manufacturing workers in the region were white alone, while just 2.5 percent were Black or African American. In addition, 6.6 percent were Hispanic or Latino origin, making it the largest minority group of workers in the industry (see Figure 4 – *please note that the numbers add up to more than 100% because Hispanic or Latino is an ethnicity rather than a race*).



Despite the low numbers, the manufacturing workforce is becoming more diverse. The number of workers identifying as white alone declined by 5 percent from 2003 to 2018, compared to a 70 percent increase in the number of jobholders of other race groups. The number of Hispanic or Latino workers in manufacturing jumped by 165 percent from 2003 to 2018.

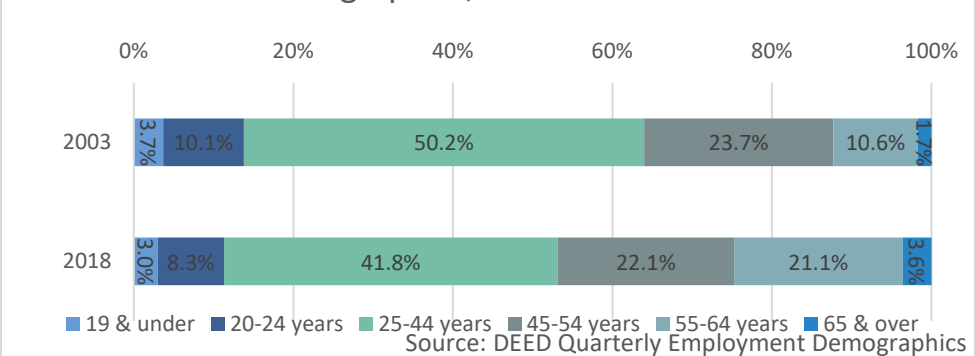
Figure 4. Northwest Minnesota Manufacturing Industry Workforce Demographics by Race or Origin, 2018



As the workforce in Northwest Minnesota ages, new graduates and other jobseekers will become increasingly important sources of workers, particularly for the manufacturing industry, which is exhibiting a trend toward a larger percentage of older workers. QED data shows that in 2018, 24.7 percent of workers were 55 years of age or older, more than double the share in 2003. In contrast, the share of workers under the age of 25 fell from 13.8 percent in 2003 to 11.3 percent in 2018. The proportion of workers aged 25 to 44 years old also dropped, from 50.2 to 41.8 percent (see Figure 5).

In the face of tight labor markets, manufacturers may need to tap into new labor pools in order to attract the talent they need to grow and replace existing workers in the future.

Figure 5. Northwest Minnesota Manufacturing Workforce Demographics, 2003-2018



Northeast Minnesota – Manufacturing Overview

According to DEED's [Quarterly Census of Employment and Wages](#) (QCEW) data, the 7-county Northeast Minnesota region was home to 346 manufacturing establishments providing 8,906 jobs through the third quarter of 2019. That was just 2.7% of total manufacturing employment in the state, easily the smallest concentration of the 6 regions in the state. Manufacturing accounted for 6.2% of total employment within the region, making it the sixth largest industry behind health care and social assistance (34,612 jobs), retail trade (17,172 jobs), accommodation and food services (16,542 jobs), public administration (11,559 jobs), and educational services (9,751 jobs).

Manufacturing firms provided about \$133 million in payroll, about 8.0% of total payroll in the third quarter of 2019, making it the third largest industry payroll in the region. Average weekly wages in manufacturing were \$1,153 in 2019, which was 29.8% higher than the average wage for all industries.

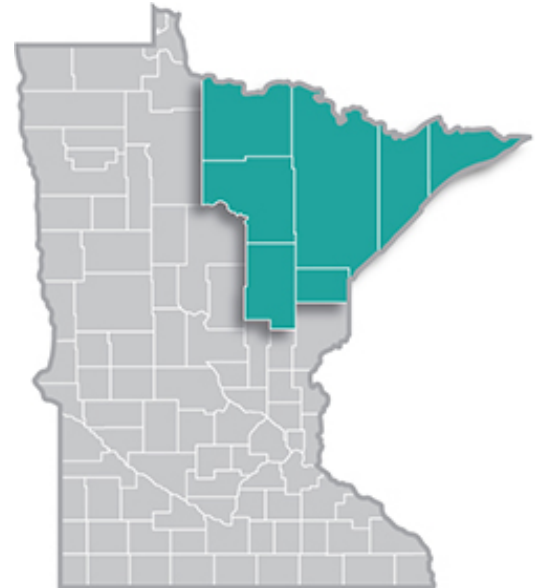


Table 1. Northeast Minnesota Manufacturing Industry Employment Statistics, Quarter 3 2019

NAICS Code	NAICS Industry Title	Number of Firms, Q3 2019	Number of Jobs, Q3 2019	Quarterly Payroll, Q3 2019	Avg. Weekly Wages, Q3 2019
0	Total, All Industries	8,914	144,664	\$1,670,039,423	\$888
31	Manufacturing	346	8,906	\$133,514,361	\$1,153
322	Paper Manufacturing	7	1,664	\$36,327,306	\$1,679
333	Machinery Manufacturing	25	1,474	\$23,172,296	\$1,209
336	Transportation Equipment Manufacturing	17	1,007	\$14,631,850	\$1,117
332	Fabricated Metal Product Manufacturing	55	785	\$10,231,579	\$1,002
321	Wood Product Manufacturing	32	586	\$8,027,950	\$1,053
327	Nonmetallic Mineral Product Manufacturing	20	578	\$10,334,669	\$1,375
334	Computer & Electronic Product Mfg.	12	417	\$5,314,806	\$980
326	Plastics and Rubber Products Manufacturing	16	362	\$3,541,426	\$752
311	Food Manufacturing	23	311	\$3,538,427	\$875
312	Beverage & Tobacco Product Manufacturing	13	297	\$2,231,136	\$577
314	Textile Product Mills	15	232	\$1,870,363	\$620
323	Printing and Related Support Activities	26	213	\$1,706,435	\$616
325	Chemical Manufacturing	9	211	\$4,051,715	\$1,477
339	Miscellaneous Manufacturing	41	191	\$1,806,487	\$727
315	Apparel Manufacturing	5	156	\$1,001,466	\$493
337	Furniture & Related Product Manufacturing	17	96	\$1,059,113	\$848

Source: DEED [Quarterly Census of Employment & Wages \(QCEW\)](#) program

In 2019, Paper Manufacturing was the largest sector in Northeast Minnesota, with 1,664 jobs at 7 establishments, followed by Machinery Manufacturing, which had 1,474 jobs. Combined, those two sectors accounted for over one-third (35.2%) of the region's manufacturing employment.

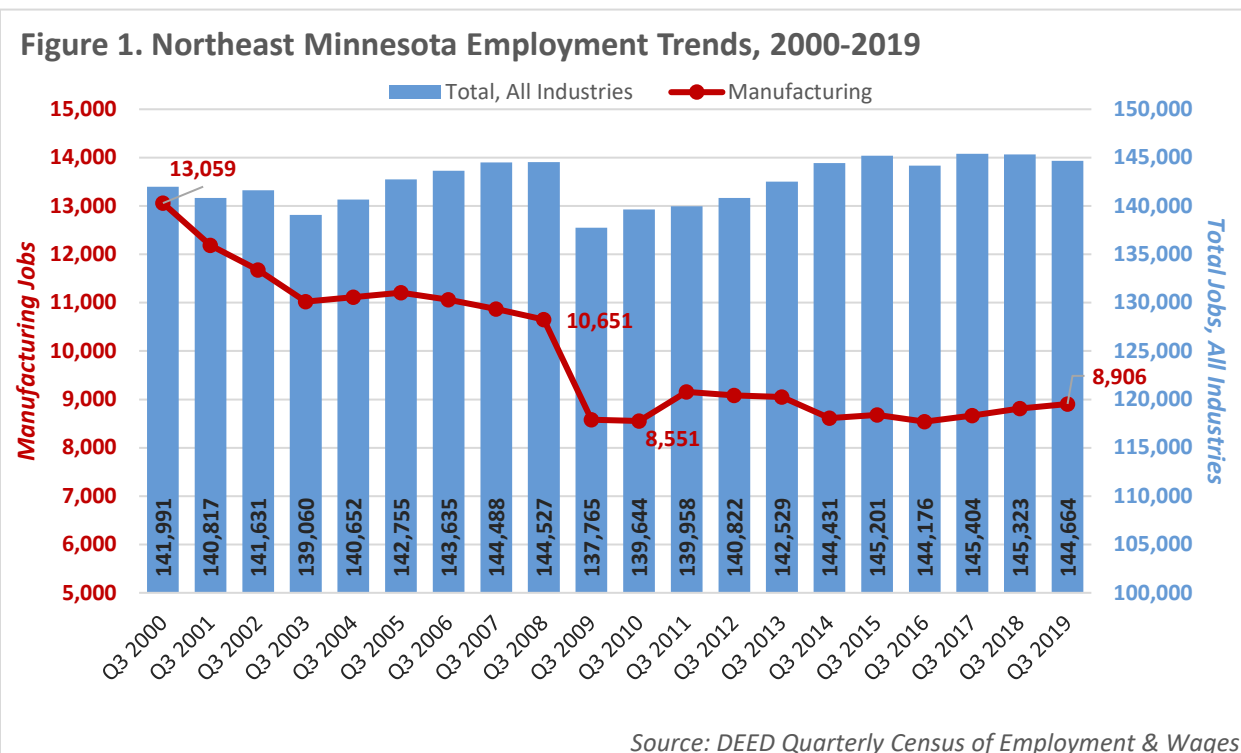
The region also had notable numbers of jobs in Transportation Equipment Manufacturing (1,007 jobs), which includes Motor Vehicle Parts Manufacturing and Ship and Boat Building; Fabricated Metal Product Manufacturing (785 jobs), Wood Product Manufacturing (586 jobs), and Nonmetallic Mineral Product Manufacturing (578 jobs). Those four sectors combined for another one-third (33.2%) of manufacturing employment in the region.

Northeast Minnesota has smaller employment in the Computer and Electronic Product Manufacturing (417 jobs), Plastics and Rubber Product Manufacturing (362 jobs), Food Manufacturing (311 jobs), Beverage and Tobacco Product Manufacturing (297 jobs), Textile Product Mills (232 jobs), Printing and Related Support Activities (213 jobs), and Chemical Manufacturing (211 jobs) sectors.

Average weekly wages in manufacturing (\$1,153) were 29.8% higher than the average weekly wages of all industries (\$888), led by very high average weekly wages in Paper Manufacturing (\$1,679), Chemical Manufacturing (\$1,477), Nonmetallic Mineral Product Manufacturing (\$1,375), Machinery Manufacturing (\$1,209), Transportation Equipment Manufacturing (\$1,117), Wood Product Manufacturing (\$1,053), Fabricated Metal Product Manufacturing (\$1,002), and Computer and Electronic Product manufacturing (\$980).

Industry Trends

Manufacturers in Northeast Minnesota cut huge numbers of jobs during the 2001 recession, losing about 2,000 jobs over the first three years of the decade, then mostly held steady from 2003 to 2008. The region's manufacturers suffered even more significant job losses during the recession from 2008 to 2010, dropping over 2,000 jobs in one year, to a low of 8,551 jobs through the third quarter of 2010. However, since 2010 manufacturing employment in the region again leveled out, gaining 355 net new jobs over that time period. The last three years, from 2016 to the third quarter of 2019, have come with continued modest employment growth (4.3%) in manufacturing (see Figure 1).



Despite the recent stability, manufacturers in Northeast Minnesota still have 1,745 fewer jobs now than before the 2008 recession. From 2005 to 2010, manufacturing employment fell 23.7percent. Since the low point of manufacturing employment in 2010, the industry added 355 jobs, a 4.2percent increase in employment. While the general trend of the past decade was one of slight growth, significant decreases in employment occurred in some sectors.

The biggest job declines in the past decade occurred in Paper Manufacturing, which lost 769 jobs from 2009 to 2019, nearly one third of the sector's previous employment level. The losses were heaviest in Pulp, Paper, and Paperboard Mills, which cut 702 jobs from 2009 to 2019. Wood product Manufacturing also experienced a significant decline in employment, cutting 364 jobs in the past decade. Nonmetallic Mineral Product Manufacturing, Food Manufacturing, Printing and related Support Activities, and Apparel Manufacturing also saw decreases to employment numbers.

Of those sectors in which employment expanded over the past decade, Machinery Manufacturing added the most jobs at 620. A large portion of the gains were in the Other General Purpose Machinery Manufacturing sector, with 420 additional jobs. Transportation Equipment Manufacturing also added 377 jobs. Beverage and Tobacco Product Manufacturing saw experienced the largest relative growth, expanding more than 750 percent from 2009 to 2019.

In sum, 10 of the 16 manufacturing sectors had more jobs in 2019 than in 2009, including four that increased employment by more than 50 percent. At the same time, some traditionally strong sectors such as Paper Manufacturing and Wood Manufacturing continued their long-term trends of employment decline (see Table 2).

Table 2. Northeast Minnesota Manufacturing Industry Trends, 2009-2019

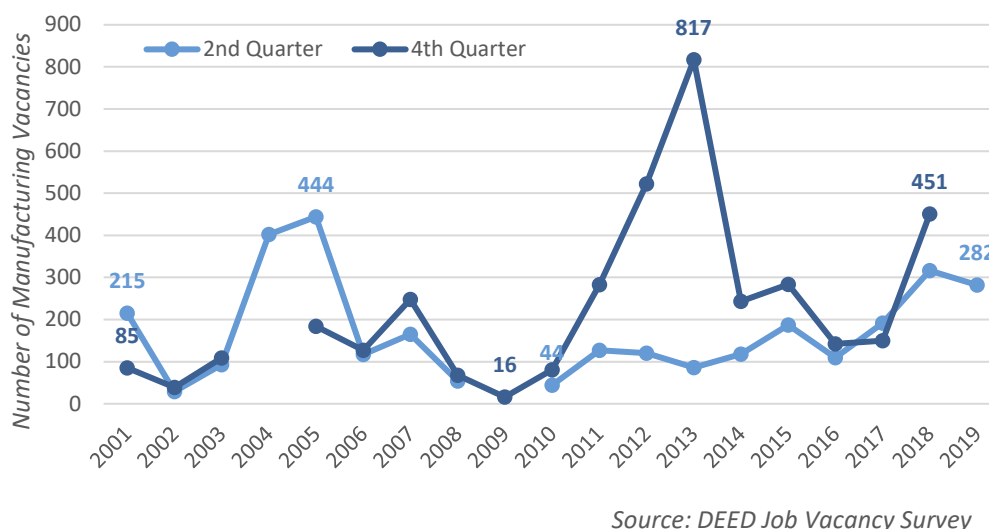
NAICS Industry Title	Number of Jobs, Q3 2019	1-Year Trend, Q3 2018-Q3 2019		5-Year Trend, Q3 2014-Q3 2019		10-Year Trend, Q3 2009-Q3 2019	
		Numeric Change	Percent Change	Numeric Change	Percent Change	Numeric Change	Percent Change
Total, All Industries	144,664	-659	-0.5%	+233	+0.2%	+6,899	+5.0%
Manufacturing	8,906	+95	+1.1%	+296	+3.4%	+327	+3.8%
Paper Manufacturing	1,664	-91	-5.2%	-405	-19.6%	-769	-31.6%
Machinery Manufacturing	1,474	+58	+4.1%	+320	+27.7%	+620	+72.6%
Transportation Equipment Mfg.	1,007	+58	+6.1%	+502	+99.4%	+377	+59.8%
Fabricated Metal Product Mfg.	785	-28	-3.4%	-48	-5.8%	+18	+2.3%
Wood Product Manufacturing	586	-19	-3.1%	-134	-18.6%	-364	-38.3%
Nonmetallic Mineral Product Mfg.	578	-13	-2.2%	-85	-12.8%	-42	-6.8%
Computer & Electronic Product Mfg.	417	+1	+0.2%	+41	+10.9%	+174	+71.6%
Plastics & Rubber Products Mfg.	362	+90	+33.1%	+56	+18.3%	+107	+42.0%
Food Manufacturing	311	-10	-3.1%	+58	+22.9%	-14	-4.3%
Beverage & Tobacco Product Mfg.	297	+33	+12.5%	ND	ND	+263	+773.5%
Textile Product Mills	232	+6	+2.7%	+10	+4.5%	+29	+14.3%
Printing & Related Support Activities	213	+4	+1.9%	+3	+1.4%	-24	-10.1%
Chemical Manufacturing	211	-20	-8.7%	-103	-32.8%	0	0.0%
Miscellaneous Manufacturing	191	+14	+7.9%	+92	+92.9%	+30	+18.6%
Apparel Manufacturing	156	+14	+9.9%	+15	+10.6%	-60	-27.8%
Furniture & Related Product Mfg.	96	ND	ND	ND	ND	+6	+6.7%

Source: DEED [Quarterly Census of Employment & Wages \(QCEW\)](#) program
 Note: Some data are suppressed to prevent identification of individual businesses.

Industry Demand

The recent slight increase in manufacturing employment had a corresponding increase in the number of job vacancies throughout the Northeast region. After a spike in 2013, vacancies declined through 2016 before beginning on a rebound. The 282 vacancies reported in the second quarter of 2019 was down from the 451 reported in the fourth quarter of 2018; however, this number of vacancies is six times the number reported at the beginning of the recovery in the second quarter of 2010 (see Figure 2).

Figure 2. Northeast Manufacturing Job Vacancies, 2001-2019



The median wage offers for vacancies dropped to \$14.93 per hour in the second quarter of 2019, down from \$17.09 in the second quarter of 2018. The 2019 median offering was the lowest reported in a second quarter since 2010. By

comparison, the median wage offer for all industries in the Northeast region was \$1.80 lower at \$13.13 and the statewide Manufacturing wage in the second quarter of 2019 was \$3.25 higher. About half of the Northeast manufacturing vacancies required at least 1 year of experience, 32 percent required postsecondary education, and 6 percent required some form of certificate or license. Twenty percent of the manufacturing openings were part-time, an increase from previous years but less than the 47 percent of vacancies across all industries (see Table 3).

Table 3. Northeast Minnesota Manufacturing Job Vacancy Survey, 2nd Quarter 2019

NAICS Industry Title	Number of Job Vacancies	Median Wage Offer	Percent Part-time	Percent Requiring Postsecondary Education	Percent Requiring 1+ Years Work Experience
Total, All Industries	7,885	\$13.13	47%	23%	39%
Manufacturing	282	\$14.93	20%	32%	49%

Source: DEED [Job Vacancy Survey](#)

The largest number of manufacturing vacancies were in production occupations, assemblers and fabricators, food processing workers, metal and plastic workers, textile, apparel, and furnishing workers, and other production occupations. The median wage offer for these positions was \$14.71 and ranged between \$11 and \$16.67 per hour. Manufacturers in Northeast Minnesota were also looking to hire sales and office, transportation and material moving, engineering, management, and installation, maintenance, and repair workers (see Table 4).

Table 4. Northeast Minnesota Production Occupations Job Vacancy Survey, 2nd Quarter 2019

SOC Occupational Title	Number of Job Vacancies	Median Wage Offer	Percent Part-time	Percent Requiring Postsecondary Education	Percent Requiring 1+ Years Work Experience
Total, All Occupations	7,885	\$13.13	47%	23%	39%
Production Occupations	211	\$14.71	12%	18%	41%
Assemblers and Fabricators	14	\$16.67	0%	34%	69%
Food Processing Workers	13	\$12.27	0%	0%	47%
Metal Workers and Plastic Workers	37	\$11.00	63%	11%	31%
Textile, Apparel, & Furnishings Workers	61	\$14.70	0%	39%	78%
Other Production Occupations	75	\$13.84	3%	3%	7%
Office & Administrative Support	574	\$11.82	47%	3%	33%
Transportation & Material Moving	238	\$15.01	56%	34%	38%
Architecture & Engineering	28	\$31.68	8%	85%	83%
Management	41	\$27.98	0%	81%	97%
Installation, Maintenance, & Repair	246	\$14.88	2%	71%	78%
Sales & Related	1,494	\$10.81	59%	6%	15%

Source: DEED [Job Vacancy Survey](#)

Industry Occupational Employment

DEED's Occupational Employment Statistics (OES) program provides detailed employment and wage data for a wide range of occupations involved in manufacturing. In sum, there were an estimated 7,390 people working in production occupations in Northeast Minnesota, accounting for about 5.1 percent of total employment in the region. Median hourly wages for production occupations were \$21.70 in the first quarter of 2019 but ranged from \$12.36 at the low end in sales and related to \$40.64 at the high end in management occupations.

As noted above, in addition to production occupations, manufacturers also require the services of workers in several other occupational groups, such as office and administrative support, transportation and material moving, architecture and engineering, management, and installation, maintenance and repair. Wages tended to be higher for the occupational groups with more management or technical focuses (see Table 5).

Table 5. Northeast Minnesota Occupational Employment & Wage Statistics, 2019

SOC Occupational Title	Estimated Regional Employment	Regional Median Hourly Wage	Estimated Statewide Employment	Statewide Median Hourly Wage
Total, All Occupations	144,430	\$18.57	2,867,700	\$20.95
Production Occupations	7,390	\$21.70	214,230	\$18.68
Office & Administrative Support	20,430	\$17.20	403,970	\$19.10
Transportation & Material Moving	7,210	\$18.06	177,580	\$18.48
Architecture & Engineering	2,200	\$35.23	56,070	\$37.53
Management	7,270	\$40.64	171,250	\$51.26
Installation, Maintenance, & Repair	6,760	\$22.97	100,030	\$23.13
Sales & Related	13,640	\$12.36	277,070	\$14.97
Business & Financial Operations	5,000	\$28.53	164,510	\$33.03
Computer & Mathematical	1,820	\$32.63	96,020	\$40.96

Source: DEED [Occupational Employment Statistics \(OES\)](#) program

Machinists, first-line supervisors, welders, cutters, solderers, and brazers, and others are the most common jobs found at manufacturing firms in Minnesota, according to DEED's Occupational Staffing Matrix data. Median hourly wages for these manufacturing positions ranged from a low of less than \$11.05 per hour for packers & packagers, hand to a high of \$34.44 per hour for paper goods machine setters, operators, & tenders. Almost all the production-related manufacturing occupations can be entered with a high school diploma and learned through on-the-job training, though some also benefit from vocational training or associate degrees (see Table 6).

Table 6. Northeast Top 30 Production-related Manufacturing Occupations, 2019 Wage Data

SOC Code	SOC Occupational Title	Estimated Regional Employment	Median Hourly Wage
512098	Team & All Other Assemblers	450	\$14.41
511011	First-Line Supervisors of Production Workers	520	\$30.17
514041	Machinists	230	\$22.92
513023	Slaughterers & Meat Packers	N/A	N/A
519111	Packaging & Filling Machine Operators & Tenders	50	\$13.63
514121	Welders, Cutters, Solderers, & Brazers	680	\$23.56
519061	Inspectors, Testers, Sorters, Samplers, & Weighers	350	\$18.37
537062	Laborers & Freight, Stock, & Material Movers	1,290	\$15.77
514031	Cutting, Punching, & Press Machine Setters	60	\$17.98
515112	Printing Press Operators	120	\$19.52
499041	Industrial Machinery Mechanics	570	\$29.32
512028	Electrical & Electro-mechanical Assemblers	100	\$16.96
519198	Helpers--Production Workers	450	\$27.77
514011	Computer-Controlled Machine Tool Operators	20	\$18.49
537051	Industrial Truck & Tractor Operators	210	\$18.46
519199	Production Workers, All Other	210	\$17.32
499071	Maintenance & Repair Workers, General	1,930	\$18.82
537064	Packers & Packagers, Hand	220	\$11.05
513099	All other food processing workers	N/A	N/A
514072	Molding, Coremaking & Casting Machine Setters	80	\$18.15
533032	Truck Drivers, Heavy & Tractor-Trailer	1,720	\$22.20
519121	Coating, Painting, & Spraying Machine Setters	70	\$23.30
513092	Food Batchmakers	50	\$13.25
519196	Paper Goods Machine Setters, Operators	360	\$34.44
515113	Print Binding & Finishing Workers	20	\$21.75
517011	Cabinetmakers & Bench Carpenters	50	\$20.14
519032	Cutting & Slicing Machine Setters, Operators	N/A	N/A
514111	Tool & Die Makers	N/A	N/A
514033	Grinding, Lapping, Buffing Machine Tool Setters	40	\$18.49
514021	Extruding and Drawing Machine Setters,	40	\$17.68

Source: DEED [Occupational Employment Statistics \(OES\)](#) program

In addition to the production-related occupations, manufacturers also rely heavily on sales and office workers including manufacturing sales representatives, customer service representatives, and production, planning, shipping, and traffic clerks; transportation and material moving workers such as truck drivers and packers and packagers; engineering occupations like industrial, mechanical, and electrical engineers; management positions such as industrial production and general managers; and business and financial operations occupations like accountants and auditors.

Many of these occupations require higher education, but also offer higher wages. For example, all the engineering positions have median wages above \$35 per hour in Northeast Minnesota, with median wages topping \$58 per hour for engineering managers, but also require bachelor's degrees at the minimum. Likewise, software developers, industrial production managers, and general and operations managers all earn over \$35 per hour, and all require bachelor's degrees. In contrast, sales representatives required just a high school diploma, but also offered relatively high wages. Some of the largest occupational groups, such as customer service representatives and office clerks, generally pay much lower median wages (see Table 7).

Table 7. Northeast Top 20 Office-related Manufacturing Occupations, 2019 Wage Data

SOC Code	SOC Occupational Title	Estimated Regional Employment	Median Hourly Wage
414012	Sales Representatives, Manufacturing	800	\$28.10
434051	Customer Service Representatives	1,970	\$15.91
172112	Industrial Engineers	210	\$43.59
111021	General & Operations Managers	2,230	\$36.92
435071	Shipping, Receiving, & Traffic Clerks	430	\$16.22
113051	Industrial Production Managers	220	\$45.66
172141	Mechanical Engineers	310	\$35.54
433031	Bookkeeping, Accounting, & Auditing Clerks	1,560	\$17.73
173026	Industrial Engineering Technicians	40	\$24.37
131023	Purchasing Agents, exc. Wholesale, Retail & Farm	N/A	N/A
439061	Office Clerks, General	3,120	\$16.81
414011	Sales Representatives, Manufacturing, Technical	30	\$38.32
435061	Production, Planning, & Expediting Clerks	220	\$26.58
132011	Accountants & Auditors	840	\$29.69
435081	Stock Clerks & Order Fillers	1,540	\$12.38
119041	Engineering Managers	120	\$58.52
172071	Electrical Engineers	N/A	\$43.92
151133	Software Developers, Systems Software	20	\$41.45
151132	Software Developers, Applications	320	\$36.78
173023	Electrical & Electronic Engineering Technicians	N/A	\$35.93

Source: DEED [Occupational Employment Statistics \(OES\)](#) program

Industry Outlook

According to DEED's 2016 to 2026 Employment Outlook data, the Northeast Minnesota manufacturing industry is projected to lose another 748 jobs over the next decade, an 8.8 percent decline. That contrasts with overall growth of 1.1 percent across the total of all industries in Northeast Minnesota but aligns with the direction of the statewide manufacturing trend. The state of Minnesota is projected to lose 5,393 manufacturing jobs from 2016 to 2026, a 1.7 percent decline. Though it is home to about 2.7 percent of total manufacturing employment in the state, the employment projections would mean that Northeast Minnesota would account for almost 14 percent of the state's manufacturing losses over the next decade.

Twelve of the 18 sectors are expected to see job declines in the next decade, with the most severe losses projected in Paper Manufacturing, Wood Product Manufacturing, and Nonmetallic Mineral Product Manufacturing. Those three sectors are expected to lose 803 jobs combined. Seven of the 12 job-cutting sectors are projected to decline more than 20 percent through 2026, with Wood Product Manufacturing (-44.7 percent) and Miscellaneous Manufacturing (-42.6 percent) showing the greatest relative losses.

In contrast, six of the 18 manufacturing sectors are expected to add jobs, led by a huge uptick in Beverage and Tobacco Product Manufacturing, which is projected to gain 193 net new jobs, a 101.6 percent expansion. Employment in Plastics and Rubber Products Manufacturing is projected to have the next largest positive percent change with 20.3 percent. The region may also see job growth in Machinery Manufacturing and Transportation Equipment Manufacturing, which are both projected to expand more than 7 percent (see Table 8).

Table 8. Northeast Minnesota Manufacturing Industry Projections, 2016-2026					
NAICS Code	Industry	Estimated Employment 2016	Projected Employment 2026	Percent Change 2016-2026	Numeric Change 2016-2026
0	Total, All Industries	160,337	162,062	+1.1%	+1,725
31	Manufacturing	8,473	7,725	-8.8%	-748
322	Paper Manufacturing	2,003	1,648	-17.7%	-355
333	Machinery Manufacturing	1,081	1,163	+7.6%	+82
332	Fabricated Metal Product Manufacturing	756	788	+4.2%	+32
336	Transportation Equipment Manufacturing	717	770	+7.4%	+53
327	Nonmetallic Mineral Product Manufacturing	587	458	-22.0%	-129
321	Wood Product Manufacturing	713	394	-44.7%	-319
312	Beverage & Tobacco Product Manufacturing	190	383	+101.6%	+193
334	Computer & Electronic Product Manufacturing	401	366	-8.7%	-35
325	Chemical Manufacturing	318	342	+7.5%	+24
326	Plastics & Rubber Products Manufacturing	246	296	+20.3%	+50
331	Primary Metal Manufacturing	273	199	-27.1%	-74
311	Food Manufacturing	261	197	-24.5%	-64
314	Textile Product Mills	228	196	-14.0%	-32
315	Apparel Manufacturing	185	134	-27.6%	-51
337	Furniture & Related Product Manufacturing	100	119	+19.0%	+19
323	Printing & Related Support Activities	189	118	-37.6%	-71
339	Miscellaneous Manufacturing	136	78	-42.6%	-58

Source: DEED [Employment Outlook](#)

Occupational Outlook

The projected job losses in the manufacturing industry are expected to be seen in production occupations as well, leading to a projected 7.9 percent decline from 2016 to 2026 in Northeast Minnesota. However, the region is still expected to have significant demand for production workers over the next ten years due to many openings from labor market exits. There are also projected to be over 3,000 additional openings from 2016-2026 from labor market exits which are primarily attributable to retirements.

Overall, just 7 of the 32 production occupations are expected to see new job growth from 2016 to 2026, led by welders, cutter, solderers, and brazers which is projected to grow by slightly more than 10 percent. Computer-controlled machine operators, cutting punching, and press machine setters and operators, and painters, transportation equipment are also projected to grow, but all have low employment estimates meaning projected numerical gains are small.

In contrast, the biggest declines are projected for helpers-production workers, paper goods machine setters and operators, and sewing machine operators. Nine of the 32 production occupations are expected to lose more than 20 percent of their jobs, with tool grinders, filers, and sharpeners seeing the most rapid drop-off.

Regardless of projected employment growth or decline, every occupation is expected to have labor market exit openings from 2016 to 2026. The largest number of total openings are projected for helpers-production workers, welders, cutters, solderers, and brazers, team assemblers, and first-line supervisors of production and operating workers, which are all expected to have hundreds of openings in the region (see Table 9).

Table 9. Top 25 Northeast Minnesota Production Occupation Projections, 2016-2026

SOC Code	SOC Occupational Title	Estimated Employment 2016	Projected Employment 2026	Percent Change 2016-2026	Numeric Change 2016-2026	* Labor Market Exit Openings 2016-2026
0	Total, All Occupations	160,337	162,062	+1.1%	+1,725	+78,155
510000	Production Occupations	7,874	7,251	-7.9%	623	+3,091
514121	Welders, Cutters, Solderers, & Brazers	547	603	+10.2%	+56	+153
512092	Team Assemblers	560	517	-7.7%	43	+230
519198	Helpers--Production Workers	568	478	-15.8%	90	+280
511011	First-Line Supervisors of Production Workers	482	456	-5.4%	26	+150
514041	Machinists	374	366	-2.1%	8	+129
519061	Inspectors, Testers, Sorters, Samplers	293	297	+1.4%	+4	+123
519196	Paper Goods Machine Setters & Operators	357	290	-18.8%	67	+117
519051	Furnace, Kiln, Oven, Drier, & Kettle Operators	259	275	+6.2%	+16	+112
516011	Laundry & Dry-Cleaning Workers	257	261	+1.6%	+4	+174
516031	Sewing Machine Operators	281	235	-16.4%	46	+147
513021	Butchers & Meat Cutters	247	234	-5.3%	13	+108
518031	Water Wastewater Treatment Plant Operators	233	209	-10.3%	24	+63
519111	Packaging & Filling Machine Operators	142	142	+0.0%	0	+67
512099	Assemblers & Fabricators, All Other	155	120	-22.6%	35	+59
519121	Coating, Painting, & Spraying Machine Setters	120	107	-10.8%	13	+32
517042	Woodworking Machine Setters & Operators	133	104	-21.8%	29	+46
519199	Production Workers, All Other	118	103	-12.7%	15	+43
513011	Bakers	126	100	-20.6%	26	+73
515112	Printing Press Operators	133	97	-27.1%	36	+45
518021	Stationary Engineers & Boiler Operators	88	92	+4.5%	+4	+29
519021	Crushing, Grinding & Polishing Machine Setters	90	82	-8.9%	8	+31
512022	Electrical and Electronic Equipment Assemblers	109	74	-32.1%	35	+46
519023	Mixing & Blending Machine Setters & Operators	74	73	-1.4%	1	+26
517041	Sawing Machine Setters & Operators	87	67	-23.0%	20	+31
514031	Cutting, Punching, & Press Machine Setters	57	62	+8.8%	+5	+22

* Labor Market Exit Openings are the projected number of workers leaving an occupation and exiting the labor market entirely (most labor force exits are related to workers retiring). Occupational transfers are the projected number of workers permanently leaving an occupation and transferring to a different occupation

Source: DEED [Employment Outlook](#)

Workforce Demographics

As the workforce in Northeast Minnesota ages, new graduates and other jobseekers will become increasingly important sources of workers, particularly for the manufacturing industry, which is exhibiting a trend toward a larger percentage of older workers. Data from DEED's Quarterly Employment Demographics (QED) tool shows that in 2019, 23.5 percent of workers were 55 years of age or older, almost double the share in 2004. In contrast, the share of workers under the age of 25 fell from 12.3 percent in 2004 to 9.4 percent in 2019. The proportion of workers aged 25 to 44 years old also dropped, from 46.5 percent to 44.1 percent (see Figure 3).



Figure 3. Northeast Minnesota Manufacturing Workforce Demographics, 2004-2019

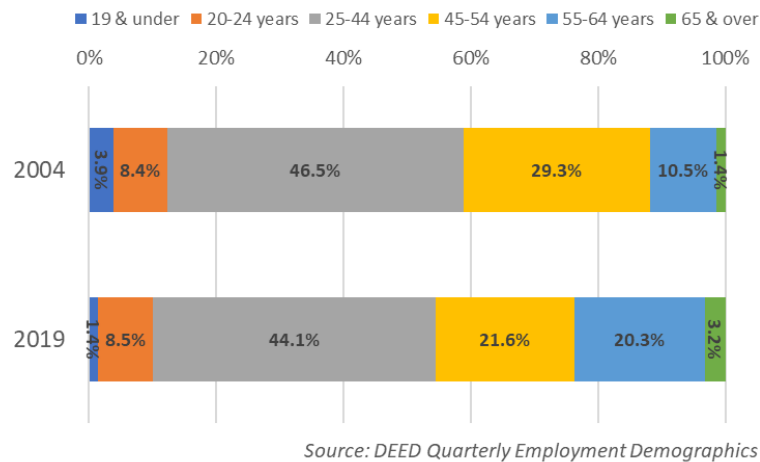
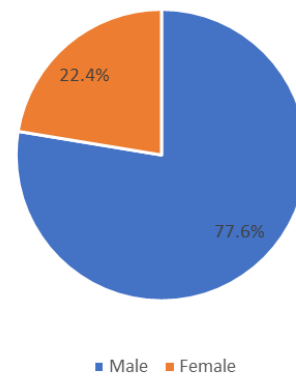


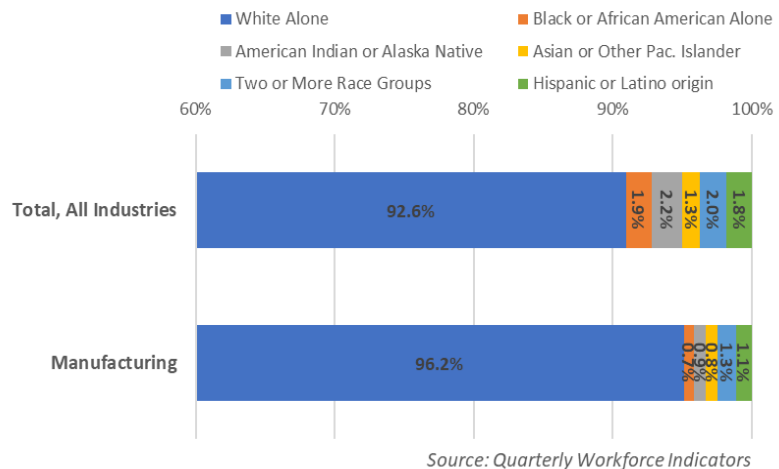
Figure 4. Northeast Minnesota Manufacturing Industry Workforce Demographics, 2019



Additional information from the QED program shows that the manufacturing workforce in the Northeast region is relatively non-diverse. In 2019, over three quarters of the workforce was male (see Figure 4) and more than 96 percent reported as white alone (see Figure 5). Demographic data from the U.S. Census' Quarterly Workforce Indicators (QWI) program show us that the non-white share of the Northeast manufacturing workforce was 3.8 percent in 2019, compared to 7.4 percent non-white workers for all industries combined. Despite this disparity, the manufacturing workforce is becoming more diverse. The share of non-white workers grew 6.0 percent and the share of Hispanic or Latino workers in manufacturing grew more than 40 percent from 2004 to 2019.

In the face of tight labor markets, manufacturers may need to tap into new labor pools in order to attract the talent they need to grow and replace existing workers in the future.

Figure 5. Northeast Minnesota Manufacturing Industry Workforce Demographics by Race or Origin, 2019



Central Minnesota – Manufacturing Overview

According to DEED's [Quarterly Census of Employment and Wages](#) (QCEW) data, the 13-county Central Minnesota region was home to 1,185 manufacturing establishments providing 42,346 jobs through the third quarter of 2019. Manufacturing accounted for 15.1 percent of total employment in the region, making it the second largest industry behind health care and social assistance (49,935 jobs) and having slightly more jobs than retail trade (36,754 jobs).

These manufacturers provided about \$565 million in total payroll in the third quarter of 2019, making it the second largest industry in terms of payroll as well. Average annual wages in manufacturing were \$53,352 in 2019, which was over \$8,000 and 18.5 percent higher than the average for all industries (see Table 1).

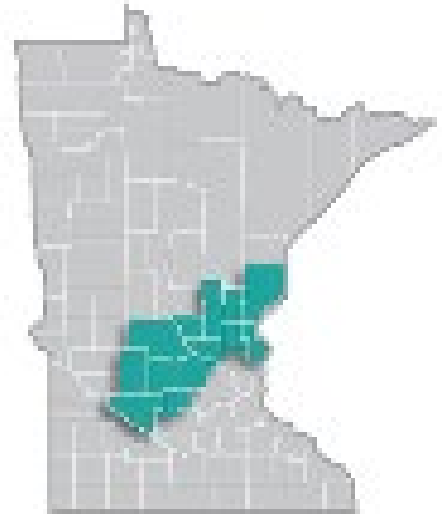


Table 1. Central Minnesota Manufacturing Industry Employment Statistics, Quarter 3 2019

NAICS Code	NAICS Industry Title	Number of Firms, Q3 2019	Number of Jobs, Q3 2019	Quarterly Payroll, Q3 2019	Avg. Annual Wages, Q3 2019
0	Total, All Industries	18,351	280,105	\$3,155,584,289	\$45,032
31	Manufacturing	1,185	42,346	\$564,893,620	\$53,352
332	Fabricated Metal Product Manufacturing	313	8,013	\$117,186,006	\$58,448
311	Food Manufacturing	102	7,973	\$98,480,928	\$49,400
333	Machinery Manufacturing	128	3,937	\$57,097,859	\$57,980
326	Plastics and Rubber Products Manufacturing	65	3,072	\$38,350,949	\$49,920
337	Furniture and Related Product Manufacturing	103	2,794	\$34,385,369	\$49,192
336	Transportation Equipment Manufacturing	39	2,662	\$34,036,377	\$51,116
327	Nonmetallic Mineral Product Manufacturing	83	2,337	\$33,207,356	\$56,836
322	Paper Manufacturing	11	2,087	\$33,323,982	\$63,856
339	Miscellaneous Manufacturing	96	2,084	\$25,508,861	\$48,932
323	Printing and Related Support Activities	66	1,451	\$16,710,747	\$46,020
334	Computer and Electronic Prod. Manufacturing	28	1,401	\$20,841,933	\$59,488
321	Wood Product Manufacturing	56	959	\$11,271,973	\$47,008
331	Primary Metal Manufacturing	8	843	\$11,727,593	\$55,640
312	Beverage and Tobacco Product Manufacturing	22	842	\$10,346,502	\$49,140
335	Electrical Equipment Manufacturing	12	809	\$9,597,044	\$47,424
325	Chemical Manufacturing	21	649	\$9,347,967	\$57,564
314	Textile Product Mills	23	355	\$2,998,008	\$33,748

Source: DEED [Quarterly Census of Employment & Wages \(QCEW\)](#) program

Fabricated Metal Product Manufacturing was the largest sector in Central Minnesota, with 8,013 jobs at 313 establishments, and just over \$117 million in quarterly payroll. The largest subsectors in Fabricated Metal Product Manufacturing include Machine Shops (2,987 jobs), Architectural and Structural Metals Manufacture (1,959 jobs), and Other Fabricated Metal Product Manufacture (1,180 jobs). The Northwest region also had notable employment in Forging and Stamping, Boiler Tank and Shipping Container Manufacturing, and Coating, Engraving, Heat Treating, and Allied Activities.

The second largest manufacturing sector in the region is Food Manufacturing with 7,973 jobs at 102 firms. The largest subsectors in Food Manufacturing include Animal Slaughtering and Processing (3,683 jobs), Other Food Manufacturing (1,253 jobs), and Animal Food Manufacturing (710 jobs).

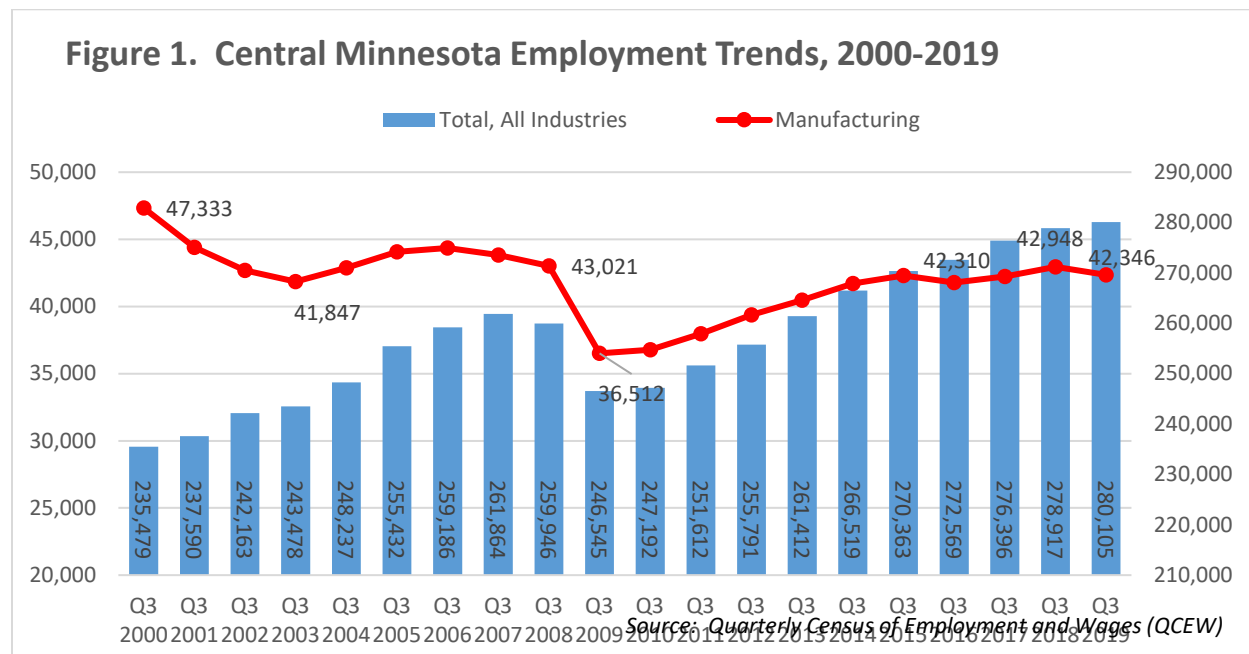
Combined, those two sectors accounted for over one-third (37.7 percent) of the region's manufacturing jobs. Central Minnesota also had notable numbers of jobs in Machinery Manufacturing (3,937 jobs), Plastics and Rubber Products Manufacturing (3,072 jobs), and Furniture and Related Product Manufacturing (2,794 jobs). Those three sectors also combined for almost one-quarter (23.1 percent) of total manufacturing employment in the region.

Central Minnesota also has considerable employment numbers in the Transportation Equipment Manufacturing (2,662 jobs), Nonmetallic Mineral Product Manufacturing (2,337 jobs), Paper Manufacturing (2,087 jobs), Miscellaneous Manufacturing (2,084 jobs), Printing and Related Support Activities (1,451 jobs), Computer and Electronic Product Manufacturing (1,401 jobs), and Wood Product Manufacturing (959 jobs) sectors.

Average annual wages in manufacturing (\$53,352) were 18.5 percent higher than the total of all industries (\$45,032), led by high average annual wages in Paper Manufacturing (\$63,856), Computer and Electronic Product Manufacturing (\$59,488), Fabricated Metal Product Manufacturing (\$58,448) Machinery Manufacturing (\$57,980), and Chemical Manufacturing (\$57,564).

Industry Trends

Manufacturers in Central Minnesota cut about 5,500 jobs during the 2001 recession, then enjoyed a slight recovery, and mostly held steady from 2003 to 2008. The region's manufacturers suffered even more significant job losses during the recession from 2008 to 2010, dropping 6,509 jobs in one year, to a low of 36,512 jobs through the third quarter of 2009. However, manufacturers in the region have again enjoyed a slow but steady recovery, regaining about 5,800 net new jobs over that time period, nearly recovering all jobs that were lost (see Figure 1).



Since the end of the recession, manufacturers in Central Minnesota now have 5,834 more jobs than ten years ago, in 2009. Manufacturing employment was up 16.0 percent from 2009 to 2019, while the total of all industries surpassed its pre-recession peak in 2013 and is now up about 33,500 jobs since 2009, a 13.6 percent increase in jobs.

In sum, 13 of the 16 manufacturing sectors had more jobs in 2019 than in 2009, including ten that increased more than 20 percent of their employment. The largest job gains occurred in Machinery Manufacturing, which added 1,249 jobs, based on expansions in Material Handling Equipment Manufacturing and Packaging Machinery Manufacturing. The other large growth was in Fabricated Metal Product Manufacturing, which expanded by 947 jobs. Central Minnesota also saw important job gains in Food Manufacturing, Transportation Equipment Manufacturing, Nonmetallic Mineral Product Manufacturing, Plastics and Rubber Products Manufacturing, and Computer and Electronic Product Manufacturing.

The biggest job declines in the past decade occurred in Wood Product Manufacturing, which sliced 475 jobs from 2009 to 2019, 12 percent of its previous employment level. The losses were heaviest in Other Wood Product Manufacturing, which cut over 450 jobs from 2009 to 2019. The other large decline in the region occurred in the Furniture and Related Product Manufacturing sector, which eliminated 287 jobs over the last 10 years.

Encouragingly, 10 of the 17 sectors added jobs since the third quarter of 2014, while only 8 of the 17 sectors gained jobs in the past year. Like the ten-year trends, the most notable recoveries in the past five years occurred in Machinery Manufacturing, Plastics and Rubber Products Manufacturing and Nonmetallic Mineral Product Manufacturing (see Table 2).

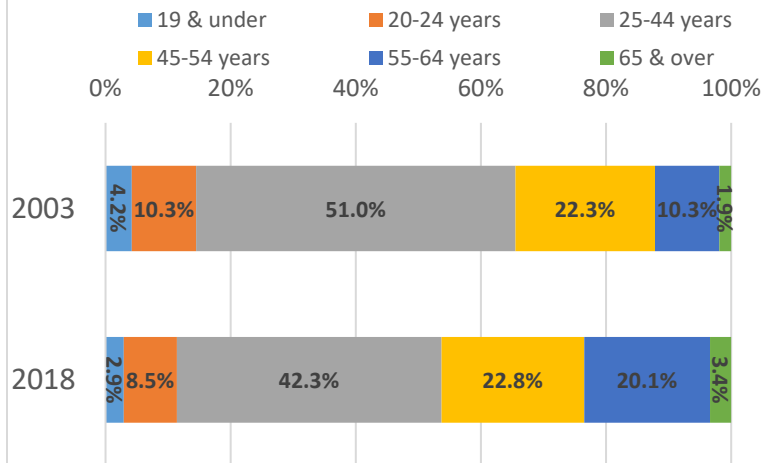
Table 2. Central Minnesota Manufacturing Industry Trends, 2009-2019

NAICS Industry Title	Number of Jobs, Q3 2019	1-Year Trend, Q3 2018-Q3 2019		5-Year Trend, Q3 2014-Q3 2019		10-Year Trend, Q3 2009-Q3 2019	
		Numeric Change	Percent Change	Numeric Change	Percent Change	Numeric Change	Percent Change
Total, All Industries	280,105	+1,188	+0.4%	+13,586	5.1%	33,560	13.6%
Manufacturing	42,346	-602	-1.4%	+635	1.5%	5,834	16.0%
Fabricated Metal Product Mfg.	8,013	+289	+3.7%	+633	8.6%	2,423	43.3%
Food Mfg.	7,973	-736	-8.5%	-73	-0.9%	444	5.9%
Machinery Mfg.	3,937	-14	-0.4%	+579	17.2%	1,273	47.8%
Plastics and Rubber Products Mfg.	3,072	+105	+3.5%	+388	14.5%	1,044	51.5%
Furniture and Related Product Mfg.	2,794	+4	+0.1%	+170	6.5%	801	40.2%
Transportation Equipment Mfg.	2,662	+76	+2.9%	-250	-8.6%	797	42.7%
Nonmetallic Mineral Product Mfg.	2,337	-35	-1.5%	+293	14.3%	195	9.1%
Paper Mfg.	2,087	-131	-5.9%	+8	0.4%	-199	-8.7%
Miscellaneous Mfg.	2,084	+129	+6.6%	+157	8.1%	811	63.7%
Printing and Related Support Act.	1,451	-37	-2.5%	-849	-36.9%	-1,279	-46.8%
Computer and Electronic Prod Mfg.	1,401	-52	-3.6%	-279	-16.6%	-605	-30.2%
Wood Product Mfg.	959	-13	-1.3%	-176	-15.5%	-27	-2.7%
Primary Metal Mfg.	843	+34	+4.2%	+452	+115.6%	#N/A	#N/A
Beverage and Tobacco Product Mfg.	842	+79	+10.4%	+235	38.7%	405	92.7%
Electrical Equipment, Applia. Mfg.	809	-247	-23.4%	-721	-47.1%	-993	-55.1%
Chemical Mfg.	649	-89	-12.1%	+185	+39.9%	415	177.4%
Textile Product Mills	355	+40	+12.7%	-105	-22.8%	-94	-20.9%

Source: DEED [Quarterly Census of Employment & Wages \(QCEW\)](#) program

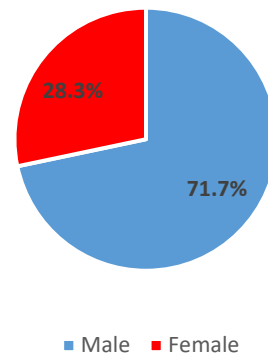
New graduates and other jobseekers will be important in filling the workforce pipeline in the manufacturing industry, which is exhibiting a trend toward a larger percentage of older workers. In 2018, nearly one-fourth (23.5 percent) of workers in the industry were 55 years or older, up from just 12.2 percent of the workforce back in 2003. In contrast, less than 11.4 percent of workers in the industry were under 25 years of age, down from almost 14.5 percent in 2003. Likewise, the percent of workers from 25 to 44 years of age dropped from 51.0 percent of the total in 2003 to just 42.3 percent in 2018 (see Figure 3).

Figure 3. Central Minnesota Manufacturing Workforce Demographics, 2003-2018



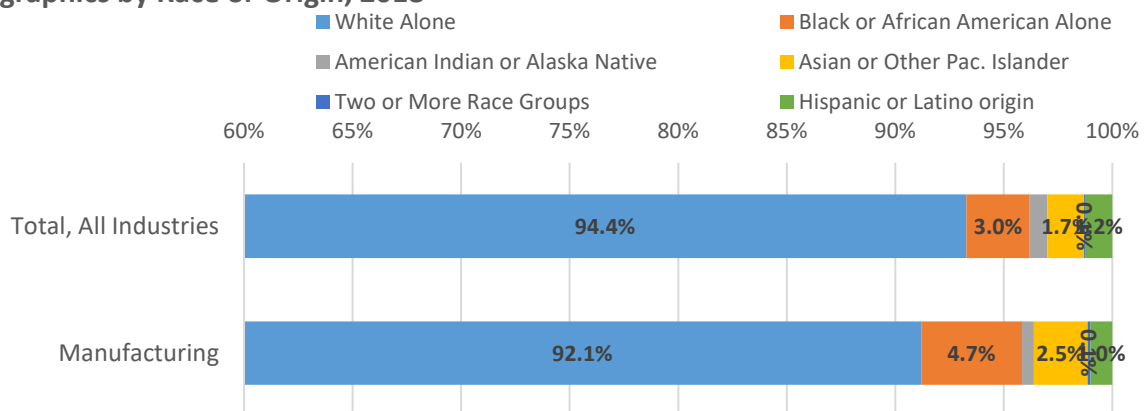
Source: DEED Quarterly Workforce Demographics

Figure 4. Central Minnesota Manufacturing Industry Workforce Demographics, 2018



Further demographic data from DEED's Quarterly Employment Demographics program shows that the manufacturing industry is relatively non-diverse, with males accounting for 72 percent of workers (see Figure 4), and about 92 percent reporting white as their race (see Figure 5). It should be noted that the Manufacturing industry has a greater concentration of non-white workers than do the total of all industries in the region with Black or African Americans making up 4.7 percent of the workforce and Asian or Other Pacific Islander making up 2.5 percent. In the face of tight labor markets, manufacturers may need to tap into new labor pools in order to attract the talent they need to grow and replace existing workers

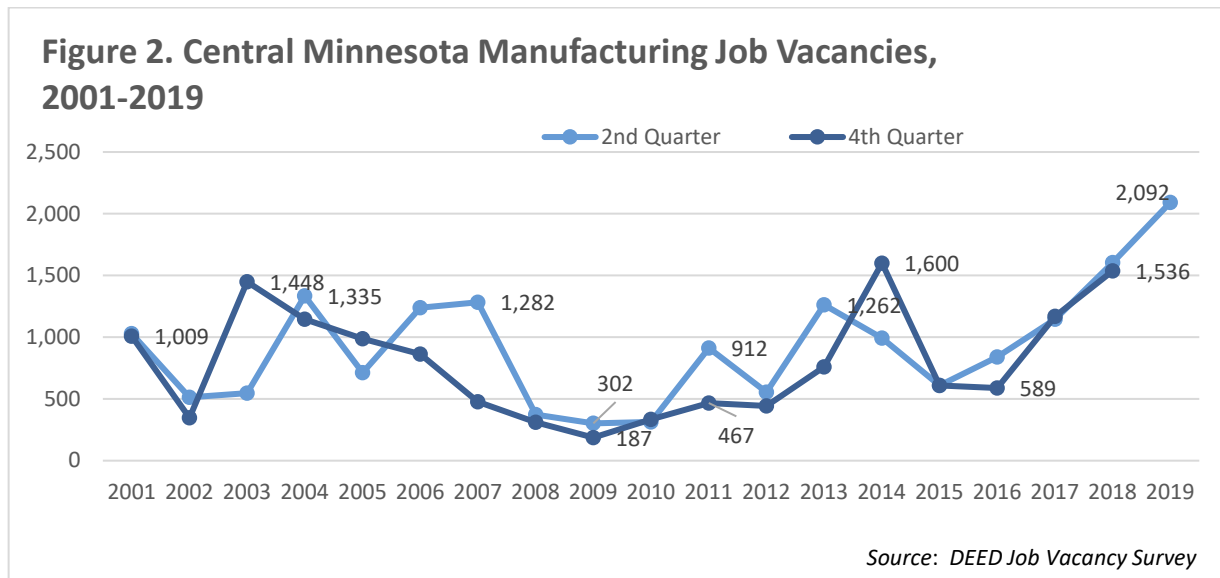
Figure 5. Central Minnesota Manufacturing Industry Workforce Demographics by Race or Origin, 2018



Source: Quarterly Workforce Indicators

Industry Demand

The steady recovery in manufacturing employment in recent years has led to a steadily increasing number of [job vacancies](#) across the Central Minnesota region as well, with demand reaching levels never before seen. The 2,092 job vacancies reported by manufacturing employers in the second quarter of 2019 was the highest number posted since 2001, and was nearly seven times more openings than the 302 vacancies posted in 2009, in the midst of the recession (see Figure 2).



The median wage offered for these vacancies held steady at about \$15.33 per hour in the second quarter of 2019 and 41 percent of the manufacturing vacancies required at least 1 year of experience and 28 percent requiring postsecondary education, which was similar to past years. Only 3 percent of posted manufacturing openings were part-time, as compared to 38 percent of vacancies across all industries (see Table 3).

Table 3. Central Minnesota Manufacturing Job Vacancy Survey, 2 nd Quarter 2019					
NAICS Industry Title	Number of Job Vacancies	Median Wage Offer	Percent Part-time	Percent Requiring Postsecondary Education	Percent Requiring 1+ Years Work Experience
Total, All Industries	13,434	\$14.55	38%	28%	41%
Manufacturing	2,092	\$15.33	3%	30%	41%

Source: DEED [Job Vacancy Survey](#)

The largest number of manufacturing vacancies were for transportation and material moving occupations with 1,526 vacancies and a median wage offer of \$18.83. Next were production occupations, including metal and plastic workers, food processing workers, assemblers and fabricators, supervisors of production workers, textile and furnishing workers, and other production occupations. The median wage offer for these positions was \$14.98 but ranged between \$11 and \$32 per hour. Manufacturers in Central Minnesota were also looking to hire sales and office, installation, maintenance, and repair workers, management, and engineering occupations (see Table 4).

Table 4. Central Minnesota Production Occupations Job Vacancy Survey, 2nd Quarter 2019

SOC Occupational Title	Number of Job Vacancies	Median Wage Offer	Percent Part-time	Percent Requiring Postsecondary Education	Percent Requiring 1+ Years Work Experience
Total, All Occupations	13,434	\$14.55	38%	28%	41%
Production Occupations	1,432	\$14.98	6%	16%	29%
Supervisors of Production Workers	107	\$32.13	0%	78%	96%
Assemblers & Fabricators	260	\$13.77	0%	6%	22%
Food Processing Workers	140	\$12.26	40%	0%	14%
Metal Workers & Plastics Workers	324	\$17.81	0%	38%	53%
Textile, Apparel, & Furnishing Workers	16	\$13.41	58%	0%	0%
Other Production Occupations	515	\$14.83	5%	0%	7%
Woodworkers	50	\$14.72	0%	0%	33%
Plant and System Operators	5	\$19.04	0%	0%	40%
Office & Administrative Support	756	\$14.04	41%	10%	52%
Transportation & Material Moving	1,526	\$18.83	33%	6%	55%
Architecture & Engineering	235	\$32.58	0%	97%	94%
Management	258	\$38.08	3%	88%	97%
Installation, Maintenance, & Repair	423	\$18.63	6%	54%	58%
Sales & Related	1,879	\$11.73	55%	2%	22%

Source: DEED [Job Vacancy Survey](#)

Industry Occupational Employment

DEED's Occupational Employment Statistics (OES) program provides detailed employment and wage data for a wide range of occupations involved in manufacturing. In sum, there were an estimated 33,920 people working in production occupations in Central Minnesota, accounting for about 11.8 percent of total employment in the region. Median hourly wages for production occupations were \$18.88 in 2019 but ranged from \$12.28 at the low end to \$46.24 at the high end.

As noted above, in addition to production occupations, manufacturers also require the services of workers in several other occupational groups, such as office and administrative support, transportation and material moving, architecture and engineering, management, and installation, maintenance and repair. Not surprisingly, wages were higher for the higher-level positions (see Table 5).

Table 5. Central Minnesota Occupational Employment & Wage Statistics, 2019

SOC Occupational Title	Estimated Regional Employment	Regional Median Hourly Wage	Estimated Statewide Employment	Statewide Median Hourly Wage
Total, All Occupations	286,270	\$18.94	2,867,700	\$20.95
Production Occupations	33,920	\$18.88	214,230	\$18.68
Office & Administrative Support	39,130	\$18.22	405,970	\$19.10
Transportation & Material Moving	20,530	\$18.65	177,580	\$18.48
Architecture & Engineering	4,680	\$32.85	56,070	\$37.53
Management	13,540	\$42.76	171,250	\$51.26
Installation, Maintenance, & Repair	12,010	\$22.08	100,030	\$23.13
Sales & Related	29,050	\$13.96	277,070	\$14.97
Business & Financial Operations	9,830	\$29.04	164,510	\$33.03
Computer & Mathematical	4,470	\$32.26	96,020	\$40.96

Source: DEED [Occupational Employment Statistics \(OES\)](#) program

Team assemblers, machinists, first-line supervisors, and more are the most common jobs found at manufacturing firms in Minnesota, according to DEED's Occupational Staffing Matrix data. Median hourly wages for these manufacturing positions ranged from a low of less than \$12 per hour for packers and packagers to a high of \$30 per hour for first-line supervisors of production and operating workers. Almost all the production-related manufacturing occupations can be gained with a high school diploma and learned through on-the-job training, though some also benefit from vocational training or associate degrees (see Table 6).

Table 6. Central Minnesota Top 30 Production-related Manufacturing Occupations, 2019 Wage Data			
SOC Code	SOC Occupational Title	Estimated Regional Employment	Median Hourly Wage
512092	Team & All Other Assemblers	4,460	\$17.32
511011	First-Line Supervisors of Production & Operating Workers	1,700	\$30.04
514041	Machinists	2,170	\$23.96
513023	Slaughterers & Meat Packers	1,290	\$15.51
519111	Packaging & Filling Machine Operators & Tenders	1,390	\$16.44
514121	Welders, Cutters, Solderers, & Brazers	2,100	\$22.44
519061	Inspectors, Testers, Sorters, Samplers, & Weighers	1,350	\$19.48
537062	Laborers & Freight, Stock, & Material Movers, Hand	4,290	\$16.75
514031	Cutting, Punching, & Press Machine Setters, Metal/Plastic	790	\$19.05
515112	Printing Press Operators	460	\$20.27
499041	Industrial Machinery Mechanics	890	\$26.45
512028	Electrical & Electronic Equipment Assemblers	490	\$18.31
519198	Helpers--Production Workers	1,540	\$14.63
514011	Computer-Controlled Machine Tool Operators, Metal/Plastic	610	\$22.30
537051	Industrial Truck & Tractor Operators	910	\$20.83
519199	Production Workers, All Other	430	\$19.51
499071	Maintenance & Repair Workers, General	2,690	\$21.02
537064	Packers & Packagers, Hand	1,560	\$12.05
513099	All other food processing workers	140	\$15.14
514072	Molding, Coremaking & Casting Machine Setters & Operators	740	\$18.34
533032	Truck Drivers, Heavy & Tractor-Trailer	5,250	\$23.28
512028	Electromechanical Equipment Assemblers	490	\$18.31
519121	Coating, Painting, & Spraying Machine Setters & Operators	560	\$21.68
513092	Food Batchmakers	600	\$15.79
519196	Paper Goods Machine Setters, Operators, & Tenders	0	\$20.18
515113	Print Binding & Finishing Workers	210	\$14.91
517011	Cabinetmakers & Bench Carpenters	880	\$19.80
519032	Cutting & Slicing Machine Setters, Operators, & Tenders	470	\$21.52
514111	Tool & Die Makers	250	\$28.50

Source: DEED [Occupational Employment Statistics \(OES\)](#) program

In addition to the production-related occupations, manufacturers also rely heavily on sales and office workers including manufacturing sales representatives, customer service representatives, and production, planning, shipping, and traffic clerks; transportation and material moving workers such as truck drivers and packers and packagers; engineering occupations like industrial, mechanical, and electrical engineers; management positions such as industrial production and general managers; and business and financial operations occupations like accountants and auditors.

Many of these occupations require higher education, but also offer higher wages. For example, all the engineering positions have median wages above \$35 per hour in Central Minnesota, with median wages topping \$56 per hour for engineering managers, but also require bachelor's degrees at the minimum. Likewise, software developers, industrial production managers, and general and operations managers all earn well over \$30 per hour, and all require bachelor's degrees. In contrast, sales representatives required just a high school diploma, but also offered relatively high wages (see Table 7).

Table 7. Central Minnesota Top 20 Office-related Manufacturing Occupations, 2019 Wage Data

SOC Code	SOC Occupational Title	Estimated Regional Employment	Median Hourly Wage
414012	Sales Representatives, Manufacturing, exc. Technical Products	3,200	\$28.42
434051	Customer Service Representatives	5,460	\$16.37
172112	Industrial Engineers	900	\$39.62
111021	General & Operations Managers	3,860	\$40.20
435071	Shipping, Receiving, & Traffic Clerks	1,590	\$17.36
113051	Industrial Production Managers	660	\$42.97
172141	Mechanical Engineers	760	\$35.58
433031	Bookkeeping, Accounting, & Auditing Clerks	2,850	\$19.90
173026	Industrial Engineering Technicians	300	\$25.30
131023	Purchasing Agents, exc. Wholesale, Retail & Farm Products	#N/A	#N/A
439061	Office Clerks, General	4,870	\$17.60
414011	Sales Representatives, Manufacturing, Technical Products	150	\$29.86
435061	Production, Planning, & Expediting Clerks	660	\$23.62
132011	Accountants & Auditors	1,560	\$30.86
435081	Stock Clerks & Order Fillers	4,760	\$12.35
119041	Engineering Managers	300	\$56.75
172071	Electrical Engineers	410	\$47.91
151133	Software Developers, Systems Software	150	\$42.94
151132	Software Developers, Applications	800	\$41.10
173023	Electrical & Electronic Engineering Technicians	230	\$26.01

Source: DEED [Occupational Employment Statistics \(OES\)](#) program, [Minnesota Educational Requirements for Occupations](#)

Industry Outlook

According to DEED's 2016 to 2026 Employment Outlook data, the Central Minnesota manufacturing industry is projected to gain 2,316 jobs over the next decade, a 5.6 percent increase. This is less than the overall growth of 8.6 percent across the total of all industries in Central Minnesota, and contrasts with the state of Minnesota as a whole, which is projected to lose about 5,400 manufacturing jobs from 2016 to 2026, a 1.7 percent decline.

Thirteen of the 17 manufacturing sectors are expected to add jobs, led by continued strong growth in Fabricated Metal Product Manufacturing, which is projected to gain 1,130 net new jobs, a 16.2 percent expansion. The region may also see job growth in Machinery Manufacturing, Plastics and Rubber Products Manufacturing, Chemical Manufacturing, Miscellaneous Manufacturing, Transportation Equipment Manufacturing, and Food Manufacturing.

In contrast, four of the 17 sectors are expected to see job declines in the next decade, with the most severe losses projected in Computer and Electronic Product Manufacturing, Printing and Related Support Activities, and Textile Product Mills. Those three sectors are expected to lose almost 900 jobs combined (see Table 8).

Table 8. Central Minnesota Manufacturing Industry Projections, 2016-2026

NAICS Code	Industry	Estimated Employment 2016	Projected Employment 2026	Percent Change 2016-2026	Numeric Change 2016-2026
0	Total, All Industries	310,433	337,062	+8.6%	+26,629
31	Manufacturing	41,361	43,677	+5.6%	+2,316
311	Food Manufacturing	7,764	7,997	+3.0%	+233
332	Fabricated Metal Product Mfg.	6,956	8,086	+16.2%	+1,130
333	Machinery Manufacturing	3,719	4,225	+13.6%	+506
326	Plastics & Rubber Products Mfg.	2843	3,458	+21.6%	+615
336	Transportation Equipment Mfg.	2,797	3,038	+8.6%	+241
337	Furniture & Related Product Mfg.	2705	2900	+7.2%	+195
322	Paper Manufacturing	2166	2367	+9.3%	+201
327	Nonmetallic Mineral Product Mfg.	2156	2253	+4.5%	+97
339	Miscellaneous Manufacturing	2060	2,346	+13.9%	+286
323	Printing & Related Support Activities	1,884	1,596	-15.3%	-288
334	Computer & Electronic Product Mfg.	1574	1025	-34.9%	-549
321	Wood Product Manufacturing	900	945	+5.0%	+45
331	Primary Metal Manufacturing	703	860	+22.3%	+157
312	Beverage & Tobacco Product Mfg.	651	864	+32.7%	+213
325	Chemical Manufacturing	631	925	+46.6%	+294
314	Textile Product Mills	497	456	-8.2%	-41
315	Apparel Manufacturing	31	14	-54.8%	-17

Source: DEED [Employment Outlook](#)

Occupational Outlook

The projected job gains in the manufacturing industry are expected to carry over into production occupations as well, leading to a projected 4.7 percent increase from 2016 to 2026 in Central Minnesota. Also, the region is expected to have significant demand for production workers over the next ten years due to many labor force exit openings – jobs that become available because the existing worker retires out of the labor force. There may be as many as 12,500 total openings for production occupations in the region due to these retirements and exit openings.

Overall, 47 of the 62 production occupations are expected to see new job growth from 2016 to 2026, led by metal workers and plastic workers, welders, cutters, solderers, and brazers, and machinists which are all expected to grow by about 15 percent. In addition to those occupations, food processing workers, supervisors of production workers, and woodworkers are expected to gain more than 180 workers in the next 10 years.

In contrast, the biggest declines are projected for team assemblers, production workers, all others, inspectors, testers, sorters, samplers, and weighers, and printing press operators. Fifteen of the 62 production occupations are expected to lose jobs.

Regardless of growth or decline, every occupation is expected to at least have some openings from 2016 to 2026. The largest number of total openings are projected for welders, machinists, first-line supervisors of production, helpers-production workers, team assemblers, cutting punching an press machine setters, packaging and filling machine operators, inspectors, testers, sorters, samplers, and weighers, and cabinetmakers and bench carpenters (see Table 9).



Table 9. Top 25 Central Minnesota Production Occupation Projections, 2016-2026

SOC Code	SOC Occupational Title	Estimated Employment 2016	Projected Employment 2026	Percent Change 2016-2026	Numeric Change 2016-2026	* Labor Force Exit Openings 2016-2026
0	Total, All Occupations	310,433	337,062	8.6%	26,629	157,485
510000	Production Occupations	30,697	32,129	4.7%	1,432	12,556
512092	Team Assemblers	2,204	1,693	-23.2%	-511	832
514041	Machinists	1,708	2,029	18.8%	321	649
514121	Welders, Cutters, Solderers, & Brazers	2,159	2,531	17.2%	372	624
512099	Assemblers & Fabricators, All Other	1212	1095	-9.7%	-117	493
511011	First-Line Supervisors of Production Workers	1,778	1,973	11.0%	195	598
514031	Cutting, Punching, & Press Machine Setters	1390	1480	6.5%	90	519
519111	Packaging & Filling Machine Operators	1,253	1,366	9.0%	113	619
514011	Computer-Controlled Machine Tool Operators	546	640	17.2%	94	164
519198	Helpers--Production Workers	1073	1203	12.1%	130	610
518031	Water/Wastewater Treatment Plant & System	326	333	2.1%	7	94
519061	Inspectors, Testers, Sorters & Weighers	1048	994	-5.2%	-54	424
519199	Production Workers, All Other	570	453	-20.5%	-117	201
512022	Electrical & Electronic Equipment Assemblers	198	160	-19.2%	-38	91
516011	Laundry & Dry-Cleaning Workers	399	409	2.5%	10	271
513099	Food Processing Workers, All Other	321	327	1.9%	6	139
513021	Butchers & Meat Cutters	317	332	4.7%	15	146
513011	Bakers	222	233	5.0%	11	146
517011	Cabinetmakers & Bench Carpenters	894	977	9.3%	83	437
515112	Printing Press Operators	410	365	-11.0%	-45	151
519121	Coating, Painting, & Spraying Machine Setters	610	726	19.0%	116	191
516031	Sewing Machine Operators	229	227	-0.9%	-2	130
514072	Molding, Coremaking & Casting Machine Setters	661	708	7.1%	47	251
519023	Mixing & Blending Machine Setters & Operators	341	394	15.5%	53	132
517041	Sawing Machine Setters & Operators	285	322	13.0%	37	123
514111	Tool and Die Makers	194	197	1.5%	3	77

* Labor Force Exit Openings are the projected number of workers leaving an occupation and exiting the labor market entirely (most labor force exits are related to workers retiring)

Source: DEED [Employment Outlook](#)

Southwest Minnesota – Manufacturing Overview

According to DEED's [Quarterly Census of Employment and Wages](#) (QCEW) data, the 23-county Southwest Minnesota region was home to 591 manufacturing establishments employing 32,304 jobs through the third quarter of 2019. Manufacturing provided 18.3 percent of total employment in the region, making it the largest industry in the region just ahead of health care and social assistance (31,859 jobs) and well ahead of retail trade (19,019 jobs). Southwest is the only region in the state where manufacturing is still the largest employing industry. The region accounted for 9.9 percent of total manufacturing employment in the state, compared to just 6.0 percent of total employment.

These manufacturers provided about \$420 million in total payroll in the third quarter of 2019, making it the largest industry in terms of payroll as well. Average annual wages in manufacturing were \$51,948 in 2019, which was nearly \$9,000 and 20.5 percent higher than the total of all industries (see Table 1).

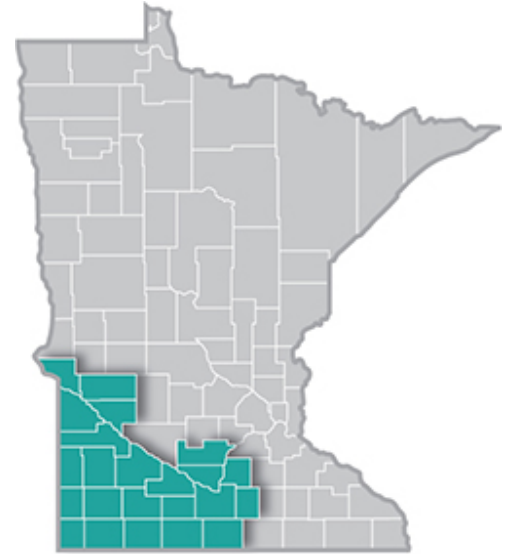


Table 1. Southwest Minnesota Manufacturing Industry Employment Statistics, Qtr. 3 2019

NAICS Code	NAICS Industry Title	Number of Firms, Q3 2019	Number of Jobs, Q3 2019	Quarterly Payroll, Q3 2019	Avg. Annual Wages, Q3 2019
0	Total, All Industries	12,404	176,503	\$1,902,853,528	\$43,108
31	Manufacturing	591	32,304	\$419,843,819	\$51,948
311	Food Manufacturing	104	12,016	\$160,441,373	\$53,404
333	Machinery Manufacturing	68	3,150	\$38,224,369	\$48,516
323	Printing & Related Support Activities	54	2,864	\$34,912,887	\$48,724
335	Electrical Equip., Appliance & Component Mfg.	20	2,123	\$28,919,839	\$54,444
332	Fabricated Metal Product Manufacturing	98	2,100	\$26,231,475	\$49,920
334	Computer & Electronic Product Manufacturing	18	1,790	\$23,929,906	\$53,456
327	Nonmetallic Mineral Product Manufacturing	28	1,578	\$25,322,303	\$64,168
325	Chemical Manufacturing	26	1,096	\$17,350,472	\$63,284
321	Wood Product Manufacturing	31	1,094	\$12,709,575	\$46,436
336	Transportation Equipment Manufacturing	20	1,041	\$12,499,497	\$47,996
326	Plastics & Rubber Product Manufacturing	22	1,010	\$11,961,103	\$47,320
339	Miscellaneous Manufacturing	42	954	\$10,968,206	\$45,968
331	Primary Metal Manufacturing	6	567	\$8,468,950	\$59,696
312	Beverage & Tobacco Product Manufacturing	15	479	\$4,062,078	\$33,904
337	Furniture & Related Product Manufacturing	21	289	\$2,783,946	\$38,532

Source: DEED [Quarterly Census of Employment & Wages \(QCEW\)](#) program

Food Manufacturing was easily the largest sector, with 12,016 jobs at 104 establishments, and just over \$160 million in total quarterly payroll. Southwest Minnesota has 25 percent of statewide employment in Food Manufacturing and had the largest number of food manufacturing jobs of the 6 planning regions in the state. The largest subsectors in Food Manufacturing include Animal Slaughtering and Processing (5,687 jobs), Dairy Product Manufacturing, Fruit and Vegetable Preserving and Specialty Food Manufacturing, Grain and Oilseed Milling, Animal Food Manufacturing, and Bakeries and Tortilla Manufacturing.

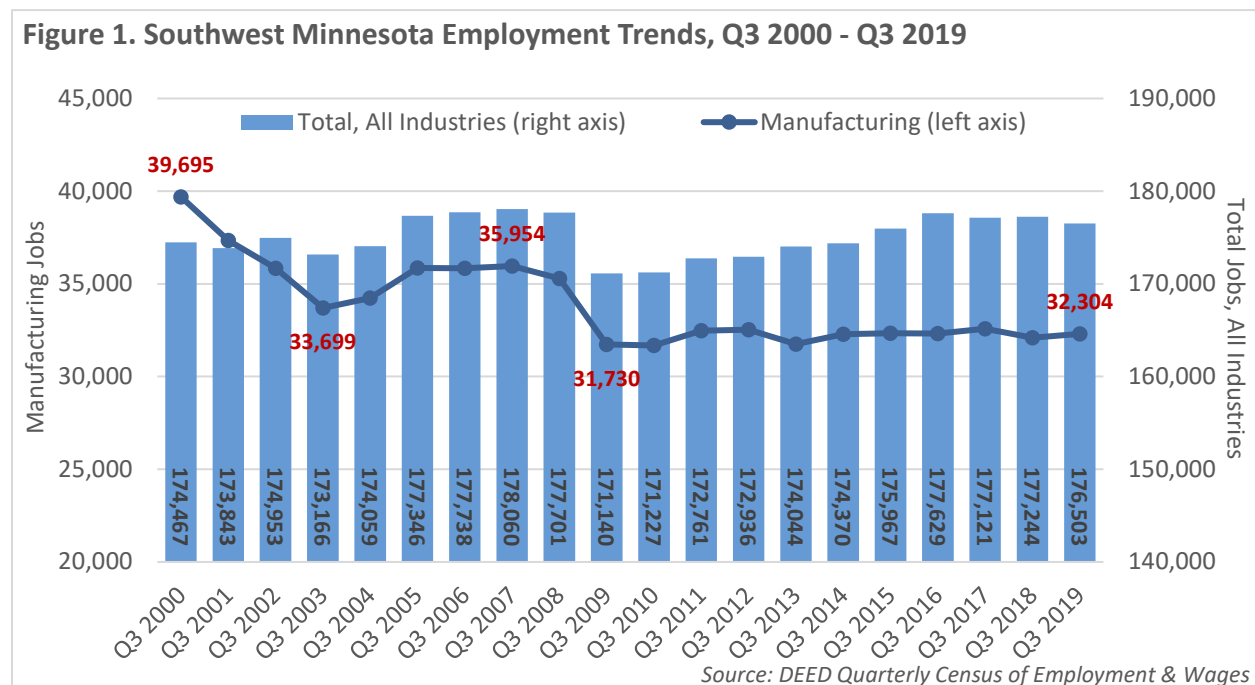
Machinery Manufacturing is the second largest sector, with 3,150 jobs at 68 establishments. That gave the region a location quotient of 1.5, exhibiting a much higher concentration than the state.¹⁶ With 2,345 jobs, the largest specialty in Southwest is Agriculture Machinery Manufacturing. The third largest manufacturing sector in the region is Printing and Related Support Activities, which had 2,864 jobs at 54 establishments through the third quarter of 2019, and was also much more strongly concentrated in Southwest Minnesota than the state, with a location quotient of 2.3. Combined, these three large sectors provided 56 percent of total manufacturing jobs in the region.

Southwest Minnesota also had large numbers of jobs in Electrical Equipment, Appliance, and Component Manufacturing (2,123 jobs), Fabricated Metal Product Manufacturing (2,100 jobs), Computer and Electronic Product Manufacturing (1,790 jobs), and Nonmetallic Mineral Product Manufacturing (1,578 jobs). The region also had smaller but notable employment in Chemical Manufacturing (1,096 jobs), Wood Product Manufacturing (1,094 jobs), Transportation Equipment Manufacturing (1,041 jobs), Plastics and Rubber Product Manufacturing (1,010 jobs), Miscellaneous Manufacturing (954 jobs), Primary Metal Manufacturing (567 jobs), Beverage Product Manufacturing (479 jobs), and Furniture and Related Product Manufacturing (543 jobs).

Average wages in manufacturing (\$51,948) were 20.5 percent higher than the total of all industries (\$43,108), led by high average wages in Nonmetallic Mineral Product Manufacturing (\$64,168), Chemical Manufacturing (\$63,284), Primary Metal Manufacturing (\$59,696), and Electrical Equipment, Appliance, and Component Manufacturing (\$54,444).

Industry Trends

Manufacturers in Southwest Minnesota cut almost 6,000 jobs during the 2001 recession, then enjoyed a slight recovery, and regained 2,000 jobs from 2003 to 2008. The region's manufacturers suffered more job losses during the recession from 2008 to 2010, dropping over 4,000 jobs in two years, to a low of



¹⁶ A location quotient of 1.5 indicates that machinery manufacturing is 1.5 times more concentrated in this region than in the state.

31,677 jobs through 2010. Since then, manufacturers in the region have again enjoyed a slow but steady recovery, regaining over 600 net new jobs from 2010 through 2019 (see Figure 1).

Thanks to the ongoing recovery, manufacturers in Southwest Minnesota now have about 600 more jobs now than ten years ago, in 2009. Manufacturing employment was up 1.8 percent from the third quarter of 2009 to the third quarter of 2019, while the total of all industries grew 3.1 percent over the past 10 years, a gain of 5,363 net new jobs.

The biggest job declines in the past decade occurred in Printing and Related Support Activities, which stamped out 1,733 jobs, Computer and Electronic Product Manufacturing, which sliced 411 jobs, and Machinery Manufacturing, which cut 362 jobs from 2007 to 2017. The region also suffered a large decline in the Furniture and Related Product Manufacturing subsector, which eliminated almost 50 percent of their employment since 2009.

In sum, 11 of the 15 manufacturing sectors had more jobs in 2019 than in 2009, with the largest job gains occurring in Food Manufacturing, which added 869 jobs, and Nonmetallic Mineral Product Manufacturing, which gained more than 500 jobs. Southwest Minnesota also saw important job gains in Fabricated Metal Product Manufacturing, Miscellaneous Manufacturing, Electrical Equipment and Appliance Manufacturing, Transportation Equipment Manufacturing, and Chemical Manufacturing.

Similarly, 9 of the 15 subsectors added jobs in the past year. Like the 10-year trends, the biggest gains were in Food Manufacturing, accounting for 188 net new jobs. Miscellaneous Manufacturing also saw a big increase since 2018, adding 134 jobs, a 16.3 percent rise. Beverage and Tobacco Product Manufacturing also grew more than 10 percent in the past year. In contrast Furniture and Related Product Manufacturing and Plastics and Rubber Product Manufacturing suffered the biggest job losses since 2018 (see Table 2).

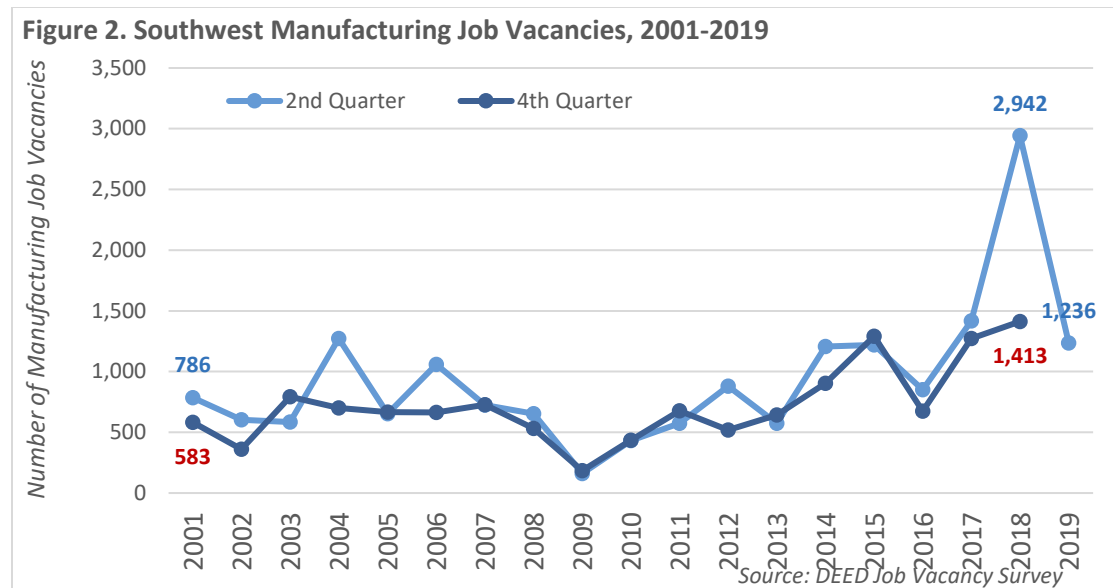
Table 2. Southwest Minnesota Manufacturing Industry Trends, 2009-2019

NAICS Industry Title	Number of Jobs, Q3 2019	1-Year Trend, Q3 2018-Q3 2019		5-Year Trend, Q3 2014-Q3 2019		10-Year Trend, Q3 2009-Q3 2019	
		Numeric Change	Percent Change	Numeric Change	Percent Change	Numeric Change	Percent Change
Total, All Industries	176,503	-741	-0.4%	+2,133	+1.2%	+5,363	+3.1%
Manufacturing	32,304	+205	+0.6%	+22	+0.1%	+574	+1.8%
Food Manufacturing	12,016	+188	+1.6%	+1,245	+11.6%	+869	+7.8%
Machinery Manufacturing	3,150	+13	+0.4%	-775	-19.7%	-362	-10.3%
Printing & Related Activities	2,864	-5	-0.2%	-793	-21.7%	-1,733	-37.7%
Electrical Equip., App. & Comp. Mfg.	2,123	+72	+3.5%	+97	+4.8%	+277	+15.0%
Fabricated Metal Product Mfg.	2,100	+52	+2.5%	+95	+4.7%	+395	+23.2%
Computer & Electronic Product Mfg.	1,790	+17	+1.0%	-129	-6.7%	-411	-18.7%
Nonmetallic Mineral Product Mfg.	1,578	-62	-3.8%	+112	+7.6%	+516	+48.6%
Chemical Manufacturing	1,096	+42	+4.0%	+197	+21.9%	+218	+24.8%
Wood Product Manufacturing	1,094	-7	-0.6%	+80	+7.9%	+146	+15.4%
Transportation Equipment Mfg.	1,041	+47	+4.7%	-1	-0.1%	+277	+36.3%
Plastics & Rubber Products Mfg.	1,010	-107	-9.6%	-57	-5.3%	+71	+7.6%
Miscellaneous Manufacturing	954	+134	+16.3%	+94	+10.9%	+392	+69.8%
Primary Metal Manufacturing	567	-20	-3.4%	-13	-2.2%	+1	+0.2%
Beverage & Tobacco Product Mfg.	479	+53	+12.4%	+167	+53.5%	+209	+77.4%
Furniture & Related Product Mfg.	289	-218	-43.0%	-276	-48.8%	-269	-48.2%

Source: DEED [Quarterly Census of Employment & Wages \(QCEW\)](#) program

Industry Demand

The steady recovery in manufacturing employment in recent years has led to a rising number of [job vacancies](#) across the Southwest Minnesota region. After setting a record high of 2,942 job openings in the second quarter of 2018, manufacturers posted 1,236 vacancies in the second quarter of 2019, which was the fourth highest number ever recorded. Likewise, the 1,413 manufacturing openings in the fourth quarter of 2018 was the highest number posted in the 18 years the survey has been conducted (see Figure 2).



The median wage offered for these vacancies climbed to \$15.54 per hour in the second quarter of 2019, about \$3.00 more than openings reported in the second quarter of 2014, and up about \$1.25 per hour compared to the second quarter of 2017. About 30 percent of the manufacturing vacancies required postsecondary education and nearly half (45 percent) required at least a year of prior work experience, which was also up in comparison with past years. Just 9 percent of the posted manufacturing openings were part-time, as compared to 34 percent of vacancies across all industries (see Table 3).

NAICS Industry Title	Number of Job Vacancies	Median Wage Offer	Percent Part-time	Percent Requiring Postsecondary Education	Percent Requiring 1+ Years Work Experience
Total, All Industries	12,458	\$13.85	34%	22%	37%
Manufacturing	1,236	\$15.54	9%	29%	45%

Source: DEED [Job Vacancy Survey](#)

The largest number of manufacturing vacancies were production occupations, including food processing workers, metal and plastics workers, first-line supervisors, printing workers, assemblers and fabricators, and other production occupations. The median wage offered for these positions was \$13.64 but ranged between \$10 and \$23 per hour depending on the occupations. Manufacturers in Southwest Minnesota were also looking to hire sales, office, transportation and material moving, management, and installation, maintenance, and repair workers (see Table 4).

Table 4. Southwest Minnesota Production Occupations Job Vacancy Survey, 2nd Quarter 2019

SOC Occupational Title	Number of Job Vacancies	Median Wage Offer	Percent Part-time	Percent Requiring Postsecondary Education	Percent Requiring 1+ Years Work Experience
Total, All Occupations	12,458	\$13.85	34%	22%	37%
Production Occupations	965	\$13.64	8%	15%	23%
Supervisors of Production Workers	52	\$22.39	0%	75%	92%
Assemblers & Fabricators	66	\$13.71	0%	3%	9%
Food Processing Workers	436	\$10.78	3%	0%	9%
Metal Workers & Plastics Workers	158	\$16.89	0%	48%	55%
Printing Workers	45	\$14.00	0%	32%	52%
Plant & Systems Operators	19	\$22.83	0%	54%	73%
Other Production Occupations	136	\$13.33	44%	0%	8%
Office & Administrative Support	639	\$12.18	29%	5%	55%
Transportation & Material Moving	1,099	\$14.53	30%	0%	19%
Architecture & Engineering	158	\$26.61	0%	93%	93%
Management	291	\$21.98	3%	41%	97%
Installation, Maintenance, & Repair	537	\$14.85	23%	17%	53%
Sales & Related	1,159	\$11.18	69%	1%	31%

Source: DEED [Job Vacancy Survey](#)

Industry Occupational Employment

DEED's Occupational Employment Statistics (OES) program provides detailed employment and wage data for a wide range of occupations involved in manufacturing. In sum, there were an estimated 18,090 people working in production occupations in Southwest Minnesota, accounting for about 10.3 percent of total employment in the region. Median hourly wages for production occupations were \$17.67 in 2019 but ranged from \$12 at the low end (10th percentile) to \$27 at the high end (90th percentile).

As noted above, in addition to production occupations, manufacturers also require the services of workers in several other occupational groups, such as office and administrative support, transportation and material moving, architecture and engineering, management, and installation, maintenance and repair. Not surprisingly, wages were higher for the higher-level positions (see Table 5).

Table 5. Southwest Minnesota Occupational Employment & Wage Statistics, 2019

SOC Occupational Title	Estimated Regional Employment	Regional Median Hourly Wage	Estimated Statewide Employment	Statewide Median Hourly Wage
Total, All Occupations	176,430	\$18.02	2,867,700	\$20.95
Production Occupations	18,090	\$17.67	214,230	\$18.68
Office & Administrative Support	24,540	\$17.40	405,970	\$19.10
Transportation & Material Moving	14,210	\$18.02	177,580	\$18.48
Architecture & Engineering	2,400	\$31.43	56,070	\$37.53
Management	8,030	\$40.34	171,250	\$51.26
Installation, Maintenance, & Repair	8,200	\$21.30	100,030	\$23.13
Sales & Related	16,490	\$13.75	277,070	\$14.97
Business & Financial Operations	5,220	\$28.58	164,510	\$33.03
Computer & Mathematical	2,000	\$30.61	\$96,020	\$40.96

Source: DEED [Occupational Employment Statistics \(OES\)](#) program

Team assemblers, first-line supervisors, machinists, slaughterers and meat packers, and more are the most common jobs found at manufacturing firms in Minnesota, according to DEED's Occupational Staffing Matrix data. Median hourly wages for these manufacturing positions ranged from a low of \$13.74 per hour for packers and packagers to a high of nearly \$30 per hour for first-line supervisors of production and operating workers. Almost all the production-related manufacturing occupations can be gained with a high school diploma and learned through on-the-job training, though some also benefit from vocational training or associate degrees (see Table 6).

Table 6. Southwest Minnesota Top 30 Production-Related Manufacturing Occupations (2019 Wage Data)

SOC Code	SOC Occupational Title	Estimated Regional Employment	Median Hourly Wage
512092	Team Assemblers	2,560	\$17.05
511011	First-Line Supervisors of Production & Operating Workers	870	\$29.14
512099	Assemblers & Fabricators, All Other	2,560	\$17.05
514041	Machinists	700	\$19.92
513023	Slaughterers & Meat Packers	1,090	\$14.74
519111	Packaging & Filling Machine Operators & Tenders	1,040	\$16.96
514121	Welders, Cutters, Solderers, & Brazers	890	\$20.00
519061	Inspectors, Testers, Sorters, Samplers, & Weighers	760	\$17.15
537062	Laborers & Freight, Stock, & Material Movers, Hand	2,840	\$16.41
514031	Cutting, Punching, & Press Machine Setters, Metal/Plastic	270	\$19.46
515112	Printing Press Operators	730	\$18.16
499041	Industrial Machinery Mechanics	740	\$22.98
512022	Electrical & Electronic Equipment Assemblers	310	\$16.08
519198	Helpers--Production Workers	480	\$15.21
514011	Computer-Controlled Machine Tool Operators, Metal/Plastic	280	\$20.76
537051	Industrial Truck & Tractor Operators	650	\$19.33
519199	Production Workers, All Other	670	\$17.90
499071	Maintenance & Repair Workers, General	1,920	\$19.58
537064	Packers & Packagers, Hand	800	\$13.74
513099	Food Processing Workers, All Other	110	\$16.14
514072	Molding, Coremaking & Casting Machine Setters & Operators	210	\$18.43
533032	Truck Drivers, Heavy & Tractor-Trailer	4,450	\$21.30
512023	Electromechanical Equipment Assemblers	310	\$16.08
519121	Coating, Painting, & Spraying Machine Setters & Operators	100	\$18.73
513092	Food Batchmakers	180	\$18.12
519196	Paper Goods Machine Setters, Operators, & Tenders	N/A	N/A
515113	Print Binding & Finishing Workers	470	\$16.61
517011	Cabinetmakers & Bench Carpenters	300	\$17.99
519032	Cutting & Slicing Machine Setters, Operators, & Tenders	200	\$18.32
514111	Tool & Die Makers	50	\$26.61

Source: DEED [Occupational Employment Statistics \(OES\)](#) program

In addition to the production-related occupations, manufacturers also rely heavily on sales and office workers including manufacturing sales representatives, customer service representatives, and production, planning, shipping, and traffic clerks; transportation and material moving workers such as truck drivers and packers and packagers; engineering occupations like industrial, mechanical, and electrical engineers; management positions such as industrial production and general managers; and business and financial operations occupations like accountants and auditors.

Many of these occupations require higher education, but also offer higher wages. For example, all the engineering positions have median wages above \$30 per hour in Southwest Minnesota, with median wages topping \$50 per hour for engineering managers, but also require bachelor's degrees at the minimum. Likewise, software developers, industrial production managers, and general and operations managers all earn well over \$30 per hour, and all require bachelor's degrees. In contrast, sales representatives required just a high school diploma, but also offered relatively high wages (see Table 7).

Table 7. Southwest Minnesota Top 20 Office-Related Manufacturing Occupations (2019 Wage Data)

SOC Code	SOC Occupational Title	Estimated Regional Employment	Median Hourly Wage
414012	Sales Representatives, Manufacturing, exc. Technical Products	2,060	\$30.15
434051	Customer Service Representatives	2,600	\$16.67
172112	Industrial Engineers	340	\$36.55
111021	General & Operations Managers	2,630	\$35.44
435071	Shipping, Receiving, & Traffic Clerks	850	\$16.61
113051	Industrial Production Managers	360	\$42.60
172141	Mechanical Engineers	430	\$37.76
433031	Bookkeeping, Accounting, & Auditing Clerks	2,170	\$18.66
173026	Industrial Engineering Technicians	230	\$23.37
131023	Purchasing Agents, exc. Wholesale, Retail & Farm Products	N/A	N/A
439061	Office Clerks, General	3,830	\$16.63
414011	Sales Representatives, Manufacturing, Technical Products	110	\$34.93
435061	Production, Planning, & Expediting Clerks	340	\$22.20
132011	Accountants & Auditors	930	\$29.65
435081	Stock Clerks & Order Fillers	2,400	\$12.70
119041	Engineering Managers	130	\$54.22
172071	Electrical Engineers	180	\$37.77
151133	Software Developers, Systems Software	40	\$45.54
151132	Software Developers, Applications	260	\$37.65
173023	Electrical & Electronic Engineering Technicians	120	\$26.01

Source: DEED [Occupational Employment Statistics \(OES\)](#) program

Industry Outlook

According to DEED's 2016 to 2026 Employment Outlook data, the Southwest Minnesota manufacturing industry is projected to lose about 120 jobs over the next decade, a slight 0.4 percent decline. The state of Minnesota is projected to lose about 5,400 manufacturing jobs from 2016 to 2026, a 1.7 percent decline, which makes Southwest Minnesota's projected stability more unique. Still, the small decline in Manufacturing contrasts with overall growth of 0.9 percent across the total of all industries in Southwest Minnesota.

Eight of the 17 manufacturing sectors are expected to add jobs, led by continued growth in Nonmetallic Mineral Product Manufacturing, which is projected to gain 351 net new jobs, a 20 percent expansion, and Chemical Manufacturing, which may add 343 jobs, a 37 percent jump. The region may also see job growth in Fabricated Metal Product Manufacturing, Wood Product Manufacturing, Miscellaneous Manufacturing, and Furniture and Related Product Manufacturing.

In contrast, 9 of the 17 sectors are expected to see job declines in the next decade, with the most severe losses projected in Printing and Related Support Activities, Computer and Electronic Product Manufacturing, Electrical Equipment Manufacturing, and Food Manufacturing (see Table 8).

Table 8. Southwest Minnesota Manufacturing Industry Projections, 2016-2026

NAICS Code	Industry	Estimated Employment 2016	Projected Employment 2026	Percent Change 2016-2026	Numeric Change 2016-2026
0	Total, All Industries	211,618	213,503	+0.9%	+1,885
31	Manufacturing	31,264	31,145	-0.4%	-119
311	Food Manufacturing	10,480	10,273	-2.0%	-207
333	Machinery Manufacturing	3,315	3,262	-1.6%	-53
323	Printing & Related Support Activities	3,533	3,073	-13.0%	-460
332	Fabricated Metal Product Mfg.	1,931	2,168	+12.3%	+237
327	Nonmetallic Mineral Product Mfg.	1,751	2,102	+20.0%	+351
335	Electrical Equipment & Appliances Mfg.	1,922	1,672	-13.0%	-250
334	Computer & Electronic Product Mfg.	1,932	1,637	-15.3%	-295
325	Chemical Manufacturing	931	1,274	+36.8%	+343
321	Wood Product Manufacturing	943	1,079	+14.4%	+136
326	Plastics & Rubber Products Mfg.	1,036	1,007	-2.8%	-29
339	Miscellaneous Manufacturing	874	958	+9.6%	+84
336	Transportation Equipment Mfg.	949	913	-3.8%	-36
337	Furniture and Related Product Mfg	603	682	+13.1%	+79
331	Primary Metal Manufacturing	562	514	-8.5%	-48
312	Beverage & Tobacco Product Mfg.	342	378	+10.5%	+36
314	Textile Product Mills	89	112	+25.8%	+23
315	Apparel Manufacturing	52	37	-28.8%	-15

Source: DEED [Employment Outlook](#)

Occupational Outlook

The decline in Southwest Minnesota manufacturing employment is expected to carry over into production occupations as well, leading to a projected 2.7 percent job decline from 2016 to 2026. However, the region is still expected to have significant demand for production workers over the next ten years due to a large number of labor market exit openings – jobs that become available because the existing worker retires out of the labor force or changes careers. There may be as many as 7,800 total openings for production occupations in the region, primarily from replacement openings.

Overall, 15 of the 48 production occupations in the region are expected to see new job growth from 2016 to 2026, led by Machinists; Extruding, Forming, Pressing and Compacting Machine Setters; First-line Supervisors of Production Workers; Stationary Engineers and Boiler Operators; and Welders, Cutters, Solderers, and Brazers. Each of these five occupations is projected to add more than 35 net new jobs during this time period.

In contrast, the biggest declines are projected for Team Assemblers; Inspectors, Testers, Sorters, Samplers, and Weighers; Extruding and Drawing Machine Setters; Printing Press Operators; and Electrical and Electronic Equipment Assemblers. Just six of the 48 production occupations are expected to lose more than 20 percent of their jobs, with Multiple Machine Tool Setters; Molding, Coremaking, and Casting Machine Setters; and Prepress Technicians seeing the most rapid drop-offs.

Regardless of growth or decline, every occupation is expected to at least have some replacement openings from 2016 to 2026. The largest number of total openings are projected for Slaughterers and Meat Packers, Team Assemblers, Packaging and Filling Machine Operators, Production Worker Helpers,

and First-line Supervisors of Production Workers, which are all expected to have at least 350 labor market exit openings in the region (see Table 9).

Table 9. Top 25 Southwest Minnesota Production Occupation Projections, 2016-2026

SOC Code	SOC Occupational Title	Estimated Employment 2016	Projected Employment 2026	Percent Change 2016-2026	Numeric Change 2016-2026	* Labor Market Exit Openings 2016-2026
0	Total, All Occupations	211,618	213,503	+0.9%	+1,885	+103,553
510000	Production Occupations	19,287	18,761	-2.7%	-526	+7,829
513023	Slaughterers & Meat Packers	2,253	2,201	-2.3%	-52	+1,000
512092	Team Assemblers	1,391	1,215	-12.7%	-176	+557
511011	First-Line Supervisors of Production Workers	1,069	1,114	+4.2%	+45	+348
514121	Welders, Cutters, Solderers, & Brazers	1,065	1,102	+3.5%	+37	+289
519111	Packaging & Filling Machine Operators	1,017	979	-3.7%	-38	+472
514041	Machinists	727	820	+12.8%	+93	+269
513022	Meat, Poultry, & Fish Cutters & Trimmers	770	752	-2.3%	-18	+342
519198	Helpers--Production Workers	713	708	-0.7%	-5	+381
514011	Computer-Controlled Machine Tool Operators	621	653	+5.2%	+32	+176
519061	Inspectors, Testers, Sorters, Samplers & Weighers	737	649	-11.9%	-88	+288
515112	Printing Press Operators	722	648	-10.2%	-74	+267
512099	Assemblers & Fabricators, All Other	639	610	-4.5%	-29	+267
519199	Production Workers, All Other	602	595	-1.2%	-7	+235
513092	Food Batchmakers	487	453	-7.0%	-34	+258
515113	Print Binding & Finishing Workers	367	326	-11.2%	-41	+263
513099	Food Processing Workers, All Other	324	318	-1.9%	-6	+138
518031	Water & Wastewater Treatment Plant Operators	315	294	-6.7%	-21	+87
512022	Electrical & Electronic Equipment Assemblers	356	284	-20.2%	-72	+162
514021	Extruding & Drawing Machine Operators	338	264	-21.9%	-74	+75
519041	Extruding, Forming, & Pressing Machine Setters	192	242	+26.0%	+50	+84
514031	Cutting, Punching, & Press Machine Setters	272	239	-12.1%	-33	+92
517011	Cabinetmakers & Bench Carpenters	207	231	+11.6%	+24	+102
516011	Laundry & Dry-Cleaning Workers	248	215	-13.3%	-33	+155
513021	Butchers & Meat Cutters	230	208	-9.6%	-22	+98
518021	Stationary Engineers & Boiler Operators	168	208	+23.8%	+40	+60

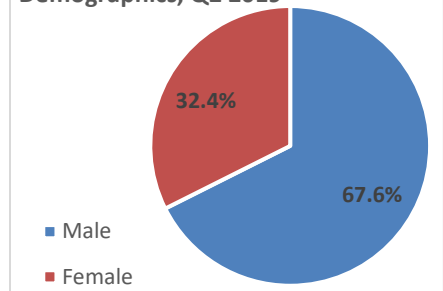
Source: DEED 2016-2026 Employment Outlook program

Workforce Demographics

Data from DEED's Quarterly Employment Demographics (QED) program shows that the manufacturing workforce in the Southwest region is relatively non-diverse. Through the second quarter of 2019, more than two-thirds (67.6 percent) of manufacturing workers are male, compared to one-third that are female (see Figure 3). In comparison, the workforce is much more evenly split between genders across the total of all industries, with about 52 percent of workers in the region being female.

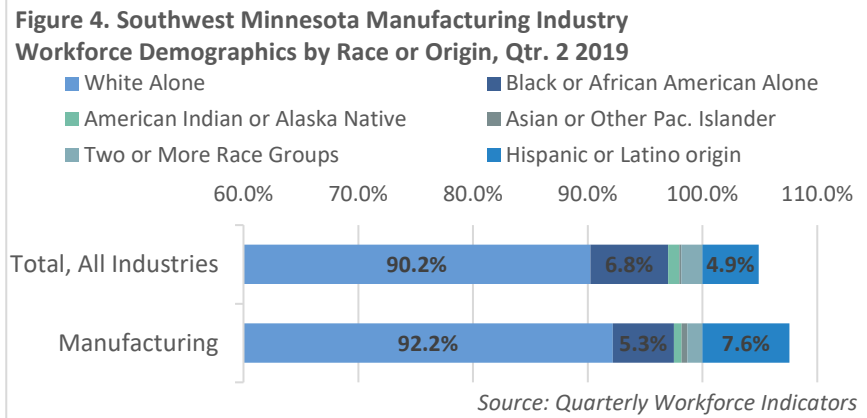
Additional demographic data from the U.S. Census Bureau's Quarterly Workforce Indicators (QWI) program show that the manufacturing workforce is also not very racially diverse. More than 92 percent of manufacturing workers in the region were white alone, while just over 5 percent were Black or African American. In addition, 7.6 percent were

Figure 3. Southwest Minnesota Manufacturing Industry Workforce Demographics, Q2 2019



Hispanic or Latino origin, making it the largest minority group of workers in the industry (see Figure 4 – please note that the numbers add up to more than 100 percent because Hispanic or Latino is an ethnicity rather than a race).

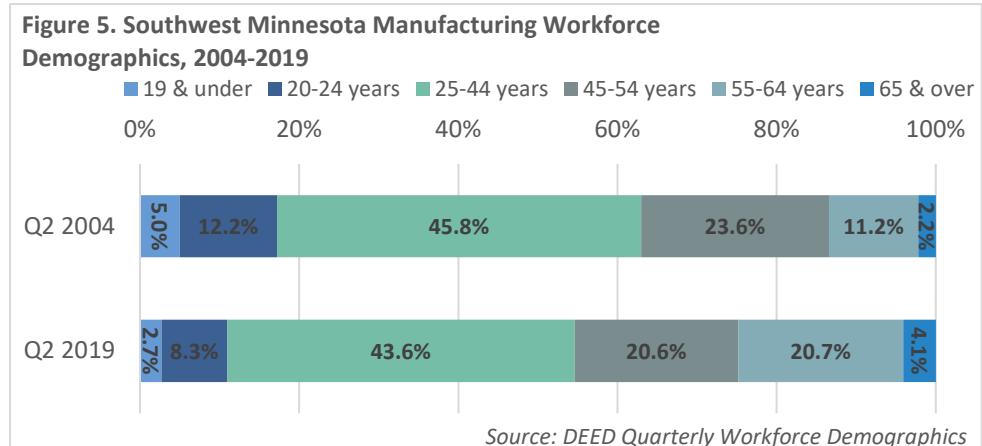
Despite the low numbers, the manufacturing workforce is becoming more diverse. The number of workers of other races more than doubled from 1,548 workers in 2004 to 3,219 workers in 2019. Likewise, the number of Hispanic or Latino workers in manufacturing grew more than 36 percent from 2004 to 2019.



As the workforce in Southwest Minnesota ages, new graduates and other jobseekers will become increasingly important sources of workers, particularly for the manufacturing industry, which shows a trend toward a larger percentage of older workers. QED data shows that in the second quarter of 2019, 24.8 percent of workers were 55 years of age or older, almost double the share in 2004. In contrast, the share of workers under the age of 25 fell from 17.2 percent in 2004 to 11 percent in 2019.

The proportion of workers aged 25 to 44 years old also dropped, from 45.8 percent in 2004 to 43.6 percent (see Figure 5).

In the face of tight labor markets, manufacturers may need to tap into new labor pools in order to attract the talent they need to grow and replace existing workers in the future.



Southeast Minnesota – Manufacturing Overview

According to DEED's [Quarterly Census of Employment and Wages](#) (QCEW) data, the 11-county Southeast Minnesota region was home to 686 manufacturing establishments providing 39,324 jobs in the third quarter of 2019. At that level, manufacturing accounted for 15.9 percent of total employment in the region, making it the second largest industry in the region behind health care and social assistance (66,654 jobs) and ahead of retail trade (25,794 jobs). Southeast has the second highest concentration of manufacturing employment of the 6 regions in the state and accounted for 12 percent of total manufacturing employment in the state.

In sum, these manufacturers provided about \$580 million in quarterly payroll in the third quarter of 2019, making it the second largest industry in terms of payroll, behind health care and social assistance. Average weekly wages in manufacturing were \$1,133, which was 10.2 percent higher than the total of all industries.

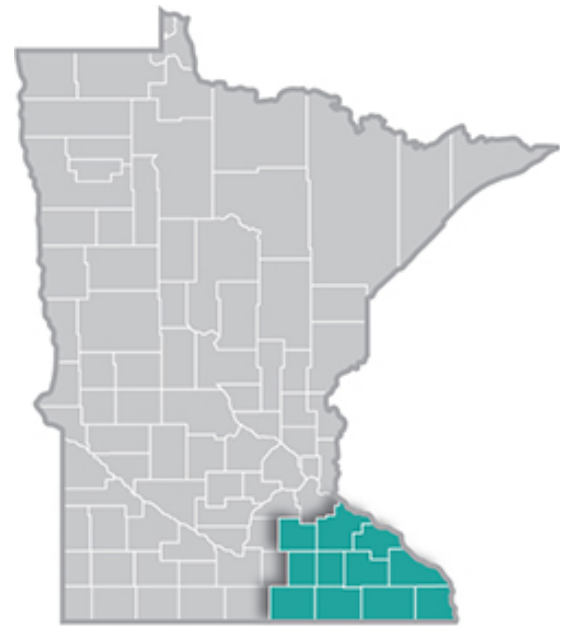


Table 1. Southeast Minnesota Manufacturing Industry Employment Statistics (Q3 2019)

NAICS Code	NAICS Industry Title	Number of Firms (Q3 2019)	Number of Jobs (Q3 2019)	Quarterly Payroll (Q3 2019)	Avg. Weekly Wage (Q3 2019)
0	Total, All Industries	12,793	247,934	\$3,315,449,418	\$1,028
1013	Manufacturing	686	39,324	\$579,483,867	\$1,133
311	Food Manufacturing	111	10,708	\$141,498,867	\$1,016
334	Computer & Electronic Product Manufacturing	27	4,966	\$123,124,705	\$1,907
333	Machinery Manufacturing	63	4,550	\$65,730,048	\$1,111
332	Fabricated Metal Product Manufacturing	125	4,316	\$55,250,782	\$984
327	Nonmetallic Mineral Product Manufacturing	55	2,929	\$40,885,586	\$1,073
339	Miscellaneous Manufacturing	68	1,683	\$17,967,161	\$821
337	Furniture & Related Product Manufacturing	44	1,510	\$19,787,695	\$1,008
326	Plastics & Rubber Products Manufacturing	22	1,416	\$16,551,669	\$899
325	Chemical Manufacturing	23	1,331	\$22,172,861	\$1,281
323	Printing & Related Support Activities	42	1,316	\$15,096,565	\$882
321	Wood Product Manufacturing	27	715	\$7,595,681	\$817
314	Textile Product Mills	13	587	\$7,756,384	\$1,016
336	Transportation Equipment Manufacturing	14	559	\$7,155,357	\$984
335	Electrical Equipment, App. & Component Mfg.	9	554	\$8,644,253	\$1,201
331	Primary Metal Manufacturing	11	497	\$7,055,113	\$1,091
322	Paper Manufacturing	7	488	\$6,631,369	\$1,045

Source: DEED Quarterly Census of Employment and Wages

Food Manufacturing was easily the largest sector in Southeast Minnesota, with 10,708 jobs at 111 establishments, and almost \$141.5 million in quarterly payroll. The region had 22.3 percent of statewide employment in Food Manufacturing. The largest subsectors include Animal Slaughtering and Processing (5,175 jobs), Grain and Oilseed Milling (1,817 jobs), Fruit and Vegetable Preserving and Specialty Food Manufacturing (1,362 jobs), and Dairy Product Manufacturing (1,299 jobs).

The second largest sector in the region is Computer and Electronic Product Manufacturing, which had 4,966 jobs at 27 establishments in the third quarter of 2019 and was also more concentrated in Southeast Minnesota than the state. Machinery Manufacturing (4,550 jobs) and Fabricated Metal Product Manufacturing (4,316 jobs) are the third and fourth largest sectors. Combined, these four leading sectors provided 62.4 percent of total manufacturing jobs in the region.

Southeast Minnesota also had large numbers of jobs in Nonmetallic Mineral Product Manufacturing (2,929 jobs), Miscellaneous Manufacturing (1,683 jobs), Furniture and Related Product Manufacturing (1,510 jobs), Plastics and Rubber Products Manufacturing (1,416 jobs), Chemical Manufacturing (1,331 jobs), and Printing and Related Support Activities (1,316 jobs). Printing and Related Support Activities (1,356 jobs). These six sectors accounted for another 25.9 percent of total manufacturing employment in the region.

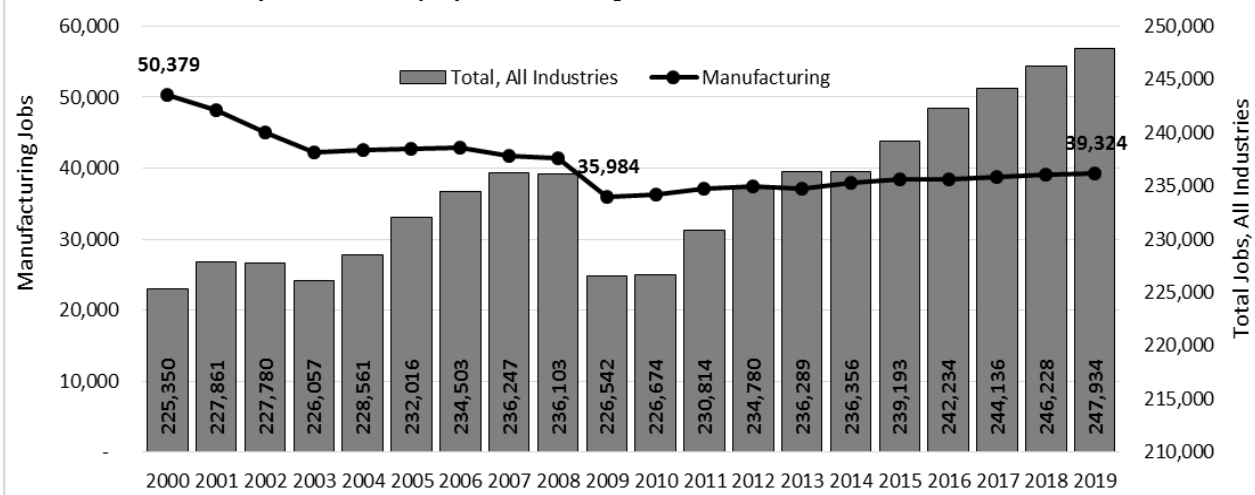
The region also had smaller but notable employment in Wood Product Manufacturing (715 jobs), Textile Product Mills (587 jobs), Transportation Equipment Manufacturing (559 jobs), Electrical Equipment, Appliance and Component Manufacturing (554 jobs), Primary Metal Manufacturing (497 jobs), and Paper Manufacturing (488 jobs).

Average weekly wages in Manufacturing sat at \$1,333 (equaling \$58,916 annually), which was 10.2 percent higher than the wages across all industries. These wages were led by high average weekly wages in Computer and Electronic Products Manufacturing (\$1,907), Chemical Manufacturing (\$1,281), Electrical Equipment, Appliance and Component Manufacturing (\$1,201), Machinery Manufacturing (\$1,111), and Primary Metal Manufacturing (\$1,091).

Industry Trends

Manufacturers in Southeast Minnesota cut about 5,350 jobs during the 2009 recession, with the lowest number of manufacturing jobs (35,984) occurring in the third quarter of 2009. Since then, the Southeast region has seen a slow but steady gain in manufacturing jobs, overall gaining 3,340 jobs from the third quarter of 2009 to the third quarter of 2019, an increase of 9.2 percent. Still, this number is much lower than what the region saw in 2000 where the number of manufacturing jobs sat at 50,379. Like manufacturing, the total jobs across all industries saw a similar increase, jumping 9.4 percent from the third quarter of 2009 to the third quarter of 2019. (see Figure 1).

Figure 1. Southeast Minnesota Employment Trends (Quarter 3 2000-Quarter 3 2019)
Source: DEED Quarterly Census of Employment and Wages



The biggest job declines in the past decade occurred in Computer and Electronic Product Manufacturing, which sliced 1,031 jobs from the third quarter of 2009 to the third quarter of 2019, a 17.2 percent decline. The region also suffered large drops in Miscellaneous Manufacturing, which cut 306 jobs, and Printing and Related Support Activities, which cut 250 jobs of their employment since the third quarter of 2009.

In sum, 3 of the 15 manufacturing sectors had fewer jobs in the third quarter of 2019 than in the third quarter of 2009, all three of which lost 15 percent or more of their employment. In contrast, 11 sectors saw employment growth since 2009, with the largest job gains occurring in Machinery Manufacturing, which added 1,103 jobs, and Nonmetallic Mineral Product Manufacturing, which gained 907 jobs. Southeast Minnesota also saw notable gains in Fabricated Metal Product Manufacturing, Chemical Manufacturing, and Plastics and Rubber Products Manufacturing, each of which saw an increase of over 500 jobs.

Encouragingly, 10 of the 15 sectors added jobs since 2013 and 9 sectors gained jobs in the past year. Unlike the ten-year trends, the second biggest loss over the last year was seen in Food Manufacturing, which lost 230 jobs over the past year, while Miscellaneous Manufacturing dropped by 262 jobs. Notable recent gains were in Machinery Manufacturing, which saw a gain of 284 jobs since the third quarter of 2018, and Fabricated Metal Product Manufacturing, which grew by 168 jobs. (See Table 2).

Table 2. Southeast Minnesota Manufacturing Industry Trends (2009-2019)

NAICS Industry Title	Number of Jobs (Q3 2019)	1-Year Trend (Q3 2018-Q3 2019)		5-Year Trend (Q3 2014-Q3 2019)		10-Year Trend (Q3 2009-Q3 2019)	
		Numeric Change	Percent Change	Numeric Change	Percent Change	Numeric Change	Percent Change
Total, All Industries	247,934	+1,706	+0.7%	+11,578	+4.9%	+21,392	+9.4%
Manufacturing	39,324	+229	+0.6%	+1,315	+3.5%	+3,340	+9.2%
Food Manufacturing	10,708	-230	-2.1%	-142	-1.3%	+249	+2.4%
Computer & Electronic Product Manufacturing	4,966	+118	+2.4%	+37	+0.8%	-1,031	-17.2%
Machinery Manufacturing	4,550	+284	+6.7%	+794	+21.1%	+1,103	+32.0%
Fabricated Metal Product Manufacturing	4,316	+168	+4.1%	+160	+3.8%	+626	+17.0%
Nonmetallic Mineral Product Manufacturing	2,929	+109	+3.9%	+553	+23.3%	+907	+44.9%
Miscellaneous Manufacturing	1,683	-262	-13.5%	-412	-19.7%	-306	-15.4%
Furniture & Related Product Manufacturing	1,510	+31	+2.1%	+181	+13.6%	+221	+17.1%
Plastics & Rubber Products Manufacturing	1,416	+117	+9.0%	+238	+20.2%	+506	+55.6%
Chemical Manufacturing	1,331	+45	+3.5%	+258	+24.0%	+536	+67.4%
Printing & Related Support Activities	1,316	-7	-0.5%	-226	-14.7%	-250	-16.0%
Wood Product Manufacturing	715	+12	+1.7%	+136	+23.5%	+253	+54.8%
Textile Product Mills	587	-69	-10.5%	-71	-10.8%	+107	+22.3%
Transportation Equipment Manufacturing	559	-59	-9.5%	-300	-34.9%	+5	+0.9%
Primary Metal Manufacturing	497	+26	+5.5%	+59	+13.5%	+199	+66.8%
Paper Manufacturing	488	-41	-7.8%	+120	+32.6%	0	0.0%

Source: DEED Quarterly Census of Employment and Wages

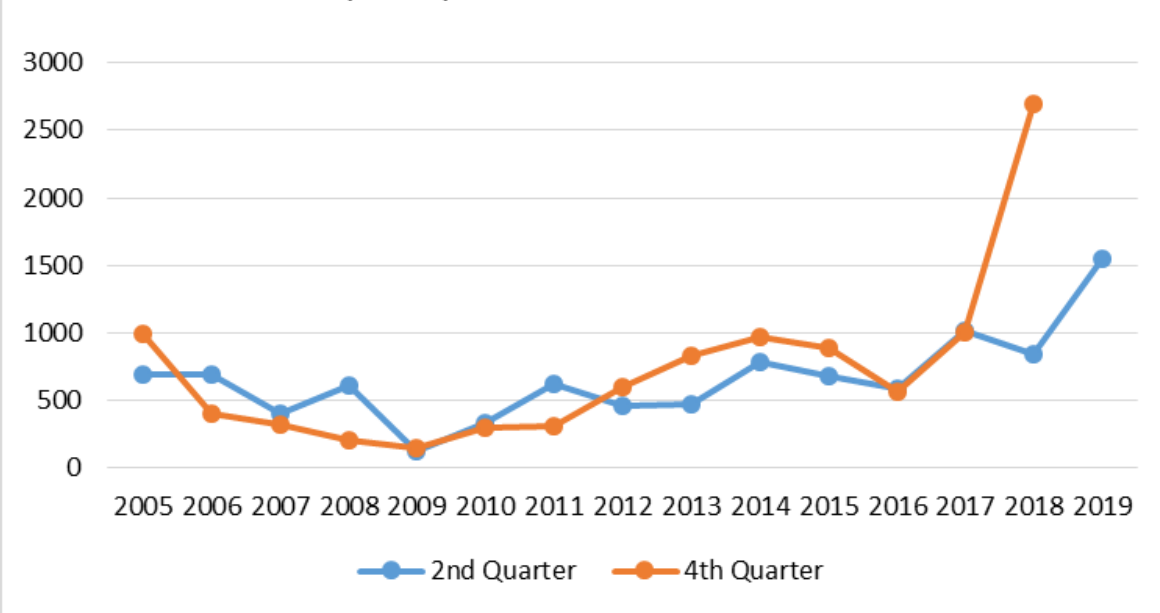
Industry Demand

Overall, the steady recovery in manufacturing employment in recent years has led to a rising number of [job vacancies](#) across the Southeast Minnesota region. The 2,699 job vacancies reported by manufacturing employers in the fourth quarter of 2018 was by far the record high and was 2.7 times higher than was seen in the fourth quarter of 2005. Most recent estimates however show that this

number had dropped considerably from the fourth quarter of 2018 to the second quarter of 2019, falling by about 1,150 job vacancies. (See figure 2).

Figure 1. Southeast Manufacturing Job Vacancies (2005-2019)

Source: DEED Job Vacancy Survey



The median wage offered for these vacancies climbed to \$15.13 per hour in the second quarter of 2019, a little over \$3.50 lower than openings reported in the second quarter of 2018, but up almost \$3.20 per hour compared to the second quarter of 2014. One-quarter of the manufacturing vacancies required postsecondary education and 46 percent required at least a year of prior work experience, which was up slightly compared with the last couple of years. Just 1 percent of the posted manufacturing openings were part-time, as compared to 38 percent of vacancies across all industries (see Table 3).

Table 3. Southeast Minnesota Manufacturing Job Vacancy Survey (2nd Qtr. 2019)

NAICS Industry Title	Number of Job Vacancies	Median Wage Offer	Percent Part-Time	Percent Requiring Post-Secondary Education	Percent Requiring 1+ Years Experience
Total, All Industries	13,672	\$14.38	38%	21%	37%
Manufacturing	1,551	\$15.13	1%	25%	46%

Source: DEED Job Vacancy Survey

The largest number of manufacturing vacancies were production occupations, including food processing workers, assemblers and fabricators, metal and plastics workers, and other production occupations. The median wage offer for these positions was \$14.92 but ranged between \$12 and \$29 per hour. Manufacturers in Southeast Minnesota were also looking to hire sales and office, transportation and material moving, management, and installation, maintenance, and repair workers (see Table 4).

Table 4. Southeast Minnesota Production Occupations Job Vacancy Survey (2nd Qtr. 2019)

SOC Occupational Title	Number of Job Vacancies	Median Wage Offer	Percent Part-Time	Percent Requiring Post-Secondary Education	Percent Requiring 1+ Years Work Experience
Total, All Occupations	13,672	\$14.38	38%	21%	37%
Production Occupations	958	\$14.92	1%	7%	28%
Supervisors of Production Workers	19	\$28.67	0%	56%	87%
Assemblers & Fabricators	176	\$12.78	0%	0%	21%
Food Processing Workers	247	\$12.00	0%	0%	1%
Metal Workers & Plastic Workers	149	\$17.92	0%	30%	76%
Printing Workers	10	\$14.89	N/A	N/A	N/A
Textile, Apparel, & Furnishings Workers	14	\$12.84	48	0%	0%
Woodworkers	206	\$14.52	0%	0%	16%
Plant & System Operators	31	\$19.33	3%	13%	93%
Other Production Occupations	106	\$16.12	2%	6%	31%
Office & Administrative Support	1096	\$11.59	64%	4%	25%
Transportation & Material Moving	936	\$15.51	25%	2%	46%
Architecture & Engineering	260	\$26.53	1%	96%	92%
Management	211	\$39.21	1%	74%	98%
Installation, Maintenance & Repair	783	\$19.55	3%	19%	44%
Sales & Related	1064	\$12.30	30%	2%	39%

Source: DEED [Job Vacancy Survey](#)

Industry Occupational Employment

DEED's Occupational Employment Statistics (OES) program provides detailed employment and wage data for a wide range of occupations involved in manufacturing. In sum, there were an estimated 24,960 people working in production occupations in Southeast Minnesota, accounting for about 10.3 percent of total employment in the region. Median hourly wages for production occupations were \$18.15 in 2019 but ranged from \$12.04 at the low end to \$45.32 at the high end.

As noted above, in addition to production occupations, manufacturers also require the services of workers in several other occupational groups, such as office and administrative support, transportation and material moving, architecture and engineering, management, and installation, maintenance and repair. Not surprisingly, wages were higher for the higher-level positions (see Table 5).

Table 5. Southeast Minnesota Occupational Employment & Wage Statistics (2019)

SOC Occupational Title	Estimated Regional Employment	Regional Median Hourly Wage	Estimated Statewide Employment	Statewide Median Wage
Total, All Occupations	241,540	\$19.28	2,867,700	\$20.95
Production Occupations	24,960	\$18.15	214,230	\$18.68
Office & Administrative Support	30,890	\$17.39	405,970	\$19.10
Transportation & Material Moving	14,740	\$17.05	177,580	\$18.48
Architecture & Engineering	3,400	\$36.49	56,070	\$37.53
Management	10,670	\$42.79	171,250	\$51.26
Installation, Maintenance & Repair	8,880	\$21.82	100,030	\$23.13
Sales & Related	21,310	\$13.49	277,070	\$14.97
Business & Financial Operations	7,460	\$28.97	164,510	\$33.03
Computer & Mathematical	4,140	\$40.41	96,020	\$40.96

Source: DEED [Occupational Employment Statistics \(OES\)](#) program

Team assemblers, slaughterers and meat packers, package and filling machine operators, first-line supervisors, and more are among the most common production jobs found at manufacturing firms in Southeast Minnesota, according to DEED's Occupational Employment Statistics data. Median hourly wages for these manufacturing positions ranged from a low of \$13.60 for packers and packagers to a high of about \$45 per hour for power plant operators. Almost all the production-related manufacturing occupations can be gained with a high school diploma and learned through on-the-job training, though some also benefit from vocational training or associate degrees (see Table 6).

Table 6. SE Minnesota Top 30 Production-Related Manufacturing Occupations (2019 Wage Data)			
SOC Code	SOC Occupational Title	Estimated Regional Employment	Median Hourly Wage
512098	Team & All Other Assemblers	3,530	\$15.42
533032	Heavy & Tractor-Trailer Truck Drivers	3,720	\$21.40
537062	Laborers & Freight, Stock & Material Movers	3,000	\$15.78
499071	Maintenance & Repair Workers, General	2,180	\$20.50
513023	Slaughterers & Meat Packers	1,700	\$16.84
519111	Packaging & Filling Machine Operators	1,680	\$19.31
511011	Supervisors of Production & Operating Workers	1,630	\$29.03
513022	Meat, Poultry, & Fish Cutters and Trimmers	1,450	\$14.55
519061	Inspectors, Testers, Sorters, Samplers, & Weighers	1,140	\$20.54
514121	Welders, Cutters, Solderers, & Brazers	1,090	\$20.27
537051	Industrial Truck & Tractor Operators	870	\$20.33
514041	Machinists	810	\$21.95
513092	Food Batchmakers	800	\$19.65
537064	Packers & Packagers, Hand	730	\$13.60
519198	Helpers--Production Workers	670	\$14.03
519199	Production Workers, All Other	570	\$22.78
499041	Industrial Machinery Mechanics	540	\$24.75
514031	Cutting, Punching, & Press Machine Operators	480	\$20.82
517042	Woodworking Machine Operators	480	\$15.57
514072	Molding, Coremaking, & Casting Machine Operators	400	\$15.84
515112	Printing Press Operators	320	\$21.15
519023	Mixing & Blending Machine Operators	290	\$18.77
519121	Coating, Painting, & Spraying Machine Operators	280	\$18.21
519193	Cooling & Freezing Equipment Operators	260	\$23.08
514011	Computer-Controlled Machine Tool Operators	250	\$18.08
518031	Water & Liquid Waste Treatment Plant & System Operators	250	\$26.80
517011	Cabinetmakers & Bench Carpenters	230	\$21.67
513021	Butchers & Meat Cutters	220	\$17.18
515113	Print Binding & Finishing Workers	220	\$15.99

Source: DEED [Occupational Employment Statistics \(OES\)](#) program

In addition to the production-related occupations, manufacturers also rely heavily on sales and office workers including manufacturing sales representatives, customer service representatives, and production, planning, shipping, and traffic clerks; transportation and material moving workers such as truck drivers and packers and packagers; engineering occupations like industrial, mechanical, and electrical engineers; management positions such as industrial production and general managers; and business and financial operations occupations like accountants and auditors.

Many of these occupations require higher education, but also offer higher wages. For example, all the engineering positions have median wages above \$30 per hour in Southeast Minnesota, with median wages over \$60 per hour for engineering managers, but also require bachelor's degrees at the minimum. Likewise, systems software developers and industrial production managers earn over \$45 per hour and require bachelor's degrees. In contrast, sales representatives required just a high school diploma, but also offered relatively high wages (see Table 7).

Table 7. Southeast Minnesota Top 20 Office-Related Manufacturing Occupations (2019 Wage Data)

SOC Code	SOC Occupational Title	Estimated Regional Employment	Median Hourly Wage
414012	Sales Representatives, Wholesale & Manufacturing	2,120	\$31.00
172112	Industrial Engineers	810	\$38.87
434051	Customer Service Representatives	3,370	\$16.02
111021	General & Operations Managers	3,360	\$34.67
435071	Shipping, Receiving, & Traffic Clerks	920	\$17.07
113051	Industrial Production Managers	560	\$46.38
172141	Mechanical Engineers	280	\$35.61
433031	Bookkeeping, Accounting, & Auditing Clerks	2,050	\$19.44
439061	Office Clerks, General	4,340	\$16.58
435061	Production, Planning, & Expediting Clerks	350	\$23.22
436014	Secretaries & Administrative Assistants	3,470	\$17.19
173026	Industrial Engineering Technicians	320	\$21.16
435081	Stock Clerks & Order Fillers	3,150	\$13.58
151133	Software Developers, Systems Software	N/A	\$45.78
132011	Accountants & Auditors	1,030	\$29.78
119041	Architectural & Engineering Managers	180	\$60.81
112022	Sales Managers	520	\$50.88
151132	Software Developers, Applications	750	\$44.29
172071	Electrical Engineers	270	\$48.84
431011	Supervisors of Office and Admin. Support Workers	1,440	\$25.51

Source: DEED [Occupational Employment Statistics \(OES\)](#) program

Industry Outlook

According to DEED's 2016 to 2026 Employment Outlook data, the Southeast Minnesota manufacturing sector is projected to gain about 700 jobs over the next decade, a 1.9 percent increase. The state of Minnesota is projected to lose about 5,400 manufacturing jobs from 2016 to 2026, a 1.7 percent decline. The increase in Manufacturing is in tandem to overall growth of 4.6 percent across the total of all industries in Southeast Minnesota.

Eight of the 20 sectors are expected to see job declines in the next decade, with the most severe losses projected in Computer and Electronic Product Manufacturing, which is expected to lose 1,124 jobs from 2016 to 2026. Leather and Allied Product Manufacturing, Furniture and Related Product Manufacturing, and Transportation Equipment Manufacturing are also projected to lose over 100 jobs.

In contrast, 12 of the 20 manufacturing sectors are expected to add jobs, led by an increase of 572 food manufacturing jobs and a strong resurgence in Machinery Manufacturing, which is projected to gain 421 net new jobs, a 10.4 percent expansion. The region may also see significant job growth in Nonmetallic Mineral Product Manufacturing and Miscellaneous Manufacturing, and smaller gains in sectors like

Plastics and Rubber Products Manufacturing, Textile Product Mills, and Wood Product Manufacturing. (see Table 8).

Table 8. Southeast Minnesota Manufacturing Industry Projections (2016-2026)					
NAICS Code	Industry	Estimated Employment 2016	Projected Employment 2026	Percent Change 2016-2026	Numeric Change 2016-2026
0	Total, All Industries	273,731	286,229	+4.6%	+12,498
31	Manufacturing	37,965	38,669	+1.9%	+704
311	Food Manufacturing	10,510	11,082	+5.4%	+572
334	Computer and Electronic Product Mfg	4,721	3,597	-23.8%	-1,124
332	Fabricated Metal Product Mfg	4,122	4,094	-0.7%	-28
333	Machinery Mfg	4,057	4,478	+10.4%	+421
327	Nonmetallic Mineral Product Mfg	2,411	2,795	+15.9%	+384
339	Miscellaneous Mfg	2,213	2,579	+16.5%	+366
323	Printing and Related Support Activities	1,453	1,379	-5.1%	-74
337	Furniture and Related Product Mfg	1,404	1,224	-12.8%	-180
325	Chemical Mfg	1,229	1,229	0.0%	0
326	Plastics & Rubber Products Mfg	1,100	1,354	+23.1%	+254
316	Leather and Allied Product Mfg	799	589	-26.3%	-210
336	Transportation Equipment Mfg	778	647	-16.8%	-131
314	Textile Product Mills	714	873	+22.3%	+159
335	Electrical Equipment and Appliances Mfg	698	750	+7.4%	+52
321	Wood Product Mfg	620	745	+20.2%	+125
322	Paper Mfg	471	556	+18.0%	+85
331	Primary Metal Mfg	393	331	-15.8%	-62
312	Beverage & Tobacco Product Mfg	163	236	+44.8%	+73
313	Textile Mills	98	127	+29.6%	+29
315	Apparel Mfg	11	4	-63.6%	-7

Source: DEED Employment Outlook

Occupational Outlook

With the increase in Southeast Minnesota manufacturing employment, the number of production occupations is expected to increase modestly, leading to a projected 3.8 percent job increase from 2016 to 2026. In addition, the region is still expected to have significant demand for production workers over the next ten years due to a large number of labor force exit openings – jobs that become available because the existing worker retires out of the labor force or changes careers. There may be almost 11,750 total openings for production occupations in the region, primarily from replacement openings.

Overall, 34 of the 53 production occupations in the region are expected to see new job growth from 2016 to 2026, led by Production Helpers, Welders, Cutters, Solderers and Brazers, and Packaging and Filling Machine Operators, which are all projected to add more than 110 new jobs. Production Supervisors, Food Batchmakers, All Other Production Workers, and Machinists are also projected to have notable employment growth in the next decade.

In contrast, the biggest declines are projected for Team Assemblers, Inspectors, Testers, Sorters, Samplers and Weighers, All Other Assemblers and Fabricators, Cabinetmakers and Bench Carpenters, and Plating and Coating Machine Operators. Just five of the 53 production occupations are expected to lose more than 10 percent of their jobs, with Photographic Process Workers and Plating and Coating Machine Operators seeing the most rapid drop-offs.

Regardless of growth or decline, every occupation is expected to at least have some labor force exit openings from 2016 to 2026. The largest number of labor force exit openings are projected for Team Assemblers, Production Helpers, Packaging and Filling Machine Operators, and Food Batchmakers, each of which is anticipated to see over 500 labor force exit openings (see Table 9).

Table 9. Top 25 Southeast Minnesota Production Occupation Projections (2016-2026)						
SOC Code	SOC Occupational Title	Estimated Employment 2016	Projected Employment 2026	Percent Change	Total Change	Labor Force Exit Openings
0	Total, All Occupations	273,731	286,229	+4.6%	+12,498	+131,011
510000	Production Occupations	25,093	26,056	+3.8%	+963	+10,783
512092	Team Assemblers	2,487	2,408	-3.2%	-79	+1,045
519111	Packaging & Filling Machine Operators	1,381	1,497	+8.4%	+116	+680
511011	Supervisors of Production & Operating Workers	1,323	1,421	+7.4%	+98	+437
519198	Helpers--Production Workers	1,156	1,419	+22.8%	+263	+690
514041	Machinists	1,115	1,209	+8.4%	+94	+404
514121	Welders, Cutters, Solderers, & Brazers	917	1,074	+17.1%	+157	+265
513092	Food Batchmakers	869	964	+10.9%	+95	+503
514031	Cutting, Punching, & Press Machine Operators	870	943	+8.4%	+73	+328
519061	Inspectors, Testers, Sorters, Samplers, & Weighers	1010	936	-7.3%	-74	+404
519199	Production Workers, All Other	699	794	+13.6%	+95	+293
512099	Assemblers & Fabricators, All Other	783	719	-8.2%	-64	+321
514011	Computer-Controlled Machine Tool Operators	432	477	+10.4%	+45	+125
516031	Sewing Machine Operators	408	473	+15.9%	+65	+250
515112	Printing Press Operators	451	459	+1.8%	+8	+177
519121	Coating, Painting, & Spraying Machine Operators	313	333	+6.4%	+20	+92
516011	Laundry & Dry-Cleaning Workers	319	319	0.0%	0	+214
517011	Cabinetmakers & Bench Carpenters	349	317	-9.2%	-32	+155
513021	Butchers & Meat Cutters	280	303	+8.2%	+23	+131
515113	Print Binding & Finishing Workers	257	277	+7.8%	+20	+203
517042	Woodworking Machine Operators	248	268	+8.1%	+20	+99
513011	Bakers	259	267	+3.1%	+8	+169
514072	Molding, Coremaking, & Casting Machine Operators	262	258	-1.5%	-4	+95
519032	Cutting & Slicing Machine Operators	222	244	+9.9%	+22	+84
519023	Mixing & Blending Machine Operators	196	223	+13.8%	+27	+75
519195	Molders, Shapers, & Casters	124	143	+15.3%	+19	+51
<i>Source: DEED Employment Outlook</i>						

Figure 3. Minnesota Manufacturing Workforce Demographics, 2003-2018

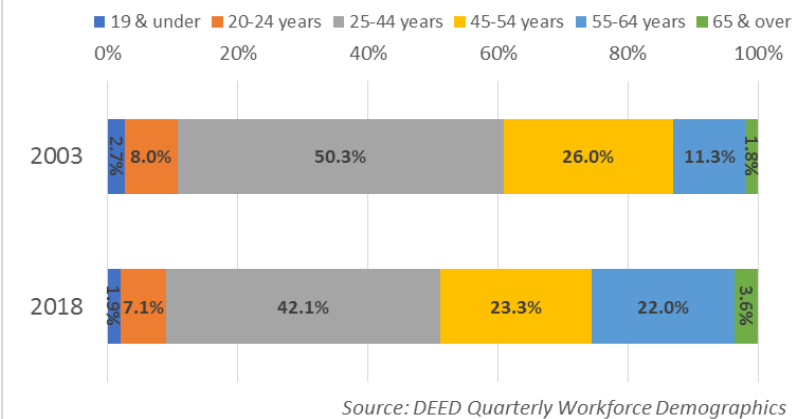
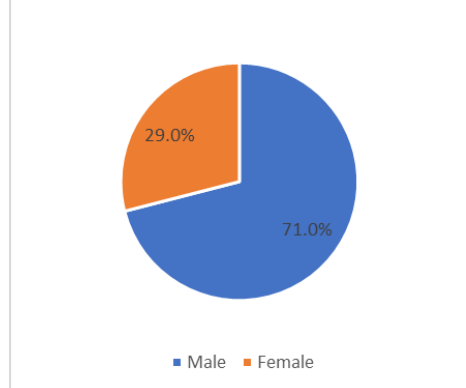


Figure 4. Minnesota Manufacturing Industry Workforce Demographics, 2018

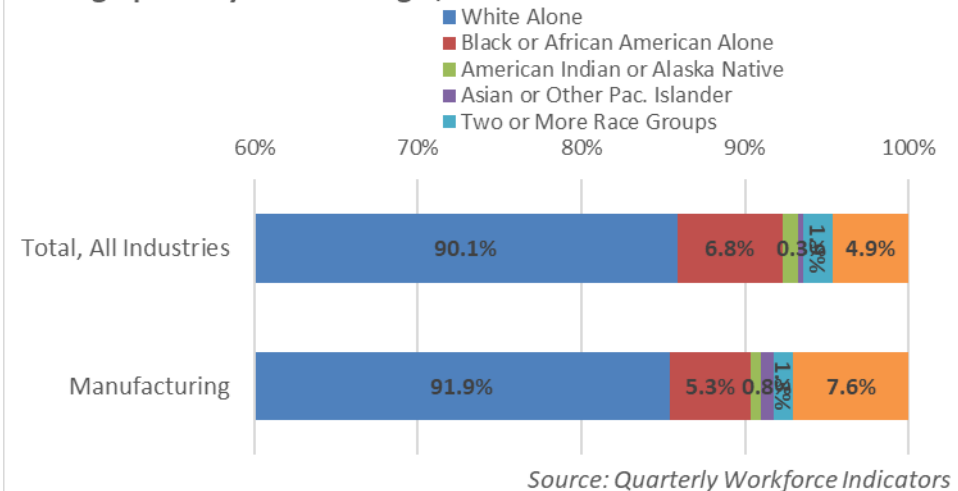


New graduates and other jobseekers will be important in filling the workforce pipeline in the manufacturing industry, which is exhibiting a trend toward a larger percentage of older workers. In 2018, over one-fourth (25.6 percent) of workers in the industry were 55 years or older, up from just 13.1 percent of the workforce back in 2003. In contrast, 9 percent of workers in the industry were under 25 years of age, down from 10.7 percent in 2003. Likewise, the percent of workers from 25 to 44 years of age dropped from 50.3 percent of the total in 2003 to just 42.1 percent in 2018 (see Figure 3).

Further demographic data from DEED's Quarterly Employment Demographics program shows that the manufacturing industry is relatively non-diverse, with males accounting for 71 percent of workers (see Figure 4), and 91.9 percent reporting white as their race (see Figure 5). However, the racial diversity of the workforce has changed over time, with the number of manufacturing workers identifying as white alone declining by 6.7 percent from 2003 to 2018, compared to a 116.8 percent increase in the number of jobholders of other race groups.

Likewise, the number of Hispanic or Latino workers in manufacturing jumped by 35.1 percent from 2003 to 2018. In the face of tight labor markets, manufacturers may need to tap into new labor pools in order to attract the talent they need to grow and replace existing workers in the future.

Figure 5. Minnesota Manufacturing Industry Workforce Demographics by Race or Origin, 2018



7-County Twin Cities Metro Area Minnesota – Manufacturing Overview

According to DEED's [Quarterly Census of Employment and Wages](#) (QCEW) data, the 7-county Twin Cities metro area was home to 4,090 manufacturing establishments providing 174,402 jobs through the third quarter of 2019. That was just over half (53.2 percent) of total manufacturing employment in the state. Manufacturing accounted for 9.7 percent of total employment in the region, making it the second largest industry behind health care and social assistance (275,202 jobs), and just ahead of retail trade (167,804 jobs).

These manufacturers provided over \$3.4 billion in total payroll through the third quarter of 2019, again making it the second largest industry behind only health care and social assistance. Average annual wages in manufacturing were \$78,624 in 2019, which was nearly 25 percent higher than the total of all industries.

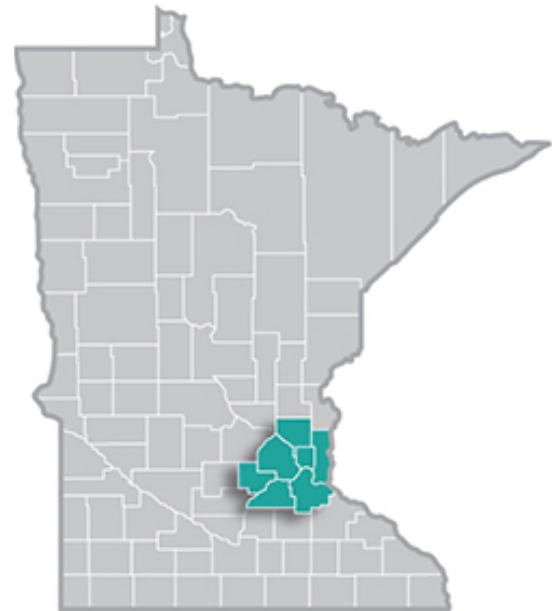


Table 1. Twin Cities Metro Manufacturing Industry Employment Statistics, Quarter 3 2019

NAICS Code	NAICS Industry Title	Number of Firms, Q3 2019	Number of Jobs, Q3 2019	Quarterly Payroll, Q3 2019	Avg. Annual Wages, Q3 2019
0	Total, All Industries	85,507	1,777,813	\$28,125,473,326	\$63,232
31	Manufacturing	4,090	174,402	\$3,429,501,101	\$78,624
334	Computer & Electronic Product Manufacturing	325	36,364	\$1,084,933,696	\$119,340
332	Fabricated Metal Product Manufacturing	812	25,427	\$412,544,735	\$64,896
339	Miscellaneous Manufacturing	637	20,853	\$354,210,860	\$67,912
333	Machinery Manufacturing	380	16,760	\$319,187,059	\$76,128
323	Printing & Related Support Activities	407	13,229	\$216,114,970	\$65,312
311	Food Manufacturing	272	10,976	\$152,532,979	\$55,536
326	Plastics & Rubber Products Manufacturing	187	10,140	\$151,136,708	\$59,592
325	Chemical Manufacturing	138	8,781	\$205,315,288	\$93,496
321	Wood Product Manufacturing	106	5,117	\$71,372,893	\$55,744
335	Electrical Equipment, Appliance, & Comp. Mfg.	88	4,993	\$88,114,253	\$70,564
337	Furniture & Related Product Manufacturing	234	4,149	\$69,434,482	\$66,924
322	Paper Manufacturing	69	4,129	\$72,569,046	\$70,252
331	Primary Metal Manufacturing	42	3,316	\$59,650,657	\$71,916
312	Beverage & Tobacco Product Manufacturing	90	2,550	\$26,908,855	\$42,172
327	Nonmetallic Mineral Product Manufacturing	96	2,517	\$46,347,454	\$73,632
324	Petroleum & Coal Products Manufacturing	17	1,967	\$58,192,809	\$118,300
336	Transportation Equipment Manufacturing	81	1,667	\$26,016,302	\$62,400
314	Textile Product Mills	56	738	\$6,964,010	\$37,700
315	Apparel Manufacturing	39	345	\$3,305,278	\$38,272
313	Textile Mills	6	195	\$2,121,427	\$43,472
316	Leather & Allied Product Manufacturing	8	183	\$2,527,340	\$55,224

Source: DEED [Quarterly Census of Employment & Wages \(QCEW\)](#) program

Computer and Electronic Product Manufacturing was easily the largest sector in the Twin Cities, with 36,364 jobs, followed by Fabricated Metal Product Manufacturing, which had 25,427 jobs through the third quarter of 2019. Combined, those two sectors accounted for over one-third (35.4 percent) of the region's manufacturing employment.

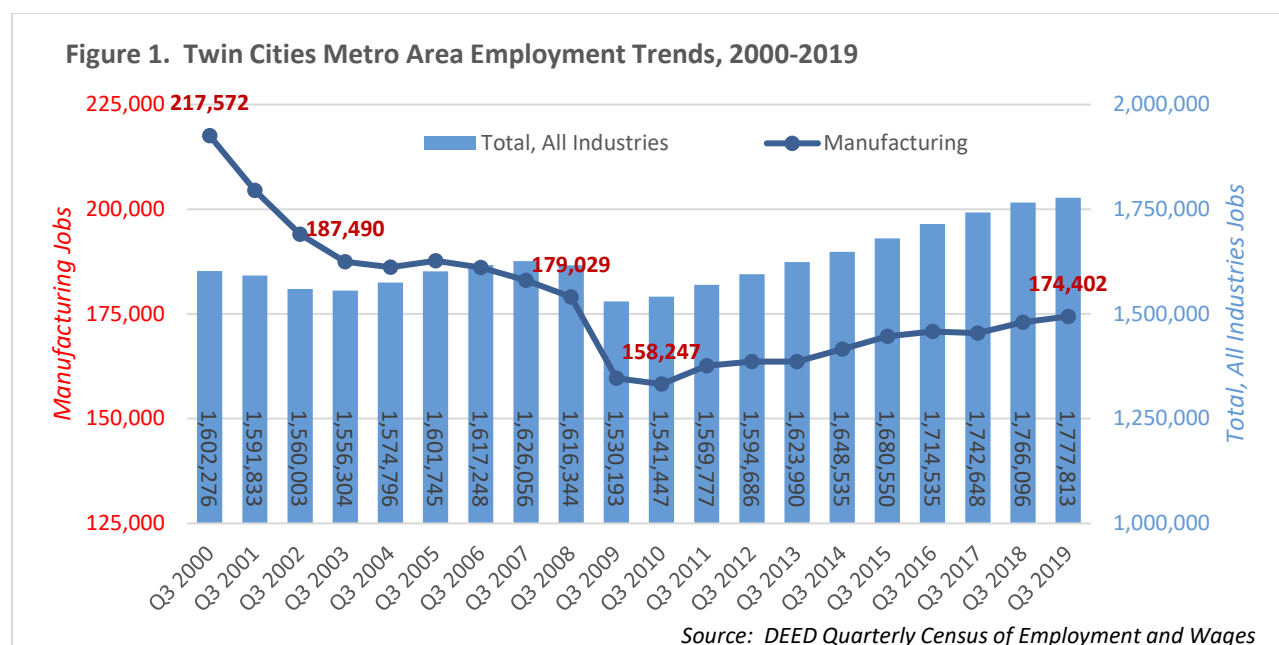
The region also had large numbers of jobs in Miscellaneous Manufacturing (20,853 jobs), which includes medical devices and equipment; Machinery Manufacturing (16,760 jobs), Printing and Related Support Activities (13,229 jobs), and Food Manufacturing (10,976 jobs). Those four sectors combined for another 35.4 percent of total manufacturing employment in the region.

The Twin Cities also has notable employment in the Plastics and Rubber Product Manufacturing (10,140 jobs), Chemical Manufacturing (8,781 jobs), Wood Product Manufacturing (5,117 jobs), Electrical Equipment and Appliance Manufacturing (4,993 jobs), Furniture and Related Product Manufacturing (4,149 jobs), Paper Manufacturing (4,129 jobs) and Primary Metal Manufacturing (3,316 jobs) sectors.

Average annual wages in manufacturing (\$78,624) were about 25 percent higher than the total of all industries (\$63,232), led by extremely high average weekly wages in Computer and Electronic Product Manufacturing (\$119,340), Petroleum and Coal Products Manufacturing (\$118,300), Chemical Manufacturing (\$93,496), Machinery Manufacturing (\$76,128), Nonmetallic Mineral Manufacturing (\$73,632), Electrical Equipment and Appliance Manufacturing (\$70,564), and Miscellaneous Manufacturing (\$67,912),

Industry Trends

Between 2000 and 2010, the manufacturing industry experienced employment declines in the Twin Cities. Manufacturers cut huge numbers of jobs during the 2001 recession, then mostly held steady from 2003 to 2007. The region's manufacturers then suffered even more significant job losses during the recession from 2008 to 2010, dropping to a low of 158,247 jobs through the third quarter of 2010. However, manufacturers in the region have regained almost 16,200 jobs from 2010 to 2019, a 10.2 percent increase (see Figure 1).



Due to recent gains, Twin Cities manufacturers have 14,761 more jobs now than in 2009, the start of the recession. Manufacturing employment was down about 8 percent from 2006 to 2016, while the total of all industries surpassed its pre-recession peak in 2014 and is now up over 160,565 jobs since 2009, a 9.9 percent increase in jobs.

The biggest job declines from 2009 to 2019 occurred in Printing and Related Support Activities, which sliced 2,211 jobs and Paper Manufacturing decreased by 960 jobs, an 18.9 percent decrease. In sum, 15 of the 21 manufacturing sectors had more jobs in 2019 than in 2009, including ten that added more than 15 percent of their employment with the largest job gains occurring in Fabricated Metal Product Manufacturing, which added 3,499 jobs. The Twin Cities also saw big gains in Miscellaneous Manufacturing, Plastics and Rubber Product Manufacturing, and Chemical Manufacturing.

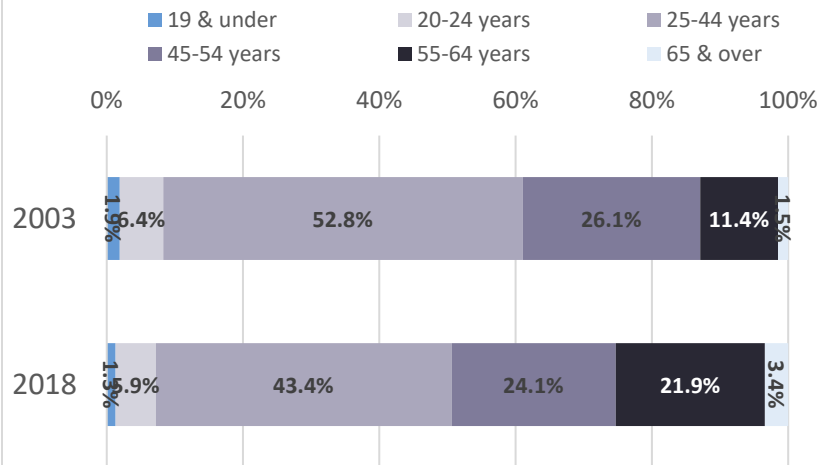
Eleven of the 21 sectors added jobs in the past year, and 13 of the 21 sectors were up since the third quarter of 2014, showing a widespread and relatively strong recovery from the Great Recession (see Table 2).

Table 2. Twin Cities Manufacturing Industry Trends, 2009-2019							
NAICS Industry Title	Number of Jobs, Q3 2019	1-Year Trend, Q3 2018-Q3 2019		5-Year Trend, Q3 2014-Q3 2019		10-Year Trend, Q3 2009-Q3 2019	
		Numeric Change	Percent Change	Numeric Change	Percent Change	Numeric Change	Percent Change
Total, All Industries	1,777,813	+11,717	+0.7%	+129,278	+7.8%	+247,620	+16.2%
Manufacturing	174,402	+1,389	+0.8%	+7,779	+4.7%	+14,761	+9.2%
Computer and Electronic Prod. Mfg.	36,364	+28	+0.1%	+938	+2.6%	+905	+2.6%
Fabricated Metal Product Mfg.	25,427	+226	+0.9%	+1,174	+4.8%	+3,499	+16.0%
Miscellaneous Manufacturing	20,853	+1,685	+8.8%	+3,531	+20.4%	+3,422	+19.6%
Machinery Manufacturing	16,760	-552	-3.2%	-399	-2.3%	+1,450	+9.5%
Printing and Related Support Activities	13,229	-234	-1.7%	-1,737	-11.6%	-2,211	-14.3%
Food Manufacturing	10,976	-90	-0.8%	-479	-4.2%	+883	+8.7%
Plastics and Rubber Prod. Mfg.	10,140	-177	-1.7%	+1,189	+13.3%	+2,236	+28.3%
Chemical Manufacturing	8,781	+72	+0.8%	+1,804	+25.9%	+1,247	+16.6%
Wood Product Manufacturing	5,117	+157	+3.2%	+1,032	+25.3%	+996	+24.2%
Electrical Equipment, Appliance Mfg.	4,993	+560	+12.6%	+315	+6.7%	+1,003	+25.1%
Furniture and Related Product Mfg.	4,149	-28	-0.7%	-126	-2.9%	+459	+12.4%
Paper Manufacturing	4,129	-34	-0.8%	-589	-12.5%	-960	-18.9%
Primary Metal Manufacturing	3,316	+21	+0.6%	-195	-5.6%	+424	+14.7%
Beverage and Tobacco Mfg.	2,550	+175	+7.4%	+874	+52.1%	+1,079	+73.4%
Nonmetallic Mineral Product Mfg.	2,517	+123	+5.1%	+395	+18.6%	+349	+16.1%
Petroleum and Coal Products Mfg.	1,967	-68	-3.3%	-376	-16.0%	-81	-4.0%
Transportation Equipment Mfg.	1,667	+53	+3.3%	+261	+18.6%	-143	-7.9%
Textile Product Mills	738	-510	-40.9%	+140	+23.4%	+141	+23.6%
Apparel Manufacturing	345	+1	+0.3%	+42	+13.9%	+89	+34.8%
Textile Mills	195	-10	-4.9%	+10	+5.4%	-7	-3.5%
Leather and Allied Product Mfg.	183	-10	-5.2%	-24	-11.6%	-18	-9.0%

Source: DEED [Quarterly Census of Employment & Wages \(QCEW\)](#) program

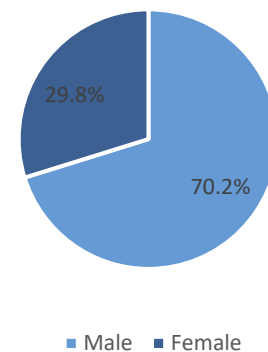
New graduates and other jobseekers will be important in filling the workforce pipeline in the manufacturing industry, which is exhibiting a trend toward a larger percentage of older workers. In 2018, one-fourth (25.3 percent) of workers in the industry were 55 years or older, up from just 12.9 percent of the workforce back in 2003. In contrast, less than 7.5 percent of workers in the industry were under 25 years of age, down from almost 8.3 percent in 2003. Likewise, the percent of workers from 25 to 44 years of age dropped from 52.8 percent of the total in 2003 to just 43.4 percent in 2018 (see Figure 3).

Figure 3. Twin Cities Manufacturing Workforce Demographics, 2003-2018



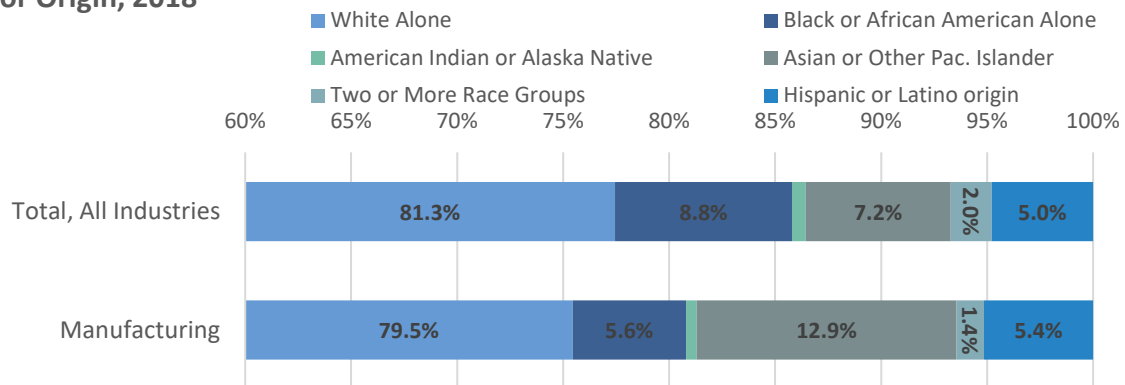
Source: DEED Quarterly Employment Demographics

Figure 4. Twin Cities Manufacturing Industry Workforce Demographics, 2018



Further demographic data from DEED's Quarterly Employment Demographics program shows that the manufacturing industry is relatively non-diverse, with males accounting for 70 percent of workers (see Figure 4), and about 80 percent reporting white as their race (see Figure 5). However, the racial diversity of the workforce has changed over time, with the number of manufacturing workers identifying as white alone declining by 18 percent from 2003 to 2018, compared to a 36.2 percent increase in the number of jobholders of other race groups. Likewise, the number of Hispanic or Latino workers in manufacturing jumped by 36 percent from 2003 to 2018. In the face of tight labor markets, manufacturers may need to tap into new labor pools in order to attract the talent they need to grow and replace existing workers in the future.

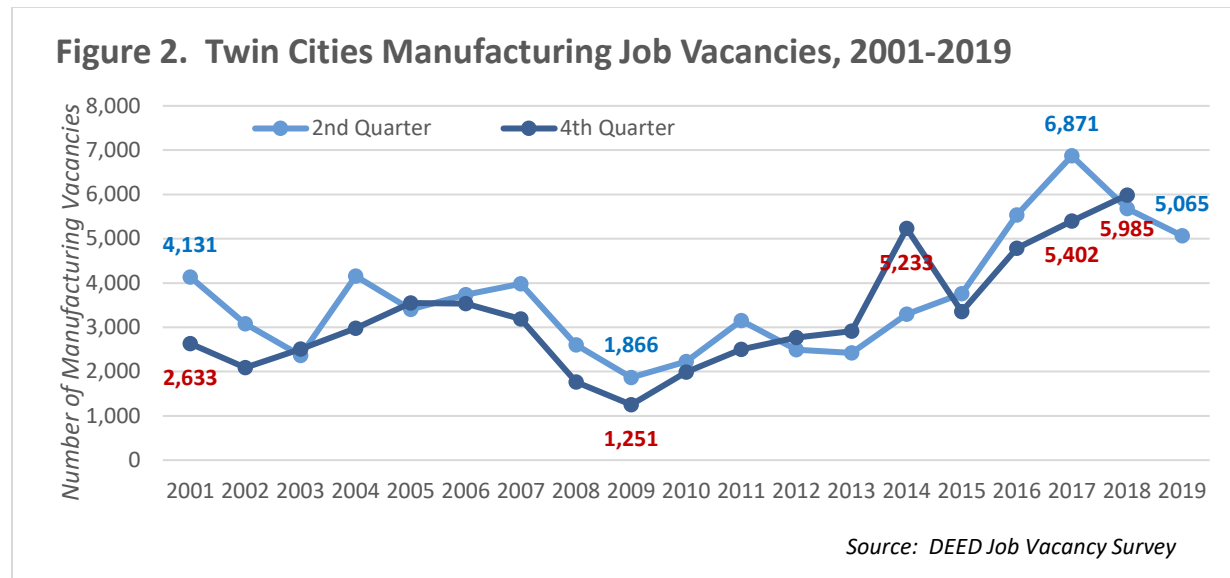
Figure 5. Twin Cities Manufacturing Industry Workforce Demographics by Race or Origin, 2018



Source: Quarterly Workforce Indicators

Industry Demand

The recent growth in manufacturing employment has led to an increased number of [job vacancies](#) across the Twin Cities metro area. The 5,065 job vacancies reported by manufacturing employers in the second quarter of 2019 was the fourth highest number ever recorded in the 2nd Quarter, only 1,800 less than the peak in 2017. Likewise, the 5,985 job vacancies posted in the fourth quarter of 2018 was the highest number reported in a fourth quarter, about 600 more than the fourth quarter of 2018, and nearly four times higher than the lowest number reported in 2009 (see Figure 2).



The median wage offered for these vacancies increased to \$22.07 per hour in the second quarter of 2019, up about \$3.50 compared to the same survey in the second quarter of 2018 and up nearly \$11.50 from the second quarter of 2001. Nearly three-fourths of the manufacturing vacancies required at least 1 year of experience, and 55 percent required postsecondary education. Manufacturing employers continue to place a high premium on related work experience, especially in comparison to other industries, with 74 percent of manufacturing jobs requiring one or more years of work experience, as opposed to only 51 percent of all industries. Just 2 percent of the openings were part-time, as compared to 31 percent of vacancies across all industries (see Table 3).

Table 3. Twin Cities Manufacturing Job Vacancy Survey, 2nd Quarter 2019

NAICS Industry Title	Number of Job Vacancies	Median Wage Offer	Percent Part-time	Percent Requiring Postsecondary Education	Percent Requiring 1+ Years Work Experience
Total, All Industries	86,044	\$15.88	31%	34%	51%
Manufacturing	5,065	\$22.07	2%	55%	74%

Source: DEED [Job Vacancy Survey](#)

The largest number of manufacturing vacancies were production occupations, including metal and plastic workers, textile and furnishing workers, food processing workers, assemblers and fabricators, printing workers, supervisors of production workers, and other production occupations. The median wage offer for these positions was \$16.39 but ranged between \$12 and \$29 per hour. Manufacturers in the Twin Cities were also looking to hire sales and office, transportation and material moving, engineering, management, and installation, maintenance, and repair workers (see Table 4).

Table 4. Twin Cities Production Occupations Job Vacancy Survey, 2nd Quarter 2019

SOC Occupational Title	Number of Job Vacancies	Median Wage Offer	Percent Part-time	Percent Requiring Postsecondary Education	Percent Requiring 1+ Years Work Experience
Total, All Occupations	86,044	\$15.88	31%	34%	51%
Production Occupations	2,876	\$16.39	6%	23%	52%
Supervisors of Production Workers	167	\$29.07	0%	42%	94%
Assemblers & Fabricators	456	\$14.97	6%	7%	49%
Food Processing Workers	400	\$12.27	10%	0%	17%
Metal Workers & Plastic Workers	807	\$18.34	0%	50%	67%
Printing Workers	350	\$14.95	2%	22%	45%
Textile, Apparel, & Furnishings Workers	144	\$12.98	38%	0%	13%
Woodworkers	26	\$16.58	20%	65%	70%
Plant & System Operators	18	\$25.18	6%	52%	78%
Other Production Occupations	510	\$16.99	9%	12%	60%
Office & Administrative Support	5,711	\$15.22	41%	3%	34%
Transportation & Material Moving	1,881	\$30.24	0%	93%	92%
Architecture & Engineering	3,612	\$42.84	2%	88%	98%
Management	3,145	\$17.81	8%	20%	56%
Installation, Maintenance, & Repair	11,108	\$13.58	32%	12%	50%
Sales & Related	2,876	\$16.39	6%	23%	52%

Source: DEED [Job Vacancy Survey](#)

Industry Occupational Employment

DEED's Occupational Employment Statistics (OES) program provides detailed employment and wage data for a wide range of occupations involved in manufacturing. In sum, there were an estimated 114,080 people working in production occupations in the Twin Cities, accounting for about 6 percent of total employment in the region. Median hourly wages for production occupations were \$19.06 in 2019 but ranged from \$12 at the low end to \$44 at the high end.

As noted above, in addition to production occupations, manufacturers also require the services of workers in several other occupational groups, such as office and administrative support, transportation and material moving, architecture and engineering, management, and installation, maintenance and repair. Not surprisingly, wages were higher for the higher-level positions (see Table 5).

Table 5. Twin Cities Occupational Employment & Wage Statistics, 2019

SOC Occupational Title	Estimated Regional Employment	Regional Median Hourly Wage	Estimated Statewide Employment	Statewide Median Hourly Wage
Total, All Occupations	1,793,870	\$22.78	2,867,700	\$20.95
Production Occupations	114,080	\$19.06	214,230	\$18.68
Office & Administrative Support	258,840	\$20.18	405,970	\$19.10
Transportation & Material Moving	105,080	\$18.69	177,580	\$18.48
Architecture & Engineering	41,330	\$39.03	56,070	\$37.53
Management	122,530	\$56.09	171,250	\$51.26
Installation, Maintenance, & Repair	53,480	\$24.30	100,030	\$23.13
Sales & Related	173,930	\$16.28	277,070	\$14.97
Business & Financial Operations	130,070	\$34.34	164,510	\$33.03
Computer & Mathematical	80,660	\$42.40	96,020	\$40.96

Source: DEED [Occupational Employment Statistics \(OES\)](#) program

Team assemblers, first-line supervisors, machinists, and more are the most common jobs found at manufacturing firms in Minnesota, according to DEED's Occupational Staffing Matrix data. Median hourly wages for these manufacturing positions ranged from a low of about \$14 for production helpers and packers and packagers to a high of about \$30 per hour for first-line supervisors and tool and die makers. Almost all the production-related manufacturing occupations can be gained with a high school diploma and learned through on-the-job training, though some also benefit from vocational training or associate degrees (see Table 6).

Table 6. Twin Cities Top 20 Office-related Manufacturing Occupations, 2019 Wage Data

SOC Code	SOC Occupational Title	Estimated Regional Employment	Median Hourly Wage
512092	Team Assemblers	18,270	\$16.07
511011	First-Line Supervisors of Production & Operating Workers	5,950	\$32.26
512099	Assemblers & Fabricators, All Other	18,270	\$16.07
514041	Machinists	7,580	\$26.26
513023	Slaughterers & Meat Packers	240	\$13.50
519111	Packaging & Filling Machine Operators & Tenders	5,140	\$16.34
514121	Welders, Cutters, Solderers, & Brazers	3,350	\$22.77
519061	Inspectors, Testers, Sorters, Samplers, & Weighers	5,890	\$21.06
537062	Laborers & Freight, Stock, & Material Movers, Hand	29,050	\$16.86
514031	Cutting, Punching, & Press Machine Setters, Metal/Plastic	3,280	\$22.42
515112	Printing Press Operators	4,310	\$22.35
499041	Industrial Machinery Mechanics	3,510	\$28.29
512022	Electrical & Electronic Equipment Assemblers	6,950	\$17.85
519198	Helpers--Production Workers	4,870	\$14.34
514011	Computer-Controlled Machine Tool Operators, Metal/Plastic	1,890	\$23.65
537051	Industrial Truck & Tractor Operators	3,260	\$19.91
519199	Production Workers, All Other	2,450	\$16.86
499071	Maintenance & Repair Workers, General	13,250	\$22.21
537064	Packers & Packagers, Hand	6,690	\$13.45
513099	All other food processing workers	250	\$12.93
514072	Molding, Coremaking & Casting Machine Setters & Operators	2,210	\$17.72
533032	Truck Drivers, Heavy & Tractor-Trailer	15,830	\$25.17
512023	Electromechanical Equipment Assemblers	6,950	\$17.85
519121	Coating, Painting, & Spraying Machine Setters & Operators	1,490	\$20.41
513092	Food Batchmakers	2,740	\$16.30
519196	Paper Goods Machine Setters, Operators, & Tenders	1,030	\$18.84
515113	Print Binding & Finishing Workers	1,610	\$17.88
517011	Cabinetmakers & Bench Carpenters	1,690	\$20.82
519032	Cutting & Slicing Machine Setters, Operators, & Tenders	840	\$19.31
514111	Tool & Die Makers	1,210	\$28.98

Source: DEED [Occupational Employment Statistics \(OES\)](#) program

In addition to the production-related occupations, manufacturers also rely heavily on sales and office workers including manufacturing sales representatives, customer service representatives, and production, planning, shipping, and traffic clerks; transportation and material moving workers such as truck drivers and packers and packagers; engineering occupations like industrial, mechanical, and electrical engineers; management positions such as industrial production and general managers; and business and financial operations occupations like accountants and auditors. Many of these occupations require higher education, but also offer higher wages (see Table 7).

Table 7. Twin Cities Manufacturing Industry Projections, 2016-2026

SOC Code	SOC Occupational Title	Estimated Regional Employment	Median Hourly Wage
414012	Sales Representatives, Manufacturing, exc. Technical Products	22,620	\$32.92
434051	Customer Service Representatives	42,490	\$19.37
172112	Industrial Engineers	7,200	\$43.97
111021	General & Operations Managers	31,030	\$50.99
435071	Shipping, Receiving, & Traffic Clerks	10,360	\$17.94
113051	Industrial Production Managers	3,230	\$52.80
172141	Mechanical Engineers	6,220	\$42.24
433031	Bookkeeping, Accounting, & Auditing Clerks	18,930	\$22.65
173026	Industrial Engineering Technicians	2,400	\$25.76
131023	Purchasing Agents, exc. Wholesale, Retail & Farm Products	#N/A	#N/A
439061	Office Clerks, General	32,840	\$18.53
414011	Sales Representatives, Manufacturing, Technical Products	4,560	\$37.92
435061	Production, Planning, & Expediting Clerks	3,630	\$24.88
132011	Accountants & Auditors	17,240	\$33.47
435081	Stock Clerks & Order Fillers	21,480	\$14.40
119041	Engineering Managers	3,290	\$70.34
172071	Electrical Engineers	2,940	\$47.63
151133	Software Developers, Systems Software	4,940	\$55.69
151132	Software Developers, Applications	17,590	\$47.32
173023	Electrical & Electronic Engineering Technicians	1,140	\$31.31

Source: DEED [Employment Outlook](#)

Industry Outlook

According to DEED's 2016 to 2026 Employment Outlook data, the Twin Cities manufacturing industry is projected to lose another 9,500 jobs over the next decade, a 5.5 percent decline. That is in contrast to overall growth of 6.8 percent in the total of all industries in the Twin Cities, but is in line with the state of Minnesota as a whole, which is projected to lose about 5,400 manufacturing jobs from 2016 to 2026, a 1.7 percent decline.

Though it is home to about 53 percent of total manufacturing employment in the state, the employment projections would mean that the Twin Cities would account for about 70 percent of the state's manufacturing losses over the next decade.

Sixteen of the 20 sectors are expected to see job declines in the next decade, with the most severe losses projected in Printing and Related Support Activities, Fabricated Metal Product Manufacturing, and Machinery Manufacturing. Those three industries are expected to account for over half (58.5 percent) of the region's total job decline.

Likewise, the region is expected to see big job declines in Paper Manufacturing and Computer and Electronic Product Manufacturing, as well as huge percentage losses in Textile Product Mills, Leather and Allied Product Manufacturing, and Apparel Manufacturing. In contrast, the only sector that is projected to have significant job growth is Electrical Equipment, Appliance, and Component Manufacturing and Miscellaneous Manufacturing (see Table 8).

Table 8. Twin Cities Manufacturing Industry Projections, 2016-2026

NAICS Code	Industry	Estimated Employment 2016	Projected Employment 2026	Percent Change 2016-2026	Numeric Change 2016-2026
0	Total, All Industries	1,878,351	2,006,300	+6.8%	+127,949
31	Manufacturing	169,852	160,446	-5.5%	-9,406
334	Computer & Electronic Product Mfg.	36,078	35,187	-2.5%	-891
332	Fabricated Metal Product Mfg.	24,465	22,744	-7.0%	-1,721
339	Miscellaneous Manufacturing	18,164	18,311	+0.8%	+147
333	Machinery Manufacturing	17,163	15,539	-9.5%	-1,624
323	Printing & Related Support Activities	14,315	12,155	-15.1%	-2,160
311	Food Manufacturing	11,633	11,269	-3.1%	-364
326	Plastics & Rubber Products Mfg.	9,372	9,192	-1.9%	-180
325	Chemical Manufacturing	7,944	7,841	-1.3%	-103
335	Electrical Equipment & Appliances	4,387	4,685	+6.8%	+298
337	Furniture & Related Product Mfg.	4,138	3,984	-3.7%	-154
321	Wood Product Manufacturing	4,575	4,672	+2.1%	+97
322	Paper Manufacturing	4,525	3,558	-21.4%	-967
331	Primary Metal Manufacturing	3,393	2,914	-14.1%	-479
324	Petroleum & Coal Products Mfg.	2,258	1,998	-11.5%	-260
327	Nonmetallic Mineral Product Mfg.	2,350	2,084	-11.3%	-266
312	Beverage & Tobacco Product Mfg.	2,210	2,280	+3.2%	+70
336	Transportation Equipment Mfg.	1,474	1,163	-21.1%	-311
314	Textile Product Mills	586	315	-46.2%	-271
316	Leather & Allied Product Mfg.	205	130	-36.6%	-75
315	Apparel Manufacturing	444	304	-31.5%	-140

Source: DEED [Employment Outlook](#)

Occupational Outlook

The projected job losses in the manufacturing industry are expected to carry over into production occupations as well, leading to a projected 5.0 percent decline from 2016 to 2026 in the Twin Cities. However, the region is still expected to have significant demand for production workers over the next ten years due to a large number of labor force exit openings – jobs that become available because the existing worker retires out of the labor force. There may be as many as 125,871 total openings for production occupations in the region, including occupation transfer openings, or jobs that open due to a worker changing careers.

However, 26 of the 78 production occupations are expected to see new job growth from 2016 to 2026, led by Helpers – Production Workers, Bakers, Butchers, and Meat Cutters, Dental Laboratory Technicians, Ophthalmic Laboratory Technicians, Food Processing Workers, All Others, Computer Numerical Controlled Machine Tool Programmer, and Medical Appliance Technicians, which are all projected to grow more than 5 percent.

In contrast, the biggest declines are projected for Team Assemblers, Electrical Equipment Assemblers, Assemblers and Fabricators, All Other, Inspectors, Testers, Sorters, Samplers, and Weighers, Cutting, Punching, and Press Machine Setters, Printing Press Operators, Print Binding and Finishing Workers, and Paper Goods Machine Setters, which are all expected to lose more than 200 jobs in the next 10 years.

Regardless of growth or decline, every occupation is expected to at least have some total openings from 2016 to 2026 due to labor force exits and occupations transfers. The largest number of total openings are projected for Team Assemblers, Production Helpers, Machinists, Packaging and Filling Machine

Operators, and Assemblers and Fabricators, which are all expected to have at least 6,000 total openings in the region (see Table 9).

Table 9. Top 25 Twin Cities Production Occupation Projections, 2016-2026

SOC Code	SOC Occupational Title	Estimated Employment 2016	Projected Employment 2026	Percent Change 2016-2026	Numeric Change 2016-2026	* Labor Force Exit Openings 2016-2026
0	Total, All Occupations	1,878,351	2,006,300	+6.8%	+127,949	+881,956
510000	Production Occupations	119,335	113,345	-5.0%	-5,990	+49,591
512092	Team Assemblers	13,372	11,444	-14.4%	-1,928	+5,299
519198	Helpers--Production Workers	6,241	7,300	+17.0%	+1,059	+3,630
514041	Machinists	7,588	7,641	+0.7%	+53	+2,645
512099	Assemblers & Fabricators, All Other	4,998	4,167	-16.6%	-831	+1,957
511011	First-Line Supervisors of Production Workers	6,130	6,109	-0.3%	-21	+1,951
519111	Packaging & Filling Machine Operators	5,548	5,491	-1.0%	-57	+2,609
512022	Electrical & Electronic Equipment Assemblers	6,838	5,663	-17.2%	-1,175	+3,168
519061	Inspectors, Testers, Sorters & Weighers	5,290	4,575	-13.5%	-715	+2,050
519199	Production Workers, All Other	3,090	3,145	+1.8%	+55	+1,225
514031	Cutting, Punching, & Press Machine Setters	4,456	4,041	-9.3%	-415	+1,537
515112	Printing Press Operators	4,281	3,992	-6.8%	-289	+1,610
514011	Computer-Controlled Machine Tool Operators	2,715	2,631	-3.1%	-84	+738
514121	Welders, Cutters, Solderers, & Brazers	3,383	3,342	-1.2%	-41	+895
513011	Bakers	2,218	2,396	+8.0%	+178	+1,481
516011	Laundry & Dry-Cleaning Workers	1,777	1,800	+1.3%	+23	+1,198
513099	Food Processing Workers, All Other	651	717	+10.1%	+66	+294
514072	Molding, Coremaking & Casting Machine	1,432	1,263	-11.8%	-169	+493
518031	Water/Wastewater Treatment Plant Oper.	924	923	-0.1%	-1	+263
515113	Print Binding & Finishing Workers	2,626	2,410	-8.2%	-216	+1,910
516031	Sewing Machine Operators	1,228	1,141	-7.1%	-87	+673
519121	Coating, Painting, & Spraying Machine Setters	1,352	1,334	-1.3%	-18	+383
513021	Butchers & Meat Cutters	1,351	1,463	+8.3%	+112	+632
513092	Food Batchmakers	2,211	2,286	+3.4%	+75	+1,235
517011	Cabinetmakers & Bench Carpenters	1,241	1,257	+1.3%	+16	+583
512041	Structural Metal Fabricators & Fitters	499	398	-20.2%	-101	+155

* Labor Force exit Openings are the projected number of workers leaving an occupation and exiting the labor market entirely (most labor force exits are related to workers retiring)

Source: DEED [Employment Outlook](#)



Education and Training

Minnesota has a robust network of post-secondary institutions. The Twin Cities campus of the University of Minnesota is the largest university in the state with 50,943 enrolled in the 2018-19 academic year, making it the sixth largest American campus by enrollment size. The Minnesota State system of colleges and universities is the third largest system of state colleges in the United States, including 30 colleges, seven universities, and 54 campuses. More than 350,000 attend Minnesota State colleges each year, and more than 35,000 degrees, certificates, and diplomas are awarded annually.

Post-secondary education plays a crucial role in building tomorrow's workforce. To analyze alignment with employer needs, interviews were conducted with college deans from each region within the state, as well as with representatives of four manufacturing education/training models. In order to further quantify and assess capacity to address workforce needs, an inventory of credit-based manufacturing-related programs was compiled.

College Perspective

To better understand the State of Manufacturing Education in Minnesota, one-on-one interviews were conducted with Minnesota college deans from across the state. The purpose of the interviews was to gain a better understanding of manufacturing program enrollment trends, strengths and weaknesses of various delivery modes, and student barriers.

Questions included the following:

- Please describe the manufacturing programs of study offered at your college, including mode of delivery (online, face-to-face, or hybrid). What are the greatest strengths and limitations of each delivery mode?
- How would you describe the typical student enrolled in a manufacturing-related program at your college?
- What are the greatest barriers for students who wish to enroll in manufacturing education or training at your college? (cost, access, time off work, etc.?) How might these barriers be overcome?
- What role might the Center play in reducing barriers for students?

MINNESOTA MANUFACTURING EDUCATION PROGRAMS

Manufacturing programs included in the college interviews:

- Additive and Digital Manufacturing
- Applied Engineering
- Automotive Technology
- Automated Systems Technology
- CAD Drafter
- CAD Mechanical Drafting and Design
- CAD Technology
- CNC Design
- CNC Machine Tool
- CNC Repair Technician
- Electronics
- Gunsmithing
- Machining
- Machine Tool
- Machine Trades
- Manufacturing Technology
- Mechanical Drafting
- Mechatronics
- Precision Machining (2x)
- Precision Manufacturing
- Robotic and Engineering Technology
- Robotics
- Quality Technician
- Welding (6X)



- What type of award(s) do students receive? Does the program lead to any industry-recognized credentials and if so, what are they?
- Can you describe the job placement for students completing a manufacturing program at your college?
- In your opinion, why do some students leave the program without finishing?
- What is the trend—are the numbers of students enrolled in manufacturing-related programs increasing or decreasing? To what do you attribute that change?
- What is the trend—are the numbers of students completing a manufacturing-related program increasing or decreasing? To what do you attribute that change?

The interviews revealed several key findings, including information about delivery format, student barriers, industry credentials, and enrollment trends.

Face-to-Face Programs Are Mode of Choice

Most manufacturing programs in Minnesota are delivered face-to-face, however, there are a few programs that are delivered online, or which have a few components online.

The following statements are reflective of the strengths of face-to-face delivery:

- *“We feel face-to-face is the best way for students to get a chance to practice and work with faculty who can give the feedback.”*
- *“There’s no substitute for hands-on.”*
- *“Students need to have time practicing on the actual equipment they will be using in industry.”*
- *“Online delivery just scratches the surface.”*
- *“It is a hands-on training that attracts this type of individual to the industry – that is their best learning mode.”*
- *“Students enroll in these programs because they are hands-on learners.”*
- *“There is the art that students learn through physically doing it.”*

The following statements are reflective of the limitations of face-to-face delivery:

- *“The drawback of face-to-face is the access. If students are distant and can’t commute it is limiting from the access point.”*
- *“Physical space limitations, as well as wear and tear on the lab.”*
- *“The biggest challenge is budgetary. The equipment is very expensive and a large investment.”*
- *“We are seeing the limitations of face-to-face delivery right now, when a virus shuts down the campus.”*
- *“We tend to attract students from within a 60-70-mile radius of the campus.”*

Potential for Expansion of Online Delivery

Several of the interviews were conducted after the Governor’s stay-at-home orders, issued in response to the COVID-19 pandemic. During this time, colleges throughout Minnesota integrated the use of online tools, such as video conferencing, to continue delivering courses. For many faculty members, this was a stretch and something they would never have considered prior to the crisis. However, after being

forced to use online platforms, many have seen the capabilities of technology and are more open to an expanded use of technology platforms for delivering courses and content.

The following statements are reflective of these changes in perception:

- *“Keeping online opportunities might be really helpful for some, looking at a video that shows them, ‘this is the way you hold your hands.’”*
- *“I see the potential to incorporate hybrid mode into the welding program as well. That is likely going forward. The instructor sees the advantage and will try to incorporate it a bit more.”*
- *“This is going to change the delivery mode of these programs because faculty are seeing a change to offer synchronous online delivery as part of their delivery mode.”*
- *“Delivering programs online is cost-effective.”*
- *“Students want to be hands-on, but post COVID-19, they are adapting.”*

Typical Student Profile

When asked to describe a “typical student,” deans noted a broad variety of age ranges and various phases in life. About 70 percent included traditional students, those right out of high school, as being typical for their school. An almost equal percentage noted older students—those who have either been out of school for a few years or those who would be classified as incumbent worker—as being typical. Others noted a lack of racial or gender diversity, along with a desire to reach a more diverse student demographic.

The following statements illustrate the range of students in manufacturing programs:

- *“We are seeing a few more women, but typically, students are white males, 18-35.”*
- *“Our students are diverse by age, but other than that, there’s not much diversity.”*
- *“The most typical student is a traditional college student that’s right out of high school.”*
- *“Usually about half of them are recent high school grads and the other half are adults returning to school, looking for a career change.”*
- *“We are attracting younger students after becoming a comprehensive college and because of the scholarship programs we have.”*
- *“The average age at our institution is 25 or 26.”*

Student Barriers

Many barriers that limit student enrollment in manufacturing programs were noted. Chief among them was the cost of tuition. A secondary barrier noted was life balance—the ability to balance school, work, and family. Additional barriers noted included time, perception, lack of housing, academic preparedness, childcare, mental health, and availability of courses.

Role of the Center in Reducing Barriers

The Deans suggested several ways that the Center could reduce cost barriers for students:

- Provide scholarships
- Structure cooperative purchasing agreements for colleges to help them leverage buying power
- Strengthen consortium model and shared seats for classes to help courses with low enrollment

Other potentially helpful suggestions relating to student access included professional development for high school instructors and college faculty and working to change the perception of the industry.

Awards and Industry Credentials

When talking about the types of awards that students receive, college deans described a clear education and career pathway with stackable credits and numerous entry and exit points, beginning with certificate programs and going through a two-year or four-year degree. Many of the programs prepared students for some type of industry-recognized credential. The most frequently noted credential was AWS. Other industry credentials noted included: ASE, FANUC, IFPS, IPS, NIMS, OSHA, and SME.

Job Placement for Program Completers

Job placement for program completers was noted to be in the upper 90's to 100 percent, virtually across the board.

The following statements illustrate job placement for graduates of manufacturing programs:

- *"If you want to work, you won't have trouble finding a job. Many industries are coming to us, looking for student interns who want to pursue careers in manufacturing."*
- *"We are seeing 100 percent placement. If the students want to work, they have a job lined up when they graduate. Many come with a job and get a promotion when they complete their degree. This is often accompanied with an increase in pay."*
- *"Manufacturing has had strong job demand in the last few years, so that's helpful for more students to go into the program and finishing—they see jobs on the other side."*

Trends in Student Enrollment

About 70 percent of those interviewed said that the numbers of students enrolled in manufacturing-related programs at their college was increasing. By and large, students who enroll in these programs are completing them, except for a few who have a tempting job offer and leave school to enter the workforce before completing.

"If students are not exposed to manufacturing at the high school level, how do we get them interested in pursuing it in college?"

Reasons Cited for Increases in Enrollment

- *"We are recruiting high school students to come to our college if within driving distance and offering an 11-credit certificate which gives them a running start toward a diploma. We are averaging 15-20 students in each high school."*
- *"Enrollment is increasing since adding the night program—it provides nice options and helps us accommodate more students."*

Students Who Leave Without Completing

In addition to cost barriers, older students already in the workforce may face compounding challenges. Time management is difficult and continuing with work obligations while taking college courses ends up being too difficult for some, especially when ancillary issues like a childcare, illness or other life events come into play.



- *“They are dealing with family issues, lack a strong relationship with the instructor, need to work to pay bills, etc. I know that anecdotally through students I’ve worked with the last six months. Students need to work full time, work overtime, and school has to wait.”*
- *“Finance is a big barrier, especially for an 11-month program. People run out of money before they finish.”*
- *“We see 50 to 60 percent of our students complete their program, and that’s across the board. Nationally, the completion rate for two-years schools is about 35 percent. It is worse for students of color, worse for those who are Pell eligible. Then you get down into the teens. If we can get 50 percent through, I’m really pleased with that.”*
- *“If you have five out of ten who finally get that degree, you have five people who put some time and effort and tuition dollars in, and they are getting nothing. That is a family that isn’t going to get a family sustaining wage or break cycles of poverty.”*

Partnering with Employers to Increase Student Completions

College deans talked about the strong relationships that they have with manufacturing employers and working with them to create a win-win.

- *“We’ve worked pretty well with our advisory boards to make sure that the companies who support our students are not poaching them before they are done, so we feel like we’ve got a pretty good relationship with those folks, to encourage the students to stay.”*
- *“The biggest change is students getting a job before their program ends. Most of the employers are supporting the student finishing their degree program.”*
- *“We’ve worked on an early out with some employers if it’s getting close to graduation.”*
- *“When we established our manufacturing program, we established stop out points with certificates. We also have it set, if a Mechatronics student wants to start in the spring, they can. There’s flexibility. We did that to accommodate employers.”*

Education Models and Products

There are three primary models used for the delivery of manufacturing training and education in Minnesota: face-to-face, online (asynchronous or synchronous) and hybrid. This environmental scan examined four manufacturing education models that are being widely used in Minnesota—360 eTECH, Live Online, Industrial Manufacturing Technician Apprenticeships, and Custom Training.

360 eTECH

360 eTECH is primarily asynchronous online except for four welding courses that feature a hybrid format. Live Online is synchronous or “live.” Live Online is a model used to deliver programs in several disciplines, including Production Technologies. The Production Technologies certificate in Live Online and in 360 eTECH use a common set of courses—known as CMAE courses—developed by the Center in 2011 in response to the talent shortage identified by Minnesota manufacturers in 2010-2011. In addition to being offered as part of 360 eTECH, CMAE curriculum has been leveraged by fourteen Minnesota colleges throughout Minnesota since its launch in 2012, including several major grant-funded educational initiatives.

360 eTECH is offered as a for-credit program. While anyone can enroll in these courses, most learners enrolled in a 360 eTECH certificate program are individuals already in the workforce who want to increase skills and knowledge. Traditional college-age and high school students make up the rest of the enrollment. 360 eTECH curriculum is aligned with the Manufacturing Skill Standards Council (MSSC) Certified Production Technician (CPT) program. The courses are regularly reviewed and updated to meet the current industry standards. Program enrollment continues to grow, with overall enrollment increasing 88 percent since 2015.

*360 eTECH and Live Online prepare individuals to enter manufacturing **production occupations**. Increasing enrollment in these programs will be **critical**—in the next few years **more than 240,000 production jobs will need to be filled.***

Programs

360 eTECH includes two college-credit certificates:

- Production Technologies (16 credits)
- Welding Technology (30 credits)

The Production Technologies certificate can be completed in two semesters. It provides foundational skills for students to be successful in an entry-level manufacturing career. In addition to basic manufacturing skills, students acquire math, computer, and print reading skills.

The Production Technologies certificate stacks into the Welding Technology certificate, which can be completed in two semesters as a full-time student, or four semesters as a part-time student. Fifteen credits from the Production Technologies certificate apply to the 30-credit Welding Technology certificate. The Welding Technology certificate builds on that foundation with technical training in welding.

Standard assessment tools include quizzes, tests, skill demonstrations, and lab projects. The lecture is delivered online and is asynchronous. It is instructor led and features weekly assignments. The Production Technologies program is delivered entirely online. The Welding Technologies program includes intensive weekend sessions at designated lab locations, where students learn practical, hands-on skills. Unique curriculum elements include the use of subscriptions such as ToolingU and Amatrol to provide interactive course content.

Consortium model

The 360 eTECH Program is delivered by a consortium of 10 partner colleges that includes Central Lakes College, Century College, Lake Superior College, Hennepin Technical College, Northland Community and Technical College, Northwest Technical College, Pine Technical and Community College, Riverland Community College, Saint Paul College, and St. Cloud Technical and Community College. These colleges share seats in the courses and divide up teaching responsibilities. Students can enroll and earn credits through any one of the colleges regardless of the teaching college.

Incumbent workers

The coursework is designed to fit current manufacturing employees' needs. Courses are offered in two, eight-week sessions each semester. Any required labs are offered over weekends (Friday, Saturday, Sunday) and scheduled well in advance of the course start date, so the student may plan accordingly. The hands-on skills labs are the same as traditional lab courses, just offered at a more convenient time.

High school program

In Fall 2014, Minnesota State Advanced Manufacturing Center of Excellence began to make 360 eTECH certificate programs available to high schools. The online delivery makes this an ideal solution to provide high school students with technical education, regardless of the school's size or location. Some schools have chosen certificates with lab components, which are offered at a technical college within the region of the school.

Students benefit from gaining entry-level skills and earning college credit while still in high school. They are prepared with the skills and abilities needed to pursue a promising career in Minnesota's vibrant manufacturing industry and reinforce the foundation to continue their educational path. Many of these students continue their education at the partner colleges.

Calendar Year

Courses begin in late August or mid-January, following the academic calendar and running on an eight-week schedule. Weekend labs (8-hour days; Friday, Saturday, Sunday) are conducted for the Welding Certificate program, with two weekend labs required within the eight-week course.

Cost

The cost of the 360 eTECH program is \$192.61 per credit. Most courses are 2 credits. Additional costs include fees from the respective colleges and the cost of the textbook(s) and/or subscriptions.

Benefits and Limitations of 360 eTECH

Benefits

MSSC Preparation—Four courses in the Production Technologies certificate program – safety, quality practices, manufacturing processes and production, and maintenance awareness – align with the Manufacturing Skill Standards Council (MSSC) Certified Production Technician (CPT) program. Students

who complete these courses are prepared to take the MSSC Certification assessments. Passing all four assessments leads to the full MSSC CPT certification.

Stackable—the 16-credit production Technologies certificate is stackable with the 30-credit Welding Technology certificate. Both programs can lead to one of two BAS degrees at Bemidji State University or to a degree at another university or college which has an articulation agreement in place or has incorporated one or more CMAE courses into their program awards.

Flexible—because the two 360 eTECH certificate programs are offered primarily online and in an asynchronous format, learners have a great degree of flexibility. They can complete coursework at a time and place that fits within their life/work/family schedule.

Fast—These are skills-based certificates. Unlike a degree, there are no general education requirements, so learners can focus on building skills that will get them into the workforce and earning a good salary in less time than it would take to earn a degree.

Viable—Because courses are offered through a consortium of colleges, it allows colleges to share seats in a course that might get cut due to insufficient enrollment.

Pipeline—the program is a great entry into a manufacturing education or career pathway. Program completers can continue their education at a 360 eTECH partner college or enter the workforce. If additional education is needed, often, manufacturing employers are willing to pay for additional college education.

Limitations

Learner-Motivation—Because the programs are asynchronous and students learn at the time and place of their choosing, they must have a certain level of self-discipline and motivation. Some students flourish in this type of learning environment. Others have a difficult time staying on track and completing. Life demands can interfere with intentions and people are not able to manage it or take on too much at once. In addition, individuals drawn to manufacturing careers tend to be hands-on learners making online courses more challenging.

Requires Hands-On Experience—While the Production Technologies certificate can be earned entirely online, the Welding Technologies certificate cannot. Since some lab time is required, students in remote locations or those who have transportation difficulties may not be able to finish the certificate.

Complex System—The Minnesota State system is not easy to navigate within the consortium model. Using the consortium model, a student can enroll in any one of the partner colleges and earn course credit through that college, but the course may be taught by another college. There are numerous associated challenges with accessing the course online through another college, including multiple email accounts, and financial aid linked to a college different from the teaching college. This can lead to frustration and students dropping out of the program. However, solutions are continually explored for ways to improve the student experience.

Articulation Agreements—the ability for the certificates to be stackable is dependent on articulation agreements between post-secondary institutions. Pathways have been established, and since the launch of 360 eTECH in 2011, numerous college partners have used 360 eTECH as part of their own curriculum

and programs. However, it has not been fully embraced as originally envisioned. Faculty members at some institutions believe that 360 eTECH competes with their own curriculum.

Competing with On-the-Job Training—Today’s tight labor market has created many challenges for employers and educators. Manufacturing employers are genuinely concerned about their ability to find skilled labor. Their level of concern is so high that they are hiring virtually anyone that meets minimum requirements and training them on the job. This practice is circumventing the interest (and possibly the need) to enroll in 360 eTECH.

Although industries may be able to train entry-level people to a standard that meets the bulk of production positions, they may need higher skilled people later and still look to post-secondary institutions to fulfill that role.

Technology Barriers—People who are not as familiar with technology or who cannot afford adequate internet service may have difficulty in accessing and completing online courses. This is a barrier which seems to be decreasing in significance as technology has improved and costs have come down.

Live Online

Live Online workforce trainings are offered through a collaboration of continuing education and customized training (CECT) centers at participating Minnesota State colleges and universities. Live Online is an education model that uses virtual classrooms, featuring live, interactive classes in which the instructor and students use a video camera and microphone to communicate with each other over the internet. The instructor shares his/her screen to present PowerPoints, videos, documents, or other materials. Classes are not recorded, and students must attend live, just as they would have to in a physical classroom. Students can interact with each other and with the instructor in real time.

More and more courses and programs are using this model. This scan examines delivery of courses within the Production Technologies certificate (part of 360 eTECH) through Continuing Education/Customized Training. Courses run every 8 weeks with a new section of classes. The courses are virtual and do not have any on-site lab requirements. As noted previously, Production Technologies courses are foundational to careers in manufacturing. Many employers use the courses to supplement in-house new employee training programs.

Calendar Year

Courses are offered year-round, with a new section beginning every eight weeks.

Benefits

Structure—students are required to attend classes, so the need for self-discipline is not as great as it is with asynchronous courses.

Connection—Networking and interaction with the instructor and other students is perceived as a large benefit by students.

Technology—Initially, the technology for this model was not as stable. Improvements to the software and hardware have resulted in a high-quality product that is very stable, as well as one that is easy for instructors and students to use.

Easy Access—Students can sit in a virtual classroom, connecting from home or their place of work.

High Perceived Value—The cost for Live Online courses is similar to the cost for other credit-based courses, but the perceived value is higher, because the training comes to the student.

Supported by Employers—Most employers are picking up the cost of tuition for their employees who enroll in the Live Online courses and allow them to take the classes during the workday. Live Online courses are a cost saving option for employers who only have a few employees that need training. With virtual delivery, seats are shared across employers, thereby reducing the costs.

Barriers and Limitations

The barriers are limited. A decade ago, the technology may not have been as accessible, but today, the technology is ubiquitous and does not present any meaningful barriers, either of access or cost.

Not as Flexible—Unlike an asynchronous class in which a student participates at the time of their choosing, students in Live Online courses must be present at the time a class is offered, in the same way they would be required to attend a class at a brick and mortar school.

Industrial Manufacturing Technician Registered Apprenticeship

The Industrial Manufacturing Technician (IMT) is a nationally recognized apprenticeship, registered with the U.S. Department of Labor. IMT Registered Apprenticeship focuses on increasing the pipeline of highly qualified and diverse individuals prepared to enter middle- and high-skilled occupations within the growing manufacturing sector. It is a 3,000-hour apprenticeship that trains entry-level workers for manufacturing positions and promotes their career advancement and standing in higher-skilled apprenticeships.

- Individual employers hire the apprentices, provide the on-the-job training, and pay for related instruction; and
- Community colleges provide the related instruction to apprentices; and
- A one-stop center or other workforce intermediary recruits apprentices and provides basic skill training or related activities.

Within Minnesota, IMT is using the Production Technologies certificate as a foundational curriculum for apprentices. Apprentices can take the Production Technologies courses as credit-bearing or noncredit courses. Most students who enter a manufacturing pathway through an apprenticeship program are not interested in college or earning college credits, but since education is part of the apprenticeship program, and with the option to earn credit, most opt to receive academic credit.

Participating students enroll in the college, but as part of IMT, they receive extra support beginning with enrollment, and continuing through program completion. In addition, participants with requisite computer skills can test out of the Introduction to Computers course and receive credit for prior learning, saving time and reducing the cost.

Companies are getting behind the credit-based apprenticeship model, thanks in large part to the role of Pine Technical and Community College that stepped in and did the administrative work, streamlining the process for employers across the state. Apprentices, including midlife individuals who never thought of

going to college, are completing the program. Many go on to take additional courses after earning the Production Technologies certificate.

Custom Training

Custom Training in manufacturing is a unique education model in which the customer is not the student, but the employer. Custom training providers work directly with employers to develop a training plan, assessment tools, and agree on training outcomes. The training is flexible and adjusts to the unique needs of each employer.

To gain an understanding of custom training in Minnesota, interviews were conducted with five custom training directors from across the state.

Custom training directors were asked a series of questions:

- Please describe the focus of the custom training that your college provides for manufacturers.
- Is there a set of courses that is in demand by the manufacturers your custom training program serves? Please describe the courses and/or programs that have been in high demand.
- Historically speaking, have your custom training programs been primarily credit based or noncredit? Do you see this changing or remaining the same in coming years?
- Based on your own observation, what importance are manufacturers placing on nationally recognized credentials?
- Have the training topics and/or content changed over the last several years? Are you seeing any emerging trends?
- What, if any, emerging trends are you seeing in terms of delivery format?
- What, if any, emerging trends are you seeing in terms of volume?

Custom Training Focus

The role of custom training programs within Minnesota is to upskill employees quickly, providing specific skills training that can put them on the shop floor fast and make them effective workers. All training directors who were interviewed emphasized the “custom” portion of what they do. They work directly with employers to develop training objectives and deliver targeted training to meet identified needs.

The following statements illustrate unique facets of custom training:

- “We can give them specific skills training that can put them on the shop floor fast and make them effective workers. Our training is just in time, and it’s focused on the skills that are needed to get the job done. That’s what employers are looking for.”
- “We are a solutions provider. The focus is whatever the customer wants it to be.”
- “We provide skilled craft training, apprenticeship-type programming, training programs, and upgrading skill levels. We are the preferred training provider for all of our supplier/vendor chain.”
- “Everyone comes with a different skill set on the first day of class. We take them from where they’re at and we identify what those skills are already, and so people move on at different paces.”



Courses in Demand

Custom training directors were able to identify several programs that were in demand among employers within the region they serve. Although there were some variations from one region to another, machine maintenance was noted to have strong demand across the state.

Courses Identified as High Demand:

- Auto Diesel Mechanics, Maintenance Mechanics, Welders, Machinists, Hydraulics, Electrical Maintenance
- Industrial Maintenance, Electrical Maintenance
- Precision Machining, Mechatronics, Machine Maintenance, Automation, PLC, Electrical Control, Lean Manufacturing, Operational Efficiency, Six Sigma, Standard Process Controls, Standard Operating Procedures
- Machining/Machine Tool, and Industrial Maintenance

Credit Vs. Noncredit

With one exception, all custom training directors emphasized delivery of noncredit training. The one exception noted that historically, custom training has been noncredit, but they are now seeing some demand for credit. Reasons for this are simply the fact that credit is available, and possibly even more important, grant-funded programs seem to prefer credit-based training.

- *"I'm not convinced you need to go to two years of education. Manufacturers only need one or two at that level. They need lots of 'one-up button pushers.'"*
- *"Right now, no one wants to go through a one- or two-year program when employers are coming to the college and yanking them right out of the programs, because they need them, and they need them now."*
- *"We stay on the noncredit side and the colleges will stay on the credit side. We fill a niche that the colleges can't, the populations they can't serve. I think there are definitely ways we can work together better with the credit side, but there's still just a lot of competition over who gets those students."*
- *"The agencies we work with (Workforce Service Agencies) want the career pathways. The employers don't care as much."*

"There is interest in trying to deliver credit-based programming in a customized training model. I think there will be less and less focus on credits or credentials and more and more focus on competency, and what I would call a work-force driven training and education model, which is more in line with traditional customized training."

Nationally Recognized Credentials

Custom training directors reported little manufacturer interest in industry-recognized credentials. The only credential noted as having some value was AWS certification.

- *"Manufacturers place very little importance on nationally recognized credentials. They will tell you they really want it but given the choice of hiring someone with or without it, they will hire someone without the credentials."*
- *"It's more about creating that industry standard and training to that, whether it's a nationally recognized credential or not."*

- *"We've promoted it, but we are not seeing employers embrace that (nationally recognized credentials) so much. It doesn't mean anything in their payment structure."*
- *"I've talked to them (manufacturers) personally, a lot of them. They care more about skills and abilities than they care about credentials."*

Emerging Trends in Training Content

Two custom training directors noted an increase in demand for leadership and supervisory management training. The primary reason for this is the large number of baby boomers that are retiring and the need to train new leaders to step into these roles over the next few years. Other topics noted include increased need for industrial maintenance training and soft skills training. The need for more industrial maintenance training is driven in large part by the increases in automation. As more machines are used in production, more people are needed to maintain those machines.

- *"We've seen the need for industrial leadership training, especially as employers are trying to hang on to employees they have, move them through the pipeline and keep them, and that is a big problem. How do you take someone from the bench and move them into a supervisory role?"*
- *"We've seen a strong spike in demand for leadership/supervisory management kinds of training. I attribute that to the tight labor force. People have been trying to grow their own supervisors instead of hiring them from outside."*
- *"As help has gotten hard to find, everyone has done more automation and taken on a much more significant equipment portfolio. As a result, we see the need for a lot higher level training in industrial maintenance."*
- *"When we've done manufacturer focus groups, soft skills are always on the top of the list. They say they can train the technical skills but training the soft skills are more of a challenge."*

Emerging Trends in Delivery Format

Custom training directors talked about the importance that face-to-face and hands-on training have had, historically. That will likely continue as the primary mode of delivery, however, virtual and online will possibly be playing a larger role going forward, in part as a result of the COVID-19 pandemic. The pandemic forced virtual delivery that would not have been considered in normal times. Instructors and employers have seen value in the online delivery.

- *"We have set ourselves up to be hands-on, but COVID 19 is pushing us toward a little less of the hands on. We might have to go to offering lecture via online."*
- *"Opening up the virtual classroom has brought in people from different countries around the world into our classroom and is opening a lot of doors. That is something that will continue, just because it makes sense, providing better access for folks to get the training in an efficient and effective manner."*

Emerging Trends in Training Volume

Almost all custom training directors reported an increase in volume.

- *"Training revenue is going way up in manufacturing and it is going to continue."*
- *"We are seeing an increase. There's a huge percentage of the workforce that is retiring. Lots of training is needed to fill those gaps."*

Minnesota State Advanced Manufacturing Center of Excellence Education Products

Career Success Skills

Career Success Skills curriculum is a set of 26 modules that teach soft skills. Each module teaches a distinct skill that enhances employability and success in the workplace. Module topics include verbal communication, reliability, positive attitude, responsibility and accountability, problem solving, continuous learning, critical thinking, and many others.

The skill topics have been identified and prioritized by industry and business professionals, who have contributed content to make sure these learning modules address the skills valued by businesses—no matter what industry. Each module includes an instructor guide, PowerPoint presentation, student workbook, quizzes, and answer keys, MP4 videos, and unique URLs from Screencast.

They were designed to be integrated in existing curriculum at the post-secondary level; however, the modules have been found to be useful with a variety of audiences, including at the high school level, or with existing employees. They are available as open-source products and are completely free to use.

Competency-Based Education

The Center has done considerable work on competency-based education (CBE) as a National Science Foundation ATE Center. Development of competency-based education was one of the objectives of the Center's 2016-2018 NSF award.

The CBE work helped the Center and its partners understand the value of transitioning away from seat time in favor of the competency-based model, which is more flexible and allows students to progress as they demonstrate mastery of academic content, regardless of time, place, or pace of learning. Students who participate in a CBE model have flexibility, and personalized learning opportunities. Incumbent workers benefit from the ability to demonstrate (and receive credit for) skills they already have.

Two of the Center's certification programs—Production Technologies and Welding Technology—have been revised to support competency-based education. Twenty-seven faculty have contributed to revised program outcomes, course descriptions, and related learner outcomes for 14 courses. Competency plans were developed for all competencies within the Production Technologies and Welding Technology certificate programs. Faculty were also trained in competency-based curriculum development, providing the foundation for development of additional competency-based courses.

CBE Pilot Projects

The Center has funded two CBE pilot projects, that further the practical use of competency-based education, one at Northland Community and Technical College, and another at Central Lakes College.

The goal of the Northland Community and Technical College pilot is to research the viability and possible modalities of CBE, as well as develop or obtain access to a curriculum for use in multiple manufacturing-related courses. The purpose of the research project is investigate ways in which to transition away from seat time, and explore a structure that creates flexibility, and allows students to progress as they demonstrate mastery of academic content, regardless of time, place, or pace of learning. Competency-based strategies provide flexibility in the way that credit can be earned or awarded and provide students with personalized learning opportunities. These strategies include online, blended and lab learning, project-based and community-based learning, and credit recovery, among others. This type of learning leads to better student engagement because the content is relevant to each student and tailored to



their unique needs. It also leads to better student outcomes because the pace of learning is customized to each student.

By enabling students to master skills at their own pace, competency-based learning systems help to save both time and money. Depending on the strategy pursued, competency-based systems also create multiple pathways to graduation, make better use of technology, support new staffing patterns that utilize teacher skills and interests differently, take advantage of learning opportunities outside of school hours and walls, and help identify opportunities to target interventions to meet the specific learning needs of students. Each of these presents an opportunity to achieve greater efficiency and increase productivity. Approximately 20 courses, comprising 3 certificates (Manufacturing Process Technology, Precision Agriculture Equipment Technician, and Electronics Technology – Automated Systems) will be enhanced using CBE best practices. NCTC will work with program stakeholders to identify best practices and instruction models to support CBE programming in the ETAS courses listed above. This research will look for best practices in classroom content; types of assessments for evaluating student skills and knowledge; curricular content that will align learning objectives with assessments; digital badging standards that can be applied to align learning outcomes with industry requirements; and identify personnel constraints within the Minnesota State education system.

The Central Lakes College pilot focused on development of competency-based education curriculum for an 18-credit Robotics certificate (comprised of eight courses) at Central Lakes College. The intention of the project is to provide manufacturing education to manufacturing businesses as well as multiple high school partners over a three-year period. The curriculum work included identification of more than 30 competencies, as well as documentation of the process for identifying and aligning the curriculum with those competencies. The curriculum has been modified to support a distance delivery model.

Inventory of Manufacturing Education Programs in Minnesota

The 2020 Environmental scan examined the post-secondary programs of 65 Minnesota colleges and universities, including public colleges and universities, private colleges and universities, and for-profit colleges and universities. The scan found 29 institutions offering manufacturing-related programs of study. Together, these institutions are responsible for a total of 281 manufacturing-related programs, resulting in certificates, diplomas, Associate of Applied Science degrees, Bachelor's degrees, Master's degrees, and other awards.

Most programs (247) are delivered face-to-face. Fourteen are provided as online programs, without any face-to-face component, and 20 are provided in a hybrid/mixed format.

These programs will play a critical role in helping to fill the industry's talent pipeline over the next ten years, as the state is expected to have significant demand for production workers due to many labor force exits. Minnesota Department of Employment and Economic Development is estimating as many as 246,504 total openings in production occupations will need to be filled.

Certificate Programs

Program	Award	Credits	Delivery	Institution
3D Printing	Certificate	14	F2F ¹⁷	Lake Superior College
Additive Manufacturing Designer	Certificate	9	F2F	Hennepin Technical College
Automated Technologies	Certificate	30	F2F	Hennepin Technical College
Automation Electronics	Certificate	12	F2F	Minnesota State College Southeast
Automation Technologies	Certificate	30	F2F	Central Lakes College
Basic Drafting Technologies	Certificate	16	Online ¹⁸	Minnesota State College Southeast
Basic Welding	Certificate	16	F2F	Century College
Biofabrication Technologist	Certificate	16	Hybrid ¹⁹	Century College
Biomedical Core	Certificate	16	F2F	Anoka-Ramsey Community College
Biomedical Equipment Technology	Certificate	27	F2F	Dakota County Technical College
Biomedical Technology	Certificate	30	F2F	Anoka-Ramsey Community College
CADD Operator Cert	Certificate	30	F2F	St. Cloud Technical & Community College
Certified Production Technician	Certificate	8	F2F	Northland Community & Technical College
CNC	Certificate	20	F2F	Ridgewater College
CNC Operator	Certificate	30	F2F	Hennepin Technical College
CNC Setup Technician	Certificate	17	F2F	Hennepin Technical College
CNC Swiss Turning Center Technician	Certificate	9	F2F	Hennepin Technical College
Computer Aided Design (CAD) Drafting Technologies	Certificate	9	Online	Minnesota State College Southeast
Computer Aided Drafting and Design	Certificate	29	Hybrid	Ridgewater College
Design for Manufacturing 3D Printing	Certificate	24	F2F	Dunwoody College of Technology
Digital Fabrication Technology	Certificate	16	Hybrid	Century College

¹⁷ F2F identifies programs that are delivered entirely face-to-face with limited to no online components.

¹⁸ Online designates programs delivered entirely online with no face-to-face component.

¹⁹ Hybrid is used to designate any program that has a mix of online and face-to-face components.



Electromechanical Systems	Certificate	29	F2F	Saint Paul College
Electronics Technology	Certificate	23	F2F	Dunwoody College of Technology
Engineering CAD Technician	Certificate	24	F2F	Lake Superior College
Extrusion Molding	Certificate	18	F2F	Hennepin Technical College
Facilities Maintenance Engineer	Certificate	30	Hybrid	Century College
Facility Management	Certificate	19	F2F	University of Minnesota
Gas Tungsten Arc Welding Production Welder	Certificate	18	F2F	Lake Superior College
GMAW Production Welder (MIG)	Certificate	16	F2F	Hennepin Technical College
GTAW Production Welder (TIG)	Certificate	16	F2F	Hennepin Technical College
Industrial Controls	Certificate	23	F2F	Dunwoody College of Technology
Industrial Maintenance Mechanic	Certificate	18	F2F	Hennepin Technical College
Injection Molding	Certificate	23	F2F	Hennepin Technical College
Lean - Quality Management	Certificate	9	F2F	Minnesota State University Moorhead
Lean Six Sigma	Certificate	30	F2F	Bemidji State University
Machine Operator	Certificate	20	F2F	Saint Paul College
Machine Technology	Certificate	30	F2F	Central Lakes College
Machine Technology Certificate 1	Certificate	16	F2F	Anoka Technical College
Machine Technology Certificate 2	Certificate	16	F2F	Anoka Technical College
Machine Technology Certificate 3	Certificate	16	F2F	Anoka Technical College
Machine Tool Technology Right Skills Now	Certificate	17	F2F	South Central College
Machining Basics	Certificate	13	F2F	Minnesota State College Southeast
Machining Right Skills Now	Certificate	17	F2F	Minnesota State College Southeast
Manual Machinist	Certificate	30	F2F	Lake Superior College
Manufacturing Foundations	Certificate	8	F2F	Pine Technical & Community College
Manufacturing Fundamentals (M-Powered)	Certificate	16	F2F	Hennepin Technical College
Manufacturing Operations Management	Certificate	16	Hybrid	University of Minnesota
Manufacturing Production Technician	Certificate	9	F2F	Minnesota West Community & Technical College
Manufacturing Production Technology	Certificate	16	F2F	Ridgewater College
Manufacturing Production Technology	Certificate	16	F2F	South Central College
Manufacturing Skills Standard	Certificate	9	F2F	Riverland Community College
Manufacturing Technician	Certificate	30	F2F	Hennepin Technical College
Mazak CNC Technician	Certificate	20	F2F	Hennepin Technical College
Mechanical Design & Manufacturing Tech	Certificate	18	F2F	St. Cloud Technical & Community College
Mechatronics	Certificate	17	F2F	Hennepin Technical College
Mechatronics	Certificate	24	F2F	Minnesota West Community & Technical College
Mechatronics	Certificate	30	F2F	St. Cloud Technical & Community College
Mechatronics Fluid Power Specialist	Certificate	17	F2F	Minnesota West Community & Technical College
Mechatronics Industrial Maintenance	Certificate	25	F2F	South Central College



Medical Device Molding	Certificate	17	F2F	Hennepin Technical College
National Certified Fluid Power Specialist	Certificate	10	F2F	Hennepin Technical College
Pipe Welding	Certificate	17	F2F	Anoka Technical College
Precision Machining	Certificate	16	F2F	Minnesota West Community & Technical College
Precision Machining Technology	Certificate	28	F2F	Pine Technical & Community College
Pro/Engineer Operator	Certificate	17	F2F	Hennepin Technical College
Process Controls Technician	Certificate	30	F2F	Ridgewater College
Production Technologies	Certificate	16	Online	Central Lakes College
Production Technologies	Certificate	16	Online	Hennepin Technical College
Production Technologies	Certificate	16	Online	Lake Superior College
Production Technologies	Certificate	16	Online	Northland Community & Technical College
Production Technologies	Certificate	16	Online	Northwest Technical College
Production Technologies	Certificate	16	Online	Pine Technical & Community College
Production Technologies	Certificate	16	Online	Lake Superior College
Production Technologies	Certificate	16	Online	St. Cloud Technical and Community College
Production Technologies	Certificate	16	Online	Saint Paul College
Production Technologist	Certificate	8	Online	Lake Superior College
Project Management	Certificate	9	F2F	Minnesota State University Moorhead
Project Management	Certificate	60 contact hours		University of Minnesota
Prototype Engineering	Certificate	13	F2F	Minnesota State College Southeast
Quality Assurance	Certificate	16	F2F	Hennepin Technical College
Right Skills Now for Manufacturing	Certificate	19	F2F	Dunwoody College of Technology
Robotic and Laser Welding	Certificate	18	F2F	Anoka Technical College
Robotic Arc Welding	Certificate	19	F2F	Hennepin Technical College
Robotic Human Machine Interface	Certificate	10	F2F	Central Lakes College
Robotic Manufacturing	Certificate	18	F2F	Central Lakes College
Robotic Offline Programming	Certificate	9	F2F	Central Lakes College
Robotic Vision	Certificate	10	F2F	Central Lakes College
Robotic Welding	Certificate	12	F2F	Central Lakes College
Robotic Welding	Certificate	16	F2F	Central Lakes College
Robotic Welding	Certificate	17	F2F	Saint Paul College
Scientific Injection Molding Specialist	Certificate	12	F2F	Hennepin Technical College
Structural Iron Fabrication and Repair	Certificate	22	F2F	Hennepin Technical College
Technology Manager	Certificate	15	F2F	Bemidji State University
Welding	Certificate	24	F2F	Lake Superior College
Welding	Certificate	16	F2F	Minnesota West Community & Technical College
Welding	Certificate	16	F2F	Ridgewater College
Welding	Certificate	16	F2F	South Central College
Welding Certificate	Certificate	17	F2F	Anoka Technical College



Welding Fabricator	Certificate	17	F2F	Anoka Technical College
Welding Manufacturing Technology	Certificate	17	F2F	Northland Community & Technical College
Welding Process Technology	Certificate	17	F2F	Northland Community & Technical College
Welding Technology	Certificate	32	F2F	Dunwoody College of Technology
Welding Technology	Certificate	30	Hybrid	Lake Superior College
Welding Technology	Certificate	17	F2F	Rochester Community and Technical College
Welding Technology	Certificate	30	Hybrid	Saint Paul College
Welding Technology	Certificate	16	F2F	Saint Paul College
Welding Technology	Certificate	30	Hybrid	St. Cloud Technical and Community College
Welding Technology	Certificate	30	Hybrid	Northland Community & Technical College
Welding Technology	Certificate	30	Hybrid	Northwest Technical College
Welding Technology	Certificate	30	Hybrid	Pine Technical & Community College

Diploma Programs

Program	Award	Credits	Delivery	Institution
Advanced CNC Machine Technology	Diploma	64	F2F	Anoka Technical College
Advanced Manufacturing Technology	Diploma	45	F2F	Pine Technical & Community College
Advanced Ultrasonic Testing Technology	Diploma	64	F2F	Ridgewater College
Automated Machinery Adjuster	Diploma	33	F2F	Hennepin Technical College
Automated Machinery Systems	Diploma	60	F2F	Hennepin Technical College
Automated Systems Technology Industrial Equipment Technician	Diploma	33	F2F	Pine Technical & Community College
Automation and Robotics Systems Technology	Diploma	64	F2F	Ridgewater College
CNC and Advanced Machining	Diploma	54	F2F	St. Cloud Technical & Community College
CNC Machine Tool	Diploma	58	F2F	Minnesota State College Southeast
CNC Precision Manufacturing Technician	Diploma	64	F2F	Ridgewater College
CNC Technician	Diploma	64	F2F	Hennepin Technical College
CNC Technologies	Diploma	48	F2F	Central Lakes College
CNC Toolmaking	Diploma	63	F2F	Saint Paul College
Computer Aided Design (CAD) Drafting Technologies	Diploma	33	Online	Minnesota State College Southeast
Computer Aided Drafting	Diploma	62	F2F	Rochester Community and Technical College
Computer Aided Drafting and Design	Diploma	64	Hybrid	Ridgewater College
Computer-Aided Mechanical Design	Diploma	59	F2F	St. Cloud Technical & Community College
Controls Engineering Technician	Diploma	60	F2F	Hennepin Technical College
Electrical Controls & Maintenance	Diploma	67	F2F	Mesabi Range College
Electromechanical Systems	Diploma	48	F2F	Saint Paul College
Electronic Technology	Diploma	32	F2F	Anoka Technical College



Electronics Technology	Diploma	66	F2F	Ridgewater College
Engineering CAD Technology	Diploma	64	F2F	Hennepin Technical College
Engineering CAD Technology	Diploma	60	F2F	Lake Superior College
Facilities Maintenance Engineer	Diploma	48	Hybrid	Century College
Fluid Power Engineering Technician	Diploma	66	F2F	Hennepin Technical College
Fluid Power Mechanic	Diploma	34	F2F	Hennepin Technical College
Hydraulic Engineering Technician	Diploma	64	F2F	Hennepin Technical College
Industrial Building Engineering and Maintenance	Diploma	44	F2F	Hennepin Technical College
Industrial Engineering Technician	Diploma	36	Hybrid	Dakota County Technical College
Industrial Maintenance and Mechanics	Diploma	72	F2F	Riverland Community College
Industrial Mechanical Technology	Diploma	60	F2F	Mesabi Range College
Intermediate Mechatronics Engineering Technology	Diploma	39	F2F	South Central College
Machine Operations	Diploma	32	F2F	Central Lakes College
Machine Production Technologist	Diploma	34	F2F	Lake Superior College
Machine Technology CNC Programmer	Diploma	64	F2F	Lake Superior College
Machine Tool Technology	Diploma	72	F2F	Alexandria Technical & Community College
Machine Tool Technology	Diploma	66	F2F	South Central College
Machine Tool Technology Foundation	Diploma	32	F2F	South Central College
Machining	Diploma	32	F2F	Riverland Community College
Machining Technician	Diploma	32	F2F	Ridgewater College
Mechanical Drafting, Design, & Engineering	Diploma	69	F2F	Alexandria Technical & Community College
Mechatronics	Diploma	66	F2F	Alexandria Technical & Community College
Mechatronics	Diploma	40	F2F	Central Lakes College
Mechatronics	Diploma	60	F2F	Hennepin Technical College
Mechatronics	Diploma	44	F2F	Minnesota West Community & Technical College
Nondestructive Testing Technology	Diploma	72	F2F	Ridgewater College
Plastics Engineering Technology	Diploma	36	F2F	Hennepin Technical College
Pneumatic Engineering Technician	Diploma	64	F2F	Hennepin Technical College
Precision Machining	Diploma	31	F2F	Minnesota State College Southeast
Precision Machining	Diploma	35	F2F	Minnesota West Community & Technical College
Process Controls Technician	Diploma	51	F2F	Ridgewater College
Robotics / Automated Systems Technology	Diploma	61	F2F	Central Lakes College
Tool and Die / Moldmaking	Diploma	64	F2F	Hennepin Technical College
Welding	Diploma	55	F2F	Hennepin Technical College
Welding	Diploma	65	F2F	Lake Superior College
Welding	Diploma	32	F2F	Minnesota West Community & Technical College
Welding	Diploma	64	F2F	Ridgewater College
Welding	Diploma	32	F2F	Riverland Community College



Welding (2 Semesters)	Diploma	32	F2F	Ridgewater College
Welding / Fabrication	Diploma	37	F2F	St. Cloud Technical & Community College
Welding and Fabrication	Diploma	45	F2F	Central Lakes College
Welding and Machining Technology	Diploma	33	F2F	South Central College
Welding and Machining Technology	Diploma	33	F2F	South Central College
Welding Manufacturing Technology	Diploma	31	F2F	Northland Community & Technical College
Welding Process Technology	Diploma	34	F2F	Northland Community & Technical College
Welding Technology	Diploma	36	F2F	Dakota County Technical College
Welding Technology	Diploma	33	F2F	Pine Technical & Community College
Welding Technology	Diploma	48	F2F	Saint Paul College
Welding Technology	Diploma	44	F2F	Alexandria Technical & Community College
Welding Technology	Diploma	34	F2F	Anoka Technical College
Welding Technology	Diploma	65	F2F	Mesabi Range College
Welding Technology	Diploma	34	F2F	Minnesota State College Southeast
Welding Technology	Diploma	36	F2F	Northland Community & Technical College

AS and AAS Programs

Program	Award	Credits	Delivery	Institution
Additive and Digital Manufacturing	AAS	60	Hybrid	Century College
Advanced Machine Production Technologist	AAS	60	F2F	Lake Superior College
Advanced Manufacturing Technology	AAS	60	F2F	Pine Technical & Community College
Applied Engineering Technology	AAS	60	F2F	Pine Technical & Community College
Applied Engineering Technology Biomedical	AAS	60	F2F	Anoka-Ramsey Community College
Automated Systems & Robotics	AAS	72	F2F	Dunwoody College of Technology
Automated Systems Technology	AAS	60	F2F	Pine Technical & Community College
Automation and Robotics System Technology	AAS	67	F2F	Ridgewater College
Automation Robotics Engineering Technology	AAS	60	F2F	Hennepin Technical College
Bicycle Design and Fabrication	AAS	60	F2F	Minnesota State College Southeast
Biomedical Equipment Technician	AAS	72	F2F	Anoka Technical College
Biomedical Equipment Technology	AAS	70	F2F	Dakota County Technical College
Biomedical Technology	AS	60	F2F	Anoka-Ramsey Community College
CNC and Advanced Machining	AAS	60	F2F	St. Cloud Technical & Community College
CNC Manufacturing Technology	AAS	69	F2F	Anoka Technical College
CNC Precision Manufacturing Technician	AAS	67	F2F	Ridgewater College
CNC Technician	AAS	72	F2F	Hennepin Technical College
CNC Technologies	AAS	64	F2F	Central Lakes College
Computer Aided Design (CAD) Drafting Technologies	AAS	60	Online	Minnesota State College Southeast



Computer Aided Drafting	AAS	72	F2F	Rochester Community and Technical College
Computer Aided Drafting and Design	AAS	67	Hybrid	Ridgewater College
Computer-Aided Mechanical Design	AAS	68	F2F	St. Cloud Technical & Community College
Electrical Controls & Maintenance	AAS	72	F2F	Mesabi Range College
Electronics Engineering Technology	AAS	72	F2F	Dunwoody College of Technology
Electronics Technology	AAS	60	F2F	Dunwoody College of Technology
Electronics Technology	AAS	60	F2F	Ridgewater College
Electronics Technology - Automated Systems	AAS	60	F2F	Northland Community & Technical College
Engineering	AS	60	F2F	Anoka-Ramsey Community College
Engineering	AS	60	Hybrid	Century College
Engineering CAD Technology	AAS	60	Hybrid	Century College
Engineering CAD Technology	AAS	72	F2F	Hennepin Technical College
Engineering CAD Technology	AAS	67	F2F	Lake Superior College
Engineering Drafting & Design	AAS	72	F2F	Dunwoody College of Technology
Engineering Technology	AAS	60	Hybrid	Northwest Technical College
Facilities Maintenance Engineer	AAS	60	Hybrid	Century College
Fluid Power Engineering Technician	AAS	72	F2F	Hennepin Technical College
Hydraulic Engineering Technician	AAS	60	F2F	Hennepin Technical College
Industrial Controls & Robotics	AAS	60	F2F	Dunwoody College of Technology
Industrial Mechanical Technology	AAS	60	F2F	Mesabi Range College
Industrial Systems Technology	AAS	60	F2F	Hibbing Community College
Instrumentation & Process Control	AAS	60	F2F	St. Cloud Technical & Community College
Machine Technology CNC Programmer	AAS	71	F2F	Lake Superior College
Machine Tool Technology	AAS	72	F2F	Dunwoody College of Technology
Machine Tool Technology	AAS	72	F2F	South Central College
Manufacturing Engineering Technology	AAS	60	F2F	Hennepin Technical College
Manufacturing Process Technology	AAS	60	F2F	Northland Community & Technical College
Mechanical Drafting, Design, & Engineering	AAS	72	F2F	Alexandria Technical & Community College
Mechatronics	AAS	72	F2F	Alexandria Technical & Community College
Mechatronics	AAS	60	F2F	Minnesota West Community & Technical College
Mechatronics	AAS	60	F2F	St. Cloud Technical & Community College
Mechatronics Engineering Technology	AAS	60	F2F	South Central College
Mechatronics Technology	AAS	60	F2F	Minnesota State College Southeast
Nondestructive Testing Technology	AAS	72	F2F	Ridgewater College
Pneumatic Engineering Technician	AAS	60	F2F	Hennepin Technical College
Precision Machining	AAS	60	F2F	Minnesota West Community & Technical College
Process Controls Technician	AAS	60	F2F	Ridgewater College



Robotic & Electronic Engineering Technology	AAS	72	F2F	Anoka Technical College
Robotics / Automated Systems Technology	AAS	70	F2F	Central Lakes College
Robotics and Automation Technology	AAS	60	F2F	St. Cloud Technical & Community College
Special Electronics Technician	AAS	72	F2F	Anoka Technical College
Tool and Die / Moldmaking	AAS	72	F2F	Hennepin Technical College
Welding	AAS	72	F2F	Ridgewater College
Welding & Metal Fabrication	AAS	72	F2F	Dunwoody College of Technology
Welding and Fabrication	AAS	60	F2F	Central Lakes College
Welding Technology	AAS	66	F2F	Anoka Technical College

Bachelors Programs

Program	Award	Credits	Delivery	Institution
Applied Engineering	BAS	120	F2F	Bemidji State University
Applied Management	BAS	120	F2F	Bemidji State University
Manufacturing Operations Management	BASc	120	F2F	University of Minnesota
Manufacturing Management	BMM	120	All	University of Minnesota Crookston
Quality Management	BMM	120	F2F	University of Minnesota Crookston
Design	BS	128	F2F	Bemidji State University
Engineering Technology	BS	120	F2F	Bemidji State University
Project Management - Construction	BS	120	F2F	Bemidji State University
Project Management - Operations	BS	120	F2F	Bemidji State University
Project Management - Product	BS	120	F2F	Bemidji State University
Manufacturing Engineering Technology	BS	128	F2F	Minnesota State University Mankato
Operations Management	BS	120	F2F	Minnesota State University Moorhead
Project Management	BS	120	F2F	Minnesota State University Moorhead
Manufacturing Engineering	BS	109	F2F	St. Cloud State University
Manufacturing Engineering Technology	BS	102	F2F	St. Cloud State University
Engineering Management	BS	137	F2F	University of Northwestern - Saint Paul
Mechanical Engineering	BSME	109	F2F	St. Cloud State University

Masters Programs

Program	Award	Credits	Delivery	Institution
Engineering Management	MEM	33	F2F	St. Cloud State University
Manufacturing Engineering Technology	MS	34	F2F	Minnesota State University Mankato
Manufacturing Engineering	MS	30	F2F	University of St. Thomas
Manufacturing Systems	MS	39	F2F	University of St. Thomas
Manufacturing Systems Engineering	MS	39	F2F	University of St. Thomas
Engineering Management	PSM	32	F2F	Minnesota State University Mankato

Other Programs

Program	Award	Credits	Delivery	Institution
Engineering Technology	Minor	18	F2F	Bemidji State University
Facility Management	Minor	19	F2F	University of Minnesota
Global Supply Chain Management	Minor	21	F2F	Minnesota State University Moorhead
Manufacturing Engineering Technology	Minor	16	F2F	Minnesota State University Mankato
Manufacturing Operations Management	Minor	16	F2F	University of Minnesota
Operations Management	Minor	18	F2F	Minnesota State University Moorhead
Project Management	Grad Certificate	12	F2F	Minnesota State University Mankato
Project Management	Minor	18	F2F	Bemidji State University
Project Management	Minor	21	F2F	Minnesota State University Moorhead
Quality Management Systems	Grad Certificate	15	F2F	Minnesota State University Mankato
Engineering Technology	Minor	18	F2F	Bemidji State University



The following institutions have no known manufacturing programs: Academy College, Adler Graduate School, Augsburg (Pre-Engineering), Bethany Global University, Bethany Lutheran College, Capella University, Carleton College, College of Saint Benedict – Saint John’s (Pre-Engineering), College of St. Scholastica, Concordia College, Concordia University Saint Paul, Crown College, Fond du Lac Tribal and Community College, Gustavus Adolphus (Pre-Engineering), Hamline University, Leech Lake Tribal College, Luther Seminary, Macalester, Martin Luther College, Mayo Clinic College of Medicine and Science, Minneapolis College of Art and Design, Mitchell Hamline School of Law, North Central University, Northwestern Health Sciences University, Normandale Community College, Oak Hills Christian College, Rainy River Community College, Southwest Minnesota State University, Saint Mary’s University of Minnesota, St. Catherine University, St. Olaf College, United Theological Seminary of the Twin Cities, University of Minnesota Rochester, Vermillion Community College, White Earth Tribal and Community College, and Winona State University.

Program Awards

In the 2017-2018 academic year, there were 3,358 manufacturing education awards statewide. Data on Minnesota program completers was gathered from *JobsEQ*, a Software as a Service (SaaS) platform that provides labor market data. The most recent data set available was from the 2017-2018 academic year. Eighty-seven SOC codes were matched to 24 distinct CIP codes, showing alignment between academic programs of study and various manufacturing occupations. Care was taken to include all SOC codes for manufacturing programs of study that were identified in the inventory of manufacturing education programs detailed in the last section of this scan.

Certificates and Degrees Awarded in 2017-2018 Academic Year by Level:²⁰

Certificate <1 Year	574
Certificate +1 but <2	482
Associate's	740
Certificate 2+ but <4 Year	216
Bachelor's	950
Post-Baccalaureate	26
Master's	339
Total	3,358

Certificates and Degrees Awarded in 2017-2018 by Program:

Welding Technology/Welder	621
Mechanical Engineering	593
Project Management	312
CNC Machinist Technology/CNC Machinist	233
Automation Engineer Technology/Technician	231
Operation Management and Supervision	212
Manufacturing Engineering Technology/Technician	174
Pre-Engineering	158
CAD/CADD Drafting and/or Design Technology/Technician	136
Machine Tool Technology/Machinist	80
Industrial Mechanics and Maintenance Technology	73
Engineering/Industrial Management	72
Industrial Technology/Technician	72
Electrical, Electronic and Communications Engineering Technology/Technician	65
Manufacturing Engineering	54
Instrumentation Technology/Technician	53
Biomedical Technology/Technician	49
Plastics and Polymer Engineering Technology/Technician	44
Robotics Technology/Technician	38
Logistics, Materials, and Supply Chain Management	33
Engineering Technology, General	23
Machine Shop Technology/Assistant	17
Quality Control Technology/Technician	11
Tool and Die Technology/Technician	4

²⁰ Jobs EQ, RealTime Talent, 2020



Youth Interest

Middle and high school students of today will be filling the jobs of tomorrow. Their level of interest in manufacturing is a strong indication of the level of success manufacturers may have in filling their talent pipeline over the next decade.

Prior research on youth interest conducted by the Center in 2015 indicated an alarmingly low level of interest in youth in manufacturing careers. Two data sources that the Center examined were *First Career Steps Survey: Student Career Interests* and *Student Paths Career Interest Survey*. These data sources indicated youth interest in manufacturing careers to be as low as three percent.

A fresh look at current data sources reveal a much more positive outlook, with 27 percent of Generation Z individuals saying they would consider working in the manufacturing industry. Even with this increase, the need for additional outreach is still indicated, particularly among populations such as minorities and females, which are underrepresented in the manufacturing workforce.

Members of Generation Z are hearing the message that manufacturing offers rewarding career opportunities. That is the finding of a survey by Leading2Lean (L2L), which says **32 percent of young Americans ages 18-22 have had manufacturing suggested to them as a career option, compared to 18 percent of Millennials and only 13 percent of the general population**. The L2L Manufacturing Index also found that a majority (59 percent) of Generation Z agrees trade schools offer promising career opportunities for high school students.

Generation Z

*56% would consider working
in the tech industry.*

*27% would consider working
in the manufacturing industry.*

Source: Leading2Lean, July 30, 2019

Youth Outreach

Youth outreach is an important strategy to increase the manufacturing talent pipeline. Dream It. Do It. Minnesota has led several outreach initiatives, with major work including the Statewide Tour of Manufacturing, the Dream It. Do It. Minnesota Digital Badge Pathway, and a female recruitment project.

The Center has provided outreach funding to college partners throughout the state. Partners use the funding to implement a variety of outreach activities using Dream It. Do It. Minnesota career exploration materials and resources. During the 2019 academic year (fall 2018-spring 2019) with leveraged funding from Minnesota State Colleges and Universities, the Center funded 28 youth outreach initiatives promoting manufacturing careers to 19 colleges with funding totaling \$183,519. Fall 2018 included 11 awards to 8 colleges where 989 students and adult influencers participated in manufacturing career exploration events. Spring 2019 included 17 events, including 3 female focused events, to 11 colleges, and impacting 2,390 individuals. The number of high school students accessing Dream It. Do It. Minnesota career exploration materials, integrated into these and other high school career exploration efforts, has significantly increased. Comparing Winter/Spring 2018 to Winter/Spring 2019, the number of high school participants increased 23 percent.

In addition to Youth Outreach college partner events, the Center sponsors large regional youth events throughout the state, such as the State Vex Robotics tournament, Stem Day at the Fair, Trap Shooting Tournaments, and career expos. These events attract thousands of youth and parents. The Dream It. Do It. Minnesota branding and career information has been strategically integrated into these events, including a variety of displays and media designed to capture contact information and promote careers in manufacturing.

With the sunset of the Manufacturing Institute's Dream It. Do It. brand, the Center is launching its own campaign, Minnesota Manufactured. The new campaign will build on the best practices established under the historic Dream It. Do It. campaign, while bringing new energy and a fresh look to manufacturing career promotion.

Statewide Tour of Manufacturing

The Center has led the Dream It. Do It. Minnesota Statewide Tour of Manufacturing for several years. This annual, statewide event is built on a strong public-private partnership that leverages the contributions of numerous partners, including industry, manufacturing associations, Minnesota Department of Economic Development, manufacturing program faculty, and regional leaders and chamber of commerce directors.

Through their years of experience in implementing the event, the Center has perfected the planning process and has created planning templates, as well as established best practices. These resources have been refined annually and are available to businesses, schools, organizations, and communities who want to expose youth and influencers to today's manufacturing industry.

Tour of Manufacturing resources include a Host Toolkit, Community Tour Guide, Manufacturers Tour Guide, Teachers Tour Guide, press releases, public service announcements, radio advertisements, parent letters, flyers, posters, and the Tour of Manufacturing website. The website provides a place for manufacturers to register their tour, promotes attendance, and provides a mechanism to follow up with manufacturers after the tour. Follow up has been an essential component of refining the tour and evaluating its impact.

The Center executes a robust promotional campaign each year to encourage manufacturers to open their doors and participate in promoting the industry and careers in manufacturing. The Center offers



funding to schools for field trips to tour a manufacturing facility and uses that opportunity to engage educators to utilize the teacher guide curriculum, manufacturing career tool, career videos and our badge pathway resource.

Through the follow up that has been done and evaluation, the tours have been shown to be an effective strategy for changing the perception of the industry. Manufacturers have seen a direct connection to the talent pipeline.

Manufacturer comments on Tour of Manufacturing:

- *“Opening our doors for tours has recently shown a return on that time and investment. We just hired a full-time person who participated in a tour a few years back. He has since graduated from a technical program and will soon be part of our team, all because of his experience touring our facility.”*
- *“Partnering with Dream It. Do It. Minnesota is just one way we get involved to address the issues facing manufacturing today. We have seen the return on investment, as youth that once toured have pursued certifications and are now a part of our team.”*



Tour of Manufacturing Toolkits and Guides



DREAM IT, DO IT! MN STATEWIDE TOUR OF MANUFACTURING SPONSORS

PLATINUM LEVEL SPONSORS:



The Host Toolkit is designed to help hosts plan, promote, and host a tour, including step-by-step instructions for planning, implementing, and follow-up.



We are so glad that you are interested in organizing a community tour during the Dream It, Do It! Minnesota Statewide Tour of Manufacturing! This guide provides valuable tips for creating your own successful Community tour!

Q & A

WHAT IS A COMMUNITY TOUR?

A group of manufacturers in a city or region come together to organize tours for the public.

WHY HOST A TOUR?

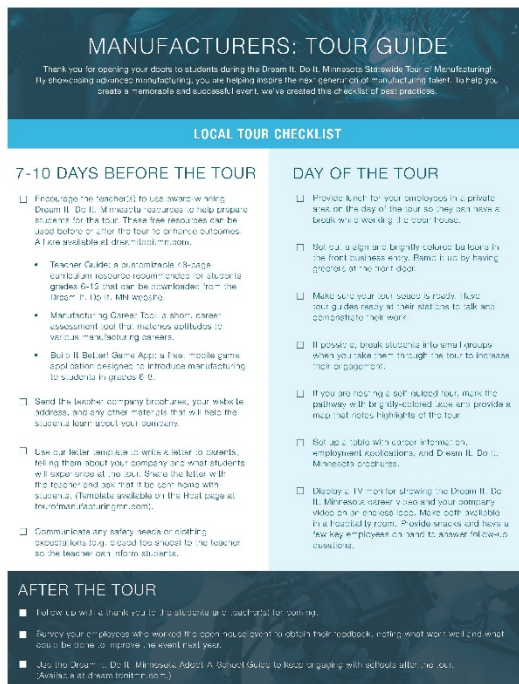
Hosting a community tour allows manufacturers to add resources and spread the word about the many rewarding career opportunities in manufacturing.

WHO SHOULD BE INVOLVED?

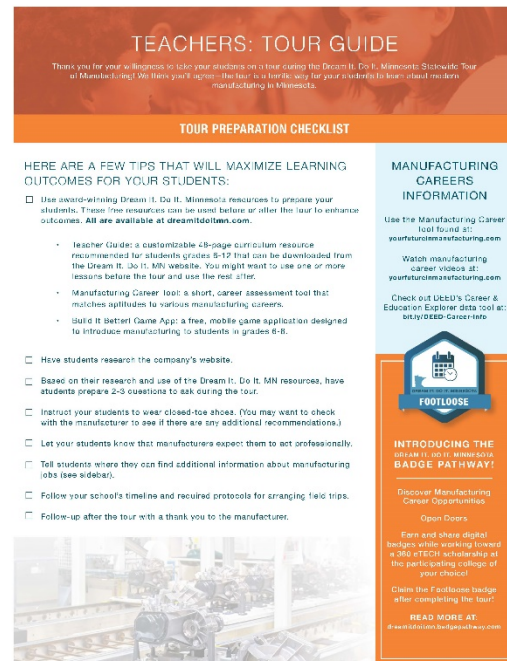
- Manufacturers
- Manufacturing Associations
- K-12 Schools & Colleges
- Chambers of Commerce
- City/Regional Agencies
- Media
- Funding/Sponsor Sources



The Community Tour Guide provides best practices for communities who want to implement a community-wide event involving multiple manufacturers.



The Manufacturers Tour Guide provides checklists for 7-10 days before the event and for the day of the tour.



The Teachers Tour Guide provides information that will help teachers maximize the learning for their students.



Female Recruitment into Manufacturing

Females are entering manufacturing careers in greater numbers but continue to be underrepresented in the industry. In Minnesota, 29.3 percent of manufacturing employees are female.²¹ The Center has researched best practices in recruiting female candidates into manufacturing and has developed targeted outreach materials, as well as a female scholarship program.

Outreach Materials

Outreach materials feature images of women in a variety of production and management roles. Embedding messaging has been tested and shown to resonate with female audiences. Manufacturing careers are depicted as clean, high-tech, and meaningful. Print and digital media (including video) have been used to full advantage. These outreach materials have been widely used in manufacturing outreach events targeted to females. The effort has been extremely successful, with the number of girls participating in outreach events increasing by 755 percent over the previous year.²²



Female Scholarships

The Center has led an effort to create a scholarship program for females. Colleges participating in the program will be incorporating a minimum of two female-focused scholarships annually. The scholarship plan has gained support from Minnesota State Colleges and Universities.

Digital Badge Pathway for Manufacturing Career Exploration

The Center has created a new way for youth in grades 7-12 to explore manufacturing careers. The Dream It. Do It. Minnesota Digital Badge Pathway is an initiative designed to create a rewarding pathway for youth to learn about the manufacturing industry and careers at their own pace. Because the badge pathway is completely online and digital, it is easily accessed. Youth can earn badges for manufacturing-related activities and add them to a digital badge backpack. Youth who earn a minimum number of badges are eligible to apply for a 360 eTECH scholarship valued at \$4,000. Since launching the badge pathway in 2017, 353 accounts have been created and 637 badges have been earned.²³



²¹ Minnesota Department of Employment and Economic Development, 2018

²² National Science Foundation, Year Three Annual Report, August 31, 2019

²³ Current as of May 7, 2020



An Introduction to Manufacturing Teacher Guide

The teacher guide, entitled “Introduction to Manufacturing in Minnesota,” was first published in 2015. Since then, teachers across the United States have used the guide to teach their students about manufacturing. Since it was first introduced, it has been updated to include more hands-on activities that appeal to a broader group of students, including girls. The curriculum is designed to be extremely flexible and can be embedded into a variety of other courses. Each chapter includes applicable education standards, teaching objectives, talking points, and various activities to engage a variety of student learning styles. High quality videos, featuring manufacturers from across Minnesota, help students to understand what careers in the industry look like. It can easily be adapted for grades 6-12.

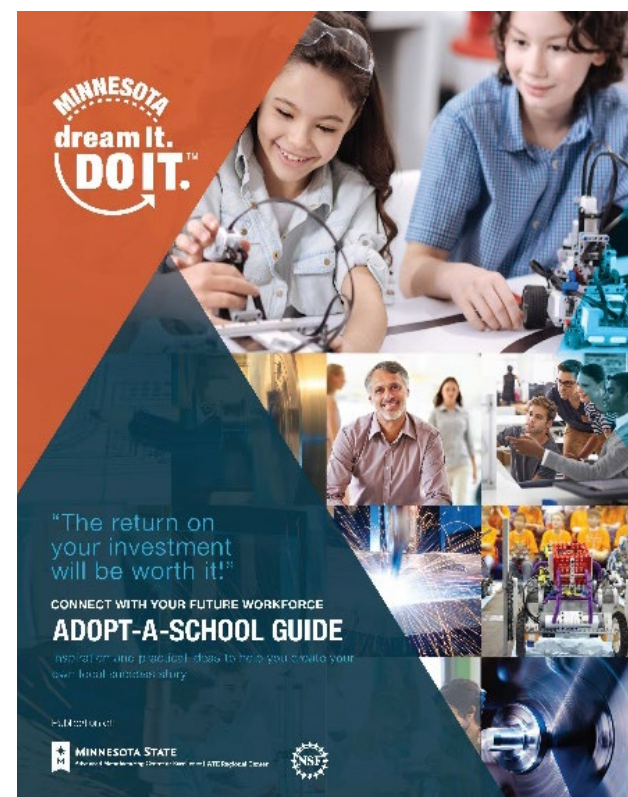
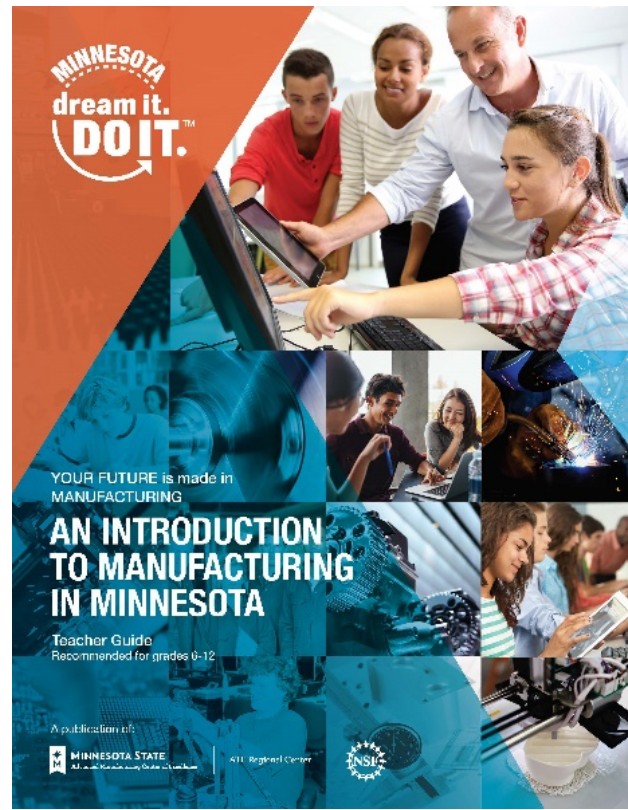
Several of the badges within the Dream It. Do It. Minnesota Digital Badge Pathway, described on the previous page, can be earned by completing activities in the guide, further enhancing the student experience, and potentially igniting student interest in manufacturing careers. Badges that can be earned with this curriculum include *Novice*, *Career Wise*, *Creator*, and *Map Maker*.

Adopt-A-School Guide

The Adopt-A-School Guide is a resource for manufacturers that provides examples and best practices for manufacturers to use with their local school. The practical advice presented in the guide helps manufacturers understand who to talk to in their local school, ways they can support the school, suggestions for starting a conversation with local educators, and examples that have proven successful in other communities, such as planning a career day, hosting an open house, mentoring, classroom presentations, and work-based learning, to name a few.

Robotics Guide

The Robotics Coaching Guide is a resource for robotics teachers and coaches that provides best practices for engaging local manufacturing businesses in support of robotics teams.





Manufacturing Career Tool

The Manufacturing Career Tool resides at yourfutureinmanufacturing.com. Site visitors can learn about manufacturing careers and discover which careers may be a good fit, based on their answers to a short quiz. The site provides additional career guidance through short videos which feature a diverse group of manufacturing employees. These employees talk about their careers and provide a glimpse into what a day on the job looks like. The website also features several Minnesota manufacturing companies, career and salary information, as well as links to education partners who provide manufacturing education programs.

High School Education

Concurrent Enrollment and PSEO Using 360 eTECH

The Center's CMAE curriculum, commonly known as 360 eTECH, is comprised of two certificate programs, described in detail on pages 95-98. The curriculum can easily be delivered to high school students through post-secondary enrollment options (PSEO) or through concurrent enrollment. The curriculum is delivered as asynchronous online classes except for four welding courses that feature a hybrid format.

Students who complete these courses during high school are exposed to manufacturing careers, earn college credit, and following high school graduation, they have the choice of entering a manufacturing career or continuing their manufacturing education pathway at a post-secondary institution.

White Bear Lake Pilot Project

Overview

The Center is partnering with White Bear Lake High School (White Bear Lake, MN), Century College (White Bear Lake, MN) and Train, Inc., to establish two concurrent enrollment courses that are part of the Production Technologies certificate. Through these courses, students are introduced to a manufacturing career pathway and have the opportunity to earn college credit at the same time. Courses include: Manufacturing and Applied Engineering 1; and Manufacturing and Applied Engineering 2.

College in the High School: Manufacturing and Applied Engineering 1

This course builds critical thinking skills and a foundation for additional training opportunities in machining, manufacturing and engineering career disciplines. Instructional areas include accuracy of print reading, use of precision measuring instruments, and use of Computer-Aided Design and Modeling. Students experience applications to benchwork and Computer Numerical Control (CNC) machining. Students learn from industry leading experts and experience real world manufacturing processes provided by Trane's global controls business located in White Bear Lake. Upon completion of this course, students have an opportunity to take the Manufacturing Skill Standards Council's (MSSC) assessments and certification systems for safety and maintenance awareness. Students are eligible to receive concurrent enrollment college credit through Century College.

College in the High School: Manufacturing and Applied Engineering 2

This course introduces Computer Numerical Control (CNC) machining, machining software and related parametric modeling applications in addition to the process of part design, CNC programming and milling parts to specs. The curriculum emphasizes lean manufacturing principles, basic supply chain management, communication skills, customer service, quality management, and its components.



Students learn from industry leading experts and experience real world manufacturing processes provided by Trane's global controls business located in White Bear Lake. This course aligns with the Manufacturing Skill Standards Council's (MSSC) assessment and certification system for manufacturing processes and quality control. Students are eligible to receive concurrent enrollment college credit through Century College.

Other Outreach projects

The Center piloted a project with Pine Technical and Community College called *STEM Academy*. This one-day career camp provided 12 seventh and eighth graders from 5 local high schools the opportunity to fully manufacture their own personal fans by using techniques from several manufacturing processes. The students used CAD to design and a 3-D printer to model, cut material, study blueprints, and use multiple machines to produce the fans. Students then experienced welding by soldering iron to fuse wires together which then connected motors to the fans. Automation was introduced as topics of motor control and DC electricity then powered the fan motor. Feedback from the students and schools was positive and plans for future Manufacturing STEM days are planned. The college instructors built the experience in such a way that smaller 2-hour, specific process-based experiences can quickly be used in order to offer flexible manufacturing career/STEM experiences. The learning activities and materials are available for other colleges or secondary schools.

Acknowledgements

Lead Author

Michelle Landsverk, President, Landsverk and Associates, was commissioned by Minnesota State Advanced Manufacturing Center of Excellence to conduct this environmental scan and was its lead author. Ms. Landsverk has been involved with economic development in the northwest region of the state for the past twenty years, and with higher education projects for the last 11 years, helping to design and implement several projects of regional and statewide impact.

Co-Author

Jeremy Leffelman is the Executive Director of Minnesota State Advanced Manufacturing Center of Excellence, led by Bemidji State University. Mr. Leffelman has held the position of Executive Director of the Center since 2016.

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